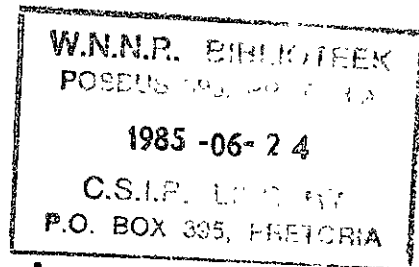


i) ~~Cat~~
ii) ~~Ref~~ Stacks



Terrestrial ecology in South Africa - project abstracts for 1980-1981

64

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PREFACE

The Committee for Terrestrial Ecosystems of the National Programme for Environmental Sciences was formed in 1973 to promote and coordinate research relating to problems in the terrestrial environments of South Africa. One of the Committee's specific responsibilities is the promotion of communication between scientists involved in terrestrial ecological research. Towards this end a series of annual abstract collections has been published since 1978. The present collection is not considered comprehensive as several research groups had not submitted abstracts by the last deadline - it is probable, however, that at least eighty per cent of relevant projects are included.

ABSTRACT

Abstracts are provided for research projects conducted during 1980-1981 in South African terrestrial ecosystems. The abstracts are arranged alphabetically according to author name and a keyword index is provided.

SAMEVATTING

Samevattings vir navorsingsprojekte wat gedurende 1980-1981 binne Suid-Afrikaanse landekosisteme uitgevoer is, word voorsien. Die samevattings is alfabeties volgens die name van outeurs gerangskik en 'n sleutelwoordindeks word voorsien.

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GUIDE TO CONTRIBUTORS

The purpose of this abstract collection is to provide local and overseas ecologists with a comprehensive yet succinct review of research activities in South African terrestrial ecosystems. The value of the annual editions of this series will depend both on the quality of reporting and on the speed of submission, editing and publication.

The previous editions have been delayed due to the late submission of abstracts and to the need to edit a large proportion of those submitted. In future only abstracts which have been correctly prepared will be accepted for publication.

Only research projects investigating aspects of the distribution, structure and functioning of South African terrestrial ecosystems and their components should be reported on. Projects initiated, continuing or completed during the calendar year under review should be described. Abstracts may be submitted in English or Afrikaans, although only English keywords will be used.

The following information must be submitted for each project:

Author/s name/s: Surname and initials

Postal address: Current postal address, including postal code

Project title and duration: Full descriptive title of the project as registered with the author's organization. File numbers should not be included. If the project is divided into a series of sub-projects these should be reported on separately under the master title. The year of commencement and expected termination must be cited.

Project description: A brief outline of the project objectives, methods, results and conclusions should be given. This description should not exceed 250 words.

Keywords: An alphabetical listing of keywords, which should include the province, biome and where appropriate, taxonomic group, research field, problem type, etc should be provided.

Publications: A listing of publications which have resulted from the project should be included.

ABSTRACTS

ALLEN-ROWLANDSON T

(Institute of Natural Resources, University of Natal, P O Box 375, Pietermaritzburg 3200)

The population dynamics and habitat preferences of the bush-buck *Tragelaphus scriptus* and common duiker *Sylvicapra grimmia* in Weza State Forest, Natal (1980-1983)

The project has four major objectives:

- (i) To determine the present status of bush-buck and duiker in Weza State Forest, which will include the development of reliable population monitoring techniques.
- (ii) To determine the distribution, movements and habitat preferences of these two species, their feeding ecology and level of interspecific competition.
- (iii) To determine the extent to which these movements, habitat preferences, and feeding strategies may affect and be influenced by forestry management practices.
- (iv) To determine the proportions of these populations that may be utilized, for trophy hunting and/or meat production, on a sustained yield basis.

Population trend is being assessed through repeated censusing using various techniques. Results emanating from these will be compared and the most reliable and feasible methods will be recommended for subsequent use by Department of Forestry personnel once the project has been completed.

Data concerning population structure, reproduction, condition, growth and diet are obtained from field observations and destructive sampling. Radiotelemetry will be employed to determine the movements and habitat preferences of these two species.

Browsing damage to marked seedlings and young plants is monitored regularly to determine the impact bush-buck and duiker have on commercially important timber species.

Keywords: bush-buck, duiker, forest biome, habitat preference, management, Natal, plantations, population dynamics, radio tracking, utilization

AUCAMP A J

(Döhne Agricultural Research Station, Private Bag X15, Stutterheim 4930)

Clipping trial to determine production and quality of the grasses at four levels of nitrogen at Woodbury, Komga (1976-1981)

Keywords: grass, nitrogen, production, savanna

AUCAMP A J

(Döhne Agricultural Research Station, Private Bag X15, Stutterheim 4930)

The introduction and evaluation of promising pasture species in the Eastern Cape: serial and regrowth clipping of star grass to determine growth pattern at Woodbury (1976-1980)

Keywords: Eastern Cape, pasture evaluation, pasture introduction, savanna, star grass

AUCAMP A J

(Döhne Landbounavorsingstasie, Privaatsak X15, Stutterheim 4930)

Optimale ontwikkeling en benutting van die droë gras/bosgemeenskap van die Oos-Kaapstreek: evaluasie van die produksiepotensiaal van 'n Acacia/grasgemeenskap/Optimal development and utilization of the dry grass/bush communities of the Eastern Cape Region: evaluation of the production potential of an Acacia/grass community (1977-1981)

Keywords: bush communities, Eastern Cape, grass, production, savanna

AUCAMP A J

(Döhne Agricultural Research Station, Private Bag X15, Stutterheim 4930)

Optimal development and utilization of the dry grass/bush communities of the Eastern Cape Region: species preference and production of grasses at the Adelaide experimental site (1979-1982)

Keywords: bush communities, Eastern Cape, grass, production, savanna, species preference

AUCAMP A J

(Döhne Landbounavorsingstasie, Privaatsak X15, Stutterheim 4930)

Die invloed van Acacia karroo op voerproduksie/The influence of Acacia karroo on forage production (1977-1981)

Keywords: Acacia karroo, forage production, savanna

BATE G C and D DU PREEZ

(Department of Botany, University of Port Elizabeth, P O Box 1600, Port Elizabeth 6000)

Mineral cycling in Burkea savanna (1981)

The contents of mineral elements in the leaves, wood, bark, twigs and floral structures of Burkea, Terminalia, Ochna, Digitaria and Eragrostis

were determined, as were the contents of the same elements in the soils down to a depth of 1 m.

The content of most minerals in the heart wood was low, registering only a trace. Immediately under the bark in the region of the cambium, however, the contents were very much higher. This means that in order to assess the total content of minerals in the standing vegetation a cross-sectional analysis of stems is required, followed by integration.

Although a comprehensive study of roots was not made, those with a diameter of less than 1 mm showed a higher nutrient content than the larger roots. The nutrient contents of these fine roots were higher than those of the leaves.

The highest content of all minerals measured in leaves did not necessarily coincide. For example, in Burkea, the highest content of K was present two weeks after flushing. P was highest in the buds while S and MG peaked in mid- to late November.

In the case of exchangeable K in the soil, the amount was shown to decrease as a power function with increasing depth ($R^2 = 0,94$).

Using MG as an example, the amount of this nutrient (exchangeable) in the soil was calculated to be $204,89 \text{ kg ha}^{-1}$. The total in the aboveground parts of the major tree species which make up the bulk of the biomass, amounted to only $7,4 \text{ kg ha}^{-1}$. If the aboveground biomass content is doubled to account for the roots, then the total amount of MG in the plant material will be less than 10% of the total exchangeable MG in the system. Using these data together with those reported by Bate and Gunton (see below) for nitrogen, it is necessary to conclude that the Burkea savanna is not limited with respect to nutrients.

Keywords: calcium, leaching, magnesium, phosphorus, potassium, savanna, soils, sulphur

BATE G C and GUNTON
(Department of Botany, University of Port Elizabeth, P O Box 1600,
Port Elizabeth 6000)

Seasonal changes of nitrogen in soils and selected plant species in
Burkea savanna (1978-1981)

The total nitrogen in Burkea savanna can be divided into three categories:

- (i) Nitrogen in aboveground plant material.
- (ii) Nitrogen in belowground plant material.
- (iii) Nitrogen in the soil.

Quantities in the Burkea savanna were found to be as follows:

<u>Location</u>	<u>kg N ha⁻¹</u>	<u>% in system</u>
Plant above ground	162,9 (4,7)	4,6
Plant below ground	95,8 (6,2)	2,7
Total soil	3273,0	92,7

Estimated total N in the system: 3532 kg N ha⁻¹

Of the aboveground N in plants, approximately 86% was due to trees, 4% due to grasses and 10% due to litter. Burkea africana contributes 59% of the nitrogen in the trees and is therefore the largest single pool of N in the plant system.

Total soil nitrogen was calculated by extrapolating power-fit depth curves down to 1 m. It has been calculated that an accurate study of nitrogen in Burkea savanna would require very intensive sampling. In order to be able to obtain a significant difference between depth (down to 225 mm), time of the year and sites (open vs under canopy), the approximate number required would be 100 samples per depth per site per month; ie 1000 samples per month if two sites and five depths are compared each month. For total N in plants, taking Burkea africana as an example to compare the change in N% in different plant parts with season (four seasons per year), 40 samples per plant part per season would be required.

These data give some idea of the difference in the variability of nitrogen levels in the system and the extent of any project required to produce results which would determine statistically significant results.

Keywords: Burkea africana, nitrogen, savanna

BERNARD R T F

(Department of Zoology, University of Natal, P O Box 375,
Pietermaritzburg 3200)

Female reproduction in five species of Natal cave-dwelling
Microchiroptera (1977-1980)

This study was performed on Miniopterus schreibersi, M fraterculus, Myotis tricolor, Hipposideros caffer, and Nycteris thebaica, the aim being to describe the female reproductive process (follicular development, growth, and atresia and monthly changes in the ovaries, uterine horns and vagina) and the female reproductive cycle for each species.

The four genera use different reproductive strategies to overcome the problem presented by the cool, dry winter experienced in the study area. In the two Miniopterus species copulation, ovulation, and fertilization occurred in autumn, implantation was delayed during winter hibernation, and parturition occurred in December. In Myotis tricolor copulation occurred in autumn and spermatozoa were stored in the uterus until ovulation in early spring. Parturition occurred in December. In Hipposideros caffer copulation, ovulation, and fertilization occurred in autumn and implantation occurred normally. Embryonic development was

retarded during winter hibernation and parturition occurred in December. Nycteris thebaica was the only species that did not hibernate in the study area and its reproductive cycle was normal with fertilization in June and parturition in November.

The climate of the study area is sufficiently temperate to make modifications to the reproductive cycle a prerequisite for survival. In Nycteris thebaica it is suggested that its specialized echolocation, flight, and feeding and the fact that this species does not hibernate enabled it to maintain a normal reproductive cycle.

Keywords: embryonic development, female reproduction, Hipposideros, Microchiroptera, Miniopterus, Myotis, Natal, Nycteris, sperm storage

BESTER J L

(Departement Dierkunde, Universiteit van Pretoria, Pretoria 0002)

Eto-ekologie en bestuur van die silwervos *Vulpes chama* met spesiale verwysing na die Oranje-Vrystaat/Ethoecology and management of the silver fox *Vulpes chama* with special reference to the Orange Free State (1977-1981)

Die doel van die projek is om inligting oor die ekologie en gedrag van die silwervos te bekom en dit toe te pas op die bestuur en bewaring van die dier.

Die bewegings van die vosse in die Soetdoring Natuurresewaat word vir een week per maand bestudeer met behulp van 'n radiotelemetriese apparaat. Tot dusver konsentreer die vosse in 'n klein area (wat ooreenstem met vorige inligting) en hulle loopgebiede oorvleuel baie in voorkeur-areas.

Veldwerk vir die bepaling van die roofpatroon en nisbekleding op plase is afgesluit. Ongeveer 100 maaginhoudmonsters is verwerk. Enkele aspekte van nisbekleding, aktiwiteit en voeding is met toestande in die Namib vergelyk.

Silwervos-speelgedrag stem baie ooreen met die van ander Canidae. Daar bestaan 'n hoë statistiese korrelasie tussen die frekwensies van die handelings van speelgedrag en die reaksies wat ontlok word van die twee ouderdomsgroepe vosse wat bestudeer is. Die optrede van die twee groepe vosse teenoor die ouers vertoon egter geen korrelasie of betekenisvolle verskille nie.

Alle houdings en uitdrukkings van die vosse se handelings is getabelleer en verskaf 'n verdere aanvulling van inligting oor die meganismes van kommunikasiegedrag van sosiale interaksies. Gevangenisskapstudies sluit hierby aan.

'n Bespreking van die dier asook die doel en motivering van die projek is afgehandel. Dele van die projek word gebruik vir 'n verslag van 'n kommissie van ondersoek na probleemdiere en onder omstandighede is dit

belangrik dat inligting so spoedig moontlik saam met ander probleem-dier-inligting verwerk en weergegee word.

Keywords: behaviour, carnivores, ecology, grasslands, management, Orange Free State, Vulpes chama

BIGALKE R C and K WILLAN

(Department of Nature Conservation, University of Stellenbosch, Stellenbosch 7600)

The effect of fire regime on mammal populations in fynbos at Jonkershoek and elsewhere (1979-1981)

Studies were undertaken on sampling methods for, and fire effects on small mammals in montane fynbos. The sampling methods study was divided into two major parts, namely studies on the relative efficiencies of Sherman and PVC live-traps and on the relative efficiencies of various baits, but tentative conclusions in respect of sampling layouts were also reached. Sherman and PVC traps were found to have complimentary capabilities, and it is recommended that they are used in conjunction with one another to obtain relatively unbiased field estimates. The most generally efficient bait was oats/raisins/sunflower oil, which was particularly effective for Otomys species, but oats/peanut butter/lard/candle wax was most efficient for shrews. Hence, it is recommended that in future studies two traps per station be used, one baited with each of these baits. A scheme whereby av D is calculated from data obtained on a 10 x 10 station grid and then applied to estimate the area sampled by 10 x 2 grids, was proposed. This scheme would couple maximum efficiency with minimum bias. Trap-spacing should be 15 m, the length of the trapping period four trap-nights, and the number of traps per station at least two. The fire effects study led to the hypothesis that productivity declines in middle-aged relative to young habitats, but increases as the vegetation becomes older.

Keywords: Cape Province, fire, fynbos, sampling methods, small mammals, trapping

BOSCH J M

(Jonkershoek Forestry Research Station, Private Bag X5011, Stellenbosch 7600)

Experimental studies into the effects of catchment management on streamflow in South Africa (1945-ongoing)

The objective of this project is to provide benchmark data on streamflow responses to management, as a foundation for trial and development of models. The first phase of this long-term project is due for completion by the end of 1982.

The influence of treatments on water yield are being investigated on several forested and natural veld catchments. Paired and multiple

catchment experiments at three sites in the Western Cape, one in the Natal Drakensberg, two in the Eastern Transvaal and one in the Northern Transvaal form the basis of this project.

Keywords: catchment management, Eucalyptus, fynbos, grassland, Pinus patula, Pinus radiata, riparian vegetation, streamflow

BOSHOFF A F

(The Lakes Nature Conservation Station, Private Bag X6546, George 6530)

Aspects of the ecology of the waterbirds of the Sedgefield-Wilderness lakes system (1979-1984)

Data is being collected on the species diversity, species richness, abundance, seasonality, habitat preference and feeding of the waterbirds of the Sedgefield-Wilderness lakes and estuarine system. This information will provide the basis for long-term monitoring of the habitat quality in the system. A major aim of the project is to draw up management proposals for the future conservation of the system.

Keywords: conservation, management, waterbirds, Wilderness lakes

BOSHOFF A F, C J VERNON and R K BROOKE

(The Lakes Nature Conservation Station, Private Bag X6546, George 6530)

Historical atlas of the diurnal raptors of the Cape Province (1979-1981)

Maps showing the past and present (1970s) distribution of 55 species of breeding and non-breeding diurnal raptor occurring in the Cape Province are presented. The compilation of the maps is such that any major range fluctuations that have taken place on a temporal basis are indicated. Almost a quarter of the species show a decrease, two show a small increase, while the rest show no change. The value of this information for long-term monitoring studies and for conservation purposes is mentioned, as are the limitations of the survey.

Keywords: Cape Province, conservation, diurnal raptors, species distribution

BOTHMA J DU P

(Eugène Marais Chair of Wildlife Management, Department of Zoology, University of Pretoria, Brooklyn, Pretoria 0002)

Ecology of the leopard in the southern Kalahari: a study of the movements, prey utilization, water use, hunting methods and general behaviour of the leopard in the Kalahari Gemsbok National Park (1975-ongoing)

Keywords: behaviour, Kalahari, leopard

BOUCHER C

(Botanical Research Unit, P O Box 471, Stellenbosch 7600)

A semi-detailed regional ecological study of the Western Cape foreland fynbos (1977-1989)

A preliminary vegetation map of the western foreland between the Berg River mouth and False Bay has been drawn. The 1:10 000 scale orthophoto maps were examined to map the boundaries of the strandveld, Coastal Fynbos and Coastal Renosterveld types on a scale of 1:250 000. These Veld Types were subdivided into twelve smaller categories. Some alterations were made to the accepted Veld Type boundaries, particularly near Saldanha Bay and the Cape Flats.

By 1972, agriculture, urbanization and the spread of introduced weeds had reduced the former extent of strandveld, Coastal Fynbos and coastal Renosterveld, south of the Berg River, to 41%, 14% and 6% respectively.

Only 0,2% of the original extent of strandveld in the western foreland is conserved, and only 0,01% of Coastal Fynbos and of coastal Renosterveld. Thus there is a very urgent need to preserve remnants of these Veld Types.

Keywords: Coastal Fynbos, coastal Renosterveld, fynbos, mapping, strandveld, vegetation map

BOUCHER C

(Botanical Research Unit, P O Box 471, Stellenbosch 7600)

Strand plant communities of the Western Cape (1977-1989)

Analysis of data collected during 1978 showed that the strand vegetation between Table Bay and the Orange River mouth can be divided into the Capensis and the Namaqualand regions, with the Olifants River mouth as boundary. Three groups of communities were distinguished in the Namaqualand and two in the Capensis strand regions.

A reserve along the Namaqualand coast is an urgent priority because extensive opencast diamond mining, which has destroyed large tracts of vegetation, is taking place there.

Keywords: Capensis, diamond mining, Namaqualand, strandveld, Western Cape

BOUCHER C

(Botanical Research Unit, P O Box 471, Stellenbosch 7600)

Vegetation transects through the Western Cape forelands (1977-1989)

The analysis of the transect data was not started during this year because the bulk of the outstanding specimen identifications have only recently been received.

Progress with the identification of specimens collected at the CSIR's research site near Pella, Atlantis was better and only 10% of the specimens are still unnamed. This research site is located along the Buck Bay to Bainskloof transect. The updating and analysis of data from this site have been completed and the preliminary communities reported on in the last report have been confirmed. Their description and the vegetation map can now be undertaken.

Structural data collected at the Pella site were analysed. The main categories identified from the floristic data were similar but the minor categories were found to be dissimilar, probably because structural features are not as variable in the Cape vegetation as the plant species are and because approximately half of the vegetation was in an immature state.

Keywords: Cape Province, Coastal Fynbos, forelands, fynbos, mapping, Western Cape

BOURQUIN O

(Natal Parks, Game and Fish Preservation Board, P O Box 662, Pietermaritzburg 3200)

Biology of the quail *Coturnix coturnix* (1975-1980)

A broad-based study of *Coturnix coturnix* are carried out in a study area located in the Natal midlands.

Keywords: ageing, biology, breeding, conservation, *Coturnix*, distribution, feeding, grasslands, management, migration, moulting, quail, taxonomy

BOURQUIN O and L RAW

(Natal Parks, Game and Fish Preservation Board, P O Box 662, Pietermaritzburg 3200)

The herpetofauna of Natal: a guide (1980-1984)

The objective of the project is to provide up-to-date information on identification, distribution, general ecology and conservation status of herpetofauna in Natal.

This will be done by literature perusal, the examination of museum and private collections and the collecting of specimens in the field.

Keywords: conservation, crocodile, distribution, frogs, herpetofauna, lizards, Natal, snakes

BOYCOTT R C

(Jonkershoek Nature Conservation Station, Private Bag X5014,
Stellenbosch 7600)

The distribution of *Heleophryne purcelli* Sclater (Anura: Leptodactylidae)
in the southwestern and southern Cape Province (1976-ongoing)

The aim of the project is to determine the distribution and taxonomic status of *Heleophryne purcelli* in the Cape Province.

With the acquisition of material from 66 localities throughout the Cape folded mountain belt the distribution of *H purcelli* in the southwestern and southern Cape has been accurately determined. As a result of extensive fieldwork in the southern Cape Province it has become apparent that the populations in this region to the east of the Gourits River could represent a species distinct from *H purcelli*. The marked difference in mating calls between the two forms is at present the only distinctive character separating them. As a result of this discovery more intensive work dealing with morphological and behavioural characteristics is required. An assessment of past taxonomic criteria is presently under review. A more comprehensive collection of tape recordings from *Heleophryne* localities in the eastern Langeberg and western Outeniqua mountain ranges is presently being compiled.

Keywords: amphibia, Cape Province, distribution, fauna, forests, fynbos, taxonomy

BRANCH W R

(Port Elizabeth Museum, P O Box 13147, Humewood 6013)

Aspects of the ecology of the angulate tortoise *Chersina angulata*
(1979-ongoing)

The ecology of *Chersina angulata* is being investigated on a 100 ha study site, composed of grazed pasture and coastal valley bushveld, in the Port Elizabeth region. Captured tortoises are weighed, measured, sexed and released after being marked with a coded notch on the marginal scutes. Recapture data are used to determine population dynamics and home range.

Observations on feeding, social interactions (particularly mating and male combat), and reproduction are also being compiled. Radiotelemetry studies of thermoregulation and short-term movements are also planned.

Keywords: ecology, feeding, fynbos, home range, populations, radiotelemetry, reproduction, tortoise

BRANCH W R

(Port Elizabeth Museum, P O Box 13147, Humewood 6013)

Aspects of the ecology of the spotted gecko *Pachydactylus maculatus* (1980-ongoing)

A large population of spotted geckos inhabit the Port Elizabeth study site. They utilize dead snail shells (*Achatina zebrina*) as refuges. Geckos are weighed, measured, sexed and marked by toe-clipping. Data concerning growth, movement and reproduction are being accumulated.

Keywords: ecology, gecko, growth, movement, reproduction

BREYTENBACH G J

(Saasveld Forestry Research Station, Private Bag X6531, George 6530)

A gradient analysis of animal communities on forest lands in the southern Cape and Tsitsikamma forest regions (1978-1982)

The distribution of small mammals, birds and insects along altitudinal gradients at three areas in the southern Cape were investigated. Fieldwork has been completed at two of the study areas (Robinson's Pass and Swartberg Pass).

Small-mammal data of the Swartberg Pass area have been analysed. Results show that foliage profiles and habitat diversity have an effect on alpha diversity and density of some of the species. *Praomys verreauxi* density for example, increases with increasing density of foliage between 140 cm and 200 cm above ground surface. This response is attributed to an increase in cover of proteoid species and hence seed availability.

Small-mammal beta diversity was fairly uniform along the gradient, but increased between habitats from different vegetation types. It must still be resolved whether this can be attributed to soil nutrient levels or plant structure.

Biomass of the small-mammal community was correlated to rainfall and hence probably primary productivity. Due to changes in species composition between sites, it seems that "density compensation" was taking place across trophic boundaries.

Keywords: Cape Province, density, diversity, forests, gradient analysis, small mammals

BREYTENBACH G J

(Saasveld Forestry Research Station, Private Bag X6531, George 6530)

Surveys and assessments of the fauna of forest and land catchments in the southern Cape and Tsitsikamma forest regions (1978-ongoing)

Locality records are kept of all vertebrates seen or collected on State Forest land.

Work is being done in conjunction with the Transvaal Museum, Port Elizabeth Museum and the Department of Nature and Environmental Conservation of the Cape Provincial Administration.

A small museum has been started and representative samples of all specimens are kept at Saasveld Forestry Research Station. Most specimens are, however, lodged at other museums, since Saasveld does not have the staff to undertake curatorial work on a large scale.

Keywords: Cape Province, forests, fynbos, survey, vertebrates

BROOKE R K

(Percy FitzPatrick Institute of African Ornithology, University of Cape Town, Private Bag, Rondebosch 7700)

Status of rare, vulnerable and endangered bird species breeding in South Africa

One hundred sixty-seven species have been proposed as rare, vulnerable or endangered breeding species as far as South Africa including the homelands, Bophuthatswana, Lesotho, Swaziland, Transkei and Venda are concerned. Methods for ranking these species to determine which require the expenditure of public funds to conserve them have been studied. It is hoped to produce a revised Red Data Book: Aves for South Africa at the end of 1981 based on such ranking and giving more up-to-date information than was available in 1976.

Keywords: birds, conservation, distribution, threatened species

BROOKE R K, J COOPER and T M CROWE

(Percy FitzPatrick Institute of African Ornithology, University of Cape Town, Private Bag, Rondebosch 7700)

Catalogue of the biota of the western islands

The objective of this project is to list the species of terrestrial plants and animals that live on South Africa's Western Cape offshore islands (which has never been done) with a view to zoogeographical analysis, historical ecological analysis and a future study of rates of faunal and floral turnover for which this will be the base line. Species richness increases with area at a greater rate than reported for any other group of islands in the world.

Keywords: biogeography, Cape Province, faunal survey, floral survey, islands, species richness

BROOKS P M
(Hluhluwe Game Reserve, P O Box 25, Mtubatuba 3935)

Movement patterns of ungulates in the Hluhluwe-Corridor-Umfolozi Complex (1975-1983)

Game removal from fairly small areas which are degraded is complicated by animal movements, in that areas designated for removal may be vacated by the time capture is to take place. The major objective is therefore to delimit subpopulation boundaries and to allocate species-specific game control units, which may be achieved by monitoring movement patterns. Secondary objectives include the mode of utilization of burns and the effectiveness of internal translocation of zebra and wildebeest to assist veld recovery in one area and provide greater utilization in another.

Keywords: ecology, fire, movement patterns, Natal, savanna, translocation, ungulates

BROOKS P M and K MEIKLEJOHN
(Hluhluwe Game Reserve, P O Box 25, Mtubatuba 3935)

Reintroduction of the Cape hunting dog *Lycaon pictus* into the Hluhluwe-Corridor-Umfolozi Complex (1979-1983)

A pack of nine hunting dogs was released into Hluhluwe Game Reserve in December 1980, and a further two packs are due for release in 1981. While in captivity, information on reproduction, growth, food consumption and health problems have been collected.

Keywords: ecology, food consumption, hunting dog, Natal, reintroduction, reproduction, savanna

BUTCHER S
(School of Environmental Studies, University of Cape Town, Private Bag, Rondebosch 7700)

Environmental changes at De Hoop Vlei (1980-1982)

This research project aims to assess the quantity of water in the De Hoop Vlei and determine what portion of this can be ascribed to runoff from the catchment. The recent history of recorded floods is examined in relation to agricultural factors in the catchment to assess whether this has had any effect on the De Hoop environment, in terms of quantity of runoff.

Keywords: agriculture, environmental changes, hydrological, lakes, runoff, vlei

CAMPBELL B M

(Botanical Research Unit, P O Box 471, Stellenbosch 7600)

Structural-functional classification of the vegetation of the mountains of the fynbos biome (1978-1982/3)

Keywords: classification, function, fynbos, structure

CODY M L and W R SIEGFRIED

(Percy FitzPatrick Institute of African Ornithology, University of Cape Town, Private Bag, Rondebosch 7700)

Species packing in diverse fynbos communities

The project comprises studies designed to test three hypotheses:

- (i) Beta diversity (the rate at which bird species change per unit habitat change) is controlled by habitat area with higher turnover rates across commoner habitats.
- (ii) Density compensation occurs in bird communities with varying species numbers.
- (iii) Species packing occurs in fynbos plants (Protea, Leucospermum and Leucodenron) which influence bird densities by complementary morphologies moulded by natural selection as co-varying values of stature, branching pattern, leaf size, shape, longevity and reproductive morphology of the plants.

Keywords: birds, fynbos, species diversity

COHEN M

(Department of Environment Affairs, Private Bag X313, Pretoria 0001)

Aspects of the biology and behaviour of the steenbok *Raphicercus campestris* in the Kruger National Park, Republic of South Africa

This study which is nearing completion deals with basic aspects of the biology and behaviour of steenbok, such as distribution and abundance, habitat selection, mother-infant behaviour, food and feeding behaviour and social organization. Daily and seasonal activity patterns, local movements and the histology of the intermandibular glandular region were also investigated.

The Kruger National Park formed the major study area. Comparative studies were undertaken on the Derdepoort Private Nature Reserve, Pretoria and the Suikerbosrand Nature Reserve near Heidelberg, Transvaal.

Subprojects included an investigation of several capture and marking techniques and the use of the mail and journal survey as a tool in wildlife management.

Keywords: activity pattern, capture techniques, distribution, feeding behaviour, histology, intermandibular gland, marking techniques, mother-infant

COHEN M

(Eugène Marais Chair of Wildlife Management, Department of Zoology, University of Pretoria, Pretoria 0002)

Behaviour and habitat preference of the steenbok in the Kruger National Park (1973-1981)

Keywords: behaviour, habitat preference, savanna, steenbok

COLLINSON R F H

(Institute of Natural Resources, University of Natal, P O Box 375, Pietermaritzburg 3200)

Evaluating techniques for estimating impala numbers on Natal farmland (1977-1981)

The objective of the study is to provide fieldworkers with sound guidelines for selecting, applying and evaluating techniques for estimating impala numbers on Natal farmland. Fundamental concepts, principles and technique options documented in the literature are being identified and condensed into a generalized and easily comprehensible framework. A strip transect technique (King's method) and a modified total count method are being evaluated with respect to their accuracy, precision and repeatability when applied to impala populations in the field. Finally, recommendations on the suitability and limitations of these two techniques for use by fieldworkers on Natal farmland are being made.

Keywords: Aepyceros melampus, census techniques, farmland, grasslands, impala, Natal

CONLONG D E

(23 Holmes Road, Umbilo, Durban 4001)

The responses of the grasslands on the eastern shores of Lake St Lucia to grazing, edaphic factors and fire (1979-1981)

The objective is to investigate the influence of grazing, edaphic factors, past human activities and fire on the eastern shores of Lake St Lucia. The data will be used to formulate a management plan for the area.

In the production study, aerial photographs, animal distribution maps and burning records were used to identify four study sites which were each tested for homogeneity before sampling commenced.

For the period September 1979-September 1980 production and grazing of the grasslands were estimated using an incremental harvest technique in combination with a system of exclosures. Soil and vegetation were sampled over this period for nutrient analyses.

Grazing pressure in all sites was found to be low and influenced markedly by fire and the drying up of pans. Nutrient studies are still to be completed.

In the ordination study, the southern half of the eastern shores was divided into high-lying, low-lying, and pan-bottom grassland, with the area of each being calculated. Sample quadrat size (4 x 4 m) was determined using the minimal area concept. The number of quadrats per grassland type was related to the area of the grassland, and within each the quadrats were positioned randomly.

For each quadrat, the species composition, together with an estimate of cover abundance, sociability and the amount of grazing was recorded during January 1981. Further soil samples for nutrient analyses were also collected.

The data will be analysed using Detrended Correspondence Analysis (an ordination programme) and Indicator Species Analysis (a classification programme) in order to define different grassland communities, and their causal factors.

Keywords: classification, Detrended Correspondence Analysis, eastern shores, edaphic factors, exclosures, fire, grasslands, grazing, hippopotamus, Indicator Species Analysis, Lake St Lucia, management, Natal, nutrient, ordination, pan, production, reedbuck

CRESSWELL C F and D ARIOVICH
(Department of Botany and Microbiology, University of the Witwatersrand,
P O Box 1176, Johannesburg 2000)

A classification of selected C₄ plants on the basis of initial products and decarboxylating enzymes as outlined by Hatch et al (1975), when grown under varying nitrogen conditions (1979-1982)

The study was carried out on the dominant grasses found at the Nylsvley study area namely Eragrostis pallens, Digitaria eriantha and Panicum maximum. The prime purpose was to investigate the relationship between the ultrastructure and the prime decarboxylation mechanism of these grasses.

Current work involves:

- (i) Detailed biochemical analysis of the photosynthetic decarboxylating pathways involved, on grasses grown under controlled environmental conditions and on grasses collected from the Nylsvley study site.
- (ii) Comparative study of the leaf surface features in the three grasses under investigation.

The aims of this study are:

- (i) To determine whether the C₄ decarboxylating enzymes of plants grown under controlled environmental conditions differed from field-grown plants.
- (ii) To determine the stomatal distribution of the three species and to relate this to photosynthetic and respiration rates of metabolites in P maximum, since preliminary work showed that P maximum grown on low nitrogen exhibits an extremely high number of starch grains in the photosynthetic organelles.

A comparative study of the photosynthetic decarboxylating enzymes showed significant differences between the field-grown grasses and those grown under controlled conditions. The enzymes which varied the most were aspartate aminotransferase and PEP carboxykinase.

These enzymes were found to respond to environmental growth conditions. This is supported by the fact that nitrogen nutrition and night temperature affected these enzymes. It is suggested that the C₄ pathway in the grasses investigated may vary with environmental changes, demonstrating a greater metabolic flexibility than indicated by the current C₄ subdivision system.

The highest average area occupied by stomata was found in D eriantha, intermediate values were found for E pallens and lowest values for P maximum. P maximum also showed the lowest number of stomata per mm² leaf. In the three grasses the adaxial surface stomata were relatively smaller than the abaxial surface stomata. These results will be related to photosynthetic and transpiration rates in these grasses, at present under investigation.

Keywords: aspartate aminotransferase, C₄ plants, decarboxylation, Digitaria eriantha, Eragrostis pallens, Panicum maximum, PEP carboxykinase, savanna, stomata

CRESSWELL C F and D ARIOVICH

(Department of Botany and Microbiology, University of the Witwatersrand,
P O Box 1176, Johannesburg 2000)

An investigation into the regulation of photosynthetic activity and starch content in *Panicum maximum* in relation to nitrogen and phosphorus nutrition (1979-1982)

Preliminary work showed a very high concentration of starch in *P maximum* bundle sheath cells, as a result of low nitrogen nutrition. In this study the influence of the supply of inorganic nitrogen and phosphorus on the photosynthetic activity, starch content and chloroplast distortion is investigated. The aim of this study is to determine the regulatory effect of nitrogen and phosphorus on the translocation of metabolites in *P maximum*.

Electron microscopic studies of *P maximum*, when grown under controlled conditions at low nutrient nitrogen (20 ppm N, KNO_3) showed bundle sheath cells several times bigger than mesophyll cells and heavily packed with starch grains. Under higher nutrient nitrogen (200 ppm N, KNO_3) the number of starch grains were drastically reduced.

Plants grown on low nitrogen nutrition and subjected to 24 hours' dark treatment were completely devoid of starch grains in their bundle sheath cells. As the starch disappeared greater incidence of disruption of the chloroplasts double membranes (wall and thylakoids) were observed. The bundle sheath inner membranes appeared to be severely distorted. The high number of starch grains in the bundle sheath cells of low nitrogen grown plants were observed even in very young plants.

The results concerning the accumulation of starch suggests that at low nitrogen levels the fixed carbon accumulates as carbohydrates in the form of starch, at the site of CO_2 fixation in the bundle sheath cells. It would appear that as the level of supplied nitrogen increases more fixed carbon is shifted into synthesis of other intermediate metabolic compounds which are transported to the different sinks within the plant.

It has been suggested that nitrogen increases translocation of metabolites from the bundle sheath cells by affecting the permeability of these cell membranes.

No starch was present in the bundle sheath chloroplasts after dark treatment of the low-nitrogen grown plants, which facilitated observation of the ultrastructure of these cells. The chloroplasts within these cells showed the marked effect of the previously accumulated starch grains. It was clearly seen that the bundle sheath chloroplasts were severely disrupted. This is probably due to mechanical damage of the chloroplast outer membranes and inner thylakoids by the accumulating starch grains.

In future this study will concentrate on the starch accumulation and utilization in *P maximum*. A study on the effect of inorganic phosphorus on starch accumulation is in progress. This is being done since it was suggested that both nitrogen and phosphorus stimulated outflow of assimilates.

With the use of isolated bundle sheath chloroplasts the photosynthetic metabolites involved in starch degradation and transport, as affected by nitrogen, will be investigated.

Keywords: nitrogen, Panicum maximum, phosphorus, photosynthetic activity, savanna, starch

CRESSWELL C F, D BARRETT, M FREAN and D ARIOVICH
(Department of Botany and Microbiology, University of the Witwatersrand,
P O Box 1176, Johannesburg 2000)

The effect of nitrogen concentration and form on the photosynthetic rate, carbon dioxide compensation point and photosynthetic metabolism of Alloteropsis semialata (R Br) Hitchc which exhibits Kranz and non-Kranz leaf anatomy (1979-1982)

Ontogenetic studies show that the anatomy of the vascular bundle sheath in leaves of Alloteropsis semialata, is essentially similar in non-chlorophyllous leaf bases of C₃ and C₄ forms of this grass. This may indicate a similar genome in the two forms which switches to either the C₃ or the C₄ photosynthetic pathway and is reflected in Kranz and non-Kranz anatomy in the chlorophyllous lamina. This work also shows that there are metabolic differences in the two plants with regard to translocation and storage of starch. The C₄ form stores more starch in the leaf base than the C₃ form.

During the course of this project (1979-1980) a solid background has been established, against which further physiological investigation may finally indicate whether or not the Kranz and non-Kranz forms of this plant can be influenced to show intermediate or changed form.

Anatomical differences between Kranz and non-Kranz forms of A semialata have been confirmed and related to specific morphological ultrastructural and physiological features. These results show that C₄ (Kranz) and C₃ (non-Kranz) forms of this grass occur within one species and within one ecological niche; they point, moreover, to the fact that the currently popular classification of C₄ grasses according to three differing decarboxylating enzymes each associated with specific structural characteristics cannot be based on anatomy alone.

Keywords: Alloteropsis semialata, C₃ grasses, C₄ plants, Kranz, leaf anatomy, nitrogen, non-Kranz, photosynthetic rate

CRESSWELL C F and M G KEMPE

(Department of Botany and Microbiology, University of the Witwatersrand,
P O Box 1176, Johannesburg 2000)

The translocation and distribution of photosynthetic products with respect to leaf age and time of season of the dominant grasses at Nylsvley (1980-1981)

The effect of three night temperatures, 25°C, 17°C and 12°C on the photosynthetic rate, starch accumulation and the distribution of ^{14}C labelled assimilates in Panicum maximum, Digitaria eriantha and Zea mays was looked at.

The two lower chilling temperatures affected the photosynthetic rates in all three species. Photosynthetic rates were reduced in P maximum and Z mays at both 17°C and 12°C. D eriantha showed higher photosynthetic rates at 17°C than at 25°C. However, at 12°C photosynthetic rates were reduced.

Failure of starch removal during the dark period was observed in P maximum and D eriantha after 10 days at 17°C, and in P maximum and Zea mays after 10 days at 12°C. No starch accumulation was observed in D eriantha at 12°C.

Chilling temperatures affected assimilation distributed in a number of ways, at 17°C Zea mays translocation of assimilates to the root, at 12°C translocation of assimilates from the presentation leaf was shown to be inhibited. The water-soluble component contributed the major labelled fraction. The incorporation of label into the lipid fractions was identified with new growth or turnover of cell membranes. There was little positive correlation with the labelling of the water-insoluble component and the other fractions.

Keywords: Digitaria eriantha, Panicum maximum, photosynthetic products, savanna, temperature, translocation

CRESSWELL C F and L RANDALL

(Department of Botany and Microbiology, University of the Witwatersrand,
P O Box 1176, Johannesburg 2000)

Primary production of three dominant grasses of the Nylsvley study site, Eragrostis pallens, Digitaria eriantha and Panicum maximum: diurnal and seasonal measurements of net and gross photosynthesis and dark respiration (1976-1982)

The major aspect to date has been the design and construction of a single-leaf cuvette which can be used in the field to simultaneously measure both net photosynthesis and gross photosynthesis. This cuvette is at present undergoing testing as to its suitability to meet the needs in the field study.

Keywords: Digitaria eriantha, Eragrostis pallens, leaf cuvette, photosynthesis, primary production, respiration, savanna

CRESSWELL C F and P VINOGRAD

(Department of Botany and Microbiology, University of the Witwatersrand, P O Box 1176, Johannesburg 2000)

Primary production of three dominant grasses of the Nylsvley study site, Eragrostis pallens, Digitaria eriantha and Panicum maximum: the effect of age, temperature, light, water stress and nutrient level on photosynthesis and respiration and the relationship between photosynthesis, light and root respiration (1976-1982)

In this project three dominant grasses of the Nylsvley study site (Eragrostis pallens, Digitaria eriantha and Panicum maximum) are being investigated in view of their special ecological requirements as these relate to the C₄ photosynthetic subgroups - PCK type, NAD-malic enzyme type and NADP-malic enzyme type.

The broad aim of this work is to assess primary productivity of savanna vegetation by measuring photosynthetic and respiratory activity on the basis of gas exchange analysis, using entire plants of E pallens, D eriantha and P maximum.

The particular factors to be studied are:

- (i) The effect of age on photosynthesis and respiration.
- (ii) The effect of temperature and light on photosynthesis and respiration at different stages of development.
- (iii) The influence of water stress (estimated by shoot water potential).
- (iv) The influence of nutrient level on photosynthesis and respiration.

It is anticipated that the data obtained from these studies will be utilized quantitatively in a photosynthetic model to be produced in cooperation with climatologists for this area.

Present studies include measurement of photosynthetic rate of Panicum maximum grown at two nitrogen levels: 50 ppm N, KNO₃, 200 ppm N, KNO₃; also included are measurements of root respiration rate of Panicum maximum during light and dark periods in order to establish the relationship between photosynthesis and root respiration and the influence of light on root respiration.

There is a difference in net photosynthetic rates of plants that were grown under low nitrogen and high nitrogen levels. Under low nitrogen supply the mean photosynthetic rate was 30 mg CO₂ cm² sec, whereas the plants grown under high nitrogen supply were found to have a mean photosynthetic rate of 85 mg CO₂ cm² sec.

It is suggested that the reduced photosynthetic rate may be the result of the destruction of the chloroplast grana and thylakoids by the accumulating starch grains.

As the nitrogen level in the growth media increases, more fixed carbon is used for amino acid synthesis and the amount of starch in the bundle sheath chloroplasts decreases. This might improve the functioning of the chloroplasts, resulting in higher photosynthetic rates.

Measurements of root respiration under illuminated and dark periods to which leaves were exposed show that light may have an effect on root respiration.

Some measurements show that under illumination of leaves, root respiration increases, and it decreases under dark conditions. In other measurements the root respiration remained constant during illuminated and dark periods for leaves.

For further measurements of the effect of age on photosynthesis respiration and transpiration three techniques will be used:

- (i) Gas exchange.
- (ii) Growth analysis.
- (iii) $^{14}\text{CO}_2$ feeds (Shimshi method for gross photosynthesis).

Carbon dioxide exchange is measured in an open system based on that of Hansen and Jensen (1977) and Frean et al (1980). The cuvette to be used was remodelled from the assimilation chamber of Hansen and Jensen (1977).

For measurement of leaf CO_2 exchange a 50 cm long, light-penetrable polythene bag is placed over the plants. The plants are inserted in the centre of a foam rubber plug, 0,5 cm in diameter, in a 20 cm diameter glass plate. A 9 cm high glass cylinder is fixed to the plate, and a polythene bag taped to the cylinder.

Air coming in to the polythene bag is distributed through a porous glass tube. The air outlet in the uppermost part of the chamber consists of an H-shaped pipe with four pores connected to a tube which leads out of the glass cylinder.

For measurement of temperature seven small thermocouples are led through two apertures in the glass cylinder. Four thermocouples are attached to the plant and three are placed in different spots in the chamber.

To determine the flux of radiation two small germanium cells are placed in two spots, one in the centre of the chamber and one near to the plant.

The glass plate rests on a 22 cm high blackened glass cylinder housing the roots. Nutrient solution is supplied to the roots by means of an atomized spray, and is continually recycled.

Keywords: Digitaria eriantha, environmental factors, Eragrostis pallens, Panicum maximum, photosynthesis, respiration, savanna

CRESSWELL C F and M M WOLFSON

(Department of Botany and Microbiology, University of the Witwatersrand,
P O Box 1176, Johannesburg 2000)

An investigation into the influence of low night temperatures on
photosynthetic activity in selected C₄ plants (1980-1981)

Large-scale patterns of distribution of C₄ plants, particularly C₄ grasses, suggest that the minimum temperature during the growing season is the environmental parameter having the strongest correlation with the relative abundance of C₄ grasses in a particular region. It appears that the deleterious effect of low temperatures during growth negate the advantages of possessing the C₄ pathway in cooler habitats. The purpose of this investigation was to determine whether the exposure of C₄ species Themeda triandra, Zea mays, Eragrostis curvula and Hyparrhenia hirta to low night temperatures of 17°C and 12°C did actually have an adverse effect on photosynthetic activity.

All plants were grown initially in a controlled environmental chamber in the phytotron at 28/25°C day/night temperatures with a fourteen-hour photoperiod. Some of these plants were maintained at these temperatures throughout the experiment while others were exposed to similar conditions apart from the night temperature, which was altered. One set of plants was kept at 28/17°C for 15 days and another set at 28/12°C for 15 days.

Variations in the levels of carboxylating, decarboxylating and aminotransferase enzymes were investigated during this period using standard assay procedures. The enzymes assayed were RuBP carboxylase, PEP carboxykinase, PEP carboxylase, NAD and NADP-specific malate dehydrogenase and malic enzyme, and aspartate aminotransferase and alanine aminotransferase. Photosynthetic rates were measured by means of an infra-red gas analyser. Sections were cut, on a freezing microtome, of the midportions of leaves prior to illumination. These sections were stained with iodine to indicate the position of starch.

Initial decreases in photosynthetic rates in response to exposure to decreased minimum temperatures appeared to be followed by a period of adaptation and an accompanying increase in the rate of photosynthesis, approaching the original levels.

Night temperatures of 12°C appeared to decrease the translocation of starch from the bundle sheath cells to the mesophyll cells, which is usually thought to occur during the night. This led to a buildup of starch overnight in the bundle sheath cells. Nevertheless, irrespective of this accumulation, photosynthetic rates continued to increase.

At minimum temperatures of 17°C the decarboxylation activity of Eragrostis curvula would seem to be at variance with those activities accepted as indicative of a NAD malic enzyme type plant. Increased PCK activity at this temperature would suggest that this species may follow either the PCK or NAD malic enzyme decarboxylation pathway when exposed to different temperatures and this could be related to differences observed in the anatomical structure.

Analysis of enzymatic activity of the NADP malic enzyme type plants Themeda triandra and Hyparrhenia hirta indicate that there are some anomalies which arise, such as the increase in NAD malic enzyme and PCK activity in T triandra at 12°C and the high levels of NAD malic enzyme in H hirta.

These observations suggest that C₄ plants have the ability to modify decarboxylation pathways under sub-optimal environmental conditions. Thus the tendency to classify C₄ species into rigid biochemical groups is open to question.

Keywords: C₄ plants, decarboxylation, grasslands, Hyparrhenia hirta, photosynthetic activity, phytotron, temperature, Themeda triandra

CROWE A A and T M CROWE

(Percy FitzPatrick Institute of African Ornithology, University of Cape Town, Private Bag, Rondebosch 7700)

Breeding seasons of southern African gamebirds and waterfowl

A quantitative study is undertaken of spatial and temporal variations in the breeding seasons of gamebirds and waterfowl in southern Africa. Nest record cards of the Southern African Ornithological Society are used for this.

Keywords: birds, breeding, gamebirds, seasonal production, waterfowl

CROWE T M and A A CROWE

(Percy FitzPatrick Institute of African Ornithology, University of Cape Town, Private Bag, Rondebosch 7700)

Biogeography of African terrestrial birds

Biogeographic models are tested through analyses of Hall and Moreau's Atlas of speciation of African passerine birds (1970) and Snow's Atlas of speciation in African non-passerine birds (1978). The specific aim is to determine whether passerine and other non-passerine species show patterns of species richness and distribution which are in accord with those found in guineafowl. From this analysis we hope to be able to predict, as did Haffer for South America, possible Pleistocene refugia and centres of evolution.

Keywords: biogeography, birds, distribution, species richness

CROWE T M and A A CROWE
(Percy FitzPatrick Institute of African Ornithology, University of
Cape Town, Private Bag, Rondebosch 7700)

Evolution of francolin

The aims of this study are to develop a parsimonious taxonomy and phylogeny for the genus Francolinus (sensu lato) (Aves: Phasianidae), and to relate patterns of phenetic variation to variation in the environment.

Keywords: evolution, Francolinus, gamebirds, taxonomy

CROWE T M and A A CROWE
(Percy FitzPatrick Institute of African Ornithology, University of
Cape Town, Private Bag, Rondebosch 7700)

Vascular anatomy of the head and neck of Struthio camelus

The aim of this project is to discover vascular arrangements which may be important to the ostrich for brain temperature regulation.

Keywords: anatomy, ostrich, thermoregulation

CROWE T M, R K BROOKE and W R SIEGFRIED
(Percy FitzPatrick Institute of African Ornithology, University of
Cape Town, Private Bag, Rondebosch 7700)

Evolution and adaptive differentiation of southern African house sparrows
Passer domesticus

The objective is to determine whether the southern African house sparrow is a descendant of approximately simultaneous introductions at Durban and East London at the turn of the century. After a period of very slow expansion, this species spread explosively throughout southern Africa in the 1950s, so that now P domesticus may be encountered at nearly any place with buildings. We aim to determine whether the explosive spread was of birds of one or the other subspecies or if it may be the result of a "super-fit" hybrid. Secondly, we hope to determine if any phenetic divergence that may have occurred since the time of introduction may be adaptive to specific environmental conditions. The Durban birds were of the Indian subspecies P d indicus, the East London birds of P d domesticus from England. It appears that in humid and mesic areas house sparrows still fall within the range of variation of indicus and that nominate domesticus has had little effect on South African phenotypes. In arid areas such as the Northern Cape and Namibia house sparrows have already achieved a stable phenotype separable from all other populations in the world.

Keywords: adaptation, birds, evolution, problem animal, sparrows

CROWE T M and R KETLEY

(Percy FitzPatrick Institute of African Ornithology, University of Cape Town, Private Bag, Rondebosch 7700)

Distribution patterns of southern African birds according to Roberts's Birds of South Africa

Distribution maps in Roberts are used to derive zoogeographic avifaunal zones for southern Africa. These zones and patterns of species diversity are related to variation in the environment. This is a more finegrained study than that on the biogeography of African terrestrial birds.

Keywords: biogeography, birds, distribution, species richness

CROWE T M, R S KNIGHT, I NEWTON and P D MORANT

(Percy FitzPatrick Institute of African Ornithology, University of Cape Town, Private Bag, Rondebosch 7700)

Weights of African birds

Bird mass data are gathered and summarized statistically, from ringing schedules, published and unpublished records under one cover. The first volume has been virtually completed.

Keywords: birds, body mass

CROWE T M and W R SIEGFRIED

(Percy FitzPatrick Institute of African Ornithology, University of Cape Town, Private Bag, Rondebosch 7700)

Island biogeographic theory applied to selected avifaunal communities

MacArthur and Wilson, in their monograph on island biogeography, derived several formulae which they found useful in the prediction of avifaunal species richness on oceanic islands. We attempt to apply this theory to insular biotopes, eg dams, forests, and mountain tops. Specifically we wish to determine the effect of measures of "island" size and isolation on their component birdlife.

Keywords: birds, biogeography, islands, species richness

DAINES T

(Döhne Agricultural Research Station, Private Bag X15, Stutterheim 4930)

Introduction and evaluation of promising pasture species in the Eastern Cape: evaluation of Rhodes grass for beefmeat production in the Alexandria-Bathurst area (1981-1986)

Keywords: Eastern Cape, meat production, pasture evaluation, pasture introduction, Rhodes grass, savanna

DAINES T

(Döhne Agricultural Research Station, Private Bag X15, Stutterheim 4930)

The introduction and evaluation of promising pasture species in the Eastern Cape: growth patterns of summer grass in the Alexandria district (1977-1982)

Keywords: Eastern Cape, growth, pasture evaluation, pasture introduction, savanna, summer grass

DAINES T

(Döhne Agricultural Research Station, Private Bag X15, Stutterheim 4930)

The introduction and evaluation of promising pasture species in the Eastern Cape: pasture nursery, Bathurst (1976-1993)

Keywords: Eastern Cape, nursery, pasture evaluation, pasture introduction, savanna

DAINES T

(Döhne Agricultural Research Station, Private Bag X15, Stutterheim 4930)

Stocking density and species area selection (1976-1981)

Keywords: Eastern Cape, savanna, species selection, stocking density

DANCKWERTS J E

(Döhne Agricultural Research Station, Private Bag X15, Stutterheim 4930)

Optimum development and utilization of the dry grass/bush communities of the Eastern Cape Region: growth and development of key grass species (1980-1983)

Keywords: Eastern Cape, grass, growth, savanna

DANCKWERTS J E

(Döhne Agricultural Research Station, Private Bag X15, Stutterheim 4930)

Optimum development and utilization of the grass/bush communities of the Eastern Cape Region: root growth and development of key grass species (1980-1983)

Keywords: Eastern Cape, grass, root growth, savanna

DANCKWERTS J E

(Döhne Agricultural Research Station, Private Bag X15, Stutterheim 4930)

Optimum development and utilization of the dry grass/bush communities of the Eastern Cape Region: carbohydrate accumulation and depletion patterns in key grass species (1980-1983)

Keywords: carbohydrate accumulation, carbohydrate depletion, Eastern Cape, savanna

DANCKWERTS J E

(Döhne Agricultural Research Station, Private Bag X15, Stutterheim 4930)

Optimum development and utilization of the dry grass/bush communities of the Eastern Cape Region: crop growth rate of key grass species (1980-1983)

Keywords: Eastern Cape, grass, growth rate, savanna

DANCKWERTS J E

(Döhne Agricultural Research Station, Private Bag X15, Stutterheim 4930)

Optimum development and utilization of the dry grass/bush communities of the Eastern Cape Region: the effect of intensity of defoliation on key grass species (1981-1984)

Keywords: defoliation, Eastern Cape, grass, savanna

DANCKWERTS J E

(Döhne Agricultural Research Station, Private Bag X15, Stutterheim 4930)

Optimum development and utilization of the dry grass/bush communities of the Eastern Cape Region: the effect of intensity of utilization on animal performance (1981-1983)

Keywords: animal performance, defoliation, Eastern Cape, savanna

DANCKWERTS J E

(Döhne Agricultural Research Station, Private Bag X15, Stutterheim 4930)

Optimum development and utilization of the dry grass/bush communities of the Eastern Cape Region: effect of seasonality and plant age on the net assimilation rate of key grass species (1980-1983)

Keywords: Eastern Cape, grass, net assimilation rate, plant age, savanna, seasonality

DANCKWERTS J E

(Döhne Agricultural Research Station, Private Bag X15, Stutterheim 4930)

Optimum development and utilization of the dry grass/bush communities of the Eastern Cape Region: yield and growth curves of various swards dominated by key grass species (1980-1986)

Keywords: Eastern Cape, growth, grass, savanna, yield

DAWSON B L and J J P VAN WYK

(Institute for Plant Production and Environmental Conservation,
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An evaluation of Eragrostis curvula ecotypes for use in revegetation in national road reserves (1978-1982)

The objective is to find varieties of E curvula which provide better results in revegetation of road reserves than those obtained using the commercially available Ermelo variety.

Vegetative material of 84 E curvula ecotypes was collected countrywide. This material was planted out in Pretoria, Potchefstroom, George and Camperdown for the purposes of seed production and evaluation. Seed obtained from this material was sown in 0,5 m² plots on steep cutslopes in the road reserve of the national road between George and Mossel Bay, and at Estcourt.

The following factors are included in the evaluation of the ecotypes: drought resistance, root system structure, basal area, seed production and viability, biomass, vitality and frost resistance.

Drought resistance is being measured in pot trials by regulating the amounts of water available to each of the treatments.

Root system structure has been measured by removing soil cores from within the root system, washing out the soil and retaining the root material in each section of each core. The root distribution and underground biomass are being computed from the mass of roots obtained from the core sections.

Basal area has been determined photographically, and vitality is subjectively assessed.

Results are not yet available as a number of the evaluations are still in progress. However, there are already clear indications that a number of the ecotypes under investigation are providing better results than the Ermelo variety, and a second phase has been initiated in which seed production of these "better" ecotypes is being undertaken on a larger scale than the initial work.

Keywords: Eragrostis curvula, revegetation, roadworks

DEACON H J and A SCHOLTZ

(Department of Archaeology, University of Stellenbosch, Stellenbosch 7600)

Pleistocene and Holocene environment in the fynbos area (1977-ongoing)

A "relict" biota is preserved in the fynbos area and the causes for the peculiar levels of species diversity and endemism characteristic of the fynbos itself need to be understood. It is clear from Quaternary studies that even in the Holocene a constant environment has not been maintained. The object of ongoing palaeoecological research is to gain an understanding of Pleistocene and Holocene environmental changes in the context of the evolution of present-day faunal distributions and vegetation associations. The methods being applied are the palaeontological study of fossil faunas accumulated by carnivores, raptors and humans, the study of charcoals accumulated in deposits from natural fires or in man-made hearths and the study of polleniferous deposits. Deposits in various regions within the fynbos area (sensu lato) are thus being investigated.

Results obtained so far indicate significant past environmental change. These include changes in both small and large mammal faunas and vegetation at the Pleistocene/Holocene boundary, changes in vegetation of the intermontane valleys between the most recent glacial maximum and the Holocene and lastly changes within the Holocene itself involving the differential spread of forest, grass and fynbos vegetation types on the southern Cape coastal forelands.

The problems currently being investigated are the fire history of the fynbos forest ecotone in the George area through the identification of charcoals from dated horizons and the changes in vegetation registered in the pollen record contained in peat deposits on the coastal forelands and mountains of the southern Cape.

Keywords: Cape Province, charcoal, fire history, fynbos, Holocene, palaeoecology, Pleistocene, pollen

DEAN W R J

(Nylsvley Nature Reserve, P O Box 540, Naboomspruit 0560)

The ecology and behaviour of mixed-species bird parties in savanna woodland (1980-1982)

Keywords: behaviour, birds, ecology, savanna

DE JAGER J M and T D HARRISON

(Department of Agrometeorology, University of the Orange Free State, P O Box 339, Bloemfontein 9300)

The climate of the Nylsvley Nature Reserve (1974-1982)

The objective of the study has been the monitoring, analysis and summary of the macro- and mesoclimate of Nylsvley. A description and characteri-

zation of the seasonal daily and hourly variation in the driving forces in the area will be provided. Data are to be presented in a format specifically intended to promote the deterministic analysis and explanation of the functioning of the various components of the savanna ecosystem.

Measurements of all the environmental driving forces are undertaken. These include incoming solar radiation, net radiation, air and soil temperatures, rainfall and evaporation.

Keywords: climate, data capture, driving forces, Northern Transvaal, savanna

DE JAGER J M and T D HARRISON

(Department of Agrometeorology, University of the Orange Free State,
P O Box 339, Bloemfontein 9300)

The microclimate of *Burkea* savanna (1977-1982)

The objective of the work is the measurement of the microclimate existing within the various habitats of a *Burkea* savanna ecosystem. Analysis of the data will be undertaken primarily with the aim of producing mathematical models which describe the habitat microclimate in terms of the macro driving forces. Such models will be used to predict microclimate given macroconditions.

A reliable mathematical simulation model for predicting microclimates obviates the necessity for making micro-observations *in situ*, provided the macromasurements are available. This greatly simplifies the work of biologists trying to explain the functioning of the biotic elements in the different compartments of the ecosystem. Furthermore, such models permit predicting conditions existing within savannas elsewhere given the reigning macroscale conditions and could provide controls against which the results of imposed treatments might be tested.

Keywords: *Burkea africana*, mathematical models, microclimate, savanna

DE VILLIERS G DU T

(Department of Geography, University of Durban-Westville,
Private Bag X54001, Durban 4000)

Rainfall interception in a *Burkea africana*/*Ochna pulchra* tree savanna (1978-1979)

Loss of water by interception during spells of rain is surveyed on two experimental plots in *Burkea africana*/*Ochna pulchra* stands. The variables influencing interception loss are analysed. Net rainfall is assessed, and it is found that an appreciable quantity of water during every storm is lost as a result of evaporation from the vegetative cover. This loss is influenced particularly by the intensity and duration of the rainfall.

The data of five different savanna interception studies are compared. From the analyses it is apparent that the different components of interception correlates relatively well. This should result in useful models in catchment management practices in savanna environments.

Keywords: Burkea africana, interception, net rainfall, Ochna pulchra, savanna, Transvaal

DIECKMANN R C

(Nature Conservation Division, Transvaal Provincial Administration,
P O Box 1232, Nelspruit 1200)

The ecology and breeding biology of the gemsbok *Oryx gazella gazella* in the Hester Malan Nature Reserve (1976-1980)

The study investigates certain ecological and behavioural adaptations of the gemsbok in the Hester Malan Nature Reserve. The gemsbok breeding system was found to be aseasonal with a high reproductive potential, being able to produce a calf every nine months. The social organization was characterized by a territorial system with the size of the territories among the largest found in ungulates. Seasonal variations in sizes of mixed herds are related to the availability and nutritional value of food plants, factors which also influenced their feeding pattern. They are opportunistic feeders as a result of their restricted existence. Variations in activity patterns are discussed in relation to endogenous and exogenous factors. The management implications of all these factors are examined.

Keywords: behaviour, ecology, gemsbok, Karoo, *Oryx gazella gazella*

DREWS B K and J C SCHEEPERS

(Botanical Research Institute, Private Bag X101, Pretoria 0001)

NAKOR National Plan for Nature Conservation (1976-1981)

This is part of an ongoing project currently administered by the Department of Water Affairs, Forestry and Environmental Conservation. For the first five years since its launching the Botanical Research Institute has provided the services of a part-time coordinator and part-time professional and technical support. The Department of Agriculture and Fisheries has also provided computer time and other support in respect of data processing. The Department of Water Affairs, Forestry and Environmental Conservation is currently taking over full responsibility for this project and will employ a full-time coordinator with staff for this purpose.

Thus far, the project has involved the setting up of a data bank for storage, retrieval and processing of data relevant for national coordination of nature conservation planning, and also the mapping of relevant information for planning purposes. The data base has formed and

improved data-processing capability is being developed. Future developments include the addition of new dimensions to the data base particularly in respect of open-air recreation requirements for coordination national planning. Also envisaged, is improved coordination of nature conservation planning at the provincial level prior to coordination of these plans at the national level.

Keywords: environmental conservation, nature conservation, planning, South Africa

DYER C

(Centre for Resource Ecology, University of the Witwatersrand, P O Box 1176, Johannesburg 2000)

Factors influencing the encroachment of bush into semi-arid grazing lands in southern Africa (1980-1982)

This is a preliminary account of a project aimed at understanding the mechanisms of bush encroachment in the semi-arid ranching areas of South Africa. The approach is to examine a large number of sites, covering the range of soil type and rainfall, in which encroachment has and has not occurred. On each site the vegetation composition and a set of site characteristics are measured, including such factors as soil depth, soil nutrient distribution, and water infiltration rate. Particular attention will be paid to fence-line contrasts where management differences have induced bush on one side but not on the other.

The eventual aim is to determine the conditions under which bush encroachment occurs, and to produce a sensitivity map of the country with respect to potential encroachment.

Keywords: bush encroachment, semi-arid, sensitivity map

ELBIN S B and T M CROWE

(Percy FitzPatrick Institute of African Ornithology, University of Cape Town, Private Bag, Rondebosch 7700)

Ethoecology of the crested guineafowl *Guttera pucherani*

The social behaviour of the crested guineafowl is being described and compared with that of the helmeted guineafowl *Numida meleagris*. Particular attention is being paid to the size and composition of flocks of crested guineafowl and to their relationships with other animals and plants to see whether the birds, other animals or plants obtain benefits from such associations. The mating system is being studied for comparison with that of the helmeted guineafowl as is seasonal use of habitat. The

crested guineafowl is thought to be an endangered species and it is expected that this study will greatly facilitate management decisions for this gamebird.

Keywords: behaviour, birds, crested guineafowl, forests, gamebirds, threatened species

EMSLIE R H

(Umfolozi Game Reserve, P O Box 99, Mtubatuba 3935)

Habitat use patterns and the grazing impact of the white rhinoceros in Umfolozi Game Reserve, Natal (1980-1984)

The overall objectives are to determine the response of selected grassland communities to varying rhino densities and study the effects of these changes on white rhino distribution and movement.

This information will be used to decide on optimum white rhino stocking rates for each of the reserve's main habitat types:

- (i) Determine changes in grass species composition and cover in selected grass communities.
- (ii) Study the response of individual grass species to different degrees of rhino use under different soil types and different rainfall conditions.
- (iii) Separate the effects of white rhino from other herbivores.
- (iv) Examine the seasonal pattern of grass changes in relation to differing conditions.
- (v) Study white rhino habitat use patterns in relation to seasonal changes and habitat changes.

Habitat monitoring techniques

A modified dry-weight rank method using weightings of ranks by total quadrat yield will be used to estimate herbaceous botanical composition. A 1,5 m Bruce Levi frame of 10 points (including spring plungers) at a spacing of 15 cm will measure rooted basal cover. Individually marked tufts and tillers will be monitored at regular intervals. Rhino-proof exclosures, clipping experiments, soil sampling, rainfall data and possibly chemical analysis of grasses will be undertaken.

Rhino habitat use techniques

It is intended to use an Eagle Microlight aircraft to monitor use patterns, as well as censusing the other major grazers and plotting surface water distribution. Back-up work on the ground and examination

of white rhino feeding sites will take place.

Keywords: Ceratotherium simum, distribution, ecology, Natal, perissodactyla, Rhinocerotidae, savanna

ENGELBRECHT A J, D EDWARDS and D J B KILLICK
(Botanical Research Institute, Private Bag X101, Pretoria 0001)

An ecological bibliography for southern Africa (1980-1981)

An ecological bibliography for southern Africa up until 1975 is currently being compiled. References recorded by researchers at the Botanical Research Institute, Pretoria are being expanded and incorporated into a computer data base. All references are annotated with codes, keywords, biomes and regions where applicable. The IBM/STAIRS programme package is used for retrieving references by means of authors and subject headings as well as sorting alphabetically. Publication of the bibliography is envisaged for 1982.

Keywords: bibliography, ecology, Southern Africa subregion

ENGELBRECHT J S
(Eugène Marais Chair of Wildlife Management, Department of Zoology, University of Pretoria, Pretoria 0002)

Ecological separation of the impala, waterbuck and kudu in the central area of the Kruger National Park (1979-1981)

Keywords: ecological separation, impala, Kruger National Park, kudu, savanna, waterbuck

EVERSON C S
(Cathedral Peak Forestry Research Station, Private Bag X1, Winterton 3340)

Some effects of fire on the mountain grasslands of Natal (1979-1981)

A veld condition assessment technique was used to determine the effect of past burning treatments on the species composition and basal cover of Highland Sourveld at Cathedral Peak. Veld condition scores in grassland protected from fire were significantly lower than those of the annual winter (AW), biennial spring (BS) and biennial spring plus graze treatments. Differences in veld condition scores between these three treatments were not significant. AW burn plots had a higher percentage of Decreaser species and lower percentage of Increaser I species than the BS burn plots. As Increaser species tiller below the ground and are most abundant in protected treatments, it is possible that tiller development of these species may be insensitive to light, and vice versa for Decreaser species. Potted plant experiments are therefore being carried out to

examine the effects of height and intensity of shading on tiller development of the six most important species at Cathedral Peak. Autecological studies are also being carried out on these selected species to determine other reasons which may account for these differences in species composition. These studies include investigations of the pattern of tiller development, elevation of main shoot apex and flowering in replicated AW and BS burn plots.

Canopy cover and dry matter yield are also being studied in AW, BS and protected plots.

Keywords: adaptation, burning, grasslands, Highland Sourveld, Natal

FERGUSON J W H and M J DE WET
(S A Lombard Nature Reserve, P O Box 174, Bloemhof 2660)

The management of black-backed jackals on farms (1974-1982)

Not all jackals cause damage on sheep farms, suggesting that general prophylactic control is not effective. Methods of affecting selective control of jackals that do damage on sheep farms are investigated, including toxic collars developed in the USA.

Keywords: black-backed jackal, predator management

FERGUSON J W H and M J DE WET
(S A Lombard Nature Reserve, P O Box 174, Bloemhof 2660)

Movement patterns of black-backed jackals (1974-ongoing)

Forty-three jackals were marked with numbered ear tags or collars, of which eight were recovered. From the above it appeared that immature jackals (1-2 years old) move over large areas. Twenty-six jackals were radio-collared. Adult pairs had fixed home ranges (average size 27,7 km²) that excluded other adult jackals. Immature jackals roamed over larger areas, averaging 132 km². Dispersal of one radio-collared jackal was studied in detail.

Keywords: black-backed jackal, home range

FERGUSON J W H and M J DE WET
(S A Lombard Nature Reserve, P O Box 174, Bloemhof 2660)

Reproductive parameters of black-backed jackals (1974-1982)

Biological samples were collected where possible to form a histological picture of the seasonal breeding pattern of jackals. Information on

litter sizes and breeding success is also collected.

Keywords: black-backed jackal, breeding, grasslands

FERGUSON J W H and M J DE WET
(S A Lombard Nature Reserve, P O Box 174, Bloemhof 2660)

Social organization of black-backed jackals (1974-ongoing)

Adult pairs are dominant over immature jackals which are, however, allowed to roam freely within adult home ranges. Some immatures stayed within the home ranges of adult pairs, helping with the rearing of pups of these resident pairs. Mated pairs seem to have long-lasting pair bonds.

Keywords: black-backed jackal, grasslands, social organization

FERREIRA N A
(Nature Conservation Division, Provincial Administration of the Orange Free State, P O Box 517, Bloemfontein 9300)

The population dynamics and habitat utilization of wild animals and game on provincial nature reserves in relation to veld condition and yield (1980-ongoing)

This is a long-term project consisting of 14 subprojects. The aim of the study is to supply management programmes for provincial nature reserves. At present only three subprojects on ungulate management are being investigated in the Willem Pretorius Game Reserve:

(i) Census methods for ungulates

Game are censused annually on all game reserves. Multiple drive counts, "known group" counts (where herds are recognized by herd structure and locality on repeated counts) and helicopter counts are being tested for reliability. It is hoped to find a practical census method for different types of ungulates and habitats.

(ii) Distribution patterns of game in the Willem Pretorius Game Reserve

The aim is to determine the seasonal distribution of the major ungulate species (black wildebeest, blesbok, springbok, impala, mountain reedbuck, white rhino, red hartebeest, buffalo, two zebra species, giraffe and eland) in the reserve. The grazing pressure on each Veld Type will be determined.

(iii) Population structure and dynamics

The population structure of the above-mentioned ungulate species will be determined. Recommendations for the removal of animals will be made according to sex and age structures of the populations.

Keywords: censusing, grasslands, Highveld, management, Orange Free State, population dynamics, seasonal distribution, ungulates, Willem Pretorius Game Reserve

FERREIRA N A

(Nature Conservation Division, Provincial Administration of the Orange Free State, P O Box 517, Bloemfontein 9300)

The status, distribution and ecology of the grey rhebuck *Pelea capreolus* in the Orange Free State (1972-1979)

Grey rhebuck numbers and past and present distribution patterns were determined in the Orange Free State. The habitat preference in relation to vegetation structure, topography, aspect, slope and geology was determined. The utilization of the different plant communities by grey rhebuck in the Zastron district were determined and compared statistically. Food preference was determined by means of faecal analysis.

The practicality of several census methods such as drive counts, pellet-group counts and the "known group" count method which involves the observer identifying and familiarizing himself with the individual groups of antelope, were determined for populations in restricted antelope areas.

Keywords: antelope, decline, distribution, faecal analysis, False Upper Karoo, grasslands, habitat preference, Highveld, Karoo, montane, Orange Free State

FOURIE L

(Mountain Zebra National Park, Private Bag X66, Cradock 5880)

The population dynamics of the rock hyrax *Procavia capensis capensis* in the Mountain Zebra National Park (1980-1983)

Keywords: Karoo, population dynamics, *Procavia capensis capensis*

FOURIE S P

(Provincial Fisheries Institute, Private Bag X1088, Lydenburg 1120)

A survey of rare and endangered plant taxa of the Transvaal (1977-1987)

The approaches to the problem of conserving a country's flora are numerous and all is imperative to the basic concept of conservation as a whole, but the first step is always the promulgation of legislation. Few countries have evolved effective legislation protecting indigenous flora, and in those that have, selection of taxa for inclusion in schedules have often been on an arbitrary and unscientific basis. The aim of this project is to provide sound scientific-based information on the conservation status

of certain plant taxa in the Transvaal with special reference to their natural distribution, factors contributing to their present status, population size and recommendations for conservation so that effective, unambiguous legislation and other conservation methods can be planned.

Keywords: conservation, distribution, endangered species, Transvaal

FROST P G H

(Percy FitzPatrick Institute of African Ornithology, University of Cape Town, Private Bag, Rondebosch 7700)

A review of the adaptive responses of organisms to fire regime in South Africa

In this project a review and synthesis are made of the available knowledge on the adaptive responses of organisms to fire regimes in South Africa. Adaptations to fire may include life history, morphological, behavioural and physiological responses, the selective advantage of each being determined by the nature of the fire regime, fire behaviour and community dynamics to which a species is exposed. The review will be directed towards identifying general patterns in the responses of organisms to fire regime and fire behaviour, and the synthesis will attempt to provide an ecological framework within which the selective advantage of the various patterns may be understood.

Keywords: adaptation, evolution, fire, population dynamics

FROST S K

(Percy FitzPatrick Institute of African Ornithology, University of Cape Town, Private Bag, Rondebosch 7700)

The effects of difference in productivity and habitat structure on niche variation in two *Melaenorhis* (Bradornis) flycatchers

The Marico flycatcher *M (B) mariquensis* and the pallid flycatcher *M (B) pallidus* are morphologically very similar species occurring in *Acacia* and *Burkea* woodlands respectively. The two woodland types differ in primary productivity and species diversity, *Acacia* woodland having a higher productivity but a lower avian diversity. These basic differences permit a number of predictions for the structure of the niches for these flycatchers which are being tested by field study.

Keywords: birds, flycatchers, insect abundance, vegetation structure

GANDAR M V

(Institute of Natural Resources, University of Natal, P O Box 375,
Pietermaritzburg 3200)

The utilization of trees in rural KwaZulu (1980-1982)

Trees are a free resource in terms of tribal land tenurial rights. Wood is gathered primarily for use as a fuel or building material although it is put to many other uses as well. This study focuses on the exploitation of trees from two standpoints: firstly that of a natural resource providing basic necessities for rural people, and secondly that of the environmental stress of over-exploitation. The main study area is the Mahlabatini district.

The demand for wood, species used, and patterns of gathering are being investigated by measurement and questionnaire. Size and species composition, biomass and wood production of trees are being measured and damage estimates made. Also being investigated are the effects of tree canopy on the herbaceous layer, soil moisture and on rates of sheet erosion using the parameters of the Universal Soil Loss Equation.

Keywords: deforestation, fuelwood, KwaZulu, savanna, trees

GELDENHUYS C J

(Saasveld Bosbounavorsingstasie, Privaatsak X6531, George 6530)

Onderzoek na die effek van die behandelings: dunning, skoonkap en ontginning, op die gemeenskapsontwikkeling in die inheemse woude van die suidelike Kaap en Tsitsikamma bosstreke/Investigation of the effects of the treatments: thinning, clearfelling and cultivation, in the community development in indigenous forests of the southern Cape and Tsitsikamma woods (1979-1985)

Die doel van hierdie projek is om bestuurstelsels te ontwikkel vir produksie van hout op 'n standhoudende basis, en om die kort- en langtermyn effekte van die huidige metodes te evalueer.

'n Verslag is voltooi oor 'n ondersoek na metodes om groot onbenutbare inheemse bome uit die lewende stand te verwyder. Normale ringbas en die gebruik van 2,4,5-T in diesolien is vergelyk. Die 2,4,5-T gee nie beter resultate as normale ringbas nie, hoewel die boomsoort, -grootte en die behandelingseisoen met die basiese behandelings 'n interaksie toon. Ringbasmetodes met goeie kontrole is as metode aanbeveel.

Ondersoeke is ook uitgevoer na die voorkoms van windvalle en staande dooie bome in onversteurde woudopstande en die digtheid en hoogteklassverdeling van die struik Trichocladus crinitus en geassosieerde verjonging in natuurlike en gewerkte opstande.

Pogings word nou aangewend om die aanwasdata uit die groot permanente persele beter te benut en in die bestuurstelsel toe te pas.

Keywords: Cape Province, forests, growth rate, population dynamics, timber production, Trichocladus crinitus

GELDENHUYS C J

(Saasveld Bosbounavorsingstasie, Privaatsak X6531, George 6530)

Onderzoek na die verspreiding en populasiedinamika van woudplantsoorte in die suidelike Kaap en Tsitsikamma bosstreke: lang- en kort-termyn/
Investigation of the distribution and population dynamics of forest plant species in the southern Cape and Tsitsikamma wood: long- and short-term (1979-1985)

Hierdie projek het ten doel 'n ondersoek na die reproduksie van woudplantsoorte; die verspreiding, populasie-ouderdomsklasverdeling en -ontwikkeling van besondere en skaars woudplantsoorte; en die ontwikkeling van suiwer en gemengde gelykjarige opstande van inheemse boomsoorte. 'n Verslag is voltooi oor die agteruitgang van Prunus africana in die Bloukranspas, wat toegeskryf is aan ongunstige toestande vir vestiging van die saailinge en ongunstige klimaatstoestande. Slegs 43 bome groter as 10 cm dbh bestaan waarvan 47% dood is. Die vinnige ontkieming in die kwekery dui op eienskappe van 'n pioniersoort.

'n Onderzoek na die aanpassings in die "vrugte" van die twee podocarps is voltooi. Die resultate dui daarop dat die aanpassings in die vrugstrukture vir verspreiding 'n belangrike invloed op die ontkieming en algemene verspreiding van die soorte het. P latifolius is baie wyer versprei met groter opstandsdigtheid as P falcatus.

Die ontleding van die data oor die morfologiese eienskappe van vrugte/saad en oor ontkiemingsbehoefte van verskeie soorte geniet aandag.

Keywords: Cape Province, forests, fruit morphology, germination, Podocarpus, populations, population dynamics, Prunus, reproduction

GELDENHUYS C J

(Saasveld Bosbounavorsingstasie, Privaatsak X6531, George 6530)

Opname en klassifikasie van die woudplantegroei van die suidelike Kaap en Tsitsikamma bosstreke/Survey and classification of the forest vegetation of the southern Cape and Tsitsikamma woods (1979-1985)

Hierdie projek het ten doel: 'n beter begrip van die invloed van omgewingsgradiënte op die soortepopulasies en gemeenskapstruktuur en -funksie; die ontwikkeling van 'n woudtipe-klassifikasie vir bestuursdoeleindes; en die ontwikkeling van identifikasie- hulpmiddels vir die verskillende groeivorms.

Uitsluitel is verkry oor die identiteit van die drie sybassoorte in die suidelike Kaap. Cassine eucleiformis is vroeër verkeerdelik as Maytenus acuminata beskou en so in die literatuur oor hierdie woude aangehaal. In Gouna, byvoorbeeld, is C eucleiformis verteenwoordig met 'n frekwensie van 42% en 19,7 stamme bo 10 cm dbh per ha, of 2,1%. M acuminata is hoofsaaklik beperk tot die woutrand en droë kreupelwoud. C maritimum is 'n struik wat slegs op die kusduine gevind word.

Fotografie van die bearing van die blare van die boom- en struiksoorte word onderneem om gebruik te word in blaarsleutels wat al die soorte sal insluit.

Voorlopige ontledings van die grond- en opstandsdata van die gradiënte is gedoen. Ondersoeke is begin na die faktore verantwoordelik vir die variasie in woudsamestelling binne 'n woudegedeelte van 24 ha waarop 'n totale boomopname op 1130 aangrensende, vierkantige persele van 200 m² gemaak is.

Keywords: Cape Province, classification, forests, ordination, shrubs, trees, vegetation survey

GERTENBACH W P D

(Afdeling Navorsing en Inligting, Privaatsak X402, Skukuza 1350).

'n Ekologiese studie van die mopanieveld in die Nasionale Krugerwildtuin/
Ecological study of the mopani veld in the Kruger National Park

Hierdie studie is omvattend en dinamies van aard, maar sluit as basis die volgende aspekte in:

- (i) 'n Floristiese klassifikasie van die belangrikste plantegemeenskappe in die mopanieveld en die inskakeling daarvan by 'n hiërargiese klassifikasiesistelsel van die plantegroei in die NKW in besonder en in die Laeveld in die algemeen. Dit is gedoen met behulp van 'n Braun-Blanquet-opname.
- (ii) 'n Strukturele klassifikasie van die plantegroei in die mopanieveld en die inskakeling daarvan by 'n klassifikasiesisteesem vir die NKW. Dit is gedoen met behulp van 'n varieerbare kwadrant-metode.
- (iii) 'n Studie van die interaksie tussen die voorkoms van bepaalde plantegemeenskappe en sekere kenmerke van die grond. Dit is gedoen deur die gronde van die mopanieveld te beskryf en te klassifiseer en deur verteenwoordigende monsters te ontleed ten opsigte van chemiese en meganiese eienskappe.

Aandag word gegee aan die voorkeur wat groter soogdiere het vir bogenoemde gemeenskappe en die mate waartoe dit benut word.

Keywords: classification, mopani veld, savanna, Transvaal

GILIOMEE J H, D DONNELLY and C SCHLETTWEIN
(Department of Entomology, University of Stellenbosch, Stellenbosch 7600)

Structure of invertebrate communities in fynbos (1979-ongoing)

In this project a study is made of the diversity, biomass and seasonal abundance of insects in the fynbos of Jonkershoek valley. This information on the most abundant animal group in the biome is considered necessary for the proper understanding and management of the system. The insects are regularly sampled with two sampling methods: pitfall traps and a D-vac sucking machine. The traps were sunk in the form of grids in six areas with different slopes and fire histories. The sucking samples were taken in four of these areas on random 2 m² plots. After a fire in one of these areas, regular samples were also taken of grasshoppers in the burnt and adjacent unburnt areas by means of a 1 m² drop-net.

The pitfall traps proved most successful for beetles and ants, and the sucking machine for ants, leafhoppers and beetles. Forty-one species of ants and 17 of grasshoppers were found and identified. Log abundance rank plots of the ants in each area showed that where there is great dominance by one species, the species number is generally reduced. Generally areas with older vegetation (more than 20 years) had fewer species than areas with young vegetation (less than 10 years). A cool fire reduced but did not destroy ant populations. In the case of grasshoppers, dominance with correspondingly lower species diversity was also evident in the areas with older vegetation. Although species number for grasshoppers differed significantly between areas with young and older vegetation, there was no significant difference between their biomass.

Keywords: Cape Province, community structure, diversity, fynbos, insects, invertebrates, Jonkershoek

GREIG J C
(Cape Provincial Administration, Department of Nature and Environmental Conservation, Jonkershoek, Private Bag X5014, Stellenbosch 7600)

A study of the ecology of the geometric tortoise *Psammobates geometricus*

Psammobates geometricus, the geometric tortoise, is one of the rarest tortoise species in the world. It is confined to the Coastal Fynbos of the southWestern Cape. Its decline may be attributed entirely to habitat destruction. (It now exists in fewer than a dozen localities from Strand in the south to Porterville in the north). Tortoises from all populations have been marked and released. Information on growth rates and population sizes is accumulating steadily. The object of the study is to provide biological data relevant to management, for example, the resistance of tortoise populations to fire, and their relationship with grazing animals.

Keywords: Cape Province, fynbos, growth rate, populations, tortoise

GREIG J C

(Cape Provincial Administration, Department of Nature and Environmental Conservation, Jonkershoek, Private Bag X5014, Stellenbosch 7600)

A survey of the reptiles and amphibians of the Cape Province (1972-1982)

The objective is to determine as far as possible the status and distribution of the Cape herpetofauna. At present, due to financial problems and travel restrictions, collections are being confined to the fynbos zone of the southWestern Cape.

Several species are endemic to the fynbos biome, and some of these collections are directly threatened by habitat destruction. The area has been poorly collected in the past, and the taxonomy of fynbos herpetofauna is far from complete. The work of the Department is obviously concentrated on the forms known to be threatened but extensive general collections have also been made.

Keywords: amphibians, Cape Province, faunal survey, fynbos, reptiles

GROBBELAAR N, N VAN ROOYEN en P C ZIETSMAN

(Departement Plantkunde, Universiteit van Pretoria, Pretoria 0002)

Biologiese stikstofbinding op Nylsvley: studie van die omvang, periodisiteit en verantwoordelike organismes/Biological nitrogen fixation at Nylsvley: study of the extent, periodicity and responsible organisms (1980-1981)

(i) Burkea-perseel

Tussen 9 Februarie en 30 April 1980 het 0-18% van die 240 grondmonsters wat ondersoek is positiewe nitrogenase resultate met die asetileen-reduksiemetode gelewer. Die positiewe resultate korreleer deurgaans goed met die aanwesigheid in die grond van peulplant-wortelknoppies.

Die gemiddelde nitrogenase aktiwiteit was slegs ongeveer een derde van wat gedurende 1974-1976 verkry is. Dit is moontlik aan die laer reënval tydens 1980 toe te skryf.

Geen nitrogenase as gevolg van oppervlak-groeiende blougroen bakterieë (Cyanobacteria) kon tot dusver waargeneem word nie.

(ii) Acacia-perseel

In teenstelling met wat verwag is, is daar dusver besonder min nitrogenase-aktiwiteit waargeneem. By slegs een van die ses toetsdatums is aktiwiteit waargeneem en wel net by twee van die nege grondmonsters.

Keywords: asetylene reduction, nitrogenase activity, nitrogen fixation, savanna

GROBLER J H
(Mountain Zebra National Park, Private Bag X66, Cradock 5880)

An assesment of the caracal population in the Mountain Zebra National Park
(1979-1982)

An attempt is being made to capture and mark the species in the Park to assess density. Observations are also being made on feeding behaviour (kills, scat analysis, food consumption) and other biological data are collected (eg breeding, group size, body measurements) to augment various parts of the study.

Keywords: caracal, feeding behaviour, Karoo, population density

GROBLER J H
(Mountain Zebra National Park, Private Bag X66, Cradock 5880)

Feeding habits of the Cape mountain zebra Equus zebra zebra in the
Mountain Zebra National Park (1979-1983)

This comprises a comparative study of some large grazers and mountain zebra; more specifically the feeding habits of the zebra themselves (feeding height, food preference, seasonal quality of food plants/ components, seasonal changes in faecal nitrogen, habitat utilization).

Keywords: Cape Province, Equus zebra zebra, feeding behaviour, Karoo

GROBLER J H
(Mountain Zebra National Park, Private Bag X66, Cradock 5880)

The leopard tortoise population in the Mountain Zebra National Park
(1979-1982)

This is a low-priority project and involves marking, sexing, weighing and relocating these reptiles in the normal course of duties. The object is to get some indication of the population size and tortoise biomass of the Park.

Keywords: Karoo, leopard tortoise, Mountain Zebra National Park, populations, population size, tortoise

GROBLER J H
(Mountain Zebra National Park, Private Bag X66, Cradock 5880)

Population dynamics of the Addo buffalo (1980-1985)

This project aims at understanding the dynamics of the buffalo at the Addo Elephant National Park and will involve looking at their age, structure,

longevity, recruitment, group size and disposition, movement, social behaviour, feeding habits etc. Because of the difficult working conditions in the Addo bush it may be some time before anything really worthwhile will be forthcoming.

Keywords: Addo, Cape Province, population dynamics, savanna

GROSSMAN D and M V GANDAR

(Institute of National Resources, University of Natal, P O Box 375, Pietermaritzburg 3200)

Land transformation in South African savanna (1980)

The savanna biome occupies ca 36% of the surface area of South Africa. Within white-owned areas, extensive cattle ranching is the major form of landuse. In tribal areas (homelands) subsistence agriculture predominates.

The major transformation processes identified are:

- (i) Deterioration of the herbaceous component in terms of species composition and basal cover.
- (ii) A general increase in the density of woody species in white ranching areas, to the detriment of the ranching enterprise.
- (iii) A general decrease of woody species in homelands where wood is used as a fuel source and for construction of dwellings and stockades.
- (iv) Resultant soil erosion and hydrological changes.

The major forces operative in causing transformation processes in white areas are:

- (i) Subdivision of farms to the extent that a significant proportion of farms are subeconomic units.
- (ii) Inappropriate landuse practices, including the cultivation of marginal land and overstocking.
- (iii) The low profitability of extensive cattle ranching in relatively isolated rural areas.
- (iv) The lack of infrastructure, marketing problems and relatively high costs associated with rural settlements.
- (v) The low aptitude and ability, poor education, advanced age and inherent conservatism of the average farmer.

In homelands, the major factors causing land transformation are:

- (i) The high population growth.

- (ii) The instability of the population as a result of rural-urban fluxes, male absenteeism, a high dependency burden and resettlement and translocations.
- (iii) The systems of land tenure.
- (iv) Overuse of communal resources, including pasturage, wood and arable land, in the absence of suitable management strategies.

Keywords: homelands, land transformation, savanna, white areas

GRUNOW J O and J A VAN TILL

(Department of Plant Production, University of Pretoria, Pretoria 0002)

Comparative studies of herbaceous layer production in *Burkea* and *Acacia* savanna, with and without grazing (1979-1980)

The objectives were to compare herbaceous layer biomass production and quality in *Burkea* savanna with that in *Acacia* savanna, subjected to the same grazing regime and production in an ungrazed control with that in the grazed treatments within each veld type.

There were three paddocks of 70 x 30 m in both *Burkea* and *Acacia* areas. Each set of paddocks represented three replicates and they were situated as close as possible to each other. Within each cattle-fenced paddock an area of 20 m x 30 m was game-fenced to act as a control.

A harvest technique was employed, with exclosures where necessary, to determine biomass accumulation rate (BAR). The following categories of plants were clipped separately in quadrats: "forage species" (preferred and principal food species); "non-forage graminoid species"; "forbs" (non-graminoids). Litter was picked up from the soil surface. The first three categories were divided into biomass and necromass.

The paddocks were moderately grazed (approx 50% by mass of the forage species) every eight weeks, starting in January 1980.

The results were as follows:

- (i) *Acacia* veld produced 3,5 times as much aboveground "grazeable" herbaceous biomass between trees as *Burkea* veld.
- (ii) The higher biomass peak of *Acacia* veld was mainly due to forbs, although grass biomass was also greater.
- (iii) *Acacia* veld had less standing necromass and litter at the beginning of the growing season.
- (iv) The greater peak biomass in *Acacia* veld was reflected in statistically significantly greater BAR's than in *Burkea* veld.

- (v) Although there was a clear tendency in most plant categories (except forbs) for the BAR to be greater on grazed than ungrazed paddocks, the differences were not proved to be significant statistically.
- (vi) It is recommended that the project be continued for at least one more growing season (1980-1981), but in a modified form aimed at reducing statistical variability and expenditure of time on labour requirements.

Keywords: ecology, grass, plant ecology, producers, production, savanna, Transvaal

GUBB A A

(Alexander McGregor Museum, P O Box 316, Kimberley 8300)

Monitoring vegetation changes (1980-1981)

A series of photographs taken by Shanz and Turner in 1919 and 1956 of parts of the Northern Cape veld have been rephotographed in November 1980. These photographs are studied to determine long-term vegetation changes.

Keywords: Northern Cape, vegetation change

GUBB A A

(Alexander McGregor Museum, P O Box 316, Kimberley 8300)

Structural and floristic classification of the vegetation of the Northern Cape (1979-1983)

The objective of this study is to classify the vegetation associations present in the Northern Cape, using both structural and floristic methodology. The Northern Cape (250 000 km²) is bounded by South West Africa, Transvaal/Orange Free State, Botswana and the Orange River. Three biomes are present, viz savanna, grassland and Karoo. The savanna biome is represented by the regional subtypes, Transvaal Bushveld (Veld Type 19) and Kalahari Scrub and Thorn Savanna (Veld Types 16 and 17). The grassland biome is represented by the regional subtype Highveld (Veld Type 50). The Karoo biome is represented by the regional subtypes Succulent Karoo (Veld Type 33), Central Karoo (Veld Types 32, 35 and 40) and the Karoo-grass Transition (Veld Type 36). Acocks's Veld Types are regarded as units insufficiently detailed to serve as a basis for land planning in the Northern Cape, especially the regional subtype Kalahari Scrub and Thorn Savanna. The Braun-Blanquet approach has been adopted for the floristic classification. An eclectic approach has been adopted for the structural classification (biomass structure). The physical environment will be discussed.

Approximately 40% of the Northern Cape has been surveyed in detail. A preliminary vegetation map has been produced. Seventeen major vegetation

units and approximately 40 subunits have been recognised. Vegetation units will be mapped using remote sensing techniques. The usefulness of satellite imagery is at present being tested. An attempt will be made to describe quaternary vegetation changes. The study will facilitate the accurate determination of the syntaxonomic and synecological transition between the Sudano-Zambesian and the Karoo-Namib regions. Preliminary results favour F White's (1976) phytogeographical map. A detailed analysis of Acocks's unpublished data for this area will be undertaken.

Keywords: floristics, grasslands, Karoo, Karoo-Namib region, Northern Cape, quaternary, remote sensing, satellite imagery, savanna, Sudano-Zambesian region, Veld Types

GUBB A A
(Alexander McGregor Museum, P O Box 316, Kimberley 8300)

Trees of the Northern Cape (1981)

The collection of photographs, text, sketches and distribution records is in process with the aim of publishing a guide book. There are 120 species which occur in the Northern Cape.

Keywords: distribution, Northern Cape, savanna, trees

GUBB A A
(Alexander McGregor Museum, P O Box 316, Kimberley 8300)

Utilization of vegetation by springbok (1980-1981)

A study was made of vegetation availability and its use by springbok in two habitats (Kalahari Thorn Veld and False Upper Karoo) during summer and winter.

Keywords: Kalahari Thorn Veld, Karoo, springbok, utilization

HALL A V
(Bolus Herbarium, University of Cape Town, Private Bag, Rondebosch 7700)

Rare and threatened plant species in the Western Cape Province (1974-ongoing)

The aim is to provide basic data for use by conservation authorities on the plant species that are critically rare, or threatened by impacts causing severe declines, in the Western Cape Province. It appears that the southern and southwestern portions of this region have the worst concentration of rare and threatened plant species of any non-tropical area in the world. Field surveys are supported by a 7000-record computer-based databank, which provides cross-references to extensive

manual files which have a dossier on each candidate species. Besides having produced a comprehensive field report on the populations and habitats of over 350 species, the survey has synthesized regional data on two critical areas, with a third in an advanced state of preparation. The survey's region includes a total of 1500 candidate species. For especially critical cases, a seedbank operating at -22°C has been established and the role of horticulture for restoring wild populations has been studied in detail and reported in a publication.

Keywords: Cape Province, endangered species, flora, fynbos, rare, survey, threatened species

HALL A V and G B HARDING

(Bolus Herbarium, University of Cape Town, Private Bag, Rondebosch 7700)

Autecology of Nassella tussock (1979-1982)

The aim is to obtain data on the reproduction, dispersal and establishment of the serious weed *Nassella tussock* *Stipa trichotoma*, in the Winter Rainfall Region, and to interpret the results in terms of infestation potentials and control measures. The plant has an exceptional capacity for producing seed, with over 100 000 florets appearing annually from well-developed individuals. Important results are emerging on variation in the caryopses, germination rates and inhibition, and growth patterns among seedlings and adults in relation to soils and other habitat features. Regional distribution patterns are also being studied.

Keywords: autecology, dormancy, germination, grass, *Nasella*, seeds, *Stipa trichotoma*, weeds, Winter Rainfall Region

HALL-MARTIN A J

(National Parks Board, Kruger National Park, Private Bag X402, Skukuza 1350)

Ecology and behaviour of elephants (*Loxodonta africana*) in the Addo Elephant National Park (1976-1982)

The intensive phase of fieldwork for this project was terminated in 1979 and data processing continues. The monitoring of births and deaths, herd structure and changes therein continues. Further valuable information on social behaviour have also recently been gathered. The physiological basis of musth in the African elephant has been confirmed.

Keywords: Addo, Cape Province, elephant, *Loxodonta africana*, population dynamics, savanna, social behaviour

HALL-MARTIN A J

(National Parks Board, Kruger National Park, Private Bag X402,
Skukuza 1350)

Ecology and behaviour of elephants (*Loxodonta africana*) in the Kruger
National Park (1980-1982)

Starting in early 1980 a total of 32 elephants were marked with CSIR-manufactured radio transmitters. Tracking has been done from the ground, from a fixed-wing aircraft using a wing-tip antenna and from helicopters with antennae fixed to the skids. Preliminary results indicate that elephant clans have home ranges whose size is determined by habitat quality. Though the major part of every home range is used exclusively by a clan, there is some overlap of ranges.

Reproductive status, herd structure and composition is being monitored from analysis of data derived from the elephant culling scheme. Other aspects of this study will be initiated in 1981.

Keywords: ecology, elephant, herd composition, herd structure, reproduction, savanna, Transvaal

HARTHOORN A M

(Nature Conservation Division, Transvaal Provincial Administration,
Private Bag X209, Pretoria 0001)

Geographical and seasonal trace element deficiencies in antelope
(1978-ongoing)

A study is being continued on seasonal variations of trace elements as well as geographical differences, and also the effects of deficiencies of these elements on the animals, particularly the possible interaction of a subclinical deficiency and the stress of capture, transport and relocation.

It may be noted that our researches show extremely low selenium levels in lactating and in pregnant animals. The seasonal low in the liver selenium level is commensurated with the highest mortality from capture stress.

Poor fertilizing practice may be inducing mineral and trace element imbalances in magnesium, copper and selenium.

Sulphate (used worldwide as fertilizer) interferes with both copper and selenium uptake and metabolism. Laboratory animals which we are feeding a diet normal in selenium and copper but with added S°_4 are showing symptoms of deficiency. Studies on blood vessels indicate a degeneration in the circulation. This also fits in with our observed circulatory changes in animals suffering from exertional stress. It is believed that the former state is conducive to the latter.

Selenium cannot practicably be given as a general therapy and it behooves us to determine which of our reserves are selenium (or copper, etc)

deficient, ie selenium supplementation should only be used when a need for it can be demonstrated, and with care.

Because of the possibly world-wide depression of trace-element levels through fertilization practices, the incorporation of old farmlands into our reserves and the increasing levels of pollution especially by lead, regular monitoring of our animals is essential.

Keywords: antelope, herbivores, nutritional status, trace elements

HARTHOORN A M

(Nature Conservation Division, Transvaal Provincial Administration,
Private Bag X209, Pretoria 0001)

Pharmacotherapy for the prevention and possible treatment of capture stress in antelope (1978-ongoing)

The possibilities of pharmacotherapy for capture stress in newly-captured animals is being explored. Previous reports have demonstrated a number of difficulties which militate against the effectiveness of such therapy such as the disadvantage of handling newly-captured animals, expense, problems of selection of treatment in relation to the type of stress or the symptoms. The tests reported on suggest that different species of antelope also respond differently to certain types of medication. A statistical analysis is made of the reaction to Orgotein therapy by tsessebe and blesbok.

Keywords: antelope, capture stress, capture techniques, herbivores

HARTHOORN A M

(Nature Conservation Division, Transvaal Provincial Administration,
Private Bag X209, Pretoria 0001)

The prevention of clinical capture stress in antelope by a process of taming, training and eventual reduced capture tempo at penning (1978-ongoing)

The capture of wild animals using a method involving training, taming, and reduced capture tempo has been the subject of experimental investigation which indicated a lowering of serum myoglobin and reduction of raised potassium levels, as well as those of CPK, GPT, GOT, and LDH. Recently an opportunity for comparison of mortality presented itself when sable antelope were captured by two different methods. Twenty-three adult and subadult sable were driven into a 10 ha enclosure. During the drive one adult male was killed. The remaining 22 animals were subjected to daily runs through a plastic-lined funnel. A second group of animals was captured subsequently using nets. Of these 11 were placed in pens on the site of capture, the remainder being immediately moved elsewhere. Of the first group (group A) none of the 22 animals died in the pens. Of the second group (group B) six died in the pens, only five adult males

remaining alive. Substantial mortality was also suffered by the remainder of group B transported elsewhere, but those deaths are not included. If we include the deaths occurring during capture in group A we get:

Group A: N=23 X_1^{22} $(X_1)^{22}$ Group B: X_2^5 N=11 $(X_2)^{25}$

Mean for each sample: A $\bar{X}_1 = 0,9565$ B $\bar{X}_2 = 0,4545$

Standard deviation: A $d_1 = 0,2039$ B $d_2 = 0,4979$

Standard error of difference: d (diff) = 0,12438

Differences between means: $t - \frac{\bar{X}_1 - \bar{X}_2}{d \text{ diff}} = 4,036$

Number of degrees of freedom: $df = N_1 + N_2 - 2 = 32$

At an 0,05 level of confidence the calculated ratio is 4,036.

This is substantially larger than the appropriate t ratio of 2,035 and the difference must therefore be regarded as significant.

The results obtained from these two methods of capture support the research hypothesis that a reduction in capture stress and resulting mortality may be obtained if animals are first driven or enticed into (10 ha) enclosures, and then subjected to a taming and training regime before they are penned or handled.

Keywords: antelope; capture stress, treatment

HOFFMAN J

(Döhne Agricultural Research Station, Private Bag X15, Stutterheim 4930)

The introduction and evaluation of promising pasture species in the Eastern Cape: pasture nursery, Döhne (1973-1993)

Keywords: Eastern Cape, nursery, pasture evaluation, pasture introduction, savanna

HOLLAND P G

(School of Environmental Studies, University of Cape Town, Private Bag, Rondebosch 7700)

Demographic studies on *Aloe ferox* (1980-1981)

This study is concerned with the distributional ecology of *Aloe ferox*. A life table for this species is being assembled through field observations, with a view to identifying management implications of demographic data.

It appears that survival rates are time independent but that recruitment is not constant. In many of the populations surveyed there are unusually large numbers of 70-80 year-old plants. This may reflect either land management practices or changing rainfall patterns. Because virtually every individual aged 30 years or older flowers and sets seeds it is unlikely that this feature can be ascribed to poor seed crops. Further, the relative importance of the 70-80 year cohort varies between neighbouring populations: areas most disturbed by fire and cattle have the smallest numbers of seedlings; and areas lacking such disruptions have abundant seedlings. If this explanation is correct then demographic studies on common species could help environmentalists gauge the impact of certain veld management practices.

Keywords: Aloe ferox, demography, distribution, ecology, management, recruitment, South Africa, survival rate

HOOK R C, D T MITCHELL and D L OLIVIER
(Department of Botany, University of Cape Town, Private Bag,
Rondebosch 7700)

Soil fungi in Mountain Fynbos (1978-ongoing)

This project is being carried out at Bain's Kloof on two sites which were burnt in 1978.

Present studies have concentrated on investigating seasonal variation in soil fungi and the fungal population numbers are being correlated with soil moisture, organic matter and pH. Two methods are being used, namely the soil dilution plate method and the Warcup soil plate method.

Soil fungal populations and organic matter were low at the beginning of the study during 1978 but increases are now taking place three years after the fire.

Isolates from both isolation methods are being identified and at the moment twenty-six species have been isolated. Although many more fungi have been identified from soils of other ecosystems, it is assumed that the low number of species isolated from the soils of Mountain Fynbos is solely as a result of seasonality of soil moisture in a Winter Rainfall Region and the oligotrophic state of the soils (ie soils of a low nutrient status).

These studies will be continued and further investigations will entail isolating soil fungi from different plant communities of Mountain Fynbos. Rhizosphere (soil near a living root) and rhizoplane (the surface of the root) fungi will also be isolated and identified from the dominant plants of Mountain Fynbos.

Keywords: fynbos, soil fungi, Winter Rainfall Region

HOWARD P C

(Institute of Natural Resources, University of Natal, P O Box 375,
Pietermaritzburg 3200)

The distribution status and ecology of common reedbuck *Redunca arundinum*
on farmland in Natal (1980-1983)

The common reedbuck is an important conservation species that has disappeared from 80% of its former range in southern Africa. In Natal it is doing particularly well on farmland in the midland and highland regions and in some areas is becoming a problem in winter when large numbers congregate and graze on irrigated pastures. The current project has been initiated to assess the extent of the problem, and make recommendations for the management of this species on farmland in the province.

A questionnaire will be distributed to farmers throughout the province, sampling on a systematic basis. This will provide data on present distribution, population trend and available habitat which will be used to identify areas that are potentially suitable for reedbuck. Where reedbuck have been translocated to farmland in recent years the level of translocation success will be monitored and considered in respect of available habitat, and genetic variability.

An intensive study is under way on a group of dairy farms along the Polela valley, north of Humeville. Particular emphasis is being placed on monitoring crop damage, using exclusion cages, and on developing a usable animal census method. Radiotelemetry will be used to assess the extent of movement between farms and follow individuals during prolonged activity studies. Some animals are being culled to assess seasonal changes in crop dependence (rumen analysis), physiological and reproductive condition.

Keywords: censusing, crop damage, distribution, ecology, farmland, grasslands, Natal, radiotelemetry, reedbuck

HOWE L G

(Döhne Agricultural Research Station, Private Bag X15, Stutterheim 4930)

The introduction and evaluation of promising species in the Eastern Cape:
growth and production of temperate grasses in the coastal belt northeast
of East London (1981-1986)

Keywords: coastal belt, Eastern Cape, grass, growth, pasture evaluation, pasture introduction, production

INGPEN R A

(Döhne Agricultural Research Station, Private Bag X15, Stutterheim 4930)

The introduction and evaluation of promising pasture species in the
Eastern Cape: seeding rate and weed control in the establishment of
Rhodes grass (1980-1982)

Keywords: Eastern Cape, establishment, pasture evaluation, pasture introduction, Rhodes grass, seeding, weed control

JACOBSEN N H G

(Nature Conservation Division, Transvaal Provincial Administration,
Private Bag X209, Pretoria 0001)

Distribution and status of reptiles and amphibians in the Transvaal

The project is still in the first phase ie collecting of specimens of all reptile and amphibian species in the Transvaal. Extensive range extensions and new records for the province have been made for many species which lead to a better understanding of their taxonomical status. This is especially so for the genera Cordylus, Platysaurus and Lygodactylus. The Cape cobra (Naja nivea) is considered vulnerable in the Transvaal as a result of habitat destruction and persecution. Recommendations have been made to ensure its continued existence in the province.

Keywords: amphibians, distribution, faunal survey, grasslands, reptiles, savanna, Transvaal

JARVIS J U M and R BUFFENSTEIN

(Department of Zoology, University of Cape Town, Private Bag,
Rondebosch 7700)

Studies on the water relationships of arid-adapted rodents (1978-1981)

Preliminary studies of Tateral eucogaster, Gerbillurus paeba, G tytonis, G setzeri, Gerbillurus species (from Kenya) and Desmodillus auricularis have shown that they can survive a minimum of 40 days on a dry seed (with approximately 8% water content) diet and no other water source. After an initial 15-25% drop in mass they stabilized at a lower body mass.

When water deprived, all these rodents excreted in their urine substantial quantities of white crystals. From mass spectrophotometry, mass NMR and infrared analysis, this substance was found to be allantoin (usually associated with purine catabolism but have excreted in apparently too great a quantity to be solely from this source). Allantoin can be further broken down into urea but this requires two additional water molecules. It would be advantageous to the water balance of these animals if they had metabolic pathways through which they were able to convert some of the nitrogenous waste normally executed as urea into allantoin. Such a pathway is not known for mammals and total urea and allantoin excretion on ad-lib and water-deprived diets is being monitored in an attempt to determine whether it does, in fact, occur in these rodents.

T leucogaster and Gerbillurus species have been used in metabolic water production studies and in determining water turnover (using tritiated water). In addition it has been shown that preferential selection, for high carbohydrate low protein seeds, occurs when the animals are water deprived but not with ad-lib water. Animals fed exclusively on high-protein seed (barley) produced the most concentrated urine.

Keywords: African, allantoin, arid-adapted, gerbilline, rodents, urea, water relations

JARVIS J U M and K C DAVIES

(Department of Zoology, University of Cape Town, Private Bag,
Rondebosch 7700)

A preliminary investigation of the ecological role of mole-rats in the
fynbos of the Western Cape (1981-1983)

This study on the ecological roles of mole-rats in fynbos is being undertaken at Pella. Three areas in which mole-rats occur have been demarcated. Every month all new mole-rat mounds are marked and numbered. This mound-building activity will be monitored for at least six months to provide information on relative ages of new areas dug by mole-rats before excavation of these burrow systems commences in the second half of 1981. Information on burrow depths and dimensions, volume of soil moved and food storage activity will be used to determine the impact of mole-rats on substrate disturbance and drainage. Their effect on plants and their roots will also be critically assessed.

A trapping programme is being undertaken. To date only Bathyergus has been found to occur at Pella. Gut contents will be analysed to determine seasonal changes in diet. Breeding data, such as the number of offspring and breeding season will be recorded.

It is hoped that this project will fill a major gap in fynbos community faunistic studies and in particular throw some light on the much-neglected fossorial niche.

The project might however be of more value if:

- (i) It were extended to areas where the three mole-rat genera occur sympatrically.
- (ii) Exclusion plots were constructed to monitor long-term effects of mole-rats on the soil and flora.
- (iii) Nutrient and trace element analyses were done on soil brought to the surface by mole-rats.

Keywords: breeding, feeding, fynbos, mole-rat, Pella, trapping, Western Cape

JONES J, G N LOUW, W R SIEGFRIED and P C WITHERS

(Percy FitzPatrick Institute of African Ornithology, University of Cape Town, Private Bag, Rondebosch 7700)

Thermoregulation, respiration, metabolism and water balance in the ostrich
Struthio camelus

The ostrich is the world's largest living bird. Its size prevents it from using favourable microhabitats in the harsh, arid environments in which it normally now lives. In spite of the ostrich's history of domestication and economic importance, little is known about its basic physiology. This

study deals with aspects of the ostrich's thermoregulation, respiration, energy and water requirements in the wild as well as in captivity.

Keywords: birds, ostrich, physiology, respiration, thermoregulation

JOOSTE J F

(Jonkershoek Nature Conservation Station, Private Bag X5014
Stellenbosch 7600)

The distribution and habitat preference of some small mammals in the
Rolfontein Nature Reserve, Cape Province (1975-1980)

The objective is to determine the distribution of certain small mammals before the implementation of management practices such as controlled burning in order to assess the influence of such practices on these populations.

The distribution was monitored by means of 3600 trapping periods in each of 11 plant communities over a period of four seasons, using three types of traps and a standardised bait. Two different methods of setting traps were also investigated.

The distribution and habitat preferences of 12 small mammal species were determined. Species richness, diversity and population density in the different communities were determined. Metal rat-traps proved more efficient than wooden mousetraps or the live-traps used. Additions to the species list were still found after four seasons of intensive trapping which suggests that a high intensity of trapping is necessary to accurately determine the species diversity of different plant communities. A comparison of different methods of trapping showed that more individuals of common species are caught where traps are moved in the trapping area every 24 hours whereas a wider variety of species is caught when traps are left at the original site for five days.

Keywords: Cape Province, distribution, habitat preference, Insectivora, Karoo, small mammals

JOOSTE J H, C M WALTERS en L M RAITT

(Departement Plantkunde, Universiteit van Stellenbosch, Stellenbosch 7600)

Aspekte van die minerale voeding van lede van die Proteaceae as
verteenwoordigers van die fynbosgemeenskap/Aspects of the mineral feeding
of members of the Proteaceae as representatives of the fynbos community
(1978-1982)

By sommige lede van die Proteaceae is 'n besonder hoë Na/K-verhouding aangetoon. Hierteenoor beweer sommige navorsers dat hierdie familie besonder gevoelig teenoor 'n hoë Na-inhoud in die grond is.

Met Leucadendron salignum in sandkultuur is aangetoon dat die plante 'n eenvormige groeipatroon getoon het met variërende hoeveelhede Na en K in die groeimedium.

Opnamestudies met afgesnyde wortels en gemerkte elemente het egter 'n voorkeur vir Rb (as plaasvervanger vir K) bo Na getoon. Mededinging vir opname tussen hierdie twee elemente is aangetoon, asook dat die opname van albei onder metaboliese beheer staan.

Die opname van Na en K deur proteoïede wortels was ongeveer dubbel so groot as dié deur gewone wortels.

Keywords: Cape Province, fynbos, mineral nutrition, Proteaceae

JOUBERT S C J
(National Parks Board, Private Bag X402, Skukuza 1350)

Responses of large herbivore populations to environmental conditions in the Kruger National Park (Long-term project to include successive climatic cycles)

Annual aerial surveys are conducted during which the following data are recorded:

- (i) Population totals of 15 of the larger herbivores, ranging from warthog Phacochoerus aethiopicus and impala Aepyceros melampus to elephant Loxodonta africana.
- (ii) The group size distribution of each species.
- (iii) The distribution of each species in five density classes.
- (iv) The distribution of surface water.
- (v) Variables of the field layer, including length, cover, litter, phenology, greenness, utilization and burns.
- (vi) Variables of the woody vegetation including phenology, burns and elephant damage.

Environmental "constants" are also incorporated in the programme, including topographical features, soil types and their distribution and plant communities. A computerized programme has been established to store and print data on a 2 x 2 km grid system of the KNP. Statistical treatment of data to determine correlations between animal populations and environmental phenomena is currently receiving attention.

Keywords: faunal survey, geomorphology, herbivores, Kruger National Park, savanna, Transvaal

KAHL M P

(Percy FitzPatrick Institute of African Ornithology, University of Cape Town, Private Bag, Rondebosch 7700)

Reproductive biology and behaviour of the African spoonbill Platalea alba

Keywords: behaviour, birds, breeding, Platalea alba

KARBERG F O C W

(Döhne Landbounavorsingsinstituut, Privaatsak X15, Stutterheim 4930)

Intensiewe skaapproduksiestelsel vir die kusstreek van die Oos-Kaap/
Intensive sheep production system for the coastal region of the Eastern
Cape (1977-1993)

Keywords: coastal region, Eastern Cape, production system, sheep

KLINGELHOEFFER E W

(Eugène Marais Chair of Wildlife Management, Department of Zoology, University of Pretoria, Pretoria 0002)

Population ecology of the elephants in Tongaland, KwaZulu (1979-1981)

Keywords: elephant, population ecology, savanna, Tongaland

KNIGHT R S and W R SIEGFRIED

(Percy FitzPatrick Institute of African Ornithology, University of Cape Town, Private Bag, Rondebosch 7700)

Birds as dispersers of plants

This project is carried out to define more precisely to what extent birds disperse plant seeds, which species do so fortuitously and which are co-adapted to certain plants to do so regularly as the plant's normal dispersal agent. Attention is now being given to the incidence of bird-dispersed trees in the various parts of southern Africa.

Keywords: birds, forest, seed dispersal, trees

KOEN J H

(Saasveld Forestry Research Station, Private Bag X6531, George 6530)

A field study of the mountain zebra Equus zebra zebra in the southern Cape (1980-1982)

The aim of this study is to formulate sound management proposals for the future conservation of this remnant group in the Kamanassie Mountain

catchment area. Their dependence on vegetational type, successional stage or physical environmental feature will be established. A helicopter survey of the area established the presence of a minimum of seven individuals.

Keywords: endangered species, Equus zebra zebra, fynbos, nutrition, population structure, southern Cape

KOEN J H

(Saasveld Forestry Research Station, Private Bag X6531, George 6530)

A study of the distribution, population composition, movements, etc of the Knysna elephant, Loxodonta africana africana (1979-1981)

The aim of this study is to supply a sound scientific basis for the future management of this free-roaming group of elephants. Faeces and food plants are analysed on a regular basis to determine the mineral and protein status. Fifty species have been identified as food plants. A major survey conducted by more than 200 persons established the presence of only an adult cow and a five year-old calf. The movements of the cow and calf are well known and they spend approximately 75% of their time on 9 km².

Keywords: distribution, forests, Loxodonta africana, movement, nutrition, population structure, southern Cape

KRUGER F J

(South African Forestry Research Institute, P O Box 727, Pretoria 0001)

Succession after fire in selected fynbos plant communities of the southwestern Cape (1979-1983)

This study involves description and analysis of successional changes in Mountain Fynbos communities after fire at Jonkershoek, Zachariashoek (near Wemmershoek) and Jakkalsrivier (Mt Lebanon) in the southwestern Cape. There are four objectives:

- (i) Description of pyric succession in terms of changes in structure, composition and diversity, to test current conceptual models.
- (ii) Analysis of certain underlying mechanisms, to determine the relative roles of inherent species' life-history traits (eg longevity) and species' interactions in determining the nature and course of succession.
- (iii) Tests of hypotheses that relate community diversity of disturbance frequency.

- (iv) Trial and development of mathematical simulation models to describe and/or predict succession as well as the effect of variable fire regimes.

Studies include:

- (i) Analysis of a 10 year record of successional changes in cover, height biomass and gross vegetation composition in different communities at Jakkalsrivier, as well as a few other long-term records available.
- (ii) Detailed analysis of changes in composition and diversity on fixed 5 x 10 m quadrats representing range of communities with different productivities.
- (iii) Demographic studies on dominant seeding shrubs.
- (iv) Superficial ecophysiological studies to assess plant responses to changes in resource availability.
- (v) In cooperation with other workers, trial of simulation models based on the JABOWA model that has been applied successfully in North American succession simulations.

Detailed sampling will continue until late 1982 and the results will be written up in 1983.

Keywords: disturbance, diversity, fire, fynbos, succession

KRÜGER J E

(Eugène Marais Chair of Wildlife Management, Department of Zoology, University of Pretoria, Pretoria 0002)

Interrelationships of the larger carnivores in the Klaserie Private Nature Reserve, with emphasis on the leopard and the cheetah (1979-1981)

Keywords: carnivores, cheetah, leopard, savanna

LAMBRECHTS J J N, A A THERON and M ST L FRY

(Department of Soil Science, University of Stellenbosch, Stellenbosch 7600)

A detail-characterization of soil under different fynbos-climate-geology combinations in the southern and southwestern Cape (1979-1981)

Preliminary soil maps of the Pella (Mamre), Swartboschkloof (Jonkershoek), and Zachariashoek (Franschhoek) research sites have been drawn. Most of the field-work in these areas has also been completed, but final field-work to check mapped boundaries and to do further sampling remains.

The Pella and Swartboschkloof sites are the two key areas in the fynbos study, and besides the soil mapping done there (using the SA Binomial System), a detailed analysis of nutrients within horizons of type profiles is being undertaken. Physical properties of the soils in these two areas are also being determined to help in the interpretation of the soil-plant relationship. The physical soil properties being determined include moisture retention, particle size analysis, and statistical analysis of size distribution data.

Some very obvious correlations between plant species and soil types have been noted in the field, but a more detailed study of this aspect of the project has and will continue to be done in conjunction with the Botanical Research Institute.

Keywords: fynbos, geology, soil-plant relationships, soils

LAMONT B B and E J MOLL

(Department of Botany, University of Cape Town, Private Bag, Rondebosch 7700)

Studies of proteoid roots in the South African Proteaceae (1981)

Keywords: fynbos, Proteaceae, proteoid roots

LAWSON D

(False Bay Park, P O Hluhluwe 3960)

The status and ecology of suni Neotragus moschatus in Natal (1981-1984)

The objectives are:

- (i) Determination of past and present distribution of the suni in Natal.
- (ii) Determination of the status of suni on those reserves reporting populations and on farmland and stateland in surrounding areas.
- (iii) Development of a suitable census method that will give reliable estimates of animal numbers.
- (iv) Determination of habitat preferences and requirements of suni.
- (v) Preparation of recommendations for future management of suni to ensure viable populations for the future.

The field-work will rely heavily on radiotelemetry studies with time being spent initially on fieldcraft skills and capture method assessment. The telemetry will yield valuable information on home range, home range utilization and territorial and spacing behaviour.

Habitat assessment by habitat preference index and discriminant function analysis will lead to elucidation of habitat preferences and requirements of suni, and enclosure experiments will give insights into feeding and social behaviour. It is expected that plant phenology will have important effects on seasonal feeding and home range utilization of suni, so monthly observations of fruiting and flowering of those plant species present will be undertaken.

The development of a suitable census method will aid the determination of abundance and status of suni as well as provide a method for future use by management staff.

The status of the suni concerns numerical abundance plus the demographic state of the population so parameters of age, condition, recruitment, emigration and mortality will be investigated.

Keywords: habitat preference, Natal, radiotelemetry, status, suni

LAYCOCK P

(School of Environmental Studies, University of Cape Town, Private Bag, Rondebosch 7700)

A study of a microchiropteran-dominated cave ecosystem (1980-1983)

A study of the overall ecosystem of De Hoop cave is being made in an attempt to determine why it is the only major microchiropteran breeding cave in the southwestern Cape. Key questions of research are:

- (i) What are the reciprocal interactions of the cave biota?
- (ii) What factors would be most likely to upset this balance?

Keywords: bat, cave, cave biota, fynbos, guanobia

LE MAITRE D C

(Jonkershoek Forestry Research Station, Private Bag X5011, Stellenbosch 7600)

Experimental investigations of the effects of season of burn on fynbos communities in plot trials at Kogelberg: studies on community structure and function and the response of communities to treatment (1976-1990)

The aim of this trial is to determine the influence of fire in different seasons on community structure in the Mountain Fynbos shrublands of the southern mountains. Treatments are complete and included three spring, one summer and three autumn burns between 1976 and 1979. One plot has been reserved in order to maintain an area of the pre-fire community.

Pre- and post-fire surveys include floristic surveys, biomass determinations and point vegetation cover surveys. Reports and an MSc on the

pre-fire community, the experimental burns and the initial responses to treatment are complete. The present studies are concentrated on analysis of the successional trends in the communities on the plots and on the population dynamics of selected species.

Keywords: Cape Province, community structure, fire, fynbos, succession

LE MAITRE D C

(Jonkershoek Forestry Research Station, Private Bag X5011, Stellenbosch 7600)

Plot trials to determine the effects of season of burn on semi-arid fynbos in the Cedarberg State Forest (1981-1990)

The aim of this plot trial is to determine the effect of season of burn on Mountain Fynbos vegetation in a semi-arid zone and to compare this to effects observed in mesic Mountain Fynbos. The principal investigation will be on the effects of season of burn on the regeneration of germinative species. Other aspects that will be concentrated on are how fire affects the species diversity, species spectrum, vegetation regrowth and soil erosion.

The initial stages of the study will focus on the present community structure and function, with special emphasis on fuel models for fire behaviour characterization, comparison of the structure of the two ages of the community and the demography of Leucadendron pubescens.

Keywords: Cape Province, Cedarberg, fire, fynbos, season, semi-arid

LE ROUX C J G

(Döhne Agricultural Research Station, Private Bag X15, Stutterheim 4930)

The introduction and evaluation of promising pasture species in the Eastern Cape: growth of temperate grasses in the Döhne Sourveld (1979-1984)

Keywords: Döhne Sourveld, Eastern Cape, grass, growth, pasture evaluation, pasture introduction, savanna

LE ROUX C J G

(Döhne Agricultural Research Station, Private Bag X15, Stutterheim 4930)

The introduction and evaluation of promising pasture species in the Eastern Cape: the phytomass potential of Rhodes grass in a Shorrocks soil series at Bathurst at various nitrogenous and phosphate levels (1981-1986)

Keywords: Eastern Cape, nitrogen, pasture evaluation, pasture introduction, phosphate, Rhodes grass, savanna

LE ROUX C J G

(Döhne Agricultural Research Station, Private Bag X15, Stutterheim 4930)

The introduction and evaluation of promising pasture species in the Eastern Cape: screening annual temperate legumes in the Döhne Sourveld (1980-1983)

Keywords: annual legumes, Döhne Sourveld, Eastern Cape, pasture evaluation, pasture introduction, savanna

LE ROUX C J G

(Döhne Agricultural Research Station, Private Bag X15, Stutterheim 4930)

The introduction and evaluation of promising pasture species in the Eastern Cape: screening of legumes in the coastal region north of East London (1980-1984)

Keywords: coastal region, Eastern Cape, legumes, pasture evaluation, pasture introduction

LE ROUX C J G

(Döhne Agricultural Research Station, Private Bag X15, Stutterheim 4930)

The introduction and evaluation of promising pasture species in the Eastern Cape: screening perennial legumes in the Döhne Sourveld (1980-1984)

Keywords: Döhne Sourveld, Eastern Cape, pasture evaluation, pasture introduction, perennial legumes, savanna

LE ROUX G H

(Directorate of Forestry and Environmental Conservation, Western Cape Regional Office, Private Bag X9005, Cape Town 8000)

The role of domestic animals using the Riviersonderend Mountains for grazing (1979-1981)

The role of grazing by domestic animals in the Riviersonderend Mountains has been changing rapidly in the last few years. A study of the past and present use of the land for grazing, and the reasons for change, give an indication of possible future trends and the significance this has for catchment management.

A questionnaire survey of all landowners in the study area has been completed. This, together with a ground survey, interpretation of earlier aerial photographs, and archival data, will permit an assessment of past practices and implications for future management.

Keywords: catchment, cultivated pastures, domestic animals, fire, fynbos, grazing, landuse, management, mountain catchments, patch burning, predators

LEWIS O A M, D T MITCHELL and W D STOCK
(Department of Botany, University of Cape Town, Private Bag,
Rondebosch 7700)

An investigation of cycling and processing of nitrogen in the fynbos biome
(1981-1983)

The aims and objectives of an investigation of N cycling and processing in the fynbos biome have been discussed. Analyses of temporal and spatial fluxes of soil N in pre-fire soils have been completed as the research site was accidentally burnt in 1980. No significant seasonal fluxes are apparent in these data. The post-fire soil N analyses were continued on the burnt-over site and a NO_3^- flush, probably due to increased mineralization, was evident after the fire.

Inorganic N input from precipitation has been monitored and is estimated to be between 1-2 kg N ha⁻¹ yr⁻¹. Studies concerning the seasonal allocation of N in Thamnochortus punctatus have been initiated and should be completed in this coming year. Further studies on N uptake and utilization by fynbos plants will be started in 1981.

Keywords: fynbos, nitrogen

LIVERSIDGE R
(Alexander McGregor Museum, P O Box 316, Kimberley 8300)

Springbok ecology (1969-ongoing)

The study comprises the following:

- (i) Annual monitoring of culled material to record changes from year to year in body mass, reproductive rate and kidney fat index.
- (ii) Nutritional values of rumen correlated with identification of plants utilized from month to month.
- (iii) Reproductive biology to determine what controls the season which is variable and percentage lambing.
- (iv) Determination of stress factors and periods of stress in both sexes, adult and yearlings through mainly physiological parameters, trace element analysis, etc.
- (v) Population dynamics.
- (vi) Culling.

This is an ongoing study primarily to determine factors which control the reproductive season and the population dynamics.

Keywords: feeding, population dynamics, reproduction, springbok, stress

LIVERSIDGE R

(Alexander McGregor Museum, P O Box 316, Kimberley 8300)

Rumen analysis (1967-ongoing)

The project comprises the identification of grasses based on epidermal characters. The work of drawings and keys for identification of over 150 species found in the Northern Cape is nearing completion.

Keywords: epidermal characters, grass, grasslands, Karoo, Northern Cape, rumen analysis

LIVERSIDGE R

(Alexander McGregor Museum, P O Box 316, Kimberley 8300)

Birds of prey of the Kalahari National Park (1974-1984)

The objective of this study is to determine long-term changes in all bird of prey populations, initially with a view to comparing some prey densities with predator densities. This study has been analysed at the four- and seven-year intervals with total bird populations broken into feeding requirements, grazers, predators, insectivores and seed-eaters. There are some interesting population changes correlated with rainfall season and quantity of rainfall. Fortunately a wet period was included and now a dry period is following.

Keywords: birds, Kalahari National Park, prey densities

LLOYD P H

(Jonkershoek Nature Conservation Station, Private Bag X5014, Stellenbosch 7600)

A study of the Chacma baboon *Papio ursinus* in the Cape Province

A population dynamics study, based at the De Hoop Provincial Nature Reserve, Bredasdorp Division, forms part of a larger ecological study of the baboon in the Cape Province. Essentially the project consists of a capture, mark, release and observation routine, in which over 150 individuals have been marked thus far, in at least three different groups. The object of the exercise is to establish the population growth rates of each group and to determine whether any differences exist between groups which more or less confine their activities to natural veld on the reserve and groups which to a greater extent utilize neighbouring farmlands. The hypothesis is that those living on the reserve itself will represent the closest approximation to a naturally stable population, despite a probably lowered level of predation by larger carnivores, whereas those that utilize agricultural lands could show a faster turnover within the population due to a stimulated birth rate countered by a higher mortality rate since they are more likely to be shot (at an earlier age) because of their activities. Hopefully this will then put us in a position to inform agriculturalists at what rate control should take place.

A food habit study is also being undertaken, utilizing shot samples from over the entire Cape Province.

Keywords: baboon, Cape Province, feeding ecology, population dynamics

LOW A B

(Cape Flats Nature Reserve, University of the Western Cape, Private Bag X17, Bellville 7530)

Litter-fall studies in dune scrub vegetation and Acacia species on the Cape Flats (1979-1981)

Litter-fall amounts and seasonality are currently being determined in five species from dune scrub (Strandveld) and two introduced species of Acacia. Litter is trapped using baskets of 0,25 m² area, with subsequent division into leaf, twig, flower and fruit components and then dried at 105°C to constant mass. Preliminary results from the dune scrub indicate a summer (December-January) peak in leaf fall (up to 115 gm⁻²) for all species with little trend in twig fall. Leaves comprised the major component of the litter dropped. Flowering structure and fruit fall vary according to the phenological activity of the respective species. Differences in leaf-litter fall between male and female individuals of each of the dioecious species appear to be insignificant.

Keywords: Acacia, Cape Flats, dune scrub, litter

LOW A B

(Cape Flats Nature Reserve, University of the Western Cape, Private Bag X17, Bellville 7530)

Phytomass of four ages of Coastal Fynbos in the Western Cape (1979-1980)

Aerial phytomass in 3,5; 6; 11 and 17 year post-burn Coastal Fynbos was determined using the clip-plot technique. Amounts ranged from 174 gm⁻² (3,5 years old) to 6395 gm⁻² (17 years old; live) and 77 gm⁻² to 1934 gm⁻² (dead). Belowground root mass was determined through excavation below aerial phytomass plots. Amounts recorded ranged from 1029 gm⁻² (3,5 years old) to 1867 gm⁻² (17 years old; live) and 593 gm⁻² to 2338 gm⁻² (dead).

Both aerial and belowground masses generally compare with those from heathland vegetation elsewhere. The figure of 6395 gm⁻² (63 950 kg ha⁻¹) for the 17 year-old (Protea repens) stand is however far higher than that recorded for a similar community in Cape fynbos or in any other shrub-dominated heathland.

Root:shoot ratios for the resprouting vegetation (3,5; 6 and 11 years old, dominated by Phyllica cephalantha) were high (5,9; 5,5 and 0,7 respectively). The 17 year-old stand (seed regenerating) displayed a low ratio of 0,3.

Keywords: aerial, belowground, Coastal Fynbos, phytomass, roots

LOW A B

(Cape Flats Nature Reserve, University of the Western Cape, Private Bag X17, Bellville 7530)

Seasonal variation in soil and leaf nutrient status in different fynbos communities along a moisture gradient in the Winterhoek Mountains (1980-1981)

This study is a continuation of previous work along a permanent transect in the Winterhoek Mountains. Eight communities from riverine scrub, flood and sandy plain, and rocky outcrop habitats are being investigated on a seasonal (three-monthly) basis for variation in soil and leaf nutrient status. The aim is to determine:

- (i) Whether seasonal fluctuations in major nutrients in soil occur, as has been demonstrated elsewhere in Mountain Fynbos.
- (ii) Whether different leaf forms of the dominant plant species along the gradient display different major leaf nutrient concentrations and whether this has any adaptive significance in a "nutrient poor" environment.
- (iii) What seasonal variations in leaf nutrient status occur and whether this is linked to phenological activity, chiefly shooting and flowering.

In addition leaves of different ages will be examined to determine whether internal recycling of various elements occurs prior to leaf drop. Preliminary soil data indicate nutrient levels in some cases to be exceedingly low, particularly with regard to N and P. Leaf analyses of several of the species also indicate fairly low major nutrient levels with some variation between species, as well as between leaves of different ages and from the same species.

Keywords: leaf, Mountain Fynbos, nutrient cycling, seasonal, soils

LUBKE R A

(Department of Plant Sciences, Rhodes University, P O Box 94, Grahamstown 6140)

Conservation and reclamation in coastal environments

Studies have been made of the indigenous vegetation in the dunes, estuaries and forest along portions of the Eastern Cape coast. The aim of this project is to describe accurately the vegetation and the surrounding environment to assess changes which may result due to man's interference with the ecosystems. More specific studies are concentrated on the reclamation techniques and results of stabilizing coastal dune systems.

Keywords: coastal dunes, coastal vegetation, conservation, reclamation

LUBKE R A

(Department of Plant Sciences, Rhodes University, P O Box 94,
Grahamstown 6140)

Structural surveys of the woody vegetation of the Savanna Ecosystem Study
Area, Nylsvley (1974-1981)

Quantitative measurements on all the woody plants of the study area were first made in 1974. Repeated surveys of trees and shrubs in permanently marked plots in five different camps have been made in order to assess the changes in frequency, density and structure of the plants over a long-term period.

Keywords: population dynamics, savanna, vegetation structure, woody plants

MACDONALD I A W

(Hluhluwe Game Reserve, P O Box 25, Mtubatuba 3935)

Characterization of the past fire regime in the Hluhluwe-Corridor-Umfolozi
Game Reserve Complex (1978-1979)

The fires occurring in the three areas that make up the central complex have been mapped annually since 1954, 1956 and 1967 respectively.

This fire map data is to be extracted according to a 0,25 km grid square system and then computerized.

This will facilitate the description of the past fire regime experienced in the area, eg proportion burnt each year, seasonal occurrence of fire, origin of fires - intentional, accidental, arson or natural, frequency of fire, etc.

More specific information will be obtained with respect to the fire regimes experienced by specific vegetation types and the fire regimes associated with known vegetation changes.

Keywords: fire, fire regime, Natal, savanna

MACDONALD I A W

(Hluhluwe Game Reserve, P O Box 25, Mtubatuba 3935)

A comparison of different approaches to the monitoring of vegetation
changes in the Hluhluwe-Corridor-Umfolozi Game Reserve Complex (1978-1982)

One of the biggest problems in game reserve management is obtaining accurate and objective measures of vegetation changes such that the effect of past management actions can be properly assessed and future management can be planned accordingly.

In this study a wide range of monitoring approaches will be compared in a number of the different vegetation types occurring in the central complex. An optimal monitoring strategy will be derived for each vegetation type based on criteria such as repeatability, yield of useful information, and man-hours required.

Keywords: Natal, savanna, vegetation change, vegetation monitoring

MACDONALD I A W

(Hluhluwe Game Reserve, P O Box 25, Mtubatuba 3935)

The effect of hydrastumper removal of *Euclea divinorum* in Hluhluwe Game Reserve (1978-1981)

Dense stands of the shrub/tree *Euclea divinorum* now cover a large proportion of the low-lying areas in Hluhluwe Game Reserve. This vegetation type is held to be spreading and is considered undesirable for a number of reasons, eg susceptibility to soil erosion, low herbivore carrying capacity, and poor visibility.

Various control measures have been attempted in the past and finally a tractor-mounted hydraulic stumper has been chosen as being the most effective.

The present trial is being conducted to measure the actual percentage kill achieved by this removal technique, firstly when all individuals are treated and secondly when only selected "easily pulled" individuals are treated. Both levels of removal are conducted with and without follow-up removal of broken roots from the removal hollow.

Species composition and basal cover of the grass sward was measured in all treatment areas prior to treatment and in an adjacent untreated central area.

All individuals of *Euclea divinorum* in each area were mapped and measured prior to treatment application.

Changes in the grass layer and regeneration of *E. divinorum* are to be monitored annually.

Keywords: bush encroachment, *Euclea divinorum*, management, Natal, savanna

MACDONALD I A W

(Hluhluwe Game Reserve, P O Box 25, Mtubatuba 3935)

A review of the vegetation dynamics of the Hluhluwe-Corridor-Umfolozzi Complex (1979-1981)

As very little information on this aspect of the area's ecology has yet been published, a symposium/workshop meeting of past and present research

and management personnel from the Complex was held in August 1979. Seventeen papers relating to the Complex were presented and two comparative papers from Mkuze and Ndumu Game Reserves were also read. Six workshop sessions were held to synthesize local knowledge on past vegetation changes, the role of man, fire, soil erosion and herbivores in these changes and the effects of these changes on faunal and abiotic components of the environment. Three further workshop sessions were held to establish priorities for vegetation monitoring in the area and to discuss management goals and management strategies for the vegetation of the central complex. It is planned to publish the results of this meeting during 1980.

Keywords: forests, land transformation, Natal, population dynamics, savanna

MACDONALD I A W and P J BIRKENSTOCK
(Hluhluwe Game Reserve, P O Box 25, Mtubatuba 3935)

A review of knowledge on the avifauna of the central Hluhluwe-Corridor-Umfolozi Complex (1978-1983)

All the available information on the avifauna of the Complex from unpublished and published sources is being collated. A preliminary annotated checklist has been drawn up and submitted to past workers in the area for the inclusion of their data. All completed field cards for the Complex for the period 1970-1979 have been analysed. A first annotated checklist of the avifauna will be published in 1980. Continuous monitoring through the completion of monthly field cards will be carried out for both reserves throughout the review period. Improved assessments of the status and abundance of each species will be published in 1983.

Keywords: avifauna, birds, forest, Natal, savanna, survey

MACDONALD I A W, P M BROOKS, J L ANDERSON and A WHATELEY
(Hluhluwe Game Reserve, P O Box 25, Mtubatuba 3935)

A review and synthesis of available information on the ecology of the Hluhluwe-Corridor-Umfolozi Game Reserve Complex (1978-1983)

In order to provide a firm basis for the ongoing management of the central Complex a review and synthesis of available information is now imperative. This information has been collected since 1897 when the Hluhluwe and Umfolozi Game Reserves were proclaimed. The extent of the data base involved is now extensive. No overall review studies have yet been undertaken. It is intended that the synthesis will provide an objective framework for the establishment of priority areas for future research in the central complex.

Keywords: ecology, forests, management, Natal, savanna

MACDONALD I A W, L MEIKLEJOHN and E A ROY
(Hluhluwe Game Reserve, P O Box 25, Mtubatuba 3935)

A bibliography of published and unpublished reports relating to the
Hluhluwe-Corridor-Umfollozi Complex (1978-1983)

All the relevant reports, theses and publications were obtained. A preliminary listing by authors was completed in 1979. Two hundred and sixty titles were obtained in this initial search. This bibliography will be updated and amended throughout the review project. A final version listing titles by author and by subject will be produced in 1983.

Keywords: bibliography, forests, Natal, savanna

MANRY D E

(Percy FitzPatrick Institute of African Ornithology, University of
Cape Town, Private Bag, Rondebosch 7700)

Ecoethology of South African ibises

The four species of ibises breeding in South Africa display marked differences in degree of sociality both when breeding and feeding. A detailed study was first made of the social behaviour, breeding biology, foraging habits, food and energy requirements of the sacred ibis Threskiornis aethiopicus. This has been used as a base in the study of the other three species including the endangered endemic bald ibis Geronticus calvus.

Keywords: birds, breeding, ecoethology, feeding ecology, ibis, social behaviour, threatened species

MANRY D E

(Percy FitzPatrick Institute of African Ornithology, University of
Cape Town, Rondebosch 7700)

Ecology of the bald ibis (Geronticus calvus) in Natal (1978-1981)

The ecology of the bald ibis was studied to provide information for the conservation of this endangered species. The bald ibis is endemic to South Africa, Lesotho and Swaziland, and occurs mainly in sour grassland areas flanking the Great Escarpment in the eastern Republic. It is primarily an insectivore, and is highly specialized for feeding in burnt grassland and short, post-burn regrowth. The bald ibis's breeding season is timed apparently to coincide with the annual winter and spring burning season in grassland.

The breeding biology of the bald ibis was studied in detail at a single breeding colony in Natal during three consecutive breeding seasons (1978, 1979, 1980); reproductive output was suppressed following the drought of 1979-1980, compared to the wet years 1977-1978.

Keywords: bald ibis, birds, breeding, distribution, drought, feeding ecology, fire, grasslands, Natal, rainfall

MENTIS M T

(Department of Pasture Science, University of Natal, P O Box 375,
Pietermaritzburg 3200)

A mathematical simulation of grazing of Sour Grassveld (1979-1982)

There are several objectives: to predict animal performance, veld composition change and soil erosion, and to permit experiments to be conducted by simulation on the computer to highlight the most critical variables and field experiments. Input data are mostly from the Moist Tall Grassveld at Ukulinga Experimental Farm. The study was initiated in 1979, and it is hoped to have the model operational by late 1982.

Keywords: animal performance, erosion, grasslands, grazing, simulation modelling, Sour Grassveld, veld composition

MENTIS M T and R C BIGALKE

(Department of Pasture Science, University of Natal, P O Box 375,
Pietermaritzburg 3200)

Population response of grey-wing and redwing francolins to hunting (1979-1982)

The purpose of the study is to ascertain the hunting pressure which francolins may sustain. Birds on the control and experimental areas on Highmoor State Forest are censused in autumn (April and May) immediately prior to hunting (June), and then again in autumn of the following year. Hunting effort and success is recorded, and these are compared with records of hunting by hunters on private land.

Keywords: birds, forests, grasslands, grey-wing francolin, hunting, population dynamics, redwing francolin

MILLS M G L

(Kalahari Gemsbok National Park, Private Bag X5890, Upington 8800)

Distribution, abundance and utilization of the tsama (*Citrullus lanatus*) and gemsbok cucumber (*Acanthosicyos naudianus*) in the southern Kalahari (1976-1980)

These wild fruits which first ripen in late summer, are an important food item and source of moisture for a number of animals living in the Kalahari.

Counts have revealed that the distribution and abundance of these fruits vary markedly annually, depending on the amount and distribution of rainfall in an as yet imperfectly understood manner. This is particularly true for the tsama which is an annual. The tsama, however, is much more resistant to frost than the more regular, perennial gemsbok cucumber.

Utilization of tsamas occurs right through the year, if the crop is good, and utilization rates of up to 90% by December have been recorded. Because of its susceptibility to frost, however, the gemsbok cucumber crop can only be utilized up until about July, although the rate of utilization is also high (\pm 80%).

Keywords: arid, fruits, Kalahari, production, rainfall, savanna, utilization

MILLS M G L

(Kalahari Gemsbok National Park, Private Bag X5890, Upington 8800)

The effect of fire on camel-thorn trees (Acacia erioloba) in the Nossob riverbed (1977-1980)

Random counts and a subjective assessment of damage to trees subjected to naturally occurring fires in 1976 have been carried out annually.

By May 1978 77,7% of the trees sampled showed good signs of recovery from the fire.

More large trees were destroyed by the fire than medium-sized or small trees, probably because they were old and in poor condition.

Examination of these trees showed that most of them had burnt from the inside, which suggests that they were in poor condition.

Keywords: arid, fire, savanna, trees

MILLS M G L

(Kalahari Gemsbok National Park, Private Bag X5890, Upington 8800)

Prey selection of the larger carnivores in the Kalahari Gemsbok National Park (1972-ongoing)

Records of kills made by large carnivores are collected and where possible the bottom jaw has been collected for ageing purposes by examining tooth wear.

Age-class systems have been developed for springbok, wildebeest, gemsbok and red hartebeest by this method.

To date only the data from springbok have been analysed in any detail. They are preyed upon by a wide spectrum of carnivores with cheetah, lion and leopard being the principle predators on the adult segment of the population. Overall predation is heaviest on lambs and young adult males.

Keywords: ageing techniques, carnivores, Kalahari, predators, prey, savanna

MILLS M G L

(Eugène Marais Chair of Wildlife Management, Department of Zoology,
University of Pretoria, Pretoria 0002)

The socio-ecology and social behaviour of the brown hyaena in the southern
Kalahari (1979-1981)

Keywords: behaviour, brown hyaena, Kalahari, savanna, socio-ecology

MILLS M G L and P T VAN DER WALT

(Kalahari Gemsbok National Park, Private Bag X5890, Upington 8800)

Monitoring ungulate movements and population trends in the southern
Kalahari (1972-ongoing)

The aim of this broad-based, long-term study is to gain a better
understanding of the ecology of the large ungulates in this area.

Monthly ungulate counts along the Nossob and Auob riverbeds coupled with a
simple assessment of the vegetation and two to four strip counts per year
from the air over the dune areas of the Kalahari Gemsbok and Gemsbok
(Botswana) National Parks are made. These data are presently being
analysed by computer.

Results have shown that large concentrations of springbok, gemsbok and red
hartebeest occur in and around the riverbeds after rains. A more gradual
movement of these ungulates away from these areas occurs as conditions
become drier. The nature and extent of the movements of the ungulates
away from the riverbeds are not well understood. There is a positive
correlation between the numbers of ungulates in the riverbeds and the
amount of rainfall in a particular year.

Blue wildebeest numbers remain more stable in the riverbeds and have been
increasing in certain areas in recent years, probably due to a series of
good rainfall years aided by the provision of potable water. Aspects of
the population dynamics of this species and springbok are being studied.

Keywords: arid, Kalahari, population dynamics, rainfall, savanna,
ungulates, water

MILLS M G L, P T VAN DER WALT and P RETIEF

(Kalahari Gemsbok National Park, Private Bag X5890, Upington 8800)

The development of an ecological model for the Auob riverbed system in the
Kalahari Gemsbok National Park (1978-ongoing)

The aim of the project is to investigate the possibility of using certain
ecological factors as tools for manipulating ungulate movements in the
Park. This is because of the fact that it is believed that some areas in
the Auob riverbed have become overgrazed and also because of the
possibility that the Park could become a closed system sometime in the
future.

Methods being used and phenomena being investigated include: the closing of certain windmills in the Auob riverbed; the burning of a small experimental plot in the dune areas to study the effect of fire on the vegetation; monthly vegetation surveys of food availability coupled with ungulate counts along the riverbed; aerial surveys of vegetation and ungulates in the surrounding dune areas; monitoring rainfall at three stations along the riverbed and two stations in the dune areas; the marking of springbok and wildebeest to study movement patterns; the study of feeding habits of the ungulates by stomach analysis.

Preliminary results suggest that the closing of windmills has little or no effect on the movement patterns of springbok and gemsbok, although it may affect the movements of wildebeest. The condition of the vegetation, however, appears to be more important in dictating the movements of all three species.

Keywords: arid, ecology, fire, food, Kalahari, movements, rainfall, savanna, ungulates, vegetation, water

MILTON S J

(Institute of Natural Resources, University of Natal, P O Box 375, Pietermaritzburg 3200)

The use of *Acacia tortilis* as animal feed (1980-1981)

The objective of the project is to determine if *Acacia tortilis* could be used as a cheap food supplement for livestock in impoverished, overstocked Valley Bushveld during the winter months. Processed *Acacia* fodder yielded the following: leafy twigs 3-17 t ha⁻¹ (mean 5 t ha⁻¹), crude protein 5-8%, fibre 44-50%; dry leaves 0,1-0,2 t ha⁻¹, crude protein 14%, fibre 21%; pods 0,01-0,2 t ha⁻¹ (mean 0,06 t ha⁻¹), protein 14-17%, fibre 21-27%. An assessment was made of the methods and costs of fodder preparation, the effect of pruning on shoot growth, and the quantity and quality of herbage in *A tortilis* veld. Provisional results indicated that cattle could be maintained throughout the winter on *Acacia* hay, podmeal and mieliemeal. Although *Acacia* products are nutritious, acceptable and available in larger quantities than herbage, they are very costly to process. A more detailed study of the productivity of *A tortilis* under pruning and browsing in various sites will be initiated shortly.

Keywords: *Acacia tortilis*, Dry Valley Bushveld, fodder, herbage, Natal, production, pruning, savanna

MITCHELL D T, O A M LEWIS, S M JONGENS-ROBERTS, G BROWN and N SCAILLET
(Department of Botany, University of Cape Town, Private Bag, Rondebosch 7700)

Studies on the phosphorus cycle in the fynbos biome (1979-1983)

As a result of the unscheduled fire at Pella, soil studies have now been modified from being seasonally based to an investigation of the phosphorus

changes during the early post-fire phases of succession. Total P contents before and immediately after a fire are similar. Increases in resin-extractable P occurred immediately after the fire but then declined. Surveys of the different soil forms have also indicated variations in resin-extractable P. Analyses of rainwater for phosphorus is in progress and preliminary calculations suggest that 135-200 g P ha⁻¹ is brought in to the Pella site by precipitation. Water potential values of the soils are being investigated by Wescor soil psychrometry and soils at the surface during the summer periods are too dry to obtain actual values. Values of -57 bars were attained during March 1981 at the 15 cm depth.

Whole-plant studies have concentrated on a seed-regenerating proteoid species, Leucospermum parile, at Pella. L parile has a sparse tap root system and the canopy accounts for most of the total plant biomass. New proteoid roots appear when sufficient moisture is present in the soil. Major root growth occurs during the moist winter months which is out of phase with that of canopy growth. The phosphorus distribution in L parile changes during the growth cycle. During winter, high P concentrations are found in proteoid roots. Vegetative buds, inflorescences, seeds, young leaves and new lateral roots act as strong sinks for phosphorus.

Keywords: biomass, fire, fynbos, Leucospermum parile, phosphorus, soils

MITCHELL D T, D L OLIVIER, P G F COLEY and A QUICKFALL
(Department of Botany, University of Cape Town, Private Bag,
Rondebosch 7700)

A preliminary study of mineral cycling (a. Production and decomposition of plant litter; and b. Organic matter distribution in the soil) and the distribution and activity of micro-organisms in the soil (1979-1985)

The fire at Pella during November 1980, destroyed most of the equipment constructed for monitoring litter production and decomposition of five dominant species of coastal fynbos. The research programme has now been modified and work is in progress on litter production and decomposition in Leucospermum parile, Protea repens and Thamnochortus punctatus and changes in soil microflora immediately after a fire. Studies have also been extended to Jonkershoek where litter production and decomposition of P repens is being undertaken.

Results indicate that maximum litter input occurs during early summer. Litter is sorted according to organ of origin. Leaf litter forms the dominant component in all the samples except during December 1980, in which over 70% of the litter of L parile consisted of flower heads. Preliminary phosphorus analyses show that levels are lower in fallen leaves than in leaves intact on shrubs of L parile. This supports the hypothesis that internal cycling of nutrients exists in vegetation of the fynbos biome. The mass loss of the litter during decomposition is extremely slow, ie 3,1% after five months by litter of L parile and this may be due to the sclerophyllous nature of the leaves. Chemical analyses of the litter are in progress.

Soil microbiology studies have concentrated on investigating changes in bacterial and fungal populations immediately after a fire. Soil pH increases to values of almost 8,0 and these alkaline conditions stimulate bacterial growth which steadily declines as the soils become acid again. Soil fungal populations isolated by the Warcup soil plate method were generally lower in the burnt sites compared with adjacent unburnt areas of the vegetation at Pella.

Keywords: decomposition, fire, fynbos, litter, mineral cycling, soil bacteria, soil fungi

MOLL E J and R M COWLING

(Department of Botany, University of Cape Town, Private Bag, Rondebosch 7700)

Vegetation dynamics within and between fynbos and adjacent biomes (1979-1982)

The aim of this project is to characterize fynbos and non-fynbos plant communities at the eastern margin of the fynbos biome; here fynbos intermingles with communities of adjacent biomes forming complex tension zones. Two study areas have been chosen: the Humansdorp coastal peneplain where fynbos and non-fynbos communities are found under conditions of similar macroclimate and topography. Floristic vegetation units have been extracted by classification and ordination and the major environmental factors determining the distribution of these units have been investigated. The units have been further characterized in terms of phytochorological affinities and endemism, selected structural attributes, post-fire regeneration strategies, modes of succession, and species diversity relations. Dynamic interrelationships within and between units have been stressed. Structural classifications have revealed successional cover states within communities and it has been possible to quantify community structural attributes along gradients of disturbance. The degree of inertia and resilience of communities has been qualitatively identified. The second study site is the Gamtoos River Valley where a direct gradient study has been carried out. Two parallel transects, one in fynbos and one in non-fynbos vegetation from sea level to 500 m, have been studied. Here we investigated parallel changes in community attributes (as above excluding dynamic aspects) along some identical environmental gradients.

All field-work and data analyses have been completed. The data are presently being synthesized for presentation in a final report.

Keywords: diversity, population dynamics, endemism, fynbos, vegetation change

MOLL E J, M L JARMAN and L BOSSI
(Department of Botany, University of Cape Town, Private Bag,
Rondebosch 7700)

An investigation into the usefulness of various remote sensing products
for studying and mapping the fynbos biome (1977-1980)

The remote sensing project within the Fynbos Biome Project aims to determine the extent of the biome and of the major landuse types within it. Various remote sensing products were used, in particular available LANDSAT 1 and 2 multi-spectral scanner (MSS) data in the form of computer-compatible tapes (CCT's) obtained from NASA via the Satellite Remote Sensing Centre at Hartebeeshoek. The development of the CATNIPS suite of programmes for the University of Cape Town Image Processing Unit (UCT IPU) made the application of computer analysis to this satellite data feasible.

The classification routines used in the UCT IPU system are an iterative clustering routine based on the ISODATA technique and the Bayesian Maximum Likelihood classifier.

The procedure used to generate a classified map involves the following: identification and extraction of the area of study from the CCT; production of histograms of the distribution of spectral reflectance values for the area to be investigated for each of the four wave bands recorded; the application of stretching routines to the data where deemed necessary; the generation of single wave band map print-outs, enabling the user to decide on test areas within the study area to be extracted; the application of the classification routines to selected test areas and production of map displays of the classified data; the choice of final map classes from test areas; pixel allocation for whole study area to map classes and accompanying map displays (refinements of choice of map classes where necessary plus repetition of whole procedure); final processing of scale and geometric corrections to map display.

The Botanical Research Unit has laid down guidelines as to the scale of vegetation mapping and the appropriate scale of survey in each case. The remote sensing project demonstrated the versatility of satellite imagery over that of conventional air-photo products when applied to the various scales of operation, in that classification was successfully carried out at a range of scale from 1:10 000 to 1:250 000 using the same basic CCT data. At the smaller scales an averaging routine was developed for producing classification units consisting of groups of pixels. The reconnaissance level of operation at 1:250 000 final map scale, has been selected as being the most suitable to meet the overall mapping objective of the Fynbos Biome Project. Direct reception of satellite data at Hartebeeshoek as from January 1981 will ensure availability of suitable up-to-date imagery.

Keywords: classification, fynbos, mapping, remote sensing

MOLL E J, D T MITCHELL and J E M SOMMERVILLE
(Department of Botany, University of Cape Town, Private Bag,
Rondebosch 7700)

Seasonal process studies in Coastal Fynbos (1980-1981)

The aim of the project is to study the phenology of Coastal Fynbos in relation to phosphorus, nitrogen and soil moisture. Key questions to be answered:

- (i) Given the low, possibly limiting, soil phosphorus and nitrogen status of the soil;
 - How does plant phenology relate to their seasonal availability in the soil and to their seasonal distribution in the plant?
 - If polyphosphates occur in non-mycorrhizal and/or mycorrhizal fynbos species, when are they synthesized and mobilized, in relation to phenology?
 - Is there redistribution of nutrients from senescing leaves immediately prior to leaf fall?
- (ii) - How is phenology related to different water regimes under the same climatic conditions?
 - How do root and shoot growth, leaf production and fall relate to seasonal soil moisture and root depth?
- (iii) What is the seasonal biomass and energy allocation to reproduction and vegetative growth above and below ground?

Three five year-old communities are being investigated on three soil types with different water regimes. Ten plants of five or six common species have been labelled at each site. Phenological activity of these plants has been observed and shoot growth and litter fall measured at monthly intervals for a year. Results to date show that phenology is similar in all three communities although individual species vary considerably. Phenology data collection will continue for a further six months until December 1981. Four seasonal biomass samples of Leucospermum parile and Thamnochortus punctatus have been taken. Soil and plant moisture measurements are to be initiated in July. Data analysis has been discussed but not begun.

Keywords: Coastal Fynbos, heathlands, Mediterranean, phenology

MOLL E J, G ORSHAN and X S KYRIACOU
(Department of Botany, University of Cape Town, Private Bag,
Rondebosch 7700)

Determination of monocharacter growth forms of selected species in the
winter rainfall area of South Africa (1981-1982)

Plant growth forms are the cumulative result of combinations of growth processes. These growth processes are extremely important in enabling plants to adapt to environmental stresses. A growth-form analysis of selected species in the fynbos is suggested as the means of identifying the adaptive importance of these growth processes, specifically as they relate to the biseasonality of the mediterranean-type climate of the south-western Cape.

This requires the construction of a monocharacter growth-form classification. Such a classification has been constructed for this study. In order that each species be fully classified, a phenomorphological study of at least two years is necessary. The parameters that will be followed during this study are also given.

With this information available, it is suggested that selected communities can also be classified according to their monocharacter and multicharacter growth forms, and comparative studies conducted with species and communities of other mediterranean-type ecosystems. It is hoped that this study will be extended to more species (possibly the species of the Cape Peninsula sensu stricto), and also to a larger number of communities.

Keywords: Cape Province, fynbos, growth forms, Mediterranean, phenology

MOLL E J and S M PIERCE
(Department of Botany, University of Cape Town, Private Bag,
Rondebosch 7700)

Phenological studies in fynbos biome communities in the southeastern Cape
(1981-1982)

Community studies in the southeastern Cape have shown that some fynbos communities have a strong admixture of elements from adjacent biomes. This study is aimed at providing phenological data to test the hypothesis of temporal partitioning of resources as a possible explanation of these admixtures.

The temporal partitioning of characteristic fynbos growth forms has been suggested as a possible explanation of high species diversity. This theory is being tested for Eastern Cape communities.

The study area is located at the eastern limit of the fynbos biome and the phenological data will supplement work in the Western Cape and the southern Cape to give an overview of phenological processes throughout the extent of the fynbos biome. These studies should provide predictive data for management programmes (fire period and frequency).

Comparisons of the phenology of different growth forms, grasses and where possible, the same species on different substrates (recent sand, TMS, Bokkeveld shale) will be made to determine substrate effects on phenological processes; climatic and topographic conditions being similar in the study area.

Methods include quantitative measures of shoot growth and leaf fall for selected species. Also qualitative assessments of phenophases (leaf growth, flowering phases, fruiting phases) will be made, as well as on dominants in the communities.

Keywords: Eastern Cape, fynbos, growth forms, partitioning of resources, phenology, Renosterveld

MOLL E J, J E M SOMMERVILLE, C BOUCHER and X S KYRIACOU
(Department of Botany, University of Cape Town, Private Bag,
Rondebosch 7700)

Post-fire regeneration studies at Pella: Coastal Fynbos (1980-1990)

Fire is recognized as an important factor in conservation and management of fynbos. Data on post-fire regenerative response of different communities to different fire regimes are needed. An accidental fire at the Pella Research Site (Coastal Fynbos) provided an opportunity for the study of some of these aspects. Fixed-line transects were set up in four community types of different ages that had been subjected to different burning intensities. Pre-burn data from Braun-Blanquet surveys are available for comparable sites adjacent to the transects. These plots will be resurveyed and this will provide information for similarity analysis. It is hoped that these post-fire regeneration studies can be continued for at least 10 years.

Keywords: Cape Province, Coastal Fynbos, fire, heathlands, Mediterranean, succession, vegetation structure

MORAN V C
(Department of Zoology and Entomology, Rhodes University, P O Box 94,
Grahamstown 6140)

The biological control of jointed cactus *Opuntia aurantiaca* in South Africa (1973-1990)

Keywords: biological control, jointed cactus, South Africa

MORRIS M I and FUGGLE R F

(School of Environmental Studies, University of Cape Town, Private Bag, Rondebosch 7700)

The variation of components in the radiation balance over different fynbos vegetation types (1978-1981)

The primary aim of this research is to test whether fynbos vegetation has a high reflection coefficient, and the secondary aim is to consider the vegetation at the sites where the radiation measurements were carried out in order to determine whether similar vegetation structural types have similar radiation regimes. In order to do this six sites were selected in the Cape of Good Hope Nature Reserve. At each site the radiation fluxes were measured for three days during the late summer, giving a total of eighteen days of observation. In addition to the radiation measurements, structural data were collected for the vegetation at each site so that comparisons between the radiation fluxes and vegetation could be made. Floristic data were also collected, to typify the vegetation at each site.

It has been found that fynbos vegetation, as represented by this study, has an unusually low reflection coefficient which varies from 0,08 to 0,13. These values are below those recorded in the literature for other heathland vegetation. On the basis of a numerical classification of the vegetation structural data, it has been found that there is no clear relationship between the vegetation and the various components of the radiation balance.

Keywords: fynbos, heathlands, radiation, reflectivity, vegetation structure

MÜLLER D B

(Afdeling Natuurbewaring, Provinsiale Administrasie van die Oranje-Vrystaat, Posbus 517, Bloemfontein 9300)

Die plantekologie van die Willem Pretorius-wildtuin/The plant ecology of the Willem Pretorius Game Reserve (1975-1981)

Die plantegroei van die Willem Pretorius-wildtuin word ondersoek met die doel om die resultate te implementeer by die bestuur van die reservaat en ter ondersteuning van ander navorsingsprojekte in die reservaat. Die plantegroei word ondersoek, beskryf en geklassifiseer volgens die Braun-Blanquet-tegniek, terwyl aandag ook gegee word aan spesifieke omgewingsfaktore wat die plantegroei beïnvloed. Die plantegroei-eenhede wat onderskei word, toon 'n sterk verband met die geologie, topografie, gronddiepte en grondtipe, terwyl daar sterk aanduidings is dat sommige van die plantegroei-eenhede 'n sekondêre oorsprong het as gevolg van biotiese invloede.

Keywords: Braun-Blanquet, classification, environmental factors, grasslands, Orange Free State, savanna

MUSIL C F

(Botanical Research Institute, Private Bag X101, Pretoria 0001)

Aquatic macrophyte communities of Natal (1974-1982)

The survey of the water plant communities of Natal has been completed and a draft paper prepared for publication. Publication of this paper, however, has been held back so that the data can be resynthesized using a computer-assisted Braun-Blanquet classification approach.

The water plant communities of Natal are at present summarized in a synoptic table and grouped into six main classes related to water salinity, pH and habitat. These classes are:

- (i) Marine communities found only in the intertidal region along the Natal coast in alkaline (pH: 8,2) sea water (salinity: 35%).
- (ii) Estuarine communities found exclusively in estuarine situations in alkaline water (pH: 7,2-8,6) with salinities fluctuating both above and below that of sea water (salinity 5-50%).
- (iii) Brackish water communities found at sites not subject to the influence of sea water, but nevertheless occurring in alkaline (pH: 7,5-8,4) brackish water with salinities fluctuating from above that of sea water to almost moderately fresh water (salinity: 1-52%).
- (iv) Moderately fresh to slightly brackish water communities found in acid to alkaline (pH: 4,8-9,2) moderately fresh to slightly brackish waters with salinities generally ranging below 1% but with a high ionic concentration (specific conductance: 220-8400 mhos cm^{-1}).
- (v) These two classes comprise communities found predominantly in acid (pH: 4,8-6,9) fresh waters with a low ionic concentration (specific conductance: 21-220 mhos cm^{-1}). The former comprises communities usually found in still or slow-moving fresh water while the latter comprises communities occurring in fast-flowing fresh waters among rapids.

Marine, estuarine, brackish water and moderately fresh to slightly brackish water communities occur predominantly along the Natal coastal plain below an elevation of 600 m in slightly turbid to turbid waters (Secchi readings: 12-100 cm). Communities of still and of fast-flowing fresh waters, on the other hand, generally occur inland in Natal above an elevation of 600 m in the clearer waters (Secchi readings: 2 m+).

Keywords: aquatic, classification, macrophyte, Natal

MUSIL C F

(Botanical Research Institute, Private Bag X101, Pretoria 0001)

Field and laboratory growth of *Eichhornia crassipes* in relation to nitrogen and phosphorus loading

Investigations into the kinetics of N- and P-limited growth of *E crassipes* in culture and in the field have been completed. Data have been synthesized and statistically analysed. Fiducial band limits (95% confidence limits) to all regressions were also computed. The following chapters of the detailed report have been written:

- (i) Review of literature.
- (ii) Methods, including culture and field studies.
- (iii) Pilot studies.
- (iv) Results, including culture and field studies.
- (v) Applications of growth coefficients.
- (vi) Discussion and conclusions. Approximately 120 graphs and 70 tables have been prepared for inclusion in the report.

Half-saturation and yield coefficients determined for *E crassipes* under N- and P-limiting conditions in culture compare favourably with those reported for various species of diatoms and algae. Reciprocal values of yield coefficients expressed as a percentage give minimum concentrations of N and P in *E crassipes* plant tissue which compare favourably with minimum tissue concentrations of N and P in *E crassipes* plant tissue reported in the literature.

The maximum specific growth rates determined in culture were inversely related to the length of the period of growth of plants in N- or P-deficient cultures. Maximum specific growth rates determined in culture, however, were considerably lower than maximum growth rates determined in the field. Provided certain assumptions are made, however, growth coefficients determined in culture do predict growth rates of *E crassipes* growing at certain sites in the field.

In the field, the growth rate of *E crassipes* is influenced by the crowding of plants which also influences their growth form. In densely compacted populations, rates of growth are approximately five times lower than those of plants growing in loosely confined populations. The rate of growth of plants growing in loosely confined populations (marginal plants) is significantly correlated with daylight intensity (diffuse component of the radiant flux), mean maximum and minimum air temperatures and relative humidities, daily photoperiod and water temperatures, and is inversely correlated with concentration of dissolved oxygen in the water. The rate of growth of plants growing in crowded populations (central plants), on the other hand, is only significantly correlated with the air and water temperatures.

Keywords: aquatic weed, autecology, ecophysiology, *Eichhornia crassipes*, growth, nitrogen, phosphorus, water hyacinth

NEL J A J

(Departement Dierkunde, Universiteit van Pretoria, Pretoria 0002)

Voedingstrategieë van bakoorsosse/Feeding strategies of long-eared foxes

Die doel van die projek is die bepaling van die taktiek en strategie van 'n insek- (veral termiet-) vretende roofdier, en 'n vergelyking hiervan met die van die aardwolf in dieselfde omgewing. Gegewens is ingesamel oor die voedingstrategie van die bakoorsosse in die Namib en Kalahari. Die projek sal hopelik ook aandag kan gee aan voedingstrategie in die Karoo.

Keywords: feeding, Kalahari, Karoo, long-eared fox, Namib

NEL J A J

(Departement Dierkunde, Universiteit van Pretoria, Pretoria 0002)

Gedragsekologie van die aardwolf/Behavioural ecology of the aardwolf

Die doel van die projek is veral die bepaling van die voedsel en voedingstrategie van hierdie termietvretende roofdier, en 'n vergelyking hiervan (asook nisskeiding) met die simpatriese bakoorsosse. Gegewens is versamel oor die voedingstrategie en merkgedrag van die aardwolf in die Namib, asook oor hul gebruik van mishope. Hierdie projek, asook die aspekte wat raak aan die kwessie van voedselnisskeiding met die bakoorsosse, is nou ook uitgebrei na die Kalahari Gemsbokpark. Die totale strategieë van die twee simpatriese termietvretende roofdiere word ook ontrafel. Gegewens oor voedselnisskeiding tussen aardwolwe en bakoorsosse in die Namib, met betrekking tot prooi-items, area van benutting en tyd van benutting van sulke areas word tans verwerk.

Keywords: aardwolf, feeding, long-eared fox, Namib

NEL J A J

(Departement Dierkunde, Universiteit van Pretoria, Pretoria 0002)

Invloed van vuur op klein soogdiere in die Nasionale Krugerwildtuin/Effect of fire on small mammals on the Kruger National Park

Die doel van die projek is om vas te stel hoeveel klein soogdiere 'n brand oorleef, hulle lewensverwachting daarna en of die gemeenskap na sy vorige samestelling terugkeer.

Daar is gevind dat oorlewing van 'n brand redelik goed is, maar dat kort daarna getalle knaagdiere drasties daal. Na twee jaar het die oorspronklike klein soogdiergemeenskap nog nie herstel nie, ten spyte daarvan dat op 'n twee-jaarlikse siklus gebrand word.

Keywords: fire, savanna, small mammals, survival

NEL J A J

(Departement Dierkunde, Universiteit van Pretoria, Pretoria 0002)

Nisskeiding van klein roofdiere in die bosveld

Keywords: niche separation, savanna, small predators

NEL J A J, J DU P BOTHMA

(Departement Dierkunde, Universiteit van Pretoria, Pretoria 0002)

Verspreiding van soogdiere in Suid-Afrika/Distribution of mammals in South Africa

Die doel van die projek is die studie van die ekologiese verspreiding en nisskeiding van veral kleiner soogdiere in die verskillende biome.

In samewerking met die Transvaal Museum, en as deel van die BSc(Hons) soogdierkursus is 'n opname van die soogdiere van die Itala Natuurreservaat, wat grens aan die Pongolarivier, onderneem. Getalle en tot 'n mate verskeidenheid van klein soogdiere was egter laag, miskien te wyte aan die strawwe brandprogram. Nietemin is daar in 'n groot aantal habitatte, van Laeveld tot op die Hoëveld, versamel.

Keywords: distribution, mammals, niche separation, South Africa

NEL L O

(Döhne Agricultural Research Station, Private Bag X15, Stutterheim 4930)

Herbage production trials for pasture species selection:
Dactylis glomerata in the Eastern Cape Region (1977-1982)

Keywords: Dactylis glomerata, Eastern Cape, pasture evaluation, production, savanna

NEL L O

(Döhne Agricultural Research Station, Private Bag X15, Stutterheim 4930)

Herbage production trials for pasture species selection:
Festuca arundinacea in the Eastern Cape Region (1980-1984)

Keywords: Eastern Cape, Festuca arundinacea, pasture evaluation, production, savanna

NEL L O

(Döhne Agricultural Research Station, Private Bag X15, Stutterheim 4930)

The introduction and evaluation of promising pasture species in the Eastern Cape: growth and production of summer grasses in the coastal belt northeast of East London (1981-1986)

Keywords: coastal belt, Eastern Cape, grass, growth, pasture evaluation, pasture introduction, production

NORTON P M

(Jonkershoek Nature Conservation Station, Private Bag X5014, Stellenbosch 7600)

An ecological study of the leopard in the Cape Province

This study has two rather conflicting themes: the leopard as an endangered species and the leopard as a problem animal. The main aim is to gain some idea of the numbers of leopards in the Cape, particularly the mountains of the southern and Western Cape, and what trends the populations are showing. The initial approach will be to gather information on day-to-day and seasonal movements and their relationship to fluctuations in food supply, as well as food-searching and territorial behaviour. Radiotelemetry will be needed and a method of collecting population statistics on small antelope, dassies, gamebirds and other prey populations must be worked out.

Later more management-orientated aspects such as movements of translocated leopards and vulnerability of domestic stock to leopard attacks will be considered.

Initial testing of equipment is being done in the Jonkershoek Valley, and further study sites, probably with one in the southern Cape, will be chosen later.

Keywords: Cape Province, conservation, feeding ecology, fynbos, leopard, management, movement, population dynamics

NORTON P M, J D SKINNER en N FAIRALL

(Soogdiernavorsingsinstituut, Universiteit van Pretoria, Pretoria 0002)

Die habitat en voedingsekologie van die klipspringer Oreotragus oreotragus in twee gebiede van die Kaapprovinsie/The habitat and feeding ecology of the klipspringer Oreotragus oreotragus in two areas of the Cape Province (1977-1979)

Die klipspringer is 'n boksoort wat hoogs gespesialiseerd is om rots- en bergagtige habitatte te bewoon. Aanpassings word onder meer getoon in sosiale organisasie, voedingsgedragpatrone, en roofdier-ontwykingstrategieë, asook anatomiese en fisiologiese aspekte, wat hom in staat stel om die besondere toestande van berghabitatte die hoof te bied.

Die sosiale organisasie van die klipspringer is aangepas om 'n vaste gebied, met voldoende voedsel om die familiegroep dwarsdeur die jaar te onderhou, af te baken en te verdedig. Die groepe bestaan gewoonlik uit 'n monogamiese paar met een lammer, of uitsonderlik meer. Aangesien die ram en ooi die meeste van die tyd 'n paar meter van mekaar af bly, is dit moontlik vir eersgenoemde om gereeld op te tree as "skildwag" teen roofdiere, wat die ooi geleentheid bied om haar hoër energiebehoefte tydens dragtigheid en melkvorming aan te vul. 'n Enkele lam word jaarliks gebore, en die uitgestrekte lamseisoen duur vanaf Julie tot Desember.

Klipspringers toon 'n unieke roofdier-ontwykingstrategie waar hulle hulself opvallend maak om roofdiere dop te hou asook sodoende verrassing te vermy, in plaas van staat te maak op verberging soos ander klein boksoorte. Hierdie gedragsaanpassing het waarskynlik ontwikkel weens tekort aan skuilplekke in rotsagtige gebiede, en word moontlik gemaak deur die klipspringer se besondere vermoë om in rotsagtige terrein vinnig te beweeg. Hierdie vlugheid word toegeskryf aan die unieke pootstruktuur en klein, ratse liggaamsbou.

Die klipspringer se vernaamste roofdiere is luiperds en rooikatte, terwyl roofvoëls soos die witkruis- en kroonarend soms 'n lam of, by wyse van uitsondering, 'n volwasse individu mag vang.

Anatomiese en fisiologiese aanpassings sluit onder andere in doeltreffende niere vir die beperking van vogverlies, en 'n buitengewoon digte haarbedekking vir isolasie. Hierdie aanpassings word geassosieer met die uiterste klimaatstoestande kenmerkend van bergagtige gebiede. Effektiewe beperking van vogverlies en die selektering van sukkulente voedsel stel die klipspringer in staat om sonder drinkwater te kan klaarkom, en sodoende kan hulle dus hul verspreidingsgebied aansienlik uitbrei.

Klipspringers toon 'n tipiese hoefdier-aktiwiteitspatroon bestaande uit piek-voedingstye net na dagbreek en voor sonsondergang. Voedingstye varieer seisoenaal en tussen geslagte, en verleng normaalweg weens hoër energie-benodighede soos tydens dragtigheid, melkvorming en met lae temperature. Hierdie boksoort is feitlik uitsluitlik blaarvretend en hulle voed op jong spruite, blomme en vrugte van struik en kruide. Voedselvoorkeure toon 'n moontlike verwantskap met die verdedigingsmeganismes van plante.

Klipspringers vermy kompetisie met ander klein boksoorte deur hulle voorkeur vir die meer rotsagtige terreine. Voedselskeiding met dassies is ook belangrik, gevolglik word dit voorgestel dat klipspringers hoër konsentrasies dassies vermy aangesien laasgenoemde neig tot oorbeweiding van plantegroei in die omgewing van hul skuilplekke.

Al bogenoemde faktore speel 'n belangrike rol in die bewaring van klipspringers en moet in ag geneem word by die oorweging van toepaslike bestuursmaatreëls.

Keywords: Cape Province, feeding ecology, habitat preference, Karoo, Oreotragus oreotragus

NOVELLIE P

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The feeding ecology of kudu in the Kruger National Park

This study concentrated in particular on the interrelationships between the abundance of the vegetation available to kudus as food, their food selection and foraging behaviour. Analyses of the vegetation included:

- (i) The seasonal variation in biomass per unit area of forb and woody plant leaves within reach of kudus.
- (ii) Seasonal variation in the nutrient contents of forb and woody plant leaves, including protein, phosphorus, calcium and moisture.
- (iii) The species composition of woody plants in the study area.
- (iv) Records of the phenology of the most important woody food species.

Diet composition of kudus was quantified in terms of the number of feeding minutes spent on the various plant species. Selectivity ratings were calculated for all the more common woody plants in the study area. An attempt was made to explain the selectivity ratings in terms of leaf nutrient content, phenology and plant structural defences. The potential of behaviour-based indices of food abundance were also assessed. Precise measurement of the quantity and quality of the diet is difficult to achieve in the field, and easily measured indices of food abundance would be valuable. The study showed that the pattern of overt foraging behaviour was closely related to seasonal variations in food abundance. Quantitative analysis of foraging behaviour could therefore provide an indication of food abundance.

Approximate protein, phosphorus, energy and water requirements of kudus were calculated using data on domestic animals. Rough preliminary estimates of daily nutrient intake were made and these were compared with requirements. The results suggested no deficiency in the above nutrients for kudu cows at any season, but more accurate measures of nutrient intake are required.

Keywords: feeding ecology, kudu, savanna

OPPERMAN D P J en A MOORE

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Waterbalansstudies in geselekteerde subhabitatte van 'n Burkea savanne/
Water balance studies in selected sub-habitats of a Burkea savanna
(1979-1981)

Tydens hierdie projek is die veldwaterbalans in vier subhabitatte van die Burkea savanne te Nylsvley Natuureservaat bestudeer. Die projek het 'n

studie van die waterverspreidingspatrone in die grond, die bepaling van die veranderinge in grondvogvoorraad oor diepte asook evapotranspirasieverliese in die vier subhabitats Eragrostis pallens, Ochna pulchra, Grewia flavescens en Burkea africana behels. Die waterverbruiksdoeltreffendheid in die eersgenoemde drie subhabitats is in terme van $\text{mm Et}^{-1} \text{dag}^{-1} \text{eenheid}^{-1} \text{BO}$ vir die spesies E pallens-assosiasie (grasse), O pulchra en G flavescens asook op 'n subhabitatsbasis bereken.

Water is die primêre dryfkrag en ook beperkende faktor in die Burkea savanne en 'n basiese kennis van die natuurlike veldbalanse is noodsaaklik vir verdere plantfisiologiese en ander navorsing wat daarop gemik is om die natuurlike plantfisiologiese prosesse in die Burkea savanne-ekosisteem te verstaan.

Wortelintegrasie kom tot 'n groot mate in die Burkea savanne voor, en die drie subhabitats E pallens, O pulchra en G flavescens is met behulp van poli-etileenstrokke hidrologies geïsoleer, sodat die hidrologiese prosesse op 'n subhabitat-basis geïnterpreteer kon word.

Die grondvogbalans, wat gebaseer is op die verandering in grondvogvoorraad oor tyd, is toegepas by die berekening van evapotranspirasieverliese. Grondvogbepaling is gravimetries en deur van neutronvogmetingstegnieke gebruik te maak, gedoen. Vir die doel van neutronvogmeting, is die betrokke apparaat vir Nylsvley-toestande in die veld gekalibreer voor gebruik.

Blaaroppervlaktebepaling was nodig ten einde 'n kriterium te verkry waarteen waterverbruik in die geïsoleerde subhabitats geëvalueer kon word. Verskillende metodes en tegnieke is gebruik by die bepaling van die blaaroppervlakte van grasse in die algemeen, O pulchra en G flavescens.

Die resultate is verwerk en word weergegee as grondwaterherverspreidingskurwes, daaglikse evapotranspirasieverliese (mm) en waterverbruiksdoeltreffendheid in terme van $\text{mm Et}^{-1} \text{dag}^{-1} \text{eenheid}^{-1} \text{BO}$. Wat die herverspreiding van grondwater betref, blyk dit dat by die E pallens en O pulchra subhabitats, wateropname hoofsaaklik in die boonste 60 cm van die grondprofiel voorkom, terwyl vog in die ondergrond selfs in die droogste maande nog vrylik beskikbaar is. By die subhabitats B africana en G flavescens vind wateropname deur die hele grondprofiel plaas. Waterherverspreiding in die grondprofiel vind vinnig plaas en na 'n reënbuie van ± 50 mm herversprei weer binne ± 12 uur tot op 'n diepte van 90 cm. Wat evapotranspirasieverliese betref, bestaan daar nie statisties betekenisvolle verskille tussen die vier subhabitats nie. Sekere tendense bestaan wel en dit blyk dat Et-verliese in G flavescens subhabitats die hoogste is, gevolg deur B africana subhabitats, E pallens subhabitats en laastens O pulchra subhabitats. Dit geld vir periodes van vier tot sewe dae na 'n reënbuie. Wat waterverbruiksdoeltreffendheid betref, is ook geen statisties betekenisvolle verskille tussen die WVD van grasse, Ochna en Grewia verkry nie, hoewel dit uit die resultate blyk dat Grewia die meeste water per eenheid-blaaroppervlakte geëvapotranspireer het.

Hoogs betekenisvolle verskille in vogverliese vanaf persele met 'n transpirerende grasbedekking, 'n nie-transpirerende grasbedekking en geen grasbedekking nie is gevind.

Keywords: leaf area, savanna, soil moisture, water balance, water use efficiency

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Ontblaring en vogstudies op meerjarige weiplante (grasse en bossies)
in die veld en glashuis/Defoliation and moisture studies on perennial
pastures in the veld and glasshouse (1975-1985)

Die resultate vir die 1980-1981-groeiseisoen word in onderstaande bespreking aangebied. Die uitbreidings van die hidrologiese eenhede op 'n subklimaks- en pionierveld is voltooi en het die afgelope groeiseisoen 'n stabilisasie-periode ondergaan. In die bespreking sal verwys word na die verskillende vogbehandelings as:

- Behandeling 1: Normale reënval.
- Behandeling 2: Normale reënval + besproeiing.
- Behandeling 3: Minder as normale reënval (20% minder).

Die 1980-1981-groeiseisoen is gekenmerk deur 'n besondere droë voorsomer wat meegebring het dat Behandeling 3 feitlik weekliks besproei moes word. 'n Besondere nat tweede helfte van die groeiseisoen het voorgekom waar Januarie en Februarie 1981 byvoorbeeld onderskeidelik 195,0 mm en 176,0 mm reën ontvang het, wat 117,9% en 111,5% hoër is as die langtermyn-gemiddelde. Hierdie hoë reënval het meegebring dat al die grasse besonder aktief gegroei het. Vir die 1980-1981-groeiseisoen het Behandelings 1, 2 en 3 onderskeidelik 642,5 mm; 792,5 mm en 577,9 mm reën ontvang.

(i) Basale bedekking en botaniese samestelling:

Wat die botaniese samestelling van die onderskeie vogpeile betref, was dit opmerklik dat die vaste Themeda triandra veld van 1978 duidelike plantegroeisamestellingsverskille begin toon het gedurende die 1980-1981-groeiseisoen. Behandeling 2 het oor die drie-jaar proefperiode feitlik dieselfde basale bedekking en botaniese samestelling gehandhaaf, nl 8,83% en 8,32% onderskeidelik vir die 1978-1979- en 1980-1981-groeiseisoene. Die botaniese samestelling van Behandeling 1 het verander van 'n vaste Themeda triandra veld, na 'n subklimaksveld, waar Sporobolus fimbriatus begin domineer terwyl die basale bedekking afgeneem het van 8,33% tot 6,19%. Behandeling 3 se basale bedekking het afgeneem van 8,45% tot 5,03% en opvallend was dat die graskomponent vervang is deur bossies (Pentzia incana en Walafrida saxatilis) wat begin inkom het, asook sekere pioniergrasse (Tragus en Aristida spesies).

(ii) Gemiddelde DM-produksie:

Opvallend van die DM-produksie vir die 1980-1981-groeiseisoen was dat Behandeling 2, waar die plante teen 3 cm hoogte ontblaar was, 70,0% meer geproduseer het as Behandeling 3, terwyl die 6 cm hoogte ontblaring by Behandeling 2 gemiddeld 79,3% meer as Behandeling 3 geproduseer het. Opvallend was die hoë produksie wat vir die periode 19 Januarie 1981 tot 19 April 1981 voorgekom het. Weens die lae reënval aan die begin van die groeiseisoen, was daar nie 'n groot verskil in DM-produksie tussen Behandeling 1 en 3 nie.

(iii) Et-verliese:

Die evapotranspirasieverliese (mm) van die onderskeie vogpeile soos bereken met behulp van die grondvogbalansvergelyking is as volg:

	<u>Behandelings</u>		
	<u>1</u>	<u>2</u>	<u>3</u>
24 Mei 1980-22 Augustus 1980	16,44	20,30	4,90
22 Augustus 1980-21 Oktober 1980	90,89	148,84	80,97
21 Oktober 1980-19 Januarie 1981	220,10	218,00	216,04
19 Januarie 1981-19 April 1981	262,93	247,77	229,59

Opvallend is die lae Et-verliese wat by al die behandelings gedurende die periode 24 Mei 1980-22 Augustus 1980 voorgekom het en die besondere hoë Et-verliese gedurende 19 Januarie 1981- 19 April 1981.

(iv) Waterverbruiksdoeltreffendheid (WVD):

Die WVD word uitgedruk as hoeveelheid water (liter) verbruik om 'n eenheid (g) DM te produseer en hier was dit opvallend dat by Behandelings 1 en 3 die WVD was die hoogste waar die intensiteit van ontblaring (6 cm) die hoogste was. Die WVD by altwee intensiteite (3 cm en 6 cm) van ontblaring was byna dieselfde as by Behandeling 2.

Keywords: defoliation, evapotranspiration, grasslands, production, soil moisture, water use efficiency

OPPERMAN D P J en G VAN NIEKERK
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Evaporatranspirasie en produksiestudies van 'n Themeda triandra veld/
Evapotranspiration and production studies of a Themeda triandra veld
(1980-1982)

Lysiemetrie: Die navorsingswerk in hierdie projek behels grootliks die bepaling van die dinamika van waterbeweging deur die grond en plant na die atmosfeer in verhouding tot klimaat asook die fotosintese-kapasiteit van veldgrasse onder natuurlike en gekontroleerde toestande. Aansienlike vordering is gemaak met installering, kalibrering en vestiging van twee

wegende lysiemeters. Die installering van 'n wegende lysiemeter wat slegs op een kragsele balanseer, is die eerste in die RSA. Voorlopige toetse en kalibrering dui daarop dat 'n sensitiwiteit van 890 g op 'n totale massa van drie tot vier metrieke ton verkry word. In terme van die oppervlakte van die grondhouer is dit ekwivalent aan 'n akkuraatheid van 0,3 mm. 'n Regressievergelyking is opgestel vir kalibrasiedoeleindes, naamlik:

$$y = 2,26628 + 0,0006 x$$

$$r = 0,998$$

y = millivoltlesing op registreerder

x = massa belading (g) op lysiemeter

Die voordele van die ontwikkeling is dat soveel as 66% op kapitaalkoste ten opsigte van kragsele gespaar kan word, waar sodanige lysiemeters geïnstalleer word. 'n Wegende lysiemeter gemonteer op 'n weegbrug met 'n kapasiteit van 20 metrieke ton is ook geïnstalleer. 'n Suiwer stand van Eragrostis lehmanniana is hierop gevestig. Hierdie lysiemeter asook 'n soortgelyke lysiemeter wat in 1979 gevestig is met 'n klimaks-grasbedekking, het 'n sensitiwiteit van 5 kg. In terme van die oppervlakte van die grondhouer is dit ekwivalent aan 'n akkuraatheid van 0,34 mm.

Grond: Die grond waarmee die lysiemeters gepak is, asook waarop die dinamika van fitomassaproduksie in verhouding tot vog bepaal word, is van die Hutton-vorm van die Shorrocks-serie. Grondvogretensiekrammes is per horison bepaal en wel vir die volgende dieptes:

A₁ 0-200 mm; B₂ 200-600 mm; II B₂ 600-800 mm.

Klimatologiese apparaat: Droë-en natbol-termokoppels om verdampingsgradiënte bokant 'n grondbedekking te bepaal is geïnstalleer en op 'n outomatiese kaartregistreerder gekoppel. Die registreerder was aanvanklik nie sensitief genoeg nie, maar die probleem is oorbrug deur twee van die weerstande in die stroombaan te verander, waarna bevredigende resultate verkry is.

Blaaroppervlakte-indeks: Tegnieke vir bepaling van blaaroppervlakte-indekse van veldgrasse het besondere aandag geniet. 'n Liniêre regressievergelyking vir blaarmassa teenoor blaaroppervlakte is verkry, naamlik:

$$y = 0,116 + 0,0574 x$$

$$r = 0,9939$$

y = blaaroppervlakte (mm²)

x = blaarmassa (g)

By die bepaling van die dinamika van boggrondse fitomassa deur die sny van kwadrate kan bogenoemde tegniek terselfdertyd aangewend word vir die afleiding van blaaroppervlakte-indeks deur middel van regressievergelykings.

Aangesien nie-destruktiwe tegnieke benodig word vir die bepaling van die tempo van fitomassaproduksie en blaaroppervlakte-indekse op die lysiemeters asook in die glashuis, is regressievergelykings opgestel vir blaarafmetings (lengte asook lengte en breedte) teenoor blaaroppervlakte. Die volgende regressievergelyking is vir blaarlengte x blaarbreedte gemeet by 0,5 van blaarlengte verkry:

$y = 4,8561 + 0,7652 x$
 $r = 0,9612$
 y = blaaroppervlakte
 x = blaarlengte x blaarbreedte

Die regressieverwantskap van blaarlengte teenoor blaaroppervlakte was nie bevredigend nie.

Fotosintese studies: Goeie vestiging is verkry met die aanplant van Themeda triandra en Eragrostis lehmanniana in potte. Probleme is egter ondervind met die kontrolering van temperature binne die kuvette. 'n Verkoelingsapparaat is gehou en voorlopige toetse dui daarop dat temperature tot $\pm 1^{\circ}\text{C}$ beheer kan word vir die heersende temperatuurreeks in die glashuis.

Keywords: evapotranspiration, grasslands, leaf area, lysimeter, production, Themeda triandra

O'REGAN B P
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The impact of browsing ungulates on the woody plant dynamics of the Umfolozi Game Reserve (1980-1983)

The objectives are to determine the response of woody plant species to browsing and the effects of the different browsing ungulates.

Methods:

- (i) Study animals - kudu, black rhino, impala, nyala.
- (ii) Study plants - Acacia tortilis, A nilotica, A nigrescens, A karroo, Zizyphus mucronata, Dichrostachys cinerea.
- (iii) Study areas - there are three study areas with different densities of the browsing ungulates for comparison.
- (iv) Permanent vegetation transects have been located for measuring vegetation cover, available browse, and browse utilization.
- (v) Shoots have been marked to determine pattern of browse offtake and the response of individual plants.
- (vi) Plants will be clipped to simulate browsing to determine the importance of the following variables - intensity and season of browsing, part removed, size and species of plant.
- (vii) Wild animals are observed to determine their feeding habits.
- (viii) Stomach samples are collected from culled impala and nyala to determine their feeding habits.

- (ix) Population sizes of kudu and black rhino will be determined from photographic recognition of all individuals.
- (x) Population size of impala will be determined by marking selected individuals in the female groups and subsequently counting these groups.

Results:

- (i) There is a greater frequency of small plants for all species except Z mucronata.
- (ii) There is a greater percentage of new shoots browsed on small plants than larger ones.
- (iii) Z mucronata and D cinerea are browsed more than the Acacia species.
- (iv) Kudu feed almost exclusively on Z mucronata in March-April.
- (v) Black rhino feed mainly on small Acacia species, in particular A karroo.

Keywords: browsing ungulates, ecology, Natal, overbrowsing, savanna, woody plants

OWEN-SMITH R N

(Centre for Resource Ecology, University of the Witwatersrand,
P O Box 1176, Johannesburg 2000)

Natural regulation of kudu populations in the Kruger National Park
(1974-1983)

The objectives are to relate population changes to controlling factors in terms of food availability and social organization. All kudus in two separate study areas are individually identifiable from variations in stripe patterns (over 800 individuals photographically documented). Foraging efficiency is assessed in terms of the feeding time achieved per unit distance covered while foraging, and in terms of dietary composition. Activity patterns and movements of males during the breeding season are also monitored.

The study population has approximately doubled in size since 1971. Year-to-year population changes are closely correlated with the preceding season's rainfall. The most sensitive response exhibited is in terms of calf survival. Below-average rainfall seasons are associated with a lowered foraging efficiency during critical dry season months. Female-young clans have generally doubled in size since the commencement of the study, and indications of clan splitting and home range changes are becoming evident in some cases. Adult males expend little extra time and energy in breeding behaviour, but exhibit mortality rates about twice those of females, resulting in a strongly skewed sex ration.

Results emphasize dynamic population fluctuations in response to rainfall patterns; but the critical vegetation features linking population changes to rainfall remain to be identified.

Keywords: feeding, ecology, herbivory, population dynamics, reproductive behaviour, savanna, social organization, ungulates

OWEN-SMITH R N

(Centre for Resource Ecology, University of the Witwatersrand,
P O Box 1176, Johannesburg 2000)

Trophic ecology of large herbivores in savanna ecosystems: comparative diet selection strategies of grazing and browsing ungulates (1979-1983)

This project forms part of a research programme leading towards the development of a predictive model linking large herbivore performance to features of vegetation structure and composition. A preliminary model based on Optimal Foraging Theory has been formulated, which identified the critical problem areas requiring detailed investigation.

The objective of this project is to elucidate the underlying behavioural control of dietary intake. Specific questions relate to the time period over which dietary control occurs, and the patterns associated with the selection of mixed diets.

Observations are carried out on hand-reared animals in the Nylsvley study area of the South African Savanna Ecosystem Project. Initially studies are on impala, with kudu and other species to be added later.

Observations of feeding behaviour are made continuously over periods extending up to a complete day. A keyboard event recorder coupled to a magnetic tape recorder is used to encode data in a computer-compatible form for direct computer transcription and storage.

Preliminary results indicate that, contrary to the predictions of elementary theory, impala select for a mixed diet including varying proportions of grasses, forbs and woody plant foliage.

Keywords: feeding ecology, herbivory, optimization modelling, savanna, ungulates

PAGE B R

(Department of Biological Sciences, University of Natal, King George V Avenue, Durban 4001)

Elephant carrying capacity in the Tuli Block, Botswana, based on an assessment of their impact on woody vegetation (1977-1982)

The interaction of elephants and woody vegetation is being investigated using a "predator-prey approach". A model simulating the dynamics of trees and elephants has been constructed. The effects of climate and defoliation on growth, survival and seed production are incorporated in

the subroutines simulating tree dynamics. The effects of depletion of surface water on elephant mortality and the reproductive responses to nutrient availability are included in the subroutine describing changes in the numbers of elephant. The model is being used to investigate the stability of the elephant-tree system.

Keywords: defoliation, elephant, population dynamics, resilience, simulation modelling, stability, Tuli Block, woody plants

PARSONS R J

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Vegetation survey of the Cape estuaries from the Kei River to the Orange River (1981-1985)

The main activity has been the mapping of the vegetation from colour air photos (1:10 000). The mapping was done using a Zoom-Transfer Scope and Topcon Stereoscope. Mapping units were delineated and these will be checked in the field. Thirty-five rivers have been mapped.

Of the rivers mapped, thirteen have been visited in the field. At each river, the dominant species, the height and cover were noted and the boundaries of each mapping unit checked. Six of the rivers visited were on the west coast viz the Holgat River, where six main mapping units were identified, Buffels River (nine mapping units), Swartlintjies River (six mapping units), Spoeg River (nine mapping units), Bitter River (eleven mapping units) and the Groen River (eighteen mapping units). Reports on these six rivers have been written. Each report consists of a vegetation map, a table indicating presence and absence of species, height, cover and area of each mapping unit and a brief description of the vegetation. These reports will be incorporated into the overall report of each river which is compiled by the Estuarine and Coastal Research Unit of the National Research Institute of Oceanology (CSIR). They will be published as CSIR reports.

Several important features of the Namaqualand coast were noted:

- Sparse rainfall.
- The occurrence of certain plants and animals which are found only along this coast.
- The mineral-rich geological formations which have led to the development of the mining industry.
- The cold but nutrient-rich sea water characterized by extensive kelp beds and the occurrence of sought-after marine organisms such as rock lobsters.
- The fine equilibrium between wind-driven sand and the highly specialized vegetation.

- Prolific aquatic bird life when and wherever lagoon or estuarine water occurs for example at the Spoeg and Groen River mouths.

Keywords: Cape Province, coast, estuaries, survey, vegetation survey

PETTIFER H L
(Hans Hoheisen Wildlife Research Station, P O Box 146, Hoedspruit 1380)

The ecology of the cheetah *Acinonyx jubatus* on the Suikerbosrand Nature Reserve (1978-1981)

The objectives of this study were:

- (i) To determine the movements, home ranges and social interactions of the various cheetah groups.
- (ii) To study the population dynamics of the cheetah and investigate limiting factors.
- (iii) To determine prey selection of the cheetah and their influence on prey populations.
- (iv) To study the population dynamics of the major prey species on the reserve.
- (v) To formulate a management strategy for the conservation of cheetahs on the reserve without detrimental effects on the prey populations.

Radiotelemetry techniques were used to meet these objectives.

Keywords: cheetah, management, movements, population dynamics, predator-prey relationships, Transvaal

PETTIFER H L
(Hans Hoheisen Wildlife Research Station, P O Box 146, Hoedspruit 1380)

Ecological surveys of the private wildlife areas, Eastern Transvaal lowveld (1978-ongoing)

Game counts in the major private wildlife areas in the Eastern Transvaal lowveld are conducted annually by road-strip, helicopter and fixed-wing counts. Additional information on habitat utilization, veld condition and soil erosion is simultaneously collected.

Keywords: aerial census, habitat monitoring, road-strip census, savanna, wildlife

PETTIFER H L

(Hans Hoheisen Wildlife Research Station, P O Box 146, Hoedspruit 1380)

The experimental relocation of captive-bred and wild cheetahs *Acinonyx jubatus* in the Transvaal Lowveld (1979-1981)

Captive-bred and wild cheetahs were radio-marked and released in the Transvaal Lowveld. Initially 24-hour continuous tracking of each group for one to three months would provide data on daily movements, activity patterns, prey selection and adaptation to the new environment. Successful relocations would then be followed up on an ad hoc basis.

Keywords: adaptation, cheetah, movements, predator-prey relationships, relocation, savanna, Transvaal

PORTER R N

(Natal Parks, Game and Fish Preservation Board, P O Box 662, Pietermaritzburg 3200)

An environmental impact assessment of the effects of proposed dams in the Mfolozi River catchment, Natal (1978-1980)

A number of possible impoundment sites have been recognized in Zululand and Northern Natal by the Department of Water Affairs on the Black and White Mfolozi rivers, as well as below their confluence. A statement of the possible environmental impacts of these proposed dams has been called for by the "Committee of Inquiry into the Ecological Implications of a Dam on the Mfolozi River" which was appointed by the Minister of Water Affairs. Some possible dam sites are located in the Umfolozi Game Reserve while others lie within KwaZulu and Natal.

At a multidisciplinary workshop it was agreed to use the matrix technique for the impact assessment. The workshop identified some 36 environmental elements that were either unique or of considerable ecological importance and also listed some 30 different engineering actions.

An assessment of each engineering action on all environmental elements has been undertaken for each possible dam site. The project has reached an advanced stage and the write-up of the report has been completed. It will be submitted in the near future.

The results of the environmental impact assessment show that the effects of any dam that floods part of Umfolozi Game Reserve will be considerable, negative and undesirable. Secondly acid-sulphur pollution of water originating from coal mining activities in the upper Black Mfolozi catchment would be stored in any future dam. Such water may be unsuitable for agricultural, industrial and domestic use depending on the level of pollution. Also, considerable sociological effects can be predicted if certain dams were to be constructed in densely inhabited areas of KwaZulu. Finally it was found that environmental impacts would be largely advantageous should future dams be constructed at sites in close proximity to Vryheid and Ulundi.

Keywords: dams, environmental impact, management, Natal, pollution, savanna

POYNTON J C

(Department of Biological Sciences, University of Natal, King George V Avenue, Durban 4001)

Ecological survey of open space areas in Greater Durban (1979-ongoing)

This survey has developed out of a study of the impact of human settlement on amphibian distribution patterns. A detailed and comprehensive survey of open space areas in the Durban area is being undertaken, including an inventory of the kinds of habitats which existing open space areas preserve. Attention is at present being focused on methods and criteria used in ecological assessment, particularly from the point of view of making recommendations regarding conservation and management.

Keywords: conservation, management, Natal, urban open space

RAITT L M and M EBRAHIM

(Department of Botany, University of the Western Cape, Private Bag X17, Bellville 7530)

The reproductive physiology of representatives of the fynbos biome (1980-1990)

Seed of some thirty of the fifty desired genera has been collected. Work on following the natural breaking of seed dormancy of selected species has been started, as has the study of the temperature response of Dimorphotheca seed. The first of a planned eight determinations of fynbos seed banks at Pella has been initiated. Preliminary results show apparent fine stimulation of germination.

Keywords: fynbos, germination, Pella, seed banks

REY M E C and H M GARNETT

(Department of Botany and Microbiology, University of the Witwatersrand, P O Box 1176, Johannesburg 2000)

Epidemiological, physiological and morphological studies of selected plant diseases at Nylsvley (1978-1982)

The objectives of this study are to determine the effects of a rust and tarspot infection on the grasses Digitaria eriantha and Panicum maximum respectively. Epidemiological studies have been completed, and reported in previous abstracts.

Morphological studies consisted of light and electron microscopical techniques for the study of ultrastructural changes in infected leaf cells. Disruption of mesophyll cells occurred in both infected grasses, due to intracellular penetration of fungal hyphae. Chloroplasts, in the bundle sheath cells, lost their centrifugal arrangement, and the grana were disrupted by large lipid bodies and starch granules. Detailed studies of haustorial penetration of cells and spore development were also carried out.

Physiological investigations included aspects such as photosynthesis, chlorophyll and crude protein. Chlorophyll concentrations appeared to alter with infection depending on the stage and extent of the disease. Photosynthesis remained unaffected in some cases, while in others decreased in heavily infected leaves. A direct relationship between the amount of total nitrogen or crude protein and disease intensity was noted.

Keywords: Digitaria eriantha, Nylsvley, Panicum maximum, physiology, plant diseases, savanna, Transvaal

RICHARDSON P R K
(Alexander McGregor Museum, P O Box 316, Kimberley 8300)

Feeding habits of the black-backed jackal (1980-1982)

Mr Richardson has conducted a programme of jackal shoots on the farm Rooipoort which is a natural reserve. From March 1980 to March 1981 there were shoots every three months and currently shoots are arranged every two months. On the 44 specimens so far taken 20 have been analysed. Diets reflect a seasonal change in availability of certain insects and fruits. Meat in the diet has been lower than in similar studies carried out in farming areas of the Transvaal and Natal. At the same time skulls and reproductive organs have been retained for study.

Keywords: black-backed jackal, diet, feeding behaviour

RICHARDSON P R K
(Alexander McGregor Museum, P O Box 316, Kimberley 8300)

Social behaviour of the aardwolf (1981-1985)

A study of this animal is planned in order to examine its status in the family Hyaenidae. Initially all the individuals on the farm Benfontein will have to be found and identified. Some will be radio-collared and the family relationships and movements will be monitored for about five years.

Keywords: aardwolf, movements, radio-collars

RICHARDSON P R K
(Alexander McGregor Museum, P O Box 316, Kimberley 8300)

Vertebrate fauna of the Northern Cape (1979-ongoing)

A survey aimed at documenting mammal and bird species and their distribution and relating this to geology and vegetation is under way. During the period under review two field trips were made, one to the northern Korannaberg, the other to the Malopo River. A total of 200 bird and 100 mammal specimens were collected.

Keywords: birds, distribution, mammals, Northern Cape, savanna

ROBERTSON H N
(6 Norfolk Close, Highstead Road, Rondebosch 7700)

An assessment of the utility of Verlorenvlei water (1978-1979)

The inadequate supply of water in the Western Cape coastal region is a problem facing its development. An assessment is made of the water utility of a large oligotrophic coastal lake, Verlorenvlei (longitude 18°24' E; latitude 32°21' S).

The electrolytic conductivity of the water was measured at various sites between December 1978 and October 1979. Values were converted to salinity (gms litre⁻¹). The concentration of the four predominant sea water cations in vlei and sea water samples was assayed using atomic absorption spectrometry.

Observations of submerged and emergent aquatic plants, fishes, birds and the domestic, agricultural and recreational use of the water by man were made.

The climate, geology and soil of the area is briefly described. The results showed that salinity in the main water body is due for the most part to the geological formations in the catchment. The range of salinities measured indicates the limited utility of Verlorenvlei water for domestic and agricultural use. Although sea water does intrude it does not appear to be detrimental to the vlei's biota. Ornithologists consider Verlorenvlei as one of the ten major wetlands for waders and a valuable feeding ground for the rare white pelican in the southwestern Cape. The vlei ecosystem, compared with the surrounding land, is relatively undisturbed.

An urgent investigation into the agricultural use of the area is suggested because there are indications of degradation which in an arid area can lead to desertification and soil salinization. Because of the features of Verlorenvlei it is recommended that a conservation-orientated management plan allowing for controlled recreational use be drawn up and implemented before the area becomes irretrievably degraded.

Keywords: agriculture, birds, Cape Province, coastal lake, conservation, fish, oligotrophic, recreation, reeds, salinity, wader, water quality, wetland

ROSSOUW L F
(Departement Plantkunde, Universiteit van die Oranje-Vrystaat, Posbus 339, Bloemfontein 9300)

'n Plantekologiese studie van die boomgemeenskappe van die Bloemfontein-omgewing/A plantecological study of the tree communities of the Bloemfontein area (1979-1981)

Die doel van hierdie projek is om die samestelling en die geografiese verspreiding van die boomgemeenskappe van die Bloemfontein-omgewing te bepaal.

'n Spesielys van die omgewing is opgestel. Opnames is gedoen volgens die Braun-Blanquet-opname tegniek. 'n Studie van omgewingsfaktore is gedoen.

Drie gemeenskappe is onderskei. Die belangrikste houtagtige soorte is Olea africana, Buddleia saligna, Grewia occidentalis, Rhus undulata, Euclea crispa, Rhus lancea, Rhus pyroides, Diospyros lycioides, Ziziphus mucronata, Acacia karroo en Salix capense.

Die Olea/Buddleia-gemeenskap kom voor op alle koppies. Drie subgemeenskappe word onderskei. Die verskille in subgemeenskappe hou hoofsaaklik verband met geografiese verskille soos verskillende hellings en klowe.

Die Acacia gemeenskap kom voor op vlaktes, langs droë lope en op die oewers van die Modderrivier. Drie subgemeenskappe word hier onderskei. Die verskille in subgemeenskappe hou hoofsaaklik verband met beskikbaarheid van vog.

Die Salix capense gemeenskap kom net voor op eilande in die Modderrivier.

Keywords: Bloemfontein area, Braun-Blanquet, grasslands, Orange Free State, savanna, tree communities

ROWE-ROWE D T

(Natal Parks, Game and Fish Preservation Board, P O Box 662, Pietermaritzburg 3200)

Drakensberg mammal ecology: antelope (1978-1980)

Distribution and density of antelope in Giant's Castle Game Reserve, particularly in relation to vegetation type and fire, are studied.

The objectives are to investigate the habitat preferences of antelope occurring in the reserve, particularly their utilization of veld burnt during different seasons and with different regularity.

Data were collected by direct observation and conducting censuses along fixed routes.

The following data are currently being analysed: distribution and habitat preference, seasonal and annual trends along fixed routes, influence of fire on distribution and density, population structures, and predation and other limiting factors.

Keywords: antelope, Drakensberg, fire, grasslands, habitat preference, utilization

ROWE-ROWE D T

(Natal Parks, Game and Fish Preservation Board, P O Box 662,
Pietermaritzburg 3200)

Drakensberg mammal ecology: black-backed jackal (1978-1980)

Study of black-backed jackal ecology in Giant's Castle Game Reserve.

The objectives are to study the role of the jackal in the game reserve with particular emphasis on alleged population increase, increased predation on antelope, and movements within the reserve and to outside areas.

Diet was studied by examining a small sample of stomach contents and a large number of faeces. Telemetry was used to establish movement patterns, social organization, and density.

The following data are currently being analysed and written up: Population structure, reproduction, diet, social organisation, home range, movements and density. Two publications exist, viz (i) trapping methods and results, and (ii) immobilization.

Keywords: black-backed jackal, diet, Drakensberg, grasslands, home range, movement

ROWE-ROWE D T

(Natal Parks, Game and Fish Preservation Board, P O Box 662,
Pietermaritzburg 3200)

Drakensberg mammal ecology: small mammals (1978-1980)

Distribution and density of small mammals in Giant's Castle Game Reserve, particularly in relation to vegetation type and fire.

The objectives are to investigate small mammal populations in different vegetation types under different burning treatments, and to collect other information relevant to their role in the ecology of the Drakensberg.

Populations were sampled by live- and snap-trapping.

Data relating to the following have been analysed: distribution and habitat preferences; relative abundance of species; density, species richness and diversity; influence of fire on populations; population structure; reproduction; diet; condition and predation. Results are being written up.

Keywords: Drakensberg, ecology, fire, grasslands, populations, small mammals

RUSSELL S

(Department of Botany, University of Fort Hare, Private Bag X1314,
Alice 5700)

The detection of vegetational pattern in South African forests with the
aid of cryptogamic indicators (1976-1982)

Studies in the lower plant flora (mainly bryophytes) of the Eastern Cape forests, are revealing a correlation between the distribution of cryptogamic communities and the pattern of forest "types" as currently defined according to macroenvironmental conditions and higher plant floristics. Such data can support existing classifications of woodland types while refining them with regard to localized habitat factors.

Particular attention is being given to the characterization of the forest microclimate and the physiological responses of several bryophyte species of "indicator" value.

Keywords: bryophytes, Cape Province, forests, microclimate,
phytosociology, water relations

SCHEEPERS J C

(Botanical Research Institute, Private Bag X101, Pretoria 0001)

Monitoring of vegetation change in South Africa on protected areas
(1960-ongoing)

The principle has been generally accepted that selected plots be identified and permanently marked for revisiting as part of the normal work programme of the regional studies, environmental ecology and experimental ecology teams. The coordination of our regional studies' work methods and programme with the Departmental Natural Resources Classification Programme is likely to lead to a standardization of approach and methods of monitoring vegetation change. This will necessitate reregistration of the facet towards standardization of approach and methods to meet present-day requirements.

Meanwhile, steps have been taken towards keeping this facet going. Mr Westfall has demarcated a fenced enclosure of grassland in the Sour Bushveld that has been severely encroached on by Stoebe vulgaris. The condition and trend of this vegetation, which will continue to be burnt and grazed according to a programme, will be monitored.

The Institute has also been approached by Westfalia Estate to monitor changes in the vegetation of selected sites for which baseline data going back some twenty years are already available. These possibilities are currently being investigated.

The grassland plot in the Pretoria National Botanic Gardens, that has been protected and subjected to various burning and cutting treatments, continues to be maintained under the same treatment regime. It is of interest that, apart from recorded changes in basal cover of grasses, there appears to have been little change over the past 15 years. It has

been noted, however, that there has been a marked invasion by woody plants of the northeastern corner of the plot, ie in the northeastern corner of the control subplot that is neither burned nor cut. All the species of invading woody plants bear fruit eaten by birds and the spatial distribution of these plants strongly suggests that this pattern results from the increased incidence of seeds from the droppings of frugivorous birds that perch on the northern and eastern boundary fences of the plot. The main invading woody plant is Rhus lancea accompanied by Cussonia paniculata, Lantana camara and R pyroides. Rhus leptodictya is also present immediately outside the northern boundary fence towards the northeastern corner. Otherwise the floristic composition remains remarkably stable although the grasses of the control plot are becoming increasingly moribund and some forbs appear to be becoming increasingly prominent.

Keywords: change, monitoring, protected plot, vegetation change

SCHEEPERS J C

(Botanical Research Institute, Private Bag X101, Pretoria 0001)

Stability of basal cover in natural grassland (1966-ongoing)

Keywords: basal cover, burning, cutting, grasslands

SCHEEPERS J C

(Botanical Research Institute, Private Bag X101, Pretoria 0001)

A revision of the karoid and adjoining Veld Types (1945-ongoing)

Keywords: Acocks, Karoo, Veld Types

SCHÜTTE K H and K ACHTLEITNER

(Department of Botany, University of Cape Town, Private Bag, Rondebosch 7700)

Dendrographic studies of the water relations of the fynbos (1979-1982)

The aims of this study are to use modern sensitive dendrographic techniques to study the water relations of selected members of the fynbos. The research technique envisaged a detailed study of the plant under glasshouse conditions, to learn its responses and characteristic behaviour pattern. This is to be followed by field studies, which can be interpreted in depth, due to the existing knowledge of the plant.

The first plant to be studied was Protea repens. Potted plants were studied in detail in the glasshouse. Investigation of transpiration, using a recording balance, was very informative. On warm sunny days (ie 30°C) transpiration exceeded 1,4 mg cm⁻² h⁻¹. P repens frequently transpires at night, even when it is quite short of water. A common rate was between 0,1 mg cm⁻² h⁻¹ and 0,2 mg cm⁻² h⁻¹.

This was not typical xeromorphic behaviour. But certain Eucalyptus species and other arid zone plants show this too. Both the dendrometer and the balance show that the P repens can lose water rapidly, but the dendrometer shows that these plants can only rehydrate slowly, ie even in well-watered soils the stems expand only very slowly, while most woody plants rehydrate rapidly.

The light responses of this plant are reasonably standard. It responds to the dawn twilight but has a slightly unusual response showing an initial stem expansion before a stem contraction. It has a clear-cut light phase in stem contraction and to complete this phase the plant must receive a light input of $9,6 \text{ KW m}^{-2}$.

Due to non-arrival of equipment, no fieldwork has yet been undertaken on P repens. Fortunately, the Forestry Department have dendrographic data in P arborea grown in Jonkershoek. The field-grown plants show very similar dendrographic patterns to those studied in the glasshouse. However, it was not possible to transfer data from P repens to P arborea to obtain quantitative results of any kind.

Keywords: dendrometer, fynbos, water relations

SEYDACK A H W

(Directorate of Forestry and Environmental Conservation, Private Bag X12, Knysna 6570)

Ecological and biological aspects of the bush-pig (Potamochoerus porcus) in the southern Cape (1980-1983)

The aim of the study on the bush-pig is to provide basic information on feeding behaviour, activity patterns, spatial occupation, reproduction, sociospatial behaviour and population dynamics. The forthcoming information and understanding can then be used as basis for management proposals and decisionmaking regarding the conservation, utilization or control of the species as required by circumstances and policy.

Concerning methods, data collection is tackled in four different ways: sample collection from culled animals, capture/release programme, radiotelemetry and studies on captives. The following collections are envisaged with respect to every culled animal: skull (age determination), stomach contents (feeding), liver samples (trace element status), bone marrow (condition index), reproductive tracts (reproduction) and blood samples (evaluation of nutritional and reproductive status). The capture/release programme is intended to provide information on density, population structure, group integrity and dispersion. The radio-tracking programme should provide information on home range, movement, activity and habitat preferences. Studies on captives is carried out in order to obtain information on behaviour, growth and age determination.

Keywords: activity, autecology, behaviour, bush-pig, habitat utilization, indigenous forests, population dynamics, reproduction, social organization, southern Cape

SEYDACK A H W

(Directorate of Forestry and Environmental Conservation, Private Bag X12, Knysna 6570)

A photographic study of the distribution and density of the larger mammals of the southern Cape indigenous forests (1979-1981)

Tested autotriggering photographic data recording units were used as a method of studying forest mammals. Six data-recording units were used, each consisting of a camera with autowinder, a flash system and trip-plate. The six units were positioned systematically along paths on 1 km² census blocks in the study area and shifted monthly to the adjacent census block. One survey cycle involved the traversing of the 6 km² study area and correspondingly took six months for completion. Three survey cycles resulted in a total of 329 photographic animal records of 12 different species. From the results, a bush-buck (Tragelaphus scriptus Pallas 1776) population density of 5,2 animals/km² was determined. Three leopards (Panthera pardus Linnaeus 1758) frequented the study area. Other species recorded include large-spotted genet (Genetta tigrina Schreber 1778), porcupine (Hystrix africae australis Peters 1852), honey badger (Mellivora capensis Schreber 1776), bush-pig (Potamochoerus porcus Linn 1758), blue duiker (Cephalophus monticola Thunberg 1789), baboon (Papio ursinus Kerr 1792), lynx (Felis caracal Schreber 1776) and marsh mongoose (Atilax paludinosus Cuvier 1777). The results of the project to date indicate that the technique has great potential for census and research of mammals inhabiting dense vegetation types.

Keywords: abundance, bushbuck, census, densities, distribution, forests, forest mammals, indigenous forest, censusing, southern Cape.

SHAUGHNESSY G L

(School of Environmental Studies, University of Cape Town, Private Bag, Rondebosch 7700)

Historical ecology of alien woody plants in the vicinity of Cape Town, South Africa (1976-1980)

The reasons for the success of certain alien plant species in the vicinity of Cape Town (ie the Northern Cape Peninsula and the adjoining Cape Flats) are examined by a consideration of their history at the hands of man. Attention is focused on 13 woody species that are considered to threaten the natural macchia-type vegetation (fynbos) of the region. They comprise Acacia (six species), Albizia lophantha, Hakea (three species) and Leptospermum laevigatum, all from Australia, and Pinus (two species) from the Mediterranean region. The method of approach is historical and the research is based primarily on manuscript documents in the Cape archives used in conjunction with annual reports of governmental bodies, especially the forestry authorities, and other contemporary accounts.

Keywords: Acacia, Albizia, Cape Province, fynbos, Hakea, historical ecology, Leptospermum, macchia, Mediterranean, Pinus, woody plants

SIEGFRIED W R and T M CROWE

(Percy FitzPatrick Institute of African Ornithology, University of Cape Town, Private Bag, Rondebosch 7700)

Avifaunal community analysis: fynbos

This long-term project will seek to define the parameters of function in fynbos habitats as they affect birds. Standard 21 hectare plots with two transects totalling 600 m were used to collect census and niche data on birds, and relate these to vegetation parameters throughout the year.

Keywords: birds, fynbos, vegetation structure

SMITHERS R H N

(Mammal Research Institute, University of Pretoria, Pretoria 0002)

The mammals of the southern African subregion (1979-1982)

The project is directed to the publication of a reference book covering the 338 species of mammals known to occur in the southern African subregion. Separate English and Afrikaans editions will be available in an A4 format and an estimated size of 480 pages, with 30 full-page colour plates, some 160 black-and-white drawings and distribution maps. Taxonomic notes and a description of each species is followed by information on its distribution, habitat, habits, food and reproduction, with notes on adaptations to its way of life. Presentation copies appropriately leather bound are available to sponsors and donors and numbered copies from a limited edition to subscribers. Subvention will allow the marketing of the ordinary edition at a low price.

Keywords: ecology, mammals, marine, Southern African subregion, terrestrial

STEINKE T D, G NAIDOO and L M CHARLES

(Department of Botany, University of Durban-Westville, Private Bag X54001, Durban 4000)

A preliminary study of mangrove litter degradation in Mgeni estuary, Durban (1978-ongoing)

In situ rates of degradation of mangrove litter were obtained from regular harvests of submerged material contained in nylon mesh bags. Litter components comprised leaves and stems of Avicennia marina (Forsk) Vierh and Bruguiera gymnorrhiza (L) Lam and stems of Rhizophora mucronata Lam. Leaves degraded more rapidly than stems and after six months Avicennia and Bruguiera leaf debris comprised only 9,5% and 15,3% respectively of their initial mass. At the end of this period approximately 80% of the initial mass of the stems of each species remained. The material from each harvest was analysed for N, P, K and total C. In the bags containing leaves of both species nitrogen percentages showed a steady increase, while phosphorus and potassium percentages showed an initial sharp

decrease before levelling off. Little differences were revealed in all analyses of stems and in total carbon values of leaves. More information is required before the significance of leaf litter in the contribution of nutrients to this estuary can be assessed fully. The role of micro-organisms and other agents, such as crabs, in litter breakdown is to receive attention.

Keywords: degradation, estuary, litter, mangrove, Mgeni, Natal

STEINKE T D, C J WARD, L M CHARLES and D K NAIDOO
(Department of Botany, University of Durban-Westville, Private Bag X54001, Durban 4000)

Studies on productivity of mangroves in Natal (1978-ongoing)

Litter baskets placed at random in the mangroves in Mgeni estuary have made it possible to obtain estimates of productivity which are important for an understanding of the role of these communities in estuarine ecosystems. Estimates of productivity were obtained in two communities: one dominated by Avicennia marina (Forsk) Vierh and the other comprising an almost pure stand of Bruguiera gymnorhiza (L) Lam. Average litter production for the Avicennia community was 2,61 g and 1,31 g dry matter $m^{-2} day^{-1}$, while that for the Bruguiera stand was 2,59 g and 2,14 g dry matter $m^{-2} day^{-1}$, for the 1978-1979 and 1979-1980 harvests respectively. Highest values in both communities were recorded at the time of seedling abscission in autumn. Woody material formed a relatively low proportion of the total litter yields. This work has been extended by placing additional baskets at St Lucia and Richards Bay.

A gas analysis system has been constructed to support the productivity data with measurements of actual photosynthesis by leaves of mangroves.

Keywords: mangroves, Natal, production

STUART C T
(Cape Department of Nature and Environmental Conservation,
Private Bag X614, Robertson 6705)

Aspects of Herpestes pulverulentus ecology in the McGregor Valley (1978-1980)

A trap, mark and release programme was undertaken to establish home range of the Cape grey mongoose, Herpestes pulverulentus, and additional information on feeding was obtained.

Keywords: feeding, home range, mongoose

STUART C T

(Cape Department of Nature and Environmental Conservation,
Private Bag X614, Robertson 6705)

The distribution, status, feeding habits and reproduction of carnivores of the Cape Province (1980)

This project covered all the species of mammalian carnivores of the Cape Province and it is seen as a base upon which species or regional studies can be undertaken. With the exception of the large carnivores, the serval, Felis serval and the spotted necked otter, Lutra maculicallis, the remaining carnivore species are considered to be safe. This work was completed during 1979 and is now in press.

Keywords: Cape Province, carnivores, distribution, feeding behaviour, reproduction, status

STUART C T

(Cape Department of Nature and Environmental Conservation,
Private Bag X614, Robertson 6705)

The ecology of the caracal Felis caracal in the Cape Province (1980-1982)

This research project is divided into two sections: (i) reproduction, ageing and feeding; and (ii) movement, home range and prey abundance.

Section (i) is nearing completion and involved the collection of reproductive organs, skulls, eye lenses, stomachs and scats. Material was obtained from several areas of the Cape Province. In order to obtain known-age material a breeding programme was initiated and a number of litters were successfully reared in captivity, and culled when required.

Section (ii) of the project involves the capture of caracal in two main study areas (eastern Robertson Karoo and the Coastal Sandveld of the Bredasdorp district), fitting them with radio transmitters and then releasing them. It is hoped that this will enable us to understand the area requirements of these cats, as well as seasonal movements. Detailed studies of potential prey abundance have been initiated in both areas.

Keywords: ageing, Cape Province, caracal, feeding, Karoo, prey abundance, reproduction, tracking

STUTTERHEIM C J

(Department of Zoology, Rand Afrikaans University, P O Box 524,
Johannesburg 2000)

Ecology of Sturnidae in the Kruger National Park (1980-1981)

The ecology of seven starling species was investigated in the Kruger National Park.

Seven study areas were selected. These were Krokodilbrug, Skukuza, Satara, Letaba, Shingwidzi, Punda Milia and Pafuri. In each study area the distribution, population dynamics, habitat preferences, feeding ecology and breeding biology of the different starling species present were studied. A few individuals of each species were also collected for DNA comparisons and stomach content analyses. This information was collected in an attempt to separate the different species ecologically.

Keywords: breeding, distribution, population dynamics, savanna, Sturnidae, Transvaal

STUTTERHEIM C J

(Department of Zoology, Rand Afrikaans University, P O Box 524, Johannesburg 2000)

An environmental impact assessment of road P160-1 in the Magaliesberg (1980)

The corridor area of the proposed road was investigated using distribution and population censuses of bird, mammal, reptile and frog species. Seven biotic communities were identified along a 10 km corridor area. For each community a community index value, barrier effect value and impact value were calculated.

Keywords: environmental impact, population censuses, roads, Transvaal

TAYLOR H C

(Botanical Research Unit, P O Box 471, Stellenbosch 7600)

Botanical survey of the Mountain Fynbos vegetation of South Africa: vegetation of the Cape of Good Hope Nature Reserve (1965-1982)

Keywords: Cape Province, classification, ecology, fynbos, mountain, phytosociology, southwestern Cape

TAYLOR H C

(Botanical Research Unit, P O Box 471, Stellenbosch 7600)

Strand plant communities of the southern Cape (1982)

This phytosociological study, confined to the special vegetation that comes under the direct and strong influence of the sea and the maritime climate, revealed a series of five major plant communities from wet to dry. Of these, two occur on bedrock, one on limestone and two on marine sand. The simple pioneer dune community is the most widespread, but since all five communities are represented in most of the landscape segments of the coastline, it is concluded that this strand vegetation comprises only one floristic element.

Keywords: dune vegetation, maritime climate, southern Cape

TAYLOR R H

(Natal Parks, Game and Fish Preservation Board, Private Bag, St Lucia Estuary 3936)

A land capability study for hippopotamuses at Lake St Lucia, Zululand (1973-1980)

The St Lucia hippopotamus population is the largest in Natal. Most of these hippopotamuses rely on the eastern shores of St Lucia, a multiple landuse area, for their food and freshwater supplies.

The main objective of this study was to determine the effects of the various landuse practices on the hippopotamus population, and to suggest management practices which could alleviate any adverse effects.

An holistic approach was taken. The St Lucia system was described in detail and a map and a physiognomic classification of the vegetation have been included.

Population parameters were described. To understand past influences on the population, historical references were collected, and these indicate that prior to the enforcement of game regulations in the 1930-1940s, the population size was reduced considerably by hunting. Census data for the period 1957-1980 were analysed. A correction factor, based on the inversely linear relationship between the numbers of hippopotamuses in the lake and the height of the water table, and hence water level in pans, on the eastern shores was applied. From these data it appears that the population has increased steadily at 2,7% pa since 1957. Currently the population is between 700 and 750 hippopotamuses.

The basic resources required by the hippopotamuses, and the capability of the area to meet these requirements were analysed. The two resources which could possibly be limiting to the population are the availability of suitable grazing and of drinking water.

The eastern shores, a multiple use area, supports approximately 550 hippopotamuses, 80% of the St Lucia population. Each of the landuse practices, its extent, and its effects on the natural environment were discussed. Management practices which may alleviate any adverse effects on the hippopotamuses or their habitat have been suggested.

When viewed in its regional perspective, the well-being of the St Lucia hippopotamus population is to a large extent dependent on the state of the catchment areas. For this reason it was suggested that a landuse study of the St Lucia catchment areas should be carried out.

In a more local perspective it was recommended that the eastern shores be zoned into areas for which the type and extent of each activity permitted is clearly defined. Close cooperation between all the landusers is necessary, and the objectives for each landuse should be stated unambiguously.

Wildlife management practices should be aimed at the maintenance of food and water supplies.

Keywords: hippopotamus, landuse, management, Natal, Lake St Lucia, wildlife

TEAGUE W R

(Department of Pasture Science, University of Fort Hare,
Private Bag X1314, Alice 5700)

Defoliation and browse production of Acacia karroo Hayne in the Eastern Cape, South Africa (1979-1982)

The objective of the study is to determine the effect of various browsing regimes on browse production from Acacia karroo Hayne in the False Thornveld of the Eastern Cape.

Studies are made to determine how the plant grows, particularly in relation to the moisture and temperature regimes, seasonal patterns of growth, reserve use and replenishment, productivity at different positions in the canopy, and with different size/maturity classes of plants. This will provide information to base the following stage of research on, the reaction of the plants to intensity and frequency of defoliation at different times of the year.

Keywords: Acacia karroo, browse production, defoliation, Eastern Cape, savanna

TROLLOPE W S W

(Department of Agronomy, University of Fort Hare, Private Bag X1314,
Alice 5700)

Fire as a method of controlling bush encroachment in the Eastern Cape Province Grassveld (1972-ongoing)

The hypothesis is being tested that the role of fire in controlling bush encroachment in the arid savannas is to maintain bush at an available height and in an acceptable state for browsing animals.

The experimental area comprises 2,2 ha and the treatments are an initial fire followed by (i) browsing and grazing, (ii) grazing and (iii) annual burning at the end of winter.

Keywords: bush encroachment, Eastern Cape, fire, grasslands

TROLLOPE W S W

(Department of Agronomy, University of Fort Hare, Private Bag X1314,
Alice 5700)

Effect of time of burning on Eastern Cape Province grassveld
(1977-ongoing)

The hypothesis is being tested that burning is less detrimental to the grass sward when the grass is dormant than when it is actively growing.

The treatments comprise burning plots 14 x 14 m in size on a monthly basis commencing on 1 July through to 1 November. Treatments are applied on a biennial basis and all pertinent fire behaviour parameters are measured at the time of burning.

Treatment effects are measured in terms of changes in the botanical composition and productivity of the grass sward.

Keywords: Eastern Cape, fire, grass, grasslands, production

TROLLOPE W S W

(Department of Agronomy, University of Fort Hare, Private Bag X1314,
Alice 5700)

Effect of frequency and season of defoliation with fire on Eastern Cape
Province Grassveld (1973-ongoing)

The effect on the grass sward of annual, biennial, triennial and quadriennial burning applied at the beginning and end of winter is being investigated.

All pertinent fire behaviour parameters are measured during the application of the burns and the treatment effects are being recorded in terms of changes in the botanical composition of the grass sward.

Keywords: defoliation, Eastern Cape, fire, grasslands

TROLLOPE W S W

(Department of Agronomy, University of Fort Hare, Private Bag X1314,
Alice 5700)

An investigation of plant succession in the Thornveld areas of the Ciskei
(1980-ongoing)

The recovery of Thornveld after complete removal of the trees and shrubs is being investigated. Perturbations involving complete rest, annual, biennial, triennial, quadriennial and sexennial burning are being applied to different plots, half a hectare in size, at the end of winter. Treatment effects are being recorded in terms of changes in the botanical composition of the grass sward and the bush component. The physiognomic

structure of the recovering bush is also being monitored. All pertinent fire behaviour parameters are recorded during the application of the burns.

Keywords: Ciskei, fire, savanna, succession, Thornveld, tree removal

VAN DAALEN J C

(Saasveld Forestry Research Station, Private Bag X6531, George 6530)

Investigation of the colonization of fynbos areas and disturbed sites by indigenous forest communities (1977-1980)

A hypothesis that the indigenous forest colonizes fynbos and disturbed sites in the southern Cape has been tested by surveying the forest-fynbos ecotone and the adjoining fynbos and analysing the data by means of reciprocal averaging and factor analysis. On all the study sites, except one, the ordination of the environmental factors with factor analysis showed no correlation with the present forest-fynbos ecotone and it was concluded that the forest ecotone has been artificially induced on these sites.

No forest species were regenerating in the adjoining fynbos. Possible reasons for this are closed nutrient cycles of the shallow rooted trees, the inability of the trees to withstand regular burning and an unfavourable macro- and microclimate. Soil moisture is important especially in the marginal areas. Except in the case of soils derived from Enon conglomerates or granites soil type is no limiting factor for forest. Fynbos is not seral in forest succession, but a different vegetation type replacing forest where possible.

Keywords: Cape Province, dynamics, forests, forest ecotone, fynbos, succession

VAN DER ZEL D W and C H SNYMAN

(Department of Water Affairs, Forestry and Environmental Conservation, Private Bag X447, Pretoria 0001)

Preparation of a forestry map of South Africa using LANDSAT data (1980-1982)

The study is divided into a pilot study and mapping project.

The objective of the pilot study is to assess and demonstrate the usefulness of computer image classification and/or enhancement techniques presently available at the Satellite Remote Sensing Centre at Hartbeesthoek as applied to LANDSAT imagery, with regard to a number of key factors related to forestry mapping.

The objective of the mapping project is to produce a forestry map of South Africa at a scale of 1:250 000 showing indigenous and exotic forests. The exotic timber plantations should distinguish between softwoods and

hardwoods, while in hardwoods eucalypts and wattles should preferably be separated. It is also the aim to determine, for each class the relevant surface area with maximum error not exceeding 10%.

Keywords: forestry, LANDSAT, mapping

VAN WILGEN B W

(Jonkershoek Forestry Research Station, Private Bag X5011,
Stellenbosch 7600)

Long-term effects of fire regime on fynbos community structure in
Langrivier and vicinity, Jonkershoek State Forest (1979-1980)

Three post-fire ages of fynbos were studied to determine the effects of fire frequency on the vegetation. The three frequencies investigated were short rotation burning (six years), moderate rotation burning (about 15-20 years) and protection from fire for 37 years.

Aerial plant biomass was determined for the three age classes. Biomass was divided into dead and live components, and fuel and non-fuel components using a diameter of 6 mm as dividing point. It was found that frequent burning drastically reduced biomass, while long protection from fire resulted in a decline in live biomass and a build-up of litter.

One hundred relevés were enumerated using the Braun-Blanquet method. Results showed that short rotation burning resulted in a reduction in plant cover, height and biomass, as well as the elimination of larger seed-regenerating shrubs. Species diversity was high and shorter graminoid and herb species dominated the vegetation. Twenty year-old vegetation had a high cover and mean plant height, but species diversity was low and undergrowth species were reduced in importance.

In old vegetation the large shrubs were reduced due to high mortality and low recruitment; as a result undergrowth species showed some signs of recovery and species diversity increased. Some tree species had begun to appear, although most of the area is not considered to be seral to forest. The results are used to support an argument for a variable burning rotation of 15-20 years for the area.

Keywords: biomass, Cape Province, fire, fire frequency, fynbos, prescribed burning

VAN WILGEN B W

(Jonkershoek Forestry Research Station, Private Bag X5011,
Stellenbosch 7600)

A phenological study in a fynbos community in Swartboschkloof, Jonkershoek
State Forest (1978-1982)

Litter fall and shoot elongation in three species of Protea (P neriifolia, P repens and P nitida) are measured at biweekly intervals.

Keywords: Cape Province, fynbos, phenology, Protea neriifolia, Protea nitida, Protea repens

VAN WILGEN B W
(Jonkershoek Forestry Research Station, Private Bag X5011,
Stellenbosch 7600)

Study of the origin, occurrence and spread of fynbos fires and controlling effects of weather as indicated by available records (1978-1980)

Fires occurring on land controlled by the Department of Forestry between 1 April 1978 and 31 March 1979 were recorded by means of a questionnaire survey. The survey was undertaken in order to obtain data on the fire regimes of the region. Fires were divided into three categories, namely wildfires, prescribed burns and firebreak burns. Data on the age of vegetation burnt, the causes, costs, duration, size and season of burn and associated weather factors have been presented and discussed in an article to be published shortly. The need for a reliable fire hazard prediction system as an aid to the practice of prescribed burning was identified.

Keywords: Cape Province, fire, fire danger rating, fynbos, prescribed burning

VAN WYK D B
(Jonkershoek Bosbounavorsingstasie, Privaatsak X5011, Stellenbosch 7600)

Vasstelling van die invloed van bestuursmaatreëls soos toegepas in eksperimentele opvanggebiede op die kwaliteit van water in die Wes-Kaap/
Determination of the influence of management tools as applied in experimental catchment areas on the quality of water in the Western Cape (1971-1984)

Die hoofdoel van die projek is om die invloed van bestuursmaatreëls, naamlik brand van fynbosgebiede in verskillende seisoene (herfs, lente en vroeë somer), met brandsiklusse wat wissel van vier tot dertien jaar se invloed op waterkwaliteit vas te stel. Die invloed van bebossing en ontbossing op waterkwaliteit word ook ondersoek.

Inligting in verband met beheerde brande uitgevoer in 1971, 1977 en 1980 is bekom. Chemiese invloed van neerslag word vir kontrole-doeleindes ingesamel. Ontledings dui daarop dat beheerde brande se invloed op waterkwaliteit slegs geld vir 'n periode van 8-10 maande na die brande. Bemonstering van die vloede het 'n beter beeld van die reaksie van die opvanggebiede op die brande uitgebring. Hier is bevind dat slegs die eerste vier vloede die vrygestelde voedingstowwe vrystel. Vanaf die resultate kan dus afgelei word dat die freatiese sone die oorsprong van die oortollige voedingstowwe is.

Die hoof-chemiese bestandele in stroomwater en neerslag is natrium en chloried. Slegs spore van fosfate en stikstof is gedurende die kontrole-tydperk waargeneem. Die brande het laasgenoemde egter nie in stroomwater laat vermeerder nie.

Dit wil ook voorkom of brande nie 'n ernstige invloed op slikuitvoere uit die fynbosgebiede deur middel van die strome tot gevolg gehad het nie.

'n Uitnodiging is ontvang om 'n referaat te lewer by die internasionale simposium in verband met bestuur van mediterreense ekosisteme in San Diego, Kalifornië, VSA. Daar is begin om die volgende referaat voor te berei: "The influence of prescribed burning as a management tool on the nutrient budgets of Mountain Fynbos catchments in the southwestern Cape, Republic of South Africa".

'n Apparaat is ontwikkel om vloede te bemonster.

Keywords: fynbos, management, plantations, water quality

VENTER H J T

(Departement Plantkunde, Universiteit van die Oranje-Vrystaat, Posbus 339, Bloemfontein 9300)

'n Plantekologiese studie van die boomgemeenskappe van die Oos-Oranje-Vrystaat/A plant-ecological study of the tree communities of the Eastern Orange Free State (1977-1981)

Die doel van hierdie projek is die bepaling van die samestelling, omvang en geografiese verspreiding van die boomgemeenskappe van die oostelike berggebiede van die Oranje-Vrystaat, asook die bepaling van die verspreidingspatrone van houtagtige soorte in die Oos-Oranje-Vrystaat.

Spesielyste is opgestel in elke boomstand wat ondersoek is, en 'n opname is uitgevoer volgens die Braun-Blanquet-opname tegniek. Omgewingsfaktore soos geologie, grondtipe, helling en aspek is by elke opname bepaal. Die gegewens van die relevés word met behulp van die Braun-Blanquet-tabuleertegniek verwerk.

Voorlopig is vyf gemeenskappe onderskei. Die samestelling hiervan hou grootliks verband met beskikbare vog en beskutting.

Die belangrikste houtagtige soorte is Podocarpus latifolius, Diospyros whyteana, Grewia sutherlandii, Protea caffra, Protea roupelliae, Euclea crispa, Buddleia salviifolia, Leucosidea sericea, Myrsine africana en Rhamnus prinoides.

Die Podocarpus/Diospyros gemeenskap van die beskutte, vogtige klowe besit die hoogste digtheid en is die rykste aan spesies. Dit hou sterk verband met die Natalse bergkloofgemeenskappe.

Die Grewia/Diospyros gemeenskap kom op basies dieselfde habitat as die vorige gemeenskap voor.

Die Protea gemeenskap groei teen blootgestelde berghange as 'n tipe savanne.

Die Euclea/Myrsine gemeenskap is ooglopend 'n droër tipe en word verder wes aangetref as die ander genoemdes.

Die Buddleia/Leucosidea gemeenskap volg die lope van die talle strome in dié gebied.

Keywords: Braun-Blanquet, classification, eastern mountainous area, grasslands, Orange Free State, trees

VERSFELD D B, A VAN LAAR and D G M DONALD
(Jonkershoek Forestry Research Station, Private Bag X5011,
Stellenbosch 7600)

Investigation of the effects of clearfelling of *Pinus radiata* in
Bosboukloof, Jonkershoek Forestry Research Station (1976-1983)

Bosboukloof is the first of several catchments at Jonkershoek, afforested to determine the influence of vegetation change from fynbos to *Pinus radiata*, to be clearfelled. The project is aimed primarily at assessing the influence of the clearfelling operation on streamflow, nutrient export, nutrient cycling, soil disturbance and erosion, indigenous faunal and floral communities. Clearfelling of the 200 ha catchment (58% afforested) will be completed in 1982.

Changes in streamflow cannot yet be quantified. No significant changes in pH (average 6,5) and conductivity have been observed but sediment yield has increased markedly. Litterfall and decomposition rates in stands of *P radiata* have been monitored for several years. Total litterfall pa has averaged 3721 kg ha⁻¹ of which needles constitute 71%. Nutrient analyses are pending. Monitoring is to be expanded to the indigenous riparian zone.

A 100% stock enumeration and intensive biomass study have been completed and results are to be coupled with an intensive study into nutrient concentrations in different components of live trees to determine partitioning between export and recycling on clearfelling.

Erosion studies have been limited to the mapping of two small sub-catchments; most sediment clearly comes off roads. The recovery of indigenous fynbos on clearfelled areas is being monitored on thirty 5 x 10 m plots: species diversity increases rapidly from five species per plot six months after clearfelling to twenty species at 12 months.

Keywords: afforestation, biomass, deforestation, forests, fynbos, litter, nutrient cycling, *Pinus radiata*, soil erosion, streamflow, Western Cape

VINCENT J
(Natal Parks, Game and Fish Preservation Board, P O Box 662,
Pietermaritzburg 3200)

The population dynamics of impala (*Aepyceros melampus liechtenstein*) in
Mkuzi Game Reserve (1969-1979)

The need to understand the dynamics of the impala population in Mkuzi Game Reserve arose during the early 1960s when it became clear that various

factors were contributing to an overpopulation of the species in the reserve. Population management was recognized as being necessary and was carried out, but it was based on inadequate information.

This study set out to establish a rational basis for future management. The social organization and behaviour of impala in Mkuzi were analysed and placed in perspective relative to the population dynamics. Two methods of counting the animals were used and a relationship obtained between the respective results. The distribution of impala within the reserve, both on a gross population basis and with respect to the various sex and age categories, was determined from sampling. In order to establish the age structure of the population, samples obtained from the control programme were used, and these were aged on the basis of molar wear. At the same time the proportions of young animals and the population sex ratios were obtained by field sampling.

Using these data, life tables were constructed, from which it was possible to interpret the behaviour of the population at the time of the study. However, caution should be exercised in extrapolating these results literally to the same population under different conditions. The study only provides guidelines for regular monitoring to be carried out. At the same time a more detailed study of the vegetation dynamics of Mkuzi Game Reserve is a priority so that the relationship between the animal and plant elements of the reserve can be properly analysed.

Keywords: ageing, impala, management, Mkuzi Game Reserve, Natal, population dynamics, savanna, social organization

VRAHIMIS S

(Nature Conservation Division, Provincial Administration of the Orange Free State, P O Box 517, Bloemfontein 9300)

Comparative production and condition of black wildebeest (*Connochaetes gnu*) on provincial reserves in the Orange Free State with emphasis on the interaction between habitat and the animal density. (1980-1983)

The population structure of the black wildebeest herds in the various reserves in the Orange Free State will be determined. The major part of the project is being carried out at the game farm Tussen-die-Riviere where the movement of the various herds are being monitored. The condition of black wildebeest hunted at the game farm is determined using the kidney fat index as well as a method based on external physical appearance. A complete botanical survey is to be carried out in all the major black wildebeest concentration areas at the game farm Tussen-die-Riviere to be able to determine the interaction between the black wildebeest populations and the habitat. Feeding preferences using rumen and faecal analysis will also be carried out.

Keywords: black wildebeest, condition, feeding preferences, habitat interaction, Orange Free State, population structure

WALKER B H and W T WEIGHILL

(Centre for Resource Ecology, University of the Witwatersrand,
P O Box 1176, Johannesburg, 2000)

The grass/woody balance and the stability of Acacia patches in the
Burkea veld (1981-1984)

It has been found that competition between Cenchrus ciliaris and Acacia trees results in lowered growth rates (measured as shoot extension) in the woody plants. Corresponding decreases in subsoil (30-130 cm) moisture presumably contribute to this effect either directly or indirectly.

Eragrostis pallens is more sensitive to ammonium nitrogen than to nitrate nitrogen. Fertilization with the former led to higher yields. Grasses in the Burkea veld may be competing more successfully than woody plants for nitrogen, by taking it up in this form.

B africana seedlings were found to grow as well in "Acacia" soil as in "Burkea" soil, provided a moisture regime equivalent to ± 1200 mm pa existed. A nilotica seedlings, however, showed poor growth rates in "Burkea" soil even under this "moist" regime. This suggests that there is a possibility of B africana establishing in Acacia areas but not vice versa.

Keywords: ammonium, growth rate, nitrate, nitrogen, plant competition, seedling establishment, shoot extension, soil moisture

WARD C J

(Department of Botany, University of Durban-Westville, Private Bag X54001,
Durban 4000)

Plant ecology of the estuaries and lagoons of the coastbelt of Natal
(1974-ongoing)

Although general monitoring of aquatic and peripheral vegetation and their environmental factors in the Richards Bay area and the Lake St Lucia system continues, basic fieldwork concerning the plant ecology of these and other estuaries and lagoons of Natal has been completed. Data from this and other sources, in particular aerial photographs, are currently being incorporated into a report to the Natal Town and Regional Planning Commission.

Keywords: aerial photographs, ecology, estuaries, lagoons, mapping, Natal

WATSON H and I A W MACDONALD

(Department of Geography, University of Durban-Westville,
Private Bag X54001, Durban 4000)

Past vegetation changes in the Hluhluwe Game Reserve-Corridor-Umfolozi
Game Reserve Complex based on remote sensing (1980-1981)

Aerial photographic images of the central Complex exist for the years

1937, 1960, 1970 and 1975. Using the Point-Interception technique, quantitative changes in the spatial distribution of the broad textural vegetation classes present and in the habitat components within these communities are being assessed. Use is also being made of the available 1973 satellite imagery.

Keywords: biogeography, bush encroachment, forests, Natal, remote sensing, savanna

WEISSER P J

(Botanical Research Institute, Private Bag X101, Pretoria 0001)

Vegetation study of the Zululand coastal dunes between Richards Bay and the Mlalazi Lagoon (1980-1981)

Vegetation mapping (scale 1:10 000) will be done by air-photo interpretation together with ground control to obtain data for the establishment of conservation priorities needed because of intended dune mining. In order to establish the primary or secondary nature of the communities, a map of the vegetation as shown on the air photos of 1937 will be drawn and the vegetation changes and trends established by comparison with 1975 photos. Results suggest conservation-worthy areas as mainly being along the coast, near the Mlalazi mouth and the northern part of the study area.

Keywords: aerial photographs, coastal dunes, dune mining, dune vegetation, Natal, population dynamics, vegetation map

WEISSER P J and K COOPER

(Botanical Research Institute, Private Bag X101, Pretoria 0001)

The dry coastal ecosystems along the east coast of South Africa (1979-1982)

The objective is to synthesize the available information on dune and rock vegetation between the Mozambique border and Port Elizabeth using the existing literature. The information available on these ecosystems is patchy: considerable information is available from Zululand and Natal and very little about Pondoland and the Eastern Cape. The species quoted by more than three authors were tabulated from north to south. Most authors recognize four main vegetation zones on the dunes: dune pioneer zone, Passerine rigida open scrub, closed dune scrub and dune forest. Literature on vegetation of rocky shorelines is scarce. Succession proceeds much slower than on the dunes due to the limiting substrate and ranges from rock-pioneer communities to low closed, wind-pruned scrub.

Keywords: coastal vegetation, dunes, dune vegetation, Natal, Pondoland, review, Transkei, Zululand

WEISSER P J, P G H FROST, S K FROST and I GARLAND
(Botanical Research Institute, Private Bag X101, Pretoria 0001)

A classification of the dune vegetation at Twinstreams, Mtunzini, Natal, South Africa (1978-1982)

One hundred and ten Braun-Blanquet plots were made along a successional gradient from dune pioneers to mature forest at Twinstreams farm, near the Mlalazi Nature Reserve. Objectives were to record species present, estimate their cover abundance, note the structure of the communities and to classify the communities based on floristics. Elaboration of tables and writing-up is in progress.

Keywords: Braun-Blanquet, dune vegetation, Natal, succession, syntaxonomy, vegetation classification

WEISSER P J, I F GARLAND AND B K DREWS
(Botanical Research Institute, Private Bag X101, Pretoria 0001)

Dune advancement from 1937 to 1977 and a preliminary vegetation succession chronology at the Mlalazi Nature Reserve, Mtunzini, Natal, South Africa (1979-1981)

Foredune advancement on a 2 km coastline north of the Siaya Lagoon mouth was studied using air photos. Between 1937 and 1977 the dunes advanced about 95 m ($2,4 \text{ m yr}^{-1}$). Vegetation was dated according to its position on a profile. If a $2,4 \text{ m yr}^{-1}$ seaward advancement of the dunes is assumed the following succession chronology is obtained: Scaevola thunbergii foredunes from 0 to 30 years; Passerina rigida open dune scrub from 30 to 60 years; closed dune scrub from 60 to 90 years and dune forest beginning at about 90 years. Variation in dune advancement rates on different coastal stretches and at different time intervals were observed. Therefore, this dune succession chronology should only be seen as a first rough approximation.

Keywords: aerial photographs, dune forest, dunes, Passerina rigida, Scaevola thunbergii, succession

WEISSER P J and R MILLER
(Botanical Research Institute, Private Bag X101, Pretoria 0001)

Dune vegetation dynamics from 1937 to 1976, Mlalazi-Richards Bay (Natal, South Africa) as shown by air-photo interpretation (1980-1982)

Dune vegetation dynamics will be studied by comparing vegetation maps based on air photos taken during 1937, 1957 and 1976 qualitatively and quantitatively.

Keywords: aerial photographs, dunes, Natal, population dynamics, succession, vegetation map

WEISSER P J and R J PARSONS

(Botanical Research Institute, Private Bag X101, Pretoria 0001)

Monitoring *Phragmites australis* increases from 1937 to 1976 in the Siaya Lagoon (Natal, South Africa) by means of air-photo interpretation (1980-1981)

The colonization of the Siaya Lagoon by *Phragmites australis* was studied by means of air-photo interpretation. It was possible to locate and estimate *P. australis* areas for 1957 (0,74 ha), 1965 (1,65 ha), 1969 (1,93 ha) and 1976 (2,94 ha). The resolution of the 1937 air photos was too poor to provide conclusive evidence. *P. australis* first inhabited the shores of the middle section of the lagoon followed by a rapid expansion in the lower section. The upper section was colonized only at its lower end by expansion from the middle section. It is hypothesized that *P. australis* was unsuccessful in this section because of competition by the *Hibiscus tiliaceus* - *Barringtonia racemosa* Lagoon - fringe forest. This community is outshading *P. australis* in some places. The notable increase in the rate of terrestrialization and littoral vegetation of the Siaya Lagoon is caused by the sugar-farming activities leading to erosion and consequent sedimentation in the lagoon. The colonization of most of the Siaya Lagoon, except the immediate mouth zone which is advancing, by *P. australis* reedswamp and *Hibiscus tiliaceus* - *Barringtonia racemosa* lagoon - fringe forest can be expected before the turn of the century. Dredging and mechanical control of vegetation will become necessary if major open water spaces are to be maintained.

Keywords: aerial photographs, Natal, *Phragmites australis*, population dynamics, succession, vegetation map

WEISSER P J and J WALKER

(Botanical Research Institute, Private Bag X101, Pretoria 0001)

Vegetation structure along a successional gradient on the dune at Twinstreams, Mtunzini, Natal, South Africa (1980-1981)

The vegetation structure was recorded along two 400 m long transects from dune pioneers to mature dune forest. The proportion between the forbs, scrubs and trees as components of the plant communities and their change with advancing succession was established. Processing of data is still in progress.

Keywords: dunes, dune succession, dune vegetation, Natal, succession, vegetation structure

WESTFALL R H

(Botanical Research Institute, Private Bag X101, Pretoria 0001)

The plant ecology of the farm Groothoek, Thabazimbi district (1980-1981)

Fieldwork on the project has been completed. The vegetation has been classified into 21 communities and variations of communities. The

condition of the vegetation has also been assessed. The synthesis of community, habitat and assessment data can be shown in a single table that was prepared by a new set of computer programmes developed for this purpose.

Keywords: phytosociology, plant:habitat correlations, savanna, Sour Bushveld, Transvaal, veld condition

WHATELEY A M

(Hluhluwe Game Reserve, P O Box 25, Mtubatuba 3935)

Numbers and movements of spotted hyaenas in Umfolozi Game Reserve, Natal (1979-1981)

By attracting rerecognizable hyaenas of one clan to baits in the northwestern part of Umfolozi Game Reserve, Natal, it was possible from the distribution of resightings to find their home range of 56 km² and their density of 0,25 km² from the 14 adult and immature hyaenas that made up the clan. The larger home range and lower density of hyaenas in Umfolozi as compared with findings in nearby Hluhluwe Game Reserve is explained by the seasonal movements of game within the hyaenas' home range, and the lower density of suitably sized prey. The presence of resident lions and other large carnivores is also considered.

Keywords: Crocuta crocuta, density, home range, hyaena, Natal, savanna

WILTSHIRE G H

(Institute for Environmental Sciences, University of the Orange Free State, P O Box 339, Bloemfontein 9300)

Primary production of reedbeds at Wuras Dam (1978-1981)

Aboveground production of Phragmites australis and Typha latifolia var capensis was measured by harvesting and allometric methods, belowground biomass by coring and digging, and cycling of the major minerals (N, P, K, Na, Mg) followed as part of an ecosystem study on a small turbid impoundment. Rates of production, fall to litter and disappearance of litter were monitored. It was shown that these emergent macrophytes are responsible for the great majority of primary production in the system and that, because of the absence of herbivores able to utilize it, most of their biomass is available to detritivores. The composition of Phragmites and Typha at Wuras Dam was compared with the same species along a polluted river in Transvaal.

Keywords: Karoo, mineral cycling, Orange Free State, Phragmites, production, reedbeds, Transvaal, Typha

WILTSHIRE G H

(Institute for Environmental Sciences, University of the Orange Free State, P O Box 339, Bloemfontein 9300)

Production, quality and utilization by large herbivores of the grass component in the Willem Pretorius Game Reserve (1979-1982)

Aboveground production of grasses under grazing by large wild herbivores and while protected from grazing for short intervals by moveable exclosures, is measured by clipping in three types of grassland differing in productivity.

Keywords: carrying capacity, feeding value, grasslands, Orange Free State, savanna

WILTSHIRE G H

(Institute for Environmental Sciences, University of the Orange Free State, P O Box 339, Bloemfontein 9300)

Responses of veld grass species to major fertilizer nutrients and water (1978-1983)

Keywords: Eragrostis chloromelas, grass, grasslands, nutrients, Orange Free State, soil moisture

WITKOWSKI E T F

(Centre for Resource Ecology, University of the Witwatersrand, P O Box 1176, Johannesburg 2000)

Ecology of the Klaserie Private Nature Reserve

Management of the Klaserie Private Nature Reserve is aimed at maintaining a high diversity of existing plant and animal communities. To achieve this, it is necessary to know (i) the minimum number and nature of spatial units which provide the degree of spatial heterogeneity needed to maintain the animal communities; and (ii) the dynamics of the essential (keystone) plant and animal species within each unit. An understanding of the dynamics will point to the likely occurrence of thresholds in the amounts of these species, beyond which the system cannot recover. This study aims to provide a fairly detailed account of the spatial heterogeneity, and a graphical analysis of the dynamics of one of the units. Preliminary results of vegetation composition, utilization (by game) and associated site conditions are presented, based on an analysis of transects.

Keywords: ecology, management, savanna, spatial heterogeneity, Transvaal, wildlife

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