



# Terrestrial ecology in South Africa and South West Africa- project abstracts for 1979

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A report of the Committee for Terrestrial Ecosystems  
National Programme for Environmental Sciences

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PREFACE

The Committee for Terrestrial Ecosystems of the National Programme for Environmental Sciences, formed in 1973, has as one of its main objectives the promotion of communication between scientists involved in terrestrial ecological research. In order to facilitate contact between researchers, especially those working in isolated field situations, an annual listing of current project abstracts was initiated in 1978 and the present collection covers activities initiated, continuing or completed during 1979.

ABSTRACT

Brief descriptions of over 200 research projects undertaken during 1979 in South African and South West African terrestrial ecosystems are presented. The abstracts are arranged alphabetically according to author name and a keyword index is provided.

SAMEVATTING

Kort beskrywings van meer as 200 navorsingsprojekte, wat gedurende 1979 in Suid-Afrikaanse en Suidwes-Afrikaanse landekosisteme onderneem is, word hierin aangebied. Die samevattings is alfabeties volgens die name van outeurs gerangskik en 'n sleutelwoordindeks word voorsien.

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## ABSTRACTS

001. ASHTON E R, R F FUGGLE and A FLEPP  
(School of Environmental Studies, University of Cape Town,  
Rondebosch 7700).

### Instrumental monitoring of controlled fynbos fires

Five controlled burns by the Department of Forestry in fynbos vegetation have been monitored. Instrumentation has been developed and tested and logging of eight temperatures at five-second intervals is possible. Maximum temperatures recorded exceed 600°C in the canopy while soil temperatures remain below 50°C.

Keywords : Cape, fire, fynbos

002. AVERY D M  
(South African Museum, P O Box 61, Cape Town 8000).

### Palaeoenvironments as reflected in micro-mammalian communities

Studies of community palaeoecology in Foraminifera have been used with considerable success for interpreting palaeoenvironments. In the present study similar procedures are being developed for use with micro-mammalian communities. The initial phase of the project, which dealt with the southern Cape during the last 80 000 years, has shown that there is good potential for the use of micro-mammals as indicators of past environmental conditions. Currently the spatial and temporal range of the project is being expanded and methods are being improved. Although each sample refers only to a small area it should be possible, as more data become available, to construct a mosaic which will cover a large area and a long time period. At present interpretation, which is related both to vegetation and to climate, is relatively generalized. It is anticipated, however, that as the appropriate data concerning living communities become available palaeo-environmental reconstruction can be refined.

As side issues, evidence is forthcoming concerning the zoogeography of small mammals and physical adaptation to environmental change by various species during the past.

Keywords : evolution, micro-mammals, palaeoecology

003. AVERY G  
(South African Museum, P O Box 61, Cape Town 8000)

### Avian fauna, palaeoenvironments and palaeoecology in the Pleistocene/Holocene of the southern and western Cape (1977-ongoing)

The aim of the project is to record the distribution and relative proportions of various avian taxa in time and space in order to

study the role of birds as indicators of past environmental change and as elements of prehistoric human ecology. Avian remains from archaeological and fossil accumulations are being examined. A comparative osteological collection is being developed to facilitate identification. Modern control data are being collected on the relative proportions of seabirds washed ashore since it is thought that most archaeological birds were eaten off the beach.

Variations in proportion through time are best interpreted as responses to environmental change. Preliminary results show that variation in stratified samples correlates with major known Pleistocene environmental changes. Lowering of sea levels and reduction of temperatures with the onset of the last glacial period is shown together with concomitant changes in local terrestrial and aquatic environments as the coastal plain expanded. The establishment of freshwater environments is indicated and there is some information on relative proportions of grass versus scrub in the coastal fynbos.

Variation in the bird remains reflects human adaptation to changing availability of natural resources in response to environmental change rather than technological ability.

Keywords : birds, fynbos, Holocene, palaeoecology, Pleistocene

004. BANDS D P  
(Jonkershoek Forestry Research Station, Private Bag X5011,  
Stellenbosch 7600).

The influence of mountain catchment declaration on land management  
in die Groot-Winterhoek area of the western Cape : ecological,  
economic and social implications (1978-1981)

It is proposed to analyse the ecological, economic and social implications of the declaration of private land as mountain catchment areas in terms of the Mountain Catchment Areas Act (No 63 of 1970), and to develop a method of assessing alternatives with a view to determining optimum landuse combinations and land management practices.

A comprehensive personal-contact questionnaire survey among land owners in the study area, designed to determine, inter alia, landuse, the relative values of landuse alternatives, land values, economic and social status of landowners and occupants, is nearing completion. A ground survey to determine the ecological effect of past and present landuse is nearing completion. A map based on ground survey and interpretation of aerial photographs illustrating the close association of settlement and landuse with geology has been drafted. The value of earlier aerial photography jobs for determining veld fire frequency and changes in landuse is being assessed.

Keywords : Cape, catchment, fynbos, landuse, management, mountain catchment areas

005. BANDS D P  
(Jonkershoek Forestry Research Station, Private Bag X5011,  
Stellenbosch 7600).

Distribution and abundance of invasive alien plants in mountain  
catchments of the western Cape forest region (1975-1982)

The objective of this study is to determine and map distribution and abundance of invasive alien plant species in mountain catchments, in order to assess the extent of the problem and plan the necessary control measures.

Surveys of four areas, Cedarberg, Groot-Winterhoek, Hottentots-Holland and Koue-Bokkeveld, including both state and private land, have been completed and maps have been prepared. Surveys of two more areas, Hawequas and Riviersonderend, are in progress.

Keywords : Cape, catchment, floral survey, forest, fynbos, invasive plants, mountain catchment areas, veld management

006. BANDS D P  
(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  
(1978-1979)

The project is aimed at answering the following questions for fynbos areas :

1. How many fires occur annually in natural vegetation on State forests and on other land controlled by the Directorate of Forestry and Environmental Conservation?
2. What is the proportion of wildfires to prescribed burns?
3. What is the extent of the areas burnt, how did the fires originate, and what is the seasonal distribution of fire occurrence?
4. What weather conditions are associated with (a) prescribed burns and (b) wildfires?
5. What are the costs associated with (a) prescribed burning and (b) controlling wildfires?
6. Is it feasible to develop a fire danger rating system for the fynbos areas based upon meteorological parameters, and if so, how should this be done?

Phase one of the project was conducted and reported by Mr B W van Wilgen of Jonkershoek Forestry Research Station. An abstract of the report, JFRS 80-01, follows.



Factors affecting fire behaviour are discussed briefly with emphasis on weather variables. All fires which occurred in fynbos in the southwestern Cape forestry region over a 12 month period from 1 April 1978 to 31 March 1979, were investigated by means of a questionnaire survey. Weather associated with the fires was investigated. Windspeed, air temperature and relative humidity were found to be significantly related to fire occurrences. Other salient points such as methods, costs, seasonality and practical problems are described and discussed.

Keywords : Cape, fire, fynbos, prescribed burning, veld management, wildfires

007. BARNARD B J A, R HASSEL en T C VAN WYK  
(Afdeling Veeartsenydiens, Privaatsak 12022, Windhoek 9000).

Hondsdolheid onder koedoes in Suidwes-Afrika (1979-1982)

'n Epidemie van hondsdolheid onder koedoes neem sulke geweldige afmetings aan dat die vermoede ontstaan het dat die siekte direk tussen individue oorgedra word en dat die virus moontlik verskil van bekende virusstamme. Daar word dus gepoog om die virus uit besmette koedoes te isoleer en studies op die uitskeiding en oordraging van die virus deur koedoes in gevangenskap word gedoen. Die omvang van die epidemie en moontlike immunisering van wilde koedoes geniet ook aandag.

Keywords : rabies, South West Africa

008. 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 bats

The aim of this project is to compare female reproduction in Miniopterus schreibersi, Miniopterus fraterculus, Myotis tricolor, Hipposideros caffer and Nycteris thebaica. During 1977 and 1979 specimens of the five species were collected on every two weeks from caves in the Natal Midlands. Female reproductive tracts were measured, and the data were processed using standard histological techniques.

The reproductive cycles of the five species differ markedly. Four of the species hibernate during winter and as a result their reproductive cycles have been modified. In the two Miniopterus species there is a period of delayed implantation that coincides with hibernation; in Hipposideros caffer there is a period of delayed embryonic development over winter, and in Myotis tricolor the female stores spermatozoa during winter. Nycteris thebaica does not hibernate and has a "normal" reproductive cycle, with copulation and fertilization occurring in July and parturition in November.

Keywords : bats, female reproduction, Miniopterus, Myotis, Natal

009. BERRY H H  
(Etosha Ecological Institute, P O Okaukuejo, SWA 9000).

Behavioural and eco-physiological studies on blue wildebeest at the Etosha National Park (1974-1979)

An investigation into the decline of wildebeest numbers at Etosha National Park was made during the period 1974-78. Activity patterns in the free-ranging population were measured over a period of one year using marked individuals and by scanning herds. The activity data were used to calculate an energy budget for maintenance and activity in the population, while energy demand for growth, gestation, lactation and homeothermy were estimated by formulae based on domestic ruminants. Similarly, a protein budget was estimated for the population on a seasonal basis. The nutritional balance of wildebeest and their major food competitors was favourable during the study, with sufficient energy and protein produced to meet the demand. Nevertheless, because boundary fences eliminate traditional migration routes, nutrition may be limiting to wildebeest during drought. Nutritional status of wildebeest, as judged by visual rating, kidney fat, bone marrow fat, liver and blood parameters was good although phosphorus, copper and cobalt may be marginally deficient but not limiting. Disease, notably anthrax, was considered limiting, resulting in a mean of 62 per cent of the known mortality in wildebeest. Anthrax and artificial water supplies at Etosha also resulted in predator increases with predator-prey biomass ratios of 1 : 72-105. The observed population structure and mortality patterns corroborated the effect of high levels of disease and predation. Management recommendations to halt this decline include modification of the existing boundaries of Etosha to incorporate previous migration routes, restraint of anthrax, and predator control by closure of artificial water points.

Keywords : activity patterns, arid savanna, blue wildebeest, disease, energy budget, management, nutritional balance/status, population dynamics, predation, ruminant, South West Africa

010. BEST M  
(School of Environmental Studies, University of Cape Town, Rondebosch 7700).

The consumption of fuel for domestic purposes in three African villages (1978-1980)

Very little information is available on domestic fuel consumption in African villages in southern Africa, yet it is a problem that concerns a large number of people, and which is contributing to environmental deterioration. At three villages, in Lesotho, the Transkei and KwaZulu, the collection and consumption of wood, dung and paraffin were recorded. The largest quantities of energy are consumed in KwaZulu with the least in the Transkei (only slightly less than Lesotho). The total consumption of energy largely

depends on the availability of wood. When wood becomes scarce, dung is burnt for heat and cooking. Paraffin is used for light, and for cooking by some women. Wood and dung are burnt at efficiencies of below 3%. The most obvious short term solution to shortages of energy is to raise the efficiency with which fuel is burnt. In the long term, alternative energy sources must be developed.

Keywords : dung, firewood, fuel, KwaZulu, land, Lesotho, Transkei

011. BESTER J L

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

Die gedrag, ekologie en bestuur van die Silwervos *Vulpes chama* (1977-1980)

Die gedrag, ekologie en bestuursmaatreëls van die silwervos word bestudeer met die oog op die toekomstige bewaring van die soort. Vanweë die algemene opvatting dat die silwervos verantwoordelik is vir verliese by skaaptroppe, word daar jaarliks in die Oranje-Vrystaat alleen ongeveer 2 000 van hierdie soort deur Oranjejag vernietig. Volgens vroeëre navorsers het die ontleding van maaginhoudes daarop gedui dat die silwervos nie skape vang nie. Die huidige projek is daarop gemik om duidelikheid oor die predasie van hierdie soort te verkry en om wetenskaplike inligting oor hierdie onbekende lid van die Canidae te versamel.

Aspekte van voeding, die strategie by die soek van voedsel, habitat-voorkeur, teling, beweging, sosiale organisasie, algemene gedrag, die ontwikkeling van gedragsspatrone en bestuursmaatreëls word ondersoek in die Oranje-Vrystaat.

Aspekte van algemene gedrag, speelgedrag, voeding en kompetisie met ander roofdiere is onder natuurlike toestande ondersoek in die Nasionale Kalaharigemsbokpark.

Beheermetodes wat beide die tradisionele boerdery sowel as die bewaringsmotief sal bevredig, word ondersoek. 'n Metode om die roofdier wat verantwoordelik is vir skade te identifiseer, is ontwikkel. Deur hierdie tegniek sal dit moontlik wees om die omvang van skade wat deur silwervosse veroorsaak is, te bepaal. Daar is gevind dat die silwervos slegs baie jong skaaplammers vang.

Die silwervos is naglewend, asosiaal en verkies 'n oop habitat, terwyl die strategie om voedsel te soek aangepas word by beskikbaarheid van prooi en die mikrohabitat. Die prooi bestaan hoofsaaklik uit muise, insekte, voëls en reptiele. Ander roofdiere, veral *Canis mesomelas* het 'n negatiewe invloed op die digtheid en aktiwiteit van die silwervos.

Keywords : behaviour, conservation, grassland, management, Orange Free State, *Vulpes chama*

012. BIGALKE R C  
(Department of Nature Conservation, University of Stellenbosch,  
Stellenbosch 7600).

Effect of fire regime on mammal populations in fynbos in  
Jonkershoek and elsewhere

Studies were undertaken on sampling methods for, and fire effects on small mammals in montane fynbos. The sampling methods work 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 efficient bait was oats/raisins/sunflower oil, which was particularly effective for Otomys spp, 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 is proposed whereby av D (Brant 1962) 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. 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, fire, fynbos, sampling methods, small mammals, traps

013. BIRKENSTOCK P J  
(Hluhluwe Game Reserve, P O Box 25, Mtubatuba 3935).

Habitat utilisation and activity patterns of the major herbivores  
in northern Hluhluwe Game Reserve

This project will tie in with annual veld assessments undertaken in Hluhluwe Game Reserve and subsequently with the game removal programme. The object of the study is to determine habitat utilization changes in the major habitat types for the eight major herbivores on a nocturnal/diurnal basis and on a seasonal basis. By doing so it will be possible to determine what each species uses each habitat for; to determine feeding time spent in each habitat; to establish seasonal variations in graze ratios and to determine plant species selected for ingestion.

Keywords : feeding ecology, habitat utilization, herbivores, Natal, savanna

014. BIRKENSTOCK P J and J GERBER  
(Natal Parks, Game and Fish Preservation Board, Hluhluwe Game Reserve, P O Box 25, Mtubatuba 3935).

The amphibians of the Hluhluwe-Umfolozi Game Reserve complex (1979-1981)

The most recent list of amphibians for the complex is that published in 1971 by Bourquin, Vincent and Hitchins. Those data were collected over the below-average rainfall years of the late 1960s. The 1970s have been above-average rainfall years and the amphibian population is being studied to see if it has shown any changes.

Keywords : amphibia, faunal survey, Natal, savanna

015. BODDINGTON G  
(School of Environmental Studies, University of Cape Town, Rondebosch 7700).

Hiking trail corridors in the Cape Peninsula mountain chain

This study outlines the planning approach and procedures followed during the alignment of a series of hiking trail corridors in a fifty-kilometre-long mountain chain which dominates the Cape Peninsula.

The lower northern slopes of the Peninsula are surrounded by some of the most populous parts of the city of Cape Town and it is walkers from these areas who make use of an extensive but unplanned path system.

Corridor planning is based mainly on environmental suitability, but also on the opinions of potential trail users. Environmental suitability is determined by rating the trail planning area in terms of the level of control which the environmental factors ecological status, erosion hazard and soil stoniness exert on trail location. Present patterns of use of the mountains and the ideas of potential trail users are determined by the use of personal questionnaires.

Final corridor alignments should provide the guide for a major outdoor recreational facility which should have minimal adverse effect on the natural environment.

Keywords : Cape Peninsula, fynbos, hiking trail, planning, recreation

016. BOND W J  
(Saasveld Forestry Research Station, Private Bag X6531, George  
6530).

Gradient analysis of the vegetation of the mountain catchment areas  
of the southern Cape and the Tsitsikama Forest Regions (1977-1980)

This study is aimed at determining the variation in mountain fynbos community structure and composition in mountain catchments of the southern Cape, as a first step towards studying communities response to fire and conservation management.

Four study areas were selected covering gradients in the southern Cape mountain climate and vegetation. Two areas each were located inland (Swartberg Pass in the west, Baviaanskloof Mountains in the east) and two in the coastal ranges (Robinson's Pass and Outeniquas in the west and Storms River and Tsitsikama in the east). Each area is a band up to six km wide from southern to northern foothills on Table Mountain Group geology. Areas are stratified in six altitudinal belts and four relevés randomly located within each belt. Floristic, structural and environmental data were recorded at each relevé. Altitudinal gradients and north/south and east/west variation in floristic and structural features will be compared by classificatory and ordination techniques.

Eight permanent sites have been located on each transect, covering altitude and aspect variations. These provide data on ecosystem processes, faunal communities and additional structural features. Features so far studied include foliage profiles, litter accumulation, phenology of representative life forms, leaf duration of selected Proteaceae, species area curves and soil profiles. Weather stations have been established in each study area and additional data on temperature and rainfall on an altitudinal gradient is collected in the Swartberg.

Keywords : Cape, floral survey, forest, fynbos, gradient analysis

017. BOSCH J M  
(Jonkershoek Forestry Research Station, Private Bag X5011,  
Stellenbosch 7600).

Determining the effects of factors of the environment and  
management measures on stream-discharge components by analyses of  
experimental catchments on the Drakensberg, Natal forest region  
(1975-ongoing)

The project is aimed at determining how treatment of Themeda triandra grassveld influences streamflow components in time and space. Treatments under investigation are: afforestation with Pinus species, protection of grassland from fire, grazing and different burning regimes. The streamflow components that are being analysed are: total yield, baseflow, stormflow volume and peak flow rates.

The effect of certain treatments on annual and dry period total yield has been analysed and results have been published.

Keywords : grassland, hydrology, management, Natal, stormflow, water yield

018. BOSCH J M  
(Jonkershoek Forestry Research Station, Private Bag X5011, Stellenbosch 7600).

The effects of management measures as applied in experimental catchments on water quality in the Natal and Zululand forest regions (1979-1982)

The project is aimed at determining changes in sediment yield and nutrient discharge from catchments under different treatments. Work is concentrated in Natal Drakensberg catchments but will include afforested catchments in the Natal midlands.

Treatments being investigated at present are: grassland protection, grazing, grassland burning, deforestation.

Keywords : afforestation, grassland, management, Natal, nutrients, sediment, water quality, Zululand

019. BOSHOFF A F  
(The Lakes Nature Conservation Station, Private Bag X546, George 6530).

A distribution, status and feeding habit survey of the larger birds of prey and vultures in the Cape Province

The first phase of this project, viz the postal survey of all landowners, has been completed and the results are in the final stages of being written up. Altogether 12 birds, 8 eagles and 4 vultures, were covered by the postal survey.

A certain amount of ground trailwork has been carried out on the postal survey results and this has indicated that the black eagle is relatively common in areas of suitable habitat in the south-western and southern Cape. This species is directly persecuted by certain farmers while birds are frequently caught in gin traps set for mammalian predators. Nevertheless it appears that there is a reasonably healthy population of mated, territorial black eagles in the areas mentioned above outside of the eastern Cape. The crowned eagle is found in the southern Cape in the area between George and Patensie where it appears to be scarce. This is probably due to evergreen forest destruction to make way for commercial timber cultivation. It appears that this species has also been the subject of direct and indirect persecution in the southern Cape. The fish eagle is a relatively common species in the southwestern and particularly the southern Cape. It is frequently found in most areas of suitable habitat such as dams,

lakes, river courses and at certain estuaries along the coast. This species is not directly persecuted by man but habitat destruction or disturbance may affect the population.

The Cape vulture used to be fairly common throughout the southwestern and western Cape but the population has now dwindled to approximately 100 birds. Many earlier breeding sites have declined to roosts or been abandoned. The last remaining regularly breeding colony, at the Potberg, Bredasdorp district, is rapidly declining as a major breeding site in the Cape Province and with only 12 nests active in 1978 appears close to extinction.

At present the Cape Department of Nature Conservation is data banking information on all raptors throughout the province and it is hoped to be able to monitor, to some extent, any population fluctuations that may take place. This is an ongoing project with periodic trend assessments.

Keywords : birds, Cape, faunal survey, fynbos, raptors, vultures

020. BOUCHER C  
(Botanical Research Unit, P O Box 471, Stellenbosch 7600).

A study of the vegetation along transects through the western Cape foreland

A sampling of the natural vegetation along four transects through the western Cape's coastal foreland was completed. Two hundred floristic and two hundred physiognomic relevés and 614 specimens were collected. All the data were coded for computer analysis. The preliminary results from the analysis of the first transect indicate that all three of Acocks's veld types found in the area can be clearly distinguished. A more detailed analysis is not possible until a larger percentage of the specimens collected has been identified.

Keywords : coast, floristic, fynbos, physiognomy, transect, vegetation

021. BOYCOTT R C  
(Cape Provincial Department of Nature and Environmental Conservation, Jonkershoek Nature Conservation Station, Private Bag X5014, Stellenbosch 7600).

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

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

*Heleophryne purcelli* is endemic to the Cape Province and has been found in the mountain fynbos and Knysna forest habitats in the folded mountains of the southwestern and southern Cape. The



distribution of H purcelli was poorly known in the past with only 12 published locality records, all widely scattered. One of the aims of the project is to investigate the numerous gaps between these scattered records in order to acquire a better understanding of the distribution of H purcelli.

The taxonomy of the Heleophryne purcelli group has been the subject of much uncertainty and dispute for more than half a century. This can be attributed in part to inadequate collection probably due to the secretive nature of these frogs and the remoteness of their habitat. Once the distribution of H purcelli is better known and larger collections become available, the taxonomic relationships of the various populations will be better understood.

Keywords : amphibia, Cape, distribution, fauna, forest, fynbos, taxonomy

022. 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 on a 100 ha study site in the Port Elizabeth region, composed of grazed pasture and coastal fynbos, is being investigated. Captured tortoises are weighed, measured, classified as male or female 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. Radio-telemetry studies of thermoregulation and short-term movements are also planned.

Keywords : Cape, feeding ecology, fynbos, home range, population, Port Elizabeth, reproduction, soil, tortoise.

023. BREYTENBACH G J  
(Saasveld Forestry Research Station, Private Bag X6531, George 6530).

Study of the changes in faunal communities along environmental gradients and in relation to fire regime (1978-1982)

Eight study sites at each of four study areas in the mountains of the southern Cape are being monitored to determine the response of certain faunal elements to an altitudinal gradient.

Small mammals: Species diversity and density, stomach analysis, food preference and differential energy requirements are being determined.

Birds: Birds are being monitored by mist netting (25 nets each of 25 metres) and counts from vantage points of all birds seen and heard within an estimated area of 1 hectare.

Arthropods: Arthropods are being sampled by using sweep nets (100 sweeps) and by beating (5 min). Pitfall traps baited with either banana, faeces or meat are also being used.

The investigation proceeds according to plan.

Keywords: arthropods, birds, Cape, faunal survey, forest, fynbos

024. BROOKE R K  
(Percy FitzPatrick Institute of African Ornithology, University of Cape Town, 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, the homelands, Bophuthatswana, Lesotho, Swaziland, Transkei and Venda are concerned. Existing data are being assembled to check the accuracy of these proposals. The assembly is being done by computer in such a way that it could be extended to other breeding birds and even to animals. Data on their ways of life is also being assembled to see if certain features are correlated with rarity. Eventually it will be possible to say with confidence which species are rare, vulnerable or endangered and, knowing their distributions, to make well-founded recommendations for the creation of nature reserves to assist in their conservation.

Keywords : birds, conservation, distribution, threatened

025. BROOKE R K, J COOPER and T M CROWE  
(Percy FitzPatrick Institute of African Ornithology, University of Cape Town, Rondebosch 7700).

Catalogue of the biota of the western islands

To list the species of 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.

Keywords : biogeography, Cape, islands

026. BROOKS P M  
(Natal Parks, Game and Fish Preservation Board, 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, whereby 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 investigating the use of burns and the effectiveness of internal relocation of zebra and wildebeest to assist veld recovery in one area and provide greater utilization in another.

Keywords : fire, Natal, relocation, savanna, ungulate

027. BROOKS P M  
(Natal Parks, Game and Fish Preservation Board, P O Box 25, Mtubatuba 3935).

Relationship between body condition and age, growth, reproduction and social status in impala, and its application to management

The influence of age, growth, social status and reproduction on condition in 182 impala rams in Mkuzi Game Reserve was examined. Von Bertalanffy equations were used to describe the growth characteristics of selected body parameters. Asymptotic body mass was reached at about four years; and from this age, significant seasonal variation in mass occurred. Males were physiologically mature by 25 months, and no decline in reproductive activity with age was detected. The mode of fat deposition varied with age, such that while the bone marrow index reliably indicated condition from 18 months of age, the use of the kidney index was restricted to four years and above. Territorial status, as indicated by solitary behaviour, was largely restricted to males about five years and above; and this group showed a significant drop in bone marrow fat during and immediately after the rut, while younger adults of bachelor status remained in good condition throughout the year.

The method of sampling necessitated an estimate of the impala's physical condition, and hence the physiological adjustment of an impala population to its environment is described.

The project is now completed.

Keywords: body condition, growth, impala, management, Natal, reproduction, savanna

028. BROOKS P M and K MEIKLEJOHN  
(Natal Parks, Game and Fish Preservation Board, Hluhluwe Game Reserve, P O Box 25, Mtubatuba 3935).

Re-introduction of the Cape hunting dog *Lycaon pictus* into the Hluhluwe-Corridor-Umfolozi complex (1979-1983)

A pack of ten Cape hunting dogs is due for release in Hluhluwe Game Reserve in late 1980. While in captivity, information on reproduction, growth, food consumption and health problems has been collected. On release, their movements will be monitored by means of radio-transmitters.

Keywords : hunting dog, Natal, re-introduction, savanna

029. BROOKS P M, A M WHATELEY and J L ANDERSON  
(Natal Parks, Game and Fish Preservation Board, Hluhluwe Game Reserve, P O Box 25, Mtubatuba 3935).

Past and present abundance and distribution of mammals in the Hluhluwe-Corridor-Umfolozi complex (1973-1983)

The relative abundance of the mammals of the complex has changed since Hluhluwe's proclamation as a game reserve in 1897 due to a number of factors, including vegetation change, animal re-introductions, fencing and other management practices. Recent research effort has concentrated on improving the accuracy of large mammal censuses, and collecting information on the sighting frequencies of both the smaller and more uncommon species. Existing information will be collated to provide a history of the mammalian populations in the Complex.

Keywords : fauna, forest, mammals, Natal, savanna, survey

030. BURGER A E, B C R BERTRAM and W R SIEGFRIED  
(Percy FitzPatrick Institute for African Ornithology, University of Cape Town, Rondebosch 7700).

Aspects of incubation in ostriches

Ostrich *Struthio camelus* was studied in South Africa and in Kenya. The effects of prolonged exposure to hot sun on the hatchability of ostrich eggs was determined. Temperature, humidity and water loss from eggs in exposed nests prior to incubation and under birds during undisturbed incubation were monitored. The role of the shiny white egg surface in reducing overheating of eggs in the sun was investigated. The constraints on the feeding and breeding behaviour of ostriches imposed by the physical requirements of their eggs are considered. The results of the study should be of value in improving hatching success of ostrich eggs in artificial commercial incubators.

Keywords : eggs, incubation, ostrich, water loss

031. CAMPBELL B M  
(Department of Botany, University of Cape Town, Rondebosch 7700).

Structural-functional classification of the mountain vegetation of the fynbos biome (1978-1981)

The fieldwork has been completed. This entailed 508 plots located along transects throughout the mountains of the fynbos biome. Detailed growth-form information, cover of selected families (eg Ericaceae, Proteaceae, Restionaceae), and cover dominant species were recorded in each plot. Analysis of the data has now begun. Topics presently being studied include the following :

- (1) Patterns of dominance of the Restionaceae (with E Esterhuysen)
- (2) Patterns of dominance of Ericaceae
- (3) Spinescence
- (4) Growth forms on nutrient-poor and nutrient-rich soils.

Keywords : Cape, classification, fynbos, growth forms, heathland, physiognomy, plant dominance

032. CAMPBELL B M and F VAN DER MEULEN  
(Botanical Research Institute, Private Bag X101, Pretoria 0001).

Patterns of plant species diversity in fynbos vegetation at Jonkershoek

The alpha (within habitat) diversity and the beta (between habitat) diversity of fynbos in a small area at Jonkershoek, South Africa, is studied in relation to the altitude complex-factor and fire. Variations in alpha diversity are mainly due to fire and the higher alpha diversity in young fynbos is explained in terms of fynbos succession. High beta diversity in the study area is due more to the altitude than to the age factor. Nonlinear interactions between age and altitude are apparent.

Keywords : fynbos, plant species diversity

033. CLINNING C F  
(Nature Conservation and Tourism Division, Private Bag 13186, Windhoek 9000).

The biology and conservation of the lappet-faced vulture, *Torgos tracheliotus*, in the Namib Desert (1975-1985)

It seems that *Torgos* may present a conservation problem in view of its restricted breeding biotope and long nesting cycle during which it is vulnerable to disturbance. The study aims to investigate the breeding biology, population dynamics and general requirements of the species in the pro-Namib.

Keywords : breeding, conservation, Namib Desert, population dynamics, vulture

034. CLINNING C F  
(Nature Conservation and Tourism Division, Private Bag 13186,  
Windhoek 9000).

Distribution patterns of South West African birds (1969-ongoing)

The eventual aim is to produce an atlas of bird distribution for South West Africa. Data is collected on printed field cards, a gazetteer of localities is available, and the cooperation of those involved in similar projects elsewhere in South Africa has been sought in order to obtain uniformity.

Keywords : birds, distribution, South West Africa

035. CLINNING C F  
(Nature Conservation and Tourism Division, Private Bag 13186,  
Windhoek 9000).

Ecology of migrant shorebirds on the South West African coast (1975-1981)

The study aims to determine the numbers of migrants visiting the coast, the periods during which visits occur, habitat requirements, moult strategies, and food requirements and availability.

Information is obtained from censuses, ringing and samples of various substrates for food availability. Research is directed towards identifying important coastal habitats and providing suitable recommendations for their management and conservation.

Keywords : birds, conservation, feeding ecology, migration, moult, shorebirds, South West Africa, waders

036. CLINNING C F  
(Nature Conservation and Tourism Division, Private Bag 13186,  
Windhoek 9000).

Breeding biology of South West African birds (1969-ongoing)

The project involves the collection of breeding data on nest record cards. This data is used in a variety of management applications such as in the definition of hunting seasons, management of guano concessions, and identification of agricultural problem species.

Keywords : birds, breeding, management, South West Africa

037. CLOETE G  
(Afdeling Natuurbewaring en Toerisme, Privaatsak 13186,  
Windhoek 9000).

Eto-ekologie van die steenbok *Raphicerus campestris* in die Namibwoestyn (1980-1982)

In die projek word aandag gegee aan voedingsvoorkeure, populasie-

dinamika, sosiale gedrag en aanpassings ten opsigte van uiterste omgewingsfaktore. Daar word ook gekyk na voedings benodigdhede en kompetisie met ander spesies.

Keywords : feeding ecology, Namib desert, social behaviour, South West Africa

038. COETZEE B J  
(National Parks Board, Private Bag X402, Skukuza 1350).

Bushveld phytosociology : Central District, Kruger National Park

A phytosociological classification system for the Central District was constructed according to the Braun-Blanquet approach.

A system for sampling and classifying bushveld vegetation structure was designed and applied to the Central District.

A system for categorizing vegetation-delineated ecosystems was designed. This system integrates the Braun-Blanquet and Acocks's vegetation systems, Thornthwaite's climatic classification system, MacVicar *et al*'s classification of land and King's geomorphological provinces. A certain category of ecosystem was described for the Central District in terms of climate, physiographic pattern, vegetation association pattern, vegetation structure and medium to large herbivore fauna. Text and figures are being prepared for publication and as a D Sc thesis, University of Pretoria.

Keywords : Kruger National Park, phytosociology, savanna, Transvaal

039. COLLINSON R F H  
(Natal Parks, Game and Fish Preservation Board, P O Box 662, Pietermaritzburg 3200).

Impala on private land in Natal : a natural resource evaluation (1977-1981)

The objective of the study is to provide data necessary for assessing the present and potential value of impala on private land in Natal. The past, present and potential distribution of impala in Natal, together with the socio-economic factors governing the present value of the resource and limiting its potential value, are being determined by means of a questionnaire survey. Two strip sampling methods (King's method and Kelker's Index) and one modified total count method are being developed, tested and modified to produce the optimum technique for landowners wishing to manage impala for profit. Using reproduction and growth data from previous studies on impala, computer models are being developed for determining the optimum frequency, size and composition of sustained yield impala harvests. Finally, sustained yield production data collected over a period of five years from a combined cattle/impala enterprise are being used to evaluate the

maximum sustained yield potential and potential economic return from this type of integrated land use.

Keywords : census, distribution, harvesting strategies, impala, Natal, production economics, savanna, status, sustained yield

040. CONLONG D E  
(Botany Department, University of Natal, P O Box 375,  
Pietermaritzburg 3200).

The responses of the grasslands of the eastern shores of Lake St Lucia to grazing, edaphic factors and fire

Basic data are required for the optimal management of the eastern shores as a major habitat for hippo and reedbuck. This study will provide information on the interaction between vegetation, soil, grazing animals and fire and the management of the vegetation and animal populations of the area. Study sites will be tested for homogeneity using Sorenson's Index of Similarity. In order to study the effects of certain animals on the vegetation various exclosures will be constructed in each homogeneous area selected.

Keywords : fire, grassland, grazing, hippo, management, reedbuck

041. COOPER J  
(Percy FitzPatrick Institute of African Ornithology, University of Cape Town, Rondebosch 7700).

Angulated tortoises on Dassen Island : population size, structure and predation

To census the population of angulated tortoises on Dassen Island and to assess the role of predation by the kelp gull Larus dominicanus on their population structure.

Keywords : gulls, population dynamics, predation, tortoise

042. CROWE A  
(Percy FitzPatrick Institute of African Ornithology, University of Cape Town, Rondebosch 7700).

Temporal and spatial variation in the breeding season of the white-fronted plover Charadrius marginatus

The project involves the use of a new computer programme which was developed to analyse variations in time of the breeding season of the white-fronted plover at various localities in southern Africa. It is intended to expand the project to include analysis of variation in egg and clutch sizes. The hypothesis that food availability has an effect on breeding periodicity will be tested, using data collected for other purposes.

Keywords : breeding, feeding ecology, white-fronted plover



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

Vascular anatomy of the head and neck of *Struthio camelus*

To discover vascular arrangements which may be important to the  
ostrich for brain temperature regulation.

Keywords : anatomy, ostrich, thermoregulation

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

Evolution of francolin

To develop a parsimonious taxonomy and phylogeny for the genus  
Francolinus (sensu latu) (Aves : Phasianidae), and to relate  
patterns of phenetic variation to variation in the environment.

Keywords : evolution, Francolin, taxonomy

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

The biogeography of African passerine birds

To test biogeographic models through the analysis of Hall and  
Moreau's Atlas of Speciation of African Passerine Birds (1970).  
Specifically, do passerine species show patterns of species  
richness and distribution which are in accord with those found in  
guinea-fowl? 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, passerine birds,  
species richness

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

Evolution and adaptive differentiation of southern African house  
sparrows

The objective is to determine whether the southern African house  
sparrow Passer domesticus 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.

Keywords : adaptation, evolution, house sparrow, problem animal

047. CROWE T M and R KETLEY  
(Percy FitzPatrick Institute of African Ornithology, University of Cape Town, Rondebosch 7700).

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

To use distribution maps in Roberts to derive zoogeographic avifaunal zones for southern Africa, and to relate these zones and patterns of species diversity to variation in the environment.

Keywords : biogeography, birds, distribution, species diversity

048. CROWE T M, R KNIGHT, I NEWTON and P D MORANT  
(Percy FitzPatrick Institute of African Ornithology, University of Cape Town, Rondebosch 7700).

Weights of southern African birds

To gather, and summarize statistically, data from ringing schedules, published and unpublished records under one cover.

Keywords : birds, body mass

049. CROWE T M and A J REBELO  
(Percy FitzPatrick Institute of African Ornithology, University of Cape Town, Rondebosch 7700).

Patterns of mass variation in the Black-eyed Bulbul Pycnonotus barbatus

To describe patterns of geographic, seasonal, sexual and developmental variation in body mass in Pycnonotus barbatus and to relate these patterns to variation in the environment.

Keywords : adaptation, body mass

050. CROWE T M, J C SCHIJF and A A GUBB  
(Percy FitzPatrick Institute of African Ornithology, University of  
Cape Town, Rondebosch 7700).

Effects of fire, rainfall, vegetation and habitat physiognomy on a  
northern Cape animal community

To relate patterns of distribution, diversity and abundance of 100  
birds and mammal species to patterns of fire, rainfall, vegetation  
and habitat physiognomy.

Keywords : birds, Cape, distribution, diversity, fire, mammals,  
physiognomy, savanna, vegetation

051. CROWE T M and W R SIEGFRIED  
(Percy FitzPatrick Institute of African Ornithology, University of  
Cape Town, 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, island biogeography, species richness

052. CYRUS D P and N F ROBSON  
(Department of Zoology, University of Natal, P O Box 375,  
Pietermaritzburg 3200).

The compilation of a bird atlas of Natal, covering the period  
1970-79 showing distribution and seasonality of all species per  
quarter degree square

Project now completed and published : Bird atlas of Natal,  
University of Natal Press, Pietermaritzburg 1979. Price R19,34  
(including tax).

320 pages with 544 black and white illustrations.  
Comprises introduction and section on atlas interpretation, main  
section with 530 distribution maps, each with short text and rarer  
species section, including vagrants. Also English and scientific  
index as well as checklist of Natal birds.

Keywords : atlas, birds, Natal

053. DEACON H J and A SCHOLTZ  
(Department of Archaeology, University of Stellenbosch,  
Stellenbosch 7600).

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

While the fynbos area preserves a relict biota, it is apparent from Quaternary studies that the area has not been a constant environment. The object of ongoing palaeoecological research is to gain an understanding of Pleistocene and Holocene environmental changes in relation to the evolution of present-day faunal distributions and vegetation associations. In particular, from results obtained thus far, significant environmental change is apparent in the small and large mammal faunas and vegetation at the Pleistocene/Holocene boundary. The methods being applied are the palaeontological study of fossil faunas accumulated by carnivores, raptors and humans, the study of carbonized wood accumulated in deposits from natural fires or in manmade hearths, and the study of polleniferous deposits on the coastal forelands and mountains of the fynbos area.

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

Keywords : fire history, fossil faunas, fynbos, Holocene, palaeoecology, Pleistocene, vegetation change

054. DE VILLIERS P A  
(Afdeling Natuurbewaring en Toerisme, Privaatsak 13186,  
Windhoek 9000)

Die ekologie, bevolkingsdinamika en gedrag van die olifant in die  
Nasionale Etoshawildtuin (1977-1980)

Die doelstellings van die projek is om te bepaal - (i) of Etosha geskik is vir olifante; (ii) watter faktore die beweging van olifante na plaasgebied beïnvloed en (iii) of daar metodes is om die beweging van olifante na plaasgebied te voorkom.

Die volgende aspekte word ondersoek : (i) Huidige en tradisionele beweging en grensbreke. (ii) Habitatsvoorkeure en invloed op die boomstratum. (iii) Voedingsekologie. (iv) Waterverbruik. (v) Getalle, tropsamestellings, aanwas en mortaliteit. (vi) Algemene gedrag.

Keywords : elephant, feeding ecology, population dynamics, savanna, South West Africa, water use

055. DU PLESSIS J J  
(Cape Provincial Department of Nature and Environmental Conservation, Northern Cape Nature Conservation Station, Private Bag, Hartswater 8570).

'n Onderzoek na wildboerdery in dele van die Noord-Kaap. (An investigation into game-farming in parts of the Northern Cape)

Opmnames in bestaande wildkampe is gedoen in die gebied wat rofweg voorkom tussen die Moloporivier in die noorde en die Mafeking-Vryburg- Kurumanlyn ten suide daarvan.

Gegewens oor die veldtoestand is deur middel van 'n puntopname ingewin waarby struik- en boombenutting ook ingesluit is. Die aanteelvermoë van die verskillende wildsoorte word per en tussen veldtipes vergelyk teenoor kampgrootte, byvoeding, jagdruk en ander bestuursmaatreëls. Ten einde te kan vasstel tot watter mate die vyf mees algemene wildsoorte oorvleuel in hulle weigewoontes, is mis versamel wat tans ontleed word vir die bepaling van grassoorte wat benut is. Aanvullend hiertoe is mis-punt distansies gemeet om dit as sensusmetode onder plaaslike toestande te toets aangesien die wildgetalle bekend is. Proewe is dus ook uitgesit om die verwerkingstempo van die faeces na te gaan.

Die werk is hoofsaaklik prakties bestuur-geörienteerd.

Keywords : Cape, faecal-analysis, game-farming

056. EARLÉ R A  
(Department of Zoology, University of Natal, P O Box 375, Pietermaritzburg 3200).

Factors governing avian breeding in Acacia savanna, Pietermaritzburg

Biological and physical factors governing avian breeding in a savanna habitat were studied over a period of 21 months near Pietermaritzburg, Natal. The most important factor controlling breeding was found to be the protein reserve of the individual bird. Only if the female has a large enough protein reserve to form eggs can breeding start. The protein reserve is however totally dependent on the availability of food which is once again dependent on the physical environmental factors. The lowest protein reserve in the bird body was always recorded towards the end of the breeding season as were the lowest body weights and these are probably closely related.

Rainfall in the 1979 breeding season was low which resulted in less breeding for most species. Because of good rains in 1978 the fruit yield was very high in the 1979 season and frugivorous birds bred early and prolifically in 1979.

Low temperatures and continuous rain over several days inhibited the starting of new clutches but had virtually no effect on nesting attempts already under way. The clutch size was to some extent

also dependent on food and environmental factors. Moults were found to be largely separated in time from breeding in all species studied.

Nesting success ranged between 10,7% and 27,2% in the different species. Predation on eggs and chicks accounted for 71% of all nesting failures.

Keywords : birds, breeding, Natal, predation, savanna

057. FERGUSON J W H and M J DE WET  
(S A Lombard Natuurreservaat, Posbus 174, Bloemhof 2660).

Ekologie van die rooijakkals *Canis mesomelas*

Die bewegings van rooijakkalse is nagespoor deur radio-opsporing, en tot op datum is 26 jakkalse gemerk en gevolg. Waarnemings op diere van beide geslagte binne die belangrikste ouderdomsgroepe is gedoen, en dit blyk dat volwasse jakkalse vaste loopgebiede het wat mekaar-uitsluitend gerangskik is. Jong diere beweeg oor die loopgebiede van volwasse diere en hulle kan oor groot gebiede beweeg.

Waarnemings is gedoen by 'n teelgat en helper-jakkalse is waargeneem, soos ook in 'n ander geval waargeneem is.

Die jakkalse se aktiwiteitspatrone volg 'n bigeminus-patroon, en gedurende donker tydperke snags is die diere merkbaar onaktief.

Kwantitatiewe inligting oor die interaksies tussen jakkalse en die paarbinding tussen die diere in halfgevangenskap is ingewin en dit blyk dat paarwording tot so lank as twee maande lank kan neem om plaas te vind.

Keywords : activity patterns, Canidae, highveld, social organization, Transvaal

058. FERREIRA N A  
(Afdeling Natuurbewaring, Provinsiale Administrasie van die Oranje-Vrystaat, Posbus 517, Bloemfontein 9300).

Die populasiedinamika en habitatbenutting van wilde diere en wild op provinsiale natuurreservate met inagneming van die veldtoestand en opbrengs (1980-1981)

Bogenoemde hoofprojek is ingedeel in verskeie skakelprojekte waarvan die onderstaande drie skakelprojekte, tans afgehandel en tot die Willem Pretorius-wildtuin in die Oranje-Vrystaat beperk word.

1. Sensus van wildpopulasies

Die doel is om betroubare metodes te bepaal waarvolgens die getalle van 17 wildsoorte jaarliks met die minste onkoste bepaal kan word. Die sensusmetode is hoofsaaklik 'n totale sensusopname met behulp van die aandryfsensusmetode. Strooksensusse word ook toegepas asook 'n metode gebaseer op die verandering in geslags- en ouderdomsverhoudings voor en na die verwydering van 'n bekende hoeveelheid wild.

2. Die verspreidingspatroon van wildsoorte in provinsiale reservate

Die doel is om die seisoenale verspreidingspatroon van elke wildsoort te bepaal en daarvolgens die weidruk van die wildsoorte op elke plantgemeenskap te bepaal en wildgetalle ooreenkomstig te laat beheer.

3. Wildpopulasie-samestelling en populasiedinamika in provinsiale reservate

Die doel is om populasie-eigings van wildsoorte volgens die geslagsverhouding, ouderdomstruktuur, aanwas, natuurlike mortaliteit, jag en verkope van wild vas te stel.

Uit die skakelprojek sal daar hopelik 'n model opgestel kan word waarvolgens 'n betroubare skatting van die volgende jaar se aanteel vooruit gemaak kan word. Sodoende kan vroegtydig beplan word watter wildsoorte verminder moet word.

Keywords : Antelope, census, distribution, habitat utilization, management, Orange Free State, population dynamics

059. FERREIRA N A  
(Division of Nature Conservation, P O Box 517, Bloemfontein 9300).

The status, distribution and ecology of the Grey rhebuck *Pelea capreolus* in the Orange Free State (1972-1980)

The ecology of the grey rhebuck was studied to provide information for the management of the species. The present population density and decline in distribution in recent years was determined. The populations were estimated by means of a method based on the "known group" method of census.

The distribution in the past was determined from the literature and by questioning long-time residents. The present distribution was determined by systematically working through the study area, questioning the farmers followed by personal identification of the species present. The decrease in population numbers was investigated by questioning farmers and the following up of the disappearance of marked antelope.

Territoriality, home range and herd structure were investigated. Special attention was paid to the feeding habits of the species. The vegetation composition of preferred feeding areas was determined by means of wheelpoint surveys and was compared to adjoining non-preferred areas. The ratio of monocotyledons to dicotyledons fed on was determined by means of faecal analyses for each season.

Keywords : distribution, feeding ecology, Grey rhebuck, habitat preference, home range, management, Orange Free State, Pelea, population dynamics, territoriality

060. FOURIE S P  
(Provincial Fisheries Institute, Private Bag X1088, Lydenburg 1120).

A survey of rare and endangered plant taxa of the Transvaal

The approaches to the problem of conserving a country's flora are numerous and all are 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 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 more effective, unambiguous legislation and other conservation methods can be planned.

Keywords : conservation legislation, conservation status, threatened species, Transvaal

061. FROST P G H  
(Percy FitzPatrick Institute of African Ornithology, University of Cape Town, Rondebosch 7700).

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

A review and synthesis 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, community dynamics, evolution, fire



062. FUGGLE R F and E R ASHTON  
(School of Environmental Studies, University of Cape Town,  
Rondebosch 7700).

A preliminary synthesis of macroclimatic patterns within the fynbos  
biome

Data on maximum, minimum and mean temperatures, rainfall, evaporation and sunshine from all known observing stations in the fynbos biome have been acquired and analysed. The seasonal patterns as well as the annual mean data have been mapped on a scale of approximately 1 : 2 000 000. Each map shows the actual value for each station as well as interpolated isolines. Ease of use is thus facilitated. An accompanying text draws attention to the main features of the climate maps.

Keywords : Cape, climate, climate maps, evaporation, fynbos, macroclimate, rainfall, sunshine, temperature

063. FUGGLE R F and M MORRIS  
(School of Environmental Studies, University of Cape Town,  
Rondebosch 7700).

Reflectivity of some fynbos communities (1979-1980)

Detailed radiation studies over six fynbos communities in the Cape of Good Hope Nature Reserve were carried out during summer months. Abnormally low reflectivity values (6%) have been established for Restionaceae and values of about 10% for Leucodendron. This suggests that fynbos vegetation either tolerates heat loadings considerably above those of other plants or has developed unusual strategies for dissipating the radiant heat load.

Keywords : Cape, climate, fynbos, radiation, reflectivity

064. FUGLER S R  
(Jonkershoek Forestry Research Station, Private Bag X5011,  
Stellenbosch 7600)

Some aspects of the autecology of three Hakea species in the Cape  
Province, South Africa (Completed in 1979)

The distribution of three South African pests of the Hakea species, H sericea, H gibbosa and H suaveolens, was studied. The H sericea infestation can be prevented from spreading further north by using the Breë River Valley and the Langkloof as natural barriers. Outlying H sericea infestations should either be eradicated or contained. H suaveolens and H gibbosa can be totally eradicated by mechanical control except in one area where a long-term management programme is needed.

Methods of estimating the density and fruit load of H sericea have been devised. An Australian weevil has been introduced which attacks the fruit of H sericea. The weevils' dispersal from a release point and the proportion of fruit it destroys can be monitored using the methods devised.

Selected aspects of the phenology of all three pest Hakea were studied in the field and the nursery. Basic phenological information of value to existing Hakea control programmes was collected and the growth strategy of H sericea was used to predict.

Keywords : Cape, fynbos, Hakea, invasive plants

065. GELDENHUYS C J  
(Saasveld Forestry Research Station, Private Bag X6531,  
George 6530).

Survey and classification of veld and forest ecosystems of the southern Cape and Tsitsikama Forest regions (Started 1979, expected termination 1985)

An understanding of forest sites, species populations and forest community structure and function in response to environmental gradients is important for conservation management of the Knysna forests. The present classification system is insufficient for management for timber production due to the large variation in species composition and size class distribution.

A survey of the flora is presently under way and a preliminary unpublished checklist has been compiled for the forests. This indicates a total number of 321 vascular species composed of 137 trees and shrubs, 49 climbers, 49 ferns and 86 other herbaceous plants.

Sampling for a phytosociological study was carried out on 141 plots at 61 sample sites. The sample sites were located within two broad transects running from the coast to the crest of the mountain ranges, near George and Knysna. Sample data include numbers or abundance by species of trees, shrubs and ground flora, soil descriptions and analyses and general site data.

Sampling will be continued on two additional transects, near Knysna and in the Bloukrans forest. The data will finally be subjected to numerical analyses for classification and ordination.

Keywords : Cape, checklist, classification, faunal survey, floral survey, forest, fynbos, vegetation survey

066. GELDENHUYS C J  
(Saasveld Forestry Research Station, Private Bag X6531,  
George 6530).

Investigation of the effects of thinning, cleaning and felling on  
the community development in the indigenous forest of the southern  
Cape and Tsitsikama Forest Regions

The aim of this project is to develop management techniques for timber production from the forest, and to evaluate the effect of the present method and intensity of management. Several large permanent sampling areas are surveyed on a regular basis to provide information on the growth and dynamics of the forest and its composite species. This is a long term investigation. Short-term investigations are, however, included in this research and reported on when completed.

Keywords : Cape, forest, growth rate, management

067. GELDENHUYS C J  
(Saasveld Forestry Research Station, Private Bag X6531,  
George 6530).

Investigation of distribution and population dynamics of natural  
veld and forest plant species in the southern Cape and Tsitsikama  
Forest Regions

This project includes several investigations:

- (i) Investigation of the reproduction of indigenous forest plant species.

Data on the fruit and seeds of the tree and shrub species from the forests are compiled. The seeds are used in trial studies to investigate the germination requirements of the various species. This information is required to explain the strategies of the various species in the dynamics of the forests. This is an ongoing project at low level.

- (ii) Investigation of the distribution, structure age and population development of forest plant species.

This investigation is directed towards the rare species in the southern Cape area. A study on Prunus africana in the Bloukrans area has been completed. Data on Faurea macnaughtonii and Psychotria capensis in the Lily Vlei area, Gouna, are being analysed at present.

- (iii) Investigation of the development of pure and mixed even-aged stands of indigenous forest species.

Several old stands of plantings in the forest are analysed for growth increment. The investigation is continued at a low level.

Keywords : Cape, Faurea, forest, population dynamics, Prunus, Psychotria, reproduction

068. GERTENBACH W P D  
(Research and Information, Kruger National Park, Private Bag X402, Skukuza 1350).

'n Ekologiese studie van die suidelikste Mopanie- en geassosieerde plantgemeenskappe in die Nasionale Krugerwildtuin

Mopanie (Colophospermum mopane) is een van die belangrikste houtagtige plante in die NKW. Ten noorde van Orpen word eie mopaniegemeenskappe egter skielik vervang deur ander plantgemeenskappe. Al hierdie plantgemeenskappe is met behulp van 'n Braun-Blanquet-opname bestudeer, geklassifiseer en gekarteer. Alle biotiese en abiotiese faktore wat 'n invloed kan hê op die verspreiding van die plantgemeenskappe is ge-evalueer en op sterkte hiervan kan voorspellings gewaag word ten opsigte van die moontlike uitbreiding van die mopanieveld.

Keywords : phytosociology, savanna, Transvaal

069. GERTENBACH W P D  
(Afdeling Navorsing en Inligting, Privaatsak X402, Skukuza 1350).

'n Ekologiese studie van die Mopanieveld in die Nasionale Krugerwildtuin

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

'n Floristiese klassifikasie van die belangrikste plantgemeenskappe 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.

'n Strukturele klassifikasie van die plantegroei in die mopanieveld en die inskakeling daarvan by 'n klassifikasiesistelsel vir die NKW. Dit is gedoen met behulp van die varieerbare kwadrant-metode soos beskryf deur Coetzee en Gertenbach (1978).

'n Studie van die interaksie tussen die voorkoms van bepaalde plantgemeenskappe 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 : savanna, Transvaal

070. GERTENBACH W P D  
(Research and Information, Kruger National Park, Private Bag X402, Skukuza 1350).

Rainfall patterns in the Kruger National Park

The available rainfall data for all the recording stations in the KNP were analysed. The average annual rainfall was calculated for each station and this served as a basis for compiling a rainfall map for the region. The cyclic nature of the annual rainfall as well as the rainfall distribution within cycles were investigated and a prediction was made of expected future rainfall.

Keywords : Kruger National Park, rainfall pattern, savanna, Transvaal

071. GERTENBACH W P D en A L F POTGIETER  
(Afdeling Navorsing en Inligting, Privaatsak X402, Skukuza 1350).

Veldbrandnavorsing in die struikmopanieveld van die Nasionale Krugerwildtuin

Voor die koms van die mens na die Laeveld, het vuur alreeds 'n rol gespeel in die ontwikkeling en migrasie van plantgemeenskappe. Hierdie veldvure is hoofsaaklik veroorsaak deur weerlig. Vandag word vuur in die NKW gebruik as 'n middel in die hand van die natuurbestuur. Besluitneming ten opsigte van vuur berus egter grootliks op persoonlike ondervinding eerder as op wetenskaplik gefundeerde inligting. 'n Poging is dus aangewend om die effek van vuur op die brandproewe in die mopanieveld te evalueer.

Persele op die vier herhalings van die proewe is met behulp van die Braun-Blanquet-metode getoets vir moontlike variasie in plante-groeisamestelling. Kroonbedekking per hoogteklaas is gebruik as basis vir vergelyking tussen die houtagtige komponente van persele en die veldlaag is gemonster deur middel van 'n wielpuntopname. Bodemopnames is gemaak en dit is in verband gebring met sekere kenmerke van die gemeenskappe.

Die volgende brandbehandelings is ge-evalueer :

- a) Augustus - jaarliks; b) Augustus - 2-jaarliks; c) Augustus - 3-jaarliks; d) Oktober - 2-jaarliks; e) Oktober - 3-jaarliks; f) Desember - 2-jaarliks; g) Desember - 3-jaarliks; h) Februarie - 2-jaarliks; i) Februarie - 3-jaarliks; j) April - 2-jaarliks; k) April - 3-jaarliks; l) Kontrole

Voorlopige waarnemings dui daarop dat daar wel floristiese variasie bestaan tussen sowel as binne herhalings. Die effek van vuur op die verskillende variasies verskil aansienlik. Indien variasies binne gemeenskappe as normaal beskou word, kan daar wel langtermyn verskille tussen behandelings waargeneem word, wat toekomstige besluitneming ten opsigte van vuur in die struikmopanieveld kan vergemaklik.

Keywords : fire regime, management, phytosociology, savanna, Transvaal

072. GODSCHALK S K B  
(Percy FitzPatrick Institute of African Ornithology, University of Cape Town, Rondebosch 7700).

The dispersal of three mistletoe species by birds in the Loskop Dam Nature Reserve

The mistletoe species Tapinanthus leendertziae, T natalitius and Viscum combreticola and their avian dispersal agents were studied in the field from February 1977 to May 1978. The study was carried out in seven different plant communities. Throughout the year surveys were made of the reproductive phenology of the mistletoes. Aspects of pollination and germination of mistletoes were investigated. The birds visiting mistletoe plants were studied with respect to the rate at which they removed fruit and the way they dealt with mistletoe seeds. The diet of the Yellow-fronted tinker barbet Pogoniulus chrysoconus, the main dispersor of the seeds of the mistletoes, was studied. Comparisons are made between mistletoes and their dispersal agents in savanna and forest biomes in South Africa, and the dispersal of mistletoes by birds in other continents of the world is reviewed.

Keywords : birds, dispersal, savanna, Transvaal

073. GOODMAN P S  
(Natal Parks, Game and Fish Preservation Board, Mkuzi Game Reserve, P O Mkuze 3965).

An evaluation of four techniques for estimating and monitoring animal numbers in a wildlife population (1976-1980)

A pilot study compared three census techniques, namely:  
(1) complete coverage (C C) of an area counted from a helicopter,  
(2) partial coverage (P C) of the area using a set of stratified random sample blocks and counted from a helicopter, and  
(3) road strip counting (R S C). Because of their repeatability and degree of precision, P C and R S C were thought superior to C C. Results indicated that R S C in addition to being the least costly gave the best return for money spent. It was concluded that the final choice of census method should not be influenced by the method used for game removal.

A walked transect system has been set up and is being used to identify herbivore habitat preferences, to improve stratification of other sampling techniques and also to compare as a census technique with C C, P C and R S C.

Keywords : census, faunal survey, Natal, savanna

074. GOODMAN P S  
(Natal Parks, Game and Fish Preservation Board, Mkuzi Game Reserve, P O Mkuze 3965).

Relationship between large herbivore communities and plant communities in Mkuzi Game Reserve (1979-1981)

Some of the hypotheses proposed concerning multispecies herbivore communities and their relation to the available food resources are being evaluated. More specifically the relationship between diversity and structure of plant communities and diversity and structure of animal communities utilizing them will be examined.

Data collection will take place at a number of nodal vegetation sites identified in the Mkuzi vegetation study (see associated project abstract).

Keywords : carrying capacity, community structure, diversity, habitat, Natal, savanna

075. GOODMAN P S  
(Natal Parks, Game and Fish Preservation Board, Mkuzi Game Reserve, P O Mkuze 3965).

Vegetation and habitat relationships in Mkuzi Game Reserve (1976-1982)

This research attempts to evaluate five key questions:

- (i) What is the state of the vegetation in the Mkuzi Game Reserve at present? (ii) What was the vegetation like in the recent past? (iii) How is the present vegetation distribution and condition accounted for? (iv) What are the successional tendencies under various forms and intensities of usage? (v) To what extent is the vegetation being used at present and what is its longterm carrying capacity?

Data have been collected in a series of stratified, randomly located stands and analysed using a numerical classification and ordination approach as well as being mapped. Former woody vegetation communities as well as vegetation disturbance and utilization (shifting agriculture, kraal sites, etc) are being mapped from early aerial photographic coverages. At present a system for monitoring long-term vegetation trends and utilization is being developed to suit local conditions and objectives.

Keywords : classification, Natal, ordination, savanna, vegetation change

076. GREIG J C  
(Cape Provincial Department of Nature and Environmental  
Conservation, Private Bag 5014, Stellenbosch, 7600).

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

The object 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 collection 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: Cape, faunal survey, fynbos, reptiles

077. GREIG J C  
(Cape Provincial Administration, Department of Nature and  
Environmental Conservation, Jonkershoek, Private Bag 5014,  
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 now 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, fynbos, habitat, tortoise

078. GRIFFIN M  
(Nature Conservation and Tourism Division, Private Bag 13186,  
Windhoek 9000).

Monitoring of changes in the population structure and movements of  
the larger game species in the gravel plains and dunes of the  
Kuiseb study area (1977-1980)

Observations on sex ratios, age structures, condition and distribution have been conducted on gemsbok, springbok and ostrich in the



Namib Desert. Springbok was calculated using Rautenbach's method while gemsbok were arbitrarily divided into four subjective age classes. Ostriches were grouped in two classes. Observations on births and mortality were also conducted.

Keywords : desert ecology, Namib Desert, population dynamics, sex ratio, South West Africa

079. GRIFFIN M and J E LENSING  
(Nature Conservation and Tourism Division, Private Bag 13186,  
Windhoek 9000).

The kudu road accident problem in South West Africa and the use of  
an optical deterrent as a possible control measure

The primary objectives of this study are to test the effectiveness of "SWAREFLEX" road reflectors as a method of reducing kudu road accidents and to define the nature of the kudu road accident problem. Observations were conducted on the behaviour of kudu on the road reserve in response to motor vehicles at night on an experimental section of the main road between Windhoek and Gobabis. Preliminary results show that road reflectors do not deter kudu significantly, that poor visibility in the road reserve is a major cause of collisions and that accident situations arise when kudu exhibit a specific behavioural sequence. All animal-related collisions as reported to the South African Police during the study period are being analysed. A sample of kudu collisions as obtained from interviews conducted with motorists involved is also being analysed.

Keywords : behaviour, problem animal, savanna, South West Africa

080. GROSSMAN D and J O GRUNOW  
(Department of Plant Production, University of Pretoria,  
Pretoria 0002).

Effects of various agricultural practices on savanna

This is an attempt to determine the extent and degree of degradation of savanna vegetation in South Africa and to relate it to land utilization efficiency. The project is a contribution to the SCOPE programme on land transformation which aims to encourage the rational use of the environment with a view to maintaining its quality and productivity.

Keywords : land transformation, landuse, savanna, vegetation degradation

081. GRUNOW J O  
(Department of Plant Production, University of Pretoria,  
Pretoria, 0002).

The effect of different induced basal covers of trees and shrubs on  
grass layer dry matter production and other variables in *Burkea*  
savanna (1979-1989)

Five different tree basal covers, established by thinning existing populations, are studied to determine their effect on dry matter production of the grass layer and certain other production-related variables. Production-related variables will include botanical composition and cover of the grass layer and probably also soil moisture conditions and availability of NPK in the soil. Dry matter production determined by harvesting is partitioned into that of desirable grasses, undesirable grasses and forbs.

Keywords : bush encroachment, production, savanna, Transvaal

082. 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

The biomass cycles and accumulation rates of *Burkea* and *Acacia* veld are being compared by harvest techniques under grazed and ungrazed situations. The live biomass is partitioned into desirable grasses, undesirable grasses and forbs. The live biomass categories are to be analysed for IVDDM, IVDOM and CP.

Keywords : phytomass, savanna, Transvaal

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

Structural and floristic classification of the vegetation of the  
northern Cape (1979-1982)

The objective of this study is to classify the vegetation associations present in the northern Cape, using both structural and floristic vegetation system methodology. The study area has an area of approximately 250 000 km<sup>2</sup>, bounded by the South West African border in the west, of the Transvaal and Orange Free State borders in the east, the Botswana border in the north and the Orange River in the south. Within this area, 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 type 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 karoo-grass transition (Veld Type 36). Acock's veld types are insufficiently detailed to serve as a basis for land planning in the northern Cape, especially for the regional subtype, Kalahari scrub and thorn savanna. For the floristic classification of the vegetation, the Braun-Blanquet approach has been adopted. For the structural classification of the vegetation (mainly biomass structure) an eclectic approach has been adopted. The methodology of the structural classification has been tested on a much-reduced study site and has been found to be relatively successful. The physical environment of the northern Cape will be discussed in detail. An attempt will be made to describe quaternary vegetation changes in the northern Cape. Vegetation units will be mapped using remote sensing techniques. The transition between the Sudano-Zambezi and the Karoo-Namib regions, which is believed to fall within the study area, will be studied to determine its syntaxonomy and synecology.

Keywords : Cape, classification, floristic, grassland, karoo, Karoo-Namib, quaternary, remote sensing, savanna, structure, Sudano-Zambezi, vegetation.

084. GUNTON C and G C BATE  
(Department of Botany, University of the Witwatersrand,  
P O Box 1176, Johannesburg 2000).

Nitrogen cycling in *Burkea* savanna

Hydrolysis experiments using 6M HCl showed that organic nitrogen makes up around 98 per cent of the total nitrogen in Nyilsvley soil and following calcium carbonate treatment to raise the pH from 3,2 to 7,8 nitrification in Nyilsvley soil showed an apparent increase. Further tests with calcium sulphate substituted for calcium carbonate indicated that the calcium ion may be important in the process of nitrification.

The inorganic soil nitrogen levels showed significant daily fluctuations varying from 1,5 ppm N to 2,3 ppm N. To determine the effect of plant growth on soil nitrogen, a study was undertaken which concentrated on two grasses, *Digitaria eriantha* and *Eragrostis pallens*, and the tree *Burkea africana*. Soil NO<sub>3</sub>N levels close to *Digitaria eriantha* were higher than around *Eragrostis pallens* but both showed higher levels than was present in soil from bare plots. This may have been due to plant decomposition producing inorganic N at a slightly higher rate than was being taken up by the plants at the time the measurements were taken. In soil around *Burkea africana*, high levels of NO<sub>3</sub>N and NH<sub>4</sub>N were recorded; maximum levels being 5,3 ppm N and 17,2 ppm N respectively.

A mathematical model describing the changes in inorganic nitrogen levels in the soil was developed but data predictions concerning the nitrification rate obtained from the model were unrealistically

high. It is probable that some plant/microbial interaction exists to control the rate of nitrification which was not included in the model. Refinements are therefore necessary.

Keywords : nitrogen, savanna, soil, Transvaal

085. HARTHOORN A M  
(Transvaal Provincial Administration, Nature Conservation Division,  
Private Bag X209, Pretoria 0001).

Improvements of capture techniques for wild herbivores

Considerable progress has been made under this project. Animals may be enticed or driven into standard camps of 10 ha. Soon after enclosure they are tamed and trained by daily runs through a double-ended capture funnel. The animals soon learn to run through the structure obtaining the necessary exercise for training and also becoming familiar both with the structure and the technique. When eventual capture is necessary, they are readily driven into a shute at a far slower tempo than is usually required to prevent them breaking back, before they have become used to such a procedure.

Experimentally it has been determined that the high levels of potassium and the free myoglobin that tend to form when untrained animals are caught and handled, are reduced to normal levels or to zero after the animals have been tamed and trained for a period of approximately one month. After such a period of taming and training the animals take more readily to pens or crates and stand the stress of transport better.

An added bonus is that during the month of taming and training, the animals may become accustomed to the change of food necessary for holding and transport, and also the nutritional state may be improved.

It is planned to use this method for regular capture of ungulates for blood sampling for nutritional and disease investigations. The method is probably ideal for game farmers.

Keywords : game capture, herbivores, Transvaal

086. HARTHOORN A M  
(Transvaal Division of Nature Conservation, Private Bag X209,  
Pretoria 0001).

The use of orgotein and other pharmacological agents in the prevention of overstraining disease

This work entails the induction of a standard exertional stress by driving antelope round a track for a specified distance and speed. Blood samples determine the degree of exertional stress, and its modification by the administration of various antistress agents.

Since the adoption of modified capture methods where animals are enticed rather than driven into enclosures, experiments are being started to monitor the effect of tranquillizers such as Haloperidol when administered orally.

The work is designed not only to find suitable antistress or tranquillizing agents, but also to determine which of the many substances commonly injected into wild animals on capture, are in fact ineffective.

Keywords : antelope, antistress agents, game capture, stress, tranquillizers

087. HARTHOORN A M  
(Transvaal Division of Nature Conservation, Private Bag X209, Pretoria 0001).

Seasonal nutritional status of animals on provincial nature reserves

To facilitate investigations, rabbits are now being used rather than antelope. The work is centred on the investigation of the role of a possible subclinical nutritional myopathy predisposing to a state of capture myopathy when the animals are stressed. Results have indicated that the levels of selenium in the tissues of pregnant and lactating animals in particular, are low, and it is these animals which are the most susceptible to death from capture myopathy. The similarity of the post mortem picture resulting from death due to one or other of these two conditions has made it difficult to determine the respective roles played by exertion and nutrition.

Attempts are being made to demonstrate a suspected circulatory derangement as a result of selenium deprivation by a study of the blood vessels of the fundus of the eye.

Keywords : game capture, herbivores, nutritional status, trace elements

088. HERSHELMAN J C  
(Cape Provincial Department of Nature and Environmental Conservation, Jonkershoek Forestry Research Station, Private Bag X5011, Stellenbosch 7600).

'n Studie van die orde Chiroptera in die Kaapprovinsie (A study of the order Chiroptera in the Cape Province

Tot voor hierdie projek is daar 33 spesies vlermuise in die Kaapprovinsie beskryf waarvan sowat sewe endemies was tot die fynbosarea. Geeneen van die vorige opnames is sistematies uitgevoer oor die hele Kaapland om die verspreiding en veral die status van elke spesie akkuraat te bepaal nie.

Met hierdie projek word beoog om enersyds die populasie dinamika en migrasiegewoontes van 'n paar spesies te ondersoek om sodoende 'n idee te kry van die werklike rol wat die orde in die natuur speel. Dit is beslis so dat hulle rol geweldig onderskat word deur veral die breë publiek. Andersyds word beoog om 'n effektiewe verspreiding en statusopname oor die hele Kaapprovinsie van alle soorte te doen om sodoende te probeer vasstel watter spesies relatief skaars en bedreig is, sodat voldoende beskermingsmaatreëls getref kan word om hulle voortbestaan te verseker.

Hierdie orde behoort 'n belangrike rol veral in die fynbosgebied te speel en behoort beslis 'n uitwerking op ander komponente te hê.

Die projek is op 'n gevorderde stadium en behoort teen die einde van 1979 afgehandel te wees.

Keywords: bats, Cape, faunal survey, fynbos

089. HEYL C W  
(Kaapse Departement van Natuur- en Omgewingsbewaring, Jonkershoek Natuurbewaringstasie, Privaatsak X5014, Stellenbosch 7600).

Die kunsmatige broei, grootmaak en uitplasing van die Kaapse fisant *Francolinus capensis* (1973-1980)

Vanweë belangstelling deur jagters is die potensiaal van hierdie voëlsoort vir kunsmatige teel ondersoek. Groeipatrone is bepaal wat waardevol vir geslags- en ouderdomsbepaling by veldondersoeke sal wees. 'n Aantal van hierdie voëls is in 'n natuurlike omgewing losgelaat en word elke tweede week gemonitor om hul aanpasbaarheid en dus ook die sukses wat met sodanige uitplasing verwag kan word, te evalueer.

Keywords : artificial breeding, Cape, francolin, re-introduction

090. HEYL C W  
(Kaapse Departement van Natuur- en Omgewingsbewaring, Jonkershoek Natuurbewaringstasie, Privaatsak X5014, Stellenbosch 7600).

Die voeding en liggaamskondisies van die rooi kaffervink *Euplectes orix* en die Kaapse wever *Ploceus capensis* in 'n graanproduserende gebied van die Wes-Kaap (1977-1980)

Die doel van die studie is om biologiese kennis in te win wat van waarde vir die latere formulering van beheermaatreëls sal wees. Monsters is een keer per maand oor 'n periode van een jaar geneem deur die vinke in misnette te vang. Voedingsgewoontes asook die jaarlikse siklusse in liggaamsvette en proteïenreserwes van die borsspiere en maatstawwe van liggaamskondisie is bestudeer. Inligting oor geslagsbepaling, ouderdomsbepaling, geslagsverhoudings en ververing is ook ingewin.

Keywords : Cape, feeding ecology, weaver

091. HOFMEYR J M  
(Nature Conservation and Tourism Division, Private Bag 13186,  
Windhoek 9000)

The ecology of anthrax in the Etosha National Park (1968-ongoing)

Anthrax is enzootic in Etosha and is responsible for a large number of mortalities especially in zebra, wildebeest and springbok. Some basic investigations on the ecology were undertaken. Aspects which require further investigation include : (i) Identification of major sources of infection (ii) Percentage of animal losses caused by anthrax (iii) Immunological considerations and (iv) Effective control measures.

Keywords : anthrax, Etosha National Park, South West Africa

092. HOFMEYR J M  
(Nature Conservation and Tourism Division, Private Bag 13186,  
Windhoek 9000).

An evaluation of large-scale game capture techniques and the blood chemistry of wild animals in relation to stress and prophylactics (1970-1984)

The objectives are the enhancement of capture efficiency, control of animal losses and prevention of the irreversible capture myopathy syndrome. Considerable progress has been made with large-scale capture techniques and the introduction of more effective narcotics and neuroleptics. Various blood parameters serve as important criteria to measure the degree of stress and the effectiveness of prophylactic measures.

Keywords : capture, game capture, South West Africa

093. HOFMEYR J M  
(Nature Conservation and Tourism Division, Private Bag 13186,  
Windhoek 9000).

Aerial game censuses, population dynamics and management of the Kaross-Khoabendus Quarantine Camp, Etosha National Park (1972-ongoing)

The 15 000 ha of Kaross-Khoabendus is set aside for the conservation of rare animal species. The programme's objectives are to evaluate census methods and to determine optimum carrying capacity of rare and common species.

This is done with annual helicopter game censuses using standardized techniques, population studies, subjective habitat evaluation, rainfall monitoring and the evaluation of management procedures.

Keywords : carrying capacity, census, Etosha National Park, habitat evaluation, management, population dynamics

094. HOFMEYR J M  
(Nature Conservation and Tourism Division, Private Bag 13186,  
Windhoek 9000).

General game diseases in the Etosha National Park

Routine and specific investigations conducted in collaboration with the Veterinary Services Division include serological studies on immobilized animals, autopsies on diseased animals, detailed quantitative external and internal parasitological surveys, microbiology, mineral deficiencies and histopathology.

Keywords : autopsies, Etosha National Park, mortality, disease

095. HOFMEYR J M  
(Nature Conservation and Tourism Division, Private Bag 13186,  
Windhoek 9000).

The follow-up of released game in the Etosha National Park and studies on introduced rare species following their release into new surroundings (1972-1981)

The cost of capture operations necessitates a programme to determine the success of released animals. Knowledge of release techniques and the selection of suitable habitats is thus acquired. Studies include methods of re-introduction, adaptation and distribution, species interaction, influence of disease and predators, habitat selection, reproduction and population increments.

Keywords : capture, competition, Etosha National Park, habitat preferences, mortality, predation, rare ungulates, re-introduction, release techniques

096. HOFMEYR J M  
(Nature Conservation and Tourism Division, Private Bag 13186,  
Windhoek 9000).

Investigation of the macromineral and micromineral elements of game in the Etosha National Park in relation to habitat selection (1978-1981)

The objective of the programme is to determine mineral deficiencies and requirements in grazers and browsers. Liver and faeces samples are collected and analysed.

Keywords : Etosha National Park, mineral deficiencies, ungulate



097. JACOBSEN N H G  
(Transvaal Provincial Administration, Nature Conservation Division,  
Private Bag X209, Pretoria 0001).

Distribution and status of reptiles and amphibians in the Transvaal

The study is progressing well and fieldwork should be completed by May 1982. At present 166 1/4<sup>o</sup> squares have been completed and a large number of range extensions have been made. Several new species and subspecies have been found, particularly within the Lygodactylus complex. Of considerable interest is the disjunct distribution pattern exhibited by some species and the restriction of many of the Lygodactylus spp to mountain passes. It is planned to complete the survey by the end of 1982.

Keywords : amphibia, faunal survey, reptiles, Transvaal

098. JACOBSEN N H G  
(Transvaal Provincial Administration, Nature Conservation Division,  
Private Bag X209, Pretoria 0001).

An investigation into the fruit bat problem in the eastern Transvaal

The final report was submitted at the end of 1979. From questionnaires and visits to as many litchi farmers as possible, as well as during the study in the litchi orchards, it was apparent that the fruit bat is not an important economic problem. Few orchards were subjected to annual visits by large numbers of bats. Litchis are a very erratic crop and in some years bear very little fruit while in other years are abundant. Losses tended to be exaggerated and in some instances by as much as 50%. No easy method of control was established although the judicious use of mist nets could appreciably reduce damage and if used at the start of the season might bring losses to a minimum. Alimantal migration occurs between the Transvaal and Natal with the flight path over Swaziland.

Closure of roosting caves temporarily, had no effect on the bats responsible for the depredations in the orchards and no doubt alternative sites are available. Wholesale destruction of those bats at such sites is unwarranted as well as being undesirable and as most major colonies are in the Homelands, cooperation in this respect would have to be investigated.

Keywords : bats, orchards, problem animal, Transvaal

099. JACOBSEN N H G  
(Transvaal Provincial Administration, Nature Conservation Division,  
Private Bag X209, Pretoria 0001).

Reptile and amphibian populations of the *Burkea africana*-*Eragrostis pallens* savanna on the Nylsvley Nature Reserve

It is of interest to note that this savanna ecosystem is the winter home of large numbers of amphibians whose biomass considerably

exceeds that of the reptiles. Preliminary figures indicate that the biomass per hectare of amphibians varies between 0 and 1,635 g depending on the season, temperature and rainfall, especially the latter, which in contrast has a depressing effect on reptiles. Greatest density of lizards was 23,6 ha<sup>-1</sup>, of snakes 6,83 ha<sup>-1</sup> and amphibians 199,9 ha<sup>-1</sup>. Densities referring to lizards and snakes exclude the two arboreal species Lygodactylus capensis and Thelotornis capensis. It is anticipated that the final write-up of this project will be completed by January 1981.

Keywords : amphibia, Burkea africana, reptiles, Transvaal

100. JANKOWITZ W J  
(Afdeling Natuurbewaring en Toerisme, Privaatsak 13186,  
Windhoek 9000)

Die plantekologie van die Waterberg-platopark (1976-1980)

Die doel van die projek is om die plantgemeenskappe van die Waterberg-platopark te klassifiseer en karteer om as basis te dien vir verdere studies op die plantegroei. Die Braun-Blanquet opname-tegniek word gebruik.

Keywords : phytosociology, savanna, South West Africa

101. JANKOWITZ W J  
(Afdeling Natuurbewaring en Toerisme, Privaatsak 13186,  
Windhoek 9000).

Die weidingspotensiaal van die grasstratum van die Waterberg-platopark (1978-langtermyn)

Die program het ten doel om die opbrengs van die verskillende gemeenskappe van die Park te bepaal. Basale bedekkingsopnames sowel as die polknipmetode word gebruik. Die opnames word jaarliks herhaal en bestaan uit 'n reeks van twee, naamlik aan die einde van die weiseisoen en aan die einde van die groeiseisoen. Die weidruk word ook hierdeur bepaal.

Keywords : carrying capacity, savanna, South West Africa

102. JANKOWITZ W J  
(Afdeling Natuurbewaring en Toerisme, Privaatsak 13186,  
Windhoek 9000).

Die voedselvoorkeure van 'n eland op die Waterbergplatopark (1979-1981)

Waarnemings op die vreetgewoontes van 'n mak elandkoei wat vry loop in die Park word gedoen met behulp van 'n bandopnemer en 'n stophorlosie. Die tyd bestee aan elke plant en die relatiewe hoeveelheid wat die dier inneem word aangeteken. Die waarneming word eenkeer per maand vir 'n week lank gedoen en sal een jaar duur.

Keywords : feeding ecology, savanna, South West Africa

103. JANKOWITZ W J  
(Afdeling Natuurbewaring en Toerisme, Privaatsak 13186,  
Windhoek 9000).

Brandproewe op die Waterberg-platopark (1979-langtermyn)

Hierdie program se doel is om te bepaal wat die invloed van brand op die plantegroei van die Park sal wees en om te bepaal of brand as 'n bestuurswerktuig gebruik kan word. Permanente lyntransekte word gebruik en dien as basis vir 'n reeks kwadrate wat langs die transekte opgestel word om die kruidstratum te evalueer. Vir houtagtige plante word die varieerbare kwadrantmetode van Gertenbach en Coetzee (1977) gebruik.

Keywords : fire management, savanna, South West Africa

104. JANKOWITZ W J en G K THERON  
(Afdeling Natuurbewaring en Toerisme, Privaatsak 13186,  
Windhoek 9000).

Monitering van plantegroeidinamika in die permanente studiegebiede van die laer Kuisebrivier (1978-1981)

Die onttrekking van water uit die bedding van die Kuisebrivier kan moontlik 'n nadelige effek hê op die houtagtige rivierplantegroei. Die doel van die projek is om te bepaal wat die effek van wateronttrekking op die lewenskragtigheid van die plantegroei sal wees. Twee tegnieke is gebruik naamlik strooktransekte op strategiese punte dwarsoor die rivier en struktuurpersele in die onmiddellike omgewing van die transekte.

Keywords : Kuiseb River, South West Africa, vegetation dynamics

105. JENSEN R A C  
(Percy FitzPatrick Institute of African Ornithology, University of Cape Town, Rondebosch 7700).

Status of the Cape eagle owl *Bubo capensis* in the Cape Province

An investigation of the distribution, numbers, general and breeding biology of the Cape eagle owl *Bubo capensis* in the Cape Province with a view to finding out why it is apparently so rare.

Keywords : breeding, *Bubo capensis*, Cape, conservation

106. JENSEN R A C  
(Percy FitzPatrick Institute of African Ornithology, University of Cape Town, Rondebosch 7700).

Status of the Red lark *Mirafra burra* in the Cape Province

An investigation of the distribution, numbers, general and breeding biology of the Red lark *Mirafra burra* in the Cape Province with a

view to ascertaining why it is apparently so rare and what is its taxonomic relationship with the karoo lark M albescens complex.

Keywords : breeding, conservation, distribution, larks, taxonomy

107. JOOSTE J F  
(Department of Nature and Environmental Conservation, Private Bag X5014, Stellenbosch 7600).

A study of the phytosociology and small mammals of the Rolfontein Nature Reserve, Cape Province (1975-1980)

The phytosociology of the Rolfontein Nature Reserve (5 210 ha) in the northeastern Cape Province was studied using the Braun-Blanquet method. Thirteen plant communities were identified and described floristically.

The distribution and habitat preferences of 13 small mammal species were recorded within the plant communities over a period of four years using an intensive trapping programme (three types of traps and two trapping methods). The distribution and habitat preferences of these small mammals were interpreted in terms of the characteristics of the plant communities.

Comparison of the trapping methods indicated that more species were caught with traps left at the original place of setting whereas more individuals of common species were caught where traps were moved every 24 hours.

Keywords : Cape, distribution, karoo, small mammals, vegetation survey

108. JOOSTE J H  
(Departement Plantkunde, Universiteit van Stellenbosch, Stellenbosch 7600).

Aspekte van die minerale voeding van lede van die Proteaceae as verteenwoordigers van die fynbosgemeenskap (1979-1980)

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 die 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, fynbos, mineral nutrition

109. JOUBERT E  
Afdeling Natuurbewaring en Toerisme, Privaatsak 13186,  
Windhoek 9000).

Lugsensusse van die bevolkings van groter wildsoorte van die  
Kusebstudiegebied gedurende die nat en droë seisoen  
(1977-langtermyn)

Gemsbokke, Hartmann-sebras, springbokke, en volstruise is jaarliks uit die lug getel sedert 1972. Die bergagtige dele en gruisvlaktes van die Namibwoestynpark is opgedeel in blokke en die blokmetode van tel is toegepas. Gemsbokke, Hartmann-sebras en springbokke het drasties toegeneem sedert 1976. Die volstruisbevolking wissel geweldig maar het nie toegeneem nie. 'n Algemene daling word binnekort verwag.

Keywords : aerial census, Namib desert, ostrich, South West Africa, springbuck

110. JOUBERT S C J  
(National Parks Board, Private Bag X404, 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 and (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

111. JUBELIUS C W  
(Division of Nature Conservation, Provincial Administration of the Orange Free State, P O Box 517, Bloemfontein 9300).

The habitat requirements and the influence of habitat manipulation on the population dynamics of upland gamebirds in the Orange Free State (1976-1982)

The ecology of upland gamebirds is studied to provide information required for the management of the birds in the Orange Free State.

The study was limited to Swainson's francolin (Francolinus swainsoni), Natal francolin (F natalensis) and helmeted guinea-fowl (Numida meleagris). By capturing and marking birds as well as by direct observations in the veld, the following aspects are studied in a selected study area : mass, body dimensions, distribution, habitat utilization, daily and seasonal activity, home ranges, covey sizes and the monthly variation thereof as well as breeding biology.

Other species of upland gamebirds will later on be included in the study.

Keywords : gamebirds, grassland, habitat, management, Orange Free State, population dynamics

112. KILPATRICK P A  
(Jonkershoek Forestry Research Station, Private Bag 5011, Stellenbosch 7600).

Theoretical analysis of the subsurface water regimes of experimental catchments in the western Cape forest region (1977-1980)

The programme UNSAT 1 (Neuman, 1972) was used to simulate the drainage of water from a uniform soil on the hillslope so as to investigate the effects of extraction of water from the unsaturated zone. The results indicate that transpiration losses from the unsaturated zone may be one cause of the daily fluctuations of streamflow encountered at Jonkershoek.

The project has now been terminated.

Keywords: afforestation, Cape, catchment, fynbos, hydrology

113. KOK O B, D P J OPPERMAN en G H WILTSHIRE  
(Department of Zoology, University of the Orange Free State, P O Box 339, Bloemfontein 9300).

Monitering van die beskikbaarheid, gehalte en benutting van die graskomponent in 'n Acacia karoo savanna (Monitoring of the availability, quality and utilization of the grass component in an Acacia karoo savanna)(1979-1982).

Produksie van die sleutelspesies, benutting- en voorkeurstudies,

bevolkingsdinamika en voedingsgedrag van enkele geselekteerde herbivore in die Willem Pretorius Wildtuin word gemeet.

Keywords : carrying capacity, feeding value, grassland, Orange Free State, savanna

114. LANE S B  
(School of Environmental Studies, University of Cape Town, Rondebosch 7700).

Interpretation of digital LANDSAT-1 imagery from Verlorenvlei Southwestern Cape

The interpretation of LANDSAT-1 multispectral scanner data obtained over the semi-arid farming district of Verlorenvlei on the west coast of South Africa is discussed. An unsupervised iterative clustering algorithm was employed to produce a classified image containing twelve land-based classes. Groundtruth data were collected using standard botanical and soil survey techniques. All field data were subjected to similarity analysis using the unrelativized CZEKANOWSKI coefficient. In this way data were rendered suitable for correlation with spectral classes. The area studied has little topographic relief but is spectrally and spatially complex due to the fragmental distribution of varying soil and vegetation types. As a result of this complexity, although the interpretation technique employed accurately described the landcover in terms of the spectral classes defined on the LANDSAT image, most classes could not be translated into discrete cover types.

Keywords : arid zone, coast, fynbos, lake, LANDSAT-1, remote sensing, satellite imagery, vegetation

115. 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 (1976-1985)

The aim of this plot trial is to determine the influence of fire in different seasons on community structure in the mountain fynbos shrublands of the southern mountains. Treatments include spring, summer and autumn burns and are applied to seven plots (one is a control) up to 50 m x 50 m in size. The relatively small number of plots available (eight) preclude a random experimental design of the classic kind, and deductions from results will be based on comparative analysis of time trends. Repeated treatments (the summer burn is not repeated) have been applied over three years, beginning 1976 and ending 1979.

The pretreatment measuring program includes a botanical analysis by means of samples of twenty 2 x 2 m quadrats in each plot, and an analysis of aboveground biomass by means of a combination of allometric and clipping quadrat samples. Climatic data are also recorded and during burns fire parameters are also monitored for a record of fire intensity and behaviour.

Post-burn studies will be concentrated on the re-establishment and development of selected species and community succession.

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

116. LENSING J E  
(Nature Conservation and Tourism Division, Private Bag 13186,  
Windhoek 9000).

Feeding ecology of rock hyrax in southern South West Africa  
(1974-1978)

This study was conducted on Karakul rangeland in response to complaints by farmers in order to define and evaluate the hyrax problem (sic) and to determine whether any particular plant species is highly preferred by the hyrax. The diet of the hyrax was determined by analysing stomach contents, which was achieved by conducting a supplementary study of the leaf epidermis anatomy of 39 monocotyledon species. The effect of moisture content on the selection of food species was also studied.

The food preferences of the hyrax were determined by comparing the relative availability of all plant species (determined by a series of vegetation surveys) with the principal foods (diet) of the hyrax.

It is concluded, inter alia, that :

- (i) Hyrax eat mainly the leaves of shrubs and trees.
- (ii) Grasses are not eaten in significant quantities except at the end of the hot dry season.
- (iii) Food species are not selected primarily for their moisture content.
- (iv) Where preferences are concerned, the hyrax is an opportunistic feeder.
- (v) A small proportion (estimated at less than one per cent) of the agricultural yield of the study area is removed annually by hyrax.

Keywords : competition, feeding ecology, food availability, savanna, South West Africa



117. LENSING J E  
(Nature Conservation and Tourism Division, Private Bag 13186,  
Windhoek 9000).

A survey of the giraffe population of the Outjo District, northern  
South West Africa (1979-1980)

The survey was conducted by visiting a sample of the farms from which questionnaires had been returned in a postal survey conducted in 1973. Aspects investigated included fences and game camps, distribution, population estimates and trends, limiting factors, damage to fences, hunting and capture and population structure. As a control, observations on sex ratio and age structure were conducted on game-fenced private land and in the Etosha National Park.

It was found that there is evidence of a gradually diminishing distribution; very few farms have resident populations of giraffe, the major proportion of the population is non-resident; there are indications of a decline; roughly half the farmers do not regard giraffe as an asset; fence damage does not determine whether or not giraffe are regarded as an asset, and the overall age, structure and sex ratio of the population is not abnormal although there is preponderance of adult bulls.

Recommendations are aimed at the ultimate goal of conservation by utilization.

Keywords : age structure, distribution, giraffe, population dynamics, savanna, sex ratio, South West Africa

118. LENSING J E  
(Nature Conservation and Tourism Division, Private Bag 13186,  
Windhoek 9000).

Cooperative trials on the control of black-backed jackal in the  
small stock area with the aid of a helicopter (1979-1980)

The high cost/benefit ratio of problem animal control in marginal sheep farming regions of South West Africa renders the cost of jackal control by helicopter worth investigating. In cooperation with the Karasburg District Agricultural Union, the Nature Conservation and Tourism Division is conducting comparative trials on the all-inclusive unit costs of jackal control with a helicopter and with coyote getters. Coyote getter performance has been disappointing in dry regions thus far.

Keywords : problem animal, South West Africa

119. LE ROUX A

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

'n Studie van die plantegroei van die Rocherpan-Natuurreservaat  
(A study of the vegetation of the Rocherpan Nature Reserve)

Die Rocherpan-Natuurreservaat is ongeveer 25km noord van Velddrif geleë en is die enigste natuurreservaat in Acocks (1975) se Strandveld van die Weskus (Veldtipe 34).

Die reservaat is hoofsaaklik 'n watervoëlskuiling en ongeveer 100 ha van die 390 ha natuurreservaat bestaan dan ook uit die pangedeelte. Aan die see se kant, wes van die pan, is duinsand en aan die oostekant van die pan is wit tot ligrooi sanderige grond. Behalwe vir die pangedeelte, is die plantegroei 'n tipiese voorbeeld van die strandveld van die weskus met bv Euclea racemosa Zygophyllum morgsana en Pterocelastrus tricuspidatus.

Die pangedeelte sal spesiale aandag kry in die opname vanweë die seisoenale invloed van water en die eilande wat gevorm word. Hierdie eilande is die broeiplekke van die watervoëls en dit is as sulks nodig om te weet presies wat hulle habitatsvereistes vir nesmaak is. Die water wat die pan vul is afkomstig van die Papkuilsrivier, waarvan die mond ongeveer 50 jaar terug na die see afgesluit is en die stroom na Rocherpan gedeflekteer is. In goeie jare stoot die water verder noord as die grense van die reservaat en daarom sal die opnames ook buite die grens gedoen word om 'n geheelbeeld te kry van hierdie waterekosistiem. Suid van die Papkuilsrivier is daar ook 'n reeks soutpanne wat miskien soortgelyk was aan Rocherpan voordat hierdie pan water gekry het van die Papkuilsrivier, en dit sal dus interessant wees om die twee pangedeeltes met mekaar te vergelyk.

Die Braun-Blanquet fitososiologiese opnamemetode sal gebruik word met spesiale verwysing na die struktuur van die plantegroei.

Keywords: Cape, pan, phytosociology, strandveld, vegetation survey

120. LE ROUX A

(Departement Natuur- en Omgewingsbewing, Kaapse Provinsiale Administrasie, Jonkershoek-natuurbeewingstasie, Privaatsak X5014, Stellenbosch 7600).

'n Oorhoofse studie van die plantegroei van Namakwaland

A. 'n Fitososiologiese/fisiognomiese studie van die plantegroei van Namakwaland

Met hierdie studie van die gebied word beoog om 'n beeld te kry van die plantegroei-eenhede binne Acocks (1975) se veldtipes. Die plantegroei sal gekoppel word aan die habitatte waarin dit voorkom. Die identifisering van gemeenskappe met hulle habitatte

sal unieke gebiede uitwys waar bv. endemiese of seldsame soorte voorkom. Die habitatsontleding sal ook kan uitwys of hierdie habitat en gemeenskap stabiel is en of dit in gevaar staan om vernietig te word. Hieruit kan gebiede aangetoon word wat nodig is vir bewaring.

Die Zurich-Montpellierskool van fitososiologie se opname- en verwerkingsmetodes sal gevolg word.

B. Die Flora van Namakwaland

'n Volledige lys van spesies wat in Namakwaland voorkom word opgestel met behulp van plantversamelings, herbariumrekords en uit literatuur.

C. 'n Plantgeografiese studie van Namakwaland

Die verspreidingspatrone van sekere spesies mag geografiese eenhede aandui wat uniek is, bv 'n sentrum of gebied waar 'n hele aantal endemiese spesies saam voorkom. So 'n gebied het dringend bewaring nodig.

Verspreidingsdata word verkry met behulp van herbariumrekords en uit literatuur en verspreidingskaarte word geteken.

D. Die seldsame en bedreigde plantsoorte van Namakwaland

Baie spesies is as gevolg van die droogtetoestande so gespesialiseerd dat hulle slegs in 'n baie noue ekologiese amplitude kan leef en hierdie habitatte is gewoonlik klein en yl verspreid. Dit is belangrik om te weet watter soorte is seldsaam; in watter kategorie van seldsaamheid hulle sorteer, om te weet of hulle bestaan bedreig word asook om die populasies te monitor.

Spesies wat ondersoek word is dié op die lys van seldsaam en bedreigde soorte soos opgestel deur die Werkgroep vir Seldsame en Bedreigde Plantsoorte, Bolus Herbarium asook spesies wat in literatuur as skaars aangegee word. Die ondersoek metodes en bepaling van kategorieë is gebaseer op die metodes wat deur die Werkgroep vir Seldsame en Bedreigde Plantsoorte, Bolus Herbarium, gebruik word.

Keywords : flora, Namaqualand, threatened species, vegetation survey

121. LLOYD P H

(Cape Provincial Department of Nature and Environmental Conservation, Jonkershoek Nature Conservation Station, Private Bag 5014, 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, feeding ecology, population dynamics

122. LOUW G N, R C BIGALKE and W R SIEGFRIED  
(Department of Zoology, University of Cape Town, Private Bag, Rondebosch 7700).

The ecological impact of herbivory on selected fynbos communities

The main aim of this project was to examine relative levels of arthropod and antelope herbivory in strandveld and to assess this in relation to nutritive and secondary compound levels present in the plants.

A thousand random points were used monthly to assess antelope browse. Because browse levels were low a qualitative "search" method was employed monthly as well. This involved examination of ca 300 individual plants along used antelope trails. Phenological observations on the vegetation were coupled to the latter method. A random point method of sampling twigs was used monthly to assess arthropod herbivory on five dominant broad-leafed shrubs. Arthropods were sampled monthly from the same species by beating so that the abundance and diversity of the phytophages could be assessed. In addition, the abundance and diversity of arthropods in strandveld in general were assessed using light trapping, pitfall trapping and sweep sampling.

Plant material was collected seasonally from a range of 21 plant species chosen to include browsed, unbrowsed and dominant plants. This was analysed for tannins, nutritive value and energy content.

Tannin levels are similar to the highest levels recorded in the literature. High tannin levels appear to correlate with low

levels of antelope browse and low levels of arthropod herbivory. Also arthropod herbivores appear to be less diverse on those shrubs which have higher tannin levels. In general, arthropod numbers peaked in spring and summer and dropped in late autumn.

Most of the fieldwork for this project has been completed - the remainder will be finished by July 1980. The tannin content and nutritive value of some plant samples still remain to be analysed. A complete literature search has been done and the writing up of the project has been started.

Keywords : Cape, fynbos, herbivory, secondary compounds

123. 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 spp on the Cape Flats (1979-1980).

Litter fall amounts and seasonality are currently being determined in five species from dune scrub (strandveld) vegetation and two introduced species of *Acacia*. Litter traps (area = 0,25 m<sup>2</sup>) are being used for catching of litter, which is subsequently divided into leaf, twig and flower/fruit components and weighed (dry mass at 105°C).

Apart from contributing to existing information on organic matter turnover in these systems, it is also hoped to determine major nutrients in subsamples (pending the availability of analytical facilities).

The study may be continued for a further year, particularly concentrating on *Olea exasperata*, the dominant shrub in the area.

Keywords : *Acacia* spp, Cape Flats, dune scrub, fynbos, litter fall

124. LOW A B  
(Cape Flats Nature Reserve, University of the Western Cape, Private Bag X17, Bellville 7530).

Allometric studies on the phytomass of dune scrub and other species occurring on the Cape Flats (1978-ongoing)

Allometric regression is being used to determine relationships between mass vs stem base circumference, or height, or both in various shrub species on the Cape flats.

Using these parameters linear regressions have proved significant in most cases :

<u>Acacia saligna</u>	:	$r = 0,987 (\log m \text{ vs } \log (\text{sbc})^2 \times h)$
<u>Euclea racemosa</u>	:	$r = 0,911 (\log m \text{ vs } \log (\text{sbc} \times h))$
<u>Metalasia muricata</u>	:	$r = 0,981 (\log m \text{ vs } \log (\text{sbc} \times h))$
<u>Olea exasperata</u>	:	$r = 0,968 (\log m \text{ vs } \log \text{sbc})$

In addition, Acacia, Euclea and Olea have been divided into leaf and various twig diameter classes (0 - 0,25; 0,25 - 0,5; 0,5 - 1,0; 1,0 - 2,0; 2,0 - 5,0; 5,0 cm). Regressions using the masses of leaves and the different classes are still to be performed.

A further three species Rhus crenatam, R glauca and R lucida are still to be studied.

It appears that allometry may be a useful tool in the study of aboveground phytomass in vegetation systems on the Cape flats. This is of obvious importance in the non-destructive determination of phytomass and in the saving of time and laborious drying procedures.

Keywords : allometry, Cape Flats, fynbos, phytomass, shrub species

125. LOW A B

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

Phytomass and nutrient studies in four ages of coastal fynbos in the Western Cape (1979-ongoing)

Aerial phytomass in each of four ages of coastal fynbos\* (Kraaifontein, Cape Flats - 6 and 11 years post burn; Mamre, west coast - 3<sup>1</sup>/<sub>2</sub> and 17 years post burn) growing on podsolized sand was examined by cropping three 2 m x 2 m or 2,5 m x 2,5 m plots. Litter was also sampled. At one plot in each age of vegetation, a pit was sunk to between 1,5 m and 2,1 m. Soil "horizons" were excavated at 15 cm intervals and root material removed by sieving the soil through a 3 mm x 3 mm mesh sieve.

Three subsamples of soil were collected from each "horizon" and are being kept for analysis.

Aboveground material was divided into live and dead standing (the former into different species). In the 3<sup>1</sup>/<sub>2</sub>- and 17-yr-old stands aerial parts are being placed into leaf and various twig size classes. Root material was divided into "live", "fibrous" and "dead" fractions.

To date the processing of material from the 6- and 11-yr-old stands has been completed; both aboveground and belowground parts were

dried at 105°C to constant mass and weighed. Total aerial phytomass varied between 482 and 780 g m<sup>-2</sup> (6 yr), and 1274 and 1914 g m<sup>-2</sup> (11 yr), with litter ranging from 12 to 76 g m<sup>-2</sup> and 31 to 129 g m<sup>-2</sup> respectively. Root phytomasses (excluding the "dead" fraction) were 2840 and 2796 g m<sup>-2</sup>.

At present material from the 3<sup>1</sup>/<sub>2</sub>- and 17-yr-old plots is being processed. In addition subsamples from all components of each age (aboveground and belowground) are being ground for subsequent nutrient analysis.

Aerial phytomass data compare with those from other heathlands growing on podsolized sands.

Root/shoot ratios of 4,55 (6 years) and 1,41 (11 years) are somewhat higher than those reported for Californian chaparral growing on clayey soils.

Three-and-one-half, 6- and 11-yr-old stands were dominated by Phyllis cephalantha, and by Protea repens in the 17-yr-old vegetation.

Keywords : belowground, coast, fynbos, nutrients, phytomass

126. LOW A B

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

Variation in vegetation and soil analytical parameters along a moisture gradient in the Winterhoek Mountains (1979-1980)

A moisture gradient in the Winterhoek Mountains north of Tulbagh was investigated for its variation in plant communities and soil analytical parameters.

A line transect and Braun Blanquet survey along the gradient revealed eight broad communities (one riparian, three floodplain, two moist sandy plain and two rocky outcrop).

Four soil samples (0-15 cm) were removed from each community and analysed. The following ranges were obtained : pH (3,69 - 5,35); OM (1,76 x 10<sup>4</sup> - 15,01 x 10<sup>4</sup>); total N (503-2712); total P (30-201); total cations : Ca (151-4746); Mg (24-506); K (39-154); Na (230-497) and base exchangeable cations - Ca (98-3772); Mg (22-108); K (17-344) (OM and nutrients in kg ha<sup>-1</sup>).

Nutrient levels, pH and OM in general compare with those from other heathland soils; the higher values obtained were however above the upper ranges previously reported for heathland systems. OM and nutrients (apart from Na) were as a rule positively correlated suggesting a close relationship between OM and nutrient turnover.

Moisture gradients of the type reported above are common in the Winterhoek Mountains and to some extent other mountain ranges in the Western Cape. Broad soil characteristics obtained here may therefore apply to similar communities elsewhere.

Keywords : Cape, fynbos, moisture gradient, plant communities, soil, Winterhoek Mountains

127. LOW A B  
(Cape Flats Nature Reserve, University of the Western Cape, Private Bag X17, Bellville 7530).

Phenology of common flowering species occurring on the Cape Flats

The phenology of some 25 perennial flowering species common to the Cape Flats was examined over a two-year period. About ten individuals from each species (where separate sexes were present, ten of each) were tagged in the Cape Flats Nature Reserve.

Every two weeks, budding, flowering and fruiting behaviour (presence/absence or later, % of whole individual) was recorded. A note was also made of shooting vigour and extent on the plant.

In addition stem length increments (at two to four week intervals) were measured in two Thamnochortus species (T erectus and T spicigerus). Both of these reeds, despite similar growth forms, have different growth and flowering patterns.

Casual observations (March 1979 - March 1980) were also made on the flowering times of the various predominant annual species present in the Reserve.

Individuals sampled occur in three broad communities : dune scrub (strandveld); flatland (resembling coastal fynbos) and wetland.

Analysis of the data (currently in progress) will therefore reveal differences and similarities among individual species as well as those existing in these broad communities.

Keywords : Cape, Cape Flats, dune scrub, fynbos, phenology, Thamnochortus

128. LUBKE R A  
(Department of Plant Sciences, Rhodes University, Grahamstown 6140).

Structural surveys of the woody vegetation of the Savanna Ecosystem Study Area, Nylsvley (1974-1980)

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

129. LUBKE R A  
(Department of Plant Sciences, Rhodes University, 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 : coast dune, eastern Cape Coast, vegetation

130. MACDONALD I A W  
(Natal Parks, Game and Fish Preservation Board, 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 (Feb 1978 to Dec 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

131. MACDONALD I A W  
(Natal Parks, Game and Fish Preservation Board, Hluhluwe Game Reserve, P O Box 25, Mtubatuba 3935).

The effect of hydrastumper removal of *Euclea divinorum* in Hluhluwe Game Reserve (May 1978 to May 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 when (a) all individuals are treated and (b) where 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, management, Natal, savanna, technique

132. MACDONALD I A W  
(Natal Parks, Game and Fish Preservation Board, Hluhluwe Game Reserve, P O Box 25, Mtubatuba 3935).

Characterization of the past fire regime in the Hluhluwe-Corridor-Umfolozi Game Reserve complex (May 1978 to Dec 1979)

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

133. MACDONALD I A W  
(Natal Parks, Game and Fish Preservation Board, Hluhluwe Game Reserve, P O Box 25, Mtubatuba 3935).

A review of the vegetation dynamics of the Hluhluwe-Corridor-Umfolozi complex (1979-1980)

As very little information on this aspect of the areas 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 : forest, land transformation, Natal, population dynamics savanna, vegetation

134. MACDONALD I A W and P J BIRKENSTOCK  
(Natal Parks, Game and Fish Preservation Board, Hluhluwe Game Reserve, P O Box 25, Mtubatuba 3935).

A review of knowledge on the avifauna of the central 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 to 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, forest, Natal, savanna, survey

135. MACDONALD I A W, P M BROOKS, J L ANDERSON and A WHATELEY  
(Natal Parks, Game and Fish Preservation Board, 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 : forest, Natal, savanna

136. MACDONALD I A W, L MEIKLEJOHN and E A ROY  
(Natal Parks, Game and Fish Preservation Board, Hluhluwe Game Reserve, P O Box 25, Mtubatuba 3935).

A bibliography of published and unpublished reports relating to the Hluhluwe-Corridor-Umfolozi 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, forest, Natal, savanna

137. MANRY D E  
(Percy FitzPatrick Institute of African Ornithology, University of Cape Town, Rondebosch 7700).

Eco-ethology 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 : breeding, feeding ecology, ibises, social behaviour

138. MILLS M G L  
(Kalahari Gemsbok National Park, Private Bag X5890, Upington 8800).

Factors controlling the spotted hyena population in the Kalahari Gemsbok National Park (1979-1981)

Information on movements, habitat use and feeding habits of spotted hyenas is being gathered by following animals in a vehicle at night during full moon periods. In addition, a marking program has been

initiated for purposes of monitoring population trends and long-term movements and data on breeding are being collected.

Initial results show that the hyenas live in fairly stable clans of 4 to 15 individuals. The clan home range is over 500 km<sup>2</sup> in extent and the hyenas hunt most of their food, particularly young gemsbok and wildebeest.

Keywords : behaviour, Cape, feeding ecology, Kalahari, movement, population dynamics, savanna, spotted hyena

139. MIMMACK G M, P D MORANT, T M CROWE and A MCKENZIE  
(Percy FitzPatrick Institute of African Ornithology, University of Cape Town, Rondebosch 7700).

Directional analysis of biological data

To provide a computer package which can describe and analyse statistically biological data which have a directional component, eg dispersal of ringed birds, orientation in large ungulates, and breeding in vertebrates.

Keywords : directional analysis, dispersal, orientation

140. MITCHELL D T and O A M LEWIS  
(Department of Botany, University of Cape Town, Rondebosch 7700).

Studies on phosphorus cycle in the fynbos biome (1979-1980)

The seasonal distribution of phosphorus in soils and specific elements of coastal fynbos at Pella is being studied. Soils of the Clovelly form have been analysed for Bray no 2, resin bag extractable inorganic and total phosphorus. Total and Bray no 2 phosphorus declined with depth to 40 cm but then increased further down the profile. Resin bag extractable phosphorus decreased throughout the profile and appeared to be the only fraction which varied seasonally. Inorganic phosphorus was mainly bound to iron. Analyses of the rhizospheres of specific physiognomic elements showed no variations in total phosphorus whereas resin bag extractable phosphorus was lowest in the rhizosphere of a restioid element.

Preliminary studies of shrubs of Leucospermum parile during April have shown an absence of new proteoid roots but old ones were present at the soil surface. Analyses of root systems of L. parile during April revealed higher total phosphorus levels in the lateral roots compared with proteoid roots. Early indications are that shoot growth of L. parile is out of phase with root growth.

Pot trials have also been carried out on seedlings grown in Clovelly soil from Pella and Hutton soil from Jonkershoek. Even though total phosphorus was considerably higher in Hutton compared

with Clovelly soils, both soils contained similar levels of resin bag extractable phosphorus. Growth of Leucadendron laureolum was more successful in the Clovelly soil with greater numbers of roots and larger proteoid roots being produced. It is suggested that the compaction of the fine textured Jonkershoek Hutton soil may have physically impeded root growth. High levels of phosphorus expressed on a dry weight basis were found in proteoid roots of L. laureolum which may be acting as a storage compartment prior to redistribution to the growth regions of the plant.

Keywords : Cape, fynbos, mineral cycling, phosphorus

141. MOLL E J and R COWLING  
(Department of Botany, University of Cape Town, Rondebosch 7700).

Vegetation dynamics within and between fynbos and adjacent biomes

The aim of the project is to characterize fynbos and non-fynbos plant communities in 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 occur under conditions of similar topography and macroclimate. The emphasis here is to investigate other factors (eg soil nutrients, patterns of landuse), which determine the distribution of the respective vegetation types, and to investigate their dynamic relationships. Vegetation units will be classified and characterized in terms of floristics and phytochorological affinities, functionally significant structural attributes, species diversity relations, post-fire reproductive strategies and modes of succession (see Moll and Cowling, 1979). A second site is the Gamtoos river valley where two parallel gradients (fynbos and non-fynbos vegetation), from approximately sealevel to 500 m have been analysed. Here we investigate parallel changes in community attributes (as above excluding dynamic aspects) along some identical environmental gradients.

At this stage fieldwork has been completed and plant specimens identified. Data are punched on computer cards and are awaiting detailed analysis.

Keywords : Cape, fynbos, vegetation dynamics, vegetation distribution

142. MOLL E J and D T MITCHELL  
(Department of Botany, University of Cape Town, Rondebosch 7700).

Phenology of fynbos plant communities

The aim of the project is to study the phenology of coastal fynbos relation to phosphorus, nitrogen, water and age after fire. Key questions to be answered:

1. Given the low, possibly limiting, soil phosphorus and nitrogen status of the soil:
  - (a) How does plant phenology relate to their seasonal availability in the soil and to their seasonal distribution in the plant?
  - (b) If polyphosphates occur in non-mycorrhizal and/or mycorrhizal fynbos species, when are they synthesized and mobilized, in relation to phenology?
  - (c) Is there redistribution of nutrients from senescing leaves immediately prior to leaf fall?
2.
  - (a) How is phenology related to different water regimes under the same climatic conditions?
  - (b) How do root and shoot growth, leaf production and fall relate to seasonal soil moisture and root depth?
3. How does plant phenology vary with age after fire in relation to its effects on soil nutrient and water status?
4. What is the seasonal biomass and energy allocation to reproduction and vegetative growth aboveground and belowground?

Four study sites have been selected on three soil types representing vegetation of two ages. Ten plants of five common species have been labelled at each site. Phenological activity of these plants is being observed at monthly intervals. Shoot growth, leaf fall, soil moisture at three depths and plant water potential at dawn and midday are to be measured at monthly intervals. Biomass and colorific values of reproductive and vegetative aboveground and belowground parts are to be determined for two species at bimonthly intervals.

Plants on the study sites have been labelled. Recording of phenological activity and shoot and leaf fall measurements has been initiated.

Keywords : Cape, fynbos, fire, nutrition, phenology, water relations

143. MULLER D B  
(Afdeling Natuurbewaring, Provinsiale Administrasie van die Oranje-Vrystaat, Posbus 517, Bloemfontein 9300).

Die Plantekologie van die Willem Pretorius-wildtuin (1976-1980)

Die plantegroei van die Willem Pretorius-wildtuin in die sentrale Oranje-Vrystaat word synekologies ondersoek volgens die Braun-Blanquet-tegniek. Die 428 relevés is getabuleer in ses tabelle waaruit die syntaxa onderskei word. Die syntaxa word

gekorrelleer met edafiese en geomorfologiese eienskappe van die omgewing. Die benuttingspotensiaal van die syntaxa deur wild word geëvalueer met die oog op die bestuur van die gebied.

Keywords : Braun-Blanquet, classification, grassland, Orange Free State, phytosociology, soil

144. NEL P S  
(Afdeling Natuurbewaring en Toerisme, Privaatsak 13186, Windhoek 9000).

Monitering van die beskikbaarheid, gehalte en benutting van voer op die gruisvlaktes en duine van die Kuiseb-studiegebied (1978-1981)

Produksie, bedekking en benutting van voer op die gruisvlaktes en duine van die Kuiseb-studiegebied word bepaal. Migrasieroetes, wildverspreiding en die wildlading van die Namibwoestynpark word bepaal.

Keywords : carrying capacity, South West Africa, vegetation dynamics

145. NORTON P M  
(Jonkershoek Nature Conservation Station, Private Bag X5014, Stellenbosch 7600).

The habitat and feeding ecology of the klipspringer in two areas of the Cape Province

The study investigates the habitat preferences and ecological adaptations of the klipspringer in the Namaqualand and the southern Cape mountains. Klipspringer social organization was found to consist of a monogamously mated pair defending a territory which varies in size according to rainfall. The pair bond is very strong and role differentiation occurs, with the male spending more time than the female in anti-predator vigilance. Anatomical and physiological adaptations include a modified digit structure, kidneys with a high concentrating ability, and a unique pelage for insulation. Seasonal variations in activity patterns and feeding preferences are discussed in relation to weather conditions, metabolic requirements and possible plant-defensive mechanisms. Klipspringers avoid competition with other small antelope by preferring more rocky terrain. The significance of all these factors in relation to the conservation and management of klipspringer populations is examined.

Keywords : Cape, feeding ecology, hyrax, klipspringer, management, mountain, social behaviour



146. NORTON P M  
(Jonkershoek Nature Conservation Station, Private Bag 5014,  
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. Radio-telemetry will be needed and a method of collecting population statistics on small antelope, dassies, game bird 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, conservation, feeding ecology, leopard, management, mountain, movement, population dynamics

147. OWEN-SMITH R N  
(Centre for Resource Ecology, Department of Botany, University of the Witwatersrand, P O Box 1176, Johannesburg 2000).

Natural regulation of large herbivore populations : population ecology of kudu in the Kruger National Park (1974-1984)

The objectives are to relate changes occurring within a natural population of large herbivore to controlling factors in terms of food availability and social organization. Kudu is used as the representative species because of the potential to identify every animal in the population individually through variations in stripe patterns. Moreover for a browser it is easier to record detailed feeding behaviour than would be the case for a grazing ungulate. Data are based on an individually registered sample of up to 900 animals in two separate study areas in the Tshokwane and Pretorius Kop districts of the Kruger National Park.

The increase by the female-young segment was 47% between 1974 and 1978, but an analysis of age structure indicates an overall population expansion between 1971 and 1978 of about 250%. This consistent increase is associated with a series of above-average rainfall years. A decline of ca 10% occurred over 1978-1979 following a poor rainfall season. Year-to-year variations in

rates of increase appear directly related to rainfall fluctuations. These are most sensitively influenced by changes in juvenile survivorship to six months of age (including prenatal losses). Changes in foraging efficiency are being measured to assess which features are related to population changes. Female-young clans have greatly increased in size since 1974, but remain intact and still occupy the same home ranges. Males exhibit a high disappearance rate after two years of age, resulting in a strongly skewed sex ratio. The movements and activity time investments of breeding males are being measured to assess the influence of the non-territorial breeding system on male mortality.

Keywords : age structure, behaviour, breeding, feeding ecology, habits, Kruger National Park, kudu, population dynamics, savanna, social organization, Transvaal

148. PENDLE B G and G C BATE  
(Department of Botany, University of the Witwatersrand,  
P O Box 1176, Johannesburg 2000)

Plant/Water relations of a South African Savanna

Aspects of the plant/water relations of five northern Transvaal veld species, Burkea africana, Ochna pulchra, Terminalia sericea, Eragrostis pallens and Digiteria eriantha, have been investigated at Nylsvley Nature Reserve.

The main variables measured were transpiration rates, by cut shoot mass loss, leaf resistance, with an automatic diffusion porometer, and water potential by both the pressure bomb and dew-point sample chambers.

The transpiration data have not been fully analysed with respect to micro-meteorological data as yet. Typical midday transpiration rates for the three trees are three to four g g dry mass<sup>-1</sup> hr<sup>-1</sup> with B africana invariably the higher of the three. The transpiration rates of the grasses were about two to three times higher than the trees.

There was little evidence of midday stomatal closure using transpiration rates and the leaf resistances for most of the 1979/80 season. Leaf resistance values appeared to react more to changes of light intensity than to water potential ie high light intensity gave low leaf resistances. This was consistent for all the species studied. It must however be noted that the 1979/80 season was particularly wet from mid-October to the beginning of April.

The plants under investigation obtained low water potential values, even shortly after substantial rain, and values of -20 bars for B africana and O pulchra and -15 bars for T sericea were common.

Keywords : water relations, savanna, transpiration, Transvaal

149. 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 whilst 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 and scoring of each matrix has been completed. The project has reached an advanced stage and the write-up of the report will be completed shortly.

Keywords : dams, environmental impact assessment, management, Natal, savanna

150. 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,  
long-term)

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, Natal, urban open space

151. REY C and GARNETT H M  
(Department of Microbiology, University of the Witwatersrand,  
P O Box 1176, Johannesburg 2000).

Morphological and physiological studies of plant diseases on  
selected species in the *Burkea* savanna (1979/1980)

The severity of the diseases occurring on *Burkea africana*,  
*Digitaria eriantha*, and *Panicum maximum* has been studied throughout  
the growing season, using disease assessment keys to estimate  
incidence and severity of infections. An increase in both these  
parameters has been noticed for all infections between October 1979  
and April 1980. The figures however were much lower than for the  
previous season. The relationship between these parameters varies  
with species and pathogen.

Morphological and physiological studies were also carried out.  
Ultrastructural changes were noted in infected cells and in several  
cases the chloroplasts were affected. Chlorophyll concentrations  
also appeared to alter with infection, depending on the stage and  
extent of the disease. Photosynthesis remained unaffected in some  
cases and 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 : pathogens, physiology, savanna, Transvaal

152. ROBERTSON H N  
(School of Environmental Studies, University of Cape Town,  
Rondebosch 7700).

An assessment of the utility of Verlorenvlei water

Verlorenvlei is a coastal lake and reed swamp system on the west  
coast of South Africa. The location, climate and catchment  
geology are the major factors that effect the quantity and quality  
of the water. Quantity and quality characteristics determine  
water utility. This environmental study indicates that the salt  
content of the vlei water limits its quality and therefore its  
utility for agricultural and domestic use. Utility is high for  
fishes and birds and there is a potential for carefully controlled  
recreational use. A detailed investigation of the agricultural  
use of the area should be carried out as soon as possible because  
there are indications of degradation which in an arid area can lead  
to desertification or soil salinification.

Keywords : agriculture, coast, estuary, lake, salinity, swamp,  
water quality

153. ROWE-ROWE D T  
(Natal Parks, Game and Fish Preservation Board, P O Box 662,  
Pietermaritzburg 3200).

The influence of jackals on antelope populations in the Drakensberg

It has been suggested that black-backed jackals exert an undue influence on populations of small antelope. In Giant's Castle Game Reserve information is being collected on jackal diet and antelope numbers. Jackal movements are being studied using telemetric techniques.

Keywords : antelope, black-backed jackal, grassland, movement, Natal, predation

154. ROWE-ROWE D T  
(Natal Parks, Game and Fish Preservation Board, P O Box 662,  
Pietermaritzburg 3200)

Mammal distribution and density in relation to fire

Information on the distribution and abundance of small mammals and antelope in relation to fire is being collected in Giant's Castle Game Reserve - a mountainous grassland area.

Keywords : antelope, density, distribution, fire, grassland, Natal, small mammals

155. RUSSELL S  
(Botany Department, Fort Hare University, Private Bag X1314, Alice  
5701).

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 reveal 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 paid to the characterization of the forest microclimate and the physiological responses of several bryophyte species of "indicator" value.

Keywords : bryophytes, Cape, forest, microclimate, phytosociology, water relations

156. RUTHERFORD M C  
(Botanical Research Institute, Private Bag X101, Pretoria 0001)

Biomass and seasonal biomass change of woody plants in Burkea savanna

Fieldwork for this project has now largely terminated and results are being organized into a series of papers. These are : "Above-ground biomass subdivisions in woody species of the savanna ecosystem project study area, Nylsvley" (published in 1979 as South African National Science Programmes Report No 36); "Woody plant biomass distribution in Burkea savannas" (in press - in Ecology of tropical savannas - edited by B J Huntley and B H Walker); "Field identification of roots of woody plants of the savanna ecosystem study area, Nylsvley" (published in 1980 in Bothalia 13: 171-184); "Plant-based techniques for determining available browse and browse utilization : a review" (published in 1979 in The Botanical Review 45: 203-228); "Survival, regeneration and leaf biomass changes in woody plants following spring burns in Burkea africana - Ochna pulchra savanna" (in press - Bothalia); "Primary production studies in the savanna ecosystem project study area Nylsvley" (In press - a joint paper in Ecology of tropical savannas - edited by B J Huntley and B H Walker); "Root systems, root:shoot biomass ratios and seasonal root tip extension in Burkea africana - Ochna pulchra savanna" (in preparation); "Seasonal shoot growth of woody plants in Burkea africana - Ochna pulchra savanna" (in preparation) and "Seasonal stem biomass increment as related to annual and diurnal changes in stem radius of woody plants in Burkea africana - Ochna pulchra savanna."

Keywords : biomass, fire, leaf area index, roots, root/shoot ratios, savanna, seasonal production, Transvaal, woody plants

157. 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

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 patterns. 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 i e 30°C, transpiration exceeded 1.4 mg cm<sup>-2</sup>h<sup>-1</sup>. P repens frequently transpires at night, even when it is quite short of water. A common rate was between 0.1-0.2 mg cm<sup>-2</sup>hr<sup>-1</sup>. This was not typical xeromorphic behaviour. But

certain Eucalyptus spp 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 i e 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  $9.6 \text{ kW m}^{-2}$ .

No field work has yet been undertaken on P repens but the Forestry Department has dendrographic data on 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 : Cape, dendrographic techniques, fynbos, water relations

158. SCOTCHER J S B  
(Natal Parks, Game and Fish Preservation Board, P O Box 662,  
Pietermaritzburg 3200).

A land capability analysis for eland in Giant's Castle Game Reserve  
(1975-1981)

The eland in the Natal Drakensberg represent an isolated population about which little is known. A study is therefore in progress to : determine population trends of eland in Giant's Castle Game Reserve in particular and in the Drakensberg as a whole; to measure the extent of utilization of the herbaceous and woody plant components in the reserve; to measure the animals' seasonal condition, reproductive activity and breeding success; to determine the carrying capacity of the reserve and the Drakensberg as a whole; and to make recommendations for future management and research.

The approach has been : to classify, describe and map the woody plant vegetation in detail; to identify the major food items from faeces and stomach samples by microscopic analysis using a permanent reference collection; to assess the degree of utilization of the vegetation via permanent transects in the woody plant component and non-permanent transects in the herb layer; to plot seasonal distribution from aerial surveys of the reserve; to record the animals' association with various habitats and vegetation types; to examine the quality and quantity of all food available to them; to examine the age and sex ratio of the herds over the years; to determine age of dead animals found in the Drakensberg; and to examine the kidney fat and bone marrow fat for condition analyses and the reproductive organs for fertility, seasonality of breeding, sex ratio at birth and conception rate.

Fieldwork is complete and the write-up is in progress.

Keywords : aerial census, carrying capacity, eland, fire, grassland, habitat associations, management, movement, Natal, population dynamics, wildlife

159. SCOTCHER J S B  
(Natal Parks, Game and Fish Preservation Board, P O Box 662, Pietermaritzburg 3200).

Status of klipspringer in the Drakensberg reserves (1974-1979)

In 1973 staff of the Natal Parks Board expressed concern over the status of klipspringer in the Drakensberg. As a result a preliminary study was put into operation in January 1974 to assess the status of this species in the Drakensberg game reserves before considering further research or management action.

The status of this animal in the five Natal Parks Board reserves, with particular reference to Royal Natal National Park, was assessed by employing monthly counts along set routes for a period of five years. Results showed that the population is stable, there being no significant difference in numbers between months or years, and that concern over their alleged decline appears unjustified. Mean group size was 2,74, typical group size was 3,00 and home range was estimated to be between 8,9 and 12,2 ha. The distribution of klipspringer in Royal Natal National Park was mapped and total estimate is put at 60-70 animals. Recommendations for future research and management are given.

Keywords : census, distribution, Drakensberg, grassland, group size, home range, klipspringer, management, Natal, sex ratio

160. SCOTCHER J S B  
(Natal Parks, Game and Fish Preservation Board, P O Box 662, Pietermaritzburg 3200).

An evaluation of veld condition in Moor Park Nature Reserve (1977-ongoing)

This reserve has suffered severe veld degradation during the last 200 years. Since 1970 the Natal Parks Board has introduced various species of herbivores and, since 1976 it has had to reduce the numbers of impala, black wildebeest and blesbok and to maintain the numbers of most animals at a predetermined stocking rate. In order to determine the effectiveness of this approach, it was necessary to monitor at frequent intervals the condition of the veld. This was done using the Foran method of veld condition assessment which involves 200 points in a 30 x 30 m plot in which strikes and nearest plant are identified. Condition is then scored relative to an "ideal" state or benchmark. Ten sites have been analysed and will be remeasured in late summer 1981.

Keywords : grassland, Natal, veld condition



161. SCOTCHER J S B and J C CLARKE  
(Natal Parks, Game and Fish Preservation Board, P O Box 662,  
Pietermaritzburg 3200).

The effect of fire on grasslands in Giant's Castle Game Reserve  
(1978-1980)

In 1973 the Natal Parks Board initiated an experimental biennial summer burning programme in selected areas of Giant's Castle Game Reserve in the belief that this approximated the most common "natural" fire regime and that the effect of such a fire on scrub and forest would be minimal when compared with a spring burn. As part of the national programme investigating the ecological effects of fire, these burns were evaluated in terms of their species composition, basal cover and aboveground standing crop.

Results have not yet been analysed.

Keywords : basal cover, Drakensberg, fire, grassland, Natal, phytomass, species composition, veld condition

162. SCOTCHER J S B, J C CLARKE and P B LOWRY  
(Natal Parks, Game and Fish Preservation Board, P O Box 662,  
Pietermaritzburg 3200.

Fire ecology in the Natal Drakensberg (1978 - 1980)

As part of the CSIR Fire Ecology Programme, the objectives of this programme are :

(1) to provide a forum for the review and synthesis of research and knowledge on the ecological effects of fire in South African ecosystems, in particular in terms of :

(a) the ecological processes involved in the manner in which fire influences and is influenced by ecosystem characteristics and

(b) management strategies for fire-regulated ecosystems particularly in the agricultural, wildlife and forestry spheres.

(2) to identify gaps in current fire ecological knowledge and to stimulate research in these areas within the framework of a three year programme.

As a result of workshop meeting, eight research and review themes were identified for each of the three biomes. As far as the Natal Parks Board's contribution to the grassland biome was concerned, the following themes were identified :

1. Characteristics of fire regime in the Natal Drakensberg reserves.

2. Effects of fire regime on vegetation structure and dynamics.
3. Effects of fire regime on herbage production and quality.

Keywords : Drakensberg, fire, grassland, Natal

163. SCOTCHER J S B, J C CLARKE and P B LOWRY  
(Natal Parks, Game and Fish Preservation Board, P O Box 662,  
Pietermaritzburg 3200).

A history of veld burning in the Natal Drakensberg Game and Nature Reserves (1978-1980)

As part of a national programme investigating the ecological effects of fire, all available reports of N P B officers stationed in the Drakensberg were examined for records of fires. Fires were classified into five categories viz (1) scheduled and (2) unscheduled, which includes accidental, lightning, arson and unknown.

Results have not yet been analysed.

Keywords : Drakensberg, fire, grassland, Natal

164. SCOTCHER J S B, J C CLARKE and P B LOWRY  
(Natal Parks, Game and Fish Preservation Board, P O Box 662,  
Pietermaritzburg 3200).

The effect of fire on herbage production and quality in Giant's Castle Game Reserve (1978-1980)

As part of the national programme investigating the ecological effects of fire, this study examines the quality of herbage following spring and autumn fires, and in unburnt grassland, with special emphasis on the food value for large herbivores. Production of total aboveground standing crop and the quality of green grass, dry grass, grass stem/inflorescence and forbs are measured on a monthly basis in various treatments and altitudes; herbage quality is similarly assessed.

Results have not yet been analysed.

Keywords : Drakensberg, fire, grassland, herbage biomass, herbage quality, Natal

165. SCOTCHER J S B and N M TAINTON  
(Natal Parks, Game and Fish Preservation Board, P O Box 662,  
Pietermaritzburg 3200 and Department of Pasture Science, University  
of Natal, P O Box 375, Pietermaritzburg 3200).

An evaluation of veld condition in Weenen Nature Reserve (1979-ongoing)

This reserve suffered severely whilst being grazed by cattle under

private ownership. When it was expropriated by the Department of Agricultural Technical Services, it was used as an experimental soil erosion reclamation farm, before being handed to the Natal Parks Board in 1976. Since 1979, various species of herbivores have been introduced with limits set to the stocking rate. In order to determine their impact on the vegetation it was necessary to establish baselines under a non-utilized state and to monitor any changes following the initial and further introductions of game.

The herbaceous layer was measured using the Foran method of veld condition assessment which involves 200 points in 30 x 30 m plot in which strikes and nearest plant are identified. Condition is then scored relative to an "ideal" state or benchmark. Woody vegetation in each plot was mapped, and various measurements of each species were recorded eg height, crown diameter, minimum browse height, number of stems etc.

Seventeen sites have been completed, baseline data established and further monitoring will take place in two years' time (1981).

Keywords : grassland, Natal, veld condition

166. SHAUGHNESSY G L  
(School of Environmental Studies, University of Cape Town,  
Rondebosch 7700)

History of the introduction and spread of certain alien plants in the vicinity of Cape Town

The problem of invasive alien plants in the western Cape is viewed from a historical perspective. Attention is focused particularly on 13 species : Acacia (6 spp), Albizia lophantha and Hakea (3 spp) Leptospermum laevigatum, and Pinus (2 spp) in the vicinity of Cape Town, that is, on the northern Cape peninsula and the Cape flats (examples, respectively, of Acocks's vegetation types 69 Macchia and 47 Coastal Macchia). Addition of historical data to the ecological data that have been collected by other workers, should contribute to our understanding of the success of these alien species.

The study is based to a large degree on manuscript sources held in the Cape Archives used in conjunction with annual reports of government departments and other contemporary accounts. The results are currently being written up.

Keywords : Cape, fynbos, historical ecology, invasive plants

167. 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-hactare 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 : avifauna, birds, fynbos, vegetation structure

168. SOWLER S G  
(Department of Biological Sciences, University of Natal, King George V Avenue, Durban 4001).

Reproduction in *Epomophorus wahlbergi* (1977-1981)

Aspects of reproductive physiology, body growth and age determination of *Epomophorus wahlbergi* from the south coast of Natal are being studied in both wild populations and captive breeding colonies, with particular emphasis on the length of gestation, the possibility of delayed implantation, age at puberty, proximate and ultimate factors influencing reproduction, and the sequence of tooth eruption and attrition.

The main birth peak occurs from the middle of November until early February with a second minor peak in May. Gestation from copulation to birth is five months, with evidence of a period of delayed implantation. A distinct progestational endometrial reaction occurs. Females copulate at six months of age and give birth for the first time at 11 months of age. Males however do not show sexually dimorphic features characteristic of maturity until they are 16 to 18 months old. Parturition takes place when the female is hanging in the normal roosting position, and has been observed to occur from late morning to early afternoon. The young is born head first assisted by the washing action of the mother's tongue. The young suckle from the mother until they obtain a full set of permanent teeth. They can fly when three months old, but will still return to the mother for milk until they are four months old.

Data on tooth eruption have been obtained and a table has been compiled for age determination of bats from birth to 13 weeks. Growth curves using linear measurements of forearm length and eye to nose distance have been drawn using the Von Bertalanffy growth equation.

Keywords : age determination, breeding, *Epomophorus*, growth, Natal, reproduction

169. STEYN D  
(Department of Zoology, University of Natal, P O Box 375, Pietermaritzburg 3200).

Reproduction of the hyrax *Procavia capensis* in relation to environmental factors (1978-1980)

The fieldwork for this project was carried out from December 1978

to November 1979 on a farm called 'Gelukstadt' in the Muden Valley, Natal. On the 14 collection trips a total of 103 dassies were collected and processed.

The reproductive condition of the dassies was investigated based on a shot sample of at least three males and three females every month for twelve months. Emphasis was placed on variation in reproductive condition with age, season and physiological condition. Age at puberty and reproductive senescence was investigated in the male and female, and proximate environmental and social factors influencing seasonal breeding were determined. Detailed anatomical descriptions of the male and female reproductive tracts were produced with emphasis on those anatomical features that undergo seasonal changes.

An age-determination technique based on both tooth eruption and attrition and an increase in eye lens mass was devised. Both techniques were correlated with the growth in mass and length of selected body parameters.

Keywords : age determination, breeding, hyrax, Natal, physiological condition, reproduction

170. TARBOTON W R  
(Transvaal Provincial Administration, Nature Conservation Division,  
P O Box 327, Nylstroom 0510).

A survey of birds of prey in the Transvaal (1978-1980)

There is evidence that several raptor species have diminished greatly in numbers in recent decades. However, quantitative data are lacking and this project is designed to obtain the necessary data.

The objectives of this project are to assess the following, for each of the 49 birds of prey known to breed in the Transvaal:

- (a) the number of breeding pairs in the Province
- (b) the distribution of the main population pools of each
- (c) the average annual productivity of these populations.

Results will be used to allocate species to different levels of conservation priority. Further, an attempt will be made to assess, for those species rating the highest conservation priority, the factors which are contributing to their threatened status and effective conservation measures will be considered.

Keywords : birds, faunal survey, Transvaal

171. TAYLOR H C  
(Botanical Research Unit, P O Box 471, Stellenbosch 7600).

A physiognomic and floristic reconnaissance of Cape fynbos  
vegetation at the Rooiberg

Mountain fynbos vegetation of the Rooiberg State Forest was studied using simple physiognomic criteria and total floristic composition of the plant cover. The relationship between physiognomic and floristic units is discussed with an emphasis on the ecological meaning.

Keywords : floristic, fynbos, physiognomy, vegetation classification

172. TAYLOR H C  
(Botanical Research Unit, P O Box 471, Stellenbosch 7600).

Botanical survey of mountain fynbos vegetation

Fieldwork for assessing the rate of infestation of plant invaders in the Cape of Good Hope Nature Reserve over a ten-year period was completed during the year. This entailed relocating 27 permanent sample plots and re-enumerating the invader density in them.

The structural units and floristic associations identified during the primary survey of Rooiberg Mountain Catchment Reserve, near Ladysmith, closely correlate with one another and their distribution reflects the major environmental influences, aspect and altitude. It is concluded that, despite the preliminary character of the survey, resource inventories of this type are suitable as a foundation for park management.

A preliminary study of floristics has also been published, in which it was shown that the Rooiberg flora has strong affinities with the eastern fynbos element and with the dry fynbos of the inland mountain ranges.

Keywords : distribution, floristic, fynbos, invasive plants management, mountain, Rooiberg, vegetation

173. VAN DAALEN J C  
(Saasveld Forestry Research Station, Private Bag X6531,  
George 6530).

Investigation of methods of re-establishment of indigenous forest  
communities on abandoned plantation areas adjoining the forest in  
the southern Cape (1979-ongoing)

Indigenous forest reconstruction is one of the five management classes for indigenous forests. The others are production, research, protection and recreation. This investigation is aimed at finding the most suitable method of re-establishing indigenous forest species on cleared or disturbed sites and other sites in the reconstruction class.

Several field experiments have been laid out. More will be laid out during 1981. This is a long-term investigation, but progress will be reported on from time to time.

Keywords : Cape, forest, plantation, regeneration, succession

174. VAN DAALEN J C  
(Saasveld Forestry Research Station, Private Bag X6531,  
George 6530).

Investigation of the colonisation of fynbos areas and disturbed sites by indigenous forest communities in the southern Cape (1978-1981)

This study is designed to determine which growth sites can be colonized by indigenous forest communities. Sites adjoining the southern Cape indigenous forests have been analysed. These were sampled by means of 10 m<sup>2</sup> plots laid down on a 100 x 25 m grid system across the forest edge. Height of all vegetation and amount of cover, and all soil and environmental data were noted.

Multivariate ordination techniques were used to analyse the data. Preliminary results and conclusions were :

- (a) Except for the marginal areas, where soil moisture is important, soil physical properties do not control the indigenous forest/fynbos ecotone.
- (b) The indigenous forest does not colonize fynbos sites.
- (c) Fynbos is not a seral stage to forest.
- (d) The macroclimate is apparently too dry for indigenous forest. The southern Cape forests appear to be relicts.

Keywords : Cape, dynamics, ecotone, forest, fynbos, succession

175. VAN DER MEULEN F  
(Botanical Research Institute, Private Bag X101, Pretoria 0001).

Plant sociology of the western Transvaal bushveld: a syntaxonomic and synecological study

About 25 000 km<sup>2</sup> of savanna-woodland in the western Transvaal were studied using the Braun-Blanquet approach. The floristic composition, structure, habitat and distribution of 22 associations are newly described. Their syntaxonomy and synecology is discussed with an emphasis on three broad vegetation-habitat situations: (i) microphyllous, thorny vegetation of warm, dry lowlands, (ii) mesophyllous vegetation of cool, moist uplands and (iii) transitional vegetation. In accordance with this distinction, the communities are arranged on a mesic-zeric gradient.

Species diversity of the communities and leaf type of the predominant woody plants is discussed. The provisional syntaxonomic ranking presented here is compared with Acocks's classification of veld types. An annotated checklist and a species-family index are included as appendices. Ten phytosociological tables are included as loose sheets in the back cover pocket of the book.

Keywords : phytosociology, savanna, synecology, syntaxonomy

176. VAN DER MEULEN F and J C SCHEEPERS  
(Botanical Research Institute, Private Bag X101, Pretoria 0001).

On vegetation studies and land evaluation in South Africa

After a brief introduction concerning the nation's physical potentialities, the role of plant ecological studies of different scales for land evaluation in South Africa is discussed. Ideas are presented on the use of future vegetation surveys for nature conservation.

Keywords : land evaluation, vegetation mapping, vegetation survey

177. VAN DER MEULEN F and J W MORRIS  
(Botanical Research Institute, Private Bag X101, Pretoria 0001).

Large-scale vegetation-soil patterns in the western Transvaal bushveld

A detailed vegetation-soil pattern consisting of alternating narrow strips of grassland and wooded scrub was studied in the northern Transvaal. Differences in structure and floristic composition between the wooded community and the grassland are discussed in relation to soil analytical data.

Keywords : savanna, soil, vegetation pattern

178. VAN DER MEULEN F, J W MORRIS and R H WESTFALL  
(Botanical Research Institute, Private Bag X101, Pretoria 0001).

A computer aid for the preparation of Braun-Blanquet tables

A non-clustering, FORTRAN IV computer programme package for the preparation of phytosociological tables is described and examples of results are given. The advantages of being able to prepare camera-ready tables by this means are discussed.

Keywords : phytosociology



179. VAN DER MEULEN F and R H WESTFALL  
(Botanical Research Institute, Private Bag X101, Pretoria 0001).

Structural analysis of bushveld vegetation in the western Transvaal, South Africa

In savanna woodland vegetation of the western Transvaal, Dansereau's system of structural diagrams is applied to communities which are floristically very similar but structurally quite different. The effect of certain (complexes of) habitat factors upon the structural types depicted is discussed. Some advantages and disadvantages of the use of the present technique are mentioned. The problem of structure in the classification of vegetation on a floristic basis is briefly dealt with.

Keywords : savanna, structural diagram, vegetation structure

180. VAN DER MEULEN F and R H WESTFALL  
(Botanical Research Institute, Private Bag X101, Pretoria 0001).

A vegetation map of the western Transvaal bushveld

On the basis of a map of land-types (complexes of terrain form, soil and climate), plant community complexes of the western Transvaal bushveld were inferred and mapped at a 1:250 000 scale. The syntaxonomy and synecology of the communities is summarized.

Keywords : savanna, vegetation mapping

181. VAN DER ZEL D W and O G MALAN  
(Department of Forestry, Private Bag X93, Pretoria, 0001 and NFNL, CSIR, P O Box 395, Pretoria 0001).

Preparation of a forestry map of South Africa using LANDSAT data (1977-1981)

Since 1977 a development study is in progress by which it is attempted to produce a forestry map with the aid of LANDSAT information. Classification into indigenous and exotic forests is aimed at. We hope to be able to classify exotic plantations into softwoods and hardwoods.

A first progress report on a feasibility study of an area around Lake St Lucia in Zululand is nearing completion and will be ready after April 1980. This study paved the way for a prognosis that such a map can be produced from LANDSAT data, as well as identifying several problems. A further progress report on extension of the study to an area in Swaziland and southern Transvaal is now in preparation. New problems were identified, for example, the shadow effect in mountainous areas. It was, however, confirmed that ultimately a map of the classes specified can be obtained. Extensive use was made of a special computer programme package, especially of unsupervised and semi-supervised classification, available at the CSIR.

The next step of investigation will be to find the classes which best bring out the different forestry vegetations. It is foreseen that eventually a number of different techniques adapted to regional topography will be used to obtain the forestry map in 1980. Regular coverage of LANDSAT thereafter can result in regular updating of the map.

Keywords : classification, forest, LANDSAT-1, mapping, remote sensing, South Africa, timber plantations

182. VAN WILGEN B W  
(Jonkershoek Forestry Research Station, Private Bag X5011, Stellenbosch 7600).

Long-term effects of fire regime on fynbos plant community structure in Langrivier and vicinity, Jonkershoek State Forest (1979-1980)

This study is aimed at comparing structure of adjacent stands of fynbos which have been managed on different burning rotations. Langrivier has been protected from fire since 1942. Adjacent firebreaks have been managed on a four-year burning rotation, while another adjacent stand was burnt in 1942 and again on 1958.

Biomass of stands representing vegetation under each fire regime was determined by means of clip plots for lower strata and allometric subsampling for larger shrubs. Data are soon to be published.

The effects of fire regime on the floristics of the communities was investigated by means of 100 relevés of 5 by 10 metres. On each relevé all vascular plants were listed and cover-abundance values assigned. Stratification, total cover and heights of important species were noted. Fieldwork has been completed and data will be prepared for publication in the coming year.

Keywords : burning frequency, Cape, fire, fynbos

183. VAN WILGEN B W  
(Jonkershoek Forestry Research Station, Private Bag X5011, Stellenbosch 7600).

A phenological study in a fynbos community at Swartboschkloof, Jonkershoek State Forest (1975-1981)

Phenological studies were initiated with the aim of establishing the essential features of seasonality in fynbos plant communities, principally because this is necessary in order to understand the differential effects on vegetation of season of burning.

Tagged individuals of a number of representative species of a typical fynbos community were monitored for phenophase over a 24 month period. Shoot elongation in three dominant species of

Proteaceae, has been measured over a similar interval. These observations have been terminated, but litter fall observations will continue for another year. A report is to be compiled shortly.

Keywords : Cape, fynbos, phenology

184. VAN WILGEN B W  
(Jonkershoek Forestry Research Station, Private Bag X5011, Stellenbosch 7600).

Investigation of the population dynamics of *Widdringtonia cedarbergensis* Marsh and its interaction with fire (ongoing)

This project was initiated with the objective of studying critical features of reproduction and growth of *Widdringtonia cedarbergensis* in relation to the incidence of veld fires, since the effect of fire is the most controversial aspect of conservation of the species.

A long-term programme of monitoring by means of population assessment in permanent sample plots is under way and a good picture of fire survival, germination and growth is emerging. These data are supplemented by means of monitoring by small format air photography to assess adult tree survival of fire. A detailed map of the distribution of the species has recently been prepared, mainly from black and white aerial photographs.

The programme of field research has not yet clarified several important questions. Germination and establishment in nature is highly unpredictable. Most attempts at artificial re-establishment have failed. Autecological studies, to discover the set of environmental conditions which determine establishment and successful growth are a priority, as is the study of the influence of small mammals on establishment. These problems will most likely receive attention from 1981 on.

Keywords : Cape, fire, fynbos, population dynamics, Widdringtonia

185. 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 (1979-1980)

A survey of all fires occurring on State forest and mountain catchment land in the western Cape forestry region during one calendar year was undertaken by means of questionnaires. The survey was completed on 31 March 1979. A report on the project is nearing completion. Information contained in the report includes weather and fuel data, cost breakdowns and fire behaviour

characteristics for prescribed burns. Causes and behaviour of wildfires under the relevant weather conditions are also given. Seasonal distribution of burns was also investigated. The report should provide a preliminary picture of present burning regimes, with special reference to prescribed burning as opposed to wildfires. Preliminary information has been gathered for a fire danger rating system. But this aspect of the project will receive further attention in the future. These results will be used in the design of a new five-year programme of research in this field.

Keywords : Cape, fire, fynbos, management, prescribed burning

186. VAN WILGEN B W and F J KRUGER  
(Jonkershoek Forestry Research Station, Private Bag X5011,  
Stellenbosch 7600).

Investigation of the effects of burning and protection of fynbos  
veld in experimental catchments at Jonkershoek, Jakkalsrivier and  
Zachariashoek Research Stations (ongoing)

The complex of catchment experiments at Jonkershoek, Zachariashoek and Jakkalsriver include extensive areas of fynbos subject to different burning regimes and therefore provide the opportunity to study the ecological effects of differential burning.

The catchments at Zachariashoek are managed on six- and twelve-year rotations and one catchment is protected. Catchments were burnt in 1965, 1971 and 1977. Data obtained from repeated observation of a sample of fixed plots have been reported for the six-year rotation catchment, treated on a six-year rotation.

Little work has been done on the vegetation at Jonkershoek, except that populations of selected species have been monitored for reproduction and survival over the last six years.

The study at Jakkalsrivier is essentially a replication of the experiments at Zachariashoek and Jonkershoek in an area representative of the southern catchments, but also aims to test the influence of burning season. A plant community monitoring program began in 1967. Sub-catchments were burnt in spring 1969 and autumn 1970. Two selected for short rotation burning were burnt again in 1974 and 1975, and were burnt again in 1979 and 1980. Field sampling has completed a ten-year quantitative analysis of plant succession in the area and these observations are now being prepared for publication.

Keywords : burning frequency, burning season, Cape, catchment, fire, fynbos

187. VAN WILGEN B W and F J KRUGER  
(Jonkershoek Forestry Research Station, Private Bag X5011,  
Stellenbosch 7600).

A survey and classification of the vegetation of the Zachariashoek  
catchments, Lamotte State Forest

A total of 161 relevés of 50 m<sup>2</sup> were enumerated in a Braun-Blanquet type survey. Various ordination techniques were used to analyse the data set, and a total of 13 plant communities were recognized. A draft report has been prepared. The report contains descriptions of the communities and their relation to the environment, Braun-Blanquet tables and other data on vegetation structure, aerial plant biomass, foliar nutrient levels and soils. Idealized transects showing the relation of vegetation to topography and soils, as well as a vegetation map, are presented.

Keywords : Cape, catchment, classification, fynbos

188. VAN WYK D B  
(Jonkershoek Bosbounavorsingstasie, Privaatsak X5011,  
Stellenbosch 7600).

Bepaling van die invloed van die vervanging van beskermde fynbos  
met plantasies van Pinus radiata op die stroomvloeikomponente by  
die Jonkershoek Bosbounavorsingstasie (Determining the effects of  
converting protected fynbos to a plantation of Pinus radiata on  
stream-discharge components at Jonkershoek Forestry Research  
Station)

Die insameling en verwerking van stroomvloei-, reënval- en dergelike rekords vir die studie duur voort op 'n roetine basis.

Verdere ontledings om 'n onverwagte neiging in stroomvloei te bepaal na die fase van maksimum afname na bebossing word nou gedoen. Dié bevindings tesame met vorige bevindings sal later in 1980 gepubliseer word.

Die opvanggebied van Bosboukloof (57% bebos, 40 jaar oud) word op die oomblik kaalgekap. Die reaksie van stroomvloei op dié behandeling behoort goeie inligting te lewer in verband met die invloed van ontbossing op stroomvloei.

Keywords : Cape, catchment, fynbos, hydrology, Pinus

189. VAN WYK D B  
(Jonkershoek Bosbounavorsingstasie, Departement van Waterwese,  
Bosbou en Omgewingsbewing, Privaatsak X5011, Stellenbosch 7600).

Die vasstel van die invloed van beheerde brandstelsels soos toegepas in fynbos op stroomafvoer-komponente van eksperimentele opvanggebiede te Jonkershoek, Zachariashoek en Jakkalsrivier (The determination of the influence of controlled burning systems as practiced in fynbos in watercourses on experimental catchments at Jonkershoek, Zachariashoek and Jakkalsriver)

Die doel van die projek is om die effek van brand in bergfynbos op stroomvloei te bepaal, asook variasie in die effek met wisseling van brandomloop en seisoen.

By Zachariashoek word brand in November toegepas op twee opvanggebiede met rotasies van ses en twaalf jaar. Die kontrole opvanggebied se natuurlike plantbedekking word beskerm. Beheerde brande is reeds in 1971 en 1977 uitgevoer. By Jakkalsrivier word 'n brandbehandeling in September en Maart met siklusse van vyf en tien jaar in vyf opvanggebiede toegepas. Beheerde brande is reeds in 1969, 1970, 1974 en 1975 uitgevoer. Die fynbos in drie kontrole opvanggebiede word beskerm. Slikmetings word in al die opvanggebiede gedoen.

Die behandeling van Abdolskloof, Jonkershoek het reeds in 1941 'n aanvang geneem. Die siklusse hier van toepassing varieer van vier tot dertien jaar. Die maand van brand kan lente, somer of herfs wees.

Ontledings op stroomvloei van gebrande fynbos opvanggebiede in vergelyking met stroomvloeirekords van beskermde opvanggebiede en reënval is gedoen om die invloed van beheerde brande vas te stel. Voorlopig het dit getoon dat brand 'n geringe invloed op die hidrologie van die opvanggebiede het. Verdere ontledings word uitgevoer om die resultate te bevestig. Die brande van 1971 en 1977 is toevallig beide deur jare met ondergemiddelde reënval opgevolg.

Die verwerking van ingesamelde data duur voort.

Keywords : Cape, catchment, fire, fynbos, hydrology

190. VAN WYK D B  
(Jonkershoek Forestry Research Station, Private Bag X5011,  
Stellenbosch 7600).

Die vasstel van die invloed van bestuursmaatreëls op die kwaliteit van water in die eksperimentele opvanggebiede van Jonkershoek, Zachariashoek en Jakkalsrivier (Determination of the effects of management measures on water quality in the experimental catchment at Jonkershoek, Zachariashoek and Jakkalsrivier) (1971-1985)

Die doel van die ondersoek is om die effek van veldbrand in

bergfynbos en bestuur en benutting van plantasies op uitvoer van gesuspensieerde en opgeloste materiaal in stroomvloei te bepaal. Hiervoor is bestaande opvanggebiedeksperimente gebruik.

Die ondersoek is in die begin 1971 te Zachariashoek begin en in 1974 uitgebrei na Jonkershoek.

Die studie by Zachariashoek behels die insameling van sewe stroom- en twee neerslagmonsters by spesifieke punte oor die hele opvanggebied. Die doel van die studie is om vas te stel wat die invloed van beheerde brand, in November, met rotasie van ses- en twaalf jaar teenoor totale beskerming van fynbos op die kwaliteit van die water is.

Die waterkwaliteitstudie te Jonkershoek poog om inligting te verskaf in verband met die invloed van kaalkapping van jaar oue uitheemse denne op die kwaliteit van die water.

Weekliks word pH- en geleidingsvermoëlesings van die watermonsters gedoen terwyl volledige ionontledings op maandelikse monsters uitgevoer word.

Onlangse resultate (in pers) het daarop gedui dat die invloed van beheerde brand in bergfynbos op waterkwaliteit in die Wes-Kaap baie klein is. Tydens die eerste twee vloedspitse na die brand vind noemenswaardige toenames in uitvoere van voedingstowwe wel plaas, maar vergeleke met normale totale jaarlikse uitvoer is die invloed gering. Die invloed van beheerde brand op voedingstof uitvoere strek net oor die eerste agt maande na die brand, daarna verdwyn dit geheel en al. Tot op die stadium is nog geen resultate beskikbaar in verband met die invloed van ontbossing op stroomvloei nie.

Resultate het ook verder daarop gedui dat die see die hoofbron van invoere deur middel van neerslag is. Daar is ook gevind dat droë invoer minimaal is in dié gebiede.

Keywords : afforestation, Cape, catchment, fynbos, hydrology, water quality

191. VERSFELD D B  
(Jonkershoek Forestry Research Station, Private Bag X5011,  
Stellenbosch 7600).

A study of interception loss in mature Hakea sericea Schrad stands, and a study of the water balance of a plantation of Pinus radiata and of fynbos at the Jonkershoek Forestry Research Station

Rainfall interception in three Pinus radiata stands has been analysed in detail. In a mature stand, interception estimates range from 21% for a 40 mm storm to 26% for a storm of 5 mm. At least 15 mm of rain is required to produce a stemflow of 2 mm - actual stemflow is quite variable. Canopy storage capacity approximates 1 mm.

Tensiometers were installed in the plantation and in an adjacent firebreak to monitor moisture differences. Soil moisture in protected fynbos is also measured to explain vegetation differences.

An automatic data logger has been acquired for further interception work and the Rutter model for the prediction of interception from stand and climatic parameters is to be tested both in the western Cape and the eastern Transvaal.

Keywords : Cape, rainfall interception, soil, water balance

192. VERSFELD D B  
(Jonkershoek Forestry Research Station, Private Bag X5011, Stellenbosch 7600).

Investigation of the effects of clear-felling of *Pinus radiata* in Bosboukloof catchment, Jonkershoek Forestry Research Station

Root and shoot biomass of *Pinus radiata* have been intensively sampled to permit estimation of major components (stem, roots, branches, needles) from diameter measurement.

Nutrient inputs in precipitation are now monitored and measurement of loss in streamflow (TDS, suspended sediment, bedload) continues, while 30% of the standing timber in the catchment has been removed. No changes in pH (6,5) and conductivity have been observed despite logging activity. Litter fall under pines averages 3720 kg ha<sup>-1</sup>yr<sup>-1</sup> and shows marked seasonality for some components. After two years needle decay is 45%, branch decay 10% and cones 3,5%.

Keywords : afforestation, biomass, Cape, clearfelling, litter fall, nutrient cycling

193. VON BLOTTNITZ F  
(Nature Conservation and Tourism Division, Private Bag 13186, Windhoek 9000)

Etho-ecology of the gemsbok *Oryx gazella* in the dune area of the Namib Desert (1980-1982)

In order to formulate a management plan for the dune area of the Namib-Naukluft Park it is essential to determine the habits and food preferences of at least the most common herbivore. It is proposed that, apart from the regular road censuses which have been conducted for two years, attention is given to food preferences, water intake, thermoregulation, social organization and the relationship of the above to migrations or changes in home range.

Keywords : feeding ecology, Namib Desert, social organization, South West Africa, water intake



194. 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 gnou in two reserves in the Orange Free State with  
emphasis on the interaction between habitat and animal density  
(1980-1982)

The purpose of this study is to provide information on the interaction between the habitat and the black wildebeest population to facilitate the management of this species in the Orange Free State.

The distribution and population dynamics of the black wildebeest will be investigated in the Willem Pretorius Game Reserve as well as the Game Farm Tussen-die-Riviere. Their concentration areas will be described botanically by recording aspects such as botanical composition, basal coverage and height of vegetation. The feeding preferences will be determined by faecal and rumen analysis.

The condition of black wildebeest will be examined by making use of methods such as kidney fat index and bone marrow techniques.

Keywords : Connochaetes gnou, feeding ecology, grassland, habitat, Orange Free State, population dynamics

195. WEISSER P J  
(Botanical Research Institute, Private Bag X101, Pretoria 0001).

Vegetation survey of the Zululand coastal dunes

The seaward advancement of the dunes at Mtunzini, Natal was studied by comparing aerial photographs taken from 1937 to 1977. Dunes advanced by an average of 95,2 m, at an average rate of 2,4 m per year.

Keywords : aerial photography, coast, dune, Natal, survey, vegetation

196. WESTFALL R H  
(Botanical Research Institute, Private Bag X101, Pretoria 0001).

The plant ecology of the farm Groothoek, Thabazimbi District

To complement earlier work on the bushveld studies programme, a project to study the ecology of the sour bushveld (Veld Type 20) has been initiated. This veld type is due to undergo greater intensification of agricultural and other uses, and rational planning for multiple-use management must be set in motion to reconcile intensification with sometimes conflicting but valid

needs such as nature conservation and recreation. Fieldwork on this project started in 1980 and by the end of March 132 quadrats had been sampled.

Keywords : floristic, savanna, sour bushveld, survey, vegetation

197. WILLIAMS A J

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

The breeding biology of Hartlaub's gull *Larus hartlaubii*

The biology of Hartlaub's gull, a common endemic species restricted to the southwestern coast of southern Africa, has never been studied. Study of the bird's breeding biology will help clarify its taxonomic status which is currently in doubt, provide information for its conservation and control, and provide information on the relationship between egg size and subsequent development of the offspring. The following aspects of the species's breeding biology are being studied : the effect of egg size upon chick growth and survival; brood size and brood reduction; the relationship between egg size and composition and the composition and state of development of newly hatched chicks; hatchling yolk-sac reserves and the hatchling's ability to withstand starvation; and growth and changes in body composition, during embryonic and post-embryonic development of the young.

Keywords : breeding, conservation, eggs, Hartlaub's gull, taxonomy

198. 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 (1978-1980)

Aboveground productivity, nutrient uptake and litter fall measured using fixed quadrats of *Phragmites australis* and *Typha latifolia*. Current season shoots numbered as they emerge and their lengths measured at intervals. Shoots of the same lengths outside the quadrats cut, dry mass measured and analysed for mineral composition. Regression of shoot dry mass on shoot length calculated. Standing dead shoots numbered initially and shoots remaining recorded at intervals. Belowground biomass sampled when accessible, by 1 m<sup>2</sup> quadrats and by 0,1 m diam cores. Soils sampled to 0,45 m in 0,15 m horizons.

Keywords : biomass, mineral cycling, Orange Free State, *Phragmites*, primary production, reedbeds, *Typha*, wetland

199. 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)

The five grassland types studied in Project 175 (Project Abstracts for 1978) are defined by the occurrence of grass species in characteristic proportions. It was shown that the soils also differ in texture, which affects waterholding capacity, and in the amounts of the available plant nutrients N, P, K, Ca and Mg, and that the uptake of N and P, but not of K, Ca or Mg, into the aboveground biomass was close to the amounts available from the particular soils. The edaphic factor is known to be important in determining botanical composition of grasslands elsewhere but has received little attention in South Africa. The nutrient and water responses of certain grass species important for grazing in the Willem Pretorius Game Reserve and on which no studies have been reported in the literature will be examined in pot trails in a glasshouse using soils from the Reserve

Keywords : biomass, grassland, mineral cycling, nutrient responses, Orange Free State, waterholding capacity, water relations

200. ZALOUMIS E A  
(First Floor, Juniper House, 92 Overport Drive, Durban 4091).

A comparative study of the breeding biology of southern African  
hole nesting anatids

The four species involved in this study are :

- The Cape shelduck
- The Egyptian goose
- The African knob-billed duck
- The African pygmy goose

Detailed nesting studies of all four species have been undertaken. This entailed breeding them in captivity and field trips during their respective breeding seasons.

A considerable amount of data has been collected on :

1. The factors initiating breeding
2. Pair formation and pre-breeding behaviour
3. Nest site and nest site selection
4. Egg laying, clutch size and egg dimensions
5. Incubation (parental roles, attentive period, incubation temperatures, and the nest environment)
6. Hatching, nest exodus and development of young.

Special attention has been paid to the nest environment and factors related to the choice of holes as nest sites, the use of down, the timing of the breeding seasons and certain specialized features.

One highlight has been the confirmation of the incubation period for the Pygmy goose which is amongst the shortest given for any anatid. For the purpose of this project these studies are now complete, and the data is being prepared for presentation.

Keywords : anatids, breeding

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