FYNBOS FORUM

MAREP MEETING
AND
DATA CATALOGUE WORKSHOP

PROGRAMME

13-15 July 1994

Bien Donné, Stellenbosch

THIS MEETING IS BEING ORGANISED
UNDER THE AUSPICES OF THE
FOUNDATION FOR RESEARCH DEVELOPMENT

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PROGRAMME

DAY 1 : WEDNESDAY, 13 JULY

07:30-08:25 Late Registration/Coffee

SESSION 1: **CHAIRPERSON: C Marais**

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Political ~~Keynote~~ address: *The Future of Nature Conservation in the Western Cape - What can we expect?* - JH Neethling

08:45-09:10 *Selecting a modelling approach for the prediction of alien plant spread in Cape fynbos landscapes* - SI Higgins / DM Richardson / RM Cowling

09:15-09:40 *Use of a GIS-based catchment management system with particular reference to the management of fire and alien weed infestation* - BW van Wilgen

09:45-10:10 *Invasive plants and water resources in the western Cape: Modelling the consequences of a lack of management* - DC le Maitre / BW van Wilgen / RA Chapman / DH McKelly

10:15-10:40 *The utilization of invasive alien Acacias as part of an integrated management plan, for the conservation of fynbos in the southern Cape Peninsula* - EJ Azorin / RM Cowling

Harvesting reduces Aliens by 4%. R28 mil/ 1000 people

10:40-11:00 TEA

SESSION 2: **CHAIRPERSON: C Coetzee**

11:00-11:25 *Are Protea population seed limited? Implications for wild flower harvesting in Cape Fynbos?* - KE Maze / WJ Bond

11:30-11:55 *Development of a method to describe fynbos habitats by quantifying vegetation structure and composition* - C Marais / HJ van Hensbergen / N Fairall

12:00-12:10 *Does harvesting affect sustainability of Protea neriifolia?* - C Marais / P Mustart / HJ van Hensbergen / M Scott / D du Preez **(Poster)**

12:15-12:25 *The need for a formal research programme on flower harvesting in natural fynbos* - M Middelmann / C Marais / G Malan **(Poster)**

12:30-14:00 LUNCH

SESSION 3: **CHAIRPERSON: G Davis**

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14:30-14:55 *An assessment of the effect of succession on plant diversity in the Goukamma Nature Reserve, southern Cape* - DB Hoare

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SESSION 4: **CHAIRPERSON: SJ Bekker**

15:35-16:00 *Public consultation: A project-delaying nightmare?* - P Britton / J Jackelman

16:05-16:50 *The development of hiking trails within the scope of ecotourism* - ML Hugo / PK Bewsher

16:50-17:30 ALLOCATION OF ACCOMMODATION

18:30 17TH CENTURY DINNER

DAY 2 : THURSDAY, 14 JULY

07:15-07:50 BREAKFAST (Only for Bien Donné jailers)

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08:00-08:25 *Ecological Data Catalogue - Fynbos Biome/Cape Floristic Region* -
D Erasmus / C Boucher / C Marais / D McDonald

08:30-10:00 DATA CATALOGUE WORKSHOP

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SESSION 2: CHAIRPERSON: DC le Maitre

10:35-11:00 *Biological control of the Port Jackson willow* -
MJ Morris

11:05-11:30 *New activities in the biological control of Hakea sericea* - AJ Gordon

11:35-12:00 *Current research in the biological control of the Australian Acacias* - D Donelly

12:05-12:15 *Limestone fynbos - How well is it conserved?*
B Heydenrych **(Poster)**

12:20-12:30 *Serrurias 'en masse'* - H Crous **(Poster)**

12:35-12:45 *Why be a hard-headed Leucadendron nut?* -
P Mustart **(Poster)**

12:45-14:00 LUNCH

SESSION 3: CHAIRPERSON: N Fairall

14:05-14:30 *Microbial respiration in relation to temperature and moisture in fynbos soils of Swartboskloof, Jonkershoek* - TH de Koker / MA Loos

14:35-15:00 *Respiration and microbial biomass of litter and soil under Protea neriifolia in Sosyskloof, Jonkershoek* -
MA Loos / H van Wyk / G Colling / J Schoeman

15:05-15:30 *The gene bank project for the conservation of fynbos genetic resources* - GM Littlejohn / JH Coetzee

15:30-16:00 TEA

16:35-17:00 Fynbos Forum: Annual General Meeting
Chairperson: C Marais

19:00 SUPPER

DAY 3: FRIDAY, 15 JULY

07:15-07:50 TEA/COFFEE

SESSION 1: CHAIRPERSON: PJ Mustart

08:00-08:25 *Effects of fragmentation on insect diversity in renoster shrublands* -
JS Donaldson / H Robertson / I Nänni

08:30-08:55 *The influence of anthropogenic biotope transformation on birds in the mountain fynbos biotopes of the Elgin district, southwestern Cape Province* - RM Little / TM Crowe

09:00-09:10 *Effects of habitat fragmentation on community structure and processes in South Coast Renosterveld - A Research Proposal* -
J Kemper / RM Cowling / DM Richardson **(Poster)**

09:15-09:25 *The fragmentation of Renosterveld by agriculture: implications for its pollination ecology*
C Zachariades / J Donaldson / I Nänni / RM Cowling
(Poster)

09:30-09:40 *ACKDAT: The national plant ecological data base*
M O'Callaghan / LW Powrie / JL Hurford /
MC Rutherford **(Poster)**

10:45-10:00 PRIZE GIVING
- Best Paper
- Best Poster

10:00-11:30 BRUNCH

ABSTRACTS OF PAPER PRESENTATIONS

SELECTING A MODELLING APPROACH FOR THE PREDICTION OF ALIEN PLANT SPREAD IN CAPE FYNBOS LANDSCAPES

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An unfortunate feature of Cape fynbos landscapes is the conspicuous and abundant presence of alien plants. Alien trees cover large tracts of land, severely degrading the structure and functioning of natural ecosystems. The rate of spread of alien plants is rapid and as such demands proactive and effective management action. The poor record of attempts at the control of alien plant spread is in part due to the lack of quality information for the planning of management actions. This project aims to provide information on the rates and patterns of alien spread and thereby facilitate effective management action. We propose to develop a framework for the predictive modelling of alien plant spread. This framework needs to be flexible enough to provide generalizations on the rates and patterns of spread and to predict the pattern and rate of spread in particular circumstances. Here we define the invasion phenomenon and thereby identify the variables and parameters required of a realistic predictive model of alien plant spread. Using this definition we evaluate which types of models are likely to be most useful in modelling alien plant spread.

USE OF A GIS-BASED CATCHMENT MANAGEMENT SYSTEM WITH PARTICULAR REFERENCE TO THE MANAGEMENT OF FIRE AND ALIEN WEED INFESTATION

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The catchment management system (CMS) has been developed by the CSIR to enable catchment managers to store, retrieve and analyse relevant information for the management of fynbos catchments.

The status of the proposed adoption of the system, and its costs and benefits, will be reviewed.

INVASIVE PLANTS AND WATER RESOURCES IN THE WESTERN CAPE : MODELLING THE CONSEQUENCES OF A LACK OF MANAGEMENT

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The invasion of fynbos shrublands by woody weed species can reduce the water yield from catchment areas dramatically. We modelled the consequences of uncontrolled invasion on water yield using a geographical information system (*Arc/Info*). Five important processes were recognised : the occurrence of fire; the spread and establishment of alien plants after fire; rainfall to runoff ratios; growth and changes in biomass between fires; and effects of these changes on streamflow. The simulations of water yield were modelled with the *Arc/Info GRID* module using a 200 x 200 m grid. Fire frequency was assumed to be 15 yrs, and proliferation and dispersal of alien plants took place only after fires. Between fires, the model simulated the growth of the vegetation and its effects on streamflow, using relationships between rainfall and runoff, and runoff and above-ground biomass. Results for the Kogelberg area in the Western Cape Province showed that alien plants invaded almost all (99,2%) of the grid cells within 50 years. Cover of alien plants increased from an initial estimate of 5,4% to 99,6% after 100 years. Invasion of catchment areas would result in an average decrease of 105 cubic metres of water per hectare per year, resulting in average losses of more than

10% of the water supply to the city of Cape Town. In individual years, where large areas would be covered by mature trees, losses would be much greater. Besides causing decreases in water yield, invasion of fynbos by alien plants will result in many extinctions of plant species, increase the difficulty of fire management, destabilise catchment areas with resultant erosion and decreased water quality, and decrease the aesthetic appeal of mountain areas. Control of alien weed species is necessary to avoid the above impacts, and costs could be justified by maintaining good levels of water runoff from stable catchments in the long term.

THE UTILIZATION OF INVASIVE ALIEN ACACIAS AS PART OF AN INTEGRATED MANAGEMENT PLAN, FOR THE CONSERVATION OF FYNBOS IN THE SOUTHERN CAPE PENINSULA

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Aliens in the Noordhoek Basin are assessed as a management tool for the conservation of fynbos, and as an economic resource for inhabitants of Masiphumelele (formerly known as "Site 5").

The aim of the study is twofold :

a. to determine: the extent to which the community could benefit economically from intensive alien plant use (eg firewood, building materials, pine rings, mulch etc); the employment opportunities generated through organised alien clearing operations by conservation groups in the area; the potential of indigenous plants and resources to replace aliens as an economic resource (eg thatch, wildflowers, reeds etc, and ecotourism in general, and

b. to determine the benefits that conservation bodies will accrue through intensive alien exploitation by the local community.

Preliminary results indicate that the current rate of consumption, ie 3500 tons of wood biomass per annum, will have little impact on the estimated 85 000 tons of standing wood biomass predicted for the Cape Peninsula and an estimated growth rate of 5 tons/ha/year for dense acacia thickets. On the

other hand harvesting rates of over 14 000 tons of fresh wood per annum will have a significant reduction on present alien thickets biomass. The study is presently evaluating the technical feasibility of such an increase, its possible impact on the Cape Town firewood market, and the economic benefit to the local economy.

ARE PROTEA POPULATION SEED LIMITED? IMPLICATIONS FOR WILD FLOWER HARVESTING IN CAPE FYNBOS?

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In this study we explore the importance of seed limitation in setting sustainable harvesting levels for the wild flower industry in Cape Fynbos. Little is known about the extent to which plant populations growth is limited by seed production. We studied the question with respect to the surplus available for harvesting of wild flowers. Preceding a scheduled burn, pre-fire seedbanks were determined for a nine-year old stand of *Protea repens* and *P. neriifolia*. Cones were experimentally harvested to provide a range of pre-burn seed densities. Five harvesting treatments (0, 25, 50, 75, 100% cone removal) were applied. Seed survival was estimated from pre-burn seedbanks, through a late summer burn until germination in spring. Subsequent seedling survival was censused over the first summer drought season. The number of seedlings that recruited after the autumn burn were counted at six and nine months following the burn. Only two seeds were required per seedling. Seedling survival until autumn was 90% in *P.repens* and 55% in *P. neriifolia*. Optimal plant densities for flower production were estimated from data relating density to cone production in pre-burn stands. These target densities were greatly exceeded by seedling populations surviving the first summer drought. This surplus appears to persist for many years in a non-reproductive state with little evidence for density dependent thinning.

Using these results, we develop a simple model for defining the minimum seed requirement needed to sustain protea populations at optimal flowering densities. Some practical guidelines for harvesting are proposed.

DEVELOPMENT OF A METHOD TO DESCRIBE FYNBOS HABITATS BY QUANTIFYING VEGETATION STRUCTURE AND COMPOSITION

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A method of describing fynbos habitats is being developed to be used in a habitat suitability evaluation for antelope in fynbos (Grey Rhebuck *Pelea capreolus*, Klipspringer *Oreotragus oreotragus* and Grysbok *Rhaphicerus melanotis*). The study is aimed at habitat structure and does not include any work on feeding ecology at this stage. For this reason it was decided to describe the habitat in terms of structure and not in terms of detailed floristic composition. The vegetation is categorized according to the major growth forms in fynbos namely non Proteoid broadleaf spp., Proteoid spp., Ericoid spp., Restioid spp. and Graminoid and other herbaceous spp.

Over and above the vegetation the habitat is also described in terms of the amount of dead matter present, surface rock cover and live plant cover. The habitats are described for a particular successional stage and no extrapolation is carried out to later stages.

After an initial literature study of survey methods, it was decided that the descriptive method should be based on biomass load estimation as being used by Burgan & Rothermel (1984) in the development of fuel load models for fire behaviour modelling. This was done in order to make a single survey serve the purpose of both fire behaviour prediction and antelope habitat suitability evaluation. An adapted toe point method combined with the recording of the height of plants touching the recording stick was then developed for habitat description purposes.

The methodology, results and problems experienced during the development phase of the project are discussed.

PLANT COMMUNITIES OF THE COASTAL FYNBOS SOUTH OF GEORGE, SOUTHERN CAPE

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Community structure and composition of the coastal fynbos south of George were investigated. The long term objective of the study was to provide a floristic database for the formulation of regional conservation policies. Sample sites, differing in slope, aspect and altitude, were subjectively located within the fynbos on the headlands. Floristic data were analysed using TWINSPAN, and communities were ordinated by DECORANA to identify the vegetation and environmental gradients. Five major plant communities and ten subcommunities were recognised within the fynbos. Demand for land and alien plant infestations appear to be the two largest threats to the continued existence of this area of fynbos. The results of this study are discussed in relation to the future management and conservation of the area.

AN ASSESSMENT OF THE EFFECT OF SUCCESSION ON PLANT DIVERSITY IN THE GOUKAMMA NATURE RESERVE, SOUTHERN CAPE

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Some concern has been expressed that in the absence of fire the fynbos vegetation in the Goukamma Nature Reserve, southern Cape, undergoes successional change towards a community dominated predominantly by woody shrubs. The abundance of the shrub, *Metalasia muricata*, has increased in the reserve, thus reducing the alpha diversity of this fynbos. The aim of this study was to determine whether there had been a change in the fynbos since 1976, at which time a phytosociological survey was done. Alpha diversity in the fynbos has changed insignificantly, but at a sub-community level much larger changes in alpha diversity were observed. Locally, life-form composition indicated an increase in woody species, and ordination of the data demonstrated a similar trend. Some species were identified as indicators which either increased or decreased in the succession towards thicket. Environmental factors (eg slope and aspect) were observed to be most important in extreme habitats and these communities have changed little since 1976.

PUBLIC CONSULTATION : A PROJECT-DELAYING NIGHTMARE?

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"If you want to delay a project forever - consult the public"

In the past (and present in some organisations) this was a common statement. However, working in an urban environment the Parks and Forests Branch of the Cape Town City Council cannot afford not to consult the public and is committed to an open decision-making process. By using topical planning examples this paper will illustrate how public consultation has led to better decision-making and has in fact not delayed projects.

THE DEVELOPMENT OF HIKING TRAILS WITHIN THE SCOPE OF ECOTOURISM

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Hiking as an outdoor recreational activity within the scope of ecotourism, is currently growing rapidly both in South African as well as internationally. In accordance with the general move towards privatisation in South Africa, hiking trails are no longer a function of any governmental department. Many farmers and other land owners are developing their own trails; often with disastrous results. These trails are neither ecologically acceptable - resulting in all sorts of environmental problems like erosion - nor do they comply with the emotional and physical needs of the hikers.

Trails and overnight facilities need to be constructed according to specific **ecological parameters** as well as **phycological needs** and desires of hikers.

If hiking is to be an ecotourism activity it should no longer merely be an outdoor activity, but rather fulfil the experiential needs of the hiker and stimulate community upliftment without causing environmental degradation. A well planned and administered trail should also be a **sustainable financial success** to the land owner.

Although there are general guidelines which are applicable to all trail development, every biome needs a site specific approach in order to make optimal use of the environment. Guidelines to attain the above are discussed at the hand of a comprehensive trail planning model which has already stood the test of time.

ECOLOGICAL DATA CATALOGUE - FYNBOS BIOME / CAPE FLORISTIC REGION

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A data catalogue was compiled comprising information about studies done in the Fynbos Biome. The aim was to consolidate what information is available, where the gaps lie and how much overlap occurs in acquiring data. Also of great importance is the fact that through this data catalogue, information that is not widely known about is made accessible. Many non-academic institutions do not publish all information, which may be of use to many others. The catalogue should help to alleviate this problem by detailing such studies. In the presentation the catalogue is explained, and details of how information was collected described. The format of the information, how the catalogue should be used, and problems surrounding collection and processing of data are discussed.

BIOLOGICAL CONTROL OF THE PORT JACKSON WILLOW

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Port Jackson willow (*Acacia saligna*) is one of the most troublesome alien invasive plants in the fynbos biome. Introduced from southwestern Australia,

the plant often forms dense infestations excluding other vegetation, and is difficult to control chemically or mechanically. During 1987 an Australian, gall-forming rust fungus, *Uromycladium tepperianum*, was first released in South Africa to help control the weed. Since then the fungus has been established at about 150 localities between Clanwilliam and Port Elizabeth. The fungus forms galls on the phyllodes, stems and inflorescences of Port Jackson, often stressing the plant enough to kill it. Inflorescence infection prevents pod formation. Up to 70% tree mortality has been recorded five years after release and the fungus has been found as far as 40 km from release sites. The number of seeds in the soil seed banks are also stabilizing or starting to decline. This fungus is proving to be a successful biological control agent for Port Jackson.

NEW ACTIVITIES IN THE BIOLOGICAL CONTROL OF *HAKEA SERICEA*

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The weed, *Hakea sericea*, is still a major threat to the floristically rich and unique mountain fynbos. The present control strategies include both mechanical and biological control. Three insect species were introduced during the 1970's, from Australia, for biological control of *H. sericea*. The seed-feeding weevil, *Erytenna consputa*, which attacks the immature fruits, is now established throughout the South African range of the weed and is contributing to the reduction of the seed crop by >80%. The hakea seed-moth, *Carposina autologa*, destroys seeds in the mature fruits but is not yet widely established. At study sites in the south-western Cape, *C. autologa* was found to have reduced the accumulated seeds by up to 64%. The weevil, *Cydmaea binotata*, which feeds on succulent vegetative growth has established, but is having no effect on the density of seedlings. Although *E. consputa* and *C. autologa* are presently contributing substantially to the control of the weed, an additional agent, *Dicomada rufa*, has been imported from Australia to reduce seed production even further.

CURRENT RESEARCH IN THE BIOLOGICAL CONTROL OF THE AUSTRALIAN ACACIAS

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At least two of the Australian Acacia spp. that are weeds in South Africa are also exploited commercially. This has created problems for the implementation of a biocontrol programme. After considerable debate, the issue was resolved by mainly considering insects that attack reproductive plant parts, thus suppressing the invasive potential of the weeds while not affecting the vegetative parts that are utilized. The gall-wasp, *Trichilogaster acaciaelongifoliae*, which was successfully established on the weed, *Acacia longifolia*, is well-known for its devastating effects. Less well-known are four species of seed-feeding weevils of the genus *Melanterius*. The first of these, *M. ventralis*, was released in 1985 on *A. longifolia*, to supplement *T. acaciaelongifoliae*. These two agents now together reduce the reproductive potential of *A. longifolia* by 99%. By contrast, *M. acaciae*, *M. maculatus* and *M. servulus* are the only agents being considered on their weed hosts, *A. melanoxylon* (blackwood), *A. mearnsii* (black wattle), and the closely related *Paraserianthes lophantha* (stinkbean), respectively. *M. acaciae* and *M. servulus*, which were released several seasons ago, are increasing in number satisfactorily, with corresponding increases in the numbers of seeds being destroyed. *M. maculatus* is due to be released on *A. mearnsii* very soon. Plans are underway to import seed-feeding biocontrol agents on *A. cyclops* (rooikrans) within the next few months.

MICROBIAL RESPIRATION IN RELATION TO TEMPERATURE AND MOISTURE IN FYNBOS SOILS OF SWARTBOSKLOOF, JONKERSHOEK

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Carbon dioxide evolution from two soils sampled under mountain fynbos in Swartboskloof, Jonkershoek from 1984 to 1988 and incubated at 26°C was proportional to soil moisture, hence showed highest values during winter and lowest values during summer droughts. However, microbial ATP in the two soils tended to show peaks during autumn and spring with declines in winter

and summer. The effect of temperature as well as moisture on the soil microbial respiration was investigated, as respiration in the field could be expected to correlate with microbial ATP. From laboratory determinations of carbon dioxide evolution from soils of different moisture contents incubated at different temperatures the following mathematical models of the Arrhenius-tipe were developed: $\ln k = 20.9 + 0.024\ M - 5600(1/T)$ for the Nomanci soil and $\ln k = 19.45 + 0.116\ M\ 5600(1/T)$ for the Clovelly soil, where k = respiration rate as mg CO_2-C per 10 days per 100 g dry soil, M = g moisture per 100 g dry soil and T = absolute temperature. Soil moisture in the field was modelled as $D_{e,t} = D_{e,t-1} + P_e - F_w(E_{pan})$ where $D_{e,t}$ and $D_{e,t-1}$ are soil moisture as mm per unit volume of soil to a depth of 15 cm on days t and t-1 respectively, P_e = the effective precipitation (rainfall minus interception by plant canopy and litter layer), F_w = weighting factor that decreases as the soil dries and P_{pan} = pan evaporation. Daily mean air temperatures were found suitable for the modelling of daily mean soil temperatures.

From these models, soil respiration was simulated for the Nomanci and Clovelly soils from February 1984 to December 1988. Simulated respiration was low during winter with an increase through spring to a maximum in summer followed by a decrease during autumn to winter values. These trends were similar to trends of carbon dioxide evolution measured *in situ* for a French mediterranean soil of a *Quercus ilex* ecosystem, but differed from the abovementioned ATP trends in the Nomanci and Clovelly soils. However, the simulated respiration for the Clovelly soil regularly during summer showed sharp declines to low levels superimposed on the high main trend of the summer respiration.

RESPIRATION AND MICROBIAL BIOMASS OF LITTER AND SOIL UNDER *PROTEA NERIIFOLIA* IN SOSYSKLOOF, JONKERSHOEK

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Microbial respiration, ATP and biomass have been studied previously in two soils in Swartboskloof, Jonkershoek, before and/or after a fire in 1987. *Protea neriifolia* grew on both soils before the fire. Soil, seasonal and fire effects were observed, but the micro-organisms and their activity in the litter layer on the soil surface were not investigated. We have therefore compared microbial respiration and biomass of litter and granitic soils sampled under 15-year-old *P. neriifolia* in Sosyskloof, adjacent to Swartboskloof. The micro-organisms in

the plant litter showed a high respiratory activity, with the production during 10 days at 26°C of 133-968 mg CO_2-C/100 g dry litter compared with the production by the underlying soils (to a depth of 15 cm) of 1-24 mg CO_2-C/100 g dry soil. However, the respiration of the litter and upper 15 cm of soil over equal areas was almost similar, with calculated CO_2-C evolution of 4-27 and 4-40 g/m²/10 days, respectively. The higher respiration levels were usually associated with wet litter and soil sampled during the cooler months of the year and the lower levels with dry litter and soil sampled during the hotter months. Biovolumes of fungi, actinomycetes and other bacteria in the litter and soil samples, determined by microscopic examination of dilutions in agar films, were used for calculation of the respective biomasses. An exceptional dominance of bacteria was observed in the litter and soil during the second year of the study. Total microbial biomass-C in the litter was 0,4-3,6 mg/g or 1.1-10.9 g/m² and in the soil (to a depth of 15 cm) 0.1-0.7 mg/g or 21-123 g/m². Ratios of mean evolution of CO_2-C(g) to mean microbial biomass-C(g) were 3.61 for the litter and 0.28 for the soil, indicating much more active microbial populations in the litter than in the soil.

THE GENE BANK PROJECT FOR THE CONSERVATION OF FYNBOS GENETIC RESOURCES

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The Fynbos Unit of the Agricultural Research Council (Vegetable and Ornamental Plant Institute) is found at the historic site of Elsenburg in the Cape Province in South Africa.

The mission of this research unit is to develop commercial cultivars from the indigenous flora of primarily the Cape Region, the so called 'fynbos', which can be used for the economic benefit of all persons involved in floriculture both in South Africa and the rest of the world. The Cape Region, renowned for having the smallest yet most diverse 'Floral Kingdom' in the world contains over 8 500 plant species, of which 1 800 are Red Data Book species. The proteas, which symbolize the potential wealth of floriculture products from the Cape Region, are grown commercially not only in South Africa, but also in Australia, New Zealand, Hawaii, California, Israel and Zimbabwe. In South Africa, where the marketing of proteas originated from flowers harvested from natural (wild) plants, the act of cultivation protects the indigenous vegetation from the ravages of injudicious picking.

The developmental work on indigenous flora is obviously heavily dependant on the availability of genetic resources from the natural vegetation. However, for genetic resources to be of economic benefit they must be evaluated for commercial worth. Thus the cornerstone of any research in development of indigenous flora must include evaluation of the plant material under commercial conditions. This is the primary aim of the gene bank at the Fynbos Research Unit, the secondary being to maintain scarce plants in cultivation for present and future use.

The gene bank currently comprises over 1000 plant types (ecotypes) of over 80 species. The majority of the collection is from the Proteaceae family, but other families in the fynbos biome are represented such as Ericaceae. The plant material is collected from the wild, from farmers, gardeners and Botanical Gardens. It is then evaluated in a plantation simulating commercial cultivation. Scarce material is grafted onto rootstocks if necessary to ensure survival. An example of the unique type of material available in the collection is a yellow *Leucospermum cordifolium* selection which was used as a parent in the cross which gave rise to the cultivar 'High Gold'. The original yellow *L. cordifolium* is no longer available in nature.

EFFECTS OF FRAGMENTATION ON INSECT DIVERSITY IN RENOSTER SHRUBLANDS

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Renoster shrublands have been extensively transformed by agricultural development, and most of the remainder of this vegetation type occurs as fragments in an agricultural landscape. A study was undertaken of insect diversity in fragments of renoster shrubland surrounded by cereal crops. Two hypotheses were tested.

1. That reduction in fragment size would lead to a decline in insect diversity.

2. That patches managed inclusively as cropfields (eg. subject to spraying) would have lower diversity than those managed as natural veld. Pitfall traps were set in large (30-80 ha), medium (3-8 ha) and

small (0.1-0.8 ha) fragments with similar slope, aspect and soil type and away from drainage lines. Traps were also set at the edge of some fragments and 15 m into the cereal crops. Preliminary results show that there were no significant differences in overall species richness or diversity indices (Shannon, Simpson and Brilloun) between different sized fragments or between fragments subjected to different management practices. However, the species composition varied between large, medium and small fragments. In addition, of the 81 taxa identified so far from renoster shrubland fragments, 32 were also collected in cropfields indicating that these taxa were not restricted to vegetation fragments. An analysis of the taxa found only in fragments showed that species richness did decline with decrease in fragment size.

THE INFLUENCE OF ANTHROPOGENIC BIOTOPE TRANSFORMATION ON BIRDS IN THE MOUNTAIN FYNBOS BIOTOPES OF THE ELGIN DISTRICT, SOUTHWESTERN CAPE PROVINCE

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The influence of biotope transformation on the diversity of natural biota in southern Africa is poorly understood, and has not been quantified. We investigated the influence of deciduous fruit farming on the bird assemblages of the Elgin district, southwestern Cape Province, South Africa. A total of 116 bird species was recorded in the district, of which 110 were recorded on the fruit farms and 30 in a nearby protected area within untransformed natural vegetation, Mountain Fynbos. Six species were recorded only in the Mountain Fynbos. Fourteen species were recorded during surveys undertaken within pure orchards. More species, especially those of scrub habitats, were recorded in orchards encompassing <0.5 ha fragments of natural biotopes than in orchards lacking natural biotopes. Population densities in orchards under traditional (= heavier and routine) insecticide and fungicide spraying programmes and those in which lower intensity spraying is targeted at specific pests were similar. We suggest that the placement, size and connectedness of fragmented natural biotopes, eg fynbos (even those infested by alien plants) within deciduous fruit farms, the addition of new biotopes, eg farm dams, and the presence of large (>20 ha) protected Mountain Fynbos areas within the matrix of transformed habitats have complimented the pre-farming avian diversity in the Elgin district as a result of district-wide land use practices.

ABSTRACTS OF POSTER PRESENTATIONS

DOES HARVESTING AFFECT SUSTAINABILITY OF PROTEA NERRIFOLIA

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The effect of wildflower harvesting on post fire recruitment and long term sustainability is not adequately known. Does flower removal influence post-fire recruitment: (i) how does it influence seedling numbers, and (ii) how does it influence the subsequent number of adult plants?

The poster will present the initial findings of the effect of harvesting on seedling numbers after the first summer and will stress the importance of monitoring the mortality over the following 10 years until adulthood.

Is there a critical number of seedlings needed to ensure population sustainability? That is the million dollar question.

THE NEED FOR A FORMAL RESEARCH PROGRAMME ON FLOWER HARVESTING IN NATURAL FYNBOS

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The effect of flower harvesting on post fire recruitment of the species being used are not adequately known. In a study that was done during 1985 by Melanie Simpson (CNC) it was shown that 295 species are generally harvested. Some of these species are currently severely threatened as a result of over-exploitation.

A good example of a species that was harvested to near extinction was the Strawberry Everlasting *Syncarpha eximia*. There is an urgent need to determine sustainable harvesting levels for different species to ensure the sustainability of the natural resource. To do this it is necessary to do a survey of what the extent of the natural resource in the veld is, and then to compare that to the volumes of the different species that are being marketed. A survey of the latter is currently being done by the ARC. This will put the industry in a position to determine the priorities for research on the ecology of individual species.

The poster tries to emphasise the need for a formal and coordinated multidisciplinary research programme on the effect of flower harvesting in natural fynbos stands.

LIMESTONE FYNBOS - HOW WELL IS IT CONSERVED?

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An investigation into the conservation of limestone fynbos vegetation in the southern Cape was undertaken. This took the form of a field survey of fifteen

sites where the presence/absence of limestone endemic plant species was noted. Threats to the vegetation and land use practices were also noted. Additional information on plant species distributions were supplemented using Herbarium records. Patterns of species distributions and information on rare plants is presented. Recommendations concerning the conservation of limestone fynbos are given.

SERRURIAS 'EN MASSE'

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With careful pruning techniques, adequate drainage, correct medium and rooting hormone, 2000 *Serruria foeniculaceae* plants have been produced from only nine mother plants in one season. *S. aemula, glomerata linearis, furcellata, trilopha* and *roxburghii* have responded in a similar manner. With these sort of results in mind, cultivating Serrurias intensively for the cutflower and nursery trade is now becoming a viable proposition.

WHY BE A HARD-HEADED *LEUCADENDRON* NUT?

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There is a wide range of seed morphologies in the genus *Leucadendron* (Proteaceae). These characteristics have been used as a basis for classifying the genus in numerous (14) sub-sections. The germination requirements of some of the nut-fruited and flat-fruited Leucadendron spp. will be presented, and the ecological significance thereof will be discussed.

EFFECTS OF HABITAT FRAGMENTATION ON COMMUNITY STRUCTURE AND PROCESSES IN SOUTH COAST RENOSTERVELD - A RESEARCH PROPOSAL

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The conservation status of South Coast Renosterveld is critical with more than 90% of its original area converted to cereals and artificial pastures. This project will attempt to explain the fragmentation effect in different sized fragments, including the role of pesticide application and edge effects in promoting species loss as well as the breakdown of plant-animal interactions in small fragments. A current vegetation sampling programme initiated in March, aims to obtain lists of both the perennial and ephemeral components. Three 50m^2 plots are sampled in eight replicates of each of four treatments (small, medium and large fragments, wheatfields). Further experiments will be conducted at a later stage to identify key community processes.

Patterns observed from an assessment of species number, composition and abundance may provide answers to the following key questions:

1. What are the effects of fragmentation on community structure?
2. Do fragments support proportionally fewer plant species than comparable areas of mainland?
3. Which species and functional groups are lost on island and why?
4. Which species and functional groups persist in agricultural lands and why?
5. What community processes will be affected by fragmentation?
6. Do areas of renosterveld managed as natural rangelands represent an important conservation resource?

The study will be linked to a parallel study by the National Botanical Institute on the effects of fragmentation on the insect fauna.

THE FRAGMENTATION OF RENOSTERVELD BY AGRICULTURE : IMPLICATIONS FOR ITS POLLINATION ECOLOGY

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Renosterveld forms a distinct vegetation type within the Fynbos Biome, growing on more nutrient-rich soils in lowland areas, but has been both little studied and poorly preserved. The remaining Renosterveld is largely fragmented by agricultural lands. A multi-disciplinary study has recently been initiated to assess the effects of this fragmentation on ecological processes in the Renosterveld, and thereby to formulate appropriate management strategies for its conservation. We propose to examine the effects of fragmentation on aspects of pollination ecology in the Renosterveld. These include the relative reproductive success of plant species with different pollination systems as fragmentation increases, and the numbers and movements of insect pollinators between and within patches of vegetation.

ACKDAT : THE NATIONAL PLANT ECOLOGICAL DATA BASE

M O'Callaghan / LW Powrie / JL Hurford / MC Rutherford
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JPH Acocks collected botanical data throughout southern Africa for more than 35 years. These data have been computerized to consist of approximately 400 000 records of 11 500 taxa at 3 500 sites. Each record includes abundance values and subhabitats are delimited. Further developments include taxanomic verification and updating, the inclusion of growth forms, and attachment of GIS and rule-based front-ends.

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