

## REVIEW OF THE WORK OF THE BOTANICAL RESEARCH INSTITUTE, 1984/85

1st April 1984 — 31st March 1985

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### INTRODUCTION

Whereas excellent progress is being made on a variety of research facets concerned with botanical topics of high priority it is a disconcerting fact that the two main projects of the Botanical Research Institute, namely the *Flora of southern Africa* and vegetation surveys are lagging behind because of insufficient support. These projects are of vital concern to our future because they are designed to supply information on which management of vegetation, essential for maintaining the plant cover of our country, is based. Maintaining an adequate plant cover is the only way in which desertification, the scourge of Africa which threatens our very existence, can be avoided. It is a fact that insufficient funds and manpower cannot be advanced as a reason for lack of support. State funds are being found for creating other botanical posts of a much less urgent nature. As pointed out before, the lack of support for priorities as vital as these, can only be attributed to the fragmented state of botany and biology as a whole in South Africa. Can we allow this state of affairs, which threatens our future, to continue?

### FLORA RESEARCH DIVISION

#### *Flora of southern Africa (FSA)*

The Department has again supported the *Flora of southern Africa* subproject, both nationally and internationally, by awarding a research contract to a contributor at a South African university and a fellowship to an overseas contributor. The third meeting of the FSA working group was held during the Congress of the South African Association of Botanists, and such meetings will be held at all future SAAB Congresses. News of interest to FSA contributors is circulated in *Forum Botanicum*, the newsletter of SAAB.

One fascicle was published: Vol. 28,4 (Dr L. E. Codd) covering the whole of the family Lamiaceae, with 37 genera and 232 species. Mr M. Iwarsson of Uppsala contributed the genus *Leonotis*. Three fascicles are in press, and may be published during 1985: Vol. 4,2 dealing with the families Xyridaceae, Eriocaulaceae, Commelinaceae, Pontederiaceae and Juncaceae, by Mrs A. A. Obermeyer (Mauve), with Mr J. Lewis of the British Museum (part of Xyridaceae) and Dr R. B. Faden of the Smithsonian Institution, USA (co-author of Commelinaceae and author of *Aneilema*); Vol. 14 on Crassulaceae by Dr

H. R. Tölken, formerly a member of the BRI, but now at the Herbarium in Adelaide, Australia; and the volume on Pteridophyta by Prof. E. A. Schelpe and N. C. Anthony of the University of Cape Town. Vol. 31,1,2 dealing with the family Rubiaceae (subfamily Rubioideae) by Dr Ch. Puff of the University of Vienna, Austria, is at an advanced stage of editing and will go to press in 1985.

The *List of Species of Southern African Plants*, Edn 2, Part 1, covering cryptogams, gymnosperms and monocots is with the printer and will appear in 1985. This second edition includes references to the literature necessary to name plants in each genus, as well as recent synonyms. The *List of Species* is intended to serve as a precursor to the FSA, and provides an overview of the southern African flora until the FSA is complete.

*A Catalogue of South African Green, Brown and Red Marine Algae*, compiled by Prof. S. C. Seagrief of Rhodes University was published.

Institute members, and outside contributors on contract or fellowship, made the following progress with research facets on volumes of the FSA:

Lichens: Dr O. Almborn of Lund, Sweden, is continuing to co-ordinate a volume on lichens, and has enrolled 28 contributors, covering most of the families.

Bryophyta: Work on Fascicle 2, covering Funariales to Bryales was completed in 1982 by Dr R. E. Magill of the Missouri Botanical Garden, USA, except for the genus *Bryum*, which will shortly be completed by Mr J. van Rooy. Dr. Magill is now working on Fascicle 3.

Vol. 2: Poaceae. Computerization of the Register of Names and Types was completed by Dr G. E. Gibbs Russell and transferred to the PRECIS Herbarium database, as a beginning to the redevelopment of the bibliographic component that was originally planned.

Oryzoideae, Centostecoideae and Bambusoideae. The genus *Ehrharta* was studied in the field by Dr G. E. Gibbs Russell, emphasizing intraspecific variation between isolated mountain groups of the south-western Cape. In Oryzoideae taxa were delimited and keys written.

Poeae and Bromaeae. Dr H. P. Linder, as light relief from his study of Restionaceae, has written the FSA account of about 45 species in these



tribes. Many of the species are naturalized aliens from Europe, and the study was completed efficiently while he was serving as Liaison Officer at Kew Herbarium.

Vol. 4: Restionaceae. The conspectus of the family, including nomenclature, keys, descriptions of new species, formal new combinations and notes on the taxonomy, ecology and distribution of the taxa was completed by Dr H. P. Linder and is in press in *Bothalia*. About 320 species are recognized, including 55 new species and 83 new combinations. This is the first large family to be treated first as a conspectus for the *FSA*.

Xyridaceae, Eriocaulaceae, Commelinaceae, Pontederiaceae and Juncaceae. Fascicle 4,2, by Mrs A. A. Obermeyer (Mauve), is with the printer.

Vol. 5: Asparagaceae. Mrs A. A. Obermeyer (Mauve) has completed her study of the two genera *Protasparagus* and *Myrsiphyllum*, and the treatment of the latter was published in *Bothalia*. Where previously one genus (*Asparagus*) with 44 species was recognized, the new classification has two genera and 77 species.

Vol. 8: Orchidaceae. Prof E. A. Schelpe, of the University of Cape Town, on contract to the Department, has continued work on this volume, assisted by Mrs N. C. Anthony. About a third of the species are completed.

Vol. 9: Salicaceae, Fagaceae, Urticaceae and Piperaceae. Miss K. L. Immelman is well advanced with her studies of *Salix*, *Populus* and *Quercus*. She has completed work on the two genera in Piperaceae, *Piper* and *Peperomia*.

Vol. 11: Mesembryanthemaceae. Dr H. F. Glen is preparing manuscripts of *Astridia*, *Acrodon* and *Ebracteola* for *Bothalia*.

Vol. 16: Fabaceae — Desmodieae. Mr B. Schrire has completed his thesis on this group, and has rewritten the account as a revision to appear in *Bothalia*.

Vol. 25: Ericaceae. Mr E. G. H. Oliver completed revisions of the minor genera *Salaxis*, *Coccosperma* and *Scyphogyne*. Research continues on *Ericinella*, *Philippia*, *Sympieza*, *Aniserica* and *Blaeria*, where limits between the genera must be more securely drawn. Special studies were made of inflorescence structure, seed and fruit types.

Vol. 28: Lamiaceae. The *FSA* treatment of the family, by Dr L. E. Codd, was published.

Vol. 30: Acanthaceae — *Justicia*. Miss K. L. Immelman completed *FSA* accounts of *Justicia* and *Siphonoglossa*. The genus *Aulojusticia* was placed in synonymy with *Siphonoglossa* and a new species described.

Vol. 31: Rubiaceae — Rubioideae — Paederieae, Anthospermeae, Rubieae. Dr Puff completed this account of about 60 species while holding a Departmental Research Fellowship. The manuscript is being edited and will be in press shortly.

## Pretoria Flora

The families Asclepiadaceae, Periplocaceae, Vitaceae and Myrtaceae were completed. Several other families were modified in the light of new revisions. To date, 542 camera-ready pages have been produced.

## Palaeoflora of southern Africa

*Prodromus of South African Megafloras, Devonian to Lower Cretaceous*, written by Drs J. M. Anderson and H. M. Anderson, and published by A. A. Balkema, is with the printer. It deals with all plant fossils known to have occurred in southern Africa during the period when all the continents were united in the single supercontinent, Pangaea. The book also includes detailed biographical information about the principal collectors of fossil plants in southern Africa.

## Liaison Officer, Kew

Dr H. P. Linder has served at Kew for a third year, and has provided information about taxonomic and related subjects to researchers on the southern African flora both from South Africa and from overseas. His research has been concentrated on the Restionaceae and its hypothetical sister-group, the Poaceae.

## DATA SUB-DIVISION

Data Sub-Division serves the needs of the Institute for electronic data processing on the Burroughs 7900 computer of the Department and a Hewlett-Packard 9845B microcomputer. Large systems maintained on the Burroughs include: PRECIS, the Herbarium database managed by Mr N. P. Barker is the largest of its kind in the world, recording specimen label information for over 600 000 herbarium specimens. In the past year PRECIS has been expanded by Dr G. E. Gibbs Russell to include a taxon-based set of on-line data files that record the most recent treatment of all 24 000 plant taxa in southern Africa, with synonyms and literature references. A beginning has been made in developing the bibliographic component originally planned for PRECIS. PHYTOTAB is a suite of programs and a database for managing spatial and temporal sampling of vegetation, and is managed by Mr M. D. Panagos. Information from past vegetation studies, as well as those currently under way, are being entered into PHYTOTAB, and a link between PHYTOTAB and PRECIS will allow automatic updating of plant names so that studies of various ages can be compared. The Garden Records system, developed and maintained by Mrs B. C. de Wet, continues to process new material added to the Pretoria National Botanical Garden. Miss A. P. Backer is developing a database of photographic records for Vegetation Ecology Division.

Smaller systems maintained on the Hewlett-Packard microcomputer are the address labels for the Institute, and programs to prepare distribution maps, specimen labels and determinavit slips for taxonomic researchers. A database of grass chromosome numbers was set up by Mr J. J. Spies, and Mr T. H. Ar-



nold is developing a database of food plant records. The National Working Group for Vegetation Ecology has records of all researchers and projects in vegetation ecology, and the Flora Research Team has a database to hold the *Register of Southern African Plant Taxonomic Projects*.

#### HERBARIUM DIVISION

The four herbaria of the Institute continued to identify plants and provide information to a wide range of people including officers of this Institute, various state and provincial departments, universities and the general public, both in the Republic of South Africa and its neighbouring states. The research input of the herbarium staff is also gaining momentum with a total of 12 registered facets.

##### *National Herbarium, Pretoria (PRE)*

Until her retirement in September, 1984, Mrs E. van Hoepen was acting curator of the Herbarium Division, assisted by Miss W. G. Welman (finances). In October 1984, Mr T. H. Arnold was appointed as curator.

During the year 16 501 specimens were named and 22 449 specimens accessioned. 62 loans (4 253 specimens) were sent to other institutes and 43 loans (4 252 specimens) were received. PRE sent out 4 770 duplicates and received 4 111 in exchange.

Collecting expeditions were undertaken to areas where the vegetation had recovered sufficiently from the drought. This included trips to the northern and north-western Transvaal, the eastern Transvaal, the Natal Drakensberg, Transkei and northern Natal. Two officers went to Tongoland to carry out a survey of potential weeds which may affect the rice-growing project planned for the region.

No new herbarium cabinets were installed and the proposed fire protection was postponed until 1989/90. Plans have, however, been approved for the installation of three more working bays on the south side of each wing. This will greatly relieve congestion, especially when visitors have to be accommodated for any length of time.

Visitors to the National Herbarium numbered about 700. These included: Prof. O. H. Volk, West Germany (Hepaticae); Dr Ch. Puff, Austria (Rubiaceae); Prof. U. Müller-Doblies, West Germany (Amaryllidaceae); Mr F. White, England (Meliaceae); Mr B. L. Burtt, Scotland (southern Drakensberg plants); Prof. O. M. Hilliard, Natal (southern Drakensberg plants); Dr S. Talukdar, Lesotho (Lesotho plants); and Dr J. Prior, England (various taxa). South African visitors included staff and students from several universities, state departments, nature conservation departments and Philatelic Services.

*Wing A:* Miss C. Reid is responsible for identifications of Pteridophytes and all Monocotyledons with the exception of Poaceae. She has a special interest in the Cyperaceae and intends revising the genus *Carex* for an M.Sc. degree. During the year she completed the list of synonyms of all taxa in her section and this work, together with the Poaceae compiled by Miss L. Smook, has gone to press as Vol. I of a

second edition of the List of Species of Southern African Plants, *Mem. bot. Surv. S. Afr. No. 48*. (The part on Dicotyledons is in preparation.)

Miss L. Smook deals with all identifications of Poaceae. She undertook a number of collecting expeditions aimed at filling in gaps in the Poaceae collections. This work forms part of her project on collecting specimens in all under-collected areas in southern Africa. On one of her expeditions (to the Transkei) she collected flowering material of *Bambusa balcooa*, and thus verified the identity of this species in South Africa.

*Wing B:* Mr G. Germishuizen is writing up his study of the Polygonaceae in Flora format, for publication in the *Flora of southern Africa*. He has commenced work on a second volume of *Transvaal Wild Flowers* in collaboration with the artist Mrs A. Fabian. About 40 plants have been illustrated to date. He is mainly responsible for identifying the Fabaceae and for curating the spirit collection.

Mrs B. J. Pienaar, who assists with general identification, is engaged in a taxonomic study of the genus *Vigna* with the view to obtaining her M.Sc. degree. In addition, she is responsible for all identifications of exotic plants.

*Wing C:* Miss E. Retief has a special interest in the identification of taxa from seeds and fruits and is concentrating on the Cucurbitaceae. Examining both macro- and microscopic features of the seeds and fruits, she hopes to better delineate the supra-specific taxa in the family.

Miss K. L. Immelman is seconded on a part-time basis from the Flora to the Herbarium Division. She is responsible for general identifications in this wing and is helping Wing B with the identification of Caparaceae and Crassulaceae and some early dicot. families.

Mr A. A. Balsinhas, a member of the Plant Exploration Division, has worked in Wing C every afternoon since 11 May 1984, doing general identifications and, thanks to his good work, Wing C has now caught up with its backlog of identifications.

*Wing D:* Although Miss W. G. Welman does general identifications in this wing, her special interest is the Asteraceae. She acted as assistant (finances) to the acting curator of the section and in the absence of the curator assumes responsibility for the Division. She continues to be active as regional abstractor for *Excerpta Botanica (Taxonomica)*.

Mrs M. J. A. W. Crosby assists with general identification in Wing D, and has also given much appreciated help in Wing B, where a backlog in identifications has built up since January 1984. In addition, she administers the Staff Gift Fund.

All professional officers in Wings B, C and D have been involved in work on the list of synonyms to be published as Vol. 2 of a second edition of the Species List (*Mem. bot. Surv. S. Afr. No. 48*). (Vol. 1, Monocotyledons, has already gone to press).

*Cryptogams:* Mr J. van Rooy, in charge of the moss herbarium, is working on Bryaceae and Psychomitriaceae for the *Flora of southern Africa*. He



has prepared a checklist of the South West African/Namibian bryophytes for two papers on the bryoflora of that region.

Mrs S. M. Perold assists with identifications in the moss herbarium, specializing in Ricciaceae, which she has been studying for several years. Most of her time, however, is taken up by the SEM, for which she is responsible. The technical assistance she gives to members of staff who make use of this microscope is invaluable.

Mr F. A. Brusse is in charge of the lichen collection, which he continues to enlarge and bring up to date. The collection has been moved to Room B16, where it is adequately housed at present.

*Service Room:* Mrs M. Dednam continues to attend to all specimens sent in for identification, e.g. freezing, preparing for sorting, listing and labelling for mounting.

In December 1984 she was joined by Mrs M. Z. Heymann, who attends to all loans and exchanges. Mrs A. M. Verhoef, who types all labels for specimens as well as parcel forms, is carrying on steadily but has a mountainous backlog (12 months) of labels to cope with.

#### *Natal Herbarium, Durban (NH)*

Identifications of plant specimens totalled 4 268, 397 visitors were received, 661 specimens were sent out on loan, and accessions to the herbarium numbered 2 672.

Mr B. D. Schrire, curator of the Herbarium and officer in charge of the Unit, completed his work on the tribe Desmodieae for his M.Sc. thesis, which has been submitted to the University of Durban-Westville. Mrs M. Jordaan is responsible for practically all identifications. Dr V. G. Coetzee, half-day technician who assisted Mrs Jordaan, left at the end of April 1984 and was not replaced. Mr A. Ngwenya, laboratory assistant, has been trained by Mr Schrire to help with some identifications, mainly in Fabaceae.

All fungus specimens were sent to Pretoria to the National Fungus Collection. The cultivated section is much improved, due to voluntary collecting of specimens in gardens and parks in the Durban area by a pensioner, Mr H. Adamson.

Five units of air-conditioners were installed in the herbarium building. This has enormously improved the storage environment for valuable books and specimens and has made working conditions more bearable, especially during the hot and humid summer days.

#### *Albany Museum, Grahamstown (GRA)*

2 567 plant specimens were identified, 893 visitors were attended to, 917 specimens sent out on loan and accessions totalled 1 898; 976 specimens were donated to the herbarium. The staff was responsible for 125 displays in the Museum foyer.

Mrs E. Brink is in charge of the Unit, and is responsible for all administrative duties, as well as part of the identification service. Dr A. F. M. G. Jacot

Guillarmod, part-time researcher, assists with identifications and displays, and is responsible for numerous publications.

After spending almost the whole year in temporary quarters, the herbarium moved to new spacious offices during the last two weeks in February 1984, and is now housed in comfort.

Since September 1984 a systematic effort has been made to rid the Grahamstown Nature Reserve of alien invaders encroaching along its boundaries. The herbarium laboratory assistant and general assistant are helping the Nature Reserve caretaker three days per week with the heavy manual labour.

Mr Neil Abrahams, a voluntary worker, assists with labelling and mounting of specimens, indexing of reprints, and any other work needing to be done. During the move to the new quarters his help was invaluable, and the staff are deeply indebted to him.

#### *Government Herbarium, Stellenbosch (STE)*

A total of 2 565 specimens was identified, 334 visitors were attended to, accessions to the herbarium numbered 2 524 and 446 specimens were sent out on loan.

Mrs C. M. van Wyk acted as curator of the herbarium, and was responsible for a great deal of administrative work, as well as doing her part of the identifications. Mrs A. C. Fellingham, research technician, assisted with identifications and general herbarium work. Mrs Van Wyk and Mrs Fellingham were involved in a systematic survey of the De Hoop area under control of Krygkor, spending 4 days in the undercollected area every 4 to 6 weeks. PRE was asked to assist with identification of the specimens collected (mainly in D wing of PRE), as STE could not possibly cope with this extra load, for which identifications were needed urgently. Staff of the unit also took part in a collecting expedition to estuaries, which are being studied by the ecologists. Collections were made of a *Cliffortia* which may be a new species.

#### PLANT STRUCTURE AND FUNCTION DIVISION

The facilities of this division were considerably improved with the acquisition of an automatic image analysis system. Equipment for wood anatomical studies was also purchased to enable Mr P. P. J. Herman to commence his comparative studies of the southern African woody plants. Mrs J. C. P. Spangenberg left us during December after doing valuable work for the National Transport Commission on the cytogenetics of *Eragrostis curvula*.

#### *Comparative grass leaf anatomy*

An exciting discovery was made by Dr R. P. Ellis during a field trip to SWA/Namibia — *Eragrostis walteri* was found to be a  $C_3$  plant. This is the first known non-Kranz member of the chloridoid subfamily. Further studies are being undertaken on plants transplanted into the greenhouses of the Pretoria National Botanical Garden.



### Cytogenetic studies

Mr J. J. Spies and Mrs H. du Plessis have completed their work on *Rubus* and have submitted a series of five papers outlining their findings. The cytogenetics team has now turned its attention to grass cytogenetics and has begun a study of all the southern African grass species. This should prove invaluable, together with the leaf anatomical information, for the Poaceae volume of the *Flora of southern Africa*. A sound start has been made to this study and successful chromosomal preparations have been obtained from many different taxa.

### VEGETATION ECOLOGY DIVISION

The former Ecology Section has now been formally separated into the Vegetation Ecology Division (under Dr J. C. Scheepers) and the Experimental Ecology Division (under Dr M. C. Rutherford). The functions of the Vegetation Ecology Division are to study the vegetation of South Africa and its ecological relations. This work involves three main aspects: the identification, description, classification and mapping of the various kinds of vegetation; study of the ecological relationships between different kinds of vegetation — with each other and with the environment — and of the various processes and mechanisms that determine the behaviour of plant communities; and the application of such ecological knowledge to the management and utilization of vegetational resources.

### Transvaal bushveld and forest studies

In the preparatory phase of the research facet, 'The vegetation ecology of Sour Bushveld in the Transvaal Waterberg', Mr R. H. Westfall has developed computerized field data capture, improved methods to increase collecting efficiency, improved plant identification aids, and developed an objective approach to vegetation sampling. Problems associated with minimum sample area and the hierarchical nature of plant communities have been overcome. A pocket-sized apparatus was also developed for estimating both basal and canopy cover.

Refinement of the Braun-Blanquet phytosociological classification of vegetation in the Sabie area of the Eastern Transvaal Escarpment by Mr G. B. Deall resulted in 62 syntaxa arranged in an informal hierarchy, and comprising 53 plant communities (with 18 variants), 14 vegetation types and 4 ecological formation classes. Vegetation types were mapped. They appear to provide a useful basis for landscape classification of practical significance to land managers. Vegetation types were subsequently integrated with existing land-type map units to provide an alternative, broader basis for landscape classification.

### Coastal studies

In the Kosi Bay – Sodwana area of KwaZulu, Dr P. J. Weisser found that first-priority sites for conservation of vegetation occur mainly on the dune barrier in the vicinity of Sibaya Lake. He discovered a previously unknown type of sand forest dominated by *Drypetes natalensis*, *Chrysophyllum viridifolium* and *Cola greenwayi* on the Mandosi Peninsula. After clearing in the course of *Pereskia aculeata* control, regeneration of vegetation is quick, the most common woody species being *Albizia adianthifolia*, *Dalbergia obovata* and *Tabernaemontana elegans*. Fig. 1.

Mr M. G. O'Callaghan has published articles on two estuarine systems in the Cape under the auspices of the Estuarine and Coastal Research Unit (CSIR). The vegetation ecology component of this project is being wound up and a final report is being prepared.

### Cape fynbos studies

Classification and description of western coastal lowland fynbos by Mr C. Boucher is well advanced. The 137 plant communities identified are classified into a hierarchy of four orders, 10 alliances, 14 sub-alliances, 59 associations and 37 subassociations; 13 azonal wetland communities have not been ranked. The analysis of aerial photographs of selected sites indicated that the Sand Plain Fynbos and the West Coast Strandveld become invaded at similar but

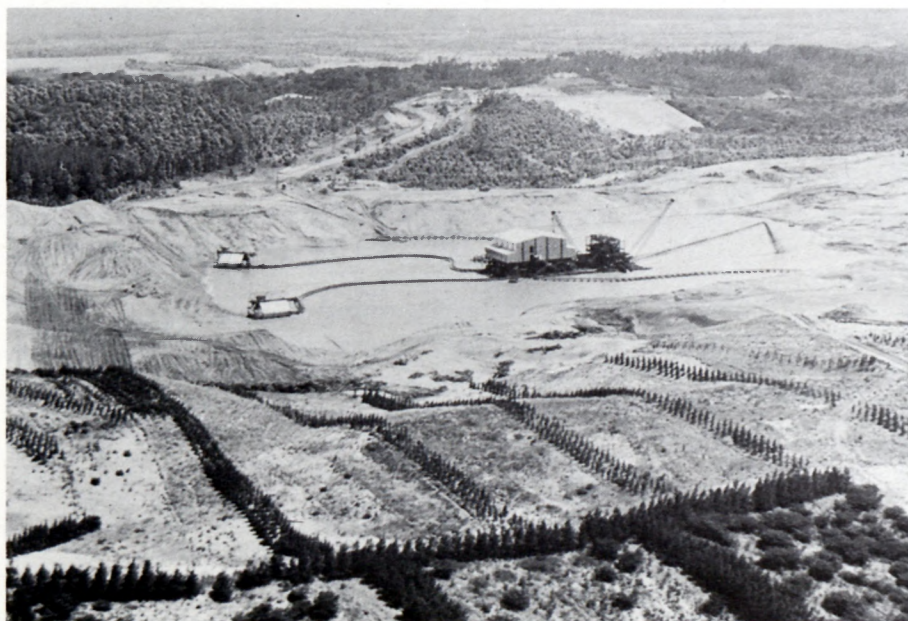


FIG. 1. — Dune mining operation by Richards Bay Minerals north of Richards Bay. Foreground shows a previously mined and now rehabilitated area. The Botanical Research Institute is mapping vegetation before mining, to establish conservation priorities.



slower rates than West Coast Renosterveld and that annual manual eradication strategies can contain alien plant spread in West Coast Strandveld. Mr Boucher attended the MEDECOS Conference in Australia in 1984. This proved to be a very valuable experience. The plant ecological study of the Cape of Good Hope Nature Reserve by Mr H. C. Taylor was completed with the final editing of five papers which were published during the report year. Two papers in *Bothalia* gave an account of methods and an analytical and descriptive account of the vegetation. Three publications in the *South African Journal of Botany* comprised an analysis of the flora, and the results of a survey and subsequent monitoring of the spread of invasive alien woody plants. Mr D. J. McDonald has completed follow-up work on classification and description of the vegetation of Swartboskloof, Jonkershoek. Ordination of the vegetation data has yielded results which have re-inforced the conclusions drawn from the classification. Investigation of environmental gradients using detrended correspondence analysis showed that soil parent material has a major influence on the distribution of different plant communities, particularly in the Mountain Fynbos. The classification and description of the vegetation will serve as a basis for future experimental work at Swartboschkloof.

Preparatory work on ecological studies of mountain fynbos by Mr H. C. Taylor and Mr D. J. McDonald, in the Cedarberg and Langeberg respectively, is well under way.

#### *Grassland studies*

Miss B. J. Turner and Mr C. W. Ries have commenced preliminary work on two key study areas in the grasslands of the south-eastern and southern Transvaal. These key areas were selected for the range of variation that they contain and for the extrapolation value of the results.

### EXPERIMENTAL ECOLOGY DIVISION

#### *Fynbos germination studies*

Miss F. M. Pressinger has investigated mechanisms to explain the sporadic nature of the germination of *Protea repens* seed in the western Cape. She has developed techniques to accelerate the germination of these seeds. Dr C. F. Musil has drawn up a detailed work plan to investigate the germination capacity of representative sets of fynbos and invasive alien plant species within mixed field communities.

#### *Fynbos competition studies*

A series of experiments to measure the effect of density, water regime and presence of *Acacia saligna* plants on the growth and performance of *Protea repens* seedlings has been completed and the results are being written up by Miss Pressinger.

#### *Fynbos transformation studies*

Mr G. W. Davis is assessing the effects of substrate disturbance on fynbos systems as a result of marginal cultivation of fynbos ornamental plants. Details of the vegetation and soils of the experi-

mental site have been recorded and a fire has been applied and quantitatively characterized. Parallel laboratory studies on selected soils are under way.

#### *Karoo research*

Mr G. F. Midgley has completed the main part of an extensive literature survey of the plant growth and life forms of the winter rainfall area of the Karoo. This constitutes the basis for initial screening of plant forms for ecophysiological research on their main adaptations to water stress.

#### *Biome studies*

In a joint effort by the Experimental and Vegetation Ecology Divisions, Dr M. C. Rutherford and Mr R. H. Westfall have determined the biomes of southern Africa according to clearly defined criteria and methods. The objective result has led to re-assessment of previously recognized biomes and to clarification of biome borders. New perspectives on plant-environmental relations at biome scale have been obtained. These include the role of (1) the interaction of moisture and temperature, and (2) the interaction of moisture levels and moisture seasonality in explaining certain biotic distributions.

### PLANT EXPLORATION DIVISION

The Division, under Mr M. J. Wells, completed its projects on timber sources and barrier plants, and is now concentrating entirely on food plant and weed research. Mr T. H. Arnold continues to lead the food plants research team although he was transferred in October to the Herbarium Division.

#### *Barrier plants*

The survey of barrier plants by Miss L. Henderson, which was completed in 1983/84, is still awaiting publication. It is scheduled to appear as a Botanical Survey Memoir during the 1986/87 financial year.

#### *Indigenous food plants*

A further 276 species were added to the national food plant databank by Mr A. A. Balsinhas. He also added to the information records of 538 species that were already on the list. The bank has proved its value by providing most of the information needed to compile a paper on Khoisan (Hottentot and Bushman) foodplants. This paper, prepared by Mr Arnold and Mr Wells was presented by the former, at the Kew International Conference on Economic Plants for Arid Lands (KICEPAL), London, 23–27 July, 1984. The paper was very well received, and resulted in South Africa being regarded as one of the countries leading in this field.

The research facet on indigenous food plants was given to Miss S. Chadwick, a contract worker from England, during June, 1984. She carried out intensive literature surveys on 14 priority species: *Acanthosicyos horridus*, *A. naudinianus*, *Coccinia adoensis*, *C. rehmannii*, *C. sessilifolia*, *Cucumis anguria*, *C. africanus*, *C. kalahariensis*, *C. metuliferus*, *Citrullus lanatus*, *Bauhinia petersiana*, *Tylosema esculentum*, *Guibourtia coleosperma* and *Vigna lobatifolia*. During this survey 586 literature references and





FIG. 2. — Researchers of the Botanical Research Institute, Pretoria, examining wild melons and cucumbers for evaluation as food plants of economic potential.

1 231 herbarium labels were consulted. Although writing up of the literature survey has not been completed, it was sufficiently advanced to provide a basis for fieldwork. One major field trip was made to the northern Cape and SWA/Namibia. More than 100 collections and many observations on the priority food plant species were made. Fig. 2.

#### *Primitive crop plants of African origin*

No field trips were undertaken but studies on the diversity of primitive crop plants were continued by Mrs K. J. Musil and Miss M. de Bruyn, using previously collected material.

*Sorghum*: 38 characters were recorded for 61 collections, bringing the total number of collections completed to 124. These are all backed by permanently mounted spikelet dissections. Recordings were made of the seed colour and tannin content of 118 collections, bringing the total number of collections examined to 352.

*Pennisetum*: 22 characters were recorded for 223 collections and a start was made with computer analysis of the results. A study of endosperm patterns showed that there are not 5 basic patterns, as reported in the literature. Seeds from a single inflorescence were found to exhibit up to 10 patterns.

*Citrullus lanatus*: sugar content was found to vary gradually from sweet to bitter types, via semi- and non-sweet intermediates. No significant differences in leaf-stomata number or position were found between the various types.

The relationship between crop frequency and preference was confirmed by analyses of data collected in Bophuthatswana during 1983/84.

Mr Arnold, who directed this work, presented a poster paper illustrating the wealth of diversity exhibited by primitive crops in South Africa, at the KICPAL conference in London.

#### *Conservation of germ plasm*

Research on indigenous food plants and primitive crops yielded a total of 601 seed collections, i.e. *Citrullus lanatus* (347), other edible Cucurbitaceae (79), *Pennisetum americanum* (82), *Sorghum bicolor* (76), and others (17). Mrs Musil was responsible for preparing and annotating the seed for storage and for handling gifts and exchanges of material e.g. with ICRISAT in India.

#### *Water conservation gardening*

Mrs D. M. C. Fourie's semi-popular publication on water conservation gardening has proved so popular with the gardening public that it has had to be re-printed. Mrs Fourie has also given several talks on the subject, which is of great relevance in this time of drought.

#### *Woody invaders*

The results of a survey of exotic woody invaders in the Transvaal, carried out by Miss L. Henderson and Mrs K. J. Musil, have been published. This survey has revealed a disturbingly widespread and effective invasion of the veld by a wide range of exotics. These invaders threaten to change the landscape of grassy areas and to replace some indigenous woody communities such as streambank woodland.

#### *National Weed List*

Mrs H. Joffe completed data sheets for the remaining 934 species in the weed list, which consisted of about 1 600 species as at June, 1984. It was then found necessary to add about 100 species in order to include all those covered either by new herbicide registrations or by new legislation on weeds and invaders. Data sheets on all  $\pm$  1 700 species were checked by Mr Wells and encoded by Mrs Joffe and Miss L. Henderson. Camera-ready copy is being produced on the word processor/printer. The index to common names, compiled by Mr A. A. Balsinhas,



FIG. 3. — One of the massive specimens of *Aloe bainesii* donated by members of the public being planted at the Reynolds Gate of the Pretoria National Botanical Garden.



and the bibliography, compiled by Mrs K. J. Musil, are also ready for typing. Publication is scheduled for the end of 1985 or early 1986. An expanded data sheet for a second edition scheduled for production in several years's time, has been drawn up by Mr M. J. Wells.

#### PRETORIA NATIONAL BOTANICAL GARDEN

Under the curatorship of Mr D. H. Dry the following developments took place: Mr H. J. de Villiers and his staff landscaped and planted a woodland stream on the main ridge and completed the last link in a circular service road around the garden. Miss S. C. Kruger landscaped and supervised the planting of the koppies of the Karoo Biome, and the area in front of the Reynolds's gate. Huge specimens

of *Aloe bainesii* donated by members of the public were planted to complement the aloe motif of the Reynolds's gates (Fig. 3). *Encephalartos* species were established in their specific biomes throughout the garden. To conserve water, all the streams have been re-sealed and a system of channelling rain water towards the main streams and dams has been devised. A start was made on reviewing and adjusting the landscaping in certain sections of the garden. Mr M. J. Wells and all technicians participated.

A total of 1 320 accessions, including 580 research accessions (mainly grasses including *Sorghum*), was received and accessioned by the records team: Mrs B. C. de Wet and Mrs K. P. Clarke. Mr D. S. Hardy collected 50 rare and endangered species for the new SWA/Namibia house. He also assisted Dr H. Glen with a taxonomic revision of the genus *Aloe*.