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NEWS-LETTER OF THE SOUTH AFRICAN ASSOCIATION OF BOTANISTS  
NUUSBRIEF VAN DIE SUID-AFRIKAANSE GENOOTSKAP VAN PLANTKUNDIGES

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BOTANICAL RESEARCH INSTITUTE, PRETORIA (Report continued from Vol. 18 No. 5):

ECOLOGY SECTION: The function of the Ecology Section, formerly known as the Botanical Survey Section, is to study the vegetation of South Africa and its ecological relationships. This work covers three main fields of activity: (1) The identification, description and mapping of various vegetation classes; (2) The study of the ecological relationships between different types of vegetation -- mutually and with the environment -- and also of the various processes and mechanisms that govern the behaviour of plant communities; (3) The development of various methods and techniques required for ecological studies of vegetation.

Veld types of South Africa: This project has been dealt a severe blow by the passing of the late Mr J.P.H. Acocks. The great quantity of processed and semi-processed data as well as his original observations have been sorted and safely housed at the Botanical Research Institute, Pretoria. Here they represent an incomparably comprehensive collection of past and present vegetational and environmental data. The formidable task of further processing this data base and exploiting its potential to the full awaits an improvement in available manpower.

Transvaal bushveld studies: To complement earlier work on this programme, Mr R.H. Westfall has started work on a project to study the ecology of the Sour Bushveld (Veld Type 20). This veld type is starting to undergo greater intensification of agricultural and other uses and rational planning for multiple-use management must be set in motion. Increasing intensification of agriculture must be reconciled with other sometimes conflicting but valid needs such as nature conservation and recreation. Field work on this project started in 1980 and by the end of March 132 quadrats had been sampled.

Coastal studies: Dr P.J. Weisser studied the seaward advancement of the dunes at Mtunzini, Natal 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.

The vegetation of the Wilderness Lakes in the Cape Midlands and the water-plant encroachment problem were also studied by Dr Weisser. An increase of emergent water plants and a decrease of submerged water plants was detected in localised areas. This is related to the lower water levels owing to the artificial opening of the Wilderness Lagoon mouth, in addition to natural succession.

Messrs. H.C. Taylor and C. Boucher, Dr P.J. Weisser and co-workers are participating in a world-wide study of dry coastal ecosystems. The floristic information gathered from more than 250 relevés is being processed by Braun-Blanquet phytosociological methods to identify plant communities of dry coastal ecosystems of South Africa and to interpret their environmental relationships. The communities of the rocky coasts are certainly different from those of the dunes, but the dune vegetation appears to be more complex than was previously thought.

Miss B.K. Drews conducted a reconnaissance of conservationworthy areas of fynbos in the Knysna-Wilderness-Plettenberg Bay Guide Plan Area for the former Department of Environmental Planning and Energy to provide the basis for the protection of natural areas. A report and map were produced recommending that 13 areas be identified as natural areas.

Vegetation survey of the Cape of Good Hope Nature Reserve: Mr H.C. Taylor has completed the field work for assessing the rate of infestation of plant invaders over a ten-year period. This entailed relocating 27 permanent sample plots and re-enumerating the invader density on them.

A primary survey of Rooiberg Mountain Catchment Reserve near Ladismith, Cape: The structural units and floristic associations identified by Mr Taylor during this survey closely correlate with each other, and their distribution reflects the major environmental influences, aspect and altitude. He concludes that, despite the preliminary character of the survey, resource inventories of this type are suitable as a foundation for park management.

In another study, he has shown that the Rooiberg flora has strong affinities with the eastern fynbos element and with the dry fynbos of the inland mountain ranges.

Hakea project: Mr S.R. Fugler has submitted his findings in the form of unpublished reports, parts of which may be published in due course. He concludes that *Hakea* encroachment can be controlled subject to availability of funds and manpower. Ecological principles are currently being applied to find practical methods of effecting control. He has since been transferred to the Department

of Water Affairs, Forestry and Environmental Planning.

Physiognomic classification of mountain fynbos: Mr B.M. Campbell has completed the field work for the classification. This consisted of 508 plots located on 20 transects throughout the mountains. In each plot detailed information on structure and function (growth-form, height classes etc.), environment and floristic composition (dominant species etc.) was collected. All the structural-functional and environmental data have been edited, coded and placed on computer file ready for analysis. The dominant species are being identified, and the floristic data are being coded.

A study of the vegetation along transects through the western Cape foreland: Mr C. Boucher and Mr P.A. Shepherd have completed sampling of the natural vegetation along four transects through the Western Cape's coastal foreland. 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' 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 have been identified.

Orothamnus project: The annual monitoring of *Orothamnus zeyheri* ("marsh rose") populations in the Kogelberg State Forest was undertaken by Mr C. Boucher during January 1980. Phenological, growth-rate and population-size data were recorded. Two new populations were found. The total number of plants counted compares favourably with the maximum population size previously known, if it is considered that between nine and twelve years have elapsed since regenerative treatments were originally applied and the *O. zeyheri* normally has a life-span of less than 23 years.

Aquatic ecology:

Classification and mapping of aquatic macrophyte communities of Natal: Mr C. Musil's preliminary classification of the water plant communities of Natal is completed. Water plant communities are grouped into five categories based on their habitat preference and tolerance of water salinity and its acidity or alkalinity. The categories are marine, estuarine, brackish water, moderately fresh to slightly brackish water, slow-flowing and fast-flowing fresh-water communities. The distribution of the communities, included within each category, are mapped and their composition

and environmental tolerances are discussed.

An ecophysiological study of water hyacinth in Natal: Mr Musil's findings on water hyacinth (*Eichhornia crassipes*) have been synthesized and the final report is being prepared. Growth constants determined in culture cannot be used to predict growth rates of plants in the field. Growth rates in the field are high with an average mass doubling time of 3 days in eutrophic situations. Growth is highly correlated with radiation, temperature and relative humidity. The density of the water hyacinth populations influences the rate of growth and chemical composition of plants.

National Conservation Plan: The work of Dr J.C. Scheepers and Miss B.K. Drews on the NAKOR National Plan for Nature Conservation has mainly entailed the handling, storage and mapping of data on conserved areas in South Africa, and the establishment of a computer data bank. At present, this data bank stores information on about 300 existing and 100 proposed conservation areas. These data are available for retrieval and processing in various ways for planning purposes.

DATA PROCESSING AND ECOSYSTEM STUDIES SECTION: This will probably be the last report by this Section in its present form as Dr J.W. Morris has been transferred to Datametrical Services (Head Office) and an internal re-organization of sections will be carried out in the near future. The mandate of this Section is the provision of data processing facilities for research purposes to the rest of the Institute as well as undertaking plant ecological research at the ecosystem (function) level. The largest data processing task to be undertaken, the computerization of the National Herbarium, is now complete. Our contribution to the Savanna Ecosystem Project at Nylsvley, determination of biomass relations and seasonal biomass change in dominant tree and shrub species has made good progress and a number of reports on biomass relations have been published. The Savanna Ecosystem Project data bank is administered by this Section, under the control of Dr J.W. Morris. He is also responsible for coordination of modelling activities as well as research in the Decomposer and Nutrient Cycling Components of the Project.

The National Herbarium Data Bank (PRÉCIS) has changed to the status of a production system and already useful results are being obtained from it. The production of maps showing the distribution of specimens selected from the data bank is a facility which has been added.

Further work on savanna root growth by Dr M.C. Rutherford has given valuable results using a sophisticated root observation chamber. The chamber incorpo-

rates a microscope and travelling carriage enabling precise observations of the activity of the belowground plant component that is important to the functioning of savanna vegetation as a whole. Pioneering work on the effects of plant water status on the radial growth of bushveld trees has also been carried out by Dr Rutherford. Techniques have included the severing of tree trunks held in position while simultaneously monitoring various properties of the tree trunk and leaves.

PLANT EXPLORATION SECTION: The Economic Botany Section under Mr M.J. Wells has changed its name to the Plant Exploration Section, as a result of the responsibility for weed research having been moved to the new Weed Research Unit in the Plant Protection Research Institute. Despite this organizational move it is anticipated that botanical aspects of weed research will continue to be handled by officers seconded to the Institute for many years to come.

The accent in the past year has been on developing new fields in plant exploration research under the team leader Mr T.H. Arnold, whilst concentrating most of our weed research effort on the compilation of the National Weed List, which we regard as basic to future research development.

The origin and evolution of *Sorghum*: This is a new project being developed by Mr Arnold. One hundred and two collections of *Sorghum* have been made during field trips to Natal and the north and north-eastern Transvaal. Thirty-two collections from elsewhere in Africa have been obtained from the Department's seed bank and have been grown. Herbarium collections, seed (when available) and photographs have been taken to form the basis of a study of the origin and evolution of *Sorghum* in the sub-continent. Chromosome counts have begun.

Previous accounts of *Sorghum* have largely ignored South African material and already Mr Arnold has found several variants that were thought not to exist in South Africa.

The origin and evolution of *Pennisetum*: A second new project on an indigenous food crop is that on *Pennisetum*. It is being carried out by Miss K.J. Duggan. Ninety-two collections of *Pennisetum* were made in Natal and the Transvaal, and seed of 25 collections from elsewhere in Africa was grown, to provide material for a study of the origin and evolution of this group. This material already includes a very wide variety of 'wild', cultivated

and intermediate plants.

Citrullus studies: Twenty-three collections of *Citrullus* (Watermelons) were added, mainly by Mr Arnold and Miss Duggan, to our already large collection. Recordings of variations in fruit and seed characteristics of *Citrullus* were made and will be used later for a study of the origin and evolution of this crop plant.

Conservation of germ plasm: This project, quiescent for some time, has benefited by material gathered in the course of other studies.

Seventy-eight collections of *Sorghum* seed and 46 collections of *Pennisetum* seed were contributed to this project which aims to conserve germ plasm of primitive varieties of crop plants. Other collections included 27 of *Citrullus* and related taxa, 6 of *Lagenaria* and 10 miscellaneous. Information relating to rare and endangered indigenous species was compiled by Mrs J.B. Hoffman who combines this work with her other duties as Public Relations Officer.

Ethnobotany: Miss C.A. Liengme has commenced an intensive investigation of wood utilization by the Tsonga of Gazankulu. Collections have been made in the study area to enable firewood and wood used for building to be identified by gross morphological features. The quantity and kinds of wood used for different purposes will be monitored over several seasons, and the effect of timber gathering will be analysed.

Miss Liengme has also continued gathering records of tribal plants uses for the sub-continent and this will continue as a long-term project.

Cover and barrier plants: Another new project, a survey of indigenous plants of potential as barriers or ground covers has been initiated by Miss L. Henderson. Plants are being collected, grown and screened for use as hedges, binders, windbreaks, etc., in the various climatic regions of South Africa. Over 100 plants with potential have been identified and over 50 have been collected.

Tree distribution in the Transvaal: Dr J. Anderson's survey of the distribution of woody plants in the Transvaal has had to take second place to his palaeoflora work but good progress was made nevertheless. Two hundred and ten field listings of woody plants have become available during the report year. Most of these were provided by co-operating researchers from outside the Department who helped fill distribution gaps in the Waterberg and in Venda. One thousand nine

hundred of the approximately 7 000 1/16th degree squares occurring in the Transvaal have now been sampled. The field work is scheduled for completion next year.

Information service: Mrs D.M.C. Fourie, our Scientific Information Officer, handled two hundred and sixty-one requests for information about economic plants and their utilization or control. These included about 120 identifications. Particular interest was shown in oil and rubber producing plants such as *Simmondsia* (jojoba) and *Parthenium* (guayule).

Over two thousand visitors including delegates to the International Rose Convention, members of the Wild Life and Tree Societies and many scholars were taken on tours of the Institute. In this aspect of her work Mrs Fourie received assistance from Mrs Hoffman, our new Public Relations Officer.

National Weed List: The first draft of the National Weed List which contained the names of 700 species, has been expanded as a result of suggestions received from many correspondents. Mr A.A. Balsinhas is responsible for the expanded list that now includes approximately 1 500 species and 4 500 common names. The identities of exotic species have been checked at Kew by Mr C.H. Stirton and the listed species are being classified by Miss V.N. Lorentz according to whether they are indigenous or exotic; and according to the situations where they cause problems and the kind of problems caused. The second draft of the list containing this information will be ready by the end of the year.

Woody invaders: The intensive survey of exotic woody invaders in the central Transvaal, which was completed last year by Miss Duggan and Miss Henderson, has been analysed and the minimum effective sampling level has been calculated. Sampling at this level is now being expanded to cover the rest of the Transvaal.

The rate of spread of some invader species has been calculated from aerial photographs. For example, one large infestation of *Acacia dealbata* (silver wattle) has increased its area by 20% in 8 years. This work is continuing.

Book on plant invaders: The book 'Plant invaders : beautiful and dangerous' compiled and edited by Mr C.H. Stirton for the Cape Department of Nature and Environmental Conservation has proved such a success that it is being re-printed.

Lantana camara: Mr Stirton has completed his review of the voluminous international literature dealing with *Lantana*, has consulted herbarium material in Europe and has sorted out most of the nomenclatural problems of the *L. camara* complex.

Most of the cytogenetic work on the many variations occurring in South Africa has also been completed by Mrs W.G. Gaum. The morphological and genetic data must now be assessed and explained in terms of the evolutionary constraints operating on the important weed group.

Rubus: Many collections of weedy brambles (*Rubus* spp.) were made by staff of the Section, and Mrs Gaum made a start on a study of the complex cytogenetics of the genus in South Africa. The occurrence of two species *R. niveus* (Java bramble) and *R. phoenicolasinius* (wineberry), both with weedy potential, has been fully documented for the first time, in articles prepared by Mr Stirton.

Cyperaceae: Several papers dealing with convergent evolution, an infraspecific hybrid, and morphological variation within the genus *Ficinia* have been prepared by Mr Arnold. These studies are of particular significance as a number of species of *Ficinia* are regarded as forestry weeds in the Cape, and a good understanding of the genus is required.

Nassella tussock: Research on the germination, establishment, and distribution of the grass weed *Nassella tussock* in the winter-rainfall area is being continued by Mr G. Harding, who took over the project from Miss S. Bulley at the end of 1979. Prior to that Mr Harding completed his B.Sc. Hons. degree whilst seconded to Natal University.

GARDEN SECTION: There were two major developments in the garden during 1979/80. Firstly, the garden was declared a national monument and a plaque was unveiled by Dr R.A. Dyer, a previous Director, on the 25th of October 1979 to commemorate the event. One of the benefits of national monument status will be protection of the terrain from expropriation for road-building and other purposes.

A second major development was the landscaping of the water garden, karoo and grassland areas. This landscaping which had long been planned, suddenly became a reality when large quantities of soil became available at an adjacent site. Contractors working on the new police stores were grateful to find a dumping area for about 35 000 cubic metres of soil, and also excavated dams for us in order to obtain shale for road building. This development was made possible by the quick-



thinking of Mr H.J. de Villiers and Mr T.A. Ankiewicz of the garden section. Six koppies were built and four dams and linking channels were excavated. In all we obtained material, labour and machine time to the value of about R100 000, in return for payment of R9 000. Understandably, other garden activities had to suffer in order to make the most of this windfall, and no perennial plants could be planted out in the nine months under review. However, progress was made in other areas. The excavation of the swamp forest area and the landscaping of savanna koppies were completed and the existing irrigation and roads systems were expanded.

The post of curator of the botanic garden has not been filled and the curator's duties continue to be divided between two acting curators, the technicians in charge of the nursery and garden sub-sections respectively. Mr D.S. Hardy continued in charge of the nursery, but health reasons caused Mr J. Erens to step down as technician in charge of the garden. His place was taken by Mr H.J. de Villiers, and Mr Erens moved to the nursery where he is responsible for the propagation of plants for display purposes.

There were 376 accessions to the garden's permanent scientific collections and 238 to the new category of temporary experimental collections, during the nine months under review. The main experimental collections were of barrier plants, and of *Sorghum* and *Pennisetum* food plants.

Mrs B.C. de Wet and Mrs K.P. Clarke continued with the task of labelling and record keeping. Mrs de Wet was particularly active in the computerization of garden records. Amongst the benefits of computerization, are biome planting lists and directly typed garden labels on request. Computerization is also assisting in keeping track of the recent surge of experimental plantings.

With so much development having taken place in 1979/80, we look forward to several years of consolidation, in building up and maintaining biome plantings, and in utilizing the material already available.

RECENT PUBLICATIONS OF THE BOTANICAL RESEARCH INSTITUTE: The following have recently appeared and are obtainable from the Division of Agricultural Information, P. Bag X144, Pretoria 0001:-

Memoirs of the Botanical Survey of South Africa

No. 45. The plant ecology of the Isipingo Beach area, Natal, South Africa by C.J. Ward. Price R5.62 Overseas R7.00

No. 46. A phytosociological study of the Upper Orange River Valley by M.J.A. Werger. Price R3.60. Overseas R4.70.

Flowering Plants of Africa

Vol. 46, Parts 1 and 2 (1980)  
Price R10.00. Overseas R10.20.

Bothalia

Vol. 13, No. 1 and 2 (1980)  
Price R15.00. Overseas R15.20.

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