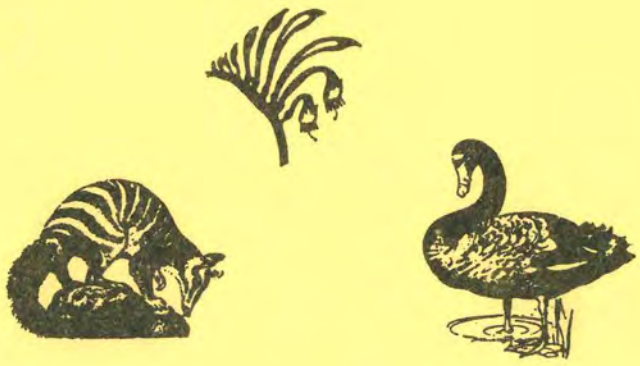
DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT

Western Australian Wildlife Research Centre



Wildlife Research Seminar

DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT

WILDLIFE RESEARCH BRANCH

RESEARCH PROGRAMS 1985

16 - 17 July 1985

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DAY 2 WEDNESDAY JULY 17

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WESTERN AUSTRALIAN WILDLIFE RESEARCH CENTRE

WILDLIFE RESEARCH SEMINAR

16 - 17 JULY 1985

ANDREW A. BURBIDGE

DISTRIBUTION OF DESERT MAMMALS

Staff: A.A. Burbidge and P.J. Fuller.

Objectives: To document the past and present distribution and status of desert mammals. To elucidate priorities for future research and management programs.

Date Commenced: Initial work 1976. This program commenced 1983.

Proposed Date of Completion: Field work 1985, writing up 1986.

Work Already Carried out: A series of field trips have been made to various parts of the western deserts of Western Australia, north-western South Australia and south-western Northern Territory. Aboriginal communities were visited and discussions held with older community members with the aid of puppet skins of the species which occur or occurred in the area. Distributions have been mapped with the aid of the FLORAPLOT routines in use at WAWRC. A paper is in preparation jointly with Dr K.A. Johnson and Mr R. Southgate of the Conservation Commission, Northern Territory. This research has resulted in a much better understanding of past and present mammal distributions and has enabled the decline of many of the species to be dated much more accurately than in the past.

Proposed Work Program 1985/86: A final field trip to the northern Great Sandy Desert is programmed for August 1985. Completion of paper should be during 1986.

RARE AND ENDANGERED VERTEBRATES

Staff: A.A. Burbidge.

Objectives: To identify which species of vertebrates are rare and/or endangered. To review the Western Australian official list of rare and endangered species, and through the CONCOM Working Group on Endangered Fauna, the Australian List. To publish information on endangered species. To advise on research priorities. To carry out preliminary surveys of possibly endangered species and to arrange for biological studies by the Department and other agencies.

Date Commenced: 1968.

Proposed Date of Completion: Ongoing.

Work Already Carried out: Numerous field trips, often in conjunction with other work, have been made to collect data on endangered vertebrates. Periodic reviews have been made of the Western Australian and Australian official lists of endangered fauna. A variety of studies have been initiated, including those on the Numbat, Black-flanked Rock-wallaby, Western Swamp Tortoise, Woylie, Long-tailed Dunnart, Noisy Scrub-bird and Ground Parrot.

Two field trips were made during 1984/85 to collect basic data on the distribution and status of the dragon lizard Ctenophorus yinnietharra.

Proposed Work Program 1985/86: This work will continue as time permits.

PATTERNS OF DECLINE IN THE WESTERN AUSTRALIAN MAMMAL FAUNA

Staff: A.A. Burbidge and N.L. McKenzie.

Objectives: To seek patterns in the decline of the mammals in Western Australia which might reveal the major causes of the decline and enable it to be halted or reversed.

Date Commenced: 1983.

Proposed Date of Completion: 1986.

Work Already Carried out: A paper presented at the 1983 ANZAAS Congress showed that it was possible to show relationships between the decline of the mammals and factors such as size, geographical distribution and habitat. Decline was independent of phylogeny, ability to fly or food. These data are being refined and worked up into a major paper.

Proposed Work Program 1985/86: Continuation of paper preparation which will be completed during 1986.

REVISION OF *BEAUFORTIA* R.BR. AND *REGELIA* SCHAV.

Staff: A.A. Burbidge and P.J. Fuller.

Objectives: Prepare generic taxonomic revisions. Document distribution and conservation status and make recommendations for conservation programs where necessary. Write up for publication in 'The Flora of Australia'.

Date Commenced: 1980.

Proposed Date of Completion: 1988/89.

Work Already Carried out: Extensive collections have been made of the described species of Beaufortia. Three undescribed species and one subspecies have been identified. Distributions are now well documented. Two species are considered to be rare and possibly endangered and detailed examination of one of these, B. purpurea, has commenced. Work on Regelia is at an early stage.

Proposed Work Program 1985/86: Further field work on the Beaufortia interstans complex is needed, and will take place in early summer 1985. Distribution maps for all species will be prepared using the FLORAPLOT routines. Initial examination of the distribution of Regelia spp will take place as time permits.

WESTERN SWAMP TORTOISE

Staff: A.A. Burbidge and P.J. Fuller.

Objectives: To monitor the population of the Western Swamp (or Short-necked) Tortoise at Twin Swamps and Ellen Brook Nature Reserves. To develop techniques for captive breeding.

Date Commenced: 1963 (while at Zoology Department, University of Western Australia).

Proposed Date of Completion: Ongoing.

Work Already Carried out: Natural history, biology and ecology are now well understood and the information has been published. Decline in wild has been due to a combination of drought, marginal habitat and fox predation. The population on Twin Swamps Nature Reserve is effectively extinct. The population in the Ellen Brook Nature Reserve is maintaining itself at about 25-30 animals.

Captive breeding experiments have been underway since 1979. Techniques for egg letdown and incubation have been perfected but few eggs have been obtained from the 3 captive females (none since 1981) and hatchling survival has been low.

There is little doubt that the Western Swamp Tortoise is the most endangered vertebrate in Western Australia. Prospects for its survival are not good.

Proposed Work Program 1985/86: Wild populations will be monitored as before. The captive population will be maintained with some variation in conditions with the aim of eventually meeting the correct combination of conditions for egg production.

NOISY SCRUB-BIRD MANAGEMENT PLAN

Staff: G.L. Folley and A.A. Burbidge.

Objectives: To ensure the persistence of the Noisy Scrub-bird (*Atrichornis clamosus*).

Date Commenced: Pilot study on translocation 1983. This program 1985.

Proposed Date of Completion: 1985.

Work Already Carried out: Following detailed biological studies of the Noisy Scrub-bird by CSIRO Division of Wildlife and Rangelands Research a Draft Management Plan for the species was prepared in 1984 and published in early 1985. The plan proposes a series of translocations of the species commencing in 1985.

Proposed Work Program 1985/86: The 1985 translocation, aimed at increasing the number of birds at Mt Many Peaks, is underway. Detailed investigations of other possible release sites will be carried out.

OFFSHORE ISLANDS SURVEY - LANCELIN TO DONGARA - BIRDS

Staff: P.J. Fuller.

Objectives: To provide information on birds, especially breeding seabirds, for the preparation of a management plan.

Date Commenced: 1979.

Proposed Date of Completion: January 1986.

Work Already Carried out: A series of surveys were made of various island groups during the summers of 1979/80 and 1980/81. Some work was carried out during holiday periods and long weekends to assess impact by visitors.

Proposed Work Program 1985/86: Additional surveys will be carried out during 1985 and early 1986 to update previous work and document changes in bird use.

BARROW ISLAND - FAUNA MONITORING

Staff: A.A. Burbidge.

Objectives: To monitor the effects of an oil field on the fauna of Barrow Island.

Date Commenced: 1969.

Proposed Date of Completion: Ongoing.

Work Already Carried out: Regular, usually biannual, visits are made to Barrow Island and an examination is made of oil field developments since the previous visit. Regular spotlight transects are made inside and outside the oil field and turtle breeding beaches checked.

Proposed Work Program 1985/86: None. Next visit in February/March 1987.

SALT-WATER CROCODILE NUMBERS IN WESTERN AUSTRALIA

Staff: A.A. Burbidge and P.J. Fuller.

Objectives: Make estimate of the numbers and distribution of *Crocodylus porosus* in Western Australia. Make recommendations for management.

Date Commenced: 1976.

Proposed Date of Completion: Ongoing.

Work Already Carried out: Counts were made of salt-water crocodiles in about half the tidal river systems in the Kimberley in 1977 and 1978. This work was done in conjunction with Professor H. Messel of the University of Sydney and the results were published in Department of Fisheries and Wildlife Reports No 3 24 (1977) and 34 (1979). A.A. Burbidge represents Western Australia on the CONCOM Working Group on Crocodiles and attended a conference on Crocodile Management in Darwin in January 1985. A paper was presented on Crocodile Management in Western Australia which will be published in the proceedings.

Proposed Work Program 1985/86: Planning is well advanced for a further count to take place in conjunction with the University of Sydney during the 1986 dry season probably during July and August.

WESTERN AUSTRALIAN WILDLIFE RESEARCH CENTRE

WILDLIFE RESEARCH SEMINAR

16 - 17 JULY 1985

H.C. CHOO

COMPUTING'S ROLE IN WILDLIFE RESEARCH

Staff: H.C. Choo and P. Gioia.

Objectives: To provide the Department with facilities to utilize existing resources as efficiently as possible to support the functions of the Department.

Date Commenced: Initial Developments - 1970
Consultant Engaged - 1982
Permanent Positions - 1984

Proposed Date of Completion: Ongoing - though various phases will be developed according to specified schedules.

Work Already Carried out: Work commenced in the 70's with the initial development of the Kangaroo Statistics system, and has since been extended to cover the following:

Flora Atlas (Plot)	-	1981
Flora Atlas (GDMS)	-	1981
Banksia Atlas (Plot)	-	1984
Animal Ecology	-	1982
Kangaroo Logbook	-	1980
Vegetation Survey	-	1980
Wetland Monitoring	-	1980
Numbat Tracking	-	1983
Population Estimates	-	1978
Wildlife General	-	1980

In November 1984, a critical review of the existing systems was carried out. This review showed that computing at Wildlife Research is at its infancy and highlighted an urgent need for more computing resources as well as a change in direction. Short and long term requirements were identified and an overall long term computing strategy was formulated. The strategy calls for a more organized and rational approach and involves the automation of current

manual procedures, the rationalisation of existing procedures, the integration of systems and communications with the other computers within the government.

Proposed Work Program 1985/86:

1. Document Processing. Provide good turn-around time during the various stages in the preparation, review and production of papers, reports and other documents. This will be achieved by extending word processing facilities to research staff (by installing six IBM PC XTs running D/WRITE3), to alleviate the bottleneck resulting from one word processing work station having to serve the needs of some forty personnel.

   Communications to be established between the host computer, the word processing PC's and the Displaywriter workstation. The system will have the ability to consolidate and extract information held within the host computer/s and to directly transfer information to the word processor for report preparation and printing.

2. Graphics. Develops an interface between the graphics plotter and the existing systems to provide the facility to produce high quality graphics output (eg - Banksia Atlas, Numbat tracking).

3. Data Collection and Management. Provide automated field data collection facility (six electronic field data recorders) to allow for data to be directly collected at the sites. Validation will be performed during recording and this will allow error corrections to be done at the time of recording.

   Provide automated data management facilities in the form of 'Fourth Generation Languages (4GL's)' to efficiently maintain large sets of information.

4. Data Analyses and Reporting. Install packages to provide research staff with the ability to perform all required forms of analysis and to generate reports.

5. Support. Provide ongoing support (ie. operations, maintenance and enhancements) for systems already implemented.

6. Education and Training. Provide and coordinate education, familiarisation and training of research staff in the use of computing facilities.

7. Computer Products Evaluation. To continue evaluation of computer hardware and software to identify and select system/s which best suit our long term requirements.

8. Inter/Intra Government Communications. Continue liaison with other government departments on direct access to information stored within the respective computers, and to establish electronic mailing facilities.

WESTERN AUSTRALIAN WILDLIFE RESEARCH CENTRE

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J.A. FRIEND

NUMBAT : STUDIES OF INDIVIDUALS AND POPULATIONS

Staff: J.A. Friend.

Objectives: To study the ecology of the Numbat as a basis for the management of the species.

Date Commenced: 1981.

Proposed Date of Completion: Field work 1986. Lab work and writing up 1986-87.

Work Already Carried out: A large amount of information has been collected, mostly at Dryandra Forest, but most is awaiting analysis. This information includes data on:

a) home range size;
b) interactions of individuals;
c) intensity of use of habitat;
d) definition of habitat, by radio-tracking and by recording sightings;
e) seasonal variation in diet;
f) life history, longevity, seasonal apsect of breeding, dispersal of young, relationship of life history to habitat use.

Proposed Work Program 1985/86: During 1985/86, the remaining field work will be largely completed, if technical assistance is available. This includes mapping areas of numbat movement (marked at present by flagging tape), keeping tabs on numbats currently fitted with transmitters for the rest of 1985/86, and collecting data on marked logs and burrows used by numbats.

Laboratory work to be done during 1985/86 includes the sorting and identification of termite remains in a large number of scats collected during the study. With technical assistance this could be completed by the end of 1987. The data from radio-tracking is largely still in a raw state,

but this analysis will be completed in 1985/86 given technical assistance and sufficient access to the Tektronix 4054. Maps displaying these movements will then be drafted, commencing late in 1985/86.

NUMBAT : SURVEY OF DISTRIBUTION AND DESCRIPTION OF HABITAT

Staff: J.A. Friend and consultant (2 months).

Objectives: To provide information on the status of the species and to help define suitable numbat habitat.

Date Commenced: 1981.

Proposed Date of Completion: 1986.

Work Already Carried out: Most data have already been collected, by canvassing for reports of numbat sightings, interviewing members of the public and following up reports with inspection of sites of possible numbat occurrence. This information has been collated.

Proposed Work Program 1985/86: An article on the distribution of the numbat in the SW will be written up during 1985/86. A consultant will be employed for 2 months to carry out an intensive survey of the Jandakot area in an attempt to identify specific numbat habitat there.

NUMBAT : FACTORS AFFECTING ASPECTS OF HABITAT

Staff: J.A. Friend.

Objectives: To distinguish environmental influences affecting the availability of food and shelter for numbats.

Date Commenced: 1981.

Proposed Date of Completion: 1987.

Work Already Carried out: This falls into two areas as follows:

a) Predictable factors - variation of termite availability with forest type, season and time of day. Variation of log availability with forest type. Field work completed, most data analysed.

b) Unpredictable factors - variation of termite availability with climate, variation of log and termite availability with fire frequency and intensity. Climate work has not yet commenced. One fire has been monitored (April 1985), and immediate changes in log and termite abundance recorded.

Proposed Work Program 1985/86: The effects of the autumn fire will be monitored through 1985/86. Another fire is planned in spring 1985, and follow-up work will be started.

NUMBAT : EFFECT OF INTRODUCED PREDATORS ON POPULATIONS

Staff: J.A. Friend.

Objectives: To determine whether the presence of introduced predators, particularly the fox, reduces numbat population numbers.

Date Commenced: 1982.

Proposed Date of Completion: 1985.

Work Already Carried out: Two areas of approximately 2 000 ha in Dryandra Forest have been chosen, as experimental and control areas, respectively. Surveys of both areas during 1981/82 established rates of sighting

frequency of numbats. The experimental area has been baited with 1080 poison each month since September 1982. Surveys during 1984 showed increases in sighting frequency in both areas.

Proposed Work Program 1985/86: Another series of surveys will be carried out in the latter half of 1985.

NUMBAT : CAPTIVE BREEDING

Staff: J.A. Friend and R.W. Whitford.

Objectives: To breed numbats in captivity and to develop an artificial diet for numbats.

Date Commenced: 1984.

Proposed Date of Completion: 1986 (1987 if funding available).

Work Already Carried out: Two numbats were brought into captivity from the wild, a male and a female with young. The young were weaned onto termites, then all but the adult female transferred to an artificial diet previously used for young echidnas. The original female and the two young females have mated with the adult male and all have produced young.

Proposed Work Program 1985/86: The colony will be maintained and it is hoped that during the breeding season of summer 1985/86 further matings will result in further young. If funds are available, the colony will be maintained through the subsequent breeding season before dispersal of the colony to zoos and through return to the wild.

NUMBAT : TRANSLOCATION TO AREAS OF FORMER HABITAT

Staff: J.A. Friend.

Objectives: To develop techniques for translocating wild numbats, and to release captive bred numbats. To use these techniques to re-establish populations in areas of former occurrence.

Date Commenced: To be commenced in 1985/86.

Proposed Date of Completion: 1987.

Work Already Carried out: Knowledge gained through study of the numbat at Dryandra will be the basis for this study.

Proposed Work Program 1985/86: Capture of young numbats in September/October and fitting of radio-transmitters will allow transfer of animals later in 1985. The translocated animals will be monitored to assess the success of the move. Captive-bred animals from Woodvale will also be released and monitored. Monitoring will continue as long as necessary. This project is dependent on the availability of technical support.

ECOLOGY OF THE WESTERN BARRED BANDICOOT

Staff: J.A. Friend.

Objectives: To investigate aspects of the ecology of *Perameles bougainville* on Dorre Island.

Date Commenced: To be commenced in 1985/86.

Proposed Date of Completion: 1987.

Work Already Carried out: No field work has yet been performed.

Proposed Work Program 1985/86: A field trip is planned, to Dorre Island, in May or June 1986. Bandicoots will be trapped and breeding data collected, and some animals fitted with transmitters. Radio-tracking techniques will be used to collect habitat usage data; scats and potential food items will be collected for analysis of diet.

TAXONOMY AND ZOOGEOGRAPHY OF AUSTRALIAN LANDHOPPERS (CRUSTACEA : AMPHIPODA)

Staff: J.A. Friend.

Objectives: Description of new species; revision of group at the generic level; drawing zoogeographic conclusions.

Date Commenced: 1981 (at WAWRC).

Proposed Date of Completion: Indefinite.

Work Already Carried out: An article describing five new species (2 from W.A.) was published in 1982. Collections have been made in Western Australia in preparation for another paper on the W.A. species.

Proposed Work Program 1985/86: Depending on outside funding an artist will be employed for several months to produce plates for publication from pencil drawings already prepared. Further collection of specimens is also dependent on funding.

WESTERN AUSTRALIAN WILDLIFE RESEARCH CENTRE

WILDLIFE RESEARCH SEMINAR

16 - 17 JULY 1985

J.T. GOODSELL

A SYSTEM OF MONITORING FOR CONSERVATION RESERVES IN WESTERN AUSTRALIA

Staff: J.T. Goodsell, A.J.M. Hopkins, J.M. Brown and E.A. Griffin (consultant).

Ojectives: To establish a system of permanently marked sites for use in monitoring long-term changes in vegetation composition and structure (in the first instance).

Date Commenced: 1976.

Proposed Date of Completion: Ongoing.

Work Already Carried out: A system of permanent monitoring posts was established at Tutanning Nature Reserves in 1976. Subsequent survey work in the south-west has concentrated on use of permanent plots. In 1983 the promotion project was expanded and taken on by Mr Goodsell. A flexible but multi-level system of monitoring based on initial recording of all biophysical attributes of a site was developed and tested at Clackline Nature Reserve. In 1984 plots were established in a range of *Eucalyptus loxophleba* - *Acacia acuminata* communities running from Pingelly to east of Hyden.

Proposed Work Program 1985/86: Work to date requires assessment before any further work can be planned effectively. However, sets of quadrats already established for the gradient study could be readily incorporated into this program.

WESTERN AUSTRALIAN WILDLIFE RESEARCH CENTRE

WILDLIFE RESEARCH SEMINAR

16 - 17 JULY 1985

A.J.M. HOPKINS

THEORY OF RESERVE MANAGEMENT PLANNING AND IMPLEMENTATION

Staff: A.J.M. Hopkins in collaboration with planning staff.

Objectives: To further develop the intellectual basis for management planning in Western Australia.

Date Commenced: 1985.

Proposed Date of Completion: Ongoing.

Work Already Carried out: This study is at the proposal stage at present and is being discussed with planning staff. Where it is necessary to undertake project work consideration will be given to using the detailed Geographic Information Systems that have been developed for Tutanning Nature Reserve and are in the process of being developed for Two Peoples Bay Nature Reserve and the proposed Mt Lesueur Nature Reserve (work on Fitzgerald River and Stirling Range is also programmed).

PATTERNS OF GROWTH AND FLOWERING OF *XANTHORRHOEA*

Staff: J.M. Brown and A.J.M. Hopkins.

Objectives: To further validate the work of Lamont, Downes & Fox in order to provide a sound basis for pre-European fire history estimation using *Xanthorrhoea*.

Date Commenced: 1982.

Proposed Date of Completion: To be reassessed in 1986/87.

Work Already Carried out: Studies of leaf production, senescence and flowering have been conducted on *X. reflexa* at Tutanning since 1983. Samples of old *X. reflexa* have been collected and prepared for analysis.

Proposed Work Program 1985/86: Data collection will continue for a further 12 months.

A FUNCTIONAL LIFE FORM CLASSIFICATION FOR THE SPECIES-RICH KWONGAN VEGETATION OF WESTERN AUSTRALIA

Staff: P.J. Grubb (Cambridge, U.K.) and A.J.M. Hopkins.

Objectives: To develop a classification for species that will enhance insight into the mechanisms of co-habitation on species-rich vegetation.

Date Commenced: 1984.

Proposed Date of Completion: 1986.

Work Already Carried out: Field work was undertaken in September-October 1984 and a preliminary working classification developed.

Proposed Work Program 1985/86: Further field work is required to test and refine the classification. The work would then be published.

ANALYSIS OF FINE SCALE PATTERN IN SPECIES-RICH SHRUB DOMINATED PLANT COMMUNITIES

Staff: A.J. Hopkins, J.M. Brown, E.A. Griffin (Consultant) L. Olsvig-Whittaker (Israel) and G. Eiten (Brasil).

Objectives: To identify relationships between individual plants and their neighbours and microsite features and between individuals of the same species.

Date Commenced: 1982.

Proposed Date of Completion: To be reassessed in 1987.

Work Already Carried out: Field work has been completed at two sites, Tutanning and Mt Lesueur, using three different sampling techniques. Some very preliminary analyses have been done.

Proposed Work Program 1985/86: Data will be analysed and prepared for publication as time permits.

THE IDENTIFICATION OF MAJOR ENVIRONMENTAL GRADIENTS IN SOUTH-WESTERN AUSTRALIA

Staff: J.M. Brown, A.J.M. Hopkins, J.T. Goodsell, E.A. Griffin and D. Mitchell.

Objectives: To identify major environmental gradients for the purpose of interpreting and understanding large scale patterns floristic and vegetation and to provide some basis for ascribing management priorities for reserves.

Date Commenced: 1980.

Proposed Date of Completion: Study 1 complete, Study 2, 1986.

Work Already Carried out: A major survey of shrub vegetation on laterite in the Jurien-Three Springs region revealed the importance of climate gradients in that area (Study 1). The present study involves shrub dominated communities from Boyagin to Lake Cronin, south to Frank Hann National Park and Dongalocking. Field sampling has been completed and laboratory work is nearing completion.

Proposed Work Program 1985/86: Results of the study will be analysed and written up for publication.

DISTRIBUTION AND ECOLOGY OF DRYANDRA (PROTEACEAE)

Staff: A.J.M. Hopkins and E.A. Griffin (Consultant).

Objectives: To map the complete distribution of all species in this endemic genus and analyse these in relation to climate and soil patterns.

Date Commenced: 1984.

Proposed Date of Completion: 1987.

Work Already Carried out: Distribution data from all herbarium records and from a thorough survey of the area Moore River to Kalbarri have been compiled in a format for the Australian Biogeographic Information System. Funding has now been obtained from ABRS.

Proposed Work Program 1985/86: Results will be analysed in relation to known edaphic and climate patterns on a ½° grid cell basis. The project is being expanded with ABRS funding to cover all the Proteaceae except Banksia and Grevillea.

THE RELATIONSHIP BETWEEN CLIMATIC AND EDAPHIC FACTORS AND THE DISTRIBUTION OF PLANT SPECIES IN SOUTH-WESTERN AUSTRALIA

Staff: A.J.M. Hopkins, J.M. Brown, J.T. Goodsell and E.A. Griffin (Consultant).

Date Commenced: 1976.

Proposed Date of Completion: Ongoing.

Work Already Carried out: A detailed study of a 20 km² area

south of Eneabba was followed up by a regional study (Jurien - Three Springs) of a single vegetation type (heath) on a single soil type (laterite) on the Mt Lesueur - Cockleshell gully area. Results from this last survey have been analysed. A systematic grid of 316 sampling points has been established at Tutanning - these have all been sampled but data await analysis. Further regional survey is being undertaken in conjunction with the monitoring and gradients projects.

Proposed Work Program 1985/86: Work will continue on analysis and preparation of reports for publication. Some new work in the Kellerberrin area, in conjunction with CSIRO Wildlife personnel is being discussed.

REGENERATION STUDIES - BARROW ISLAND

Staff: A.J.M. Hopkins.

Objectives: To monitor the regeneration of vegetation following disturbance (major earthworks and fire).

Date Commenced: 1975.

Proposed Date of Completion: To be assessed.

Work Already Carried out: Study sites have been laid out in areas that have been affected by a variety of disturbance types. These have been assessed twice.

Proposed Work Program 1985/86: Study sites will be reassessed in November 1985 following the CONCOM islands workshop.

REGENERATION STUDIES - ENEABBA RESERVES

Staff: A.J.M. Hopkins and E.A. Griffin (consultant).

Objectives: To develop an understanding of the ecology of the Eneabba region to ensure appropriate land-use management, particularly in relation to the various mining activities in the area.

Date Commenced: 1977.

Work Already Carried out:

1. Ecological survey of the mineral sand mining area at Eneabba.
2. Effects of cutting native vegetation for use in rehabiliation as brush material.
3. Rehabilitation after sand mining (analysis of results of the Allied Eneabba S.E. Factorial experiment).

Proposed Work Program 1985/86: A report on the S.E. Factoral Experiment will be prepared for publication.

REGENERATION STUDIES - TUTANNING

Staff: A.J.M. Hopkins and P. Farrington (CSIRO).

Objectives: To examine appropriate methods for the revegetation of disused farmland in the central wheatbelt.

Date Commenced: 1980.

Proposed Date of Completion: Ongoing.

Work Already Carried out: Three avenues of investigation have been pursued: (i) a study of the soil-borne seed bank

in the farmed areas; (ii) an investigation of seed dispersal into cleared areas from adjacent native vegetation and (iii) regeneration from seed and seedlings with various soil surface treatments.

Proposed Work Program 1985/86: Results of the above studies will be worked up for publication as time permits.

FIRE ECOLOGY

Staff: A.J.M. Hopkins, E.A. Griffin and N. Burrows.

Objectives: To examine population structure and reproductive strategies of important plant species in relation to fire. To examine the effects of fire on structural and successional pattern in vegetation.

Date Commenced: 1977.

Proposed Date of Completion: Ongoing.

Work Already Carried out: The first study at a woodland site E of Lake King has been published already. Field work has been completed on a further two sites, a Banksia woodland and Jacksonia tall shrubland, at Eneabba. Data have been compiled and analysed and one paper has been drafted.

Proposed Work Program 1985/86: Papers on the two Eneabba studies will be completed. Some preliminary discussions with the Mr Neil Burrows (Manjimup) suggest the possibilities of collaborative studies in State Forest, this will be developed and implemented as appropriate.

FIRE ECOLOGY - MT LESUEUR

Staff: A.J.M. Hopkins and E.A. Griffin (Consultant).

Objectives: To monitor the regeneration of vegetation in the Irwin Botanical District (northan sandplains) and of selected species (including gazetted rare flora) after fire.

Date Commenced: 1985.

Proposed Date of Completion: Ongoing.

Work Already Carried out: In May 1985 an existing study area with over 300 fixed study plots was burnt by a combination of wildfire and back burns. Work has commenced to relocate the initial quadrats to allow monitoring to begin on September 1985.

FIRE ECOLOGY - MIDDLE ISLAND (RECHERCHE ARCHIPELAGO)

Staff: A.J.M. Hopkins, J.M. Brown, A.S. Weston and M.E. Trudgen (consultants).

Objectives: To monitor the regeneration of the vegetation after fire and to study the development and maintenance of vegetation in the absence of fire.

Date Commenced: 1973.

Proposed Date of Completion: Ongoing.

Work Already Carried out: Over the past 12 years, a comprehensive inventory of the island's resources has been compiled (flora, fauna, vegetation, history, physigraphy and visitors use). The 36 study quadrats in the 1972/73 fire

area have been sampled seven times. Studies have also been conducted on the dynamics of the unburnt vegetation (estimated to be 170 years since fire). The work has been written up for publication.

Proposed Work Program 1985/86: Minor editing work remains to be done on the Middle Island Bulletin. This publication will include up to date review of information for the whole Archipelago of the Recherche. This data base will be developed through further work on other islands as opportunities permit. Particular attention will be paid to the relative proportions of seed regeneration to resprouting in the vascular flora of the islands in relation to times of isolation from the mainland.

FIRE ECOLOGY - MODELLING

Staff: A.J.M. Hopkins plus collators overseas and interstate.

Objectives: To develop an array of ecosystem and land-use modelling strategies for use in reserve management and research.

Date Commenced: 1979.

Proposed Date of Completion: Ongoing.

Work Already Carried out: A PREPLAN (Pristine Environment Planning Language and Simulator) system was developed for Tutanning Nature Reserve in 1979. This system is now being upgraded particularly by the use of new Geographic Information System Technology. At the same time the data bases for the Two Peoples Bay Nature Reserve and the Mt Lesueur area are being developed. Observation from an

experimental fire at Tutanning in 1985 will be used to test the Tutanning PREPLAN system.

Proposed Work Program 1985/86: Upgrading Tutanning PREPLAN and testing completion of Two Peoples Bay GIS completion of Mt Lesueur data. Assessment of possible new fire behaviour models.

FIRE ECOLOGY - TUTANNING NATURE RESERVE

Staff: A.J.M. Hopkins and J.M. Brown (G. Friend).

Objectives: To study fire behaviour, effects of fire on, and rates of regeneration of a variety of structural and floristic types of vegetation.

Date Commenced: 1981.

Proposed Date of Completion: To be reassessed in 1995.

Work Already Carried out: Twenty-six paired plots were established and comprehensively sampled in 1981 in a block programmed to be burnt in autumn 1982. This block was burnt in April 1985.

Proposed Work Program 1985/86: One quadrat of each pair will be fenced off in spring 1985 to exclude grazing. Regeneration will be recorded in September/October each year.

FIRE ECOLOGY - TWO PEOPLES BAY

Staff: A.J.M. Hopkins and J.M. Brown.

Objectives: To study the processes and time scales and regeneration of south coast kwongan vegetation after fire.

Date Commenced: 1976.

Proposed Date of Completion: 1996.

Work Already Carried out: Two study plots were established in closed heath vegetation. Both were sampled (species composition, number of individuals, cover, structural characteristics and biomass). The first plot was burnt in September 1976, the second in February 1979. Plots have been resampled at intervals of 0, 1, 2, 3, 5 and 7 years after the fire. Harvested material has been dried and weighed and data compiled. In addition, at Year 5, quadrats outside the grazing exclosure were harvested to ascertain the impact of kangaroo grazing on post-fire regeneration.

Proposed Work Program 1985/86: A further period of sampling is scheduled for October 1985. In the meantime, results from previous work will be written up for publication.

WESTERN AUSTRALIAN WILDLIFE RESEARCH CENTRE

WILDLIFE RESEARCH SEMINAR

16 - 17 JULY 1985

S.D. HOPPER

ADMINISTRATION AND MANAGEMENT OF GAZETTED RARE FLORA

Staff: S.D. Hopper, R.E. Sokolowski, Senior Clerk Flora and Wildlife Officers.

Objectives: To provide advice, research data, liaise with government departments and the public, and to initiate surveys, reserve acquisition, oversee departmental correspondence and liaise with the Senior Clerk Flora, wildlife officers and operations personnel to ensure effective implementation of Section 23F of the Wildlife Conservation Act.

Date Commenced: Research - September 1977, Administration 1980.

Proposed Date of Completion: Ongoing.

Work Already Carried out: Locations of gazetted rare flora are established by a continuing program of surveys undertaken by research staff, wildlife officers, consultant botanists supervised by S.D. Hopper and, on an ad hoc basis, by members of the Australian professional botanical community in the course of systematic or ecological research. Research staff collate locational information and, through the Senior Clerk Flora, set up a departmental file on each species, request follow up surveys by Wildlife Officers where necessary, establish ownership of the land involved, and ensure that official notification about the rare flora and legal responsibilities associated with its protection is hand delivered by a Wildlife Officer to the owner. Various avenues of protection are explored, including purchase of the land as a nature reserve, fencing to prevent grazing by stock, cessation of destructive activities such as sand or gravel mining etc, and propagation of species. District Wildlife Officers and other Departmental staff routinely monitor known populations of rare flora, and regular reports are sent via the Chief

Wildlife Officer and Senior Clerk Flora to research staff. Applications to damage or destroy rare flora for industrial development, prescribed burning, mining, horticultural or scientific research etc. are routinely sent to research staff for advice. Requests for information on rare flora by mineral exploration companies, local authorities, consultant botanists working on E.R.M.P.'s and government officers are processed by research staff and the Senior Clerk Flora.

Proposed Work Program 1985/86: To continue as above. Subject to staff availability, the possibility of transferring some rare flora liaison responsibilities to the Protection Branch will be explored. Establishment of a computerized rare flora data base is proposed. Subject to funds becoming available, a program of fencing of rare flora on private property will be co-ordinated by research staff. Establishment of artificially propagated rare flora in the wild will be attempted for the first.

ADDITIONS AND DELETIONS TO THE GAZETTED RARE FLORA

Staff: S.D. Hopper and S.J. Patrick (Consultant Botanist).

Objectives: To undertake and collate research on the conservation status of plants considered for addition and deletion to the schedule of gazetted rare flora.

Date Commenced: September 1977. Proposed Date of Completion: Ongoing. Current revision of schedule by Mrs Patrick - December 1985.

Work Already Carried out: This is summarized in Department of Fisheries and Wildlife Report Nos 42 and 53 entitled "A Guide to the Gazetted Rare Flora of Western Australia" and ".... ibid : Supplement 1". Taxonomic and ecological literature and active field workers are routinely screened for possible taxa of interests. Field surveys are

undertaken or initiated and supervised in the manner described for the previous project. Survey data are then collated and a proposal for addition, deletion or no action is prepared for consideration by senior staff and forwarding to the Minister for formal gazettal. Currently, Mrs Patrick is collating data on several hundred taxa that have been proposed for consideration for gazettal as rare flora.

Proposed Work Program 1985/86: A summary report proposing additions and deletions to the gazetted rare flora will be completed by December 1985. Ongoing monitoring of the schedule of rare flora will continue.

BRYOPHYTES AND LICHENS - NEED FOR GAZETTAL AS PROTECTED FLORA

Staff: S.D. Hopper, Dr R. Wyatt and Dr. A. Stoneburner (University of Georgia, U.S.A.).

Objectives: To collate available information and add to knowledge of Western Australia's bryophytes (mosses and liverworts) and lichens so that a case can be made for including them in the schedule of protected flora as defined in the Wildlife Conservation Act.

Date Commenced: March 1984.

Proposed Date of Completion: December 1985.

Work Already Carried out: Knowledge of the State's lichens has been summarised by Richardson, R.M., & Richardson, D.H.S. (1982). A systematic list with distributions of the lichen species of Western Australia, based on collections in the Western Australian Herbarium. West. Aust. Herb. Res. Notes 7 : 17-29.

Dr Wyatt and Dr Stoneburner spent six months on sabbatical in W.A. in 1984 as visiting scientists to the Wildlife Research Centre. Extensive bryophyte collections were made throughout the south-west, focusing on nature reserves and national parks. In addition, collections were made by S.D.H. of bryophytes in the Gibson and Great Victoria Deserts. All material in the Western Australian Herbarium and Herbarium of the Botany Department, University of Western Australia, was examined and curated by Drs Wyatt and Stoneburner. A checklist of the bryophytes of Western Australia is in preparation.

Proposed Work Program 1985/86: Completion of the checklist of W.A. bryophytes, and a submission to senior staff for the gazettal of bryophtes and lichens as protected flora. Short notes on the bryophtes of Rottnest Island and the Gibson and Great Victoria Deserts will be prepared for publication.

PRESUMED EXTINCT AND VERY RARE WHEATBELT PLANTS

Staff: S.J. Patrick (Temporary Research Officer) and S.D. Hopper.

Objectives: To collate available published and herbarium information, to prepare line drawings and draft text for a publication on the subject.

Date Commenced: January 1984.

Proposed Date of Completion: December 1985.

Work Already Carried out: Literature and herbarium work (including a two week study of type specimens at the National Herbarium, Melbourne) is complete. Drawings of most taxa are finished. Many taxonomic problems were encountered and most resolved by consultation with relevant botanists. A manuscript is in preparation. An unpublished

report providing all literature and herbarium data on each taxon is finished.

Proposed Work Program 1985/86: Finalize manuscript and submit it for publication. Distribute the report to departmental staff in wheat-growing districts to encourage the rediscovery of presumed extinct taxa.

DATA BASE ON GEOGRAPHICALLY RESTRICTED PLANTS OF WESTERN AUSTRALIA

Staff: S.D. Hopper and various consultant botanists.

Objectives: To collate into unpublished departmental reports all available literature and herbarium data on geographically restricted plants of the State on a regional basis. To thus provide a data base for planning detailed regional surveys of rare plants, and for rapid retrieval of available information on the rare and restricted plants of regions of the State.

Date Commenced: 1982.

Proposed Date of Completion: 1986 (possibly ongoing).

Work Already Carried out: Unpublished reports have been completed on all regions of the State except the Goldfields and the Stirling Range.

Proposed Work Program 1985/86: Subject to the availability of funds, a botanical consultant will be hired to prepare a report on the Goldfields.

LICENSING AND MANAGEMENT OF THE WILDFLOWER INDUSTRY

Staff: S.D. Hopper and R.E. Sokolowski.

Objectives: To advise and undertake research on the licensing and effective management of the wildflower industry.

Date Commenced: 1977.

Proposed Date of Completion: Ongoing.

Work Already Carried out: This is summarized in the following two publications.

Rye, B.L. Hopper, S.D. and Watson, L.E. (1980). Commercially exploited vascular plants native in Western Australia : Census, Atlas and Preliminary Assessment of Conservation Status. Dept. Fish. Wildl. West. Aust. Rept No. 40, 1-307.

Burgman, M.A., & Hopper, S.D. (1982). The Western Australian wildflower industry 1980/81. Dept. Fish. Wildl. West. Aust. Rept No. 53, 1-217.

Advice on licenses is routinely provided to the Senior Clerk Flora. There is a clear need to amend legislation so that wholesalers have to be licensed and submit returns of flora traded. Attendance at the 1985 Buenos Aires meeting of the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) led to the successful removal of all remaining heavily traded W.A. wildflowers from Appendix II of the convention.

Proposed Work Program 1985/86: Prepare submissions to senior staff for proposed changes to legislation. Continue routine advice. Seek new staff appointments to work on the wildflower industry. Prepare for the Australian National Parks and Wildlife Service a booklet on W.A. plants listed on CITES.

RESERVATION STATUS OF COMMERCIALLY EXPLOITED FLORA

Staff: J. Mutter (Temporary Research Officer) and S.D. Hopper.

Objectives: To establish the reservation status of Western Australian plant species exploited in the wildflower trade, particularly those included on Appendix II of CITES or identified as being at risk.

Date Commenced: February 1984.

Proposed Date of Completion: January 1985.

Work Already Carried out: Project completed, and an unpublished report is available. The following is a summary of the study of 122 species.

Information was obtained from published literature, files at the Western Australian Department of Fisheries and Wildlife and National Parks Authority and from field surveys of 55 Nature Reserves and National Parks. The data were compiled by means of a computer-based flora atlas and presented on distribution maps.

On the whole, species exploited in the wildflower trade were well represented on parks and reserves. Only 8 species were not recorded on any reserves, none of which are harvested in large quantities.

Heavily exploited and geographically restricted species such as *Dryandra polycephala* and *Banksia burdettii* were shown to be vulnerable, while further research and management may also be warranted for *Anigozanthos pulcherrimus*, *Banksia hookeriana*, *Helichrysum cordatum*, *Macropidia fuliginosa* and *Verticordia nitens*.

Proposed Work Program 1985/86: Seek funds from ANPWS for detailed follow-up studies on Anigozanthos pulcherrimus, Macropidia fuliginosa and Cephalotus follicularis. If successful, appoint Temporary Research Officers and initiate projects.

HARVESTING TECHNIQUES USED IN THE WILDFLOWER TRADE

Staff: A. Napier (Temporary Research Officer) and S.D. Hopper.

Objectives: To gain information on harvesting techniques and make recommendations for further study on species at risk and on management of commerical picking.

Date Commenced: May 1984.

Proposed Date of Completion: June 1985.

Work Already Carried out: An unpublished report on an initial study over May-July 1984 is available and has the following abstract:

> The report on the Western Australian Wildflower Industry by Burgman and Hopper (1982) included a recommendation to examine harvesting methods of geographically restricted species. An expanded list of 124 species which warranted study was compiled. Plants included on the list had been harvested in some form and were either geographically restricted, on the CITES (Convention on Trade and Endangered Species) Appendix II list or were the 55 most heavily exploited.
>
> Contact with pickers revealed details about harvesting methods, species availability and potential regeneration of plants after picking. On the whole plants which are harvested heavily regenerate well and there was little

observed death caused by picking. Fire or other disturbance is an essential part of the growth cycle as far as saleable stems on many species are concerned. Many plants are only available for good cut stems when they are young and older plants of the species are untouched. Additionally, wholesaler requirements for picked stems significantly limit the percentage of each plant available for harvest in many species.

Only Banksia coccinea, Verticordia brownii and V. grandis appeared to be possibly limited supplies of cut flowers with B. coccinea being badly affected by Phytophthora cinnamomi (die-back) in some areas. Angiozanthos pulcherrimus and Macropidia fuliginosa require further management as natural populations but cultivation of the species is alleviating supply shortages.

There is a significant trend among suppliers of cut flowers to cultivate or bush-farm species which should help lessen the pressure on some heavily exploited species, expecially of Banksia and Anigozanthos.

Further work on harvesting techniques is in progress.

Proposed Work Program 1985/86: Complete final unpublished report. Consider changes to conditions on commercial picking licenses in light of recommendations made.

REVIEW OF FLORA CONSERVATION IN WESTERN AUSTRALIA

Staff: S.D. Hopper.

Objectives: To prepare for publication a refereed scientific review paper and a book that summarize approaches to flora conservation in Western Australia and place these

in an international context. To use results of the review to plan future flora conservation research.

Date Commenced: 1978.

Proposed Date of Completion: Review paper - 1986, book - 1987/88.

Work Already Carried out: Two papers covering general aspects of this field have been published to date:

Hopper, S.D. (1979). Threatened vascular plants in Western Australia. In "A Vanishing Heritage : the problem of endangered species and their habitat", Nature Conservation Council : Wellington.

Hopper, S.D., and Muir, B.G. (1984). Conservation of the Kwongan. In J.S. Pate and J.S. Beard (eds), "Kwongan, Plant Life of the Sandplain", University of Western Australia Press, Nedlands.

Research on several other projects will contribute data to the proposed review.

Proposed Work Program 1985/86: Draft text of scientific review paper and of selected chapters of book.

FLORA POSTERS, LEAFLETS, MAGAZINE ARTICLES AND PUBLIC LECTURES

Staff: S.D. Hopper and Publicity Staff.

Objectives: To convey flora research results and the need for flora conservation to the general public through the use of colour posters, leaflets, magazine articles and public lectures.

Date Commenced: 1977.

Proposed Date of Completion: Ongoing.

Work Already Carried out: Two flora posters, eight leaflets on rare flora, and several magazine articles have been published. A number of public lectures, field courses and University Extension courses have been given.

Proposed Work Program 1985/86: Continue as above. The need to maintain production of posters and regular publication of the departmental magazine is considered vital to maintain public interest in flora conservation. Research staff will provide the Publicity Branch with every assistance possible to ensure that flora publications for the public appear regularly.

ESTABLISHMENT OF FIELD HERBARIA IN ALL DISTRICT WILDLIFE OFFICES

Staff: R.E. Sokolowski.

Objectives: To assist all District Wildlife Officers in the establishment of system-card based field herbaria, and to offer *ad hoc* support in their continued maintenance.

Date Commenced: 1983.

Proposed Date of Completion: Project completed December 1984.

Work Already Carried out: Materials for all field herbaria were purchased and personally delivered. One or two days were spent in each country office setting up the equipment, undertaking field training in collecting technques, and in subsequent handling of specimens.

Proposed Work Program 1985/86: Ad hoc follow-up assistance as opportunity allows.

A FLORA SURVEY OF THE RAVENSTHORPE-CAPE ARID MALLEE BELT

Staff: M.A. Burgman (consultant botanist) and S.D. Hopper, W.A. Loneragan (U.W.A.).

Objectives: To undertake a study of the flora, ecology and biogeography of the eastern Roe Botanical District and to thereby assesss the impact of proposed agricultural development on vacant Crown land between Ravensthorpe and Cape Arid National Park.

Date Commenced: 1983.

Proposed Date of Completion: April 1985.

Work Already Carried out: Project completed and two unpublished reports prepared. 3 635 specimens of 1 220 plant taxa were collected. Of these 1 890 were undescribed species or of uncertain taxonomic status. 146 taxa (12%) were rare, geographically restricted or poorly known, and 59 were sufficiently threatened to be proposed for gazettal as rare flora. Like the better known heathland vegetation, a rapid turnover in species over short distances was documented and there were thus low levels of resemblance between structurally similar vegetation growing on similar soils but separated geographically. Flora and vegetation of 33 conservation reserves were surveyed. Only 58 of the 146 taxa considered to be rare were found on these reserves. Existing reserves were not representative of most of the land proposed for development. It was concluded that each area considered for agricultural development should be very thoroughly surveyed, and conservation measures should be designed independently for each one.

Proposed Work Program 1985/86: Mr Burgman will prepare several papers for publication. Through the Senior Clerk Flora and the Senior Clerk Reserves, action will be taken on recommendations arising from the study in relation to proposed gazetted rare flora and changes in purpose, vesting and management of nature reserves.

FLORA SURVEY OF SELECTED CROWN LANDS

Staff: S.D. Hopper and R.E. Sokolowski.

Objectives: To undertake general collections and prepare flora lists for selected Crown lands such as poorly known nature reserves or national parks, or areas of Crown land proposed for acquisition as reserves.

Date Commenced: 1978.

Proposed Date of Completion: Ongoing.

Work Already Carried out: Collections completed and reasonable flora lists collated for Eyre, Mt Augustus, the proposed Mt Adams Nature Reserve and part of the proposed Edgar Range Nature Reserve. A detailed survey of banksias and eucalypts on Two Peoples Bay Nature Reserve has been drafted with G. Folley for publication in the forthcoming management plan.

Proposed Work Program 1985/86: Prepare lists for Eyre and Mt Augustus for publication. Commence general collections for selected granite rocks throughout the south-west.

BIOLOGICAL SURVEY OF COOLOOMIA NATURE RESERVE

Staff: S.D. Hopper, A.A. Burbidge and P.J. Fuller.

Objectives: To survey the flora and fauna of Cooloomia Nature Reserve (S of Shark Bay) and prepare a report for publication.

Date Commenced: 1979.

Proposed Date of Completion: 1986/87.

Work Already Carried out: Full surveys undertaken in September 1979, March 1980, and subsequent flora collections in August 1984. Preliminary lists collated. Most herbarium work finished. Most fauna data collated.

Proposed Work Program 1985/86: Complete data analysis and draft report.

ATLAS OF THE W.A. FLORA - PILOT PROJECT (ORCHIDS)

Staff: S.D. Hopper, P. Gioia, S.J. Patrick (consultant artist).

Objectives: To conduct a volunteer-participant pilot atlas project aimed at recording the distribution of W.A. orchids. To develop an interactive computerized data base system that allows for the retrieval and manipulation of the biogeographical information to serve departmental responsibilities in wildflower conservation.

Date Commenced: Initial concept - 1978; first contributions sought - 1981.

Proposed Date of Completion: Closing date for final contributions - 1 July 1985. Publication of Orchid Atlas - 1986.

Work Already Carried out: Computer programming over several years has led to the development of a sophisticated

interactive graphics display system without parallel in Australia. Several thousand orchid sight records have been contributed by some 30 selected members of the W.A. Native Orchid Study and Conservation Group who were invited to participate in the Pilot Project. Line drawings of almost all known W.A. orchids have been completed by Mrs S. Patrick in preparation for publication of the Orchid Atlas.

Proposed Work Program 1985/86: Analyse data statistically and prepare publication quality computer maps of all orchids for the Atlas. Draft text and complete illustrations. Submit the Atlas for publication.

NATIVE TREES AND TALL SHRUBS OF PERTH - GUIDE AND ATLAS

Staff: S.D. Hopper, R.J. Powell and S.J. Patrick (consultant artist).

Objectives: To prepare an illustrated guide to the identification of native trees and tall shrubs (>3 m), of Perth, and to use this as a basis for a mapping program involving metropolitan schools and other interest groups.

Date Commenced: 1984.

Proposed Date of Completion: Guide - 1978; atlas project - 1990.

Work Already Carried out: Line drawings of almost all trees and shrubs are complete, as is photographic coverage of most.

Proposed Work Program 1985/86: Complete photographic coverage. Initiate drafting of text.

POLLINATION OF WESTERN AUSTRALIAN TERRESTRIAL ORCHIDS

Staff: S.D. Hopper, A.G. Wells (consultant photographer) and A.P. Brown (W.A. Herbarium).

Objectives: Conduct field work and prepare for publication a colour book on the various pollination modes of W.A. terestrial orchids.

Date Commenced: June 1985.

Proposed Date of Completion: December 1986.

Work Already Carried out: Preliminary field work and literature searches.

Proposed Work Program 1985/86: A.G. Wells will use infra-red triggered high-speed photographic techniques on a range of orchid genera to illustrate behaviour of pollinators. Collaborative field work will be undertaken so that scientific aspects of each pollination story can be recorded. The manuscript will be drafted early in 1986.

ORCHIDS OF METROPOLITAN PERTH

Staff: A.P. Brown (W.A. Herbarium), S.D. Hopper and S.J. Patrick (consultant artist).

Objectives: Prepare for publication a colour book on the biology and identification of Perth's 100+ orchids.

Date Commenced: 1982.

Proposed Date of Completion: 1986 or 1987.

Work Already Carried out: Most of the text has been drafted, all drawings are complete, and most colour photos are in hand.

Proposed Work Program 1985/86: Completion of the book has been deferred until taxonomic studies of several problem genera are finalized. Once manuscripts on the latter are submitted for publication, work on the book will recommence, probably early in 1986.

A REVISION OF CALADENIA, DRAKAEA AND ALLIED GENERA OF ORCHIDACEAE IN WESTERN AUSTRALIA

Staff: S.D. Hopper and S.J. Patrick (consultant artist).

Objectives: Conduct field and herbarium surveys to enable preparation of a formal taxonomic revision of this group of terrestrial orchids, focusing especially on rare taxa.

Date Commenced: 1982.

Proposed Date of Completion: 1986.

Work Already Carried out: With considerable assistance from members of the W.A. Native Orchid Study and Conservation Group, field studies and collections have been made of all known taxa in this group of about 90 species. A number of new taxa will be named as a result of the study. Several of these are rare and threatened. Drawings of all are complete. Descriptions of some have been drafted.

Proposed Work Program 1985/86: Complete descriptions and field work, and submit a manuscript for publication in Nuytsia.

GENERIC RELATIONSHIPS AND EVOLUTION OF *CALADENIA*, *CHLORAEA* AND ALLIED ORCHIDS

Staff: S.D. Hopper and M.A. Burgman (consultant botanist).

Objectives: To revise the tribal and subtribal classification of this Australasian-South American group of orchids from an evolutionary (cladistic) perspective. Part of a series of studies in preparation for forthcoming books on W.A. orchids.

Date Commenced: April 1985.

Proposed Date of Completion: 1986.

Work Already Carried out: Field work, literature search, herbarium studies and preliminary data collation in progress.

Proposed Work Program 1985/86: Complete compilation of data matrix, undertake computer analyses, and write up the study for publication.

A REVISION OF *EUCALYPTUS WANDOO* AND ALLIED SPECIES (*EUCALYPTUS* SERIES *SUBCORNUTAE*)

Staff: M.I.H. Brooker (CSIRO, Forest Research), S.D. Hopper, M.A. Burgman (consultant botanist) and S.J. Patrick (consultant artist).

Objectives: To conduct fieldwork and herbarium studies on the *Subcornutae* and prepare a taxonomic revision for publication. To investigate evolutionary relationships in the group using numerical cladistic and phenetic techniques and submit the results for publication.

Date Commenced: November 1981.

Proposed Date of Completion: Early 1986.

Work Already Carried out: Several collecting trips throughout the south-west have been completed and two new rare species discovered. Material (including types) in all major Australian herbaria has been examined. Seed lots of all but two of the 20 taxa involved have been germinated and raised in glasshouses at CSIRO. The taxonomic revision is in first draft. Work on the cladistic study by M.A. Burgman commenced on June 3, 1985.

Proposed Work Program 1985/86: Complete final draft of taxonomic revision and submit for publication in Nuytsia. Prepare cladistic study for publication.

TAXONOMY OF NEW WESTERN AUSTRALIAN EUCALYPTS

Staff: M.I.H. Brooker (CSIRO, Forest Research), S.D. Hopper and S.J. Patrick (consultant artist).

Objectives: To conduct field and herbarium surveys of W.A. eucalypts aimed at discovering or relocating and formally naming new taxa.

Date Commenced: 1978.

Proposed Date of Completion: Ongoing.

Work Already Carried out: Several surveys have been undertaken in the south-west, goldfields and southern desert regions. In many instances, these surveys have been the first for the region concentrating solely on eucalypts. As a consequence, in excess of 40 new taxa have been discovered. It is evident that most groups of W.A. eucalypts require taxonomic revision. Besides the existence of many new taxa, the project has shown that names of such common mallees as E. foecunda and E. redunca have been

misapplied. A combination of careful field observation, examination of types, growing of seedlings, and the investigation of a range of new characters of the seed, leaf and bud have resolved several previously confused groups into well-defined taxa.

Proposed Work Program 1985/86: Prepare for publication in one paper the description of the majority of new taxa now known. Continue collaborative field, herbarium and glasshouse studies. Extend field surveys to the eastern Great Victoria Desert and, possibly, to the Great Sandy Desert.

GENETIC VARIATION IN OUTLYING POPULATIONS OF JARRAH AND IN COEXISTING ALLIED RARE SPECIES

Staff: S.D. Hopper, G.F. Moran (CSIRO, Forest Research, Canberra) and A.H.D. Brown (CSIRO, Plant Industry, Canberra).

Objectives: To assay genetic variation using allozyme markers in outlying jarrah populations at Mt Lesueur and Jilakin Rock, and in four rare allied species in the Mt Lesueur region. To test the suitability of allozyme assay as a technique for determining which populations of gazetted rare eucalypts should have highest priority in conservation management such as fencing or land purchase. To determine whether general principles for the conservation of the gene pools of eucalypts may be derived by allozyme assay of selected species.

Date Commenced: October 1984.

Proposed Date of Completion: 1986 or 1987.

Work Already Carried out: Allozyme assays of populations of *E. marginata*, *E. pendens*, *E. johnsoniana*, *E. suberea*, *E.*

lateritia, and E. exilis are complete. Data are partly collated.

Proposed Work Program 1985/86: Data analysis and preparation of results for publication, subject to other work commitments of Dr Moran.

BIRD POLLINATION, NECTAR FLOW AND THE MATING SYSTEM OF EUCALYPTUS CAESIA

Staff: S.D. Hopper, R. Wyatt (University of Georgia, USA), and G.F. Moran (CSIRO, Forest Research, Canberra).

Objectives: To document variation in bird pollinators over several years and across the geographical range of E. caesia. To study patterns of nectar flow and correlated bird feeding behaviour in the two subspecies. To document outcrossing rates and their variation within and between populations using allozyme markers.

Date Commenced: 1978.

Proposed Date of Completion: 1986.

Work Already Carried out: All field work, allozyme assays and most data analysis completed.

Proposed Work Program 1985/86: Complete data analysis and write up the work for publication.

CONSERVATION STATUS, MORPHOMETRICS AND ALLOZYME VARIATION IN EUCALYPTUS MACROCARPA AND ALLIED SPECIES

Staff: S.D. Hopper, Y. Fripp (Latrobe University), T.J. Fetherstonhaugh (Consultant Botanist) and N. Caputi (W.A. Marine Research Laboratories)

Objectives: To document patterns of genetic variation in these eucalypts using allozyme and morphometric techniques, and to assess the adequacy of the reservation of their gene pools in conservation reserves.

Date Commenced: Field work and morphometrics - 1979; allozymes - 1984.

Proposed Date of Completion: 1986 or 1987

Work Already Carried out: Field surveys and morphometric analyses completed. Preparation for publication is well advanced. Allozyme survey by Dr Fripp is still underway.

Proposed Work Program 1985/86: Complete draft and submit morphometric study for publication. Likewise for allozyme survey should Dr Fripp's commitments allow.

REPRODUCTIVE BIOLOGY AND MANAGEMENT OF EUCALYPTUS RHODANTHA

Staff: J. Sampson and S.H. James (University of Western Australia), B. Collins and proposed M.App.Sc. student (W.A.I.T.) S.D. Hopper.

Objectives: To document patterns of gene flow and establish minimum viable effective population size in this rare eucalypt. To investigate pollination seed set and natural recruitment with a view to supplementary management if required.

Date Commenced: April 1985.

Proposed Date of Completion: J. Sampson's Ph.D program - April 1988. WAIT M.App. Sci. student - December 1986.

Work Already Carried out: Field surveys and mapping of known populations completed in 1982.

Proposed Work Program 1985/86: My involvement will be limited to cosupervising the two students, a few days' field work with them, and expediting the administration of the department's consultancies that are funding the research.

A CLADISTIC STUDY OF RELATIONSHIPS AMONG WESTERN AUSTRALIAN MONOCALYPTS

Staff: P. Ladiges (Melbourne University), S.D. Hopper and M.I.H. Brooker (CSIRO Forest Research)

Objectives: To investigate evolutionary relationships of the c.30 W.A. monocalypts, a group that includes jarrah and several gazetted rare mallees, using computer-based cladistic analyses of adult, seedling and seed characters.

Date Commenced: 1982.

Proposed Date of Completion: 1986.

Work Already Carried out: Field, herbarium and glasshouse studies complete. Data matrix collated.

Proposed Work Program 1985/86: Dr Ladiges will undertake computer analyses of the data matrix and then come to W.A. as a visiting scientist at the Wildlife Research Centre to collaborate in preparing a paper for publication.

PATTERNS ON LEAF VENATION AND OIL GLANDS IN WESTERN AUSTRALIAN EUCALYPTS

Staff: M.I.H. Brooker (CSIRO Forest Research) and S.D. Hopper.

Objectives: To photographically document transmitted sunlight images of adult leaves and assess the resultant patterns of ventation and oil glands as useful characters for identification and classification of W.A. eucalypts.

Date Commenced: 1982.

Proposed Date of Completion: 1986 or 1987.

Work Already Carried out: Photographs from one or more populations of all known W.A. taxa have been taken. Preliminary analysis indicate useful distinctions between species (E.G. E. marginata and E. staeri) as well as uniformity in certain higher groups (e.g. the bloodwoods).

Proposed Work Program 1985/86: Obtain black and white prints of representative photographs of all taxa. Continue analysis of patterns. Commence drafting paper for publication.

NATURAL HYBRIDIZATION IN W.A. MONOCALYPTS, WITH PARTICULAR REFERENCE TO THE STIRLING RANGE

Staff: S.D. Hopper, G.F. Moran (CSIRO Forest Research, Canberra) and M.I.H. Brooker(CSIRO Forest Research Wembley).

Objectives: Investigate putative hybrids in W.A. monocalypts (jarrah and allied mallees) using morphometric, allozyme and progency trial assays. Prepare results for publication.

Date Commenced: 1976.

Proposed Date of Completion: 1986 or 1987.

Work Already Carried out: Morphometric, allozyme and progeny trial assays on all known hybrids are complete. The Stirling Range contains a remarkable array of monocalypt hybrids.

Proposed Work Program 1985/86: Commence data analysis.

A GUIDE TO THE EUCALYPTS OF THE STIRLING RANGE

Staff: S.D. Hopper and R.E. Sokolowski.

Objectives: To prepare a booklet on the eucalypts of the Stirling Range with introductory text on classification and biology, and a systematic description with illustrations of each species and hyrid.

Date Commenced: 1982.

Proposed Date of Completion: 1987 or 1988.

Work Already Carried out: Field work involving traverses on most firebreaks and the ascent on foot of several peaks. Taxonomic research on several unnamed species and hybrids is ongoing with M.I.H. Brooker.

Proposed Work Program 1985/86: Finalize taxonomic studies. continue field surveys.

EUCALYPTUS CARNABYI - RARE HYBRID OR RELICT SPECIES?

Staff: S.D. Hopper.

Objectives: To investigate morphometric relationships, progeny variation and the reproductive biology of the gazetted rare plant E. carnabyi and test Pryor and Johnson's

hypothesis that it is a rare hybrid of E. macrocarpa and E. drummondii.

Date Commenced: 1978.

Proposed Date of Completion: 1986.

Work Already Carried out: Field studies, progeny trials, morphometric analysis and sterility estimation complete. The accumulated evidence favours the hybrid hypothesis.

Proposed Work Program 1985/86: Draft a paper for publication.

EUCALYPTS OF THE GREAT VICTORIA DESERT

Staff: S.D. Hopper.

Objectives: To take advantage of recently made mineral exploration tracks and survey new areas of the Great Victoria Desert for eucalypts. To prepare for publication a paper on the results of the survey which will describe and map each species and consider the adequacy of its representation on existing conservation reserves.

Date Commenced: 1984.

Proposed Date of Completion: 1988.

Work Already Carried out: Two trips traversing the desert, one of which focused on Queen Victoria Springs Nature Reserve, were completed in 1984. One new species (allied to York Gum E. loxophleba) was discovered, and the known range of several undescribed species was extended. The surveys confirmed the discovery by Kalgoorlie CALM staff of E. pimpiniana (previously known only from South Australia) S of Lake Minigwal. They also showed that E. angulosa var.

ceratocorys, previously known only north of Kalgoorlie, was common on dunes in and near Queen Victoria Spring Nature Reserve.

Proposed Work Program 1985/86: A survey of the SE and E end of the Great Victoria Desert will be carried out.

FLORA OF AUSTRALIA TREATMENT OF ANIGOZANTHOS, MACROPIDIA AND CONOSTYLIS (HAEMODORACEAE)

Staff: S.D. Hopper and S.J. Patrick (consultant artist).

Objectives: To prepare descriptions, maps and illustrations of all taxa of kangaroo paws and related plants for publication in a forthcoming volume of the "Flora of Australia".

Date Commenced: Field work - 1973, manuscript 1984.

Proposed Date of Completion: 1986.

Work Already Carried out: Field and herbarium studies completed. Manuscript for Anigozanthos and Macropidia submitted for publication. Treatment of Conostylis (including the description of c. 20 new taxa) in preparation. Drawings complete.

Proposed Work Program 1985/86: Finish manuscript on Conostylis and submit for publication.

A CHECKLIST OF OBSERVATIONS OF VERTEBRATES FEEDING ON ON FLOWERS AND FRUITS OF W.A. PLANTS

Staff: A.H. Burbidge and S.D. Hopper.

Objectives: To collate published and unpublished site-specific observations of birds and mammals feeding on nectar, pollen and fruits of Western Australian plants. To analyse the data for major trends, and prepare the study for publication.

Date Commenced: 1978.

Proposed Date of Completion: 1986.

Work Already Carried out: The study is finished and the manuscript awaits final editing prior to submission for publication.

Proposed Work Program 1985/86: Complete editing and submit for publication as a departmental report.

BIOLOGY AND CONSERVATION OF KANGAROO PAWS AND CONOSTYLIS

Staff: S.D. Hopper.

Objectives: To collate and prepare for publication studies conducted on the biology and conservation of kangaroo paws and *Conostylis*.

Date Commenced: 1973.

Proposed Date of Completion: Ongoing.

Work Already Carried out: Several papers have been published, principally in the Australian Journal of Botany.

Data on natural hybridization and a chromosome number survey are analysed.

Proposed Work Program 1985/86: Draft papers on the above as time allows. Commence collation of material for a proposed field guide to kangaroo paws and related plants.

POLLINATION ECOLOGY OF THE AUSTRALIAN FLORA

Staff: S.D. Hopper.

Objectives: To develop an understanding of Australian plant-pollinator relationships, particularly those involving birds and small mammals. To explore the significance of pollination studies to the conservation of plants.

Date Commenced: 1976.

Proposed Date of Completion: Ongoing.

Work Already Carried out: Several papers on pollination have been published. Field work completed on as yet unpublished studies of honeyeaters feeding on *Grevillea petrophiloides*, pollinator-triggered anthesis of *Banksia* flowers (with V. Turner, A.N.U.), bird pollination of *Oreocallis pinnata* in SE Queensland rainforests, and lorikeets feeding on eucalypt flowers.

Proposed Work Program 1985/86: Continue pollination observations on an *ad hoc* basis in conjunction with other field work. Prepare material for publication as time allows.

WESTERN AUSTRALIAN WILDLIFE RESEARCH CENTRE

WILDLIFE RESEARCH SEMINAR

16 - 17 JULY 1985

G.J. KEIGHERY

BIOLOGICAL SURVEY OF THE NULLARBOR PLAIN - FLORA

Staff: G.J. Keighery and B. Downing. A.C. Robinson and P. Canty of South Australian Department of Environment and Planning are co-investigators.

Objectives: Computer based inventory and survey of flora of Nullarbor Plain and surrounds (Eucla basin). Document past collections, elucidate conservation priorities, obtain ecological data base for current flora.

Date Commenced: 1984.

Proposed Date of Completion: July 1985 (report).

Work Already Carried out: Two major field trips of 4 separate parties to 16 campsites (83 quadrats) undertaken in April and September 1984. Preliminary report to Commonwealth, June 1984. Final report June 1985. Computer analysis of data completed (367 plant species collected). April collections sent to Herbaria. Previous known collections of flora obtained from PERTH and ADELAIDE, collated and typed. Final report should have been completed by this seminar.

Proposed Work Program 1985/86: Complete studies on taxonomic status of Roe plain populations of Santalum. One final field trip proposed for October 1985 to sample western cliff top sites, obtain species' list for Toolina Cove in Nuytsland Nature Reserve.

CENSUS OF AUSTRALIAN PLANTS

Staff: G.J. Keighery (R.J. Hnatiuk of Bureau of Flora and Fauna is Co-ordinator).

Objectives: Compile list of all native and naturalized flora (with distribution per phytogeographical region for Western Australia). W.A. data contributor.

Date Commenced: March 1984.

Proposed Date of Completion: January 1985.

Work Already Carried out: Completed.

Proposed Work Program 1985/86: To be published by Australian Biological Resources Study (A.B.R.S.) in 1985/86.

INDEX TO PLANT CHROMOSOME NUMBERS

Staff: G.J. Keighery.

Objectives: Worldwide listing of plant chromosome numbers from literature. Australasian/Pacific editor.

Date Commenced: Continuing project.

Proposed Date of Completion: Continuing Project.

Work Already Carried out: Publications:

Index to Plant Chromosome Numbers 1975 - 1978. Monographs in Systematic Botany 3. Missouri Botanic Garden. 1983.

Index to Plant Chromosome Numbers, 1979-1981. Monographs in Systematic Botany 8. Missouri Botanic Garden. 1984.

Index to Plant Chromosome Numbers, 1982-1983. Monographs in Systematic Botany (in press).

FLORA LISTS FOR RESERVES IN TOODYAY/YORK/NORTHAM SHIRES

Staff: G.J. Keighery and J.J. Alford.

Objectives: To compile species lists (flora) for management plans of these reserves. To obtain data on rare flora.

Date Commenced: June 1984.

Proposed Date of Completion: January 1986.

Work Already Carried out: Flora list obtained for Wongamine Nature Reserve, now in management plan. Collections undertaken on Goonaring Nature Reserve. First survey undertaken on Clackline, Mokine, Wambyn and St Ronan's Nature Reserves.

Significant new records which were obtained in many reserves will enable better planning of same. Most reserves contain 250 - 300 species of flowering plant compared to 70 - 100 currently listed. Preliminary list prepared for draft plan.

Proposed Work Program 1985/86: Complete flora lists for York/Northam reserves and send to Planning Branch.

OFFSHORE ISLANDS SURVEY : LANCELIN TO DONGARA - FLORA

Staff: G.J. Keighery and J.J. Alford.

Objectives: Data base for management plans (vegetation map; floristics, monitoring sites).

Date Commenced: May 1985.

Proposed Date of Completion: January 1986.

Work Already Carried out: Reconnaisance survey May 1985.

Proposed Work Program 1985/86: Full survey October 1985.

CHECKLIST OF FLORA OF STIRLING RANGES (AND ENVIRONS)

Staff: G.J. Keighery.

Objectives: Compile annotated checklist of native and naturalized flora of Stirling Range National Park. Map endemic flora. Study aspects of systematics and biology of endemic flora. Check surrounding uplands for similar flora.

Date Commenced: 1977 (while at Kings Park Board).

Proposed Date of Completion: 1988.

Work Already Carried out: Checklist now at 940 species. Currently 61 known endemics. Several new endemics described. Article on Darwinia species should have been published in Landscope during June. Taximetric study of Darwinia species completed; awaiting return of co-author (N.G. Marchant) from overseas study tour.

Proposed Work Program 1985/86:

a) Survey of Geekabee Hill Reserve in May 1985.
   Re-sampling Darwinia regeneration plots May 1985.
b) Gnowangerup/Cranbrook Shire; flora of the Stirling Ranges (for the public) course leader, September 1985.
   Sukey's Peak/Hamilla Hills/Warriup-Green Range be to visited September 1985.

CONSERVATION, ECOLOGY, BIOLOGY OF WESTERN AUSTRALIAN TREMANDRACEAE

Staff: J.J. Alford and G.J. Keighery.

Objectives: Computer based flora survey teaching model to utilize data entry, analysis and standard field search techniques, on a small but poorly understood group.

Date Commenced: 1984.

Proposed Date of Completion: 1989.

Work Already Carried out: Data sheets obtained on all known taxa from Herbarium, literature searches and colleagues.

Proposed Work Program 1985/86: Attempt to relocate Tetratheca deltoidea, a species known only from near Mt Caroline, last collected in mid 19th Centuary. Obtain population information on Tetratheca retrorsa, a species currently known only from Tutanning and Wongan Hills.

GARDEN ESCAPES, NATURALIZED FLORA OF WESTERN AUSTRALIA

Staff: G.J. Keighery.

Objectives: Document current status of supposed naturalized species of Liliaceae and Fabaceae, obtain data on previously unrecorded naturalized taxa. Develop expertise in identification of possibly harmful weeds and their biology; advise on control.

Date Commenced: 1977 (while at Kings Park Board).

Proposed Date of Completion: Ongoing.

Work Already Carried out: Twenty five records of previously unrecognized species added to lists of naturalized flora of Western Australia. Taxonomy of naturalized Narcissus species clarified for Flora of Australia. Agriculture Protection Board given information on Genista species; N.S.W. National Parks Working Group provided with information on boneseed (Chrysanthemoides monilifera); Rottnest Island Study Group given data on Agave and Narcissus during 1984.

Proposed Work Program 1985/86: Continuing study as opportunities arise.

SYSTEMATICS OF WESTERN AUSTRALIA FLORA

Staff: G.J. Keighery (some with N.G. Marchant).

Objectives: Taxonomic revisions of selected genera of Western Australian native flora.

Date Commenced: 1976 (while at Kings Park Board).

Proposed Date of Completion: Ongoing.

Work Already Carried out: Flora of Australian treatments prepared for Arnocrinum, Hensmania, Johnsonia, Hodgsoniola, Laxmannia and Stawellia (Liliaceae). Revisions of Western Australia Burchardia (Liliaceae) and Chamelaucium (Myrtaceae) in press. New genera of Gyrostemonaceae and Myrtaceae described. Tribal limits of Western Australia Liliaceae re-defined. Generic treatment of Dasypogonaceae prepared (with H.T. Clifford).

Proposed Work Program 1985/86: Description of new species of Darwinia from Busselton/Augusta region (m/s prepared). Complete revisions of Balaustion, Actinodium and Myrtella (Myrtaceae).

BIOLOGY OF WESTERN AUSTRALIAN PLANTS

Staff: G.J. Keighery.

Objectives: Develop an understanding about the biology (habitats, distribution, pollination and breeding systems) of the Western Australian flora. Collate and prepare material for publication, especially of a "popular" or "semi-popular" nature. Increase knowledge of the natural history of W.A. plants.

Date Commenced: 1975 (while at Kings Park Board).

Proposed Date of Completion: Ongoing.

Work Already Carried out: A number of papers, reports (and pers. comm. in taxonomic, ecological and horticultural texts) and public seminars have been written and given over the years on this general subject.

Proposed Work Program 1985/86: Continue public seminars, advice, articles in W.A. Wildflower Society Newsletter and Australian Plants. Prepare invited major review on the Pollination and Breeding Systems of Australian Legumes for book Biology of Legumes. Prepare contributed paper on Phytogeography and Conservation of Western Australian Legumes for same volume. Continue ad-hoc observations on biology of native flora.

WESTERN AUSTRALIAN WILDLIFE RESEARCH CENTRE

WILDLIFE RESEARCH SEMINAR

16 - 17 JULY 1985

J.E. KINNEAR

FIRE ECOLOGY OF THE TUTANNING WOYLIE

Staff: J.E. Kinnear and M. Onus.

Objectives: To carry out studies on the fire ecology of the woylie persisting in Tutanning Nature Reserve for the purpose of formulating management plans for the species.

Date Commenced: Initial work 1978. Project in abeyance since 1979. Project suspended because of low population numbers making study impractical.

Proposed Date of Completion: Open - dependent on population recovery.

Work Already Carried out: Very low catch-per-unit-effort for woylies was indicative of low population densities. The cause of the decline was unknown. It is now believed that predation by foxes may have been a significant factor in causing the decline. A fox control program was implemented in 1984.

Proposed Work Program 1985/86: Population surveys annually.

TUTANNING RESERVE PREDATOR CONTROL

Staff: J.E. Kinnear, M. Onus and R. Bromilow.

Objectives: To control foxes and feral cats with the aim of protecting and increasing the populations of tammar, woylies, possums, and any other species affected by predation.

Date Commenced: November 1984.

Proposed Date of Completion: November 1986.

Work Already Carried out: Tammars and woylies were trapped and spotlight surveys were carried out to establish a pre-control population benchmark or baseline. Baiting was then commenced and monthly baitings have been carried out.

Proposed Work Program 1985/86: Monthly baitings, annual census.

THE WOYLIE AND FLUORACETATE (1080)

Staff: J.E. Kinnear and M. Onus.

Objectives: The woylie is remarkably tolerant to the poison "1080" which is produced by many plants on Tutanning Reserve. It has been suggested that woylies therefore, have acquired resistance to 1080 to enable them to eat plant materials containing 1080. An effort was made to test this hypothesis.

Date Commenced: 1979.

Proposed Date of Completion: Open.

Work Already Carried out: The known detoxification metabolism of 1080 involves removal of the fluorine from fluoracetate. The fate of the fluoride is subject to 2 competitive processes - urinary excretion or uptake by the skeleton. Given this situation, then one should expect woylie bone to contain high levels of fluorine if they ingest 1080 in their diet.

Analysis of woylie skeletal materials was negative for high F levels.

Proposed Work Program 1985/86: Nothing planned; further attempts to define the diet of woylies in Tutanning will be made when the population increases.

BIOLOGY AND ECOLOGY OF WHEATBELT ROCK WALLABIES

Staff: J.E. Kinnear and M. Onus.

Objectives: To carry out studies on surviving rock wallaby (RW) populations with the purpose of formulating a management plan for region.

Date Commenced: Late 1978.

Proposed Date of Completion: Ceased data collection on biology of species 1980. Continued studies on the predation ecology to present.

Work Already Carried out: Standard collections of data on life history, reproduction, etc, were made. The populations were small and recruitment was low despite the fact that most females were carrying pouched young. It was concluded that, in the longterm, survival prospects were poor, but the reasons for this were not self-evident.

Proposed Work Program 1985/86: The data will be incorporated into a management plan and integrated with the results obtained from the predation study.

POPULATION GENETICS OF ROCK WALLABIES

Staff: J.E. Kinnear, M. Onus and Dr M. Johnstone, University of Western Australia.

Objectives: To collect data on the genetic variability of wheatbelt rock wallaby populations.

Date Commenced: 1979.

Proposed Date of Completion: 1980.

Work Already Carried out: Blood samples were analysed electrophoretically. There was no detectable variation within and between populations. Implications: all populations are severely inbred.

Proposed Work Program 1985/86: None.

ECOLOGY OF PREDATION BY THE FOX ON WALLABIES

Staff: J.E. Kinnear, M. Onus and R. Bromilow.

Objectives: To experimentally test the hypothesis that fox predation represents a serious threat to surviving species of medium sized marsupials.

Date Commenced: 1982.

Proposed Date of Completion: 1986.

Work Already Carried out: The wheatbelt rock wallaby populations were used as experimental populations. Two populations were used as control populations (i.e. no treatment), and two other colonies were used as experimental populations. A census of all populations was made in March 1982 and a fox control program was implemented on the reserves carrying the experimental Rock Wallaby populations - Nangeen Hill and Mt Caroline. After two years of fox control, a census of an experimental population (Nangeen Hill) and a control population (Sales' Rock) was made. The results were: on Nangeen Hill following two years of fox control, the population almost doubled, while the population subject to no fox control showed no significant increases in Rock Wallaby numbers.

Proposed Work Program 1985/86: Fox control to continue: Census of all populations March 1986.

ECOLOGY OF PREDATION: SURVEY STUDIES

Staff: J.E. Kinnear and M. Onus.

Objectives: To locate and survey mammal populations subject to fox predation, and to appraise and assess the need for protection.

To compare the ecology of populations not subject to predation with populations subject to predation.

Date Commenced: 1980.

Proposed Date of Completion: Ongoing.

Work Already Carried out: Populations on islands and the mainland have been investigated and compared. Significant differences in behaviour and ecology have been noted. This work complements and is consistent with the findings of the wheatbelt predation study.

Proposed Work Program 1985/86: It is planned to visit and study remote desert populations known to exist in the Great Sandy Desert, along the Canning Stock Route and in the Walter James Range, near Giles.

DAMPIER ARCHIPELAGO : HABITAT REQUIREMENTS OF ROTHSCHILDS' ROCK WALLABY

Staff: J.E. Kinnear, M. Onus and R. Sokolowski.

Objectives: Two islands in the archipelago support thriving populations of Petrogale rothschildi - a wallaby restricted to the Pilbara and East Gascoyne. Mining leases held by Hamersley Iron cover extensive areas of sand plain habitat on both islands; mining would destroy this habitat. The object of this work was to assess the importance of the sandplain habitat to the Rock Wallaby populations.

Date Commenced: 1980.

Proposed Date of Completion: Field work completed 1984; write-up 1985/86.

Work Already Carried out: The sandplain habitat was shown to be the principal source of food for the rock wallaby populations. Destruction of this habitat would drastically reduce the carrying capacity of the islands.

Proposed Work Program 1985/86: Writing up.

DAMPIER ARCHIPELAGO : FIRE ECOLOGY OF P. ROTHSCHILDI

Staff: J.E. Kinnear, M. Onus, and R. Sokolowski.

Objectives: To document the response of P. rothschildi to fire.

Date Commenced: 1981.

Proposed Date of Completion: 1984.

Work Already Carried out: An experimental burn was successfully carried out. The area of the burn encompassed both shelter and feeding habitats. Studies of movement and behaviour of rock wallabies was facilitated by fitting some rock wallabies with radio transmitters. No fatalities were observed. Plant succession and recovery were monitored for three years. rock wallabies affected the recovery on the sand plain. Much was learned about food preferences of rock wallabies from this experiment. The negative and positive aspects of fire are now better understood as a result of this work.

Proposed Work Program 1985/86: Writing-up, participation in management planning.

DAMPIER ARCHIPELAGO : TRANSLOCATION EXPERIMENTS USING ROCK WALLABIES

Staff: J.E. Kinnear and M. Onus.

Objectives: To release rock wallabies on an island in the archipelago and to observe and interpret the consequences. To evaluate unpopulated islands as potential habitat for *P. rothschildi*.

Date Commenced: 1983.

Proposed Date of Completion: Open.

Work Already Carried out: Fifteen rock wallabies were captured on Enderby Island and were released at an appropriate site on nearby West Lewis Island. Subsequent observations implied that most if not all survived. The rock wallabies are now widely dispersed, and do not feed on the nearby sandplain. The plant community on the W. Lewis sandplain has a low coefficient of similarity with Enderby and Rosemary Islands.

Proposed Work Program 1985/86: Writing up; annual surveys.

EASTERN PILBARA ROCK WALLABIES - SURVEYS

Staff: J.E. Kinnear and M. Onus.

Objectives: To assess the status of mainland populations of P. rothschildi and to compare mainland populations with the island populations.

Date Commenced: 1983.

Proposed Date of Completion: 1987.

Work Already Carried out: The distribution and abundance of this species is being mapped. On sites where the species is found the population density is invariably low. There are numerous sites where the habitat appears to be ideal for this species, but it is absent.

Several small populations have been found on Woodstock Station and data relevant to management is being collected.

Proposed Work Program 1985/86: To continue.

FIRE ECOLOGY IN THE EASTERN PILBARA

Staff: J.E. Kinnear and M. Onus.

Objectives: Indiscriminate burning in the Pilbara represents a grave threat to many wildlife species. Rock wallabies and dalgytes are particularly vulnerable to the misuse of fire. An example of misuse was evident on Woodstock Station, and an opportunity was taken to study and document the consequences of burning rock wallabies habitat indiscriminately.

Date Commenced: 1983.

Proposed Date of Completion: 1987, but dependent on vegetation regeneration.

Work Already Carried out: Recovery and succession in the burned areas are being monitored jointly along with aspects of rock wallaby behaviour, and diet.

Proposed Work Program 1985/86: To continue.

DALGYTE BIOLOGY AND ECOLOGY

Staff: J.E. Kinnear and M. Onus.

Objectives: To carry out the required research on the dalgyte for the purpose of writing a management plan for the species.

Date Commenced: 1984.

Proposed Date of Completion: Open at this stage, and dependent on rate of essential data collection.

Work Already Carried out: A dalgyte population was discovered on Hillside Station. This population was intensively surveyed and mapped; working from this site the region was systematically searched for more populations in 1984. This year (April) the survey continued and we have extended the range of colonies to Woodstock Station. This was a significant discovery - a point which will be elaborated upon at the research seminar. Two colonies have been selected as subjects for concentrated studies. There is a need for a large reserve in the Pilbara for this species.

Proposed Work Program 1985/86: Work to commence at the study sites in August.

BIOLOGICAL SURVEY OF THE CHANNAR IRON ORE LEASE

Staff: J.E. Kinnear and M. Onus.

Objectives: To survey the Channar iron ore development (Hamersley Iron) for the purpose of assessing the impact of mining on rock wallabies.

Date Commenced: April 12 1985.

Proposed Date of Completion: April 17 1985.

Work Already Carried out: The mine sites were surveyed for the presence of *P. rothschildi*. The area was judged to be suitable habitat for rock wallabies. However few signs of rock wallabies were evident. It was concluded that development of this new mine site will not have a significant impact on the conservation status of the species.

Proposed Work Program 1985/86: None.

KALBARRI NATIONAL PARK : FERAL ANIMALS

Staff: J.E. Kinnear, M. Onus and Park Rangers.

Objectives: To implement control programs for: (a) foxes and feral cats, (b) feral species - goats, pigs, cattle.

Date Commenced: April 1985.

Proposed Date of Completion: 1986 - project to be transferred to protection staff.

Work Already Carried out: The gorge was surveyed by helicopter in April 1985 under ideal flying conditions in order to census rock wallabies and exotic/feral species. No rock wallabies were sighted. Feral goats were numerous; some feral pigs were also recorded. Partial control has been achieved by shooting, but the gorge acts a refuge as it is generally inaccessible. Discussions with Rangers have resulted in a proposal submitted to a Federal Granting Agency for funds to use a helicopter for more effective control.

Proposed Work Program 1985/86: Implementation of proposal subject to funding.

KALBARRI NATIONAL PARK : TAMMAR WALLABY

Staff: J.E. Kinnear and M. Onus.

Objectives: Tammar Wallabies (Macropus engeni) are known to exist in the park, but at very low densities. The fox is probably a factor, and it is likely the tammar would benefit from fox/feral goat control. Fire is another factor, but little is known about the fire ecology of the tammar in this environment. It is proposed to study the tammar with the aim of promoting its conservation in the park.

Date Commenced: April 1985.

Proposed Date of Completion: Unknown at this stage.

Work Already Carried out: An exploratory survey was carried out in April and a survey technique was devised.

Proposed Work Program 1985/86: Distribution and population density within park.

CAPE RANGE NATIONAL PARK - ROCK WALLABY CONSERVATION

Staff: J.E. Kinnear and M. Onus.

Objectives: To assess the status of *P. lateralis* in the park and region with the aim of producing a management plan for the species.

Date Commenced: May 1985.

Proposed Date of Completion: 1987.

Work Already Carried out: Preliminary studies involved survey of the area and vegetation transects of Rock Wallaby habitat. It was concluded that this species persists in most of the gorges on the western side of Cape Range. The park (and proposed extensions) has the potential to be a conservation stronghold for *P. lateralis* on the mainland if foxes and feral goats are controlled.

Proposed Work Program 1985/86: Surveys to continue in particular south of Yardie Creek. It is hoped to find a population in sufficient numbers to make trapping practical. There is a need for greater fox and goat control.

BOYAGIN NATURE RESERVE : MACROPODID SURVEY

Staff: J.E. Kinnear and M. Onus.

Objectives: To survey this large wheatbelt reserve for tammar and woylies with the aim of producing a management plan.

Date Commenced: January 1985.

Proposed Date of Completion: Open at this stage.

Work Already Carried out: The reserve has been surveyed and trapped in selected areas, but results have been negative to date.

Proposed Work Program 1985/86: Efforts to locate these macropodids will continue.

WESTERN AUSTRALIAN WILDLIFE RESEARCH CENTRE

WILDLIFE RESEARCH SEMINAR

16 - 17 JULY 1985

J.A.K. LANE

BACKGROUND

With the formation of DCALM in March 1985 the Waterbird Research group of the W.A. Wildlife Research Centre comprises two technical officers and half a senior research officer.

Current activities of the Waterbird Research group include:

1. Provision of advice concerning management of duck hunting in Western Australia; ie determination of hunting seasons, game and protected species, bag limits, shooting areas, refuges etc.

2. Research relating to the management of duck hunting in W.A., eg annual assessment of conditions (environmental) for waterfowl breeding, waterfowl population assessment, analysis of hunter success.

3. Liaison with pro-hunting, non-hunting and anti-hunting associations and individuals concerning management of duck hunting in W.A. eg Western Australian Field and Game Association, Royal Australasian Ornithologists Union.

4. Provision of technical advice and comment to Department of Conservation and Environment, Town Planning Department, Public Works Department and other State and Local Government bodies concerning potential impact of proposed developments involving wetlands, regardless of tenure. Advice on such matters may also be provided at times to other organizations and individuals such as environmental consultants, conservation groups and concerned members of the public. Some areas of current involvement are the Busselton Wetlands (proposed canal developments), Peel Inlet (canal developments and channel dredging), Lake McLarty (small holding subdivision), Maylands Peninsula.

5. Participation in various inter-departmental committees concerning special management problems eg Northern Arthur River Wetlands Rehabilitation Committee (salinisation of Lake Toolibin), Beverley Lakes Working Group (water level and salinity control), Mosquito Control Review Committee (mosquito control on Peel and Leschenault Inlets).

6. Involvement in acquisition and management of Wetland Nature Reserves and other areas of DCALM (wet)land. Areas of current involvement include Benger Swamp, Lakes Forrestdale, Chittering, Carbul, Gidong and Kubitch and the Muir group of lakes.

7. Supervision of consultancies relating to specific management problems eg Benger Swamp management, Lake Forrestdale bulrush and midge control.

8. Development and direction of waterbird and wetland related research programmes undertaken under contract by non-government volunteer organizations eg 1981-85 RAOU South West Waterbird Survey.

9. Provision of logistical support and technical advice for research programmes undertaken by volunteer waterbird/wetland groups eg North-West Wader Expeditions conducted by the Australian Wader Studies Group.

Research programmes, current and proposed, undertaken or directed by the Waterbird Research Group are as follows.

WETLAND MONITORING PROGRAMME

Staff: D.R. Munro, J.A. Lane, G.B. Pearson and the W.A. Field and Game Association.

Objectives: To monitor seasonal, annual and long term changes in water depth and quality of selected wetlands in the south-west of the State. Data obtained are used as a basis for determining duck-hunting seasons and in the management of wetlands.

Date Commenced: The first depth gauge was installed in 1977. Two-monthly monitoring began in November 1978.

Proposed Date of Completion: The two-monthly monitoring program was completed in May 1985. September and November monitoring will continue each year as a basis for duck season determination.

Work Already Carried out: Depth gauges have been installed on 120 wetlands from Dongara to Esperance. Water depth and salinity were monitored at two month intervals from November 1978 to May 1985. This program provided an essential measure of wetland "condition" during the RAOU South West Waterbird Survey.

In conjunction with rainfall statistics, results obtained from the monitoring program provide a sound basis for year to year comparisons of conditions for waterfowl breeding and for prediction of conditions likely to prevail during impending duck shooting seasons.

The data gathered continue to be of considerable assistance in dealing with management problems which have a hydrological component, eg Forrestdale Lake.

Proposed Work Program 1985/86: Monitoring frequency will be reduced to September and November each year, as a basis for duck season decisions. More frequent monitoring of selected key wetlands, particularly those with management problems, eg Lake Forrestdale, will be undertaken as required. Volunteer assistance will be used where most efficient.

SOUTH-WEST WATERBIRD SURVEY

Staff: R.P. Jaensch (RAOU), J.A. Lane, G.B. Pearson and 100 volunteers.

Objectives: To provide information on waterbird usage of Wetland Nature Reserves in order to facilitate their wise management. To assess the role and importance of the WNR system in the conservation of waterbird populations. To provide appropriate experience for future monitoring of waterbird abundance. This survey is seen by other States and the RAOU as a pilot project for a national waterbird survey.

Date Commenced: April 1981.

Proposed Date of Completion: December 1985.

Work Already Carried out: The Royal Australasian Ornithologists Union was commissioned to undertake this 4 year study. Total funding is $134 500; $71 300 from the Wildlife Conservation Trust Fund (duck-shooters' licence fees) and $63 200 from Consolidated Revenue. The RAOU appointed a full time Project Coordinator, Mr Roger Jaensch, to develop census procedures; recruit, train and coordinate a team of amateur observers; collate and analyse data obtained, and to prepare a final report.

Surveys of waterbird usage (species, numbers, breeding activity areas utilized etc.) have been conducted at frequent (two month or less) intervals from July 1981 to May 1982 to May 1985. Approximately 100 amateur observers are involved on a regular basis, surveying the wetland of their choice. More than 200 Wetland Nature Reserves have been visited.

The total number of waterbird species recorded to December 1984 was 97, with 49 recorded breeding. The highest total

count for any month was 122 000 in January 1983. The highest count for any one wetland was 41 000 at Peel Inlet. The highest species count was 67 at Alfred Cove and highest number of breeding species 21 at Lake Toolibin.

Proposed Work Program 1985/86: The final field survey was conducted in May 1985. The remaining seven months will be spent finalizing the data base, analysing the data and preparing the final report by December 31, 1985. This will complete the project.

The South West Waterbird Survey has aroused considerable interest, both public and government, in W.A. and nationally. The data gathered will be or considerable benefit to managers and the spinoffs of greater public awareness, involvement and commitment cannot be over estimated.

The Survey has also highlighted the need for and practicability of several new projects. These include:

a) Annual abundance monitoring of game species of ducks. (There is no effective monitoring at present).

b) Annual monitoring of breeding status of "at risk" colonial nesters eg Great Egret (Egretta alba) (W.A. has international treaty obligations with this species).

c) Continued two-monthly monitoring of selected wetlands (approximately 20) which are of national or international significance, and under threat.

d) Assessment of remote wetlands of probable international significance. "Expeditionary" surveys will be required. W.A. has international treaty obligations in this regard.

It is proposed that the Department of Conservation and Land Management establish as a major new initiative a five year contract with the Royal Australasian Ornithologists Union to conduct these projects. Funding to be $60 000 per year, with $20 000 from CRF and $40 000 from the Trust Fund. Duck shooters licence fees presently raise $5 x 5 000 = $25 000 per year and in 1985/86 should raise $10 x 5 000 = $50 000 per year in which a Full Season is declared.

Such an initiative would not only enable the above projects to be undertaken most effectively at minimum cost, it would also enable the RAOU to continue to serve as a focus for other important projects such as the Ground Parrot Survey, North West Wader Expeditions, Perth Metropolitan Bird Survey, Feral Duck Survey, Eyre Bird Observatory and proposed Broome Observatory. Over the past five years the RAOU has established the only comprehensive, computerized bird data base in Western Australia. This has proved to be a most valuable information resource for the conservation of bird habitat in this State. As such it is frequently referred to by government departments, community groups and individuals, and is worthy of continued support.

WESTERN AUSTRALIAN WILDLIFE RESEARCH CENTRE

WILDLIFE RESEARCH SEMINAR

16 - 17 JULY 1985

N.L. MCKENZIE

STRATEGIES AND DESIGNS FOR BIOLOGICAL SURVEY

Staff: N.L. McKenzie.

Objectives: To incorporate the results of contemporary ecological research into the design of our biological surveys so that the data base they provide can be used in monitoring change and provide a basis for management decisions for nature conservation such as those to optimise the persistence of species richness.

Date Commenced: This program commenced with the assessment of pit-fall traps at Dundas in 1977 and the design of the site-based survey of the Eastern Goldfields in 1978.

Proposed Date of Completion: Continuing.

Work Already Carried out: An ongoing process of literature review, involving the assessment and adaption (through experimentation) of concepts and techniques. Two relevant publications were produced in 1984.

Current work involves the application of ecological pattern analysis (eg NTP) to our most recent survey data base (from the Nullarbor) to examine problems in; (i) identifying biological gradients across a study area the size of a phytogeographic district given the vast differences in scale (longevity and mobility) perceived by, for example, birds and trees. Our object is to design a reserve system that represents the biota of the district giving equal consideration to a wide variety of species.

Proposed Work Program 1985/86: A field trip in September 1985 to the Nullarbor to: (i) assess patchiness within our supposedly "homogeneous quadrats"; (ii) to extend our data base for the district to include the Toolina area; and (iii) to re-sample the quadrats at one of the campsites sampled in

1984 to assess to what extent the species composition of assemblages are likely to change from year to year.

To organize a demonstration of the Numerical Taxonomy Package (NTP) by its author (Lee Belbin of CSIRO Division of Water and Land Resources) in early 1986.

BIOLOGICAL SURVEY - EASTERN GOLDFIELDS

Staff: N.L. McKenzie (five study areas), A.A. Burbidge (one study area), extra-Departmental members of the Biological Survey Committee (six study areas), and two consultant botanists.

Objectives: To design, organize and undertake a biological survey of C.T.R.C. System 11 (Eastern Goldfields, W.A.).

Date Commenced: Initial work 1977. This program commenced in late 1978.

Proposed Date of Completion: Field work 1982, writing 1986.

Work Already Carried out: The field work was completed as programmed. Writing-up commenced in 1983 with identification and tabulation of the species recorded on quadrats in each Study Area. In 1983 I also did some preliminary analysis of the data from the Kalgoorlie-Kurnalpi study area to assess the adequacy of our sampling procedures. The jointly authored publication on methodology was published in 1984. The paper on the results of the Kalgoorlie-Kurnalpi Study Area is being typed. The results of the vertebrate surveys of three of my other four study areas are tabulated.

Proposed Work Program 1985/86: Preparation of publication on the Southern Cross-Coolgardie Study Area, and the Sandstone-Sir Samuel and Laverton-Leonora Study Areas.

BIOLOGICAL SURVEY - NULLARBOR

Staff: N.L. McKenzie and extra-Departmentally, A.C. Robinson of the S.A. Department of Environment and Planning. Other staff from CALM. involved in particular aspects: A.A. Burbidge, G. Keighery and L. Boscacci.

Objectives: Undertake a biological survey of the Nullarbor District of Australia to:

i) provide an inventory of the biological resources of the district in relation to the biota of adjacent natural districts;

ii) document patterns of species distribution within the district for a wide array of its biota (plants and vertebrates) and relate these to gradients in the physical environment. Thus derive an appraisal of reserve needs.

iii) provide a biological data base involving a selection of assemblages documented in terms of their species structure and precise location, that represents the biological diversity of the district. A data-base, suitable for monitoring long-term changes in the species richness of the district.

Date Commenced: Conceived in November 1983. Funds were available by Decmeber 1983.

Proposed Date of Completion: A report was produced in July 1984 and a further Commonwealth Grant obtained to allow a second session of sampling. Deadline for the manuscript of the final report is 30 June 1985, though editing obligations continue into 1986.

Work Already Carried out: I designed the study and selected the 80 sample sites in January and February 1984. the sites were established (pit-traps drilled) in February and March. A computer-based data storage system was devised in March

and the first sampling session undertaken between 27 March and 20 April. A report (McKenzie and Robinson 1984) was published in July 1984. A second session of sampling was undertaken between 17 September and 9 October 1984. Specimen determinations were completed and the entire data base was entered into computer by February 1985. It was edited and analysed between March and May 1985.
Preparation of the biological papers for the report is our responsibility (CALM biological survey unit) and commenced in mid-May 1985.

Proposed Work Program 1985/86: The South Australian Department of Environment and Planning will handle the layout and printing of the final report.

BIOLOGICAL SURVEY - DESERTS

Staff: N.L. McKenzie and A.A. Burbidge.

Objectives: Improve knowledge of the habitats, distributions and conservation status of desert wildlife from which the reserve system proposed by CTRC (1974) can be assessed and, where necessary, additional reserves delineated.

Date Commenced: 1975, with work in the Great Victoria Desert, then the Gibson, Little Sandy and, from 1979, the Great Sandy Desert.

Proposed Date of Completion: Continuing.

Work Already Carried out: Documented in publications in: Wildl. Research Bull. West. Aust. between 1976 and 1983. Current work involves a survey of quadrats in the Mandora Salt Marsh/Radi Hills area with a view to delineating a nature reserve to represent the western edge of the Great

Sandy Desert. This is a part-time study carried out as time allows. Field sampling in the salt marsh area was undertaken in August 1983 along with further investigations of the biogeographic and palaeoclimatic significance of the peat swamps associated with the Mandora palaeodrainage system.

Proposed Work Program 1985/86: Provided time allows, a two week visit to the area is proposed in late October 1985 to sample upland surfaces of the Radi Hills and document further freshwater swamps in the palaeodrainage system.

BIOLOGICAL SURVEY - KIMBERLEY

Staff: N.L. McKenzie.

Objectives: Improve knowledge of the habitats, distributions and conservation status of Kimberley wildlife to provide a basis for reserve acquisition recommendations and to identify areas of particular conservation concern.

Date Commenced: 1971, with work on the Bonaparte Archipelago (1971-73), Prince Regent Nature Reserve (1974), Drysdale River National Park (1975), Edgar Ranges (1976-1980), Dampier Peninsula (1977-1981), Mitchell Plateau (1977).

Proposed Date of Completion: Continuing.

Work Already Carried out: Documented in publications in Wildl. Res. Bull. West. Aust. between 1975 and 1983. Vegetation, bird and bat survey-work in the Cambridge Gulf mangroves in 1983 led to recommendations to extend the Ord River Nature Reserve.

Proposed Work Program 1985/86: Work is suspended pending

the outcome of the Bungle Bungle National Park issue. In early November 1985 a brief field trip is proposed (in conjunction with reserve management personnel) to inspect the effects of cattle on the Prince Regent Nature Reserve to inform people on adjacent cattle stations of the purposes and values of the reserve.

BIOLOGICAL SURVEY - FITZGERALD RIVER NATIONAL PARK

Staff: N.L. McKenzie in conjunction with the two consultant biologists to the Fitzgerald River National Parks Association. A National Heritage Commission grant. A project originally devised by B. Muir of the National Parks Authority that I was asked to take control of after CALM was created.

Objectives:

i) Inventory the vegetation and vertebrate fauna of the Fitzgerald River National Park and the significance of the Park to conservation;

ii) Document patterns of species distribution within the Park

iii) Provide the first time-point in a site-based biological data base suitable for monitoring long-term changes in the species richness of the Park's biota.

Date Commenced: Field work commences in July 1984.

Proposed Date of Completion: Programmed to finish in 1986 but application for 1976/77 funds already sought.

Work Already Carried out: In April 1984 the emphasis of the objectives was shifted, several new objectives defined (as above), and the design extensively revised.

Proposed Work Program 1985/86: Provide logistical support to the consultants as agreed under previous arrangements - in the form of advice, loans of equipment and liaison with the State Heritage Committee.

ECOLOGICAL STUDIES - MANGROVE BAT COMMUNITIES

Staff: N.L. McKenzie.

Objectives: The mangrove community is stable compared with most other natural communities in Western Australia. It is not subject to frequent catastropic disturbances such as fire. Cyclic fluctuations in temperature and humidity associated with diurnal and seasonal influences are minimised by marine influences. The mangal has characteristics of high resilience and persistence in species composition. This study seeks to examine two aspects of ecology fundamental to biological survey: (i) the relationship between stability and determinism in the species sturcture of communities (ii) the relationship between mobility and perceived patch-size of species with otherwise very similar life-history strategies that potentially belong to the same guild. This study documents and analyses the species structure of guilds of obligate insectivorous bats that forage at night in stands of mangroves. An array of stands along the tropical coastline of Western Australia is being sampled.

Date Commenced: 1977.

Proposed Date of Completion: A part-time study as opportunity presents.

Work Already Carried out: A publication on the results of work in stands of the coast of Kimberley is in press (McKenzie & Rolfe in press). Sampling of Pilbara stands is well advanced and A.N. Start has been invited to collaborate in the Pilbara work to minimise field-sampling costs.

Proposed Work Program 1985/86: A field trip in late 1985 or early 1986 is proposed to finalise sampling in stands of the Pilbara. A paper on the results of this study is to be presented at the Fourth International Theriological Congress in Edmonton in August 1985.

CHIROPTERAN STUDIES - *MORMOPTERUS* TAXONOMY

Staff: N.L. McKenzie (extra-departmental and N. Caputi, P. Bavistock)

Objectives: To document species boundaries in Australian bats of the Genus *Mormopterus* and thereby maintain a knowledge of modern taxonomic techniques - electrophoresus, classification analyses and anatomical characters important in taxonomy as opposed to ecology.

Date Commenced: 1978.

Proposed Date of Completion: Continuing as a hobby project.

Work Already Carried out: The study is complete. I await an opportunity (time) to write the publication. Three new species for Western Australia are recognised.

Proposed Work Program 1985/86: Low priority.

..ESTERN AUSTRALIAN WILDLIFE RESEARCH CENTRE

WILDLIFE RESEARCH SEMINAR

16 - 17 JULY 1985

K.D. MORRIS

BIOLOGICAL SURVEY OF NW ISLAND NATURE RESERVES

Staff: K.D. Morris.

Objectives: To assess the flora and fauna of island nature reserves between Shark Bay and Port Hedland and prepare a detailed biological inventory for future management plans for these islands.

Date Commenced: November 1982 - Dampier Archipelago.

Proposed Date of Completion: Dampier Archipelago study complete end 1985. Emphasis to then shift to Shark Bay/Carnarvon area 1986-1987.

Work Already Carried out: Biological survey of Dampier Archipelago has been completed and this data is now being incorporated into a management plan for the nature reserves. Preliminary biological data on some of the islands between Exmouth and Dampier has also been obtained.

Proposed Work Program 1985/86: To complete draft management plan for nature reserves in Dampier Archipelago. A biological survey of Serrurier Island is planned for August 1985. Initial inspections of Shark Bay islands to be made in early 1986.

TURTLE UTILIZATION OF NW ISLANDS

Staff: K.D. Morris.

Objectives: To assess the importance of NW islands for turtle breeding, and to determine areas of potential conflict between this and recreational/industrial development. To initiate more detailed studies on the breeding biology of the four species utilizing NW islands.

Date Commenced: Studies on turtle utilization of islands in the Dampier Archipelago commenced in January 1983. A tagging program in the Dampier Archipelago and on Barrow Island is due to commence in the summer 1985/86.

Proposed Date of Completion: Aerial surveys of turtle nesting beaches in the Dampier Archipelago should be continued until at least 1987/88 to provide baseline nesting distribution data. The tagging program should be extended after 1985/86 to include other island groups, and this would probably need to continue for 10 years. A joint study with Zoology Department University of W.A. on the reproductive, physiology of turtles in the Dampier Archipelago is programmed 1985-86 to 1987-88.

Work Already Carried out: Two years aerial survey data on nesting in the Dampier Archipelago has been obtained. Some preliminary data on turtle breeding biology has also been obtained.

Proposed Work Program 1985/86: Continue aerial survey in Dampier Archipelago. Initiate tagging program and studies on reproductive physiology in Dampier Archipelago.

FERAL ANIMAL CONTROL ON NW ISLAND NATURE RESERVES

Staff: K.D. Morris.

Objectives: To eradicate feral animals present on some of the islands between Shark Bay and Port Hedland, and to determine methods of selectively eradicating feral species in the presence of rare and endangered native species.

Date Commenced: April 1983.

Proposed Date of Completion: 1988, after which time other areas such as the Kimberley islands will be worked on.

Work Already Carried out: All, except one of the islands in the vicinity of Barrow Island, have been baited to eradicate Rattus rattus. A goat eradication program on Bernier Island was conducted in May 1984 using a helicopter and experienced shooter. The success of this has not yet been fully determined. In Spetmber 1984 the Burrup Peninsular and adjacent islands of the Dampier Archipelago were baited for foxes and feral cats. This resulted in a 90% reduction of these species.

Proposed Work Program 1985/86: Continue to monitor the islands in the vicinity of Barrow Island for Rattus. Conduct a Rattus eradication program on Middle Island. Conduct another fox baiting program on islands in the Dampier Archipelago. If approval and funds are made available from the Federal Government, conduct a baiting program on the Monte Bellos Islands to eradicate Rattus and the feral cat.

WESTERN AUSTRALIAN WILDLIFE RESEARCH CENTRE

WILDLIFE RESEARCH SEMINAR

16 - 17 JULY 1985

R.I.T. PRINCE

BANDED HARE WALLABY - DIRK HARTOG ISLAND

Staff: R.I.T. Prince and technical help when available as can be arranged.

Objectives: To attempt re-establishment of the species on Dirk Hartog Island. To obtain further information about the species and its biology.

Date Commenced: The initial phase of this project was commenced in 1974 and ended in 1980. Capital items needed to revive the project and implement the second phase have been acquired since 1983.

Proposed Date of Completion: Five years from time of resumption of work for second phase. Lack of transport of necessary gear and plant to the Island and limited availability of technical assistance prevented resumption as planned for 1984-85.

Work Already Carried out: Initial phase of project demonstrating potential for successful re-introduction for and planning and purchasing of materials required for second phase.

Proposed Work Program 1985/86: July-August 1985 - erect new fencing Dirk Hartog Island and stock enclosures with new wallabies from Dorre Island.
November 1985 - check status of experimental group.
March 1986 - check status of experimental group.

DORRE ISLAND STUDIES - FIRE ECOLOGY

Staff: R.I.T. Prince.

Objectives: To follow the regeneration of vegetation post-fire. To develop an understanding of the vegetation of

the island, its development, and the effects of this on distribution of the vertebrate fauna.

Date Commenced: December 1973, following occurrence of a severe human-lit wildfire in October-November. Work on this project has been in suspense since 1978.

Proposed Date of Completion: Work to date has shown that re-establishment and development of vegetation on this Island following distrurbance is an exceedingly slow process. Resumption of required monitoring work and completion of outstanding analysis and reporting on results of previous visits could be envisaged for completion early 1987.

Work Already Carried out: Visits to establish monitoring sites and record changes in vegetation on these sites, and to document the vegetation of the island have been undertaken previously on five separate occasions, viz., December 1973, June 1974, October 1975, August 1977 and August 1978. Flora lists and preliminary vegetation analyses have been compiled, and map base sheets at 1 : 10 000 scale produced. Ongoing aerial photographic monitoring has also been maintained - last date of photography was 10 August 1984.

Proposed Work Program 1985/86: Dependent on resources.

DUGONG IN NORTHERN WESTERN AUSTRALIA

Staff: R.I.T. Prince and external colleagues.

Objectives: to determine ambundance and seasonal changes in distribution of dugongs on the Western Australian coast. To determine factors affecting, or which have effected, local populations of dugongs, and where human activity is involved, to establish a basis for effective management and education. To document the distribution of seagrasses and

seagrass communities and determine their relative importance to dugong.

Date Commenced: Initial dugong surveys were made in February 1977. The present program commenced June 1984.

Proposed Date of Completion: West Kimberley work (current), end 1985, North Kimberley (continuation), mid 1986.

Work Already Carried out: Aerial survey work in the Shark Bay-Exmouth Gulf area was last attempted in 1979. Present work has included reconnaissance survey of all northern West Australian coastline from Onslow to W.A./N.T. Border in July 1984, and more detailed work in the sector La Grange to Collier Bay. The current program is focussed on the Dampier Land area, and includes direct surveys, specimen collection and contact with Aboriginal communities and other interested members of local communities, eg Broome. Aspects of national history of dugongs and seagrasses, part and present impacts of human presence on dugongs, and management are under study.

Proposed Work Program 1985/86: The second of these field trips to the Dampier Land area is now underway (July), the third trip to this area will be undertaken in September-October 1985. Work in the far north Kimberley is proposed for March April 1986.

Operational expenses for the current program via ANPWS.

WESTERN AUSTRALIAN WILDLIFE RESEARCH CENTRE

WILDLIFE RESEARCH SEMINAR

16 - 17 JULY 1985

M. SERENA

ECOLOGY OF WESTERN NATIVE-CAT

Staff: Dr Melody Serena, Todd Soderquist (visiting Scientists) and A.A. Burbidge (co-ordination and advice).

Objectives: To document biology and ecology of *Dasyurus geoffroii* in the Darling Range, and if possible elsewhere. To make recommendations to promote conservation of the species.

Date Commenced: July 1985.

Proposed Date of Completion: June 1987.

Work Already Carried out: Background reading.

Proposed Work Program 1985/86: An intensive work-recapture and radio-tracking program will be carried out on a population in the Darling Range, probably near Boddington. Data will be collected on food, population biology, reproduction and juvenile dispersal, and on the effects of management practices such as fire.

WESTERN AUSTRALIAN WILDLIFE RESEARCH CENTRE

WILDLIFE RESEARCH SEMINAR

16 - 17 JULY 1985

A. TAYLOR

BANKSIA ATLAS

Staff: A. Taylor, P. Gioia, S.D. Hopper and S.J. Patrick (consultant artist).

Objectives: To co-ordinate a computer based national Banksia Atlas program based on sight records supplied by volunteer contributors over a three year period (1984-87).

Date Commenced: February 1984.

Proposed Date of Completion: February 1987.

Work Already Carried out: A Banksia Atlas recording kit has been designed for distribution to volunteer contributors. The kit includes introductory letter, book of recording sheets, field notebook, instructions for completing a sight record sheet, and supplementary field guide. The project was officially launched in July 1984. At present, there are some 800 people enrolled throughout Australia. Publicity has been achieved through a series of illustrated talks and field trips in all States. In addition there have been newspaper and magazine articles and radio talks. An audio-visual has been produced, outlining the aims of the Atlas and providing a brief introudction to the Genus Banksia. A 3 monthly newsletter is sent to all volunteers, and contact is also maintained through a voluntary co-ordinator in each state. Completed record sheets are checked for errors, and letters of acknowledgement sent to all first-time contributors Records already received are being compiled into the first set of Interim Distribution Maps using FLORAPLOT routines in use at WAWRC. The 1 800 or so record sheets already received have raised many new questions about the genus Banksia. For some species range extensions are becoming apparent. In Western Australia, a new Banksia species has been found. Northern New South Wales may have a new variety of Banksia spinulosa. Possible hybridisation amongst some of the prostrate banksias is

becoming increasingly apparent. There are many other lines of enquiry still to be explored.

Proposed Work Program 1985/86: To continue as for 1984/85 but with decreasing emphasis on recruitment. As interim distribution maps become available, they will be assessed to determine which areas still need to be covered, and volunteers notified accordingly. A deadline for receipt of final record sheets will be set of August 1986, to allow approximately five months for production of the final Atlas.

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SUMMARY OF AREAS OF ACTIVITY AND ADVICE

Andrew Burbidge B.Sc. (Hons.), Ph.D. - Principal Research Officer

RESEARCH TOPICS

Population study and conservation of the Short-necked Tortoise.
Conservation of rare species of vertebrates.
Barrow Island - comparison of animal numbers within and outside oilfield.
Biological Survey.
The Conservation Reserves System in Western Australia.
Marine Turtle nesting sites.
Crocodile numbers in the Kimberley.

AREAS OF INTEREST AND ADVICE

Mammals in general, especially conservation.
Australian Tortoises and Turtles.
Crocodile conservation.
Sea birds and protection of breeding sites.
Island biogeography, ecology and management.
Desert reptiles.
Rare and endangered species of fauna.
General Editor - Wildlife Research Bulletin and Reports.

COMMITTEES

Bush Fires Board.
CONCOM Working Group on endangered fauna.
CONCOM Working Group on Crocodiles.
CONCOM Working Group on the Management of Endangered Vertebrates.
IUCN Species Survival Commission Australian Marsupials Specialist Group.
IUCN Species Survival Commission Freshwater Chelonian Specialist Group.
Biological Survey Committee (Chairman).
Policy Advisory Committee, Master of Natural Resources Management, University of W.A.
Working Group on Land Releases (Environmental Protection Authority).
Working Party assisting the Agricultural Land Release Review Committee.
Scientific Advisory Committee, World Wildlife Fund Australia.
Division of Research and Planning Computer Users Committee, Chairman.

Mike Choo B.Sc. (Hons.), M.Sc. - Computer Systems Officer

COMPUTING PROJECTS

Under Development

Flora Atlas (Plot).
Banksia Atlas (Plot and Reports).
Animal Ecology.
Kangaroo Stats.
Vegetation Survey.
Wetland Monitoring.
Population Estimates.
Wildlife General.

Proposed 1985/86

Word Processing and its Interfaces.
Statistical and Numerical Analysis.
Species Distribution Atlas.
Graphics.
Automated Data Capture.
Biological Survey.
Animal Ecology.
Vegetation Survey.
Reserve Management.
Fire Ecology.
Water Birds.
Interface to Taxonomic Packages.
Gazetted Rare Flora Database.
Spread Sheet Applications (eg LOTUS 123).

AREAS OF INTEREST AND ADVICE

Data Processing, Organization and Management.
Analyses of Data.
Development and Integration of Systems.
Graphics.
Geographical Information Systems.
High Level Fourth Generation Language Applications.

COMMITTEES

CALM - Research and Planning Directorate Computer Users Committee.

Tony Friend B.Sc. (Hons.), Ph.D. - Research Officer

RESEARCH TOPICS

Ecology and biology of the Numbat.
Conservation of the Numbat.
Captive breeding of Numbats.
Regulation of termite populations in forests.

Taxonomy, ecology and reproductive biology of terrestrial amphipods.
Ecology of the Western Barred Bandicoot.

AREAS OF INTEREST AND ADVICE

Conservation of invertebrates.
Forest invertebrates and fire.
Biogeography of Australian forest invertebrates.
Feeding in echidnas.

COMMITTEES

None.

Jim Goodsell B.App.Sc. - Research Officer

RESEARCH TOPICS

Temporal monitoring of the biophysical parameters at sites within natural vegetation.

AREAS OF INTEREST AND ADVICE

Management of salt-affected aquatic environments.
Osmoregulation of aquatic invertebrates.

COMMITTEES

Member, Shire of Wanneroo Linear Lakes Management Committee.
Chairman, Wanneroo and Northern Suburbs Branch of the Western Australian Naturalists Club.

Angas Hopkins B.Sc. (Hons.) - Research Officer

RESEARCH TOPICS

Management of natural ecosystems - especially in relation to the use and effects of fire in conservation reserves.
Development of techniques for the rehabilitation of disturbed areas.
General ecological field studies - Eneabba, Mt Lesueur, Tutanning, Boyagin, Two Peoples Bay, Lake King and Esperance.
Rehabilitation of mined areas - Eneabba, Barrow Island, Woodvale, Mandurah.
Development of computer systems for integrating resource data on individual reserves together with fire behaviour tables to permit long term effects of management decision to be predicted.
Studies of regeneration following fire - Eneabba, Mt Lesueur, Tutanning, Two Peoples Bay, Lake King, Middle Island.
Revegetation of previously farmed land at Tutanning.

Species richness (especially in W.A. heathlands) and biogeographic implications.
Design of a conservation reserve system in relation to environmental gradients and design of individual reserves particularly in relation to degrading influences.
Effects of drought stress on native plant species.
Monitoring rates of change in natural communities of plants and animals.

AREA OF INTEREST AND ADVICE

Environmental Impact Assessment.
Heritage matters.
Mangroves, especially Anglesea Island (Bunbury).
Effects of Honey Bees on native plants.
Planning for management and actual management of National Parks, Nature Reserves, State Forests and other Crown lands.

COMMITTEES

Australian Heritage Commission (Part Time Commissioner).
Australian Heritage Commission - W.A. Natural Environment Evaluation Panel.
National Conservation Strategy for Australia, Interim Consultative Committee.
Mineral Sands Agreements : rehabilitation Co-ordinating Committee.
Technical Committee on Environmental Problems associated with Underground Water Extraction.
CONCOM/CSIRO Mallee Conservation Working Group.
Ecological Society of Australia - Council.
Various organizing committees for scientific meetings, seminars, workshops.

Stephen Hopper B.Sc. (Hons.) Ph.D. - Research Officer

RESEARCH TOPICS, AREAS OF INTEREST AND ADVICE

Rare flora - conservation status, locations, identification, biology, administration, legislation, management.
Licensing and management of the wildflower industry.
Identification and biology of eucalypts, orchids, kangaroo paws and Conostylis.
Botanical consultants - supervision, project design, administration.
Impact of honey bees on native flora and fauna.
Pollination ecology (especially involving birds and mammals).
Community involvement in biological data gathering (eg Banksia Atlas).
Plant and animal systematics, genetics, evolutionary biology, biogeography.
Conservation of genetic resources.

Conveying flora conservation to the general public via the mass media, posters etc.
Scientific methodology, experimental design.

COMMITTEES

CONCOM Working Group on Endangered Flora.
CITES Plant Working Group.
IUCN Species Survival Commission Orchid Specialist Group.
Australian Orchid Foundation Research Committee.
Australian Flora Foundation Scientific Committee.
WAWA Flora Committee (current status unknown).
Technical Advisory Committee to the Road Verges Conservation Committee.
Advisory Committee for the Bachelor of Applied Science (Biology) course, W.A.I.T.
Supervisory committees for two Ph.D. students (U.W.A.) and three M.App.Sc. students (W.A.I.T.).

Greg Keighery B.Sc. (Hons.) - Research Officer

RESEARCH TOPICS

Biological survey of existing and proposed reserves
- Nullarbor.
- Stirling Range and environs.
- Lancelin to Dongara islands.
- York/Northam nature reserves.

Systematics of Western Australian Flora.
Naturalized Flora of Western Australia.
Biology of Western Australian Flora.

AREAS OF INTEREST AND ADVICE
Poorly collected, rare flora.
Distribution of native, naturalized flora.
Public involvement in flora conservation (Vice President W.A. Wildflower Society, Co-ordinator of plant study groups for Western Australia, provision of name changes of W.A. plants to newsletter).
Pollination native flora.

COMMITTEES

None.

Jack Kinnear B.Sc., M.Sc., Ph.D. - Research Officer

RESEARCH TOPICS

Ecology and management of marsupials.
Ecology of exotic predators with reference to their impact on wildlife.
Control of exotic predators.
Competition between feral species and native species.

Conservation Genetics: with special reference to the problems associated with small population size, habitat isolation and fragmentation.
Fire ecology and conservation.
Re-introduction of species to reserves.

AREAS OF INTEREST AND ADVICE

Kangaroo management.
Nutritional biology and ecology with special reference to herbivory.
Application of microcomputers to research.

COMMITTEES

Feral Cats - Biological Committee.
Feral Pigs - Control.
Computing - Wildlife Research Branch.
Computer Users Group - Division of Research and Planning.

Jim Lane B.Sc. - Senior Research Officer

RESEARCH TOPICS

Waterbird population and habitat assessment.

AREAS OF INTEREST AND ADVICE

Conservation of waterbird populations and their habitats.
Management of waterfowl hunting.
Public attitudes to wildlife conservation.
Community involvement in wildlife conservation.
The role and structure of government.

COMMITTEES

CONCOM Working Group on International Treaties relating to Migratory Birds and Wetlands of International importance.

Research Committee of the Royal Australasian Ornithologists Union.

Northern Arthur River Wetlands Rehabilitation Committee.

Beverley Lakes Working Group.

Norman McKenzie B.Sc. (Hons.) M.Sc. - Research Officer

RESEARCH TOPICS

Biological survey for nature conservation.
- Design philosophies, strategies, data bases.
- CTRC System 11 (Eastern Goldfields).

- Nullarbor.
- Fitzgerald River National Park.
- Kimberley.
- Deserts.
- relevance in reserve system design.

Taxonomy of bats in the Genus Mormopterus.
Community Ecology of Animals.

AREAS OF INTEREST AND ADVICE

Mammals in general - distribution, taxonomy, conservation status.
Acquisition of Nature Reserves.
Biology, taxonomy and ecology of bats.
Mangrove communities in Western Australia - distribution, vertebrate fauna, conservation.
Application of biological survey data to wildlife management.
W.A. editor of "Macroderma".

COMMITTEES

Biological Surveys Committee.
DCE Working Group on the Bungle Bungle area.

Keith Morris B.Sc., M.Sc., - Research Officer, Islands

RESEARCH AND MANAGEMENT TOPICS

Management of Island Nature Reserves.
Biological Survey of North West Island Nature Reserves.
Preparation of Draft Management Plan for Dampier Archipelago Nature Reserves.
Turtle utilization of North West Islands.
Control of introduced plants and animals on Island Nature Reserves.
Assessment of recreation and oilfield activities on North West Islands.
Native rodent distribution on North West Island Nature Reserves.

AREAS OF INTEREST AND ADVICE

Conservation and biology of native rodents.
Control of Rattus rattus and fox on islands.
Breeding Biology of Turtles.
Sea bird nesting on islands.
Bird hazards to aircraft at aerodromes.
Aerial survey techniques.
Increasing public awareness of conservation reserves, especially islands.

COMMITTEES

Pilbara Regional Herbarium Management Committee (Chairman).
Science and Technology Committee, Karratha College.

Robert Powell B.Sc., Dip.Ed. - Senior Clerk Reserves

ADMINISTRATIVE AREAS

Processing proposals for new nature reserves. Co-ordinating the investigation of proposals that affect nature reserves.
Co-ordinating responses to mining applications that affect nature reserves.
Keeping registers (including cartographic records) of nature reserves and proposed nature reserves.
Providing advice to the public on nature reserves and proposed nature reserves.

AREAS OF INTEREST AND ADVICE

Written expression : style, grammar and punctuation.
Vegetation types of the Swan Coastal Plain.
Bush reserves in the Metropolitan Region.
The management of Metropolitan Bush areas.
The cultivation of local plants.

COMMITTEES

Star Swamp Management Advisory Committee (and its Environment Subcommittee).
Greening Australia W.A. : Steering Committee and Environment Committee.
Beekeeper's Reserve Management Advisory Committee.

Bob Prince B.Sc. (Agric.) (Hons.), Ph.D. - Research Officer

RESEARCH TOPICS

Dugongs - biology and management, traditional exploitation, seagrass resource base.
Dorre Island - Fire ecology - development of regenerating vegetation and its effects on distribution of the vertebrate fauna.
Banded Hare Wallaby - Dirk Hartog Island ecology on relation to reestablishment of the species on Dirk Hartog and general biology.
Marine mammals, turtles, and traditional fisheries - incidental to dugong work.
General aspects of land and wildlife management in relation to problem species.

AREAS OF INTEREST AND ADVICE

Land management, especially rangelands.
Traditional fisheries in relation to wildlife conservation.
Macropods in general.
General wildlife conservation and management problems.

COMMITTEES

M10 Marine park group (DCE)

Anne Taylor B.A. (Hons.) M.Sc., - Research Officer, Banksia Atlas

RESEARCH TOPICS, AREAS OF INTEREST AND ADVICE

Banksias.
Community involvement in biological data gathering.
Community involvment in environmental issues.
Techniques of biological atlassing.
Extension and publicity of wildlife information.

COMMITTEES

W.A. Wildflower Society - Eastern Hills Branch.