DEPARTMENT OF FISHERIES AND WILDLIFE

Western Australian Wildlife Research Centre

RESEARCH PROGRAMMES SEMINAR

28 APRIL 1981

DEPARTMENT OF FISHERIES AND WILDLIFE

WESTERN AUSTRALIAN WILDLIFE RESEARCH CENTRE

RESEARCH PROGRAMMES SEMINAR

28 April 1981 8.30 a.m.

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PROGRAMME

0830	Mr J.A.K. Lane
0900	Dr R.I.T. Prince
0930	Mr N.L. McKenzie

MORNING TEA

1030	Mr A.J.M. Hopkins
1100	Dr J.E. Kinnear
1130	Mr A.J. Friend

LUNCH

1330	Dr S.D. Hopper
1400	Dr I.G. Crook
1430	Mr K.J. Wallace

AFTERNOON TEA

1530	Mr J.T. Goodsell
1600	Dr A.A. Burbidge

REFRESHMENTS

WESTERN AUSTRALIAN WILDLIFE RESEARCH CENTRE

RESEARCH PROGRAMMES SEMINAR

28 April 1981

CHIEF RESEARCH OFFICER'S REPORT

ANDREW A BURBIDGE

INTRODUCTION

The Wildlife Research Branch currently has a staff of 11 professional, 14 technical, 2 wages and 2 clerical persons, making a total of 29. Current re-arrangements will change this to 12 professional, 14 technical, 1 wages and 2 clerical.

During the year we officially created a Nature Reserve Management Section within the Branch. This new section of eight persons consists of a Chief Reserve Management Officer (to be appointed), 3 Reserve Management Officers, 3 Reserves Officers (previously technical officers) and one Technical Officer. This leaves 17 people in the Research Section of the Branch plus the WA Wildlife Research Centre clerical and ranger staff and the Chief Research Officer.

This new arrangement regularises a structure within the Branch which has developed gradually over the past decade. However, in my opinion it is vital that the two sections continue to work very closely together to ensure that the expertise of both sections is brought to bear on Nature Reserve Management problems.

MAJOR DEVELOPMENTS

During the past 12 months there have been some notable developments in the work of the Branch. These include:

Atlas of the Western Australian Flora - pilot study

A revised application to the Australian Biological Resources Study resulted in a grant of $46 000 for the purchase of computer hardware. This will form the basis of a graphics work station for the processing of wildflower distribution data provided by volunteer participants.

Discussions with personnel from Government Computing resulted in a tender document which may form the basic specifications for similar computer systems to be operated by similar land management oriented agencies.

Participation by volunteers in the Atlas commenced with a project on Western Australian Orchids, data being provided by members of the Western Australian Native Orchid Study and Conservation Group.

Nature Reserve Management Plans

The first three management plans in the new series for Nature Reserves were taken through from the drafts prepared last year to working plans approved by WA Wildlife Authority and the Minister. This established a procedure for the preparation of plans involving the maximum amount of participation by the public, reserve neighbours and Government agencies.

Working plans will be published as a new series of Departmental publications under the title of "Western Australian Nature Reserve Management Plans". The management planning process will be described in a Departmental Report.

Northern Sandplains

Increasingly it is becoming clear that the major flora conservation problem region is the northern sandplains from Moore River to Dongara, especially in the Eneabba - Mt Lesueur area. Publications have now been produced on the kwongan vegetation near Eneabba which is highly species-rich and which is threatened by various developments.

Numbat Research

A major step toward the conservation of the State's mammal emblem occurred with the appointment of a Research Officer in December 1980 to study Numbat ecology. This position was obtained by re-arrangement of existing staff numbers.

MAJOR PROBLEMS

Increasing responsibilities combined with lack of growth means that some important matters are not being resolved satisfactorily. Some areas of concern are:

Nature Reserve Management Teams

In 1977, following protracted negotiations and submissions Cabinet endorsed a plan to extend Nature Reserve Management operations work by basing staff in country towns and on Nature Reserves. Year 1 of a 4 year plan was approved in 1977/78 but Year 2 has been postponed since then because of limitations made to the growth of the Public Service.

The lack of additional reserve management teams is causing considerable concern. The Department made a number of commitments to various Local Government Authorities to step up management work and these have not all been met. Since 1977 the number of Nature Reserves has increased from 946 to 1036 and the area from 7.5 million hectares to 9.1 million hectares. The number of reserves vested in WA Wildlife Authority has, over the same period, risen from 385 to 555 and the number will continue to rise.

It is imperative that the Department's ability to manage Nature Reserves be enhanced. Without proper management some Nature Reserves will gradually become less valuable as wildlife conservation areas. Additionally the Department's reputation, especially in country districts, will be harmed.

We are now so far behind that at least 3 additional teams of 3, and 3 additional reserves officers are needed immediately.

Flora Conservation

Western Australia is renowned for its spectacular and rich flora which is of great scientific, as well as tourist, interest. Additionally we have a valuable wildflower industry based on cut flowers, seeds and horticulture.

Recent legislation has affirmed this State's resolve to protect and manage this asset. At the time of transfer of the responsibility for flora conservation to the Department of Fisheries and Wildlife only one professional botanist was added to our staff. The work he has done has clarified the problems of conservation and produced some dramatic statistics, e.g.

(i) Of the approximate 7400 described species of plants in Western Australia more than 2000 species are so poorly known or so geographically restricted that their continued existence is in doubt.

(ii) 100 species have been declared to be "rare flora" under the Wildlife Conservation Act. These species were sufficiently well known that scientists were satisfied that only a few thousand or less reproductively mature plants exist in the wild (one species is known from only a single plant).

(iii) It appears that these 100 taxa are only a small proportion of the rare plants that could be gazetted if they were better known.

(iv) Over 1100 species of native plants are commercially exploited in the cut flower, nursery or seed trades. About 200 of these are regarded as being rare, geographically

restricted or poorly collected and further studies are needed to determine whether they are in danger of over exploitation.

It is clear that much work needs to be done to ensure that flora conservation is based on sound scientific knowledge of plant distribution and reproductive strategies. Unless additional botanists are added to the staff of the WA Wildlife Research Centre, species will become extinct. At least 10 botanists are needed now.

Impact of land releases for agriculture

Through the Environmental Protection Authority's Working Group on Land Releases the Wildlife Research Centre is being asked to provide data on the impact on the flora and fauna of proposed land releases for agriculture. At present we are not able to provide such data and the effect of land releases is being assessed by a quick review of the available information, both published and unpublished. Often no specific information is available.

At present mining and manufacturing industry has to prepare detailed Environmental Review and Management Programmes before a development can proceed. Agriculture has the capacity to destroy the flora and fauna of much greater areas than mining or industry and yet no assessment of environmental impact is made. Clearly individual farmers cannot be expected to carry out such work and therefore it must be carried out by Government.

To be able to assess land at the current rate of release at least 2 professional biologists, plus a field assistant, are needed. If the rate of land release increases, as has been mooted, additional teams will be needed.

RETIREMENT

I wish to record my personal appreciation of the work done over the years by Mr Trevor Evans, who retires soon. Mr Evans joined the Wildlife Research Branch in 1968 as a Technical Officer. Previously he had been a Fauna Warden.

Mr Evans rapidly became an authority on Nature Reserve Management techniques and for some time, as Senior Technical Officer, has been responsible for all firebreaking, fire-fighting and prescribed burning on Nature Reserves. He became renowned as a conscientious person who worked long hours in the field and who brooked no slacking from staff and contractors alike. He has been responsible for the construction and maintenance of the vast majority of the more than 3000 km of firebreaks on Nature Reserves.

It is a reflection of Mr Evans' efficiency and standing that we are, in effect, replacing him with two people - one a professional. I wish him and Mrs Evans (who has been seen on the operative end of a fire hose more than once) a long and rewarding retirement.

WESTERN AUSTRALIAN WILDLIFE RESEARCH CENTRE

RESEARCH PROGRAMME SEMINAR

28 April 1981

Jim Lane

1 Wetland Nature Reserves (WNR's) : Monitoring of water depth and quality.

1.1 Objectives

Routine monitoring of the water depth and water quality of selected WNR's in the south-west of the State assists in:

i) annual evaluation of conditions for waterfowl breeding

ii) prediction of summer conditions for waterfowl

iii) determination of seasonal, annual and longer-term variations in water depth and quality - important aspects of the condition of WNR's.

iv) determination of salinity tolerances and preferences of waterbirds for breeding and other purposes.

v) determination of salinity and depth tolerances for other aquatic fauna and flora.

vi) management of particular WNR's e.g. Lakes Chittering, Nonalling, Byenup, Tordit Garrup, Poorginup, Chandala and Benger.

1.2 Procedures

i) Gauge Installation: 14 depth gauges (staffs) were installed during 1980/81, bringing the total number of gauged wetlands to 82. 71 of these are WNR's vested in Western Australian Wildlife Authority.

ii) Monitoring : Depth and salinity have been monitored by Research Staff at two-monthly intervals since November 1978. West Australian Field and Game Association members have provided valuable assistance in monitoring since January 1980.

1.3 Results

All data are now on computer and available on request.

1.4 Conclusions

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

The data gathered have also provided a sound basis for the development of a meaningful salinity classification for WNR's of the south-west (see Research Project 2).

1.5 Proposals for 1981/82

During 1981/82 it is proposed to install depth gauges on a further 20-25 Western Australian Wildlife Authority - vested WNR's in the south-west of the state. This will complete the gauge installation programme. Two-monthly monitoring of water depth by Research Staff, W.A.F.G.A. members, and participators in the waterbird usage study (see Research Project 3) will continue through

1981/82. Salinity and pH will also be monitored.

1.6 Publications 1980/81

A paper presenting results of the monitoring programme to date has been completed and is awaiting publication (see Research Project 4.12).

1.7 Publications 1981/82

It is proposed to publish results of the monitoring programme either yearly or two-yearly.

2 Wetland Nature Reserves : Area of wetland reserved. Salinity and permanence classification.

2.1 Objectives

i) To determine the total area of wetland reserved under the WNR system. (Each WNR may include both wetland and dryland. Although the total area of each WNR was known, the area of wetland included in each WNR was not known)

ii) To develop a salinity and water-permanence classification system for WNR's and to classify each WNR accordingly

2.2 Procedures

i) The boundaries of wetlands contained within each WNR in the South West and Eucla Land Divisions were marked on 1:40,000 black and white aerial photography, with field inspections where necessary.

A digitising computer (Lands Department) was used to calculate the area of wetland reserved.

ii) Water depth and salinity data obtained from the routine monitoring programme (Research Project 1) and from additional visits to non-monitored WNR's were used for the permanence/salinity classification.

2.3 Results

There are 164 WA Wildlife Authority vested WNR's in the South-west and Eucla Land Divisions of Western Australia. The total area of these reserves is 1,184,000 hectares. The total area of wetland included in these reserves is 110,000 ha . A rough (very, at the time of writing) classification is as follows

	PERMANENT		NON-PERMANENT		TOTAL	
	No. of WNR's	Area ha	No. of WNR's	Area ha	No. of WNR's	Area ha.
FRESH (never exceed 1 ppt)	8	5,000	2	500	10	5,500
BRACKISH (exceed 1 ppt, but not 3 ppt)	11	1,000	14	1,000	25	2,000
SALT (exceed 3 ppt)	20	5,000	109	97,500	129	102,500
TOTALS	39	11,000	125	99,000	164	110,000

2.4 Conclusions

Though the total area of fresh or brackish wetlands in the south-west of Western Australia is not known, it is obvious from the results above that only an extremely small proportion is included in WA Wildlife Authority-vested Nature Reserves. Such areas should therefore continue to be given high priority for conservation by acquisition.

2.5 Proposals for 1981/82

The above data will be polished and published.

2.6 Publications 1980/81

None

2.7 Publications 1981/82

One proposed

3 Wetland Nature Reserves : Survey of waterbird usage

3.1 Objectives

i) To provide information on waterbird usage to assist in the management of WNR's and in the resolution of conflicts between different uses.

ii) To assess the role and importance of the WNR system in the conservation of waterbird populations.

iii) To provide appropriate experience for future monitoring of waterbird abundance.

3.2 Procedures

The Royal Australasian Ornithologists' Union is to be funded to co-ordinate this amateur-based survey of waterbird usage of WA Wildlife Authority-vested WNR's in the South-West and Eucla Land Divisions of the State. A four-year study is proposed, commencing April 1981. A Field Officer will be employed by the R.A.O.U. to administer the project. He will have two main roles : to co-ordinate the activities of amateur observers, and to design, test and report on census techniques. Data will be stored and analysed by computer to provide fast and comprehensive feedback to observers.

In the first year of the study a sample group of WNR's will be selected for the development and evaluation of different counting techniques and for training observers in their use. The WNR's chosen will be those known to be good waterbird areas; they will provide a representative range of wetland types; and they will be accessible. Much time will be devoted to training observers in the first year and to the development of suitable survey techniques.

In the 2nd, 3rd and 4th years all WA Wildlife Authority-vested WNR's will be surveyed. Each will be visited at least every 2 months and at times of particular interest (eg. as they dry out in summer). All waterbirds will be censused. As observers become more expert, particular emphasis will be placed on breeding counts and

on the quantitative assessment of which parts of each wetland are most used by which species.

The R.A.O.U. will produce annual summaries of the information obtained and a final report at the end of the four years discussing the methods employed, the results, and their implications for management both of waterbirds and WNR's.

Water levels and water quality (initially salinity and pH) will be monitored during the course of the study (see Research Project 1).

The Minister for Fisheries and Wildlife has approved the expenditure of $93,000 over five financial years to fund the study.

3.3 Results

Project has yet to commence.

3.4 Conclusions

None at this time.

3.5 Proposals for 1981/82

Waterbird Research Staff will be involved in facilitating the study, and will participate in it.

3.6 Publications 1980/81

None

3.7 Publications 1981/82

R.A.O.U. will do the publishing.

4 Wetlands : Other studies and management projects

Waterbird Research Staff were involved in a number of other research and management projects during 1980/81.

4.1 Islands for Waterbirds:

Acting on a proposal by Mr Neville Beeck, WA Wildlife Authority allocated $5,000 for the construction of islands on selected WNR's in the vicinity of Narrogin and Katanning. 44 islands were constructed on Lake Coyrecup in March 1980, and 43 on Little White Lake in April for a total cost of $4,600. It is hoped that these will be used for nesting purposes by waterbirds, particularly ducks. Little rain fell in these areas during the winter of 1980 and the two lakes have been almost continuously dry since construction of the islands. Further monitoring will therefore be needed to determine the success or otherwise of the project.

4.2 Lake Chittering:

The "check structure" (adjustable-height weir) on the outlet from Lake Chittering requires frequent checking and adjustment during winter and spring each year in order to fill the lake without flooding the adjoining landholders' properties.

Since the check structure was installed in April 1977 it has been possible to hold water right through summer, despite the low rainfalls of recent years. Lake Chittering is therefore a most valuable breeding and summer refuge area for waterbirds.

4.3 Lakes Byenup, Poorginup, Tordit-Garrup (Lake Muir Wetland Nature Reserve).

Mines Department require three-monthly monitoring of water depth, salinity and pH of the above lakes so that appropriate conditions can be applied to peat mining leases to be granted in the near future. This monitoring has been carried out by Waterbird Research Staff since April 1977, and will continue during the mining operation.

4.4 Wetland Survey and Acquisition:

It has not been possible for the Waterbird Research section to give sufficient attention to wetland survey and acquisition during 1980/81, due to lack of staff. Some survey work was undertaken in the Gingin to Dongara areas however, and a reserve on Minyulo Brook, west of Cataby, has been proposed to the Lands Department. Research Staff have been involved in a number of other proposals for acquisition of wetlands during 1980/81 including the southern end of Lake Wannamal, Mialla Lagoon, Owingup Swamp, an un-named swamp on south side of Peel Inlet, the east side of Lake Cairlocup, and

Benger Swamp.

Wetland survey and acquisition is at present, a neglected area.

4.5 Farm Dams for Waterfowl

During 1980, Technical Officer Grant Pearson visited the Cunderdin, Narrogin, Harvey and Denmark Agricultural Schools to talk with the students about methods of increasing the suitability of farm dams for breeding waterbirds, particularly game-species of ducks. It is proposed to repeat these talks during 1981. We are encouraging Agricultural Schools, the W.A. Field and Game Association and a small number of interested farmers, to experiment with various types of artificial nest sites for waterbirds in the hope that more suitable designs may be developed. W.A.F.G.A. have already had considerable success with 5 gallon metal drums with both ends half open, and placed in tree forks.

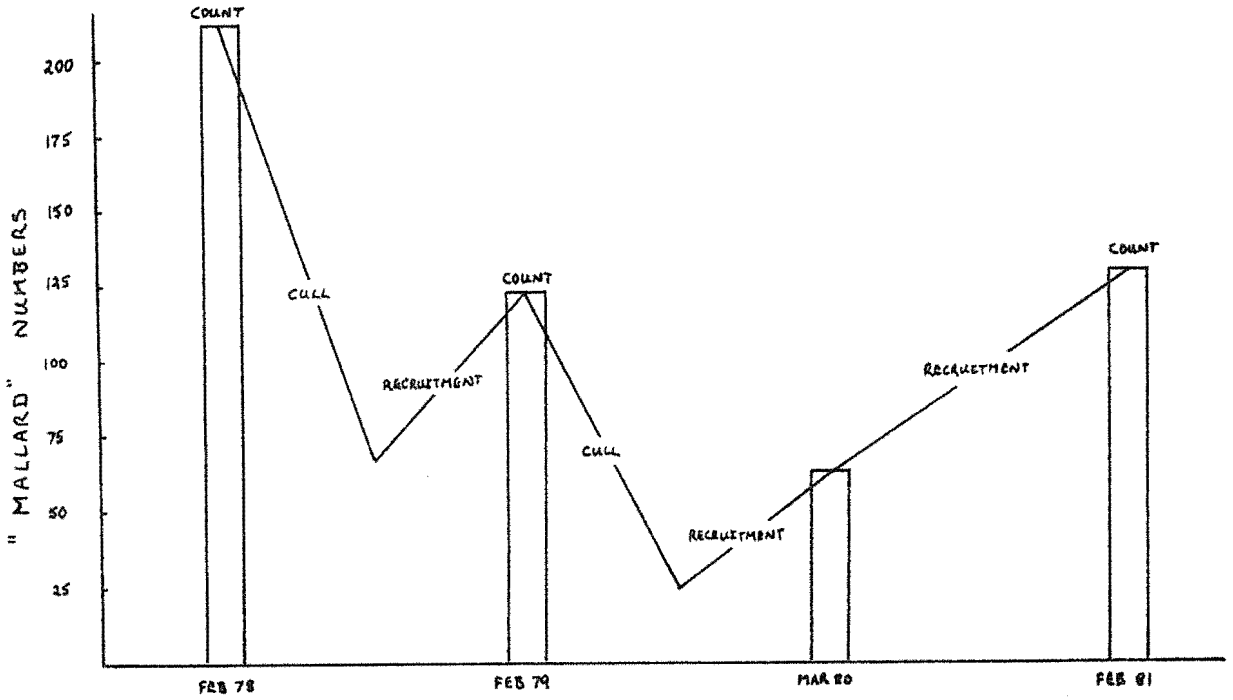
4.6 Aquatic Flora

Dr M. Brock, Tutor in Plant Biology, School of Environmental and Life Sciences, Murdoch University, commenced a study of the ecology of hydrophytes (angiosperms and the larger algae) in salt lakes in Western Australia in September 1980. This work is considered to be of value in increasing our understanding

of the ecology of wetlands and is therefore supported by the Waterbird Research Section. Field work is primarily on WA Wildlife Authority-vested WNR's because water depth and water quality data is available for these wetlands. Collections are made by Dr. Brock during the two-monthly monitoring trips by Research Staff.

4.7 Feral Ducks and Geese

The last cull of feral ducks and geese on metropolitan lakes was in 1979. Lack of man-power prevented a cull being undertaken in 1980. From March 1980 to February 1981 feral "mallard" numbers rose from 63 to 130, muscovy from 7 to 21 and geese numbers fell from 18 to 5.



If sufficient man-power is available in 1981, feral duck and geese numbers will be reduced.

District Wildlife Officers reported small numbers of feral ducks in country areas during 1980 and these have also been reduced.

4.8 Birds of Lakes Jandabup and Forrestdale

Technical Officer Grant Pearson completed a twelve month study (one day per lake every two months) of the above lakes in August 1980, and is preparing a paper for publication this year.

4.9 Duck-Shooting Seasons : Opening-Day Bag-Check Data.

Bag-check data for all shooting seasons since 1972 is currently being re-worked for publication this year.

4.10 Aerial Survey of Waterbird Populations of Eastern Goldfields and Murchison

Rainfall in the pastoral areas of Western Australia was much above average during 1980 and flooding occurred. Aerial surveys of waterbird populations were conducted during September and October, partly as a contribution to the Eastern Goldfields Biological Survey being conducted by Fisheries and Wildlife and the WA Museum. A three-week, follow-up ground survey was also conducted.

A brief paper presenting the findings of the air survey is proposed.

4.11 West Australian Wader Study Group

During the past two years Research Staff have been "handing over" the Branch's wader banding programme to the WA Wader Study Group (amateur ornithologists) which

was formed in 1979. Water Study Group members were instructed in mist-netting and banding techniques during the 1979/80 wader season and have been instructed in cannon-netting techniques this season.

4.12 Determination of Annual Duck-Shooting Seasons

Decisions concerning duck seasons in the south-west of the State (i.e. the South-West and Eucla Land Divisions) are based on annual assessments of conditions for waterfowl breeding. These assessments are based on rainfall data, and on water-depth data derived from the WNR monitoring programme (see Research Project 2). 1980 was another drought year (the fifth consecutive year of below average rainfall in all five Meteorological Districts of the south-west) and a "No Season" was declared. The rest of the state (82% of the total area) remained open to shooting.

4.13 Wetland Creation

The most promising possibility for wetland creation would appear to be the damming of creeks and rivers, particularly the old drainage lines (salt lake chains) of the wheatbelt. These drainage lines have little direct value to present landholders as their salt-laden soils are unsuitable for crops and pastures, and their sparse vegetation is generally unsuitable for grazing. There are also many areas of Crown Land (including WNR's)

along their courses. Because the drainage lines slope very gently, long stretches of water can be created by the construction of quite small dams or weirs. The Salt River, for example, falls only 20 metres in the 85 kilometres from Quairading to 15 kilometres west of Bruce Rock. A 2 metre high wall would therefore back water up for approximately 8.5 kilometres. Beverley Lakes (further downstream along the Salt River) are an excellent example of what can be achieved at very little cost.

The Research Staff will pursue this idea further during 1981/82.

4.14 Publications 1980/81

Technical Officer Don Munro published an article on the "Islands for Waterbirds" project (4.1) in S.W.A.N.S. Vol. 10 (2) 11-13, Summer 1980.

A paper on the determination of duck-shooting seasons (project 4.10) has been completed and is awaiting publication.

4.15 Publications 1981/82

Papers on the determination of the 1981/82 duck shooting season, and the results of opening-day bag checks for each shooting season since 1972 are proposed for 1981/82. A pamphlet on design of artificial nest sites for ducks is also proposed. Grant Pearson will also publish the results of his studies of the birdlife of Forrestdale and Jandabup Lakes.

ADVICE AND COMMITTEE WORK

During 1980/81 approximately 25% of my time was spent on advice and committee work.

I am a member or deputy-member of the following committees:

1. Bird Committee of the Western Australian Wildlife Authority
2. Standing Working Group on Birds of the Council of Nature Conservation Ministers. (Has not met for 4 years)
3. Peel Inlet Management Authority. (Deputy Membership expired April 1981)
4. Planning Committee of PIMA (Deputy Membership expired April 1981)
5. Wetlands Advisory Committee of the Environmental Protection Authority (Meets infrequently)
6. Lake Joondalup Regional Open Space Technical Advisory Committee (Meets infrequently)
7. Field Investigation Committee of the Royal Australasian Ornithologist's Union.

WESTERN AUSTRALIAN WILDLIFE RESEARCH CENTRE

RESEARCH PROGRAMMES SEMINAR

28 April 1981

R.I.T. Prince

Summary of 1980-81

The past year was principally one of marking time as far as progress of research work was concerned.

The last research programme meeting overlapped in part my absence on extended leave in the UK, during which time I took the opportunity to visit a number of nature reserves, designated National Parks, and other similar areas in England, Scotland and Wales.

Later in the year I also visited a number of colleagues in eastern Australia to discuss matters of mutual interest in relation to Kangaroo management and related topics.

Progress on the home front was curtailed by loss early in 1980 of one of the two technical staff previously assigned to this work segment. This loss of assistance was further compounded by the injury and subsequent prolonged incapacity of the remaining technical officer during mid July-September 1980.

The work attempted during the year was therefore largely restricted to maintenance and updating of the Kangaroo Monitoring programme, a check on the Banded Hare Wallaby experiment on Dirk Hartog Island, and commencing to tidy up loose ends remaining from previous years.

The resources available also suggest that a similar situation will prevail during 1981-82.

RESEARCH PROJECTS

1 Red Kangaroo Management (also including Euros)

1.1 Objectives

To maintain up to date information on harvested kangaroo stocks, and to improve knowledge of the exploitation system.

1.2 Procedures

Commercial shooting data obtained from shooter's returns (Form 3) are processed via standard EDP programme and summarized data output in the form of tables and graphs as required.

Additional information aiding understanding of this situation is sought where possible.

1.3 Results

Summary data on current harvests are available on call.

The predictive equations discussed in the previous report (1980-81) provided a fair indication of the realized 1980 Red Kangaroo harvest. Further advice has been provided on expected harvest levels for 1981 and 1982.

The projected aerial census of West Australian Red (and Western Grey) Kangaroo populations discussed previously was programmed to commence on April 14, 1981. This job is being done by Dr Graeme Caughley of C.S.I.R.O. Division of Wildlife Research, Canberra. Major funding is via C.S.I.R.O., but the Department of Fisheries and Wildlife is providing additional finance for a more intensive survey of the Red Kangaroo population within the Gascoyne Catchment.

The visit of Dr David Anderson in March 1980 resulted in the US Government considering review of its ban on importation of kangaroo products. Positive action has not yet resulted.

1.4 Conclusions

As previously. The patterns in the harvest data appear consistent with the hypothesis that accessibility of kangaroos for shooting and recruitment to stocks are the important factors affecting the harvests taken.

A clearer picture should be available when the census data can be compared with the harvest data.

1.5 Programme for 1981/82

Harvest data will have to remain the major source of information on the field situation. These will be dealt with as before. I will be collaborating with Dr Caughley re results from the aerial surveys.

1.6 Publications 1980/81

None complete.

The draft review paper entitled "Exploitation of Kangaroos and Wallabies *F.Macropodidae* in Western Australia. A review to 1970, with special emphasis on the Red and Western Grey Kangaroos", is presently being rewritten.

No further progress was made on the second review.

"Exploitation and Management of Kangaroos in Western Australia 1970-1979."

Drafts of both the above were provided to several colleagues for comment during my recent trip east.

1.7 Publications 1981/82

Rewriting of the first review above is proceeding and should be completed by mid-year. Work on the second review will be resumed on completion of the above. Both reviews will be published as Departmental Bulletins.

A short paper on kangaroo-management in Western Australia for the CONCOM Technical Meeting in May 1981 is proposed.

Results of the aerial surveys will be related to known harvest patterns and written up in collaboration with Dr Caughley.

2 Western Grey Kangaroo Management

2.1 Objectives

To gain knowledge of the management situation.

2.2 Procedures

This programme was suspended during 1980-81. Further discussions were however had regarding future development of the research programme being conducted by Dr G.W. Arnold. The planned kangaroo census work mentioned under Item 1.3 will include census of this species.

2.3 Results

No further results to report at present.

2.4 Conclusions

Further knowledge of the distribution and abundance of these kangaroos around farms and in adjacent bushland will assist in further understanding of the management situation in South-western Australia.

2.5 Programme 1981/82

As for 1980/81.

2.6 Publications

2.7 See under 1.6 - 1.7

3 Skull Collections - Western Grey and Red Kangaroos

3.1 Objectives

To obtain comprehensive modern collections of these species from different local populations.

3.2 Procedures

Collections have been obtained in past years during the course of the normal management and research programmes involving these species.

3.3 Results

Primary data required have been used in the specific research programmes.

No further work has been done on the remainder of the Western Grey material since early 1979.

During the past year one research sample of 200 Red Kangaroos has been cleaned, and is presently being prepared for transfer to the West Australian Museum.

Western Grey material on loan is still retained by Mr W.E. Poole, C.S.I.R.O. Division of Wildlife Research Canberra, pending completion of his work.

3.4 Conclusions

Cleaning and processing of further Red Kangaroo material for transfer to the West Australian Museum collections will continue to be a slow process.

3.5 Programme 1981/82

Further processing of Red Kangaroo research samples will be continued as time and opportunity permit.

3.6 Publications 1980/81

Nil

3.7 Publications 1981/82

None proposed.

4 Dorre Island Studies

Work in suspense during 1980/81. Further progress on the vegetation mapping work is held in abeyance pending return of a colleague from overseas.

5 Banded Hare Wallaby - Dirk Hartog Island

5.1 Objectives

To attempt re-establishment of the species on

Dirk Hartog Island. To obtain further information on breeding patterns and growth rate of young. If the project appears to be succeeding, it is also anticipated that further progress could be amenable to research on the dynamics of re-invasion. Further information on Dirk Hartog Island as wallaby habitat etc., is also being sought.

This is a joint project with Dr A.A. Burbidge.

5.2 Procedures

Generally as previously described. One extended visit was made to check further progress of the animals in the experimental release group during September 1980. The opportunity was also taken during this visit to inspect the northern parts of the island.

5.3 Results

The wallaby trapping programme showed that numbers in the release group had declined since mid 1979. Only 1 adult male (born and reared within this group) and four adult females were confirmed present. One dependent juvenile female was also trapped.

All four adult females were trapped at least twice, and each carried a pouch young at this time. However only one of these females had bred during the early

part of 1980. In normal circumstances, the peak breeding would be expected in this latter period.

The five adult animals trapped were all occupying essentially the same areas as those in which they were trapped in mid-1979. Extensive searching on foot of the areas adjacent to that trapped also revealed no traces of wallabies that may not have been trapped during the 1980 visit, whereas a similar search showed that additional wallabies may have been present but not trapped during the 1979 visit.

The above evidence, plus observation of the recent death of an estimated 30-40% of the Acacia shrub cover pointed to loss of animals resulting from severe drought over the 1979 - 80 summer period. The remaining live shrub cover in the release area was also observed to be suffering from apparently increased physical damage. Greater numbers of goats appeared to be using this area in September 1980 in comparison with previous visits. The tracks of feral cats also appeared to be more numerous in the vicinity of the release area during this latter visit.

A pit-trapping programme was also run in conjunction with the 1980 visit. The continued existence on Dirk Hartog Island of a small Dasyurid marsupial akin

to *Sminthopsis murina* was proven. Two males were trapped among flowering *Beaufortia dampieri* in heathland vegetation on deep reddish sand at the northern end of the island. *Pseudomys hermansburgensis* was generally abundant on the island at this time, but the only House-mice seen and captured were taken in the homestead area.

5.4 Conclusions

The evident loss of wallabies from the release group prior to the 1980 visit, combined with the partial loss of essential shrub cover for the wallabies represents a major set back to this programme. Numbers remaining in the group may now be too few to ensure its future persistence. The obviously slow regeneration of suitable shrub cover in this situation, and the recent loss of cover also points to the need to protect the remaining live shrub cover from further damage where possible, if the project is to proceed further.

Two steps appear necessary at this point to capitalize on the situation as it now stands, and the knowledge previously obtained via this project. Firstly the numbers of wallabies need to be increased. These will have to be taken direct from Dorre Island, the original source of the stock. Secondly, measures will have to be taken to minimize the further physical damage to the surviving shrub cover in the release area that is presently attributable largely to the goat population.

5.5 Programme 1981/82

Endeavour to implement the programme suggested above in addition to continued monitoring of the remainder of the original experimental group.

5.6 Publications 1980/81

Prince, R.I.T. "Reintroduction of the Banded Hare Wallaby (*Lagostrophus fasciatus*) to Dirk Hartog Island, Western Australia. A Report on Progress to September 1980, with some further notes on the biology of the species." (in prep.) for *Australian Wildlife Research*.

Prince, R.I.T., "Some Further Notes on Reproduction and Growth in the Banded Hare Wallaby *Lagostrophus fasciatus* (Peron). " (in prep.). For *Australian Journal of Zoology*.

Prince, R.I.T. "Capture of Dasyurids on Dirk Hartog Island". Manuscript to be submitted to "The Western Australian Naturalist" when Museum access Nos. available for inclusion.

6 Dugong

6.1 Resume

No further work attempted during 1980/81.

The need for further information on dugong occurrence and abundance in northern Western Australian waters remains

The ABC - TV wildlife programme filmed during the 1979 dugong work in Shark Bay was screened nationally on December 22, 1980.

6.2 Programme 1981/82

Professor P.K. Anderson now proposes to further his studies on Shark Bay dugong during sabbatical leave in 1981/82. This work is planned to commence in September 1981.

Ways of obtaining information on northern Western Australian dugong populations will be further investigated, and if a practicable scheme presents itself, this will be followed up.

6.3 Publications 1980/81

Prince, R.I.T., Anderson, P.K. and Blackman, D. (1980) "Status and Distribution of Dugong in Western Australia" in Marsh, H. (Ed.). Proceedings of Dugong Workshop, Townsville, May 1979. James Cook University, Townsville.

Prince, R.I.T., Anderson, P.K. and Blackman, D. "Observations on the Status and Behaviour of Dugong *(Dugong dugon)* in Western Australian Waters." (in prep.) Re-writing suspended 1980.

6.4 Publications 1981/82

The second paper above will be rewritten for submission to "Biological Conservation".

7 Bernier Island

A 3 man research team from New South Wales National Parks and Wildlife visited Western Australia in March 1981 in the course of investigations into the habitat etc. of *Bettongia* spp with a view to possible attempts at reestablishment in Kinchega National Park of one or other of the two species now restricted to Western Australia. I accompanied the party to Bernier Island.

During this visit I did some further trapping of *Bettongia lesueur*. Results of this work were similar to previous information obtained previously on Dorre Island.

SEMINARS, EXTENSION, PUBLIC RELATIONS, ETC. 1980/81

A draft chapter on "Exploitation of Kangaroos and Wallabies" was written for the proposed book on Nature Conservation in Western Australia.

A draft descriptive text for the Banded Hare Wallaby was written for the National Photographic Index of Australian Wildlife.

Information on Western Australian kangaroos and wallabies supplied to Dr G.W. Arnold was used in a talk given by him to the Huntingdon Flora and Fauna

Society - December 1980.

Arrangements for attendance at the Worldwide Furbearer Conference fell through at a late stage. The paper being prepared for this meeting was abandoned when a satisfactory alternative presentation could not be arranged.

Programme 1981/82

CONCOM Technical Meeting on Harvesting of Australian Animals - (Guidelines for Culling Populations of Native Animals) - Melbourne, May 1981.

AAS Symposium on the Biology of Rare and Endangered Species in Australia, Canberra November 1981.

Committees

Kangaroo Management Advisory Committee Coordinating Committee (APB, Animal Health-Agriculture, Fisheries and Wildlife).

Technical Sub-Committee (Coordinating Committee) to consider Holdings of Fauna and Exotic Animals.

WESTERN AUSTRALIAN WILDLIFE RESEARCH CENTRE

RESEARCH PROGRAMME SEMINAR

28 April 1981

N.L. McKenzie

Annual Research Programme

Seminar

N. L. McKenzie

1980/81

RESEARCH PROJECTS

1. Biological Survey - Deserts

1.1 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.

1.2 Procedures

Organize and undertake biological surveys in desert regions. Review relevant available data in the collection of the Western Australian Museum. This is a continuation of previous work.

1.3 Results and Conclusions

The Great Sandy Desert mammal paper was brought to first draft with the inclusion of mammals recorded in the desert since first settlement by Europeans. Determination problems resulting from inadequate taxonomy have provided further data on the morphological variation of *Pseudomys hermannsburgensis* and *Planigale ingrami* .

A new species of *Sminthopsis* closely related to *S. hirtipes* is being described in conjunction with Mike Archer. Both species have arid zone distributions and are known only from sandy surfaces. The new species has a tropical distribution through Western Australia and Northern Territory; *S. hirtipes* records are restricted to sub-tropical and temperate regions. Their ranges overlap along the fringe of the Great Sandy, Little Sandy and Gibson Deserts although the new species is also known from the north end of the Carnarvon Basin.

The revisit to the Ankatell Ridge site in the Great Sandy Desert in March 1980 confirmed the presence of an extant population of Rabbit-eared Bandicoots in this desert.

1.4 Recommendations and Proposals for 1981/2

No further desert field work is envisaged.

1.5 Publications 1980/1

Nil

1.6 Future Publications

McKenzie, N.L. and Youngson, W.K. (in prep.) "Mammals" *In* : Burbidge, A. A. and McKenzie, N.L. (eds), "Wildlife of the Great Sandy Desert and adjacent sites". Wildl. Res. Bull. West. Aust.

McKenzie, N.L. and Archer, Michael (in prep.) *"Sminthopsis youngsoni"* (Dasyuridae, Marsupialia) - a new species from the Australian arid zone."

2. Biological Survey - Kimberley

2.1 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 conservational concern.

2.2 Procedures

(i) Organise and undertake biological surveys in the Kimberley.

(ii) Encourage, edit contributions to, and write survey publications on Kimberley wildlife, thereby promoting study of plant and animal groups in the Kimberley by government organizations.

(iii) Undertake survey work and write papers relevant to Kimberley mammals, especially their biogeography and taxonomy, where these are relevant to conservation needs.

2.3 Results and Conclusions

A seven day visit to the proposed Edgar Ranges Nature Reserve to apply the drift fencing technique and to sample the dune fields in the south-western corner of the proposal (inaccessible during the 1976 work) was undertaken during September 1980.

Valuable data on the vertebrates and vegetation were gathered that further clarified the areas biogeographical relationships. A number of bird, reptile and mammal species were added to the fauna list.

The Edgar Range Bulletin was completed and sent for publication.

2.4 Recommendations and Proposals

A two week revisit to areas on the Dampier Peninsular is envisaged in June 1981 to apply the drift-fencing technique, thereby improving our data on rodents and desyurids on the existing and proposed reserves. Previous trapping involved less powerful techniques.

During the same trip it is planned to

(1) do a reconnaisance of the Radi Hills area on Anna Plains (a CTRC recommendation);

(2) clear up several gaps in our information that have emerged during preparation of the Dampier Peninsular Bulletin: improve several vegetation descriptions including that of the sandstones near Cygnet Bay, re-take several faulty habitat photographs, check-out some areas of interest such as Carnot Hill and Mount Jowlaenga to give a better understanding of south-eastern section of the Peninsula not previously visited.

(3) collect tissues for enzyme work to resolve the taxonomic problem of Kimberley *Nycticeius* (Broad-nosed Bats). This is a co-operative venture being undertaken with Peter Bavistock's ABRS collectors who will be in the area at that time. Two forms of *Nycticeius* are symatric in Western Australia (at Cap Bossut, near Pender, and on Point Torment).

A survey of the Buccaneer Archipelago is planned for mid-1982; planning and equipment preparation will commence later this year. Should the air-photos arrive in time, an overflight of the Archipelego, to inspect islands to be visited, will be undertaken during the June work in Dampierland.

2.5 Publications 1980/81

McKenzie, N.L. (1980). "Taxonomy of *Nycticeius greyii* and *N. balstoni* in Western Australia". Bat Research News No. 15, 6-7.

Kitchener, D.J., Keller, L.E., Chapman, A., McKenzie, N.L., Start, A.N., and Kenneally, K.F. (1981) "Observations on mammals of the Mitchell Plateau area, Kimberley, Western Australia". In : *Biological Survey of Mitchell Plateau and Admiralty Gulf, Western Australia* (WA Museum : Perth).

2.6 Publications 1981/2

McKenzie, N.L. (in press). "Mammals of the Phaerozoic South-West Kimberley, Western Australia - biogeography and recent changes". *J. Biogeog.*

McKenzie, N.L. (ed) (in press) : "Wildlife of the Edgar Ranges Area, South-west Kimberley, Western Australia". Wildl. Res. Bull. West. Aust.
Senior author of Background paper.
Co-author of Mammal paper
Author of Conclusions and Recommendations paper.

2.7 Future Publications

McKenzie, N.L. (ed) (in prep.). "Wildlife of the Dampier Peninsula, Western Australia." Wildl. Res. Bull. West. Aust.
- senior author of Background and Mammal papers
- author of Conclusions and Recommendations paper

Bavistock, P., McKenzie, N.L. and Caputi, N. "Taxonomy of *Nycticeius* in Western Australia".

3. Biological Survey - C.T.R.C. System 11

3.1 Objectives

In conjunction with the organizations represented on the Biological Survey Committee to design, organize and undertake a biological survey of C.T.R.C. System 11 (Eastern Goldfields, W.A.) with emphasis on the more southern portions. The main objectives are:

1. Conduct a quantitative survey of the vegetation at selected sites to document structure and species composition. This information will be used to provide habitat date for fauna collections and observations and to re-define existing vegetation maps.

2. Observe, and collect where necessary, vertebrate animals at selected sample sites to provide information on distribution, habitat utilization, temporal fluctuations in abundance, and taxonomy.
3. Using data gathered, reassess the conservation requirements of the system.

3.2 Procedure

As discussed in the 1978 research seminar, the goldfields have been divided into twelve cells with the WA Wildlife Research Centre being responsible for surveying six and the WA Museum undertaking the survey of the remaining six. The three year field program was listed in the 1979 research seminar.

3.3 Results and Conclusions

All cells in the region have been visited at least once and field work (the three visits) has been completed on cell 6 (Kalgoorlie-Kurnalpi). Only three field trips remain to be undertaken. Dates of these trips are: 28 April - 10 May 1981, 17-31 August 1981 and 13-25 October 1981.

Compilation and analysis of the great body of data will begin as soon as the remaining Kimberley and desert survey publications are in press. To this end, only a single biological survey trip (1 month in the Buccaneer Archipelago) is proposed in 1982.

3.4 Recommendations

An on-going survey program entering a write-up phase early in 1982.

3.5 Publications 1980/81

Nil

3.6 Proposed Publications

Detailed in the 1978 research seminar

4. Chiropteran Studies - *Tadaridd (Mormopterus)* taxonomy

4.1 Objective

To review the taxonomy and distribution of *Tadarida (Mormopterus)* in Western Australia.

4.2 Procedure

Morphometric examination of available specimens; comparison with material from elsewhere in Australia. Use of enzyme electrophoresis to cross-check morphometric conclusions. Material for this purpose will be collected as convenient during biological survey trips.

4.3 Results and Conclusions

During the 1980/81 year material from the Pilbara, Queensland and Northern Territory was measured and specimens from New South Wales are currently being measured.

Arrangements were made with Peter Bavistock, of the Institute of Medical and Veterinary Science, Adelaide,

to carry out the electrophoretic work specified for Western Australian material.

A much more detailed pattern is emerging from the morphometric analyses.

4.4 Recommendations

An on-going program occupying perhaps 1-2 weeks per year. Better collections from the North-west Kimberley are required and may emerge from the Buccaneer Survey in 1982 or the field work by A.B.R.S. and W.W.F. researchers (on northern bats) being undertaken in May-June and April-May 1981 respectively.

4.5 Publications 1980/81

Nil

4.6 Proposed Publication

McKenzie, N.L. and Caputi, N. "The Taxonomy and distribution of *Mormopterus* in Australia".

5. Chiropteran Studies - Mangrove Bats

5.1 Objectives

A long term ecological study, the first step of which is an inventory of the species richness of bats in the different mangrove blocks along the W.A. coastline. The project aims to inventory bats occurring in each block of mangroves and, by combining the results

from blocks within each mangrove biogeographical region (as defined in Semeniuk *et al* 1978, "Mangroves of Western Australia." Handbook No. 12, W.A. Naturalists' Club, Perth.) recognise characteristic bat faunas.

By correlating the environmental situation and observed behaviour of each bat recorded with the flight characteristics of its wings (aspect ratio calculations based on wing bone measurements), it is hoped to document species structure of bat communities in mangroves. In effect, I am trying to separate the species within each such fauna in terms of ecological niche parameters related to differences in the functional requirements of their food hunting. A cross-check on the differences in environmental utilization of the mangrove community by the different bat species will be undertaken by Cyalume tracking of released animals.

5.2 Procedure

Seventeen different mangrove blocks have now been visited and four blocks revisited on two or more occasions. In all, seventeen different bat species have been collected for 36 nights effort. Overall the inventory has not improved with the extra effort during 1979, although greater consistency in species composition has been achieved between blocks in the same biogeographical regions of Western Australia.

5.3 Results and Conclusions

Other work commitments precluded further collections during 1980/81. Sufficient data is probably now available

to begin analysis. This will be undertaken in 1981.

5.4 Publication 1980/81

McKenzie, N.L. (1980) "Bats of Mangrove Communities" Page 26 in : "Mangroves - papers presented to a workshop on mangroves convened by F. Honey (C.S.I.R.O. Division of Land Resources Management) and G. Chittleborough (W.A. Department of Conservation and Environment) and held at C.S.I.R.O. Floreat Park, Western Australia, on 14 August 1980 (Mimeographed).

5.5 Proposed Publication

As for 1979/80 review.

COMMITTEES

Biological Survey Committee - the System 11 survey derives from this committee.

SEMINARS, WORKSHOPS, PUBLIC RELATIONS, EXTENSION

Chapters titled "Biological Survey and Acquisition of Nature Reserves", "The Kinds of Conservation Areas", "The Selection and Design of Continental Nature Reserves" and "Protected Natural Area Reserves in Western Australia" are drafted as contributions to a book on Nature Conservation in Western Australia.

Accounts of six species of native mammals were prepared for a book titled "Mammals of Australia" being edited

by R. Strahan of the National Photographic Index of Australian Wildlife. Each account was a 500 word summary of knowledge on the species - conservation status, distributions, habits, habitats, morphology and taxonomy. The following were the species:- *Mesembriomys macrurus*, *Isoodon auratus*, *Ningaui ridei* and undescribed populations, *Nyctophilus arnhemensis*, *Sminthopsis hirtipes* and *Sminthopsis longicaudata* (co-authored).

The Key-note address on Western Australian's arid zone was prepared and delivered to students attending the Biology Enrichment Program at W.A.I.T.

WESTERN AUSTRALIAN WILDLIFE RESEARCH CENTRE

RESEARCH PROGRAMMES SEMINAR

28 April 1981

A J M Hopkins

SUMMARY

A total of three months was spent in the field during the past year with trips to Tutanning, Two Peoples Bay, Middle Island and Eneabba. Long-term studies at the first three of these localities were continued through intensive sampling. Two months' leave was taken interstate, timed to incorporate two major symposia. In spite of this time away from the office, a considerable amount of writing was completed : the first two papers on the initial Eneabba study have now been published, a third is in press, and papers detailing results of the two subsequent studies are written. Data from the Mt Lesueur - Cockleshell Gully studies have been analysed and await further interpretation. Several papers on fire ecology and related studies are well advanced.

During the coming year, field work will be concentrated at Tutanning and Two Peoples Bay. At the first of these reserves, the remainder of the systematic grid points will be sampled. An experimental fire is proposed for about March 1982. The area will be sampled intensively before and after burning, and the behaviour of the fire will be monitored. At Two Peoples Bay, both pyric succession study plots will be harvested. Compilation of results will follow these harvests since it is now five years since the first study commenced. Some further work will also be undertaken at Eneabba. Assessment of the Lamont-Downes technique for determining fire history from *Xanthorrhoea* and *Kingia* will continue. Preparation of material for publication will have high priority for non-field time.

RESEARCH PROJECTS

A FIRE ECOLOGY STUDIES

1 Modelling

1.1 Objectives

To develop an array of modelling strategies, including the Gradient Model of Kessell, for reserve management and research. This deductive approach to the study of change in complex ecosystems is complimentary to the inductive approach based on observation.

1.2 Procedures

A simple model was developed in 1976/77 to simulate effects of various fire regimes on a Tutanning-like model reserve. This provided some indication of optimum regimes and highlighted further research needs. Collection of appropriate field data from Tutanning Nature Reserve commenced in 1977.

In 1979 Dr Stephen Kessell visited this institution and collaboratively developed PREPLAN, A Pristine Environment Planning Language and Simulator, for Tutanning. The work highlighted a number of inadequacies in the data base for such a system; subsequent effort has been directed towards remedying these.

1.3 Results

The capabilities of the very basic system include immediate recall of site information (elevation, slope, aspect, topography, soils, fire history, vegetation) and production of plants and fire fuels present. Fire behaviour can be predicted for any set of meteorological conditions.

1.4 Conclusions

The values of this type of model for land-use management and research have been clearly demonstrated.

1.5 Proposals for 1981/82

A large proportion of the resource inventory work remains to be done. It is proposed to utilise some of the new computer software available at Associated Surveys to expedite this work.

Field sampling of the vegetation is being continued. Analyses of these additional data will provide the basis for upgrading the floristic component of the model as time permits.

An experimental fire is proposed for around March 1982. Data from monitoring fire behaviour, effects on vegetation and subsequent regeneration will be incorporated into the model and will be used for developing a Plant Succession Model.

1.6 Publications 1980/81

Nil

1.7 Publications 1981/82

S.R. Kessell, R.B. Good and A.J.M. Hopkins. Implementation of Two New Resource Management Information Systems in Australia. for submission to Environmental Management. A manuscript is presently being prepared.

2 Wheatbelt Field Studies (Tutanning, Boyagin, Dryandra SF.)

2.1 Objectives

To develop a knowledge and understanding of the patterns and processes of regeneration of the central wheatbelt vegetation following fire.

2.2 Procedures

General environmental information is being compiled from diverse sources to provide a background for the comprehensive ecological studies. A variety of sampling techniques is being used to elucidate important plant-environment relationships and the influences of past fires.

The most comprehensive field study involves scoring environmental and floristic attributes at points in the systematic grid system. A supplementary sampling programme in the heath areas was undertaken in 1980.

A recent innovation in the study of fire history details involves the use of the Lamont-Downes technique which is based on flowering episodes in *Xanthorrhoea*.

2.3 Results

Tutanning. Over half the 316 systematic grid points have now been sampled. Data from the first *ca.* 130 points were used in the development of the gradient model, as was much of the other background information. Preliminary analyses of the results from the 12 heath samples (4 soil types) a) confirm the floristic importance of this vegetation type in the wheatbelt : about 50% of the *ca.* 550 species so far recorded from the whole 2000 ha reserve were found in 12 samples b) suggest that the duplex soils suppcrt the richest assemblages of plants and an apparently disproportionate number of legumes are confined to this soil type, and c) provide no evidence to support the contention that there is a loss of species from this vegetation type with time since fire : for example the longest unburnt heath (ca. 50 years since fire) is not significantly different in species richness from the richest sample on that soil type.

Only 4 individuals of *Xanthorrhoea reflexa* have been sampled - 2 from each of 2 localities. Patterns of growth are not as clear as for *X.preissii* and perhaps this will require further field study before interpretations of patterns is undertaken.

Boyagin Nature Reserve and Dryandra SF was undertaken in these areas in 1980

2.4 Conclusions

Await further analyses of data.

2.5 Proposals for 1981/82

Collection of resource inventory data from grid points will continue in Spring 1981. One further heath sample is required to complete that study : this will be undertaken at the same time. Assessment of *Xanthorrhoeas* will also continue.

An experimental fire is proposed for March 1982. The area proposed to be burnt has already been extensively sampled but this programme will be enlarged in Spring 1981. A comprehensive assessment of fuels will be made and the fire behaviour will be monitored. Plots will be established in pairs (fenced and unfenced) to study regeneration of the vegetation.

2.6 Publications 1980/81

Specht RL, Rogers R.W. Hopkins A.J.M. (1981) Seasonal growth and flowering rhythms : Australian heathlands. pp. 5-13 In R.L. Specht (ed) 'Ecosystems of the World. Vol.9B Heathlands and Related Shrublands. Analytical Studies'. (Elsevier, Amsterdam).

2.7 Publications 1981/82

Hopkins A.J.M. and Burbidge A.A. Tutanning Nature Reserve I. History, Environment and Results of Some Preliminary Biological Studies. Dept. Fish.Wild. WA. Rept. (carried over from 1980/81).

Hopkins A.J.M. Monk D and Robinson C.J. Population Structure Analyses of some Central Wheatbelt Plant Species (carried over from 1980/81)

Brown J.M. and Hopkins A.J.M. The heaths of Tutanning Nature Reserve.

3 Two Peoples Bay

3.1 Objectives

To study the processes and time scales of regeneration of south coast kwongan vegetation following fire.

3.2 Procedures

Collection and collation of background information is a necessary prerequisite to detailed ecological studies.

A 625 m^2 plot was established in September 1976. Sets of sub-plots were harvested then, and immediately after a prescribed fire, and 1, 2 and 3 years later. Harvested plant material has been sorted by species and oven dry weights determined.

A second plot of 425 m^2 was established in February 1979, burned and sampled in a similar way. This plot was sampled again in October 1980.

3.3 Results

Data are presently coded but not yet analysed.

3.4 Conclusions

Nil

3.5 Proposals for 1981/82

Sets of sub-plots will be harvested in both plots in October 1981. If time permits some sampling will also be undertaken outside the enclosures to ascertain the effects of grazing.

The first five years of data will be worked up over summer.

3.6 Publications for 1980/81

Nil

3.7 Publications for 1981/82

Two publications are planned but it is likely that these will not be completed within the year. One is a general background document on Two Peoples Bay Nature Reserve with Dr. Graeme Smith (CSIRO Wildlife). The second is on the results of the fire study.

4 Middle Island (Recherche Archipelago)

4.1 Objectives

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

4.2 Procedures

A set of permanent quadrats was established in the 1972/73 burn area in 1973. These have been sampled 6 times in 8 years. Sections of the then unburnt portion of the island were sampled during the 1976 visit. A fire in January 1977 consumed the vegetation of much of this unburnt section including some of the unburnt vegetation monitoring sites. These sites were re-sampled in November 1978 and 1980.

4.3 Results

The most recent visit confirmed earlier stated conclusions regarding the regeneration. The results are currently being prepared for publication.

4.4 Conclusions

To be detailed in the publication.

4.5 Proposals for 1981/82

A visit is planned for May 1981 to collect plant specimens and to undertake renovations to the hut. An effort will be made to complete preparation of the publication.

4.6 Publications for 1980/81

Nil

4.7 Publications for 1981/82

Hopkins A.J.M. (editor). Results of Studies on Middle Island (Recherche Archipelago). Wildl. Res. Bull. West. Aust. (carried over from 1980/81).

5 Other

5.1 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 patterns in vegetation.

5.2 Procedures

As appropriate for the particular situation. No new field work was undertaken for this project in 1980/81.

5.3, 5.4 Results and Conclusions

No new findings for 1980/81

5.5 Proposals for 1981/82

Two further study areas have been located near Eneabba and Lake Indoon. These will be sampled in Spring 1981.

B REGENERATION STUDIES

6 Eneabba Reserve

6.1 Objectives

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

6.2 Procedures

Four major studies have been undertaken to date :

a) an ecological survey of vegetation in the north portion of C31030 and adjacent vacant Crown land : the area proposed for heavy mineral sands mining in the next 10-15 years (with Dr R.J. Hnatiuk, of WA Herbarium).

b) an ecological survey of vegetation on lateritic uplands from Jurien to Three Springs - a total of 31 sites (with Mr E.A. Griffin on contract and Dr R.J. Hnatiuk.)

c) an assessment of the short term impacts of brush harvesting (a rehabilitation practice) on the vegetation (with E.A. Griffin on contract)

d) an ecological study of the vegetation on Mt Lesueur - Cockleshell Gully area - total of *ca* 150 sites (with E.A. Griffin).

In addition work is currently underway to assess results of various rehabilitation treatments on Allied Eneabba Ltd. tailings areas.

6.3 Results

The results of the first study were discussed in the 1980/81 Seminar and are presently being published. The results of the second study show:

a) that the vegetation in the Mt Lesueur area is quite distinctive,

b) that the units of vegetation on lateritic uplands north of Eneabba to the Arrowsmith River form a grouping which is less distinct than the Mt Leseur group. The lateritic hills in this area tend to be much more isolated from each other than the lateritic uplands in the centre of the study area.

c) that within the remainder of the area the vegetation shows a pattern of east-west change which correlates with a number of climatic variables.

d) that there are trends in the distributions of major families which correspond with phytogeographic patterns in the area

e) that the kwongan flora is extremely heterogenous ; the high degree of dissimilarity between sites reflecting high species turnover. A manuscript reporting this study is very nearly completed.

The study of brush harvesting shows a loss of species as a result of the practice. Many regenerate but a number of sensitive species are identified. These are principally non-resprouting or obligate seed regenerating species, and many are in the families Proteaceae and

idaceae - important kwongan families. The slow of return to pre-harvest levels of above-ground and seed store which are anticipated suggest that re-harvesting will not be practicable.

A large proportion of the data from the Mt Lesueur - Cockleshell Gully study have now been analysed and some writing has been done. This work will assume greater importance in the next few months.

6.4 Conclusions

Continuing studies further highlight the botanical importance of the Eneabba - Mt Lesueur area on both local and international scales. The studies substantiate the need for more reserves in the area (particularly Mt Lesueur - Cockleshell Gully) and for effective management of existing reserves.

6.5 Proposals for 1981/82

Preparation of publications on the fourth study will procede with some urgency. A further contract will be let to Mr Griffin to work in the Lake Indoon area.

6.6 Publications for 1980/81

Hnatiuk R.J. and Hopkins A.J.M. (1980) Western Australian species-rich kwongan(sclerophyllous shrubland) affected by drought. Aust J Bot 28 : 573-85

6.7 Publications for 1981/82

Hopkins A.J.M. and Hnatiuk R.J. (1981) An ecological survey of the kwongan south of Eneabba, Western Australia. Wildl. Res. Bul West Aust. 9 : 1-33

Hnatiuk R.J. and Hopkins A.J.M. (1981) An ecological analysis of the kwongan vegetation south of Eneabba, Western Australia Aust. J Ecol. 6 (4) (in press)

Griffin E.A. and Hopkins A.J.M. The short term effects of brush harvesting on the kwongan vegetation at Eneabba, Western Australia. Dept.Fish.Wildl. West.Aust. Rept.

Griffin E.A. and Hopkins A.J.M. and Hnatiuk R.J. The kwongan vegetation on lateritic uplands in the Eneabba region, Western Australia. ?/for Ecology

Hopkins A.J.M. and Griffin E.A. The vegetation of Mt Lesueur, Western Australia parts I - III

Griffin E.A. and Hopkins A.J.M. The vegetation of the Mt Lesueur - Cockleshell Gully area of Western Australia.

7 Barrow Island

7.1 Objectives

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

7.2 Procedures

Permanent sampling sites were established in 1973 by Dr N. Marchant (WA Herbarium). Further sites were established in 1975. Sites are monitored approximately biennially.

7.3 Results and Conclusions

7.4

Nil

7.5 Proposals for 1981/82

A visit will be made if time permits.

7.6 Publications for 1980/82

7.7

Nil

8 Tutanning

8.1 Objectives

To examine appropriate methods for the re-vegetation of disused farmland in the central wheatbelt.

8.2 Procedures

This is a collaborative study with Dr P. Farrington (CSIRO Land Resources Management) and involves three main lines of enquiry:

a) old-field succession (Natural regeneration).

b) autecology of major habitat species.

c) techniques for artifical revegetation.

During the past year, this first aspect has been the principal area of collaborative work involving air-photo interpretive assessment of vegetation changes in abandoned farm areas at Tutanning, and setting up of seed traps to assess movement of propagules into these areas. Soil samples have also been taken to study seed storage and fertility status.

Dr Farrington has also worked on the two other aspects of the problem, firstly by looking at germination requirements of some of the major species and secondly by establishing a factorial field trial involving setting out of seed and seedlings at Tutanning.

8.3 Results and Conclusions
8.4

Nil as yet

8.5 Proposals for 1981/82

Dr Farrington will continue to have major responsibility for this work : the commitment of staff of this institution is relatively small.

8.6 Publications for 1980/82
8.7

Nil

9 Other

Rehabilitation plans have been prepared and, to varying degrees, implemented, for 3 areas of reserves:

a) Woodvale - area disturbed by construction of sewage main

b) E. Wallabi - area cleared for airstrip and eroding badly

c) Two Peoples Bay - vehicle and visitor walking tracks

Results of these programmes are monitored as appropriate.

C RESERVE ADEQUACY

10 Tutanning Nature Reserve - Edge Effect

10.1 Objectives

To monitor the long-term changes in the reserve associated with edge deterioration, weed invasion etc.

10.2 Procedure

This monitoring programme is incorporated within the existing one outlined in Item 2, involving regular sampling of the 316 systematic grid points. Weed invasion following control burns is also being monitored.

10.3 Results

About 25 species of introduced plants have been collected to date. These are most common on the edges of the reserve, but some individuals have been noted germinating from seed in kangaroo faeces well within the reserve. A similar association between the activities of kangaroos and the presence of a ruderal flora has also been noted during the Eneabba Study. Three species *(Hypochoeris glabra) Arctotheca calendula* and *Ursinia anthemoides)* are widespread throughout the reserve.

10.4 Conclusions

Nil

10.5 Proposal for 1980/81

Monitoring of grid points is to continue.

10.6 Publication for 1980/82
10.7

Nil

11 Eucalyptus forrestiana

11.1 Objective

To examine the distribution of *Eucalyptus forrestiana* in relation to proposed and existing reserves in the Truslove area, pursuant to E.P.A. recommendation 3-9 Red Book 1.

11.2 Procedure

Reserves are traversed by vehicle and on foot and populations of *E. forrestiana* estimated.

11.3 Results

Thirty reserves have been surveyed

11.4 Conclusions

Material which has been collected suggests that *Eucalyptus forrestiana* sub sp. *dolichoryncha* may not be a good sub species. Substantial populations of *E forrestiana* ssp *forriestiana* are present on existing reserves but the range of variation which includes ssp *dolichoryncha* may not be well reserved. The species boundary with *E stoateii* also appears unclear.

11.5 Proposals for 1981/82

Mr Chris Robinson (Kings Park and Botanic Gardens) has responsibility for this study.

11.6 Publications 1980/81

Nil

11.7 Publications 1981/82

A report will be submitted to the E.P.A. Some results may be submitted for publication

D MISCELLANEOUS

Three small projects on mangroves are continued as time permits.

a) The population dynamics of the Mangroves of Anglesea Island (Bunbury)
b) The conservation of mangrove communities in Australia
c) The rehabilitation of mangroves in S.E. Queensland

SEMINARS, WORKSHOPS, PUBLIC RELATIONS

A number of seminars, symposia etc. were participated in. These included the Ecological Society of Australia's Symposium on Ecological Gradients and Boundaries (Melbourne, May 1980) and the co-sponsored symposium on Evolution of the Flora and Fauna of Arid Australia (Adelaide May 1980).

Two public lectures and one radio talk were given. There has been continuing involvement in student programmes at Murdoch University.

COMMITTEES

1 Mineral Sands Agreements (Eneabba) Rehabilitation Co-ordinating Committee (DRD)

2 WA Wildlife Authority, Flora Committee

3 CONCOM Working Group on Endangered Flora - now the responsibility of Dr Hopper

4 Technical Committee on Environmental Problems Associated with Underground Water Extraction (PWD-MWB)

Commitment to committee work and to the provision of advice within the Department is about 20% of time. Of this the major time consuming issue continues to be mining and rehabilitation. However the relevant committee now appears moribund so time allocated to this committee has been spent on resuscitating the associated scientific programmes.

WESTERN AUSTRALIAN WILDLIFE RESEARCH CENTRE

RESEARCH PROGRAMMES SEMINAR

28 April 1981

J.E. Kinnear

1 Wheat-belt Rock Wallaby Project

Preamble

At previous seminars, evidence has been presented which indicates that the wheatbelt rock wallaby (RW) population has undergone a range and habitat contraction, a relatively recent decline in numbers, and the extinction of 2 populations in the last 10-12 years. Attempts to determine the causes of this situation have focused (when possible) on the following list of factors:

(a) Environmental stresses
(b) Nutritional/water stresses
(c) Competition for food e.g. with rabbits
(d) Predation, i.e. foxes, feral cats
(e) Disease
(f) Genetic e.g. inbreeding.

Two new developments of some significance to the project occurred this year namely -

(1) A license to use '1080' for fox, feral cat, and rabbit control was granted

(2) The study area was severely drought affected.

The discussion at the seminar will centre on these two aspects; at this writing some data is still being collected and analysed.

1.1 Objectives

(i) population census etc.

(ii) genetic screening of the Langdon population

(iii) establishment of a breeding colony

(iv) susceptibility to disease

(v) predator control

(vi) rabbit control

1.2 Methods

(i) trapping

(ii) electrophoresis

(iii) 2 RW were trapped 1♂ and 1♀ and were released into a yard at Wildlife Research Centre

(iv) in collaboration with the Murdoch Veterinary Clinic

(v) baiting with APB factory wild dog/ fox baits

(vi) 'one shot' technique by the APB

1.3 Results

(i) the annual trapping of the population is, at this writing in progress; some results will be summerized at the seminar.

(ii) the Langdon population was trapped for the first time; this once thriving population is now about 8 animals - no results yet available from electrophoresis

A new 'soft' trap designed and built by R. Bromilow was used with good success.

(iii) The establishment of a breeding colony was not successful - wild adults do not adapt to confinement; it is now clear that hand-reared wallabies will have to be used.

(iv) RW are now known to be susceptible to coccidious; both juveniles here at the Wildlife Research Centre were positive and the male became gravely ill.

(v) The factory APB baits were not effective; data from the trials are still being collected and analyzed and will be presented at the seminar

(vi) In these experiments we asked this question. "Does rabbit control by '1080' affect fox numbers?" i.e. the secondary poisoning theory.

The answer? - to be discussed.

1.4 Future work

(i) predator control : objectives - to achieve effective control by all possible means.

(ii) to assess the consequences of severe drought on the populations.

2 Dampier Archipelago - Rock Wallaby Project

Preamble

From the point of view of rock wallaby research and conservation, the Dampier Archipelago is of interest and concern for the following reasons:-

(a) three islands carry rock wallabies *(P. rothschildi)* 2 are free of exotic predators and carry thriving populations, but the 3rd has foxes and feral cats and the RW density is very low - cause and effect?

(b) Iron ore companies hold mining leases on the sand-plains of Enderby Island; the importance of this habitat to the RW population is unknown.

(c) The effect of fire is unknown; under certain circumstances (e.g. fire intensity, timing and extent) fire could be disasterous.

These aspects were studied to varying degrees.

2.1 Objectives

(i) to conduct additional surveys of Dolphin, Enderby and Rosemary Islands.

(ii) predator survey and control on Dolphin on an experimental basis.

(iii) to burn an experimental area on Enderby Island and to determine the effects on a resident population of RW.

2.2 Methods

(i) Transects at night with a long range spotlight.

(ii) Track counts; baiting on beaches with Wild Dog/fox baits (in collaboration with APB).

(iii) Burning by standard methods; radio-tracking of RW on the burned area.

2.3 Results

(i) Dolphin Island survey - in 4 nights, 4 RW sighted i.e. 0.5 RW/hour.

Enderby - 12-15 RW/hour

Rosemary - similar to Enderby - sandplain area not utilized by RW - too far from shelter.

(ii) Predator surveys Dolphin Island -

May 1980 no tracks or sightings, tracks numerous on nearby Burrup Peninsula.

August 1980 - fox tracks numerous on Dolphin

October 1980 - fox baits laid on beaches
Follow up assessment - no effect.
Baits not attractive?

(iii) Fire ecology - Enderby : Pre-fire data

13 RW tagged in study area. 2 with radios used some rockpile during day; used sand plain usually until midnight or longer.

Post-fire data - no mortality of population observed after fire; radio tracking - greater use of sand plain.

2.4 Future work

(i) post-fire studies on Enderby

(ii) importance of the sand plain

(iii) more surveys of Rosemary

(iv) liaison with APB on Fox control on Dolphin

3 Dorre and Bernier Island

Last year's objectives were not achieved because of restrictions on temporary staff. No further work planned because of these restrictions.

A draft of the metabolic studies on Bettongs was written up. Both species show an impressive array of physiological adaptations to arid conditions.

4 Electrophoretic Analyses

If funds are available, it is planned to purchase equipment and learn the technique.

5 Committees

Feral cats

Feral pig control

6 Publication

None; 3 papers in preparation

WESTERN AUSTRALIAN WILDLIFE RESEARCH CENTRE

RESEARCH PROGRAMMES SEMINAR

28 April 1981

J.A. Friend

RESEARCH PROJECTS

A. Numbat Ecology

The distribution of the Numbat *(Myrmecobius fasciatus)* has decreased since white settlement until, by the middle of this century, it was apparently restricted to forest and woodland in the south-west, east of the scarp. Numbats were, however, locally abundant in places. During the 1970s, the frequency of sightings decreased drastically, particularly in areas formerly with healthy populations, such as Dryandra State Forest. This project, which is subdivided here into four sections, aims to provide insights into the ecology of the Numbat, and the dynamics of its environment, in an attempt to explain the recent decline. Relevant management procedures might then be recommended.

Three main hypotheses have been advanced by various people to explain the decline, Briefly, these involve

1) change of habitat by controlled burning
2) reduction of food (termite) availability due to drought
3) predation by introduced species, especially the fox, whose numbers appear to have increased recently. These hypotheses will be tested as part of this project.

1 Numbat : Survey of distribution and description of habitat

1.1 Objectives

As well as providing information on the status of this species, a survey of present distribution will reveal the range of habitat types suitable for the Numbat. From this information it is hoped that certain generalizations about Numbat habitat may be made. At this stage, it is intended to define the habitat of the Numbat with respect to 3 axes which appear to be the most important.

a) Abundance of termites in the numbat feeding zone:
   i) in the upper 5 cm of soil under leaf litter
   ii) under small pieces of wood and in soil at the sides of logs

b) Abundance of suitable shelter logs

c) Extent of ground cover.

1.2 Procedures

Sites will be selected for intensive inspection, either in a follow-up of alleged sightings, or eventually, a fairly systematic treatment of south-west nature reserves and State forests. The presence of numbats will be established by a variety of means, initially through searching for hairs, scats, diggings and shelter logs (which are very distinctive) and ultimately by use of automatic photographic equipment.

Assessment of the abundance and species composition of termites and the abundance of shelter logs will be made by quadrat sampling, and the structure of the vegetation at each site will be described. A comprehensive assessment of vegetation, soils and topography will be made at each site.

1.3 Results - preliminary

Publicity concerning this project stimulated a number of reports of recent numbat sightings some of which have already been followed up. An interesting feature of this information is that the great majority of sightings have been in jarrah forest, although wandoo forest is traditionally regarded as the prime numbat habitat.

1.4 Conclusions

It is too early to draw conclusions, but some interesting points have emerged. The population crash at Dryandra (demonstrated in a 1979-80 survey) may be indicative of a general decline of numbats in wandoo, which has not occurred to the same extent in jarrah. Areas of jarrah frequented by numbats are still quite easy to find in the Perup River Fauna Priority Area, east of Manjimup.

1.5 Programme for 1981/82

Priority will be given to this aspect for the next four to six months, during the cooler months, when

numbats are reportedly more visible. An appeal for reports of sightings will be made in country newspapers, particularly in districts with patches of wandoo forest.

2 Numbat : factors affecting aspects of habitat.

2.1 Objectives

To distinguish environmental influences affecting the availability of food and shelter for numbats. It is assumed that these animals depend heavily on hollow logs for shelter and on termites for food. Analysis of scats found during field work will be used to test the assumption (based on John Calaby's work) that termites are the main dietary item.

a) Availability of termites. Hypothesis: Under certain fire regimes there is a reduced abundance of termites in the numbat feeding zone.
Hypothesis : Abundance of termites in the numbat feeding zone in jarrah and wandoo forest depends on summer rainfall.

b) Availability of shelter logs. The importance or otherwise of a high density of shelter logs will be established as a result of parts 1 and 4.

The effects of the following factors on the density of numbat logs will be examined:

i) fire frequency

ii) season of fire

iii) forestry activity (logging)

iv) abundance of termite species which attack sound wood (e.g. *Coptotermes acinaciformis*).

2.2 Procedures

Fire effects on termites and logs

- monitoring short-term effects in areas to be burnt, examined before and after fire, and subsequent monitoring for 1-2 years
- comparison of similar areas with different fire histories to elucidate long-term effects. Termites sampled seasonally.

Effects of climate on termites

- manipulation of climate in a small area of forest by watering on several occasions during summer drought to simulate rainfall. Comparison of termite abundance in numbat feeding zones in watered and unwatered areas.

2.3 Results - preliminary

Recent monitoring of an intense autumn burn in jarrah forest in the Perup Fauna Priority Area indicated that the majority of logs used by numbats are burnt in this kind of fire.

2.4 Programme for 1981/82

With the cooperation of the Forests Department it is intended to select areas either to be burnt, or with known fire histories in which to carry out fire studies.

3 Numbat : effect of introduced predators on populations.

3.1 Objectives

To determine whether the presence of introduced predators, particularly the fox, reduces numbat populations.

3.2 Procedures

Reduction of predator numbers in an experimental area by baiting over a period of 2-3 years. Monitoring of numbers of fox and numbat in this and a control area, by means yet to be determined. Dryandra State Forest appears the most suitable, as it is known that numbats were plentiful here.

3.3 Programme for 1981/82

Selection of suitable area for study, development of census techniques.

4 Numbat : studies of individuals and populations.

4.1 Objectives

To study the ecology of numbats to fill gaps in knowledge and provide data for management.

4.2 Procedures

a) Radio telemetry. This technique, if performed on a number of animals in a variety of habitat types, should present much valuable information about cycles of activity, use of shelter logs, selection of feeding areas, size of range. It may also allow field observation from hides.

b) Trapping. At present, no technique for trapping numbats is known. I am experimenting in the Perup Fauna Priority Area with several techniques.

Successful trapping would allow a tentative population estimate for an area, as well as allowing tagging which might be used in conjunction with automatic photography to present further information on log use and discreteness of territories. Some data on reproductive biology would also become available.

c) Observation and experimentation with captive animals. Despite the limitations of this situation, much might be learnt using captive animals, including promising means of attraction to traps.

4.3 Programme for 1981/82

Radio telemetry. This aspect will be given high priority when specially-designed transmitters arrive from the United States.

Trapping. A concerted effort will be made during the next year, to find a method of trapping numbats regularly.

B. Other Research

5 Taxonomy and zoogeography of Australian landhoppers (terrestrial Amphopoda).

5.1 Objectives

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

5.2 Procedure

Collection of specimens; examination of these and museum collections; drawing and description; application of classical taxonomic concepts.

5.3 Results

This is a continuation of work in progress. Drawings and descriptions of almost half (20 out of 45) the known Australian species are now complete, although more species certainly await discovery.

5.4 Conclusions

The landhopper fauna of Australia is diverse and shows evidence of Gondwanaland relationships. There is a high degree of regional endemicity.

Western Australian species are endemic, but show generic relationships with the faunas of south-eastern Australia and Tasmania.

5.5 Programme for 1981/82

Completion of two manuscripts for publication; collection of specimens in the south-west.

5.6 Publications for 1980/81

Ph.D. thesis : "The taxonomy, zoogeography and aspects of the ecology of the terrestrial amphipods (Amphipoda : Talitridae) of Tasmania". Submitted December 1980.

5.7 Publications for 1981/82

Friend, J.A. New terrestrial amphipods (Amphipoda : Talitridae) from Australian forests. (Manuscript under revision).

Friend, J.A. Tasmanian terrestrial Amphipoda (Talitridae). (In preparation).

6 Investigation of reproduction in *Talitroides alluaudi* (Amphipoda) from populations near Millstream, Hamersley Range.

6.1 Objectives

To establish whether *T. alluaudi* is capable of parthenogenesis as mentioned in the literature. This species is one of two which are unusual amongst the group in having dispersed widely in the tropics. This could be partly due to the possession of such an anomalous reproductive strategy.

6.2 Procedures

Isolation of ovigerous females and new hatchlings in the laboratory; monitoring development over one year.

PUBLIC RELATIONS

A number of interviews on the numbat project were given to the news media during 1981.

WESTERN AUSTRALIAN WILDLIFE RESEARCH CENTRE

RESEARCH PROGRAMMES SEMINAR

28 APRIL 1981

S D Hopper

CONTENTS

RESEARCH PROJECTS

1. ATLAS OF THE W.A. FLORA - PILOT PROGRAMME

1.1 Objectives

To initiate a volunteer - participant atlas programme aimed at recording the present distribution and abundance of Western Australian orchids (136 spp.) banksias (46 spp.) and kangaroo paws (12 spp.) To develop field recording sheets which are efficient to use, provide the information required for the atlas, and are suitable for direct transcription for computer storage. To collaborate with N. Hall, N. Caputi and I. Crook in developing an interactive computerized data base system which allows for the retrieval and manipulation of the biogeographical information to serve departmental responsibilities in wildflower conservation. To apply for a grant from the Australian Biological Resources Study to purchase a mini computer, plotter and digitiser for the project. To assess the value of extending the atlas programme to other plant groups on completion of the pilot scheme.

1.2 Procedures

Activity this past year has included:

a) resubmitting a grant application for computer hardware to the Australian Biological Resources Study;

b) assessing field observations on kangaroo paws and related plants on computer files to test the capabilities of the data base manager MAPPER on the Univac computer at the Systems Research Institute of Australia;

c) preparation and publication of sight record sheets specimen record sheets and literature record sheets;

d) assigning code numbers to the 7000 plant species in the State's flora using J.W. Green's computerized census file;

e) launching the volunteer-participant project with members of the Western Australian Native Orchid Study and Conservation Group.

1.3 Results

The application for money to purchase computer hardware was successful. A grant of $46,000 is

available. A tender document for a minicomputer graphics system was prepared by Dr. I. Crook, and tenders were being called for at the time of writing.

All my field observations on kangaroo paws and related plants to 1977 are now on computer file and are being analysed. Sight record sheets and their instruction booklet have been published and were distributed to members of the Orchid study group in December 1980. The first completed sheets should be received in April 1981 when the flowering season commences.

An alphabetical arrangement of J.W. Green's census is now available and code numbers for the Atlas have been assigned to all species.

1.4 Conclusions

None as yet

1.5 Proposals for 1981/82

Purchase the minicomputer and develop a system that will enable rapid interactive graphics work with the main data base. Attempt a number of analyses and explore graphics capabilities using the kangaroo paw data and the incoming orchid distribution data. Maintain a close liason with the orchid society to stimulate interest in the pilot project. When an efficient graphics system is developed, investigate the possibility of extending the pilot project to a study of banksias and rare plants.

1.6 Publications 1980/81

Chatfield, G.R., and Hopper, S.D. (1980). Sight Record Sheet Instruction Booklet. Atlas of the Western Australian Flora (Dept. Fish.Wildl., Perth)

1.7 Proposed Publications 1981/82

Nil

2. LICENSING AND MANAGEMENT OF THE WILDFLOWER INDUSTRY

2.1 Objectives

To devise license and return forms which will facilitate the effective management of the wildflower industry.
To assist administrative staff in assessing license applications and the quality of subsequent return forms.
To develop, in collaboration with Waterman's computing staff, a means of processing license and return forms on computer.

2.2 Procedures

2.3 Results

2.4 Conclusions

No new work has been undertaken on this project other than routine assessment of license applications and rapid appraisals of incoming return forms following proclamation of the Wildlife Conservation Act 1950-79 in April 1980.

2.5 Proposals for 1981/82

With the assistance of a contractural employee, analyse the first 12 months' data on flora returns and critically appraise the effectiveness of the current system in providing meaningful statistics on (a) the species being exploited, (b) quantities of parts taken, and (c) the economic value of the wildflower industry to the State.

2.6 Publications 1980/81

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.

2.7 Publications proposed 1981/82

A departmental report on wildflower harvesting in Western Australia - 1980/81.

Chapter on the wildflower trade for the W.A.W.R.C. book on nature conservation in Western Australia.

3. CONSERVATION STATUS AND BIOLOGY OF RARE SPECIES

3.1 Objectives

To investigate the systematics, distribution and reproductive biology of rare plant species and undertake effective programmes of reserve acquisition and management for their conservation. To supervise contractual work aimed at surveying rare plants.

To recommend additions and deletions to the list of taxa gazetted as rare under the Wildlife Conservation Act. To prepare publications on the State's rare flora.

3.2 Procedures

Information on rare species was obtained through literature searches, consultation with local botanists, active field programmes, and through the letting of consultancies for surveys of particular species. Attempts to acquire reserves for rare plants were initiated.

The filing system on rare species was expanded to facilitate rapid retrieval of the available information.

3.3 Results

In 1979, two publications appeared dealing with rare Western Australian plants. "Australian Plants at Risk" (Aust. Natl. Pks. Wildl. Serv. Occ. Pap. No. 3), by W. Hartley and J. Leigh, listed 936 W.A. species as being rare or endangered. "Poorly Collected and Presumably Rare Vascular Plants of Western Australia", (Kings Park Res. Notes No. 5), by N.G. Marchant and G.J. Keighery, listed 124 species as rare, and a total of 2022 species as being rare, restricted or poorly collected (1544 were placed in the latter category).

Both these publications indicate the magnitude of the problem of rare species in W.A. and both highlight the need for systematic biological surveys on rare taxa.

Major developments over the past year have been:

a) collating information on plants that could be gazetted as rare with confidence - a list of 100 taxa recommended for special protection was published in the Government Gazette of November 14, 1980 (Table 1);

b) the manuscript of a 211 page "Guide to the Gazetted Rare Flora of Western Australia" was completed and submitted for publication;

c) manuscripts for colour leaflets on eight rare species were completed and submitted for publication;

d) contract botanists completed surveys and submitted unpublished reports on the conservation status of Dodonaea hackettiana, Eucalyptus macrocarpa, E.rhodantha 13 Wongan Hills species, plants with fleshy underground storage organs, and three rare plants of the Jurien Bay hinterlands (Eucalyptus pendens, E. johnsoniana and Banksia tricuspis);

e) studies on the possible role of mammals as pollinators of Eucalyptus caesia and Banksia goodii were undertaken;

f) a brief survey of rare eremophilas and related plants was completed with R.J. Chinnock of the Adelaide Herbarium;

Table I. Notice listing rare flora in the Government Gazette, W.A. of November 14, 1980.

WILDLIFE CONSERVATION ACT, 1950-1979.

(Section 23F.)

Notice.

F. & W. 616/80.

I, GORDON EDGAR MASTERS, Minister for Fisheries and Wildlife, acting under the provisions of subsection (2) of section 23F of the Wildlife Conservation Act, 1950-1979, hereby declare that protected flora of the taxa listed in the schedule to this Notice growing in its original state and not in its domesticated or cultivated state are rare flora throughout the whole of the State.

GORDON EDGAR MASTERS,
Minister for Fisheries and Wildlife.

Schedule.

Acacia anomala
Acacia aphylla
Acacia argutifolia
Acacia depressa
Acacia guinetti
Acacia simulans
Adenanthos cunninghamii
Adenanthos detmoldii
Adenanthos dobagii
Adenanthos ellipticus
Adenanthos eyrei
Adenanthos ileticos
Adenanthos pungens
Adenanthos velutinus
Aponogeton hexatepalus
Asplenium obtusatum
Banksia brownii
Banksia goodii
Banksia tricuspis
Caladenia lavandulacea
Casuarina fibrosa
Conostylis misera
Coopernookia georgei
Darwinia acerosa
Darwinia carnea
Darwinia collina
Darwinia macrostegia
Darwinia masonii
Darwinia meeboldii
Darwinia squarrosa
Dodonaea hackettiana
Drosera occidentalis
Drummondita hassellii var. *longifolia*
Dryandra comosa
Dryandra pulchella
Eremophila denticulata
Eremophila virens
Eucalyptus aquilina
Eucalyptus burdettiana
Eucalyptus caesia
Eucalyptus calcicola
Eucalyptus carnabyi
Eucalyptus coronata
Eucalyptus desmondensis
Eucalyptus exilis
Eucalyptus insularis
Eucalyptus johnsoniana
Eucalyptus kruseana
Eucalyptus pendens
Eucalyptus rhodantha
Eucalyptus steedmanii
Franklandia triaristata
Gastrolobium appressum
Gastrolobium glaucum
Grevillea baxteri
Grevillea cirsiifolia
Grevillea drummondii
Grevillea dryandroides
Grevillea inconspicua
Grevillea infundibularis
Grevillea involucrata
Grevillea prostrata
Grevillea ripicola
Grevillea saccata
Hakea aculeata
Hakea megalosperma
Hibbertia bracteosa
Hibbertia miniata
Hydrocotyle lemnoides
Kennedia beckxiana
Kennedia glabrata
Kennedia macrophylla
Lambertia echinata
Lambertia orbifolia
Lambertia rariflora
Lasiopetalum bracteatum
Lechenaultia pulvinaris
Lechenaultia superba
Leucopogon obtectus
Melaleuca baxteri
Pentapeltis silvatica
Pityrodia augustensis
Pomaderris bilocularis
Pomaderris grandis
Ptychosema pusillum
Rhizanthella gardneri
Ricinocarpus trichophorus
Roycea pycnophylloides
Spirogardnera rubescens
Stachystemon axillaris
Stawellia dimorthantha
Stylidium coroniforme
Stylidium expeditionis
Stylidium galioides
Synaphea pinnata
Tegicornia uniflora
Urocarpus phebalioides
Verticordia helichrysantha
Verticordia staminosa
Villarsia calthifolia

g) manuscripts on Eucalyptus caesia, E. macrocarpa E.stoatei and Conostylis wonganensis sp. nov. are now near completion or have been submitted for publication;

h) lists of geographically restricted plants (range< 100 km) were collated.

i) a week was spent in Canberra in May 1980 to finalise work on Eucalyptus caesia and E. stoatei with collaborators in CSIRO, Division of Forest Research

j) the first attempt to acquire some private land for a rare species (Eucalyptus caesia)has been unsuccessful because of the difference between the farmer's asking price and the government valuer's assessment of the monetary value of the land.

3.4 Conclusions

Given present resources, reasonable progress has been made in setting up a system for obtaining information on rare plants. However, it is now clear that a substantial injection of funds and new staff will be required for flora conservation if the Department seeks to fulfill its statutory responsibilities and effectively conserve the State's rare flora.

Undoubtedly,as exemplified by the case of Eucalyptus caesia mentioned above, some tough decisions lie ahead in situations where rare species occur on private land or on Crown land in the path of mining projects.

3.5 Proposals for 1981/82

Surveys of rare and poorly known species will continue, primarily by consultants unless new permanent staff positions become available. Additionally, it is intended to enlist the support of amateur groups such as the Western Australian Wildflower Society in the search for rare plants. No major biological studies will be initiated until publications on Eucalyptus caesia are completed.

The full administrative load involved in communicating with land owners will probably be felt this coming year. Considerable liason and publicity work is certainly needed in this area.

3.6 Publications 1980/81

Brooker, M.I.H., and Hopper, S.D. (1981). New subspecies in Eucalyptus caesia and in E. crucis of Western Australia. Nuytsia, submitted.

Hopper, S.D. (1981). A new species of Conostylis (Haemodoraceae) from the Wongan Hills district. Nuytsia, in press.

Hopper, S.D., and Moran, G.F. (1981). Bird pollination and the mating system of Eucalyptus stoatei. Aust. J. Bot., submitted.

Rye, B.L. (1981a). Caesia Eucalyptus caesia Benth. (Myrtaceae). Rare Western Australian Plants Leaflet No. 1 (Dept. Fish. Wildl. Perth). In press.

Rye, B.L. (1981b). Green Honeysuckle Lambertia rariflora Meisn. (Proteaceae). Rare Western Australian Plants Leaflet No. 2. (Dept. Fish.Wildl., Perth). In press.

Rye, B.L. (1981c). Fitzgerald Eremophila Eremophila denticulata F. Muell. (Myoporaceae). Rare Western Australian Plants Leaflet No. 3. (Dept. Fish Wildl., Perth). In press.

Rye, B.L., (1981d). Good's Banksia Banksia goodii R.Br. (Proteaceae). Rare Western Australian Plants Leaflet No. 4. (Dept. Fish.Wildl., Perth). In press.

Rye, B.L. (1981e). Lesueur Hakea Hakea megalosperma Meisn. (Proteaceae). Rare Western Australian Plants Leaflet No. 5 (Dept. Fish. Wildl., Perth). In press.

Rye, B.L. (1981f). Mogumber Bell Darwinia carnea C.A. Gardner (Myrtaceae). Rare Western Australian Plants Leaflet No. 6 (Dept. Fish. Wildl., Perth). In press.

Rye, B.L. (1981g). Augusta Kennedia Kennedia macrophylla (Meisn.) Benth. (Leguminosae). Rare Western Australian Plants Leaflet No. 7. (Dept. Fish. Wildl., Perth). In press.

Rye, B.L. (1981h). Underground Orchid Rhizanthella gardneri Rogers (Orchidaceae). Rare Western Australian Plants Leaflet No. 8. (Dept. Fish. Wildl., Perth.) In press.

Rye, B.L., and Hopper, S.D. (1981a). A guide to the gazetted rare flora of Western Australia. Dept. Fish. Wildl. West. Aust. Rept. No. 42 (Dept. Fish.Wildl. : Perth). In press.

Rye, B.L. and Hopper, S.D. (1981b). Misapplication of the aboriginal name Gungurru to Eucalyptus caesia and notes on the species'distribution. J. Roy. Soc.West. Aust., submitted.

3.7 Proposed publications 1981/82

Genetic diversity and the insular population structure of the rare species Eucalyptus caesia - coauthored with G.F. Moran.

Geographical variation in Eucalyptus caesia - coauthored with N. A. Campbell and N. Caputi.

Pollination ecology of Eucalyptus caesia

Geographical variation and conservation status of Mottlecah Eucalyptus macrocarpa and E. macrocarpa x pyriformis hybrids - coauthored with T. Fetherstonhaugh and N. Caputi.

Eucalyptus carnabyi - rare hybrid or relict species?

Conservation status of the kalbarri catspaw Anigozanthos kalbarriensis

Chapters on rare flora and rare species reserves (the latter coauthored with A. Burbidge) for the WA Wildlife Research Centre book on nature conservation in Western Australia.

4. RESERVE SURVEY, ACQUISITION AND MANAGEMENT

4.1 Objectives

To contribute botanical expertise in reserve survey, acquisition and management on an ad hoc basis.

4.2 Procedures

Proposed reserves were visited when requested by the C.R.O. or opportunity allowed, and recommendations made regarding acquisition and management.

4.3 Results

Over the past year the following reserves or proposed reserves have been surveyed or visited.

Vacant Crown land NW of Munglinup and E of the Jerdacuttup River 11-13 March 1980.

Fitzgerald River National Park 13 March and 5 December 1980.

Air survey of Mt Churchman, Fraser Rocks and Chiddarcooping Hill Nature Reserve 18 March 1980

Cooloomia Nature Reserve 24-28 March 1980

Millbrook Nature Reserve 25 April 1980
10-13 January 1981

Two Peoples Bay Nature Reserve 25 April 1980
1-10 and 17-22 1981

Tutanning Nature Reserve	20 22 June 1980
Boyagin Nature Reserve	20 22 June 10 12 July 1980
Watheroo National Park	30 July 1980
Burma Road Nature Reserve	9 September 1980
Vacant Crown land south of Mt Adams	10 September 1980
Wongamine Nature Reserve	15 September 1980
Vacant Crown land - Edgar Ranges	21 30 September 1980
Vacant Crown land NW of Cataby	22 23 October 1980 an 3 March 1981
Wongan Hills	20 November 1980
Gravel reserves, York Shire	1 December 1980
Lake Cronin Nature Reserve Pallarup Rocks Nature Reserve	4 December 1980
Chutawalakin Hill	6 December 1980
Reserve 19881 NE of Nornalup	14 15 January 1981
Hassell National Park	21 February 1981

As a result of the surveys in vacant Crown land, proposals for nature reserves have been recommended for NW of Munglinup and E of the Jerdacuttup River (preservation of Eucalyptus stoatei) S of Mt Adams (rich northern heathlands flora) and NW of Cataby (ephemeral swamps).

Intensive work on Two Peoples Bay Nature Reserve has enabled the completion of a pit trap survey of small mammals, reptiles and frogs, and the mapping of all bansias and eucalypts on a 500m grid throughout the reserve. Highlights of the latter project were the discovery of two live plants of Banksia verticillata and two very rare undescribed mallee eucalypts on the reserve.

4.4 Proposals for 1981/82

Write up work on Cooloomia Nature Reserve and on Two Peoples Bay banksias and eucalypts. Continue surveys on an ad hoc basis.

4.5 Conclusions

Nil

4.6 Publications 1980/1

Griffin, E.A., Hnatiuk, R.J., and Hopper, S.D. (1981). Flora conservation values of vacant Crown land south of Mt Adams. West. Aust. Herb. Res. Notes, submitted.

Hopper, S.D. (1981). Honeyeaters and their winter food plants on granite rocks in the central wheatbelt of Western Australia. Aust. Wildl. Res. 8, in press.

Hopper, S.D. (1981). A pit trap survey of small mammals, reptiles and frogs on Two Peoples Bay Nature Reserve. West. Aust. Dept. Fish. Wildl. Rept. No. 43, in press.

Hopper, S.D. (1981). Flora conservation values of Hassell National Park. Unpubl. report, West. Aust. Dept. Fish. Wildl., Perth.

4.7 Proposed publications 1981/82

A biological survey of Cooloomia Nature Reserve - co-authored with A. Burbidge, P. Fuller and J. Rolfe.

Distribution of banksias and eucalypts on Two Peoples Bay Nature Reserve - coauthored with G. Folley.

5 BIOLOGY OF KANGAROO PAWS AND CONOSTYLIS

5.1 To collate and prepare for publication studies conducted on the kangaroo paws and Conostylis. To continue observations on pollination on an ad hoc basis. To undertake a detailed study of the systematics of Conostylis.

5.2 Procedures

Standard data analysis, literature research, herbarium studies and writing manuscripts. Limited field surveys were also conducted.

5.3 Results

Opportunistic field observations on several species of kangaroo paws and Conostylis were made in the course of routine field work on other projects. Additionally, a study of morphometric and allozyme variation in a hybrid kangaroo paw population at Gingin was undertaken in collaboration with Dr S. H. James.

A description of a rare Conostylis from the Wongan Hills was written and submitted for publication.

5.4 Conclusions

None

5.5 Proposals for 1981/82

Write papers and continue field observations as time, inclination and opportunity allow. Prepare descriptions of all Conostylis species for a taxonomic revision. Undertake a study of the pollination of Conostylis androstemma

5.6 Publications 1980/81

Hopper, S.D. (1980). Conostylis neocymosa sp.nov. (Haemodoraceae) from south-western Australia Botaniska Notiser 133 : 223-226.

Hopper, S.D. (1980). A biosystematic study of the kangaroo paws, Anigozanthos and Macropidia (Haemodoraceae). Aust. J. Bot. 28 659-680.

Hopper, S.D. (1981). A new species of Conostylis (Haemodoraceae) from the Wongan Hills district. Nuytsia, in press.

5.7 Proposed publications for 1981/82

Natural hybridization and hybrid speciation in the kangaroo paws.

New taxa in Conostylis (possibly).

6. POLLINATION ECOLOGY OF THE AUSTRALIAN FLORA

6.1 Objectives

To develop an understanding of Australian plant-pollinator relationships, particularly those involving birds and small mammals. To explore the significance of pollination studies in conserving rare plants.

6.2 Procedures

Pollination observations were made on an ad hoc basis in conjunction with field work. Methods were mainly observationa but also may have included capturing pollinators and checking for pollen loads, measuring nectar volume and nectar concentration, and examining related features of the reproductive biology of plants under study. A literature search was continued for observations of vertebrates feeding at flowers of W.A. plants.

6.3 Results

Further original observations of honeyeaters and honey possums feeding on flowers were made. These, together with published observations and numerous personally communicated records from interested colleagues have been collated in draft form for a proposed departmental report.

Several small projects are at various stages of completion.

6.4 Conclusions

None

6.5 Proposals for 1981/82

To continue ad hoc observations. To continue a study of the comparative pollination ecology of Banksia species on Two Peoples Bay and Millbrook Nature Reserves.

6.6 Publications 1980/81

Hopper, S.D. (1980). Pollen loads on honeyeaters in a Grevillia rogersoniana thicket south of Shark Bay. West. Aust. Nat. 14 : 186-189.

Hopper, S.D. (1980). Bird and mammal pollen vectors in Banksia communities at Cheyne Beach, Western Australia. Aust. J. Bot. 28 : 61-75.

Hopper, S.D. (1980). Pollination of the rain-forest tree Syzygium tierneyanum (Myrtaceae) at Kuranda, Northern Queensland. Aust. J. Bot. 28 : 223-237.

Hopper, S.D. (1980). Pollen and nectar feeding by Purple-crowned Lorikeets on Eucalyptus occidentalis. Emu 80: 239-240.

Hopper, S.D. (1981). Honey Possums. S.W.A.N.S., in press.

6.7 Proposed publications 1981/82

A checklist of observations of vertebrates feeding at flowers and on fruits of Western Australian plants- co-authored with Allan Burbidge.

Evolutionary responses of Western Australian plants to nectarivorous birds - co-authored with Allan Burbidge.

The relative importance of nectarivorous birds and mammals as pollinators of a banksia and a eucalypt at Cheyne Beach, Western Australia - co-authored with Andrew Burbidge.

Mechanical and temporal controls of flower opening in Banksia - co-authored with V. Turner.

Pollination ecology of Grevillea petrophiloides co-authored with I. and G. Crook.

WESTERN AUSTRALIAN WILDLIFE RESEARCH CENTRE

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28 APRIL 1981

K. J. WALLACE

It is envisaged that the graphics computer system being installed at the Wildlife Research Centre will be used in the development of a feasibility study for the Reserves data base during 1981/2.

5.3 Results

Through the Land Information System, which is being set up by Government Computing the Department has played a formative role in the development of a computerised Crown Reserves Register. This Register includes all data held on Reserves by the Roads and Reserves Section of the Department of Lands and Surveys, uncluding the digitised boundaries of the Reserves themselves. The system that has been developed for the Crown Reserves Register will be accessible to the Department through terminal equipment installed at Wanneroo. The system is also designed so that it can be addressed as a data set for the Reserves management data base.

COMMITTEES

Land Information System Advisory Committee
(Convener, land-use group)

Reserves Committee, Western Australian Wildlife Authority

Bush Fires Board (Deputy to Dr Burbidge)

SEMINARS

None.

Pollination ecology of eucalypts - co-authored with A. Griffin.

7. EVOLUTION AND BIOGEOGRAPHY OF THE AUSTRALIAN FLORA

7.1 Objectives

To develop an understanding of evolutionary processes and biogeographical principles in the Australian flora.

7.2 Procedures

Literature review and analysis, writing manuscripts, ad hoc field work.

7.3 Results

Work on the phytogeography of central Australian acacias was completed, presented at the "Evolution of the Flora and Fauna of Arid Australia" symposium in Adelaide, May 1980, and submitted for publication.

Preliminary discussions were held in Canberra with G.M. Chippendale and M.I.H. Brooker about undertaking a study on the phytogeography of eucalypts in Australia. A similar project on Acacia is well advanced in collaboration with B.R. Maslin, L. Pedley and R.J. Hnatiuk.

7.4 Conclusions

None

7.5 Proposals for 1981/82

Continue work on the phytogeography of Australian acacias and eucalypts.

7.6 Publications 1980/81

James, S.H., and Hopper, (1981). Speciation in the Australian flora. In : J.S. Pate and A.J. McComb (eds). 'Biology of Australian Native Plants.' (Univ. West. Aust. Press, Nedlands). In press.

Maslin, B.R., and Hopper, S.D. (1981). Phytogeography of Acacia (Leguminosae : Mimosoideae) in Central Australia. In W.R. Barker and P.J.M. Greenslade (eds.) 'Evolution of the Flora and Fauna of Arid Australia.' In press.

7.7 Proposed Publications 1981/82

Phytogeography of Acacia in Australia - co-authored with B.R. Maslin, L. Pedley and R.J. Hnatiuk.

Chapter on the flora of W.A., co-authored with A.J.M. Hopkins, for the W.A.W.R.C. book on nature conservation in Western Australia.

COMMITTEES

1. W.A.W.A. Flora Committee

2. Technical Advisory Committee to the Road Verges Conservation Committee.

3. Convening Committee, Perth Chapter, Australian Systematic Botany Society.

4. Council Member, Royal Society of Western Australia.

5. Committee Member, Western Australian Native Orchid Study and Conservation Group Inc.

   Committee work this past year involved 10% of my time during office hours.

SEMINARS AND SYMPOSIUM POSTERS

1. Phytogeography of Acacia in central Australia - co-authored with B.R. Maslin and presented at the Symposium on the Evolution of the Flora and Fauna of Arid Australia, Adelaide, May 9 1980.

2. Research on flora conservation in Western Australia - presented to the Australian Institute of Horticulturalists (Perth Chapter) at Kings Park administration building, 20.00 hrs, 3 July 1980

3. Vertebrate pollination in Western Australia - presented to W.A.I.T. postgraduate biology course, 16.30 hours, 14 August 1980.

4. Aspects of flora conservation in Western Australia - presented to the Australian Systematic Botany Society (Adelaide Chapter) at the State Herbarium, Adelaide, 20.00 hrs, 27 August 1980.

5. Reasons for the prevalence of vertebrate - pollinated plants in south-western Australia - presented at the inaugural meeting of the Australian Pollination Ecology Society, Monarto (South Australia), 26 August 1980.

6. Conservation status of Eucalyptus caesia - presented at CSIRO, Wembley, 15.00 hours 22 September 1980.

7. Vertebrate pollination of Banksias - presented to the Australian Systematic Botany Society (Perth Chapter) at the Kings Park administration building, 10 November 1980.

8. Vertebrate pollinators - symposium poster presented as in 7.

WESTERN AUSTRALIAN WILDLIFE RESEARCH CENTRE

RESEARCH PROGRAMME SEMINAR

28 April 1981

I. G. Crook

Annual Research Programme
Seminar
I. G. Crook
1980/81

MANAGEMENT PROJECTS

1. Establishment of a Management Planning Process for Nature Reserves in Western Australia

1.1 Objectives

To establish a planning process which can be routinely applied to planning the management of Nature Reserves and groups of Nature Reserves.

1.2 Procedures

Three Nature Reserve Management Plans, two for individual Reserves and one for all the Reserves in the one Local Authority district, were passed through all phases of a provisional process of management planning during the year.

1.3 Results

An administrative framework was established wherein routine production of management plans can proceed.

A management planning process, tailored to the specific requirements of the Western Australian Wildlife Authority and the Department of Fisheries and Wildlife, was thereby set up. The process has three major features:

- It conforms with the statutory requirements for management planning of Nature Reserves laid down in Section 12A of the Wildlife Conservation Act (as amend.). It allows for adoption of Plans by the Wildlife Authority

and for their approval by the Minister of Fisheries and Wildlife. At these stages of the process plans assume the status of 'Schemes of Operations' and 'Working Plans' respectively in the meaning of the Act.

- It is based on publicly distributed drafts of management plans. In the draft stage plans have no status either in the Department or with the Wildlife Authority, being drawn up as foci for public comment.

- At all stages of the process emphasis is placed on consultation with all interest/ed parties, including Government Departments, Local Authorities and interest groups.

A new series of Departmental publications, to be known as "Western Australian Nature Reserve Management Plans" was established.

1.4 Publications 1980/1

See section 2 below: 'Management Plans for Nature Reserves'

1.5 Future Publications

A Departmental Report describing the structure of management plans and detailing the management planning process as established is envisaged for 1981/2.

2. Management Plans for Nature Reserves

2.1 Objectives

- To produce management plans for individual Reserves of high importance and for groups of Reserves of similar type and those in the one Local Authority district.

- To prepare a library of published plans which might stand as models of different approaches to management planning for the Western Australian Nature Reserve system.

2.2 Procedures

The following Nature Reserve management plans are at the stages of the planning process detailed below. In addition, a revision of the existing management plan for the Two Peoples Bay Nature Reserve is set down for preparation during 1981/2.

PLAN No.	NAME	STAGE
1	Moondyne Nature Reserve	final plan in press
2.	Thomsons Lake Nature Reserve	final plan in press
3.	Nature Reserves of the Shire of Serpentine-Jarrahdale	final plan in press
4.	Lake Magenta Nature Reserve	draft plan in circulation
5.	Nature Reserves of the Shire of Dandaragan. Volume 1: Southern portion.	Pre-planning consultation in progress
	Nature Reserves of the Shire of Toodyay	Reserve surveys in progress
	"Sheepwash Creek" Nature Reserve	Pre-planning consultations in progress
	Nature Reserves of the Shire of Albany	Reserve surveys in progress

2.3 Publications for 1980/1

Crook, I.G. (1980) 'Avon Valley' Nature Reserve. West. Aust. Nat. Reserve Manage. Plan No. 1 (Audit of Public Submissions). Dept. of Fish. and Wildl., Perth.

Crook, I.G. and Evans, T. (1980) 'Avon Valley' Nature Reserve. West. Aust. Nat. Reserve Manage. Plan No. 1 (Revised Draft). Dept. of Fish. and Wildl., Perth.

Crook, I.G. (1980) Thomsons Lake Nature Reserve. West. Aust. Nat. Reserve Manage. Plan No. 2 (Audit of Public Submissions and amendments to the Draft Plan). Dept. of Fish. and Wildl., Perth.

Crook, I.G. (1980) Nature Reserves of the Shire of Serpentine-Jarrahdale. West Aust. Nat. Reserve Manage. Plan No. 3 (Audit of Public Submissions and Amendments to the Draft Plan). Dept. of Fish. and Wildl., Perth.

Crook, I.G. and Burbidge, A.A. (1980) Lake Magenta Nature Reserve. West. Aust. Nat. Reserve Manage. Plan No. 4 (Draft). Dept. of Fish. and Wildl., Perth.

2.4 Future Publications

As noted in the table (section 2.2, above) final versions of Plans nos. 1 - 3 are in press. Lake Magenta Nature Reserve (plan no. 4), now in published draft form, should negotiate all stages of the management planning proces during the forthcoming year. Plans for the south Dandaragan Shire Reserves and the "Sheepwash Creek" Nature Reserve (no. 35168 in the Shire of Plantaganet) are being prepared in pre-publication draft form for "pre-planning" discussions with the Shires concerned. Both should reach late stages of the planning process during 1981/2. A plan for the Nature Reserves of the Shire of Toodyay is set down for drafting during 1981/2.

Finally, the revised management plan for Two Peoples Bay Nature Reserve and a plan for Nilgen Nature Reserve, prepared to follow action taken there to evict squatters, are in preparation and may reach a stage of publication of drafts during the forthcoming year.

3. Development of Management Principles and Guidelines

3.1 Objectives

To develop a set of guidelines for management which are applicable to all Nature Reserves in the Western Australian system and covering all aspects of the management of Reserves for public use and protection purposes.

3.2 Procedures

Originally it was intended to produce, fairly quickly, for public comment, a document detailing principles and guidelines for all aspects of the use and protection of Nature Reserves. This document would be in the style of a draft management plan and could be passed through the management planning process to the stage of discussion, and finally adoption, by the Western Australian Wildlife Authority.

Sources of management guidelines for this document include Wildlife Authority policies and established Departmental practice. The fields to be covered include fire protection, protection from noxious pests, public use and mis-use and inter-Departmental and Local Authority liaison procedures.

This has proved to be a longer term project than first anticipated. A number of areas, for example public use of Reserves for purposes as divergent as bee-keeping, environmental education, recreation and sand and gravel extraction are under active discussion at Departmental and Wildlife Authority levels. In others, where established policies exist, such as those concerning fire protection and protection from noxious pests, details of application are being negotiated at Departmental, Local Government and local community levels.

There is a further group of use and protection aspects where continuing development of principles is possible. Questions of application and relaxation of controls on public use, particularly in relation to their scientific and nature conservation values, for example, require routine decisions in planning of management for individual Reserves. Past decisions have left a number of excellent models, such as those provided by the "Tortoise Reserves", Tutanning, Boyagin, Two Peoples Bay and Lake Magenta, from which use/protection relationships can be developed into more generally applicable principles. As with other "guidelines" fields to do so would have the dual advantage of promoting public understanding and providing a basis of policy for reserve management staff to follow.

Finally, there is a group of isolated, smaller issues, all of which have received attention from time to time and which would benefit from being brought together in a generally applicable set of management guidelines. Examples include matters as varied as the future of unused and undeveloped roads on Reserves, sign-posting, public utilities crossing, public access, scientific research on Reserves and neighbourhood participation in Reserve management among many others.

While so many aspects of use and protection management are being actively pursued as individual issues at different levels it would be premature to attempt to spell them out in a "guidelines" style document except in a superficial way. An alternative approach, taking advantage of initiatives in progress, advancing others for consideration at the appropriate level, searching out the ramifications involved in applying developed policy through the great diversity of Reserves and

attitudes towards Reserves throughout the State, promoting discussion and placing management issues in the context of the rationale for management of the Reserve system as a whole is considered more appropriate at this time. Consensus is the keynote and, though planning staff have played their part with others throughout the Department in the development of management principles and guidelines in several fields throughout the year, the overall co-ordinating role in the development of management guidelines could well be taken by a Chief Reserve Management Officer upon his appointment.

4. Local Authority Liaison

4.1 Objectives

To promote understanding and active interest among Local Government bodies in the Nature Reserve system and in Nature Reserve management.

4.2 Procedures

Again, there is nothing new in this. The "project" has been one of assessing the potential for a particular style of personal contact to advance understanding of, and positive attitudes to, the Nature Reserve system among local communities in Western Australia.

The local communities singled out for attention have been predominantly ones where negative attitudes to nature conservation prevail. There are others where an attempt has been made to take advantage of existing interest to promote local participation in management.

This activity is more appropriately within the orbit of regionally-based management officers, but where none exist and in the interests of a 'pilot study' of potential, a series of forays were made during the year into Shire Council meetings and meetings of Council committees. The following Shires were visited during 1980/1:

ALBANY - In connection with management plan development.

DOWERIN - In reply to the Shire's response to the 'Muir' report on unvested Reserves.

KENT - Management plan discussion and development of management advisory committee for Lake Magenta Nature Reserve

NARROGIN - In response to negative attitude to 'Muir' report

PLANTAGANET - In response to Shire reservations about Departmental fire protection procedures.

TOODYAY - Fire on Nature Reserve, management plan development.

WONGAN-BALLIDU - Cool response to 'Muir' report.

WYALKATCHEM - Development of local support in Reserve management.

4.3 Results

Generally encouraging.

5. Reserves Management Data Base

5.1 Objectives

To establish a computer facility for the storage and processing of administrative, scientific and management data about Nature Reserves.

5.2 Procedures

In co-operation with the Data Processing Section at the Watermans Marine Laboratory and the Government Computing Land Information System Consultant, the feasibility of various approaches to a data base involving large frame or mini-computers or both is being assessed.

MANAGEMENT OPERATIONS

1. Fire

1.1 Firebreak Design and Construction

During the present financial year approximately 170 km of firebreaks and part firebreaks have been constructed. The major element of the 1980/81 programme was the construction of firebreaks on the Dragon Rocks Nature Reserve. During the 1981/82 financial year the firebreak programme will be aimed at completing firebreak systems on the larger, vested Nature Reserves within the western part of the Pingelly Management District. It is also hoped that finance will be available to firebreak at least one large Nature Reserve within the eastern wheatbelt.

1.2 Firebreak Maintenance

The Pingelly Reserve Management Team (PRMT) carried out firebreak maintenance on four Nature Reserves and organised maintenance work on a further 35 Nature Reserves in 1980.

Two new methods of firebreak maintenance were tested during 1980/81. Firstly, a ripper was used to remove mallee regrowth from the firebreaks of Reserve No. 29857. This operation combined with follow-up work has proved very effective and should result in lower long-term maintenance costs. Secondly, following discussions with the Main Roads Department and the Department of Agriculture, eucalypt regeneration on some firebreaks was poisoned on an experimental basis. The results of this work cannot be assessed until a further 12 months has elapsed, however initial results are encouraging. While the costs of treating plant regeneration with herbicides are initially high, if the method is successful long-term maintenance costs will be greatly decreased.

1.3 Fire Control

Up to and including 19 March, 1981 the PRMT has attended one wildfire on a Nature Reserve.

1.4 Prescribed Burning

Part of one buffer strip on Boyagin Nature Reserve was burnt in May 1980, and it is intended to carry out a further burn in 1981. A prescribed burn is also planned for Reserve No. 32448 (Boddington Shire) in 1981.

As in previous years the PRMT will assist the Perth Management Team with prescribed burns outside the Pingelly Management District.

2. BIOLOGICAL SURVEY

2.1 Proposed Nature Reserves

Up to and including March 1981 nine areas of bushland have been surveyed and, with one exception, been recommended either as Nature Reserves or for Conservation of Flora and Fauna to be added to an existing purpose.

2.2 Vesting and Reserve Class

Reserve No. 25681 has been recommended for a change in Class from Class "C" to Class "A". No Nature Reserves have been recommended for vesting in 1980/81 by the PRMT.

2.3 Surveys of Existing Nature Reserves

Survey work is continuing at Boyagin Nature Reserve and it is anticipated that this survey will be completed during 1981/82. It should be pointed out that *Sminthopsis murina* was first recorded from Boyagin in 1972 and not 1980 as stated in the Research Seminar report for 1980.

Reserve No. 32448 (Boddington Shire) was surveyed during 1980/81 and a report is in preparation.

3. RESEARCH

The PRMT has assisted research workers where required. Assistance has been given to research workers from C.S.I.R.O. Division of Wildlife Research, University of Western Australia and the Department of Fisheries and Wildlife.

4. GENERAL MANAGEMENT ACTIVITIES

4.1 Examination of Requests for Excision from Nature Reserves.

4.2 Inspection of Nature Reserves.

4.3 Recommendations with Regard to Specific Requests.

Examples of this type of work include recommendations concerning requests to remove gravel from Nature Reserves.

4.4 Liaison

Liaison with adjoining landholders; Government Departments (e.g. Bush Fires Board, Main Roads Department); local government.

4.5 General Maintenance and Other Activities

5. OPERATIONS MANUAL

Further chapters have been tackled within the past 12 months and it is anticipated that a section of the manual dealing with *Phytophthora cinnamomi* will be produced in a final form during 1981.

6. PUBLIC RELATIONS AND EDUCATION

During the past 12 months the Pingelly Reserve Management Officer has given talks to the following groups: Darling Branch of the WA Naturalist's Club, Students from Churchlands Teacher's College, Cubs and Pingelly Apexians. Talks were also given at an Advanced Course of the Bush Fires Board in Perth, and at a Bush Fires Board seminar in Corrigin.

WESTERN AUSTRALIAN WILDLIFE RESEARCH CENTRE

RESEARCH PROGRAMMES SEMINAR

28 April 1981

J.T. Goodsell

MANAGEMENT PROJECTS

1 My work throughout the year has been the resolution of landuse problems associated with Nature Reserves and other natural areas, and the accommodation of recreation use on Nature Reserves.

1.1 Objectives

To investigate and report on varieties of landuse problems associated with Nature Reserves and other natural areas.

To liaise with interested parties e.g. Local Government, interested members of the public.

1.2 Procedures

During the past year I have been involved in the following projects:

(a) Woody Island, Recherche Archipelago: Management of recreational use. Management of tourist concessionaire.

(b) Thomsons Lake and Moondyne Nature Reserves: These are being managed and developed as the first units of a Metropolitan Nature Reserve System. A reserve system which is principally for wildlife but which can accommodate passive uses by those people of Perth who wish to enjoy a pristine environment.

(c) Benger Swamp : Land acquisition and management as a wetland nursery.

(d) Belaring Springs, Goonaring Springs and Wildhorse Swamp Nature Reserves: Possible extension and monitoring of salinity effects.

(e) Proposed subdivision by Agnew Clough of land at Woorooloo: Investigation of environmental impact.

(f) Lake Magenta Nature Reserve: liaison with Shire of Kent re construction of road through reserve.

(g) Yorkrakine Rock Nature Reserve: Liaison with Shire of Tammin re rehabilitation of gravel pit.

1.3 Proposals for 1981/82

I will continue to be involved in the above projects, and others that may be referred to me from time to time. A new project which is already in a formative phase at Thomsons Lake and the Moondyne Nature Reserves, is the development of a system of Metropolitan Nature Reserves where people can study or simply enjoy a natural environment that is readily accessible to Perth residents.

2 Arthur River Headwaters and Lake Toolibin Nature Reserve:

The feasibility of rehabilitating this salt damaged area is being investigated by a joint committee of the five Departments of Public Works, Mines, Forests, Agriculture and Fisheries and Wildlife. The completion of the first objective of developing a salt budget for Lake Toolibin over a flooding cycle has been delayed by lack of rain. Nevertheless, in response to the Committee's query of what are desirable water qualities another investigation has been pursued. Three freshwater crayfish have been selected as indicators and osmoregulation curves compiled for them. These curves were presented to the 1980 seminar but had not been analysed. Polynomial regression equations have been fitted to each curve and compared statistically. Each curve is significantly different from each other. These equations are computer compatible and will be biological input to models aimed at investigating the feasibility of managing Lake Toolibin's water quality.

2.1 Proposals for 1981/82

These are completely subject to rainfall. Only if the lake fills can a salt budget be completed.

3 COMMITTEES

Northern Arthur River Wetland Rehabilitation Committee.

Policy Advisory Committee - Diploma of Natural Resources, W.A.I.T.

Departmental representative at Benger Drainage Board meetings.

WESTERN AUSTRALIAN WILDLIFE RESEARCH CENTRE

RESEARCH PROGRAMMES SEMINAR

28 April 1981

A. A. Burbidge

1 Short-necked Tortoise *(Pseudemydura umbrina)*

1.1 Objectives

To monitor the populations on Twin Swamps and Ellen Brook Nature Reserves. To develop techniques for captive breeding.

1.2 Procedures

Visits were made to both Nature Reserves at frequent intervals during Winter and Spring. Tortoises were captured by hand. Data on sex, age, size, growth and location were entered in a card index. Population numbers are estimated using the Jolly-Seber Model and the Manley and Parr method, and a minimum number is calculated from mark and recapture data.

A captive population comprising animals from Perth Zoo and wild-caught animals from Twin Swamps Nature Reserve has been established.

1.3 Results

1.3.1 Twin Swamps Nature Reserve

Previous data showed that this population is headed for extinction and the decision was made to transfer any animals caught to the WA Wildlife Research Centre breeding population. Only one animal, a juvenile,

was captured in 1980.

1.3.2 Ellen Brook Nature Reserve See Table 1

Seven tortoises were captured in 1980 and three of these were unmarked. Latest estimates of population size are consistent with previous ones. The three unmarked tortoises were juveniles and hatched in different years - 1977, 1979 and 1980, confirming previous views that this population is recruiting consistently, but at a low rate

1.3.3 Captive breeding

The two fertile eggs incubated last year both hatched and the hatchlings are growing slowly. Three zoo females and one Twin Swamps Nature Reserve female were kept at WA Wildlife Research Centre through the breeding season. One wild caught female (from Ellen Brook Nature Reserve) was also kept for a short time. Nineteen eggs were obtained by hormonal injection, 12 of these were fertile and are incubating. All 4 eggs from the Ellen Brook Nature Reserve female were fertile. Zoo females produced mostly smaller eggs with a high rate of infertility. One young female from Twin Swamps Nature Reserve, kept in captivity since 1979 without a male produced 4 eggs; only one of these was fertile. Hatching is expected in April/May 1981.

TABLE 1. POPULATION ESTIMATES, ELLEN BROOK NATURE RESERVE

YEAR	NUMBER CAUGHT	MINIMUM NUMBER	JOLLY-SEBER ESTIMATED POPULATION	JOLLY-SEBER 95% CONFIDENCE LIMITS	JOLLY-SEBER ADJUSTED 95% LIMITS*	MANLEY & PARR ESTIMATED POPULATION
1963	4	16	-	-	-	-
1964	10	16	21	0-51	16-51	41
1965	2	11	27	0-67	11-67	0
1966	3	9	4	0-9	9	9
1967	2	11	18	0-43	11-43	0
1968	5	12	9	5-13	12-13	17
1969	1	10	5	3-7	10	10
1970	2	11	23	0-57	11-57	0
1971	0	11	-	-	-	0
1972	6	12	11	3-12	12	13
1973	0	14	-	-	-	0
1974	2	15	11	0-26	15-26	28
1975	3	14	12	0-24	14-24	20
1976	9	13	24	1-47	13-47	15
1977	3	11	9	3-15	9-15	15
1978	8	12	18	0-45	10-45	18
1979	3	7		Not calculated		7
1980	7	7	-	-	-	-

* Lower limit adjusted to minimum number

1.4 Conclusions

The Twin Swamps Nature Reserve population appears doomed to extinction. The Ellen Brook Nature Reserve population is maintaining itself, but at very low numbers.

Artificial incubation of eggs obtained by hormonal injection is a promising technique for increasing numbers of this species but a long period of time must pass before the technique can be proved.

1.5 Proposals for 1981/82

Monitoring of Ellen Brook Nature Reserve will be continued. Any tortoises captured at Twin Swamps Nature Reserve will be transferred to the WA Wildlife Research Centre. Captive breeding will be continued.

1.6 Publications 1980/81

Burbidge, Andrew A. 1981. The ecology of the Western Swamp Tortoise, *Pseudemydura umbrina* (Testudines : Chelidae). *Aust. Wild. Res. 8*, 203-222.

1.7 Publications 1981/82

None proposed.

2 Desert Wildlife (joint project with N.L. McKenzie)

2.1 Objectives

To document the flora and fauna of existing and proposed Nature Reserves in Western Australian deserts.

To delineate and propose nature reserves in the Great Sandy Desert. To investigate the status of rare desert mammals.

2.2 Procedures

A follow up trip was made to the Lake Gregory area to investigate a possible hare-wallaby sighting from the 1979 trip. Additional data was collected at Lake Gregory and in the Great Sandy Desert south of Balgo Hills. The Northern Territory Conservation Commission programme on hare-wallabies and the dalgyte was examined and I took part in a meeting at Warburton to discuss the proposed Baker Lake Nature Reserve with the traditional owners of the area and with relevant Government officers.

2.3 Results and Conclusions

The wallaby at Lake Gregory proved to be the Northern Nail-tail *Onychogalea unguifera*. Additional data was collected on the vertebrates of Lake Gregory (which contained extensive areas of water) and the Great Sandy Desert south of Balgo and this is being incorporated into a forthcoming series of papers on the flora and fauna of the Great Sandy Desert. Discussions on the proposed Baker Lake Nature Reserve did not resolve the land-use conflict which exists.

2.4 Proposals for 1981/82

A further trip to the Baker Lake area is planned. The objects of this trip are to continue discussions with the traditional owners and to investigate the status of the Long-tailed Dunnart, *Sminthopsis longicaudata*. The only recent specimen of this animal is from breakaway country in the Baker Lake proposal.

2.5 Publications 1980/81

Nil

2.6 Publications 1981/82

"Amphibia and Reptiles" In "The Wildlife of the Great Sandy Desert" to be published as a Wildlife Research Bulletin.

3 Biological Survey of the Eastern Goldfields

3.1 Objectives - See Mr McKenzie's paper

3.2 Procedures

Two further visits were made to Cell 3 in the Eastern Goldfields, one in September 1980 and one in March 1981.

3.3 Results and Conclusions

Zoological work in Cell 3 is now complete and the data is being collated for publication.

3.4 Proposals for 1981/82

A further trip will be made to Mt Manning Range Nature Reserve in September 1981 to assist Dr Milewski (consultant botanist) complete a vegetation map of the reserve. Further work by the Biological Surveys Committee is under review.

3.5 Publications 1980/81

Nil

3.6 Publications 1981/82

A publication will be prepared on the vertebrates of Cell 3 and of the Mt Manning Range Nature Reserve. A paper titled "Banded Stilt breeding at Lake Berlee" by A.A. Burbidge and P.J. Fuller has been submitted to *Emu*.

4 Eggshell thinning

There has been no progress during the past 12 months. The data collected during 1979/80 are still being analysed.

5 Conservation of the Dibbler *(Antechinus apicalis)*

There has been no work during the past 12 months. In 1980 Dr P. Woolley of La Trobe University obtained the Western Australian Government's agreement to delay the

release for farming of an area of Crown land near Jerdacuttup because she believed it was the most likely place in that area from which the Dibblers found there had come. Extensive trapping with traditional metal live traps by a team led by Dr Woolley has failed to locate Dibblers there. The period allowed for further work ends in November 1981. I propose a trip to the site for further trapping, but using pit-fence traps.

6 Barrow Island

A further visit was made to Barrow Island in February 1981. The usual spotlight counts were conducted inside and outside the oil field. Some data was collected on the Boodie. I am currently investigating the possibility of publishing the data from spotlight counts in conjunction with Dr H. Bakker of the University of Western Australia Zoology Department, who has similar data.

7 Marine Turtle Nesting Sites

No work has been possible during the past 12 months and it is unlikely that time will permit work on this subject in the foreseeable future.

8. Revision of *Beaufortia* (joint project with M. Burbidge)

8.1 Objectives

To investigate the taxonomy of the genus, and assess

the conservation status of all its species.

8.2 Procedures

Examine the collection in the Western Australian Herbarium, collect in the field.

8.3 Results

Approximately half the species in the genus have been examined in the field and additional data has been collected on distribution and habitat.

8.4 Proposals for 1981/82

Continue the study when time is available. It is envisaged that this study will continue for some years.

SEMINARS AND PUBLIC RELATIONS

1 Talk to Western Australian Naturalists' Club 5 September 1980 "Crocodiles in Western Australia".

2 Three day trip to Nature Reserves in the south-west with Mr J.A.W. Robley, Superintendent Bush Fires Board.

3 Accounts of seven species of Australian mammals were prepared for "Mammals of Australia" being produced by the National Photographic Index of Australian Wildlife. The species are: *Wyulda squamicaudata, Perameles bougainville, Lagorchestes conspicillatus* (with P.M. Johnson), *Lagorchestes hirsutus* (with K.A. Johnson)

Onychogalea lunata, *Bettongia lesueur*, *Sminthopsis longicaudata* (with N.L. McKenzie).

COMMITTEES

I am a member of the following committees.

1. Bush Fires Board.
2. Conservation and Environment Council (Deputy).
3. National Parks Authority (Deputy).
4. Western Australian Wildlife Authority Reserves Committee.
5. CONCOM Working Group on rare fauna.
6. CONCOM Working Group on the management of threatened vertebrates.
7. Biological Surveys Committee (Chairperson).
8. Western Australian Wildlife Authority on rare fauna.
9. Policy Advisory Committee M.Nat.Res.Mgmt. U.W.A.
10. Working Group on Land Releases (Environment Protection Authority).
11. Editorial Advisory Committee, *Australian Wildlife Research*.

My membership of the Peel Inlet Management Authority terminated in April 1981.

Committees account for about 20% of my time.

ADMINISTRATION

Administration of the Wildlife Research Centre and of the Reserve Management Section and the provision of advice to Head Office staff, other Government Departments and the public accounts for about 40% of my time.