S.W.A.N.S.

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DEPARTMENT OF FISHERIES AND WILDLIFE, PERTH

S.W.A.N.S.

Vol. 8 No. 1

1978

Issued by direction of the Hon. Graham MacKinnon, M.L.C., Minister for Fisheries and Wildlife.

Director of Fisheries and Wildlife: B. K. Bowen, B.Sc.

Conservator of Wildlife: H. B. Shugg, A.A.P.A., A.F.A.I.M.

The support of the public is an essential component in any conservation or reserve management programme—but an informed, educated public is needed to ensure its continuing success.

This publication is designed as a medium by which the various organisations, individuals, and wildlife management personnel may be kept informed of the work being carried out by this department; of departmental policies and directions; and for promoting a better understanding and appreciation of Western Australian wildlife and the role it plays in maintaining a suitable environment in which man can live.

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SOMETHING TO THINK ABOUT

WATER, A VITAL FINITE RESOURCE

In a note to all Departments recently the Premier expressed concern at the low levels of water storage in the Darling Range Reservoirs and has asked Departments through their respective Ministers, that every possible means of water conservation be implemented immediately.

The article, "Warning: The Swan Coastal Plain—a Possible Desert" which appeared in S.W.A.N.S. Vol. 6 No. 3 last year was widely received and its principles brought home the importance and necessity of saving water. In a state where people have learned to squander their natural resources, the article was a forerunner of many of today's publicity campaigns to "use water wisely".

Lately, many commercial concerns are suggesting through media advertising, that the suburban home owner should convert from water mains reticulation to underground bore reticulation.

In doing this "Mr Home-owner" can save on his water bills and also conserve remaining valuable water stocks in the hills reservoirs.

While this is correct, it must be realised that underground water supplies are also a finite resource that must not be abused.

The practise of watering gardens *in the middle of the day* with a fixed sprinkler is seen to be inefficient, wasteful and it is hoped, a thing of the past.

An individual may solve his own immediate problem of water shortage with a bore, but there may be disastrous effects on the environment if everyone decided on the same thing at the same time without some form of investigation and control on extraction.

Severe down-draught in an underground water level would cause a loss of some lakes and some vegetation near bore fields.

The Metropolitan Water Board has stated that there are adequate water resources available for Perth to satisfy growth for the reasonably forseeable future but the cost, both financial and environmental will gradually increase.

Can we afford this adventure?

Can we continue unchecked to put bores in the ground along with our heads?

IN THIS ISSUE . . . .

	Page
Ranger Training Workshop	4
New Rare and Endangered List	5
Our Diminishing Heritage—Crocodiles	8
The Wongan Hills	10
Marsupial Breeding Station	12
Invertebrates and Fire Management in Kojonup Nature Reserves	17

PEOPLE . . . THEY JUST SLAY YOU

The Department of Fisheries and Wildlife, Western Australia, is seen by other state and world conservation bodies as an organisation having policy, performance and publications of high integrity with regard to wildlife conservation.

The Wildlife Conservation Act and Regulations established to enable the Department to give full and legal protection to the State's wildlife, is an intricate structure of rules and procedures necessary for successful conservation management. In times of need for commonsense, some humane acts are sanctioned by the Department so as to further protect our wonderful wild heritage.

Unfortunately, there are unscrupulous people who constantly and blatantly abuse these sanctions at the expense of the Department, the law and the wildlife. There have at times been repercussions in the newspapers with what always seems a "getting-even-with-big-daddy" story, supported by a delicate photo.

Certain biased press stories have highlighted the need to explain the relationship between "rescuing" immature birds and nest robbing.

The Conservator of Wildlife is concerned that the term "rescuing" is so often used as a cover for birds, particularly parrots and cockatoos, being taken from nests in the wild.

Only in those cases where we catch nest robbers redhanded is it usually admitted that the birds have been stolen from trees. Even then, they are likely to claim to be "only looking" unless they have young birds in cages.

"What chance have I got?"

Generally speaking, the chances of baby birds being rescued from trees knocked down during bulldozing operations must be very slight. Any distress calls made by the young if they survived the felling would normally be drowned by the noises of bulldozing operations. In the case of rare birds such as Major Mitchells, the possibility of a tree being accidentally knocked down and the birds recovered is even more remote. Yet this tired old story keeps being repeated with the claimant making a show of righteous indignation but not being able to show wildlife officers the trees from which the birds were so luckily saved.

One small cocky cage and ten immature galahs=next week's beer money.

Experience suggests that the greater the fuss made by the people concerned the less likely is their story to be true. Those who wish to keep the young birds for aviculture or for sale or for display in a commercial zoo use the media to play on peoples' sympathy so as to discourage the Department from taking appropriate action. What we want to ensure is that the "rescued" birds are cared for by competent people with adequate facilities. Such organisations as the Perth Zoo, the Animal Welfare League and scientific organisations are non-commercial and can provide professional or practised care around the clock and seven days a week.

Our experience has been, as one might expect, that people who genuinely rescue immature or sick birds or other fauna prefer to see them properly cared for by competent people and returned to the wild when they can fend for themselves. No one would expect permanently injured fauna to be turned loose but unfortunately a few people have such a strong desire to obtain and keep particular birds that they are willing to mutilate them so that they can make a strong plea to retain them.

EARLIER RAINBOW LORIKEET SIGHTINGS

In the previous S.W.A.N.S. Vol. 7, No. 1 we featured an article on Rainbow Lorikeets. It was stated that these birds were first sighted at large in Western Australia in 1968.

Our good friend Vincent Serventy has since helped update our records by advising us that he observed a bird in the metropolitan area as early as 1962. A few months later a pair was seen by him to feed on Tuart blossoms, giving further proof of their adaptability toward a Western Australian indigenous tree as a food source.

Residential Ranger Training Workshop, Alice Springs, N.T.

by R. Sokolowski

Wildlife Officer G. Hanley and I were privileged to be selected to attend a ten-day training school at Alice Springs in May/June 1977. The school was held under the auspices of the Australian National Parks and Wildlife Service, Canberra.

The Director of the school was Mr A. Fox (Nature Conservation, Information and Training) Australian National Parks and Wildlife Service, Canberra, while the Northern Territory Reserves Board under its Director, Mr T. Hare, were the hosts.

Delegates attended from Norfolk Island, Papua New Guinea, Tasmania, New South Wales, Western Australia, A.C.T., Department of Defense and Rangers from many stations in the Northern Territory.

The training course was orientated to National Parks, but a variety of subjects covered common areas of wildlife and park management. Some aspects were control of feral animals, judiciary and crown law, court precedures, study and preservation of fauna and flora, management programmes for high tourist pressure areas such as Ayers Rock (Uluru) and the Olgas, machinery and vehicle servicing, law enforcement and planning.

Visits were made to Ayers Rock, the Olgas, National Park (covering 487 sq miles) and also to some of the reserves in the West Macdonnell Ranges, to carry out field studies in vegetation, wildlife and tourism. The use of basic field survey instruments and aerial photo interpretation exercises were included in the field work.

Ayers Rock (Uluru) and the Olgas are both important in the mythological beliefs and ritual life of the Aborigines of the Pitjandjara tribes. All male delegates were privileged to be conducted into the sacred initiation cave, Ayers Rock, by the keeper, Paddy Uluru, a senior tribal elder. The N.T. Reserves Board is conscious of the need for aboriginals to maintain their ceremonial and ritual functions, which are still conducted at Ayers Rock and the initiation cave is permanently closed to the public.

Workshop delegates with workshop director Mr A. Fox of A.N.P. & W.S., front third from right.

Supt. D. Roff, Senior Ranger in charge of Ayers Rock National Park, gave an informative lecture on all aspects of management problems for this popular tourist area. A collection of aboriginal artefacts in a small museum at the Park Headquarters illustrated native culture of the area.

At the West Macdonnell Ranges reserves which were visited, a close study was made of the flora diversity in areas subjected to stock grazing, tourist visitation and fire. Mr Peter Latz, Senior Botanist, N.T. Arid Zone Research, spoke on this subject and supervised field exercises where groups of students produced informative records by use of a compass and inclinometer along a transect.

Geologically, most of the West Macdonnell reserves lie on the contact of the Arunta Block and the Amadeus Basin, which are thought to date back 1 700 million years. Rocks of the Arunta Block are tightly folded schists and gneiss. The younger Amadeus Basin is Heavitree Quartzite and rests on the Arunta metamorphics. A thin discontinuous siltstone formation may occur between these two. Both the siltstone and quartzite are part of the Upper Proterozoic Heavitree Quartzite formation which can be seen in recumbant folds at some of the gorges.

An early proliferation of fauna and flora species within these Ranges has been greatly reduced by feral animals and domesticated stock. The rock wallaby (*Petrogale penicillata*) was observed at some locations and a variety of avifauna was seen. Rock pools contained interesting aquatic life, including the spangled grunter (*Terapon unicolor*) and shrimps.

In-depth lectures and discussions, continuing into late evening, took place at the Library of the N.T. Reserves Board in Alice Springs. All delegates were expected to participate in the discussions. Anthropologist Miss S. Sullivan, of the N.S.W. National Parks and Wildlife Service, lectured on "The Problems of Maintaining and Preserving Aboriginal Cultural Resources" and discussed the employment of aborigines in the mapping and cataloguing of sites containing artefacts.

Mr C. Lendon of the C.S.I.R.O., Northern Territory, lectured on Avifauna within the region, and Mr B. L. Bolton, Senior Research Officer, Arid Zone, spoke on Wildlife Management in the arid zones, and the proper preservation of collected specimens to facilitate scientific investigation.

The hospitality and co-operation of the N.T. Reserves Board Rangers, under their Field Supervisor Mr Page-Sharp, was much appreciated and contributed greatly to the success of this workshop. The A.N.P. & W.S. is to be congratulated on arranging and organising the course. May they continue.

WILDLIFE DISTRICTS

WILLIAM C. BROWN, Government Printer, Western Australia

74002/3/78—2300

EXISTING RESERVES, CHANGE OF PURPOSE 1976/77

No.	Name	Vesting	From	To	Area	Date
2023	....	W.A.W.A.	Stopping place & Flora	Cons. of Flora & Fauna	40·468 6	1/10/76
11372	....	W.A.W.A.	Water & Cons. of Flora & Fauna	Cons. of Flora & Fauna	29·137 4	12/11/76
27872	....	W.A.W.A.	Cons. of Flora	Cons. of Flora & Fauna	202·287 1	19/11/76
27871	....	....	Cons. of Flora	Cons. of Flora & Fauna	206·270 8	19/11/76
19900	....	W.A.W.A.	Cons. of Flora	Cons. of Flora & Fauna	87·209 7	21/1/77
30306	....	W.A.W.A.	Cons. of Flora	Cons. of Flora & Fauna	39·203 9	4/2/77
A.25808	....	W.A.W.A.	Ecological Purposes & Cons. of Flora	Cons. of Flora & Fauna	199·635 8	11/3/77
A.24792	....	W.A.W.A.	Cons. of Flora	Recreation & Cons. of Flora & Fauna	306·878 2	22/4/77
15388	....	W.A.W.A.	Protection of Native Flora & Fauna	Cons. of Flora & Fauna	157·018 0	20/5/77

EXISTING RESERVES CANCELLED 1976/77

Reserve No.	Vesting	Area	Date Gazetted
26643	W.A.W.A.	168·753 9	11/3/77
31378	W.A.W.A.	914·928 4	1/4/77
28479	....	32·374 9	17/6/77

EXISTING RESERVES VESTINGS CHANGED 1976/77

Reserve No.	Name	Previous Vesting	New Vesting	Area (ha)	Gazetted
A.24392	Millstream National Park	W.A.W.A.	National Parks Authority	441·107 3	1/4/77

PROHIBITED AREAS (RESERVES)

Barlee Range	↑	A26808
Middle Island	↑	A22796
Dorre Island .... Part	↑	A24869
Nangeen Hill	↑	23187
Part Two Peoples Bay	↑	A27956
Prince Regent River	↑	27164
Lake Magenta	↑	A25113

DEPARTMENT OF FISHERIES AND WILDLIFE DISTRICT OFFICERS

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108 Adelaide Tce., Perth. Tel. 325 5988

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Campion House, 63 Serpentine Road.
Tel. 41 4811

BROOME:
Hamersley Street. Tel. 92 1121

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Stirling Street. Tel. 21 2598

BUSSELTON:
14 Queen Street. Tel. 52 2152

CARNARVON:
Fishermans Wharf. Tel. 41 1185

DONGARA:
Carnarvon Street, Port Denison.
Tel. 27 1187

ESPERANCE:
Wallaceway Centre. Tel. 71 1839

FREMANTLE:
Cliff Street. Tel. 335 6369

GERALDTON:
Fisherman's Wharf. Tel. 21 1956

JURIEN BAY:
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KALGOORLIE:
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KARRATHA:
Lot 750, Andover Way. Tel. 85 1427

LANCELIN:
Bootoo Street. Tel. 78 1111

MANDURAH:
Leslie Street. Tel. 35 1240

MANJIMUP:
Department of Agriculture.
Tel. 71 1299

MOORA:
Padbury Street. Tel. 41 1055

MT MAGNET:
124 Laurie Street. Tel. 96

PEMBERTON:
Trout Hatchery. Tel.(097) 76 1044

PINGELLY:
Park Street. Tel. 273

SHARK BAY:
Knight Tce., Denham. Tel. 48 1210

WAROONA:
Four Acre Street. Tel. 33 1331

WONGAN HILLS:
Fenton Street. Tel. 232

WYNDHAM:
P.W.D. Office—3 Mile. Tel. 61 1342

AMENDMENTS TO AREA 1976/77

No.	Name	Vesting	Old Area	New Area	Difference	Date
25194	Andersons Lake	W.A.W.A.	441·512 0	436·909 6	—4·602 4	23/7/76
893	Chapman River		16·187 4	15·342 6	—·844 8	6/8/76
32178			5·101 8	9·148 3	+4·046 5	17/9/76
A.30523	Pt. D'Entrecasteaux		3 002·363 2	4 101·784 9	+1 099·421 7	29/10/76
33174	Thevenard Island	W.A.W.A.	581·482 7	581·305 6	—7·177 1	29/10/76
24789			10 070·040 9	10 070·991 9	+·951 0	19/11/76
26001			102·096 6	93·095 0	—9·001 6	24/12/76
32864			1 741·589 9	1 436·912 5	—4·677 4	24/12/76
32865			630·866 9	579·168 4	—51·698 5	24/12/76
1736	Beaufort Bridge		218·042 1	183·861 4	—34·180 7	4/2/77
1432	Sanford Rocks		809·371 3	805·939 1	—3·432 2	18/2/77
A.27632	Nuytsland W. L. Sanct.	W.A.W.A.	625 262·430 5	625 343·367 6	+80·937 1	4/3/77
1740	Wild Horse Swamp	W.A.W.A.	258·998 8	258·386 6	—·612 2	4/3/77
30142		Kalamunda Shire	4·188 5	3·732 0	—0·456 5	18/3/77
20765		Mundaring R.B.	3·642 2	4·058 5	+0·416 3	18/3/77
27277			137·593 1	130·878 6	—6·714 5	1/4/77
14493			481·575 9	297·858 2	—183·717 7	3/6/77
29289			18·210 9	173·212 8	+155·001 9	3/6/77

EXISTING RESERVES VESTED 1976/77

No.	Name	Vesting	Area (ha)	Date
2023		W.A.W.A.	40·468 6	1/10/76
11372		W.A.W.A.	29·137 4	12/11/76
20069	Dongolocking	W.A.W.A.	199·105 3	19/11/76
27871		W.A.W.A.	206·270 8	19/11/76
27872		W.A.W.A.	202·287 1	19/11/76
A.11144	Boyagin Rock	W.A.W.A.	121·810 4	10/12/76
19900		W.A.W.A.	87·209 7	21/1/77
A.13145	Rifle Range	W.A.W.A.	133·610 5	4/2/77
30306		W.A.W.A.	39·203 9	4/2/77
25809	Lake Powell	W.A.W.A.	185·750 7	4/3/77
A.25808		W.A.W.A.	199·635 8	11/3/77
A.687	Namalcatching Well	W.A.W.A.	258·998 8	18/3/77
A.11047	Mt. Caroline	W.A.W.A.	351·671 8	1/4/77
27216		Dandaragan Shire	1 575·845 9	1/4/77
A.11048	Mt. Stirling	W.A.W.A.	224·957 1	1/4/77
A.24792		W.A.W.A.	306·878 2	22/4/77
15388		W.A.W.A.	157·018 0	20/5/77

EXISTING RESERVES MADE CLASS "A"

No.	Name	Vesting	Area (ha)	Gazetted
A.31634	Sugar Loaf	W.A.W.A.	·809 4	9/7/76
A.16379	Buntine	Min. for Water Supply	1 370	11/3/77
A.29860	Lake Pallarup	W.A.W.A.	3 248·115 9	11/3/77
A.29864	One Mile Rocks	W.A.W.A.	864·861 3	11/3/77
A.29857	Tarin Rock North	W.A.W.A.	1 415·509 4	11/3/77
A.33530	Wongan Hills	W.A.W.A.	417·494 2	11/3/77
A.23187	Nangeen Hill	W.A.W.A.	176·442 9	11/3/77
A.25808		W.A.W.A.	199·635 8	11/3/77
A.11047	Mt. Caroline	W.A.W.A.	351·671 8	1/4/77
A.11048	Mt. Stirling	W.A.W.A.	224·957 1	1/4/77
A.18803	Chinocup	Min. for Water Supply	979·339 3	22/4/77
A.24792		W.A.W.A.	306·878 2	22/4/77
A.33811	Bedout Island	W.A.W.A.	30·711 6	22/4/77

TABLE OF RESERVES

Year 30 June	Total Number	Area (ha)	Vested in the W.A. Wildlife Authority	
			No.	Area (ha)
1969	278	2 342 966	127	818 442
1970	315	2 100 318	156	867 362
1971	359	4 955 893	213	4 415 595
1972	404	5 077 224	242	4 533 944
1973	440	5 013 287	265	4 607 266
1974	454	5 033 935	281	4 626 617
1975	491	5 103 037	320	4 713 482
1976	918	5 339 947	351	4 747 403
1977	946	7 520 839	385	6 927 627

SUMMARY OF NATURE RESERVES—30 JUNE, 1977

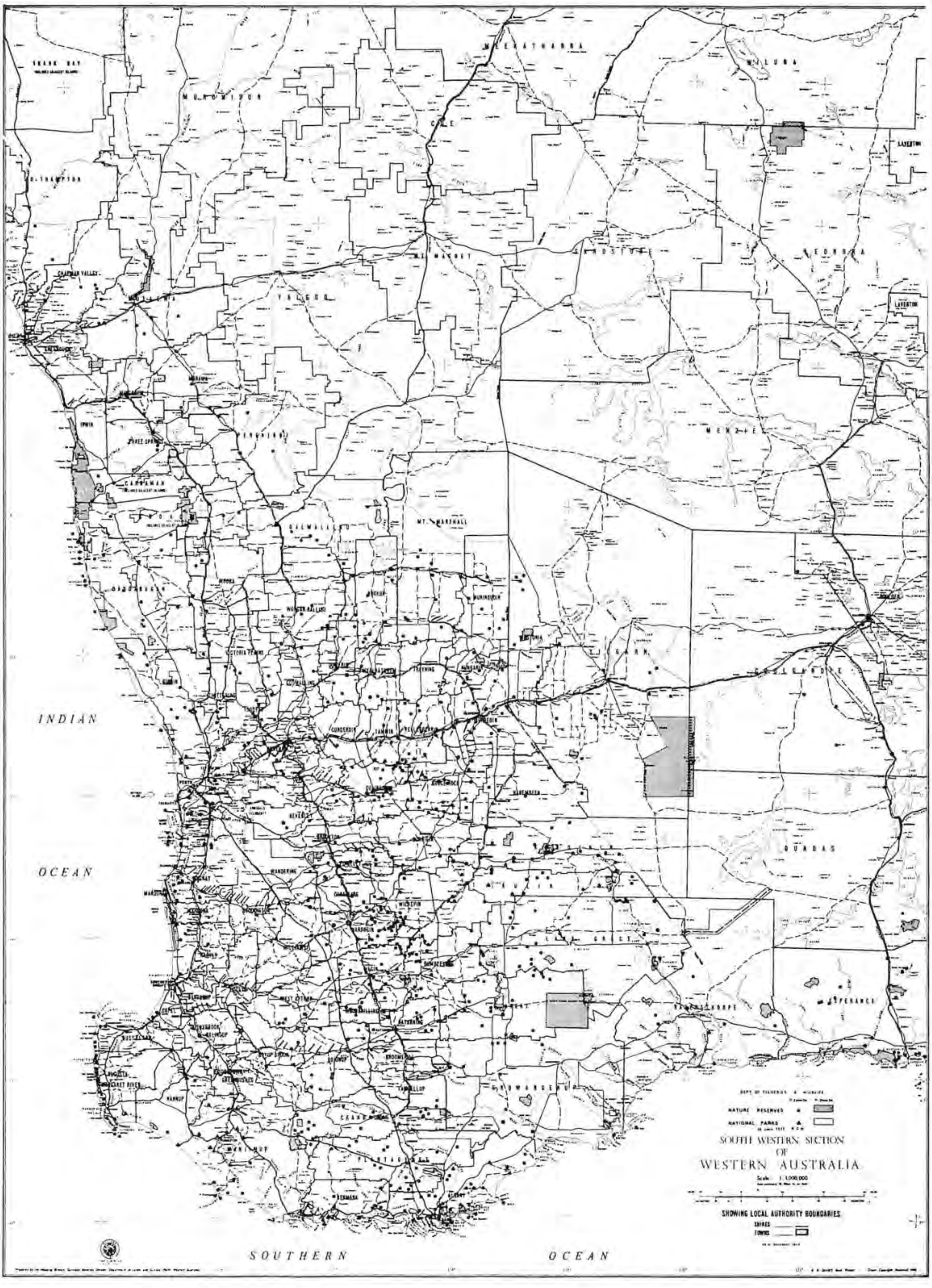
As at June 30, 1976	918 reserves	5 339 947·479 7 ha
New reserves 1976/77	31 reserves	2 180 974·765 2 ha
Amendments 1976/77	18 reserves +	1 033·658 9 ha
Cancelled reserves 1976/77	3 reserves	1 083·682 3 ha

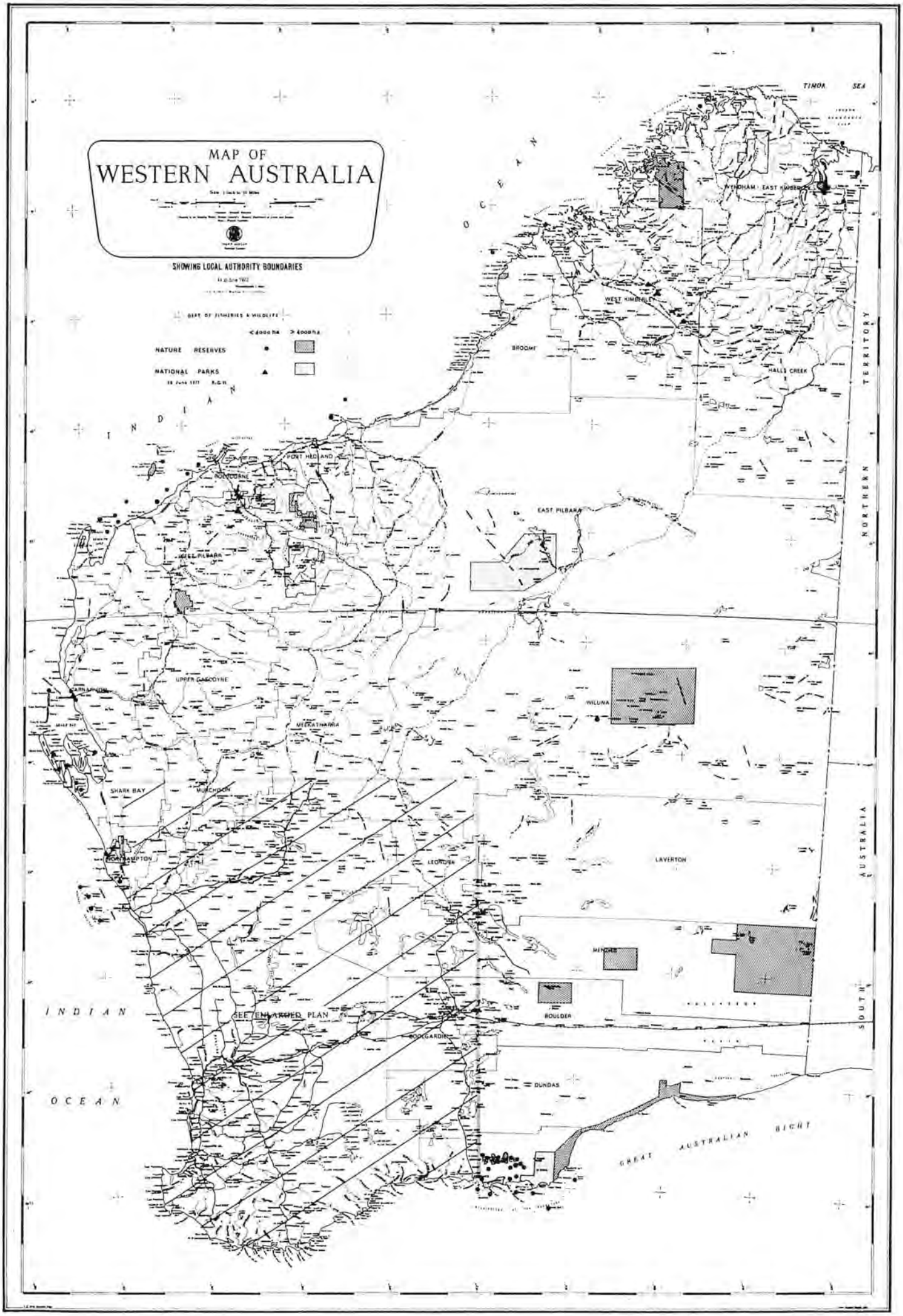
NATURE RESERVES VESTED IN W.A. WILDLIFE AUTHORITY—JUNE 30, 1977

As at June 30, 1976	351 reserves	4 747 403·015 0 ha
New reserves 1976/77	20 reserves	2 178 699·688 0 ha
Amendments 1976/77	4 reserves +	68·545 4 ha
Existing reserves vested 1976/77	16 reserves	2 744·014 1 ha
Cancelled reserves 1976/77	2 reserves	1 524·789 6 ha

NEW RESERVES 1976/77

No.	Name	Area (ha)	Vesting	Gazetted
22096		386·070 1	W.A.W.A.	23/7/76
34136		49·654 0	W.A.W.A.	6/8/76
34140		12·978 1		6/8/76
34197		637·438 7	W.A.W.A.	20/8/76
34257	Swan Ils.	29·032 2	W.A.W.A.	17/9/76
18342		·462 9	W.A.W.A.	1/10/76
34288		·234 2	Ravensthorpe Shire	1/10/76
34290		·236 4	Ravensthorpe Shire	1/10/76
34295		929·062 1		1/10/76
26264	Mailalup	768·184 4	W.A.W.A.	29/10/76
971		404·685 6		29/10/76
34385	Nembudding	14·161 3	Wyalkatchem Shire	19/11/76
26158		4·825 8		10/12/76
34442		1 895·633 2	W.A.W.A.	24/12/76
687	Namalcatching Well	258·998 8		28/1/77
2393		40·468 6	W.A.W.A.	4/2/77
34522	Lake Ace	1 403·740 2	W.A.W.A.	18/2/77
34523		909·880 0	W.A.W.A.	18/2/77
34527		133·093 5	W.A.W.A.	4/3/77
34571		6·045 0		18/3/77
A.11039		127·476 0	W.A.W.A.	1/4/77
A.17258	Lake Wardering	42·675 0	W.A.W.A.	1/4/77
A.34560	Little Rocky Island	4·645 2	W.A.W.A.	1/4/77
A.34578	North Turtle Island	51 (approx.)	W.A.W.A.	1/4/77
34585	Point Spring	302·990 6	W.A.W.A.	1/4/77
16405		619·017 2	Water Supply	22/4/77
A.34604	Mungilli Claypan	3 635·830 7	W.A.W.A.	22/4/77
A.34605	Plumridge	308 990·0 (approx.)	W.A.W.A.	22/4/77
A.34606	Browne Range	1 859 286·0 (approx.)	W.A.W.A.	22/4/77
20878		24·832 7		20/5/77
25919		5·412 7	W.A.W.A.	17/6/77


INDIAN
OCEAN
SOUTHERN
OCEAN
NATURE RESERVES
NATIONAL PARKS
SOUTH WESTERN SECTION
OF
WESTERN AUSTRALIA
Scale 1:1,000,000
SHOWING LOCAL AUTHORITY BOUNDARIES
SHIRES
TOWNS


MAP OF
WESTERN AUSTRALIA
SHOWING LOCAL AUTHORITY BOUNDARIES
DEPT OF FISHERIES & WILDLIFE
<4000ha
>4000ha
NATURE RESERVES
NATIONAL PARKS
TIMOR SEA
WYNDHAM EAST KIMBERLEY
WEST KIMBERLEY
BROOME
HALLS CREEK
NORTHERN TERRITORY
PORT HEDLAND
ROEBOURNE
EAST PILBARA
WEST PILBARA
UPPER GASCOYNE
CARNARVON
MURATHARRA
WILUNA
SHARK BAY
MURCHISON
NORTHAMPTON
LEONORA
LAVERTON
MENZIES
BOULDER
SEE ENLARGED PLAN
KOOLGARDIE
DUNDAS
SOUTH AUSTRALIA
INDIAN OCEAN
GREAT AUSTRALIAN BIGHT

results reveal that the ant faunas of 17760 and 17759 are similar, that of 8617 and 15388 are similar and not unlike that of the first two reserves mentioned, while that of 2243 is the most distinct. This suggests that the existing sampling programme may provide adequate information on the first four reserves while a separate programme could profitably be initiated in the Mininup Nature Reserve.

The study which I have described forms part of a larger programme of fire ecology monitoring throughout the forests and woodlands of the south-west of this State. It is hoped that the results may be integrated to provide a greater insight into the effects of the various fire management programmes which are currently being practised so that recommendations on the environmentally most desirable approach may be adopted.

Continued from page 16

The first of two field trips to an area of vacant Crown land north-east of Yuna took place in March 1977. This was in response to a recommendation by the Environmental Protection Authority in its report on Conservation Reserves for Western Australia. A preliminary vegetation map and a compilation of its vertebrate fauna has been prepared. After a second field trip which took place in September 1977, a report on the area will be published.

SILVER GULL PROGRAMME

Dr Ron Wooller from the School of Environmental and Life Sciences at Murdoch University, has been involved with a programme on Silver Gulls during the past year.

In recent years, large numbers of gulls have moved into the Perth metropolitan area, scavenging from open garbage tips and congregating at local water ways.

It is thought that these birds have increased in their inland populations because of the availability of local food sources.

Because of their habits and increased numbers, it is thought that future large concentrations of gulls could contaminate local waterways.

As part of an ongoing study on the birds' breeding sites and movement throughout the metropolitan area, Dr Wooller banded and released 317 Silver Gulls on Carnac Island.

Each bird is banded with four rings, two on each leg. On one leg there is a numbered metal ring with a colour ring above and on the other, two individual colour bands. Each bird has it's own individual number and sequence of colour rings.

Should any of these birds be sighted, Dr Wooller would be most grateful for information, particularly the sequence of the colours, the ring number, the area and the date of sighting.

Nature Reserves

During 1976/77 the number of nature reserves in the State and the area of reserves vested in the Western Australian Wildlife Authority increased. While there were 31 new reserves listed, the area vested in the Western Australian Wildlife Authority nearly doubled.

Plumridge Nature Reserve No. A34606 and Browne Range Nature Reserve No. A34606 together totalled some 2.2 million ha of land.

The Plumridge Nature Reserve includes areas typical of the fringe of the Nullarbor Plain and of the Great Victoria Desert while the Browne Range Nature Reserve lies in the central Gibson Desert.

Plumridge Lakes area. Mulga (*Acacia aneura*) with tussock grasses.

Desert reserves proposed by CTRC are very extensive, and it was the Committee's opinion that a large size is the only way to take into account the following peculiarities of desert ecosystems—

(a) Many of the rarer floral and faunal elements of the ecosystems are very sparsely distributed. Large areas are needed to ensure their inclusion in the reserve.

(b) Desert ecosystems are subject to natural catastrophes, e.g. fire and drought of varying intensity and extent.

(c) Natural regeneration following such normal catastrophes are by means of plant successional stages which in the desert environment are slow and of long duration, and, of course, different plants develop and regenerate at different rates.

(d) Much of the diversity found within the desert ecosystems can be attributed in part to differences in age of the regeneration following natural disturbances in the distant past.

(e) Desert ecosystems are finely and delicately balanced, and management can only be achieved by allowing natural processes to proceed at natural intervals and rates without significant human modifications of a natural quasi-equilibrium situation.

The Western Australian Wildlife Authority supports the CTRC in its recommendation of large reservations in the semi-arid and arid desert areas, and the size of these reservations must be regarded as realistic.

Invertebrates and the Kojonup Nature Reserve Fire Management Programme

by Dr J.D. Majer,
Biology Department, W.A.I.T.

Kojonup is on the edge of the Western Australian wheatbelt. The several nature reserves in this Shire are of interest in view of the paucity of undisturbed land within the region. A fire management programme has recently been initiated for these reserves by the Department of Fisheries and Wildlife. The programme objectives include the reduction of wildlife hazards to wildlife, preservation of the aesthetic values of reserves and also the promotion of vigour and diversity of flora and fauna.

In May 1976 staff of the W.A.I.T. Biology Department and BIOSTAS (the Biology Students Association) commenced long-term monitoring of the effects of prescription burning on the flora and fauna of five Kojonup reserves. BIOSTAS has been handling the flora and vertebrate fauna aspects of the study while the author and Rob Emery have been investigating the invertebrate fauna, with particular reference to ants. This aspect of the study has been funded by the W.A.I.T. Environmental Studies Group. The first year of the study has been occupied with documenting baseline data on flora and fauna, since the first prescription burns were not performed until last autumn. These studies will be reported on in the near future although I wish to describe here what information we hope to obtain by studying the invertebrate fauna.

Perhaps our concern with such small animals should first be justified. A recent submission to the Senate Standing Committee on Science and the Environment by the Australian Entomological Society stated that "insects are known to contribute a considerably greater biomass than vertebrates to forest faunas and they include more species, usually by several orders of magnitude". In addition to this high biomass, insects, and other invertebrates, are important agents for decomposition, plant growth limitation, seed dispersal and destruction, the enhancement of soil health and so on. Therefore in view of their predominant importance in ecosystems and their suitability for meaningful quantitative studies; invertebrates should naturally be considered when monitoring mans land-use activities.

Towerlup Creek Reserve No. 17760 Compartment 1 before experimental prescription burn.

Four characteristics of a burn should be considered when monitoring its effects. These are its intensity, its frequency, its timing and the size and patchiness of the burn area. The management programme specifies prescription burning of approximately equal sized compartments in autumn on an eight year cycle. Our monitoring therefore concentrates on the effects of varying fire intensity although the other characteristics will also be considered.

Our first objective was to describe the seasonal variation in invertebrate abundance and activity in order to provide a backdrop against which to consider the effect of an autumn burn. Since this sort of work takes a large time commitment, we have confined our initial observations to Towerlup Nature Reserve No.

Towerlup Creek Reserve during burn.

17760. Grids and transects of pitfall traps were established in May 1976 in a control compartment and a compartment scheduled for burning in the Autumn of 1977. The traps have now been running for one week periods in every month so we have one full years pre-fire data and are currently gathering our early post-fire recordings. Sorting and identification of the trap catches is time consuming so most invertebrates have only been sorted to family or order level. Since promotion of species diversity is one of the reserve management programme objectives, the ants have been selected for sorting to species level. It is anticipated that the diversity of this representative group will reflect that of the remaining invertebrate fauna. Thirty six ant species have been collected from this reserve and a total of sixty two species have been accumulated from pitfall trap samples and hand collections throughout the five main Kojonup reserves.

We intend to establish invertebrate monitoring schedules in other Kojonup reserves. In order to economise on effort, Rob Emery has sampled and made a statistical comparison of the ant faunas in the five major nature reserves at Kojonup, (Mininup, No. 2243; Towerlup, No. 17760; Jowerlup, No. 17759; Mettabinup, No. 15388; Narlingup, No. 8617). His

THE BARLEE RANGE CAPER

An article which appeared in the November 1977 issue of "Australian Outdoors" magazine has disturbed the Conservator of Wildlife, Mr H. B. Shugg.

The article concerned a week spent in the wilderness of Western Australia by a Mr Dave Tassell and his family. It expounded the need for the average Australian to get a welcome stimulus by coming to terms with his harsh outback environment.

The area chosen by Mr Tassell was near and in one of Western Australia's seven important Nature Reserves with a "Prohibited Area" classification.

The Barlee Range Nature Reserve No. A26808 of 104 406 ha in area, was declared a prohibited area under the Wildlife Conservation Act in 1969.

It was further upsetting to read that firearms were carried, wild ducks were shot and vehicles driven on the reserve.

Mr Tassell has contacted the Department however, and pointed out that contrary to the impression in the article, the shooting and vehicle use were outside the reserve boundary.

With 4 wheel drive adventuring becoming more popular, the article is misleading to others intending to visit this and other Nature Reserves in Western Australia. It is illegal to camp and carry firearms on *any* Nature Reserve in Western Australia. Vehicles may be driven only on existing roads.

Mr Shugg has pointed out that the onus is on the people who travel in outback areas to have the responsibility of ensuring that they do not trespass upon prohibited areas whether they be nature reserves, private property or Aboriginal reserves.

WILDLIFE CONSERVATION TRUST FUND GRANT

The Western Australian Wildlife Authority has approved the spending of $1 200 of the Wildlife Conservation Trust Fund on a special Western Australian Seabird Island edition of the journal of the Australian Bird Study Association.

The Wildlife Conservation Trust Fund was established under the Wildlife Conservation Act, 1950-1975 and is administered and controlled by the Minister. It consists of moneys obtained from Duck Shooting licenses, gifts, bequests and proceeds from any investment of part of the Fund and the Minister may use this Fund for all or any of the purposes of research relating to fauna conservation and for any other purposes relating to the conservation of fauna that are recommended by the Authority to the Minister.

The Australian Bird Study Association's September 1977 issue was the third special issue consisting entirely of seabird island items from other States and was the first to appear under the new title of "Corella" (previously the "Australian Bird Bander").

The preparatory work for the Western Australian special issue has been progressing steadily for some 12 months and production is planned for early 1978.

Wildlife Research

In its section of the Western Australian Wildlife Authority Annual Report 1977, the Western Australian Wildlife Research Centre Wanneroo has indicated a very busy and productive past year.

Various biological surveys were undertaken throughout some of Western Australia's vast unknown areas. Documentation of these surveys will provide vital information for the successful future management of our natural resources.

The ongoing biological survey of the Kimberley Region continued with a shift in emphasis from the high rainfall areas to the more arid South Kimberley. As with previous surveys in this region, staff from the Western Australian Museum, the Western Australian Herbarium and C.S.I.R.O. Division of Entomology participated in the field work and will contribute papers, in their areas of specialisation, in the survey publication.

An area of vacant Crown Land at the southern limits of the Kimberley Division was the subject of a biological survey in August 1976. The area includes the Edgar Range, an outlying scarp of the Fitzroy Valley. An extant population of the Rabbit-eared Bandicoot (or Dalgyte) (*Macrotis lagotis*) was recorded.

In April, 1977, a biological survey of the Coulomb Point Nature Reserve and the vacant Crown Land between Pender Bay and Cygnet Bay was carried out. Both areas are on the Dampier Peninsula, north of Broome.

Also relevant to the Kimberley regional survey was the joint Western Australian Museum-Chicago Field Museum of Natural History survey of the Mitchell Plateau area, undertaken in October 1976. A research officer from the Department of Fisheries and Wildlife participated.

Publications on these surveys are in various stages of preparation and contributing papers have been submitted for a Wildlife Research Bulletin on the Islands of the North-west Kimberley.

The ongoing biological survey of the desert regions of Western Australia also continued. Papers for a Wildlife Research Bulletin based on the November 1975 and March 1976 desert surveys were called from contributing authors. The mammal paper was finalised following critical reading by selected referees and includes a review of the current status of desert mammals in Western Australia. The paper concludes with the recommendation that further surveys be undertaken to attempt to find and conserve extant populations of desert wallabies and bandicoots.

Following this recommendation, a reconnaissance of the Warburton Region was conducted during June 1977. Mammal trapping was undertaken in the Jameson and Blackstone Ranges and in the Schwerin Mural Crescent.

During this trip, and during a preliminary trip in January 1977, various groups of aborigines were interviewed concerning the mammals of the region. A paper is being prepared for publication.

In February 1977, a final visit was made to an area of vacant Crown land east of Lake Moore. A report on the wildlife of this area was brought to final draft and a copy forwarded to the Department of Conservation and Environment to assist in the delineation of boundaries for the proposed 300 000 ha Karroun Hill Nature Reserve.

Continued on page 18

WESTERN SWAMP TORTOISE

Size comparison of adult and young Western Swamp Tortoise.

There's a little fellow at Bullsbrook, Upper Swan, who is "walking-the-plank" of life but he doesn't know it. Mind you, he's been doing it for perhaps thousands of years, but as we know from the story of "The Tortoise and the Hare", the tortoise will probably make it—with a little help from his friends.

With the establishment of a satellite colony of 13 young and 8 adults at the South Perth Zoological Gardens and the protection and management of the tortoise's natural habitat, the Department of Fisheries and Wildlife is trying to prevent the extinction of this rare reptile.

The situation at present, however, with respect to the future survival of the species, is grave.

Population estimates at the Twin Swamps Nature Reserve suggest that the species is declining in numbers. It is thought that about 40 animals could be the present population at this reserve.

In the 1976 winter, only 3 animals were captured compared with 66 in 1966.

The reason for this decline lies basically with the series of poor winters in recent years. Research has shown that two wet years in a row are needed before the species recruits successfully. The only time this has happened since the study of this species commenced in 1963 are 1963-64, 1964-65, 1967-68 and 1973-74.

The 1976-77 drought years have cast extreme doubt on the animal's future.

The population on the Ellen Brook Nature Reserve seems a little better off. In 1976 nine tortoises were captured, of which 3 had been previously marked. Because of low numbers accurate population estimates are impossible but it is noteworthy that the population breeds and recruits most years.

Continued from page 8

Crocodiles are not much interested in humans as food; estuarine species certainly prefer fish, dogs or pigs. The Australian Freshwater Crocodile is a shy, inoffensive little animal which will never attack humans unless attacked or wounded first.

A recent Departmental survey of saltwater crocodiles in some of the north west Kimberley river systems has shown that crocodile populations remain greatly depleted following extensive hunting for their skins in the 1950s and 1960s.

Counts were made of saltwater crocodiles in the estuarine portion of four river systems in the north west Kimberley—the Lawley, Mitchell, Roe-Hunter and Prince Regent. Only 463 crocodiles, 109 of which were hatchlings, were spotted during the ten day survey—an estimated 60% sighting. Based on these figures the maximum number of known hatchling crocodiles in the four systems is just short of 700. Few large crocodiles were seen.

Although the skin of the Saltwater Crocodile is preferred by poachers to that of the freshwater animal, the scarcity of the aforementioned has led to increased predation by humans of the smaller inferior skinned animal.

Although *C. johnstoni* is more prolific throughout its inland waterways than *C. porosus* in its marine habitat, the number of large breeders of both species has diminished.

In Western Australia hunting pressure on *C. porosus* was particularly high during the early 1960s and by 1969 the species had become rare. *C. johnstoni* was fully protected in 1962 but still suffers from poaching. *C. porosus* was not protected until April 1970, by which time commercial hunting had become uneconomic. Protection followed in the Northern Territory in 1972 and a total export-import ban on crocodile products was declared by the Commonwealth Government later the same year. It was this ban that effectively stopped hunting throughout Australia.

Both species have now been classified rare and likely to become extinct in Western Australia, it is unfortunate however, that hunting to near extinction of *C. porosus* was the reason to protect it.

DUCK SHOOTING IN THE NORTH ONLY

The open season for shooting waterfowl in the Kimberley, North-West and Eastern Land Divisions remains unchanged again for 1978.

The large remote wilderness area of the North, which receives infrequent and fragmented hunting pressure, is open from January 1 to December 31, 1978.

However, the Minister for Fisheries and Wildlife announced late last year that there would not be an open season in the South-West and Eucla Land Divisions. This was because of evidence received at the conclusion of Departmental ground and aerial surveys of wetland systems in the regions.

For the second year in succession the winter rainfall for all districts in the central South-West of Western Australia was considerably below average. Those districts to the north and east which are in a low rainfall belt were seriously affected. The situation for the remainder of the South-West varied from poor to reasonable.

Generally, the result of consecutive years of below average rainfall has been a serious decline in the condition of wetlands which at the same time last year were considered to be only reasonable.

It is apparent from Departmental records that wetlands within the South-West and Eucla land Divisions are at the lowest levels recorded for many years. Catchment into the systems in most areas has been negligible and only in the coastal districts has there been sufficient to raise or maintain the levels of lakes with the result that very few have attained full capacity.

The Department's Waterbird Research Unit observed during the October and November 1977 surveys, large populations of waterfowl on some waterways. Breeding, however, was minimal in all districts. With this situation at hand, shooting would have concentrated on next season's breeding stock which must be husbanded (normally the majority of birds shot are young birds, but because of little breeding, they are not available this year). Also birds congregating on the comparatively few areas of available water would have been unusually vulnerable to shooting.

It is expected that water levels will continue to recede through the summer with the result that many of the wetlands which are already shallow, will become dry.

As waterfowl habitat diminishes and natural pressures increase, it is anticipated that many birds will be forced to migrate to the Eastern States and to the north of Western Australia. Also, a large number, particularly Black Duck and Black Swan can be expected to seek refuge on lakes in the metropolitan area.

With the present weather pattern continuing, outbreaks of botulism and algal poisoning appear inevitable. Such events may result in the death of many hundreds of waterfowl.

DROUGHT CONDITIONS

Parts of the Northern and Central Agricultural districts of Western Australia have, for the second year, experienced severe drought conditions.

Indigenous wildlife as well as agricultural stock have been affected by the lack of food and water.

Reports have come to hand indicating small populations of Zebra Finches and Cockatiels out of their usual range. The Zebra Finches were seen South East of Geraldton in early October and Cockatiels were recorded about 16 km South East of Merredin in mid October.

People in the affected areas will no doubt notice a lack of wildlife, but nature has it that when the seasons are back to normal, local populations will return and flourish once more. In the meantime, districts surrounding the drought areas may experience wildlife strange to the locality.

Stripe-Faced Dunnarts vs Feral Cats

The Stripe-faced Dunnart is a rarely seen but widely ranging marsupial mouse found throughout the Pilbara. It is most easily identified by the stripe from the nose to between the ears and, in the case of well fed animals, a thick tail which is the result of the storage of excess food fats.

Analysis of feral cat gut samples in the Pilbara have indicated that this animal is suffering heavy predation by cats living in the wild. For example three cats taken at Karratha Station by Mr D. Cutting, September 1977, and forwarded for examination were found to have eaten geckoes, grasshoppers, snakes, centipedes and five Stripe-faced Dunnarts.

Dunnarts feed principally on insects, but mice, baby rats, small birds, lizards and centipedes may be taken, indicating that feral cats not only predate on Dunnarts but directly compete with them for food.

The rarely seen Stripe-faced Dunnart.

All animals had been released at boat-ramp (northern edge of Banganup Lake). During the trapping programme of 16 trap nights using 12 box traps, 17 quokkas were captured with 10 recaptures and 4 double recaptures; 15 possums and 8 bandicoots were also captured.

Considering the dry summer, kangaroos are in good condition and are still breeding well. Male offspring still outnumber females. Culling of some of the males is expected during the next year.

The vegetation appears to have suffered due to poor winter rains and the long, hot, dry summer. *Banksia* species appeared to lose more leaf than normal. *Banksias* in certain areas have died, e.g. Russell Swamp. It was thought that the trees were infected with *Phytophtora* but an investigation by the C.S.I.R.O. proved that this was not the case, although *Phytophtora* was discovered within the Thompson Lake Reserve not far from Russell Swamp.

A management plan was drawn up for the Reserve, and a burning programme was to be started during the Autumn of 1977. Various research programmes concerning these burns were also proposed. Unfortunately, due to the fire of March 14, 1977, this programme now has to be reorganised.

The area burnt by the fire on March 14 amounted to a little less than half the Reserve, and more than half of the burnt area included the Lake. The following research programmes within the burnt area have been instigated:

(i) Small enclosures have repeatedly demonstrated that grazing animals closely regulate the post-fire plant regeneration. However, the cost of fencing effectively precludes the application of this knowledge in large-scale regeneration, and so an experimental 10 000 square metre plot has been installed so that its effectiveness in keeping kangaroos out can be assessed.

(ii) Observations of territorial behaviour of kangaroos within the burnt area are made on a regular basis in order to see whether aggregation on the burnt area outside that enclosed in (i) above is leading to any abnormal behaviour on the part of the kangaroos.

(iii) This has been done in conjunction with observations on the feeding habits of kangaroos who, as is well-known, aggregate on burnt areas.

Lake Banganup dried up completely on January 25, 1977, except for some small water-holes in the south-east corner (discovered since the burn).

Total rainfall for 1976 was 718.3 mm, with a total of 95 rainy days.

Some 430 visits were made to the Reserve by staff, students and visitors.

Albany Pelican Tagging

In its ongoing study into pelicans in Western Australia the Wildlife Research Centre at Wanneroo recently conducted a tagging session at Albany.

At the western end of Princess Royal Harbour, cannon nets were used to capture 43 birds.

The birds were released immediately after being tagged, except for 8 which were tagged from previous encounters. These were closely examined and records taken. Each of these birds received a 20 minute inspection. This entailed measuring, feather counting and coloured wing tag application. One bird had previously come from Wittenoom.

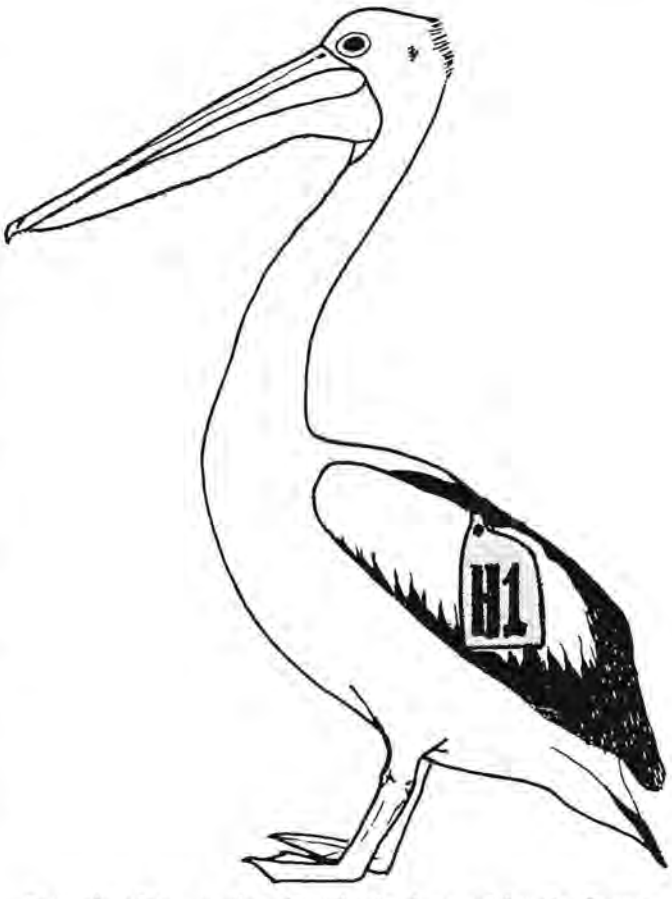
The end results of the wing-tagging studies as opposed to banding and other pelican studies in progress help establish three things:

- Migration patterns.
- The age when they first breed.
- How regularly they keep to certain breeding spots.

The compiled results will help to ensure that these birds can be protected against any possible future man-made or environmental threat to their existence.

Interestingly, there's one curious by-product of these investigations—they help to determine the sex of the birds. Measuring the length of the beak and comparing it to the length of the tarsus (from the heel to the base of the toes) is the only simple way to determining if a pelican is male or female.

How long these birds live is still unknown, however, and it will be some years before the ongoing studies provide an answer.



Example of tag placing. If sighted, please advise the Department's Water Bird Research Branch of the colour and number.

W.A. University's Marsupial Breeding Station

In S.W.A.N.S. Vol. 4, No. 2, 1973, an article featured the Western Australian University's Marsupial Breeding Station at Thompson Lake Reserve, Jandakot. Planning and management techniques of the station were outlined giving an indepth look at future study possibilities.

The following interesting report has come to hand and is now reprinted to show the progress and present work being done at the station.

THE UNIVERSITY OF WESTERN AUSTRALIA MARSUPIAL BREEDING STATION, JANDAKOT
(Reserve No. 29241)
ANNUAL REPORT—APRIL 1976/1977

(a) Progress of Research Programmes

Mr R. Whelan's research towards his Ph.D. is now being concluded and writing up is in progress.

The important points to come out of Whelan's work are that in burns which leave a clear mineral ash bed, regeneration of vegetation from seedlings is good, whereas in places where there is still some litter or where the burns are not extensive, a great deal of predation by herbivores such as grasshoppers prevents the establishment of seedlings. Not all species are equally palatable—e.g. *Sterlingia latifolia* is unpalatable, while some legumes (for example, *Jacksonia sternbergiana*) are so palatable that their regrowth can be severely regulated by insect grazing.

This finding is particularly important, since work by Honours students in previous years has shown that at about 8-10 years of age *Jacksonia* is a significant component in the shelter requirements of macropods.

Another significant finding from Whelan's work is that *Banksia* seedlings are significantly better established in the second rather than the first year after burning.

Work is proceeding on other aspects of the biology of *Banksia* trees. The ability to produce viable seedlings is seen as being composed of the following elements:

The efficiency of pollinators.
The predation of seeds once they are set.
The predation of the seedlings after they have germinated.
The competition between trees as they grow.

The pollination aspect has been studied by Whelan and Burbidge who have continued the work commenced in earlier years.

John Scott started a project investigating the predispersal predation by insects of *Banksia* seeds, and Dr R. Black has continued his project on spacing of species in *Banksia* woodland.

Mr B. T. Clay has continued his research on the long-necked tortoise, and has marked an additional 17 animals. Total number of animals marked to date are: adults 176, and juveniles 125. Recaptures are high—approx. 50%. The same investigator has begun the following two projects:

(1) A study of the epidermis of the leaves and stems forming the diet of the macropods. From this study it will be possible to establish a collection from which dietary material of the macropods can be determined.

(2) The growth rates of various *Banksia* species and the growth rate of Jarrah. Both of these are of importance in managing the Reserve.

(b) Teaching

(1) *Honours Projects:*
  (i) Spread and survival of *Theba* (Land Snail).
  (ii) Post-dispersal predation of *Banksia* seeds.

(2) *Third-Year Projects:*
  (i) Territorial behaviour in male dragon-flies.
  (ii) Spacing in *Tettigonioidea*.
  (iii) Grasshopper feeding selection in two habitats.
  (iv) Effects of fire on insect populations.

(3) *Second-Year Projects:*
  (i) Food selection of honey-eaters.
  (ii) Seed predation on *Banksias*.

(4) *First-Year Project:*
  Responses of Arthropods to increased cover.

These projects are much less detailed than those listed under Section (a) above, and they are given only in outline.

(c) Monitoring

The State Health Department continued to monitor animals and water for *Salmonella*. The reserve still remains free of any invasion of *Salmonella* other than indigenous species.

The Public Health Department continued to measure atmospheric levels of sulphur dioxide. Levels of sulphur dioxide increased considerably during the year with 129 micrograms per cubic metre recorded on December 6, 1976, and this converted to parts per million equals 0.11 ppm. The California Standard for ambient air quality suggests that 0.3 ppm for 8 hours is damaging to vegetation. Monitoring is continuing.

(d) Works and buildings undertaken in the past year and proposed for the ensuing year

The intertior of the laboratory was repainted. Shelving and hanging space was added to each individual room. One sink cupboard and shelving above the sink plus an extension of the work-bench were also completed.

A new implement shed was completed during the year and is now in full use.

Due to the dry season drinking water for macropods was piped to Russell Swamp, Melaleuca Swamp and Banganup Lake. At all three points concrete troughs with ball valves were installed.

A fully-equipped laboratory has been proposed for the future, due to student pressure on existing facilities.

(e) The condition of the flora and fauna on the Reserve

Sixty-seven quokkas were introduced from July to October. Most of these animals were two-year-olds direct from Rottnest. A trapping programme by the Warden resulted in the following:

(1) 17 quokkas captured;
(2) all but two animals had increased in body weight;
(3) animals were caught in the north-west corner (Pearse and Russell), eastern and northern edges of Banganup Lake and Russell Swamp.

Many of the birds that have declined elsewhere in the Wheatbelt, due to land clearing, are quite common in the Hills. Included among these are Malleefowl, Redthroat, White-browed Babbler, Chestnut-tailed Thornbill, Southern Scrub-robin, Yellow Robin and White-eared Honeyeater. The presence of the Splendid Wren, *Malurus splendens* is interesting because this bird is extremely uncommon throughout most of the Wheatbelt. It exists in the Wongan Hills together with populations of Blue-breasted Wren, *M. pulcherrimus* and the White-winged Wren, *M. leucopterus.*

The occurrence of the Ashy Grey Mouse, *Pseudomys albocinereus* is significant because in the Wheatbelt this species is rare, being recorded on only six widely scattered reserves. The mouse-like Common Dunnart, *Sminthopsis murina* and the Fat-tailed Dunnart, *Sminthopsis crassicaudata* have been observed below the ridges at the junction of grassland and bushland. The Little Broad-nosed Bat, *Nycticeius greyi* which occurs in the Wongan Hills has not been recorded elsewhere in the Wheatbelt.

There is an interesting assemblage of reptiles and frogs including the geckos, *Diplodactylus pulcher* and Whipsnake, *Demansia reticulata* and the skink, *Morethia butleri* which is the most westerly known record of a dry country species.

The Gray Fantail, a resident of the Wongan Hills.
Photo by R. Garstone

A breakaway in the Wongan Hills.
Photo by K. Kenneally

DEPARTMENTAL INVOLVEMENT

In its review of environmentally important areas in System 4 (the Wheatbelt), the Environmental Protection Authority recommended that:

> "The owners of private lands (the Wongan Hills) adjoining the reserves, should be commended on the conservation work they have done. If the present conservation work ceases, however, steps should be taken to retain the land in its present state."

This recommendation is being considered now by the Department of Fisheries and Wildlife and monitoring has already commenced using colour aerial photography. Such photography clearly shows boundaries between vegetative communities; it also indicates that each farm property is subject to a particular land-use regime. The photography could be used for photogrammetric contouring if and when the vegetated ridges begin to erode.

SO IT CAN REMAIN AS WILDERNESS

The local community will be encouraged to continue to conserve the Hills as a wilderness area. If any change is contemplated by landowners, by way of clearing or other development, the Department would like to be invited to discuss the proposal with a view of either purchasing the property or reaching an agreement which would ensure the retention of the land as a wilderness area.

THE WONGAN HILLS

During 1977 the W.A. Naturalists' Club conducted a biological survey of the Wongan Hills.

Such a survey had not been done for many years and it was necessary to evaluate the current biological situation and determine possible past effects from agriculture.

The Department of Fisheries and Wildlife decided to produce a leaflet incorporating a precis of the report with additional reasons why the status of the Hills should be maintained by its private land owners. It was also necessary to inform the people of Wongan-Ballidu of the need to maintain the biological diversity and natural resources of their community.

The Wongan Hills are vegetated by one of the largest remaining single representative samples of natural bushland (some 1 750 hectares) in the Northern Wheatbelt.

The Hills themselves, lie 12 km north-west of the township of Wongan Hills which is 194 km north-east of Perth in the Wongan-Ballidu Shire.

FLORA

Over two hundred and fifty species of flowering plants exist in the Hills—an exceptionally high number of species for a single area. Some plants such as the Dryandra, *Dryandra comosa* and the Triggerplant, *Stylidium coroniforme* do not occur anywhere else in the world.

There are only two small nature reserves existing within the Hills for the protection of flora and fauna. Most of the Hills are on private property, and their future as a prime ecological entity depends upon the landowners.

LANDSCAPE

The Hills' landscape is a complex of ridges dissected by steep gullies, and Breakaways. A capping of laterite overlays outcropping greenstone rocks. Such a concentration of rugged landforms are uncommon in the Wheatbelt, and the rugged terrain has created difficulties for farming. Consequently, it is fortuitous that the Hills remain as an isolated haven for native plants and animals.

HISTORICALLY IMPORTANT

The Hills are important both historically and biologically. Named in 1836 by Surveyor-General J. S. Roe they were subsequently visited as early as 1842 by the colonial botanist James Drummond who was accompanied by John Gilbert, the noted collector employed by the famous British ornithologist John Gould. Many plant and animal specimens obtained from the Hills by these men were new to science.

FAUNA CONTENT

There is a wealth of vertebrate animals in the Wongan Hills; to date 112 birds, 10 native mammals and 26 reptiles and frogs have been recorded. Such a variety of animals is directly due to the diversity of vegetation.

Common Dunnart.

Photo by A. G. Wells

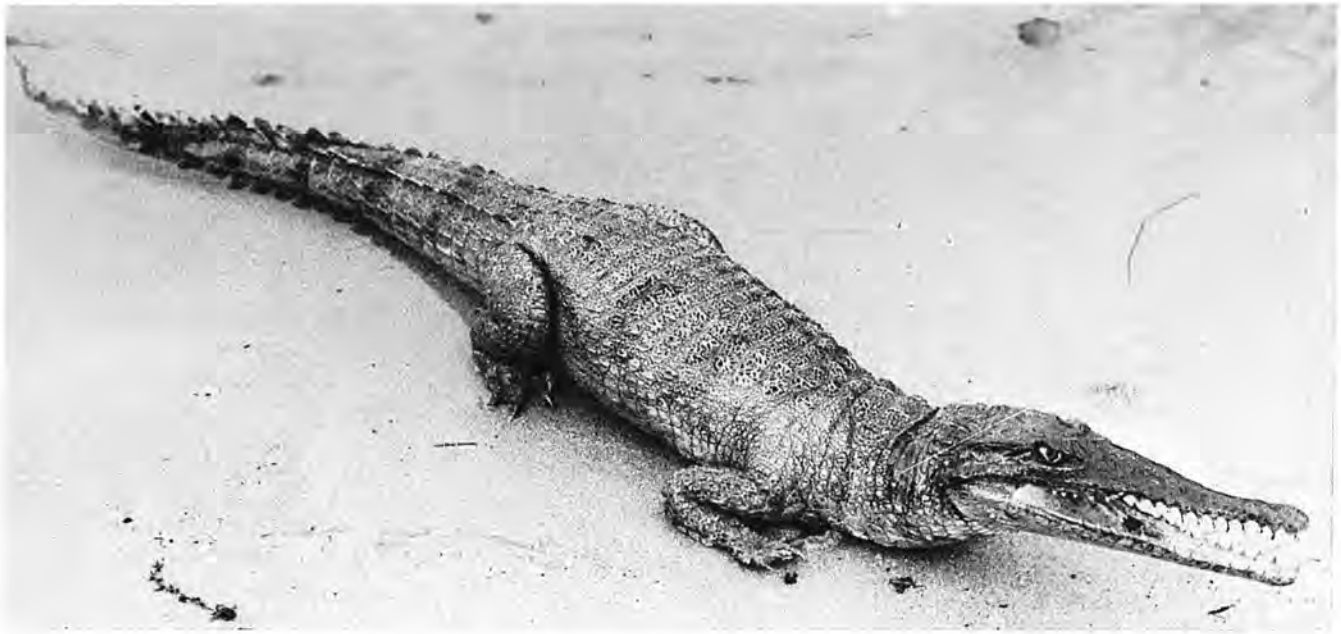
FRESHWATER OR "JOHNSTONE'S" CROCODILE

Crocodylus johnstoni

Description. Snout narrow, smooth without ridges; 19 teeth normally, on each side of the upper jaw, 15 on the lower; a post-occipital shield of scutes and a nuchal shield. The upper surface is brown, sides mottled, and ventral surface whitish. Attains 2-3 m.

Food. Any creature large enough to swallow, but preference is shown for frogs, giant shrimps, crayfish, small fish, and insects and spiders. In some dissected specimens have been found the remains of water rats, young *C. johnstoni,* and goannas.

Reproduction. During August and September the female, with her hind feet, scoops an ovoid hollow measuring about 15 cm by 30 cm, and 46 cm deep, in a high firm sandbank close to the water. She deposits from twelve to twenty-four white hard-shelled eggs and covers them with sand.



SALTWATER OR ESTUARINE CROCODILE

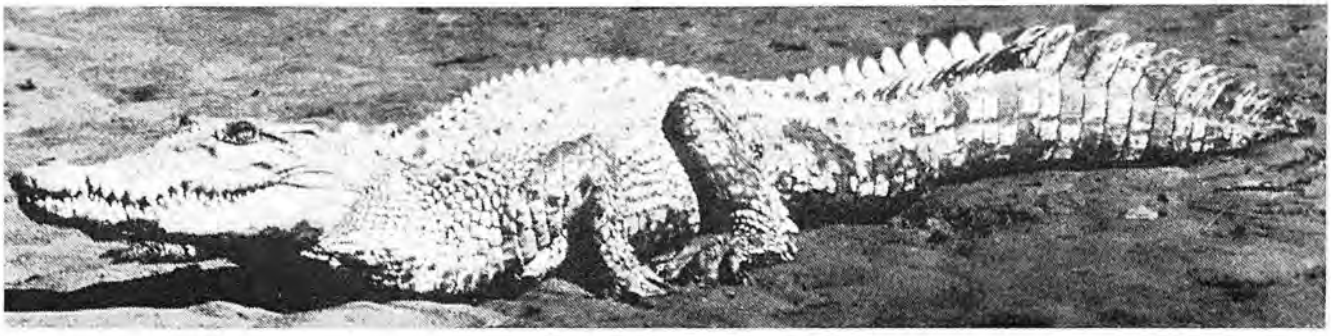
Crocodylus porosus

Description. Snout comparatively broad. A ridge extends from each eye to the premaxilla; normally 17 teeth on each side of the upper jaw, 15 on each side of the lower jaw. A shield of nuchal shields present but rarely any post-occipital scutes. Dorsal surface variable from blackish to mottled brown and yellow, ventral surface whitish to yellow.

Food. Principally fish and crabs in salt water, and fish, crayfish, and water rats in fresh water. Examination of the stomach contents of over three hundred Esturine Crocodiles, yielded fish, birds, turtles, turtle-eggs, smaller crocodiles, snakes and wallabies.

Reproduction. It was previously assumed that all Estuarine Crocodiles made their way to fresh water to breed, and returned to salt water every dry season. Actually they will breed wherever the banks are suitable along the salt-water rivers, usually away from the mouth.

Throughout the wet season to early in the dry season, between October and May, the female deposits from forty to eighty or more hard-shelled eggs, measuring up to 8 cm in length, on a hard bank well protected by river scrub. The eggs incubate in a nest mound of leaf mould roughly 2 m across by 46 cm deep.



Our Diminishing Heritage

A most maligned animal group, widely loathed, little understood and surrounded by myths—Crocodiles are reptiles but like spiders, enjoy low public esteem, being credited with many harmful and unpleasant habits.

So wrote Dr H. Robert Bustard, an authority on crocodiles.

In his many writings from which most of this article is taken, Dr Bustard points out that crocodiles have a place in nature and are no more than master predators that have already evolved a way of life making them supreme in their chosen habitat. They are descended from prehistoric reptiles called archosaurs—ancestral also to the dinosaurs, and somewhat like them in living pattern. Crocodiles have continued to maintain the same life style for 170 million years.

Like most reptiles, crocodiles do not thrive under cool conditions. For this reason they are restricted to the tropics, in Australia being found only in the north, occurring in Western Australia, the Northern Territory, and Queensland. In Western Australia they are restricted to the Kimberley Division.

In Australia there are two species of crocodile, the Freshwater or Johnstone's Crocodile (*Crocodylus johnstoni*) and the Saltwater or Estuarine Crocodile (*Crocodylus porosus*). These two species illustrate a number of points which have been central to evolution and distribution of the crocodile group. There has been a radiation or evolution in two main directions, namely, the development of long-snouted species with slender jaws and of short-snouted, broad-jawed species. The Australia freshwater species and the estuarine crocodile are representatives of these two groupings respectively. The distribution of freshwater crocodiles is usually closely circumscribed, since saltwater forms a barrier to their dispersal. Hence, adjacent areas of the world separated by even a narrow area of sea may have evolved quite distinct freshwater crocodiles.

The saltwater crocodiles on the other hand, like many seagoging animals, have been able to disperse and colonize other suitable habitats. Probably no crocodile has been as successful at this as the estuarine species (*C. porosus*). This crocodile is widely distributed in Asia from the Indian sub-continent eastwards, and extends southwards through the Malay peninsula and Indonesia to northern Australia. It often occurs on fairly small, remotely-placed Pacific islands having, for instance, been recorded at least once in the Fiji Islands, which are thousands of miles from any substantial land-mass.

The young crocodile begins life as one of a batch of eggs laid by the mother somewhere where they will not run the risk of being flooded by rising water.

Some crocodiles nest during high water levels, either in or immediately after the "wet". Some solve this problem by laying their eggs in nests which they construct in floating grass islands that rise and fall with the water. The estuarine crocodile constructs its nests in fresh water swamps or on the banks of rivers, usually above flood level. However, many nests are destroyed by sudden floods after heavy rain. Others, of which the Australian freshwater species is an example, nest during the dry season, laying their eggs in sandbanks. The young of the latter species must emerge before the water-levels rise at the start of the next wet season. Emergence is usually timed so that the rising flood-waters serve to disperse the recently-hatched young, which would be extremely vulnerable if they were all cooped up in small dry-season pools. When they hatch, baby crocodiles are quite tiny, a total length, including the tail, or around 23 cm being usual, although of course, there are species differences. They are extremely vulnerable to a whole host of predators, including many fish, birds, reptiles, and mammals which larger crocodiles themselves eat.

Although juvenile crocodiles have many enemies, without man to disturb the balance crocodiles would always be numerous. This is because they are long-lived animals and require only a very low level of survival among their progeny to offset natural losses.

All crocodiles are semi-aquatic, and show adaptations to their way of life. The eyes and nostrils (see the accompanying photos) are placed well up on top of the head so that the crocodile can swim or float with only the eyes and nostrils exposed. There is a fleshy flap at the back of the mouth which cuts ofl the throat so that crocodiles can open their mouths under water withont drowning. The rear feet are webbed and the tail, the main organ of propulsion, is flattened laterally to make a powerful paddle. When swimming, all four limbs are folded back along the body. Crocodiles' jaws are well equipped with sharp teeth to hold the prey. This is particularly important with slippery prey such as fish, which forms an important part of the diet of all species at least during part of their life.

Crocodiles, like other reptiles, grow throughout life, old is synonymous with large. Let us take an example from the Australian estuarine species. Although females very rarely exceed 4.2 m, males certainly grow to at least 6.1 m. Sexual maturity in females is reached at between 1.8 m and 2.1 m. The old male crocodile is king within his territory or "station". In territorial battles the young males may be killed without having a chance to breed, breeding being the prerogative of the "station" owning crocodiles.

Crocodiles are carnivores and as they grow their diet changes from insects, tiny fish and frogs at birth, to crustacea, larger fish, then other reptiles and birds and in large individuals, mammals usually come to make up a large part of the diet.

They like fresh prey, and eat it at once. The idea that they keep food in underwater lairs until it is rotten is a myth.

Continued on page 15

Rusty Numbat—*Myrmecobius fasciatus rufus.*
Dibbler—*Antechinus apicalis.*
Long-tailed Dunnart—*Sminthopsis longicaudata.*
Ingram's Planigale—*Planigale ingrami.*
Pygmy Marsupial-Mouse—*Planigale maculata.*
Big-eared Hopping-Mouse—*Notomys megalotis.*
Long-tailed Hopping-Mouse—*Notomys longicaudatus.*
Dusky Hopping-Mouse—*Notomys fuscus.*
Stick-Nest Rat—*Leporillus conditor.*
White-tipped Stick-Nest Rat—*Leporillus apicalis.*
Shark Bay Mouse—*Pseudomys praeconis.*
Gould's Native Mouse—*Pseudomys gouldii.*
Shortridge's Native Mouse—*Pseudomys shortridgei.*
Dugong—*Dugong dugon.*

Birds

Red-tailed Tropic bird—*Phaethon rubricauda.*
White (Mute) Swan—*Cygnus olor.*
Freckled Duck—*Stictonetta naevosa.*
Cape Barren Goose—*Cereopsis novaehollandiae.*
Burdekin Duck—*Tadora radjah.*
Crested Hawk—*Aviceda subcristata.*
Red Goshawk—*Accipiter radiatus.*
Peregrine Falcon—*Falco peregrinus.*
Grey Falcon—*Falco hypoleucos.*
Scrub Fowl—*Megapodius freycinet.*
Lesser Noddy—*Anous tenuirostris.*
Red-crowned Pigeon—*Ptilinopus regina.*
Green-winged Pigeon—*Chalcophaps indica.*
Partridge Pigeon—*Geophaps smithii.*
Mangrove Kingfisher—*Halcyon chloris.*
Alexandra (Princess) Parrot—*Polytelis alexandrae.*
Naretha Bluebonnet—*Psephotus haematogaster narethae.*
Ground Parrot—*Pezoporus wallicus.*
Night Parrot—*Geopsittacus occidentalis.*
Grass Owl—*Tyto longimembris.*
Rufous Owl—*Ninox rufa.*
Noisy Scrub-bird—*Atrichornis clamosus.*
Cicadabird—*Coracina tenuirostris.*
Western Whip-bird—*Psophodes nigrogularis.*
Purple-crowned Wren—*Malurus coronatus.*
Thick-billed Grass-Wren—*Amytornis textilis.*
Rufous Bristle-bird—*Dasyornis broadbenti.*
Brown Bristle-bird; *Dasyhornis brachypterus.*
Lemon-breasted Flycatcher—*Microeca flavigaster.*
White-browed (Buff-sided) Robin— *Poecidryas superciliosa.*
Rufous Fantail—*Rhipidura rufifrons.*
Shrike-Tit—*Falcunculus frontatus.*
Red-eared Firetail—*Emplema oculta.*
Yellow-rumped Finch—*Lonchura flaviprymna.*
Major Mitchell—*Cacatua leadbeateri.*

Reptiles

Salt-water Crocodile—*Crocodylus porosus.*
Fresh-water Crocodile—*Crocodylus johnstoni.*
Western Swamp (Short-necked) Tortoise—*Pseudemydura umbrina.*
Leathery Turtle—*Dermochelys coriacea.*
Lancelin Island Skink—*Ctenotus lancelini.*
Lined Skink—*Lerista lineata.*
Carpet Snake—*Python spilotus.*

Amphibians

Round Frog—*Arenophryne rotunda.*

Wildlife and Fisheries Officers now in Uniform

All Fisheries Inspectors and Wildlife Officers are now wearing uniforms for the first time.

The Minister for Fisheries and Wildlife Mr G. C. MacKinnon, officially presented the new uniforms to the public on a T.V. news programme.

Mr MacKinnon said that the uniform would allow the public to recognise Fisheries and Wildlife Officers and so obviate some of the past problems associated with establishing identity.

The uniform has a colour combination of light fawn and deep brown with epaulettes embroidered with the words "Fisheries and Wildlife".

On the cap is a badge which also carries the Department's name and each officer is identified on a silver bar worn above the left breast pocket; the bar contains the Departmental motif and the officer's name.

Shorts will replace the long pants for summer dress and an olive green jacket is worn for cold weather duty.

Mr MacKinnon added that on special occasions it might be necessary for officers to wear "civvies" but on every occasion an authority card was carried which identified the Officer and members of the public should always insist upon the production of this identification.

The new uniform worn by Wildlife Officer M. Osborne.

6. *Pseudomys occidentalis*—Western Mouse.
Survey work has shown that the Western Mouse has secure habitat on a number of reserves.
7. *Wyulda squamicaudata*—Scaly-tailed Possum.
Recent work shows that this species is widespread in the north-west Kimberley.

Additions

1. *Planigale ingrami*—Ingram's Planigale.
This was formerly known as *P. subtilissima* in W.A. It is known from only two localities in W.A.—Kununurra and near Derby.
2. *Planigale maculata*—Pygmy Marsupial Mouse.
Known from only two localities in W.A.—the Drysdale River National Park and Barrow Island.
3. *Anous tenuirostris*—Lesser Noddy.
In Australia this species is found only in the Abrolhos where it has only two nesting colonies—on Pelsart and Wooded Islands. One catastrophe such as a wrecked tanker or oil spill could be disastrous.
4. *Megapodius freycinet*—Scrub Fowl.
Restricted to a very few localities in the Kimberley where there are well developed vine thickets. Relatively common in the Northern Territory and Queensland.
5. *Aviceda subcristata*—Crested Hawk.
In W.A. only known from the Kimberley and rarely sighted.
6. *Accipiter radiatus*—Red Goshawk.
Again an eastern species which is rarely sighted in the Kimberley.
7. *Falco hypoleucos*—Grey Falcon.
Although this bird has a widespread distribution it is extremely rare and breeding records are most unusual.
8. *Ptilinopus regina*—Red-crowned Pigeon.
Restricted to a few patches of vine-thicket in the Kimberley.
9. *Chalcophaps indica*—Green-winged Pigeon.
Same as Nos. 6 and 10.
10. *Ninox rufa*—Rufous Owl.
Known only from a very few localities in the Kimberley.
11. *Halcyon chloris*—Mangrove Kingfisher.
Rarely observed or collected in Western Australia.
12. *Coracina tenuirostris*—Cicadabird.
Another very rare Kimberley species which is more common in other States.
13. *Microeca flavigaster*—Lemon-breasted Flycatcher.
This race, often referred to as the Brown-breasted Flycatcher is restricted to the Kimberley and is only rarely recorded.
14. *Poecilodryas cerviniventris*—Buff-sided Robin.
Rarely recorded in the Kimberley, also occurs in the Northern Territory and Queensland.
15. *Falcunculus frontatus*—Shrike-Tit.
Both the southwestern race (*leucogaster*) and the northern race (*whitei*) are rarely sighted.
16. *Rhipidura rufifrons*—Rufous Fantail.
Another species which is rare in the Kimberley but more common in the Northern Territory and eastern states.
17. *Amytornis textilis*—Thick-billed Grass-Wren.
Occurs in the southern half of W.A. excepting the south-west corner. Rarely sighted.
18. *Malurus coronatus*—Purple-crowned Wren.
Occurs in the Kimberley where it is rarely sighted.
19. *Lonchura flaviprymna*—Yellow-rumped Finch.
Occurs in the Kimberley and Northern Territory. rarely sighted in the Kimberley.
20. *Emblema occulata*—Red-eared Firetail.
Restricted to wet valleys in the deep south-west. Its habitat is coming under increasing pressure and the species is declining.
21. *Dermochelys coriacea*—Leathery Turtle.
It is accepted that this species is in world-wide danger of extinction. It occurs occasionally in W.A. waters and should be given special protection.
22. *Python spilotus*—Carpet Snake.
A declining species in the south-west and in need of special protection. There are secure island populations.
23. *Ctenotus lancelini*—Lancelin Island Skink.
Occurs only on Lancelin Island.
24. *Lerista lineata*—Lined Skink.
Known only from Garden and Rottnest Islands and a few southern suburbs of Perth.
25. *Arenophryne rotunda*.
This frog is known only from False Entrance in Edel Land, Shark Bay.

Consequently, in the *Government Gazette* of February 3, 1978, the Minister for Fisheries and Wildlife, pursuant to the powers conferred by Paragraph (ba) section 14 (2) of the Wildlife Conservation Act, 1950-1976, does hereby cancel wholly the provisions and operations of the proclamation and notices described in the First Schedule hereto and does hereby declare that the fauna described in the Second Schedule hereto is for the purpose of that Act fauna which is rare, or otherwise in need of special protection.

First Schedule.

1. Notice published in the *Government Gazette* (No. 22) of March 17, 1972;
2. Notice published in the *Government Gazette* (No. 50) of June 30, 1972;
3. Notice published in the *Government Gazette* (No. 14) of February 9, 1973;
4. Notice published in the *Government Gazette* (No. 34) of May 11, 1973; and

Second Schedule.

Mammals

Barrow Island Euro—*Macropus robustus isabellinus*.
Crescent Nail-tailed Wallaby—*Onychogalea lunata*.
Spectacled Hare-Wallaby—*Lagorchestes conspicillatus*.
Western Hare-Wallaby—*Lagorchestes hirsutus*.
Banded Hare-Wallaby—*Lagostrophus fasciatus*.
Brush-tailed Rock Wallaby—*Petrogale penicillata*.
Woilie—*Bettongia penicillata*.
Boodie—*Bettongia lesueur*.
Broad-faced Potoroo—*Potorous platyops*.
Gilbert's Potoroo—*Potorous tridactylus gilberti*.
Rock-haunting Ringtail—*Petropseudes dahli*.
Marl—*Perameles bougainville*.
Pig-footed Bandicoot—*Chaeropus ecaudatus*.
Dalgyite—*Macrotis lagotis*.

The Olgas "Katatjuta" 32 km west of Ayers Rock. Height: 546 m, 1 072 m above sea level. Circumference of Group: 22 km. Assignment: Prepare a management programme for this area.

NEW LIST OF PROTECTED RARE FAUNA

In 1972 it was decided that certain species of Western Australian fauna required additional protection and so the "rare and likely to become extinct" list was proclaimed with penalties of $1 000 for non-compliance.

By early 1973, 53 species were afforded this protection, which covered 5 main categories.

(1) Species which were probably already extinct in Western Australia.
(2) Species which were always rare.
(3) Species which were once widespread, but whose range has been reduced drastically since European settlement.
(4) Species which have been collected very rarely; may be common, may be extinct, no information available.
(5) Species which are still relatively common but which are subject to hunting pressures which may cause them to become very rare.

It has been four years since the last extensive review of species declared under Section 14 of the Wildlife Conservation Act and since then, much additional knowledge has been gained of previous little known areas and species in Western Australia.

The Minister has therefore approved the classification of a revised list of species in accordance with Section 14 of the Wildlife Conservation Act which reads:—

> "The Minister may, from time to time by notice published in the *Government Gazette*, declare that any fauna specified in the notice is for the purposes of this Act fauna which is likely to become extinct, or is rare or otherwise in need of special protection and while such declaration is in operation—
>
> (i) such fauna is wholly protected throughout the whole of the State at all times; and
>
> (ii) a person who commits an offence under Section sixteen of this Act with respect to or in relation to such fauna is liable, notwithstanding any other provision of this Act, to a penalty of one thousand dollars."

The deletions from and additions to the new list together with explanations are as follows:—

Deletions

1. *Antechinus rosamondae*—Little Red Antechinus. Work by Dr P. Woolley has shown that this species is easily obtainable in the Pilbara.
2. *Sminthopsis granulipes*—White-tailed Dunnart. Now known from several additional localities in the south-west.
3. *Sminthopsis murina oooldea*—Troughton's Dunnart.
   Has been collected in the Great Victoria Desert, on both existing and proposed reserves.
4. *Planigale tenuirostris*—Narrow-nosed Planigale. Following a revision of this group by Dr M. Archer it is clear this species is not known from W.A.
5. *Planigale subtilissima*—Kimberley Planigale. This is now included in *Planigale ingrami* (see below).