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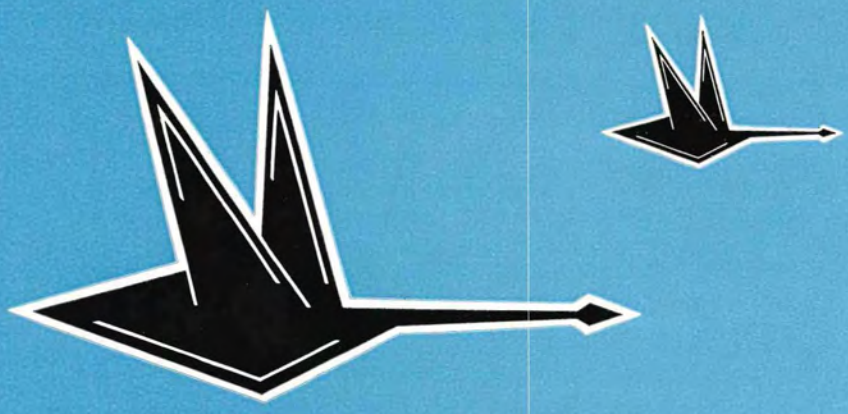
WESTERN AUSTRALIA



S.W.A.N.S.

State
Wildlife
Advisory
News
Service

Vol. 4 No. 3
Winter, 1973

S.W.A.N.S

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WINTER, 1973

Issued by direction of the Hon. A. W. Bickerton, M.L.A., Minister for Fisheries and Fauna.

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

Chief Warden of Fauna: 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....

The Commonwealth ban on the export of kangaroo products remains. Although South Australia has announced the introduction of a tagging system with similarities to the Western Australian Kangaroo Management Programme, and Tasmania is expected to introduce a tagging system soon, the other States do not appear to have made much progress. Western Australia has already forwarded its report on its Kangaroo Management Programme to the Department of the Environment and Conservation in Canberra but, despite the acknowledged excellence of our system, it is unlikely that we can look forward to any particular consideration. The Hon. Minister for Fisheries and Fauna is more optimistic, however, and considers that "we will win one day".

Even if Western Australia's management programmes are acceptable to the Commonwealth Government there is some doubt whether the United States (the main market) will be prepared to allow the import of kangaroo products until *all* states have acceptable management programmes for kangaroos.

In this issue, we have set out (pages 55 onwards) the details of Western Australia's Kangaroo Management programmes in the form that they were forwarded to the Department of the Environment and Conservation. We make no apology for filling the bulk of this issue with details of this report; acceptance of the report and the continuance of our management programmes is of vital importance to Western Australia and essential for the conservation of kangaroos in this State.

IN THIS ISSUE....

RESEARCH: A BASIS FOR MANAGEMENT

By J. D. OVINGTON and R. W. BODEN

A paper presented at the Australia and New Zealand Association for the Advancement of Science Conference held in 1971 in Brisbane.

Professor Ovington is head of the Department of Forestry at the Australian National University and Dr. Boden is a senior officer in the Federal Department of Environment and Conservation.

JUSTIFICATION FOR RESEARCH

Currently more than 34 million acres have been set aside specifically for conservation purposes in Australia and it seems likely this area will increase significantly within the next decade. The acquisition and declaration of conservation reserves is only a beginning: once acquired a reserve must be managed to ensure it is kept in an appropriate ecological condition. The management and maintenance of these areas largely depends on public funds and, clearly, there is a need to introduce planned management to ensure these funds are used wisely.

Research is fundamental to sound management of any business, organisation or natural resource, and a well designed and controlled research programme can be a wise economic investment in ensuring the prescribed management aims are attained at minimum cost. Conservation management is no exception to this need for supporting research.

Research in conservation has specific features and, whilst research in the related fields of forestry, agriculture, fisheries, watershed and rangeland management can provide information relevant to conservation areas, seldom are the results completely satisfactory for conservation purposes. This is partly because the aims of conservation are more comprehensive, usually being concerned with more than one species and involving whole ecosystems rather than emphasising single products. For example, in forests managed primarily for timber, hazard reduction by prescribed burning is an established practice, with large areas burnt each year. Whilst the principle of prescribed burning has application in conservation management, the methods and scale of operations adopted in commercial forests cannot be applied uncritically to conservation areas. Similarly, the results of nutrition studies on domesticated animals for wool or meat production might assist in formulating management policies for the indigenous fauna but cannot be applied indiscriminately.

Productivity in agriculture, forestry and water catchment may be measured in pounds of wool, tons of logs, or gallons of water and emphasis is generally placed on one or, at best, a few main products. In conservation management, features such as diversity are desirable and the component parts of the ecosystem assume individual importance. Productivity in conservation reserves is difficult to measure; surprisingly little research has been done in formulating management aims and in developing techniques to assess the success of conservation management. Declaration is only the beginning in reserve management and research.

NATURE OF RESEARCH

If the term conservation reserve is considered in the broad sense to include national parks as well as strict nature reserves, conservation research can be grouped into two major categories. First, studies of such natural resources as animals, plants, rocks, soils and their interaction and, second, study of the people who use the areas—their numbers, behaviour patterns, interests and, particularly, benefits derived from the reserve.

[a] Natural Resource Research

Ideally, detailed study of the natural resources of a conservation area should be carried out as a basis for selecting sites. In practice detailed study generally begins only after a reserve is established and tenure secure.

Initially, research in a particular reserve usually centres on the survey and assessment of the resources using techniques such as the establishment of permanent plots to record changes with time and evaluate the success or otherwise of management.

Later, research may concentrate more on individual features of the reserve, for example, interactions between characteristic organisms, bird breeding cycles, litter fauna composition, or tree regeneration patterns. This latter type of interpretive research is often carried out by specialist scientists or short-term post-graduate students but the results add to the accumulating knowledge of the reserve and often provide valuable management information.

Another important type of research can be "problem solving" where management may persuade, invite, or commission research workers to investigate problems affecting management. Examples of this type of study include methods to control invading exotic plants and animals without adversely affecting indigenous ones, disease outbreaks in fauna, the effect of visitor numbers on soils and vegetation, or the design of a suitable road, track and nature trail network.

The primary application of this research should be in the preparation of management plans to achieve the conservation aims for which the reserve was established, and in checking the effectiveness of management. Such research results are also of fundamental value in the preparation of interpretive material for displays, films, booklets, and notice boards at points of interest in the reserve. If public and student use cannot be encouraged on the reserve, there are often areas of similar characteristics nearby which can be used in nature interpretation.

[b] User Research

The second major kind of research in some conservation areas is "user research". Many reserves are established with public enjoyment and education as aims, but little study is done to determine if these objectives are being achieved. Some managers of conservation areas may feel that, while ever visitors come to the reserve, it must be fulfilling its aims, but there is need to know if the same visitors keep returning and, if not, why. It is well

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established that the measure of enjoyment of music, theatre and sport is related to the level of understanding of the art, and it is likely that visitor reaction to a conservation reserve is related to his background knowledge. "All gum trees look the same" is a common remark.

A recent visitor study at Tidbinbilla Nature Reserve in the A.C.T. found many people expressing disappointment at the apparent absence of animals during the middle of the day. Biologists know that many native animals are nocturnal but many of the public do not until, by various means, this fact is interpreted for them and it is pointed out that evening visits to the bush can be much more rewarding. Similarly, many visitors expect to see large numbers of animals and birds, partly because they are only familiar with high density populations in zoological gardens. They are unaware of the intense supplementary feeding to support such numbers and the small carrying capacity of the native bushland.

When visitors to a reserve claim they "did not see much" it is often because what is there was not interpreted for them at all or was described in terms they could not understand.

The natural history scientist needs the assistance of the social scientist to conduct research to determine the effectiveness of educational programmes. Interpretation is often the first to suffer in budgetary cuts, largely because at present there is no measure of its effectiveness. Also the benefits from it are often not reflected in the reserve itself but elsewhere in the community.

Visitor surveys can be an aid to management by recording use of different areas. In the A.C.T. study referred to, 77% of groups visited the kangaroo enclosure but only 33% the visitor centre; thus, if management is relying on displays in the visitor centre as its main educational tool, ways must be found of attracting more visitors to it.

Users surveys can also be of value in obtaining basic information on patterns of attendance throughout the year and within each day to assist management in staff allocation. They may be vital in providing data which enables conservationists to convince politicians of the need for supporting finance for management and reserve acquisition.

CONTROL OF RESEARCH PROJECTS

The long term protected status of conservation reserves combined with their high degree of naturalness and often the availability of trained wardening staff makes them increasingly attractive areas for research. The attractiveness will tend to increase as a body of scientific knowledge relevant to the reserve accumulates, as facilities such as laboratories, observation huts, museums and living quarters are constructed, and as more and more scientists develop research programmes in the reserve. As alienation of native bushland for agriculture, factory and urban development continues, conservation reserves will become the major source of material for research into indigenous species and ecosystems.

Even though scientific data from which to formulate sound management policies are very limited and much needed in Australia, some restrictions may still have to be placed, even at an early stage, on the number of research workers, the types of research and the timing of research lest they adversely affect the conservation quality of a particular reserve.

For example, in a coastal reserve having an important colony of ground nesting sea birds, it may be necessary during the breeding season to prohibit all visitors to the breeding area except for a small number of responsible ornithologists carrying out relevant research on the breeding colony. At other times of the year, the uninhabited breeding areas would not be banned to others, e.g. botanists and geomorphologists, provided their research is unlikely to change significantly the ecological nature of the area.

A variety of other reasons may justify control of research activities on conservation areas. Typical examples are in small reserves where a particular project is on such a scale it interferes with other research projects: in cases where research creates health hazards, for instance through the introduction of radio active elements into an ecosystem; where the research may require an undesirable massive introduction of equipment into a reserve; destructive sampling, or where a research worker is unwilling to release the results of his research to aid management decisions.

The control and direction of research activities in conservation areas, particularly where scientific knowledge is limited, can present serious problems to anyone responsible for managing the area to attain prescribed management aims. This is especially so if restrictions have to be placed on unco-operative scientists, or people occupying senior positions and who may have been active in having the area declared a conservation reserve.

Nevertheless, responsible control must be exercised over research in conservation reserves and it is important to set down acceptable guidelines within which research may be carried out whilst ensuring they are not unreasonably restrictive and unimaginative in operation.

RESEARCH PRIORITIES AND CRITERIA

Clearly, high priority should be given to monitoring-type studies which provide successional records of the organisms present and ecological conditions. Such studies can be invaluable in judging the success of past management, but care must be taken to ensure sampling is not on such a scale as to adversely affect the reserve. Repetitive photography from fixed positions can provide valuable records of change with little impact on the reserve.

High priority should also be given to research orientated to solving practical management problems of current concern, indeed initially, management itself may be organised so as to be of an experimental exploratory nature leading to research opportunities in the critical evaluation of the effects of different kinds and intensities of management.

For example, whilst many Australian ecological communities have been influenced by fire, the use of fire as a management tool to maintain characteristic communities on Australian reserves is a matter of debate. The management plan for a conservation reserve where fire is an important ecological factor might initially require the general continuance of the existing management whilst introducing to selected subdivisions of the reserve different fire regimes ranging from complete protection to regular prescribed burns of different intensities. The replication, location and size of each treatment should be sufficient to permit research scientists to make statically sound evaluations of the effects of different treatments on the flora, fauna and soil.

It then becomes possible to formulate a programme of reserve management incorporating the most appropriate fire regime or combination of regimes, to enhance the conservation value of the reserve.

Another important consideration in allocating research priorities is related to the uniqueness of a reserve. If the reserve is truly unique then obviously management research has to be done largely on the reserve itself. In many cases neighbouring areas are ecologically sufficiently similar to the reserve that research there can meaningfully be applied to the reserve. Under these conditions, there can be little justification for allocating high priority to research on the reserve, particularly where it may involve destructive sampling or large scale intrusion into the landscape.

DISCUSSION

Whilst research has an important contribution to make to the management of conservation reserves, its success will depend upon co-operation: co-operation between research scientists, and between research scientists and and the managers of reserves. Research scientists, like the general public, must accept the need for some control. In particular it is important that they concentrate research on the more critical problems of management. Acceptance of this immense challenge can provide satisfaction and achievement in seeing the research successfully applied and in serving as a demonstration of sound conservation management.

(With acknowledgment to "Australian Parks" Vol. 10, No. 1 August 1973).

PETRELS LONG FLIGHT

Warden Kevin Morrison of Busselton has forwarded the following report:—

"In my report of 10th July this year about the number of Giant Petrels blown ashore during the early winter gales, I mentioned that one of these petrels which had been found in an exhausted state at Wonnerup on 3rd July, was wearing a British Museum leg band No. 504.9560.

I subsequently wrote to the British Museum in London, reporting the recovery of the bird and have now received back the details of the place and date the bird was banded.

It was banded on Signy Island in the South Orkney Group at Antarctica on 23rd March this year. Three months and ten days later it was recovered at Wonnerup near Busselton.

This represents a distance travelled by the bird of at least 5,350 miles, measured in a straight line, from the point of banding to the point of recovery. The actual distance covered by the bird during this period would probably be far greater.

Taking the distance of 5,350 miles, which is the minimum the bird could have travelled in the 100 days from the time it was banded to the time it was recovered, the petrel averaged 53½ miles per day.

As a point of interest, the bird was taken to Perth the day after being found and handed over to Miss Lexie Nicholls. It was cared for until it had regained its strength, and then released."

COMMERCIAL FARMING OF MARRON

The Fisheries Research Branch of the Department has obtained funds ($22,719 in 1973–74) from the Commonwealth Fishing Industry Research Trust Account for further research to encourage the development of commercial farming of marron.

An extensive experiment is proposed in the Kojonup area of the south-west over the next three years using existing farm dams, so as to avoid the usual major initial cost of fish farming necessitated by the construction of ponds.

Specially selected dams will be stocked with different numbers of young marron bred in expanded facilities, newly built with State funds at the Pemberton Fish Hatchery. The progress of these stocked marron will be followed for up to two years by monthly sampling to determine growth and survival of the marron and important environmental factors in the dams. Departmental staff will closely liaise with farmers in managing the environments of the selected dams, so as to favour high growth rates and survivals, and hence maximal crops of saleable marron. Cropping of edible sized marron and market testing will complete the field project. Results of the project will then be made available to all interested persons.

The environmental factors influencing the success of marron in farm dams near Kojonup have been determined by the Fisheries Department during the past four years. The information obtained will soon be available in a Departmental publication—Morrissy, N. M. (1973) "The ecology of marron, *Cherax tenuimanus* (Smith), introduced into some farm dams near Boscable in the Great Southern area of the Wheatbelt Region of Western Australia" Fisheries Bulletin No. 12—obtainable from the Publicity and Extension Officer, Department of Fisheries and Fauna, 108 Adelaide Terrace, Perth, W.A. 6000 (from 1st December, 1973).

Farmers within a 20 mile radius of Kojonup who are interested in commercial marron farming, and who would co-operate with the Department by allowing the use of a dam on their property for the new experiment, should write to—"Farm Dam Marron Officer", W.A.M.R.L., P.O. Box 20, North Beach, W.A. 6020, enclosing a map and directions as to the farm location.

Selection of nominated dams will be carried out during the forthcoming summer. The catchments of such a dam should be clover pastured and the size of the dam should be approximately "2,000 cubic yards". The Dam should be located on a hill slope, well uphill from valley creeks and be excavated into white clay. Management of a dam for marron may necessitate control of sheep numbers in the paddock, but their presence is usually a favourable factor. Banking of the ground, just uphill from the dam will be required during summer, to prevent debris-laden run-off from heavy downpours entering the dam at that season. Preference will be given to newer dams or those recently renovated by draglining. Dams proposed should not contain existing populations of marron or other fish.

PROTECTION OF INLAND AND TIDAL WATERS AND WETLANDS

One of the major conservation problems in Western Australia is the continuing deterioration of our wetlands. Not only draining for agriculture, urbanisation and industrialisation but also the deterioration caused by the dumping of refuse.

Honorary wardens should certainly be aware of the following extracts from the Fisheries Act and Regulations and from the Fauna Conservation Regulations. Perhaps they and other readers are not aware, however, that Section 106 of the Police Act 1892–1972 also prohibits the dumping of rubbish and interference with the course of waterways.

1. FISHERIES ACT AND REGULATIONS

(It should be noted that, in this section, "fish" means and includes all or any of the varieties of marine or fresh water fishes and crustacea or marine animal life.)

(a) **Regulation 17.** No person shall deposit any filth, refuse, or other deleterious matter in any tidal or inland waters or into any watercourse, whether dry or not, leading into any tidal or inland waters where fish are or are likely to be.

(b) **Regulation 18.** No person shall deposit any filth, refuse, or other deleterious matter, or discharge any matter from mining works, sawmills, gasworks or other manufactories or boiling-down or wool-washing establishments in any place in a manner which will cause or be likely to cause the destruction of fish in waters near or adjacent to the place in which the matter aforesaid is deposited or discharged or injury to any fishing grounds.

(c) **Section 26.**

(1) It shall not be lawful by the explosion of dynamite or any explosive substance, or by means of any poisonous or noxious thing, to destroy or take fish in any Western Australian waters: And if any person shall explode any dynamite or any explosive substance in or under such waters, or place or cause to flow thereinto any poisonous or noxious thing, such person and all other persons assisting or being at the time in company of such persons shall, for every such offence, be severally liable to a penalty not exceeding one hundred dollars and not less than twenty dollars; But nothing herein contained shall apply to any person duly authorised by the persons and in the manner to be prescribed by the regulations to explode torpedoes or dynamite in any such waters.

(2) If any person is found in possession of, or has in his boat, any dynamite or other explosive substance immediately after such explosion, it shall be *prima facie* evidence that such person caused such explosion.

2. FAUNA CONSERVATION ACT

Regulation 46. Except as the Chief Warden of Fauna may authorise in pursuance of a management scheme or working plan or in the administration of the Act and these regulations, a person shall not, in respect of any sanctuary:—

(a) remove or disturb any humus, leaf mould, rotting vegetation, soil, stone, sand, rock or gravel;

(b) cut, pick, pull, break, remove, injure, poison, strip or destroy any tree, shrub, herb, grass or other plant thereof, whether living or dead;

(e) interfere in any manner with the water level or water supply in any sanctuary, including any lake, swamp, watercourse, river, drainage flow, well, water hole, or dam, whether natural or artificial, or use any water therefrom.

(n) introduce, place, drop, pour, spray, fog, mist or otherwise use or discharge any dangerous, poisonous or noxious substance.

3. POLICE ACT 1892–1972

Section 106.

Every person who shall cast any bottles, earthenware, filth, rubbish or any noxious substance into any watercourse, drain, river, ornamental water, canal or reservoir, or shall obstruct or divert from its channel any public sewer, watercourse, drain, or canal, shall, on conviction, forfeit the sum not exceeding $40, and shall pay the cost of removing such filth or obstruction, or of restoring such sewer, watercourse, drain or canals to its proper channel.

Wetlands and samphire flats play an invaluable role in natural life cycles and are among the richest feeding areas for crabs, prawns, fish, birds and other forms of wildlife. Because of this their use as sanitary land fill sites is inadvisable as it must lead to further depletion of the State's fish and wildlife. Already over 500,000 acres of valuable wetlands on the coastal plain alone have been drained, filled in or otherwise destroyed and wildlife stocks have been impoverished as a result. It is considered that those that still remain must be retained unless a careful evaluation by all interested parties suggests it would be in the public interest to do otherwise.

HONORARY WARDENS — APPOINTMENTS

John James, of Roy Hill Station, via Meekatharra.
John Albert Payne, of Snag Island, C/- Golden Gleam, Geraldton.
Robin Atkinson, of 319 Pellew Street, Exmouth.
Robert John Skinner, of Post Office Box 73, Wittenoom.
Donald Edward North, of corner of Murat Road and Pellew Street, Exmouth.

HONORARY WARDENS — CANCELLATION

Mr. F. Richards of P.O., Dardanup.

FAUNA DISTRICTS AMENDED

There are now 15 fauna districts in the State, divided as follows:—

Fauna District 1
Based at Wyndham. Embracing the Shires of:—
Wyndham, Halls Creek, West Kimberley, Broome.

Fauna District 2
Based at Onslow. Embracing the Shires of:—
Ashburton, Exmouth, Tableland, Roebourne, Nullagine, Port Hedland, Marble Bar.

Fauna District 3
Based at Mt. Magnet. Embracing the Shires of:—
Mt. Magnet, Yalgoo, Sandstone, Cue, Greater portions of the Murchison, Meekatharra and Wiluna.

Fauna District 4
Based at Carnarvon. Embracing the Shires of:—
Carnarvon, Upper Gascoyne, Shark Bay, portion of Murchison and Meekatharra.

Fauna District 5
Based at Geraldton. Embracing the Shires of:—
Northampton, Chapman Valley, Mullewa, Geraldton, Greenough, Irwin, Mingenew, Three Springs, Morawa, Perenjori.

Fauna District 6
Based at Moora. Embracing the Shires of:—
Carnamah, Coorow, Dandaragan, Moora, Victoria Plains, Gingin, Chittering, Toodyay.

Fauna District 7
Based at Wongan Hills. Embracing the Shires of:—
Dalwallinu, Mt. Marshall, Wongan-Ballidu, Koorda, Mukinbudin, Westonia, Goomalling, Dowerin, Wyalkatchem, Trayning, Nungarin, Merredin, Kellerberrin, Tammin, Cunderdin, Northam.

Fauna District 8
Based at Waroona. Embracing the Shires of:—
Mandurah, Murray, Serpentine-Jarrahdale, Wandering, Waroona, Boddington, Williams, West Arthur, Collie, Harvey.

Fauna District 9
Based at Pingelly. Embracing the Shires of:—
York, Beverley, Brookton, Pingelly, Cuballing, Narrogin, Wagin, Woodanilling, Dumbleyung, Lake Grace, Wickepin, Kulin, Kondinin, Corrigin, Quairading, Bruce Rock, Narembeen.

Fauna District 10
Based at Kalgoorlie. Embracing the Shires of:—
Kalgoorlie, Boulder, Menzies, Leonora, Coolgardie, Yilgarn, Laverton.

Fauna District 11
Based at Busselton. Embracing the Shires of:—
Bunbury, Dardanup, Capel, Donnybrook, Balingup, Nannup, Margaret River, Augusta, Busselton.

Fauna District 12
Based at Albany. Embracing the Shires of:—
Albany, Denmark, Plantagenet, Cranbrook, Tambellup, Broomehill, Katanning, Nyabing-Pingrup, Gnowangerup, Ravensthorpe.

Fauna District 14
Based at Manjimup. Embracing the Shires of:—
Manjimup, Greenbushes, Bridgetown, Boyup Brook, Kojonup.

Fauna District 15
Based at Esperance. Embracing the Shires of:—
Esperance and Dundas.

(See also map on p. 76.)

THE POETICAL GANGER

Some time ago the Department gave permission for a road to be built through the Lake Cairlocup Wildlife Sanctuary (Reserve No. 28324). The road was to be built by the Albany Division of the Main Roads Department and work was scheduled to commence in October this year. There was some concern that the habitat of the Fat-tailed Dunnart (*Sminthopsis crassicaudata*) would be disturbed, but the Main Roads Department was most co-operative even to the extent of arranging for a deviation in the proposed path of the road.

The following instruction was sent to the Construction Foreman:

PROTECT THE FAT-TAILED MOUSE

You may hunt the pheasant, quail and grouse
But do not harm the fat-tailed mouse
If you see her speeding like a rocket
With her young tucked warmly in her pocket
Looking for a habitat
That's safe from farmer's dog or cat,
Inside a log or under rocks
Safe also from the wily fox.

Some live in deserts, some on plains
Or in the forests where it rains.
She can eat, the experts say,
Her weight in insects every day
Then in the years when the seasons fail
Live off the fat stored in her tail,
Or let her heart be filled with hate
When she attacks and eats her mate.

As the country grows and the land is cleared
It could come to pass as we have feared.
If at this creature we would look
We will see them only in a book,
Without some effort to preserve
All natural growth on the bush reserve.
So the word has gone to Foreman Trowse
Do not disturb the fat-tailed mouse
Or let bush fires get away
And burn the bush where she loves to play.

ANON.

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Our Diminishing Heritage

The Woylie (Brush-tailed Bettong; Brush-tailed Rat Kangaroo) was once very common in the southern half of Australia, and its range extended through south-western Australia, southern South Australia and north-western Victoria to central New South Wales. It was probably once the most common and widest ranging of all rat kangaroos, but it was this very abundance which led to its destruction. Around the turn of the century, dealers in Adelaide were selling Woylies at ninepence a head for coursing, and disease and competition from rabbits and foxes were additional factors in the decline of the species. In the eastern states this decline was so rapid that Wood Jones writing in 1923 said ". . . this animal seems to have disappeared from South Australia . . . so far as this State is concerned, the race is represented only by some half-dozen skulls".

The Woylie was known by early naturalists as a kangaroo rat, for although it is a small marsupial, it does look like a large grey rat. The common name of Brush-tailed Rat Kangaroo is still used although the aboriginal name (Woylie) is receiving increasing acceptance and useage.

There are five genera of rat kangaroo which can be split into two groups, bettongs and potoroos. The bettongs, with the exception of the Boodie (*Bettongia lesueur*) which digs burrows (see S.W.A.N.S. Vol. 4, No. 1), all make their nests on the surface. The Woylie's nest is made in a hollow, usually scratched out at the base of an overhanging tussock or bush, and is generally well concealed and difficult to detect. When the nest is being made the nesting material is carried curled up in the Woylie's prehensile tail; this habit has also been observed with Woylies kept in captivity.

Woylies are partly carnivorous and, in captivity, are avid meat eaters. In the wild, food consists mainly of herbage and tuberous roots.

Woylies have five toes on the forefeet with long nails which are used for scratching holes to search for roots and grubs and for holding the food (in possum-fashion) when eating. In those times when they were more abundant they were known to gather around camps at night and approach close to people for scraps of food. Although they were once used for coursing and obviously could not outrun dogs, they are extremely agile and nimble animals.

Sadly, it does appear that the species is now extinct in eastern Australia and South Australia. That Woylies remain at all in Western Australia is due to one or all of a number of factors, including the later introduction of predators, the later clearing of the land for agriculture and our geographical isolation. However, the range of the species in Western Australia has been reduced drastically and Woylies are now known to survive only in three localities in the South West—

in Tutanning Wildlife Sanctuary, east of Pingelly

at Dryandra

in the Tone/Perup River area east of Manjimup.

Existing known populations would appear to be relatively scarce. The Tutanning Reserve is set aside in perpetuity for the conservation of flora and fauna and the other two areas are State Forest. There has been some concern that the much-criticised woodchip industry will destroy Woylie habitat, but the Forests Department has excluded that part of the State Forest where Woylies are known to exist from the woodchip industry area.

It is possible that there are other isolated pockets of Woylies still to be found in the South West. If so, then it is important that these areas be set aside and conserved. The Department's research staff will be most interested to hear from any reader who makes a positive sighting of a Woylie outside its present known range.

WOYLIE

Bettongia penicillata

DISTRIBUTION:

Formerly found in southern S.A., north-western Vic. (Murray) and central N.S.W., but now apparently restricted to the south-west of W.A.

HABITAT:

Dry sclerophyll woodland.

LOOKS:

Medium, slender build; similar to a large grey rat.

General colour—grey-brown; undersurface yellowish-white.

Ears—short and rounded with yellow hairs.

Head—short; snout is naked.

Tail—prehensile, tapering; with crest of black hair on tip.

Feet—5 toes on forefeet; 4 on hindfeet; long claws.

WEIGHT:

Male and Female—900 g (average from W.A. Museum specimens).

LENGTH:

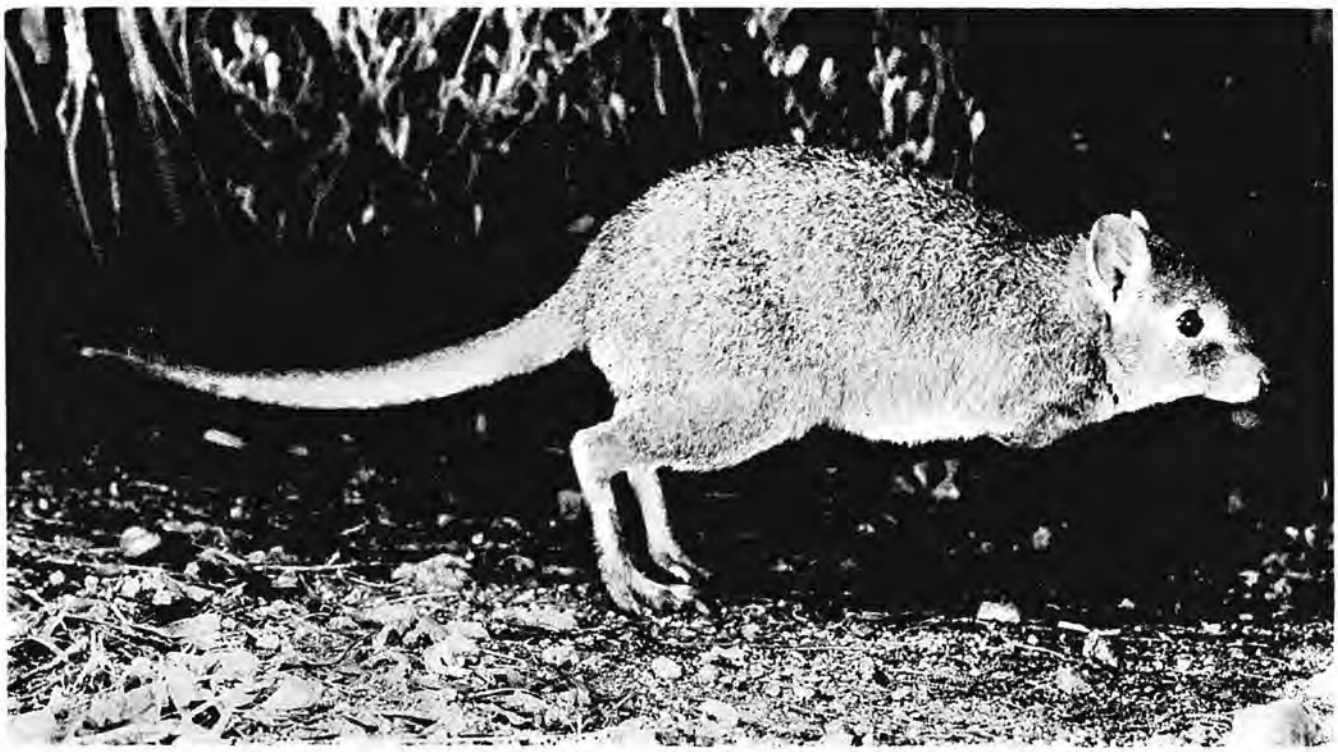
Male and Female—Head and Body 327 mm (Museum specimens)

Tail 296 mm (Museum specimens)

BREEDING:

Nests are made of grass and sticks; usually well hidden. Tip of tail is curled around nesting material to carry it. Probably breed throughout the year.

Litter size—one.



IUCN VIEWPOINT—SAVING ENDANGERED WILDLIFE

In one way or another virtually all wild things have become the wards of man. They depend on what he does—or does not do—for their survival.

As a result, many species are facing extinction. Some are seriously reduced in numbers or their habitats have been decreased or destroyed, leaving them vulnerable to the threat of extinction. Others are so rare that a constant watch must be maintained to guard them from harm.

If there is a hope to save many of the world's threatened species it will be by satisfying their biological requirements within the world's changed and changing environments.

Conservationists, unfortunately, have not always realised this necessity. Too often actions have been guided by the belief that if a species is protected from hunting, and perhaps from other forms of predation, all will be well. It has taken a long while for those who take an interest in wildlife to learn that wildlife habitat must also be protected.

Wildlife managers have slowly accumulated knowledge about cover, food habits and animal diseases. Through the development of the science of ecology information has accumulated on food chains and their place in more complex food webs. It is now known that any species exists as part of an ecosystem in which all parts must function if the species is to survive.

For more than two decades, IUCN has provided a forum for the development of a conservation philosophy which is based on the concept of an integrated environment. It has engaged in broad-range conservation action programmes to preserve unique areas as national parks or as strict nature reserves. These areas contain entire communities of plants and animals, with each unit influencing the survival of the others.

The world's threatened species have a doubtful future unless whole natural areas are preserved where life can flourish in all its complex variety. The need to preserve a wide range of such natural areas as a long-range goal, while taking immediate emergency action to halt the destruction of threatened species of plants and animals and to keep open options for continued diversity in the natural world, is a basic and central idea in the broad IUCN programme.

Based on these premises IUCN, through its Survival Service Commission, has been organising the information necessary for the protection of threatened species. An equally important function has been to organise the known biology of each threatened species so as to determine its conservation needs. Particular attention is given to endangered species whose conservation needs are urgent and to species which have not fully recovered from past depletion or whose numbers may be declining at such a rate they might subsequently be threatened with extinction.

Among the reasons why 132 mammals (listed in the current edition of the IUCN Red Data Book, Vol. 1) are threatened with extinction and an additional 60 are either approaching that situation or have only recently escaped from it, direct reduction by man stands foremost and indirect action which has caused loss or degredation of habitat stands second. The two, however are interrelated. Loss of habitat exposes a species to direct reduction. Animal species which have been overexploited or persecuted by man or which depend on relatively undisturbed habitats, whether forests, swamps or savannas, are in difficulty through the world.

The natural associations of a plant and animal community are not a simple collection of separate entities, any one of which can be changed without regard for the others. Rather, they involve many intricate inter-relations in composition, function, and structure. Some animals can thrive in a wide variety of conditions and may be represented in a number of communities. Conversely, others are specialised and may be limited to a single community.

Protection and restoration of species threatened by over-exploitation or reduction compaigns may be a painfully slow process, but it is possible if their habitats have survived, if their niche has not been occupied by a hardier species, and if they have survived persecution in sufficient numbers to sustain genetic viability. Assuming there is intent, financial support, and co-operation between political jurisdictions where they are needed, these species can be saved from extinction. Enforcement of protective regulations and application of wildlife management techniques can be effective if they are vigorously applied.

There is risk, though, in too much reliance on management because it involves a certain amount of meddling with systems that we do not understand completely and where there is a great deal of uncertainty. Most of the endangered species will survive only if the ecosystems in which they live remain intact or if they can adapt to a changed environment. The concept of an ecosystem is a very broad one, based not on size or on the number of interacting parts, but on the functional stability for a given period of time. It is conceived as a dynamic rather than a static situation.

Successful conservation programmes cannot be based on a preoccupation with saving the animal by itself. Its total environment must be preserved. The complexity of this undertaking can be realised as one considers the fragility of some associations and appreciates the amount of tinkering that has occurred with most biotic communities.

Biotic communities are continually lost or changed as agriculture, industry and human habitation puts some areas which are essential to wildlife to other uses. Many of the changes thus brought about are irreversible. Vast areas which were formely sparsely occupied by peoples who lived with nature have become thickly inhabited by agrarian and industrial societies and turned to exploitive uses. Continued and accelerating occupation seems inevitable for some time in the future.

The effect of these events in changing biotic and environmental factors which govern the distribution and quality of major ecosystems is of paramount concern to IUCN. In view of this concern, IUCN has been asked to take over operations of the Section of Conservation of Terrestrial Biological Communities of the International Biological Programme, which were to end in 1972. Some modifications of the IBP Check Sheet Survey of biotic communities are being studied with a view to

adapting these data more closely to IUCN requirements in relation to endangered species and biotic communities.

Through the work of several of its commissions, IUCN is developing a system for compilation of data based on existing classifications of biotic communities. The compilation of information on threatened species will be increasingly organised on the basis of this classification or subsequent refinements of it. The broad outlines of plant distribution are not precisely those of animal distribution, but form a useful basis for conservation effort. The effect which man has had in changing the ecological boundaries of plant and animal communities makes individual communities sometimes difficult to delineate.

IUCN's goal is to monitor a worldwide range of natural and man-made ecosystems. It will assess the extent to which adequate samples of intact systems are preserved, identify additional areas that should be set aside to insure the safeguarding of essential biotic communities, and call attention to the decline or threatened loss of animal species.

To accomplish this, current and consistent data will be obtained on a series of biotic communities. In addition, particular attention will be paid to endangered species and to vulnerable species whose survival might subsequently be threatened. For other species, the best that can be accomplished is the maintenance of a continuing surveillance of those biotic communities of which they form a part.

This continuing surveillance and review will guide the establishment of priorities for field research and conservation action. It will enable us to maintain a constructive conservation programme based on the best scientific data available.

But IUCN and all those who are working towards the same basic goals will need all possible help of all elements of the world conservation community to make it fully effective.

GREENER PASTURES

Your Assistant Editor, Richard F. Ward, who for the past two years has put together this journal every quarter, has moved on to greener pastures as the Public Relations Officer for the Community Recreation Council.

Richard took over as Assistant Editor from the winter issue of S.W.A.N.S. in 1971 (Vol. 2 No. 3) and since then has seen the circulation and popularity of the journal grow to a point where today it has become one of the foremost publications of its kind. This has been achieved by the enthusiasm and devotion of Richard to ensure that all material used was accurate, of interest to as many readers as possible, was pertinent to the time and occasion, and, most important, was of educational value to a wide spectrum of readers in the wildlife field.

The standard having now been set we must not fall below it. With a temporary reduction in the editorial staff it may be that the next issue of S.W.A.N.S. will be delayed. As Editor I feel that this will be preferable to a publication of lesser quality which would have to be put together under the pressure of staff shortage.

A. C. WALDON,
Editor.

1974 DUCK SHOOTING SEASON

On November 17, 1973 The Hon. Minister for Fisheries and Fauna, Mr. A. W. Bickerton announced the dates for the 1973-74 South West duck shooting season.

The season will open at 6 p.m. Saturday, January 5, 1974 and will close at midnight on March 31, 1974. (Published in *Government Gazette* on November 16, 1973). This closing date is provisional, said Mr. Bickerton, and a firm decision on the closing of the season will be made when research staff have studied the effect of shooting and climatic conditions on duck populations.

Mr. Bickerton said that the decision to delay the opening of the season until the new year was made because of the late breeding of many species. Had the season been opened any earlier many young birds would not have been on-the-wing.

The bag limit this season is ten ducks per person per day and there are nine game species, said Mr. Bickerton. The Pink-eared Duck had been removed from the list of game species ; it was a slow flier, a poor game bird, and had been shown to need protection.

Mr. Bickerton added that although there had been good rainfall this winter, this followed four years of near-drought conditions when many birds had not bred. For this reason there was no duck shooting season last year. Although duck populations had recovered to some extent, said Mr. Bickerton, reasonable restrictions had to be imposed this year so that the present favourable trend was not ruined.

A licence (fee $2.00) had to be obtained before game birds are taken, and these can be obtained by calling at any district office of the Department of Fisheries and Fauna or by post from the Head Office at 108 Adelaide Terrace, Perth, said Mr. Bickerton.

Mr. Bickerton added that the revenue from game licences was paid into the Fauna Conservation Trust Fund and used exclusively to finance game management research. This year, shooters would be asked to assist in the research by completing a questionnaire on their shooting activities and by returning the bands from any banded ducks which they happened to shoot. Waterfowl research was vital to the continuation of the sport of game shooting said Mr. Bickerton.

All duck shooters will be issued with a guide to the regulations when they receive their licence. This guide was very comprehensive, said Mr. Bickerton, and no shooter should have any excuse for failing to observe the rules governing the open season. Open and closed areas, game species and other restrictions are detailed in the Guide available with each licence.

WESTERN AUSTRALIA—KANGAROO MANAGEMENT PROGRAMMES

RED KANGAROO (*Megaleia rufa*)

Introduction

This report is prepared in accordance with the recommendations of the Ministerial Working Party on Kangaroos set up by the respective State and Australian Government Ministers at their meeting in Melbourne on March 9, 1973.

The Red Kangaroo Management Programme has functioned in Western Australia from February 1971. The following notes set out details of that programme in the format recommended by the Working Party.

Classification of Land Use and Habitat

Red Kangaroos occur in varying density over a range which occupies approximately two-thirds of the State, that is, an area of approximately 1,500,000 square kilometers. The map on page 65 shows the range of Red Kangaroos in Western Australia and the land use within that range.

(a) Area of range where the natural habitat is relatively unchanged. Nearly two-thirds of the range of the Red Kangaroo (900,000 square kilometres) is too arid to support pastoral and agricultural activities. Consequently, it has been relatively unchanged by European man. In this very arid area the population of Red Kangaroos is continuous but sparse.

(b) Area of range where the natural habitat is relatively unchanged but where major development is likely to occur in the future.
No major changes can be anticipated in the foreseeable future over most of the range of the Red Kangaroo. Minor changes in land use on the south western and southern limits of the range are possible.

(c) Area of range where the habitat has been greatly modified and is now largely unsuitable for *M. rufa*. No significant area.

(d) Area of range where land use has improved the habitat of *M. rufa*.
This area includes a very large proportion of the pastoral i.e. sheep and cattle grazing lands of the State. It would approximate about 600,000 square kilometres. This is the area in which the highest densities of Red Kangaroos have probably always occurred. Commercial harvesting is confined to this part of the range of *M. rufa*.

Evaluation of The Reserve/Sanctuary System

The need for reserves depends on the habitat requirements of the species and on the type and intensity of land use practised within its range.

In that part of the range of *M. rufa* which is not subjected to any use and is practically unoccupied some very large reserves exist. Further reserves could be created with little difficulty. A reserve of about 4,000,000 hectares to be known as the Queen Victoria Desert Wildlife Sanctuary has been recommended by the Australian Academy of Science and is earmarked for reservation on Lands Department plans.

There is a lack of reserves in the preferred habitat of *M. rufa*, because practically all the valuable land has been leased for grazing purposes for very considerable periods. This is the part of the range of the species where land use has altered the habitat due to the "lawn mowing" effect referred to by Newsome (1971) which tends to make green fodder available to kangaroos when normally it would not have been. The provision of stock watering points for sheep and cattle has enabled the Red Kangaroo to exploit food resources which would not have been available to it in prepastoral times, so that populations are now much larger than before settlement.

The strategy of the Red Kangaroo Management Programme is to maintain kangaroos as viable and widespread populations in its preferred range within the pastoral area. It is accepted that the Management programme must take cognizance of the total grazing pressure on the habitat which supports the introduced domestic animals and kangaroos. This is considered to be preferable to reliance on reserves in this area not only because they would have to be limited in size but also because they would encourage the elimination of kangaroos on the pastoral leases outside reserves.

It is emphasised, nevertheless, that wildlife reserves in the pastoral country are highly desirable, not so much for the preservation of *M. rufa* but for less well known species of wildlife which frequently have more rigorous requirements for food and shelter and which cannot live in areas grazed by domestic stock.

There are no major reserves for *M. rufa* in its preferred habitat. For the reasons set out above the provision of reserves for this species in this portion of its range is not seen as an urgent requirement.

The major reserves within the range of *M. rufa* have been provided primarily for the conservation of other species of wildlife and other nature conservation interests. These reserves which are listed below contain small and probably viable populations of *M. rufa*.

Wildlife Sanctuaries:

(i) Mungaroona Range Wildlife Sanctuary—approx. 110,000 hectares.

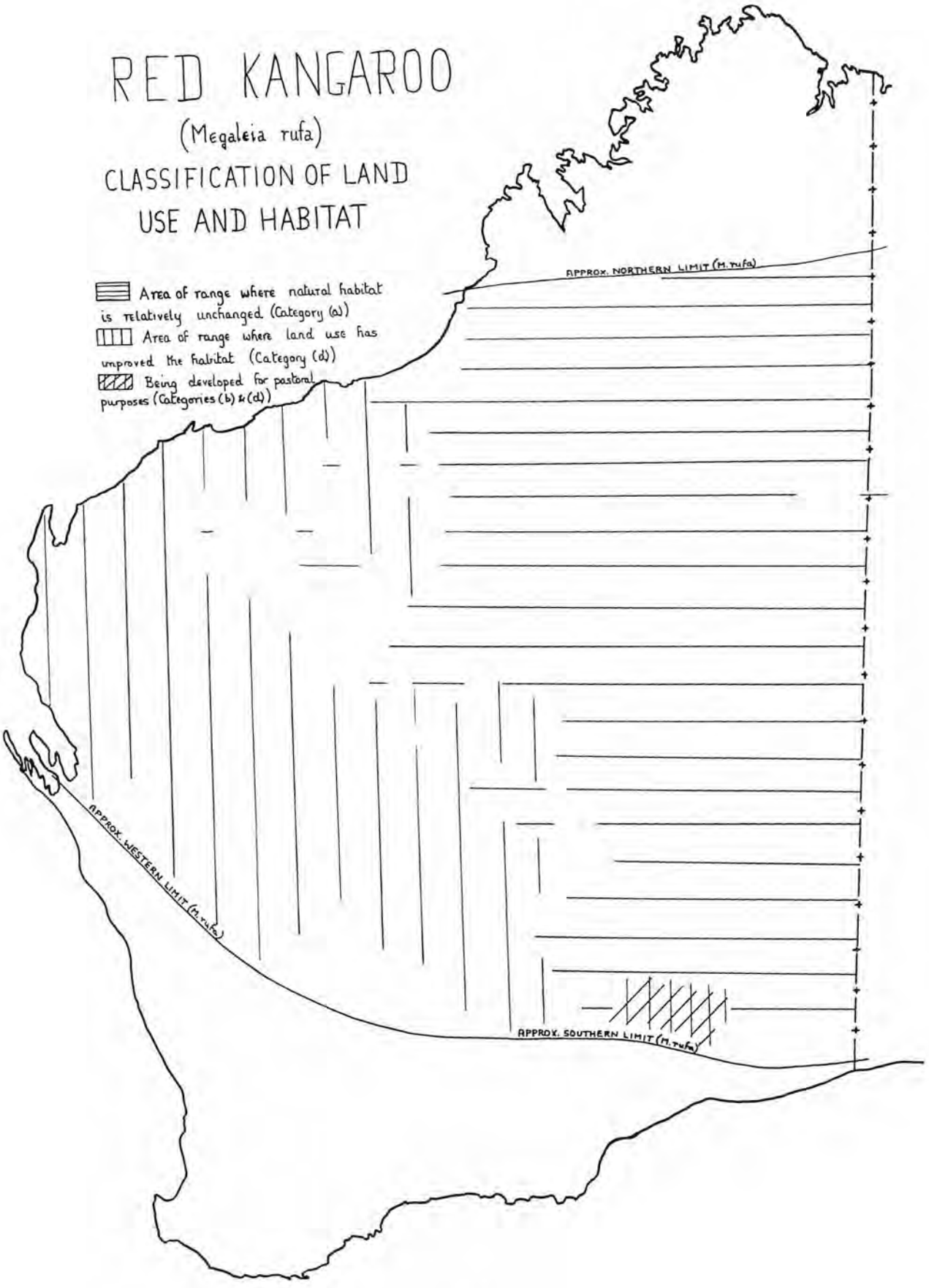
National Parks:

(i) Hamersley Range National Park—approx. 600,000 hectares.

(ii) Chichester Range National Park—approx. 150,000 hectares.

Assessment Programme

Continuous assessments of populations of *Megaleia rufa* are undertaken in that part of its range 1 (d) when land use has improved the habitat for this species and where kangaroos have the propensity to become sufficiently abundant to cause economic loss to landholders.


RED KANGAROO
(Megaleia rufa)
CLASSIFICATION OF LAND USE AND HABITAT
Area of range where natural habitat is relatively unchanged (Category (a))
Area of range where land use has improved the habitat (Category (d))
Being developed for pastoral purposes (Categories (b) & (d))
APPROX. NORTHERN LIMIT (M. rufa)
APPROX. WESTERN LIMIT (M. rufa)
APPROX. SOUTHERN LIMIT (M. rufa)

Assessments are carried out by:

(i) ground surveys,

(ii) aerial surveys,

(iii) sampling of populations to provide information on age structures and reproductive condition,

(iv) analysis of harvest returns.

(i) *Ground surveys* are undertaken by district wardens by day and by night in order to make a continuing check of the density of populations to determine the effect of harvesting in the areas where licensed shooters are operating and the effect of seasonal conditions. In addition, surveys are carried out at the request of pastoral lessees who claim that kangaroos are so abundant that they are causing them economic loss.

(ii) *Aerial surveys* are undertaken from time to time using procedures documented by Newsome, Frith and others in order to provide information on population abundance and distribution and on the major seasonal effects.

(iii) *Populations* are samples by research officers. The samples not only provide information on the reproductive condition of kangaroo populations but also aid in the interpretation of harvest returns.

(iv) *Complete harvest data* are collected from shooters as part of the regulatory system. This includes the area of operation, hunting success, sex, weight, catch for unit effort and total harvest. Analysis of these data provides substantiating evidence of population densities and reproductive condition. At present, the computerisation of data is being planned. This will enable more precise evaluations of kangaroo populations to be made.

By means of the above assessment the Department is able to ensure that level of harvest does not jeopardise the survival of viable numbers of Red Kangaroos and that those numbers are not great enough to contribute an undue percentage of the total grazing pressure on the rangelands.

Determination of Safe Harvesting Levels

It is stressed that commercial harvesting of *M. rufa* is confined to that part of its range described in 1 (d). It is further stressed that the main aim of the Red Kangaroo Management Programme is to ensure the continuance of viable populations of Kangaroos throughout their preferred range. This aim, incidentally, perpetuates the co-existence of kangaroos and domestic grazing animals; a fact which is accepted in the pastoral industry.

There will always be some disagreement between sections of the pastoral industry and the Department and conservationists as to the desirable and safe levels at which kangaroo numbers may be maintained. In order to resolve this disagreement on a scientific basis the Department has developed its Red Kangaroo Management Programme. In 1969, using comparative data on kangaroo population densities similar to that since published by Newsome (1971) and Frith and Calaby (1969) the total population of *M. rufa* in pastoral areas was estimated to vary between 1 and 2 million according to seasonal conditions.

Applying safe harvesting levels of 1:6 as indicated from studies by Newsome, Main and Winter, the numbers of kangaroos which might be harvested annually was estimated to be 170,000–330,000. Comparing this figure with historical records of kangaroos taken and making an allowance to ensure that the permitted future take of kangaroos will be conservative, a quota of 200,000 plus or minus 50,000 *Megaleia rufa* was set initially. The management strategy combines analyses of harvest data, average density indices obtained by ground and aerial surveys and seasonal conditions. Continual analysis of this data, with allowances made for changing seasonal conditions, will enable increasingly precise adjustments to be made to annual quotas as evidence of any local or general over- or under-harvesting occurs.

The number of Red Kangaroos harvested commercially in 1971 was 170,000; in 1972 it was 204,000.

Management Programme

Under the provisions of the Fauna Conservation Act all wild vertebrate fauna is protected until otherwise declared by the Minister. Protection can be lifted either by declaring the species to be unprotected throughout the whole or any parts of the State or by declaring an open season throughout the whole or any part or parts of the State for any period of time. The open season declaration can restrict the taking or the disposal in any manner that the Minister considers desirable. Long term open seasons for *M. rufa* have been declared in those parts of the State in which the preferred habitat of the species and pastoral activities coincide. That is, in the part of the range of *M. rufa*. As indicated previously, this covers between about half or one third of the range of the species in Western Australia. The areas concerned and the restrictions are set out in the extract from the *Government Gazette* on page 72.

Outside the open season areas illegal harvesting is virtually impossible because—

(a) all kangaroo carcasses in chillers or transported by any means or in processing works, must have a lawful tag attached,

(b) patrolling by District Wardens presents a continuous hazard to would-be illegal operators;

(c) unlicensed hunters operating illegally would receive no support from pastoral lessees or from licensed shooters. The same deterrents apply within the open season areas to make illegal harvesting there virtually impossible. The inaccessibility and lack of support systems or systems of any kind in the desert and very arid areas, together with the sparseness of the kangaroos and the uneconomic transport costs involved all help to ensure that the legal protection has practical effect.

Any skins or carcasses found without tags are liable to confiscation. Any person found in possession of skins or carcasses or who consigns or transports them is also liable to prosecution (see extract from Regulations on page 72). Royalties are charged at the rate of 20 cents for each kangaroo tag. If the carcass and skin are consigned separately a tag must be fixed to each. The proceeds are credited to revenue.

Conclusion

The kangaroo industry in Western Australia is used as a tool of management under the Department's Red Kangaroo Management Programme to ensure that viable populations can co-exist with domestic stock. Kangaroo numbers need to be kept within certain limits to prevent superabundance. Making use of this industry in a closely controlled manner is preferable to alternative means such as poisoning, which are indiscriminate and non selective and affect a wide range of species and age classes, or the employment of Government shooters who would require back-up facilities such as housing and vehicles that would involve considerable commitments from public funds.

GREY KANGAROO (*Macropus fuliginosus*)

Introduction

The following notes set out details of the Grey Kangaroo Management Programme operating in Western Australia. It is presented in the format recommended by the Ministerial Working Party on Kangaroos, set up by a special Meeting of State and Australian Government Ministers held in Melbourne on March 9, 1973.

It must be emphasised that the Grey Kangaroo Management Programme in Western Australia, unlike the Red Kangaroo Management Programme, is not based on commercialisation of the species. The only reason for allowing the taking of Grey Kangaroos for commercial purposes is to allow reduction of numbers in areas where they are causing substantial damage to property.

Classification of Land Use and Habitat

The map on page 68 shows the land use and range of the Grey Kangaroo in Western Australia.

The principal stronghold of this species in this State has been the series of State forests situated in the jarrah and karri belts of the dry and wet sclerophyll forests. As will be seen from the land use map, a considerable area of the habitat of the Grey Kangaroo has been lost to the species, due to clearing for agricultural and industrial pursuits as well as for suburban and urban areas.

Considerable inroads have also been made into the forest country, initially by agriculture and in latter years to a lesser degree by mining activities.

(a) Area of range where the natural habitat is relatively unchanged.
About 1,800,000 hectares of State forest remain relatively unchanged. It is common knowledge that the species occurs in good numbers throughout the forest. No effort has been made to the present to determine the actual density of Grey Kangaroos throughout this area because of the recognised abundance of the species and the security of its habitat.

(b) Area of land where the natural habitat is relatively unchanged but where major development is likely to occur in the future.
Bauxite mining leases are currently held over approximately 700,000 hectares of State forest. Additionally, approximately 400,000 hectares of forest is involved in the recently negotiated wood chipping agreement centred on Manjimup. However, the agreement provides that only 10,000 or 12,000 hectares will actually be cut each year for fifteen years (i.e. about 45% of the forest in the license);

(c) area of range where the habitat has been greatly modified and is now largely unsuitable for *M. fuliginosus*. Approximately two-thirds of the original habitat of the Grey Kangaroo has been modified by agricultural, industrial or other human activities.

(d) Area of range where land use has improved the habitat for *M. fuliginosus*.
Nil.

Evaluation of the Reserve/Sanctuary System

The persistence of Grey Kangaroos in Western Australia depends upon the maintenance of an adequate reserve/sanctuary system. The principal areas in which the habitat of the species is relatively secure are:—

(a) Wildlife reserves termed sanctuaries under the Fauna Conservation Act which are set aside in perpetuity and vested in the Western Australian Wild Life Authority;

(b) National Parks, also set aside in perpetuity and vested in the National Parks Board of W.A.;

(c) State forests, the control of which is vested in the Conservator of Forests. The habitat in State forests is not considered to be as secure as the previous categories because forestry practices, such as the development of plantations of exotic pines, etc. and the susceptibility of State forests, at present, to the Mining Act, can induce changes detrimental to wildlife conservation;

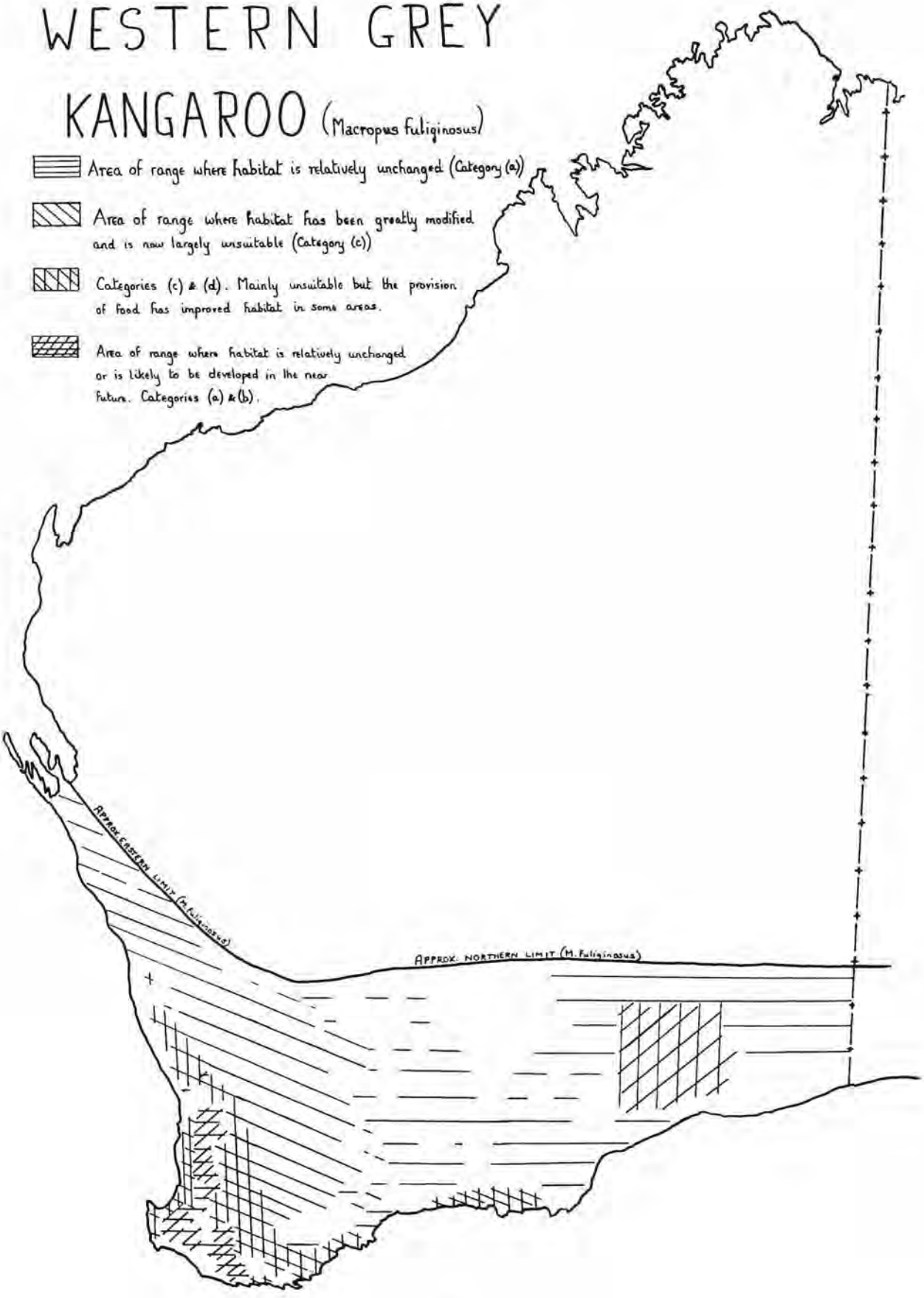
(d) Water catchment areas. These are important but they generally coincide with State forests. They have the effect of making that part of the forest more secure.

The main areas of habitat protected in these categories within the range of the Grey Kangaroo are:—

(a) *Wildlife Reserves*
- (i) Lake Barker Wildlife Sanctuary—approximately 210,000 hectares
- (ii) Lake Magenta Wildlife Sanctuary—approximately 94,000 hectares
- (iii) Nuytsland Wildlife Sanctuary—approximately 620,000 hectares
- (iv) Queen Victoria Springs Wildlife Sanctuary —approximately 272,000 hecatres
- (v) Great Victoria Desert Wildlife Sanctuary—approximately 2,500,000 hectares

(b) *National Parks*
- (i) Kalbarri National Park—approximately 150,000 hectares
- (ii) Stirling Range National Park—approximately 110,000 hectares
- (iii) Fitzgerald River National Park—approximately 250,000 hectares
- (iv) Cape Arid National Park—approximately 250,000 hectares
- (v) various sand plain National Parks between Perth and Geraldton, approximately 40,000 hectares.

WESTERN GREY KANGAROO (Macropus fuliginosus)



(c) *State Forests*

Approximately 2 million hectares of more or less continuous jarrah, marri, wandoo and karri forests.

In addition to the foregoing, there are about 300 wildlife sanctuaries individually less than 20,000 hectares (and the great majority less than 4,000 hectares each) which are vested in the Western Australian Wildlife Authority and lie within the range of *M. fuliginosus*. Additional reserves are continually being sought. None of these are specifically for this species but many will include general habitat on which the Grey Kangaroo occurs. Anecdotal evidence suggests that there is limited movement of Grey Kangaroos between at least some of the small reserves and adjacent uncleared land or other reserves. The value of the large number of small reserves in the conservation of the species is difficult to determine, but it may not be as insignificant as some maintain.

Assessment Programme

Continual assessments of local populations are carried out by Wardens under the requirements of the damage license system which calls for inspections of properties to substantiate claims of damage being suffered. These include:

(i) Ground surveys which are undertaken in the normal course of patrolling by Wardens.

(ii) Aerial surveys of rangeland areas within the species range used by the Biologist in charge of the programme in order to obtain information on overall population distribution.

(iii) Data required by the damage license system for all animals traded commercially, includes the area of operation, sex, weight, hunting effort and total harvest. Additional biological samples are taken as required to provide information on age distribution and reproductive condition of populations.

Determination of Safe Harvesting Levels

The number of Grey Kangaroos permitted to be destroyed is determined solely on the basis of mitigating the damage which they cause, no cognizance whatsoever is given to satisfying any commercial demand.

Wardens inspect, note and report on the frequency and extent of fence damage, the plentitude of scats, the use of kangaroo scats from adjacent forest to agricultural land and on acres of crop damage.

Damage is sporadic in time and location according to season conditions. The numbers taken under damage licenses have fluctuated between 10,000 and 30,000 animals a year. It can be expected that this take, which can be regarded as the spill out of populations from secure habitat reservations on to adjacent agricultural land will continue for many years. A factor likely to reduce it is the encroachment into forests of land incompatible with the existence of the Grey Kangaroo. The basic aim of the Grey Kangaroo Management Programme is to maintain as high a population of the species as is possible, not only in the areas where their habitat is secure or relatively secure, but also in uncleared privately owned land. This is identical with the desirable level expressed by the Australian Conservation Foundation in its supplement to A.C.F. Viewpoint No. 1—i.e. ". . . below pest levels and not as a continually hunted and harried population. . . ."

Management Programme

Under the provisions of the Fauna Conservation Act all wild vertebrate fauna is protected until otherwise declared by the Minister. Protection can be lifted either by declaring the species to be unprotected throughout the whole or any parts of the State or by declaring an open season throughout the whole or any part or parts of the State or by declaring an open season throughout the whole or any part or parts of the State for any period of time. The open season declaration can restrict the taking or the disposal in any manner that the Minister considers desirable. Restricted open seasons for *M. fuliginosus* have been declared over the areas indicated in the pamphlet, "Management Program—Grey Kangaroo". This pamphlet was reproduced in S.W.A.N.S. Vol. 3, No. 2).

In those districts where a limited open season has been declared a farmer whose property is being damaged may kill kangaroos without any other prior authorisation. He must, however, inform the Local District Warden immediately so that the Warden may check the need to destroy kangaroos, and may order the farmer to cease shooting if the Warden considers that the number of kangaroos in the vicinity has been sufficiently reduced. This authority to destroy kangaroos without any special permit or license is only allowed if the skins or carcases are not to be sold. If there is to be any commercialisation of the culled animals, it is necessary for the farmer or his agent to obtain a license beforehand and to acquire the tags for the number of kangaroos the Warden authorises to be killed. Experience clearly shows that few farmers care to exercise the authority given them under the restricted open season to cull and not sell. Most maintain that they have not the time to spend on this operation and require the services of an authorised and licensed shooter. The latter is limited in the number of kangaroos that he may take by being allowed to operate only on private property subject to damage licenses, under which the number of kangaroos that may be taken is limited to the tags made available by the Warden.

Illegal hunting has been reduced to an absolute minimum by the Management programme and the tagging system, and by the patrolling of District Wardens of whom there are 10 within the range of the grey kangaroo. Assistance from ex-officio Wardens, Fisheries Inspectors, Forest Officers, Police and Honorary Wardens supplement the oversight maintained by District Wardens.

EUROS—(*Macropus robustus*)

Introduction

The Euro, Hill Kangaroo or Biggada (*Macropus robustus*) occurs over a wide area in the State but major populations are found in the Pilbara district where it is in conflict with domestic grazing stock. It has been closely studied there by Ealey (1967).

Classification

The map on page 71 shows the range of the species *M. robustus* and land use throughout its range.

(a) Area of range where the natural habitat is relatively unchanged.
Most of the land in the northern portion of the range of *M. robustus* is unchanged.

(b) Area of range where the natural habitat is relatively unchanged but where major development is likely to occur in the future. No significant areas are likely to be developed. The population of euros is discontinuous and generally restricted to "hard" country, i.e. rocky outcrops and the highlands. This type of land is unlikely to attract widespread changes of land use in the future.

(c) Area of range where the habitat has been greatly modified and is now largely unsuitable for *M. robustus*.
A considerable part of the southern portion of the range has been cleared for agriculture. However, this was probably never a very significant part of the range of the species. The section contains outliers or relict populations, many of which are now isolated by large tracts of alienated and cleared land.

(d) Area of range where land use has improved the habitat for *M. robustus*.
Ealey (1967) records that changes in the environment caused by sheep farming has favoured the euro population in the Pilbara district (cited by Ealey p. 10 as 50,000 sq. kilometres—) Ealey's hypothesis that the sheep induced spread of spinifex and the provision of watering points have benefited euros and allowed a marked increase in their numbers and effective habitat has been widely accepted. This phenomenon, however, appears to be limited to the Pilbara.

Evaluation of the Reserve/Sanctuary System

As with other species, the need for reserves to protect sections of habitat and its endemic fauna depends on the forms of land use to which the habitat of the species as a whole is subject.

Ealey (1967) showed that euros tend to aggregate in or near granite outcrops during the day and to feed in surrounding areas between sunset and sunrise. After heavy rain, the outcrops would be deserted but obviously this habitat form is indispensible to the survival of euros during the critical periods when hot, dry conditions are continuous. Obviously these critical rocky outcrops are durable and interspecific competition does not appear to be a serious factor. It does not appear therefore that the survival of euros depends on reserves. Their cover (outcrops) is secure in both spatial and temporal senses while the degradation of the vegetation by sheep which produced a marked increase of spinifex (*Triodia pungens*) has increased their food supply on a massive scale and, finally, their territories have been little affected by fences or other man made divisional barriers.

Nevertheless, there are some large reserves which will support significant populations of euros in perpetuity. These include:—

(a) *Wildlife Sanctuaries*

(i) Mungaroona Range Wildlife Sanctuary—approximately 110,000 hectares

(ii) Barlee Range Wildlife Sanctuary—approximately 20,000 hectares

(iii) Barrow Island Wildlife Sanctuary—approximately 20,000 hectares

(Note: The Barrow Island population is distinct and of special scientific relevance.)

(b) *National Parks*

(i) Hamersley Range National Park—approximately 600,000 hectares

(ii) Chichester Range National Park—approximately 150,000 hectares.

Assessment Programme

The euro population in Western Australia suffers only limited exploitation. Consequently there has been no demand to assess populations since Ealey's work terminated. Ealey (1967) however, showed that the density of euros on stations studied was frequently higher than that of sheep. On Mt. Edgar Station, for example, euro density ranged from 1 euro to 6 acres to one per 8 acres. His mean sheep densities on all stations in the Pilbara was 28·8 acres per sheep. Ealey also showed that populations of euros are subject to increases and crashes—a drop in density from one in 2 acres to one in 30 acres being recorded on one station.

Surveys of euro populations by Wardens are limited to those done in response to infrequent complaints of damage. The same techniques used for *Megaleia rufa* are used for *Macropus robustus*. If it is accepted that in the 20,000 square miles (as quoted by Ealey) of the Pilbara, euros occur in not less than the mean densities as sheep, the population of euros in that region would approximate 1 euro to about 30 acres or something in excess of 400,000 animals. Good habitat for euros occurs outside the Pilbara—the Barlee Range for example—so that the total population in Western Australia would be much higher.

Determination of Safe Harvesting Levels

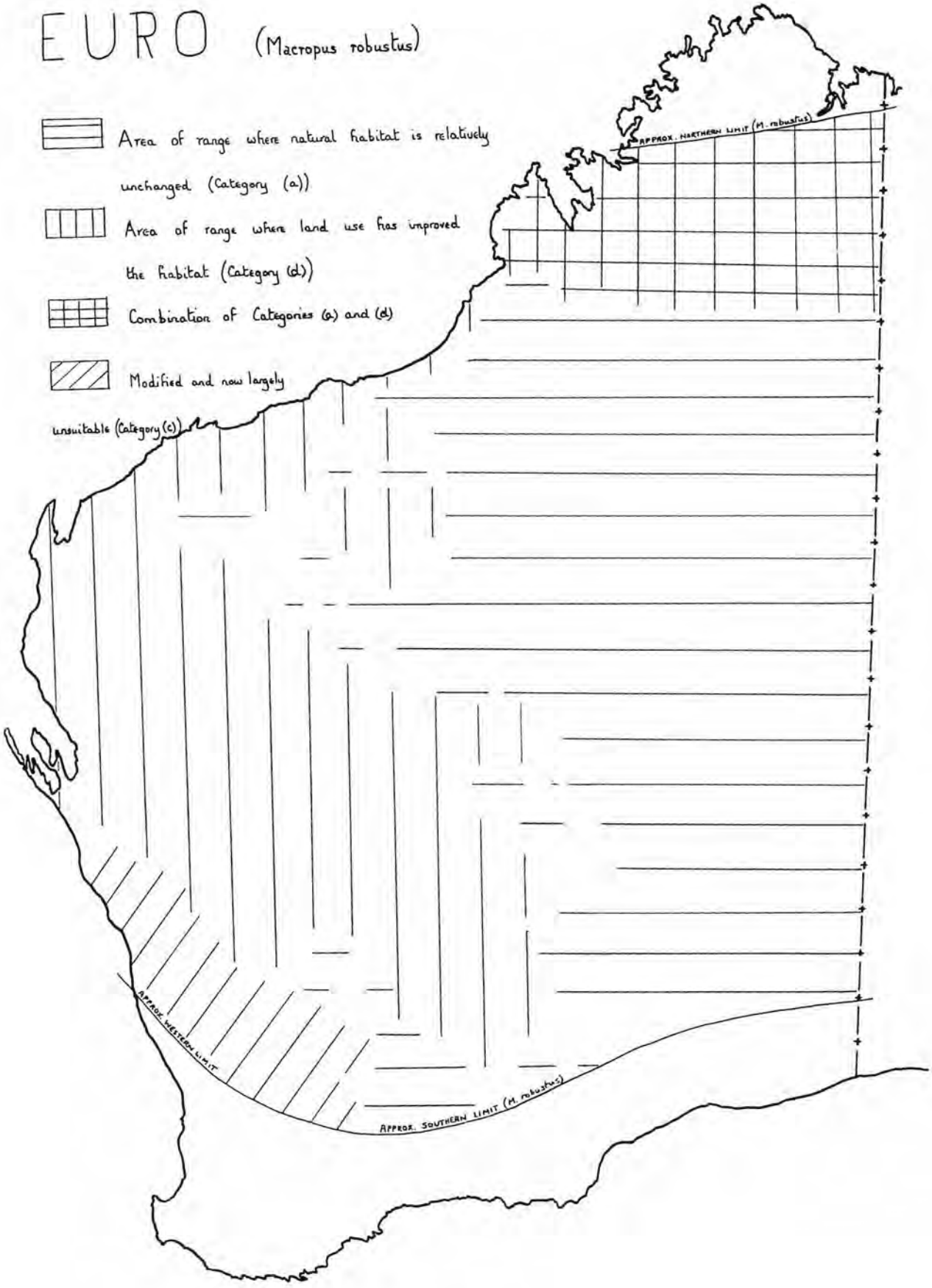
The aim of the current programme is to license harvesting of euros to occur as damage is sustained and seasons and the economics of the industry permit.

Sadlier (1965) concluded that the euro is so well adapted to aridity that even severe and prolonged drought had little effect on the ages at which either males or females reached maturity. Ealey also showed that the populations would respond to good pastoral conditions when practically all females would be ready to breed. With a population not less than 400,000 in the Pilbara alone, safe harvesting levels could be higher than for *M. rufa* so that Winter's figure of one in 6·5 could be considered as conservative for this species. Even if the State population is estimated to be as low as 500,000 and a cropping figure of 1 in 10 adopted it would suggest a safe harvesting level of 20,000 euros. This figure is unlikely to be reached under existing conditions.

Management Programme

Under the provisions of the Fauna Conservation Act all wild vertebrate fauna is protected until otherwise declared by the Minister. Protection can be lifted either by declaring the species to be unprotected throughout the whole or any parts of the State or by declaring an open season throughout the whole or any part or parts

EURO (Macropus robustus)



of the State for any period of time. The open season declaration can restrict the taking or the disposal in any manner that the Minister considers desirable. Long term open seasons for *M. robustus* have been declared to coincide with the pastoral areas of the State. Outside those areas euros are fully protected. No damage licenses have been sought or issued to take euros in the protected area. Supplies of special tags have been authorised and have been available for issue to licensed hunters since May of this year. Previously the same tags were used for euros as for reds. None of the new tags have been issued in the period they have been available—16th May, 1973 to date 7th September, 1973—as there has been no demand for them.

The commercialisation of euros is as strictly controlled as is that of other kangaroo species in Western Australia. In common with the conservation and management programmes in respect of *Megaleia rufa* and *Macropus robustus* the following controls are applied:—

1. Euros may be harvested only by a limited number of licensed shooters.
2. Tags are purchased by the licensed shooter and issues are limited.
3. No skin or carcass may lawfully be taken for sale or transported or held in a chiller or processed unless its taking has been authorised and it has a lawful tag affixed to it.
4. Any skin or carcass (up to the time of lawful processing) which does not have a lawful tag affixed to it is liable to confiscation and the person in possession, or who takes, buys, sells, transports or holds an untagged skin or carcass is liable to prosecution.

EXTRACTS FROM FAUNA CONSERVATION ACT AND REGULATIONS

Government Gazette 17/4/1970

FAUNA CONSERVATION ACT, 1950–1969.

Department of Fisheries and Fauna,
Perth, 1st April, 1970.

THE Minister for Fisheries and Fauna, pursuant to the powers conferred by section 14 of the Fauna Conservation Act, 1950–1969, does hereby declare an open season in respect of the Red Kangaroo (Marloo) (*Megaleia rufa*) and the Hill Kangaroo (Euro or Biggada) (*Macropus robustus*), in all those parts of the State, but not including any National Park, or any sanctuary within the meaning of the Fauna Conservation Act, 1950–1969 which lie within the boundaries of the Shires specified in the schedule hereto subject to the following restrictions:

(1) Red kangaroos and euros may be taken without license only by landholders and leaseholders (or their approved nominated agents).

(2) Notwithstanding paragraph (1), a person shall not take red kangaroos or euros for sale nor sell red kangaroos, or euros or their carcasses and skins, unless he is the holder of the appropriate license under the Fauna Conservation Act Regulations.

(3) A person shall not buy red kangaroos or euros nor their carcasses or skins from any person other than a person authorised to sell such fauna by an appropriate license under the Fauna Conservation Act Regulations.

(4) The Chief Warden of Fauna may refuse to issue a license authorising the taking for sale of any kangaroos to any person who has not been a permanent resident in Western Australia during the whole of 1968 and 1969 and who was then engaged in the taking of kangaroos for gain or reward.

G. C. MacKINNON,
Minister for Fisheries and Fauna.

Schedule.

The shires of Ashburton, Sandstone, Cue, Carnarvon, Meekatharra, Mount Magnet, Murchison, Roebourne, Tableland, Upper Gascoyne, West Kimberley, Wiluna, Hall's Creek, Kalgoorlie, Laverton, Broome, Leonora, Wyndham, Menzies, Marble Bar, Yalgoo, Nullagine, Port Hedland and Mount Marshall.

Government Gazette 1/5/1970

FAUNA CONSERVATION ACT, 1950–1969.

Department of Fisheries and Fauna,
Perth, 21st April, 1970.

THE Minister for Fisheries and Fauna pursuant to the powers conferred by section 14 of the Fauna Conservation Act, 1950–1969, does hereby vary the notice published in the *Government Gazette* No. 39 on 17th April, 1970, by including in the schedule of shires in which an open season has been declared in respect of the Red Kangaroo (Marloo) (*Megaleia rufa*) and the Hill Kangaroo (Euro or Biggada) (*Macropus robustus*) the following shires.

G. C. MacKINNON,
Minister for Fisheries and Fauna.

Schedule.

Shires of Shark Bay, Northampton and Mullewa.

Government Gazette 18/11/1970

PART 7.—MARKING, SALE AND TRANSPORT OF FAUNA.

Marking, Sale and Transport of Carcasses and Skins.

50. (1) A person shall not sell, buy, transport or have in his possession or control, or consign for any purpose the skin or carcass of any fauna unless—

(a) he is the holder of a current license authorising such sale, purchase, transport, possession or control or consignment; and

(b) a tag has been duly affixed to the skin or carcass.

(2) The colours of tags to be affixed to fauna, and the prices for which they shall be sold, are as follows—

(a) for grey kangaroos—white tags, 20 cents each;

(b) for red kangaroos and euros—yellow tags, 10 cents each; and

(c) for other fauna—such colours as the Chief Warden determines, 50 cents each.

(3) A person shall not—

(a) mark or attempt to mark the skin or carcass of any fauna with an illegal tag; or


PRINCIPAL AREAS WHERE KANGAROOS ARE TAKEN
GREYS
REDS & EUROS
WYNDHAM
DERBY
BROOME
ONSLOW
CARNARVON
DENHAM
GERALDTON
MOUNT MAGNET
DONGARA
JURIEN BAY
MOORA
WONGAN HILLS
KALGOORLIE
LANCELIN
PERTH
FREMANTLE
MANDURAH
PINGELLY
BUNBURY
BUSSELTON
ESPERANCE
ALBANY

(b) affix a tag or an illegal tag to any fauna which has not been lawfully taken.

(4) The provisions of this regulation do not apply so as to make it unlawful for any person to purchase, sell, use or to have or give as a gift any skin of any fauna which has been lawfully taken and processed and sold pursuant to licenses held under these regulations.

(5) A person who is—

(a) the holder of a professional shooter's license;

(b) the owner, employee or agent of a licensed processing establishment; or

(c) a direct dealer,

and shall not transport the skins or carcasses of fauna—

(d) except those which have been lawfully taken and tagged; or

(e) except in a registered transport unit along a registered route from an open season area to the licensed premises or chiller unit concerned.

(6) A person who is the holder of a damage license shall not give, sell or supply a tag to a person other than—

(a) a person who is his approved agent and who intends to attach the tag to fauna which he lawfully destroys on behalf of the holder on the holder's property; or

(b) the Chief Warden of Fauna.

(7) A person who owns or operates a transport unit or a chiller unit shall supply to the Chief Warden of Fauna, whenever he so requests, particulars of the number plates issued under the Traffic Act, 1919, for, and a description of, the unit, together with any other details that the Chief Warden of Fauna requests.

(8) (a) A person who intends to operate a transport unit or a chiller unit to hold or transport the skins or carcasses of any kangaroos or other fauna shall forward to the Chief Warden of Fauna a detailed description of the place of operation and of the route to be followed by the unit and the Chief Warden of Fauna may, if he approves of the place of operation and route, register them as the site of operations of that unit and the route to be used by that unit.

(b) A person who operates a registered transport unit or chiller unit shall not cause or permit the unit to deviate from the registered route for that unit, except that he may deviate around any section of that route that has been closed by the person or authority controlling the closed section.

(c) A person who operates a chiller unit to hold the skins or carcasses of any fauna shall not remove the unit to any other place of operation than that approved by the Chief Warden of Fauna unless he notifies the Chief Warden of Fauna in writing and receives approval to remove that chiller unit to the proposed place of operation.

(9) A person who operates any processing establishment, transport unit or chiller unit shall keep and maintain such establishment or unit in a clean and hygienic condition satisfactory to the Chief Warden of Fauna or to any warden or officer appointed pursuant to the Act or of any other person authorised by the Chief Warden of Fauna.

(10) A person shall not sever, cut, mark, scratch, abrade, file, heat, burn, melt or otherwise deface any tag in such a manner as to alter or interfere with or obliterate any letter or number or other identifying mark on the tag, whether it is affixed to a skin or carcass or not.

(11) A person who operates an establishment for the tanning of skins of fauna shall, before commencing the process of tanning any skin, remove from the skin the tag affixed in such manner and with such care as is necessary to preserve all the letters and numbers and other identifying marks on the tag and keep and store the tag in a place of safety and hand it on demand to any warden or authorised officer.

(12) A person other than a warden shall not remove any tag from any skin or carcass of any fauna except in the circumstances specifically authorised by these regulations and in the manner prescribed by subregulation (11) of this regulation.

51. (1) The Chief Warden of Fauna shall authorise in writing the design and manufacture of such tags as are required.

(2) Where the Chief Warden of Fauna approves and accepts a design for a tag, whether original or amended, he shall cause to be published in the *Government Gazette* and in at least one issue of a newspaper with a wide circulation, a drawing and description of the design of the tag.

(3) A person who issues, gives, buys, receives, sells, uses, manufactures or distributes any device which resembles an illegal tag, commits an offence.

(4) A person who issues, gives, buys, receives, sells, transfers, distributes or uses a tag in any manner other than is authorised pursuant to these regulations, commits an offence.

(5) A person who is required by these regulations or by the conditions of any license issued under these regulations to affix a tag to the skin or carcass of any fauna and who fails to so affix the tag or who attaches it other than in the manner described in the interpretation "affix", commits an offence.

(6) A person, not being a warden or other officer authorised to collect used tags or a holder of a processor's license or a person engaged in the tanning of skins, who has in his possession a used tag not secured to the skin or carcass or part thereof of lawfully taken fauna, or who has in his possession any illegal tag, commits an offence.

Marking, Sale and Transport of Live Fauna

52. A person shall not sell or take or offer to buy or sell or consign for the purposes of aviculture any young fauna not fully fledged or not able to stand or not able to feed unaided.

General.

53. The Chief Warden of Fauna may, at such intervals of time as may be convenient, supply to the Commissioner of Public Health a list of the licensed processing establishments and registered chiller units together with any other details of their standards, use and operation as may be required.

Government Gazette 23/7/1971

FAUNA CONSERVATION ACT, 1950–1970

Department of Fisheries and Fauna,
Perth, 15th July, 1971.

THE Minister for Fisheries and Fauna, pursuant to the powers conferred by section 14 of the Fauna Conservation Act, 1950–1970 does hereby declare an open season in respect of the Grey Kangaroo (*Macropus fuliginosus*), in all those parts of the State, not including any National Park, or any sanctuary within the meaning of the Fauna Conservation Act, 1950–1970, which lie within the areas specified in the schedule hereto, subject to the following restrictions:—

(a) Grey Kangaroos may be taken only by the owner or occupier of the land on which they are taken or by an agent appointed in writing by the owner or occupier.

(b) Where the land is virgin land or land held under pastoral lease, the owner or occupier or his agent shall not take any grey kangaroos unless he has first obtained a damage license in accordance with the Fauna Conservation Regulations.

(c) The kangaroos shall be taken only on land which is being actively farmed and on which the kangaroos are causing damage.

(d) The person taking the kangaroos shall notify the nearest warden of fauna as soon as practicable after he has commenced the taking of kangaroos.

(e) The warden may, if after an inspection of the property he considers it necessary, prohibit the further taking of any grey kangaroos on that property until the owner or occupier obtains a damage license in accordance with the Fauna Conservation Regulations and thereupon no person shall take grey kangaroos on that property except under the authority of a license.

(f) Nothing in this notice authorises the sale of the skins or carcasses of grey kangaroos that are taken by a person who does not hold a license issued under the regulations authorising such sale.

(g) Notwithstanding the restrictions in paragraphs (a) and (b) of this notice, grey kangaroos can be taken during the open season by a person holding a license for that purpose in accordance with the Fauna Conservation Regulations.

RON DAVIES,

Minister for Fisheries and Fauna.

Schedule.

The Shires of—
Albany
Augusta–Margaret River
Boddington
Boyup Brook
Bridgetown–Greenbushes
Carnamah
Chapman Valley
Coorow
Cranbrook
Dandaragon
Dalwallinu
Donnybrook–Balingup
Denmark
Dundas
Esperance
Gnowangerup
Greenough
Irwin
Kojonup
Kondinin
Koorda
Kulin
Lake Grace
Manjimup
Mingenew
Morawa
Mount Marshall
Mukinbudin
Mullewa
Nannup
Narembeen
Northampton
Nyabing–Pingrup
Perenjori
Plantagent
Ravensthorpe
Tambellup
Three Springs
Wandering
West Arthur
Westonia
Williams
Yilgarn

All that part of the Shire of Merredin East of the Vermin Fence.

Government Gazette 30/6/1972

FAUNA CONSERVATION ACT, 1950–1970.

Notice

Department of Fisheries and Fauna,
Perth, 23rd June, 1972.

THE Minister for Fisheries and Fauna, pursuant to the powers conferred by section 14 of the Fauna Conservation Act, 1950–1970, does hereby vary the notice published in the *Government Gazette* of 23rd July, 1971, in which an open season has been declared in respect of the grey kangaroo (*Macropus fuliginosus*) by including the Shire of Collie in the Schedule of Shires attached thereto.

RON DAVIES,

Minister for Fisheries and Fauna.

(b) affix a tag or an illegal tag tc
not been lawfully taken.

(4) The provisions of this regula
as to make it unlawful for any per
use or to have or give as a gift ar
which has been lawfully taken anc
pursuant to licenses held under the

(5) A person who is—

(a) the holder of a professiona

(b) the owner, employee or
processing establishment; c

(c) a direct dealer,

and shall not transport the skins or

(d) except those which have bee
tagged; or

(e) except in a registered trar
registered route from an ope
licensed premises or chiller

(6) A person who is the holder
shall not give, sell or supply a tag to a

(a) a person who is his appro
intends to attach the tag to
fully destroys on behalf of
holder's property; or

(b) the Chief Warden of Fauna.

(7) A person who owns or opera
or a chiller unit shall supply to th
Fauna, whenever he so requests,
number plates issued under the Tra
and a description of, the unit, toge
details that the Chief Warden of Fau

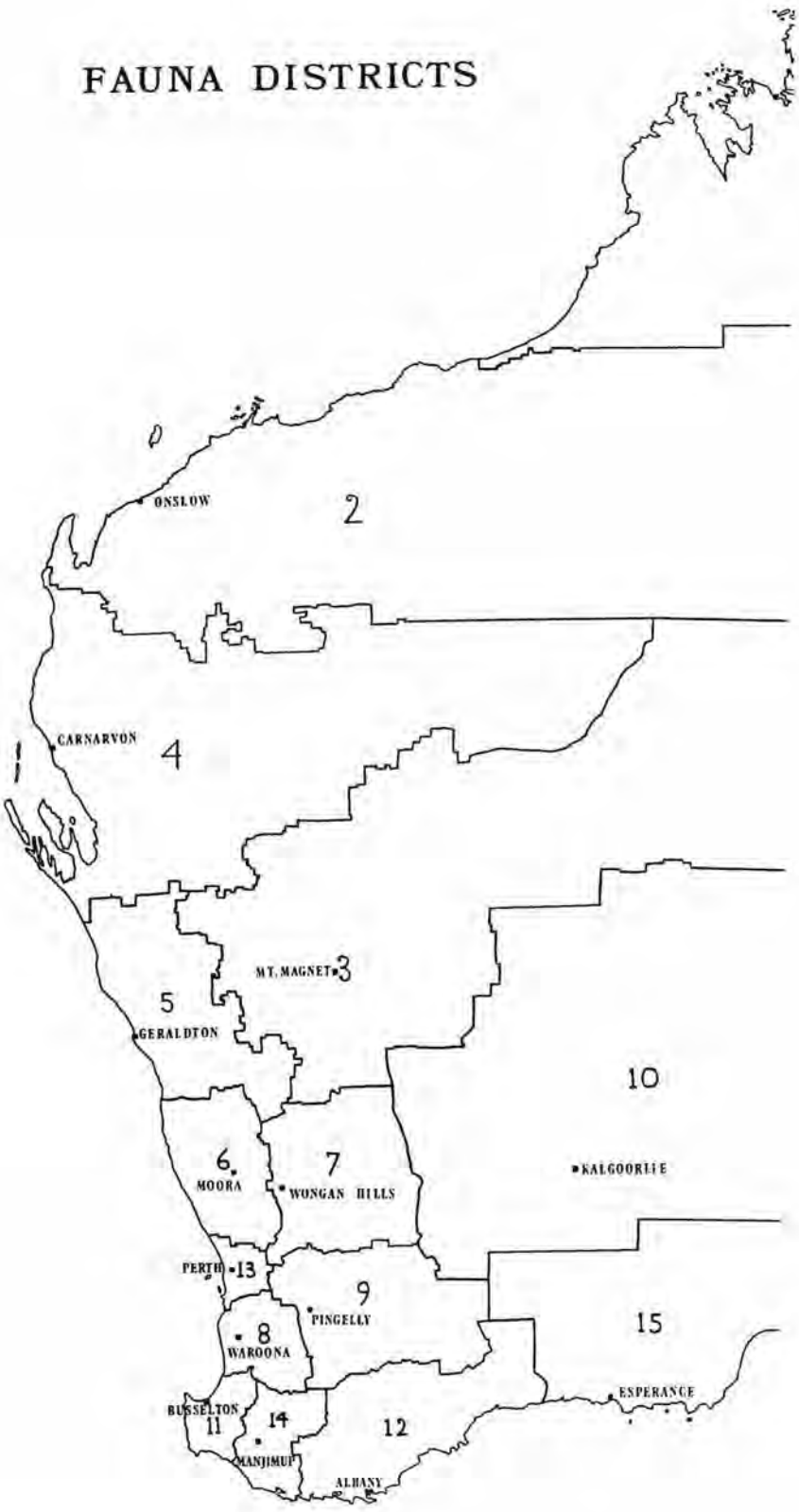
(8) (a) A person who intends to
unit or a chiller unit to hold or tra
carcasses of any kangaroos or other
to the Chief Warden of Fauna a det
the place of operation and of the rou
the unit and the Chief Warden of
approves of the place of operation
them as the site of operations of that
to be used by that unit.

(b) A person who operates a regist
or chiller unit shall not cause or
deviate from the registered route fo
that he may deviate around any sec
that has been closed by the person or
ling the closed section.

(c) A person who operates a chille
skins or carcasses of any fauna shall n
to any other place of operation than
the Chief Warden of Fauna unless he
Warden of Fauna in writing and re
remove that chiller unit to the propos
tion.

(9) A person who operates any pr
ment, transport unit or chiller unit sha
tain such establishment or unit in a

FAUNA DISTRICTS



DECLARATION AND AMENDMENT OF RESERVES

NEW RESERVES

Name	Res. No.	Locality	Plan	Area	Previous Use	Purpose	Vesting	Gazettal
Wilgarup	32142	8 miles N. of Manjimup	439/80	197·3374 ha	....	Conservation of Flora & Fauna	....	27/7/73
....	32178	....	Kalgoorlie/ Boulder Sheet 1	5·1018 ha	....	Conservation of Flora & Fauna	Town of Kalgoorlie	20/7/73

NAMING OF RESERVES

Name	Res. No.	Locality	Plan	Area	Purpose	Vesting	Gazettal
Pelican Island Wildlife Sanctuary	29541	N. of Wyndham	Medusa Banks4 mile	20 acres	Wildlife Sanctuary	W.A.W.L.A.	27/7/73
Mungaroona Range Wildlife Sanctuary	A31429	30 miles N. of Wittenoom	Pyramid and Marble Bar 4 mile	261,542 acres	Conservation of Flora & Fauna	W.A.W.L.A.	27/7/73
Michaelmas Island Wildlife Sanctuary	30049	King George Sound—Albany	457/80	224 acres	Conservation of Flora & Fauna	W.A.W.L.A.	27/7/73
Locker Island Wildlife Sanctuary	A29011	Near Onslow	95/300	Abt. 75 acres	Conservation of Flora & Fauna	....	27/7/73
Sand Knoll Ledge Wildlife Sanctuary	29258	Off Cervantes....	61/80 F3	Abt. 1 a. 2 r. 0 p.	Conservation of Fauna	W.A.W.L.A.	27/7/73
Fisherman Islands Wildlife Sanctuary	29256	Nr. Green Head	92/80 E3	Abt. 4 a. 2 r. 0 p.	Conservation of Fauna	W.A.W.L.A.	27/7/73
Cervantes Islands Wildlife Sanctuary	29253	Off Cervantes....	61/80 F4	10 a. 3 r. 8 p.	Conservation of Fauna	W.A.W.L.A.	27/7/73
Boullanger, Whitlock, Favorite, Tern and Osprey Islands Wildlife Sanctuary	29251	Jurien Bay	61/80 F1	85 a. 2 r. 0 p.	Conservation of Fauna	W.A.W.L.A.	27/7/73
Buller, Whittell and Green Islands Wildlife Sanctuary	29252	12 miles S. of Cervantes	59/80 A1	Abt. 15 acres	Conservation of Fauna	W.A.W.L.A.	27/7/73
Lipfert, Milligan and Snag Islands, Webb Inlet, Orton and Drummond Rocks Wildlife Sanctuary	29259	Leeman—Green Head area	92/80 E2	Abt. 1 a. 3 r. 24 p.	Conservation of Fauna	W.A.W.L.A.	27/7/73
Ronsard Rocks Wildlife Sanctuary	29260	Off Cervantes....	61/80 F3	Abt. 32 p.	Conservation of Fauna	W.A.W.L.A.	27/7/73
Wedge Island Wildlife Sanctuary	29254	15 miles N. of Lancelin	59/80 B3	Abt. 3 a. 3 r. 0 p.	Conservation of Fauna	W.A.W.L.A.	27/7/73
Essex Rocks Wildlife Sanctuary	29257	Jurien Bay	61/80 F2	Abt. 1 a. 2 r. 32 p.	Conservation of Fauna	W.A.W.L.A.	27/7/73
Great Victoria Desert Wildlife Sanctuary	A30490	....	Pastoral South 6/800, 28/300, 29/300	6,167,200 acres	Conservation of Flora	W.A.W.L.A.	27/7/73

CHANGE OF PURPOSE

Name	Res. No.	Locality	Plan	Area	Previous Purpose	New Purpose	Vesting	Gazettal
Beechina	30667	Beechina	2 A/40	54·6832 ha	Timber	Conservation of Flora & Fauna	W.A.W.L.A.	20/7/73
....	22797	Harvey Dam	383/80	743 a. 0 r. 29 p.	Government Requirements	Conservation of Flora & Fauna	....	15/6/73
Lake Hurtstone	27837	6 miles N. of Holt Rock	375/80 F 1, 2	Abt. 2154 ha	Protection of Natural Vegetation	Conservation of Flora & Fauna	W.A.W.L.A.	20/7/73

CANCELLATION

Name	Res. No.	Locality	Plan	Area	Purpose	Vesting	Gazettal	Special Note
Twin Lagoons	28988	Nr. Lake Muir	443/80 E.F. 3	1763 acres	Conservation of Flora & Fauna	W.A.W.L.A.	16/3/73	This reserve has been incorporated in the Lake Muir Sanctuary (No. 31880).

VESTING OF RESERVES

Name	Res. No.	Locality	Plan	Area	Purpose	Previous Vesting	New Vesting	Gazettal
Doubtful Islands Wildlife Sanctuary	A23516	Bremer Bay	448/80	Unsurveyed	Flora & Fauna	....	W.A.W.L.A.	20/7/73
Beechina	30667	Beechina	2 A/40	54·6832 ha	Conservation of Flora & Fauna	....	W.A.W.L.A.	20/7/73

AMENDMENT OF AREA

Name	Res. No.	Locality	Plan	Previous Area	New Area	Purpose	Vesting	Gazettal
Parry Lagoons	31636	E. of Wyndham Townsite	1054/80	12,626 ha approx.	12,589 ha	Conservation of Fauna	W.A.W.L.A.	25/5/73

32738/11/73—1900

WILLIAM C. BROWN, Government Printer, Western Australia

Government Gazette

OF

WESTERN AUSTRALIA

(Published by Authority at 3.30 p.m.)

No. 76] PERTH: TUESDAY, 2nd OCTOBER [1973

PROCLAMATION

WESTERN AUSTRALIA
TO WIT,
DOUGLAS KENDREW,
Governor.
[L.S.]

By His Excellency Major General Sir Douglas Anthony Kendrew, Knight Commander of the Most Distinguished Order of Saint Michael and Saint George, Companion of the Most Honourable Order of the Bath, Commander of the Most Excellent Order of the British Empire, Companion of the Distinguished Service Order, Governor in and over the State of Western Australia and its Dependencies in the Commonwealth of Australia.

WHEREAS it appears to me, the Governor, desirable that an animal emblem be adopted as an emblem of the State of Western Australia and further that such emblem ought to be the animal known as the Numbat or Banded Anteater and more fully described as *Myrmecobius fasciatus* : NOW, THEREFORE, I, the Governor, acting with the advice and consent of the Executive Council hereby declare that the animal known as the Numbat or Banded Anteater and more fully described as *Myrmecobius fasciatus* be adopted and recognised as the animal emblem of the State of Western Australia.

Given under my hand and the Public Seal of the said State, at Perth, this 25th day of July, 1973.

By His Excellency's Command,
JOHN T. TONKIN,
PREMIER.

GOD SAVE THE QUEEN ! ! !

Animal Emblem of the State of Western Australia

DESCRIPTION

NUMBAT OR BANDED ANTEATER

(*Myrmecobius fasciatus*)

The Numbat is one of Western Australia's most attractive marsupials, and although its range once extended into northern South Australia, the population today is confined mainly to the south-west of the State.

Preferred habitat is Wandoo forest where the ground is littered with fallen branches and hollow logs. Here the Numbat finds both shelter and food and can be observed during daylight hours searching for termites in the logs and sub-surface soil. Termites are the main food of the Numbat and are exposed by the animal's sharp claws and then licked up by its exceptionally long tongue.

The Numbat is very easy to recognise; its general colour is reddish brown with a generous sprinkling of white hairs, and across the rump are several prominent white bars between which the hair is dark, sometimes almost black. Through the eye there is a prominent dark stripe which is framed above and below by long white streaks. The tail is often carried erect with the hair fluffed out like a bottle brush.

An adult Numbat is generally about 16 inches long, of which slightly less than half is tail length. Usually a litter comprises four young which are born between January and April; these are carried or nursed by the mother through winter.

19745/8/73

By Authority: WILLIAM C. BROWN, Government Printer

Government Gazette

OF

WESTERN AUSTRALIA

(Published by Authority at 3.45 p.m.)

No. 77] PERTH: TUESDAY, 2nd OCTOBER [1973

PROCLAMATION

WESTERN AUSTRALIA
TO WIT,
DOUGLAS KENDREW,
Governor.
[L.S.]

By His Excellency Major General Sir Douglas Anthony Kendrew, Knight Commander of the Most Distinguished Order of Saint Michael and Saint George, Companion of the Most Honourable Order of the Bath, Commander of the Most Excellent Order of the British Empire, Companion of the Distinguished Service Order, Governor in and over the State of Western Australia and its Dependencies in the Commonwealth of Australia.

WHEREAS it appears to me, the Governor, desirable that a bird emblem should be adopted as an emblem of the State of Western Australia and further that such emblem ought to be the bird known as the Black Swan and more fully described as *Cygnus atratus* : NOW, THEREFORE, I, the Governor, acting with the advice and consent of the Executive Council hereby declare that the bird known as the Black Swan and more fully described as *Cygnus atratus* be adopted and recognised as the bird emblem of the State of Western Australia.

Given under my hand and the Public Seal of the said State, at Perth, this 25th day of July, 1973.

By His Excellency's Command,
JOHN T. TONKIN,
PREMIER.

GOD SAVE THE QUEEN ! ! !

Bird Emblem of the State of Western Australia

DESCRIPTION

BLACK SWAN

(*Cygnus atratus*)

The Black Swan was first recorded by the Dutch navigator Vlaming in January 1697 in the Swan Estuary. Although it is to be found throughout Australia, this graceful bird has been regarded with special affection by many generations of Western Australians and has long been used to identify things Western Australian.

The plumage is black, often with a brownish tinge, but the flight quills are pure white and very prominent when the bird is seen in flight. The beak is red with a white band near the tip and the legs and feet are dark grey.

Males and females are similar in size and appearance but males can be identified in flight by their larger neck and, when swimming, hold their neck more erect. The bird's voice can often be heard at night and is a musical honk or bugling sound.

Nests are a bulky collection of sticks and rushes found in fresh or brackish swamps and lakes. Between four to eight eggs are laid and these are pale green, becoming paler as incubation proceeds. Incubation takes thirty-five days.

Aboriginal lore tells how the family ancestors of a section of the Bibbulman tribe of Western Australia were black swans who had been changed into men.

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