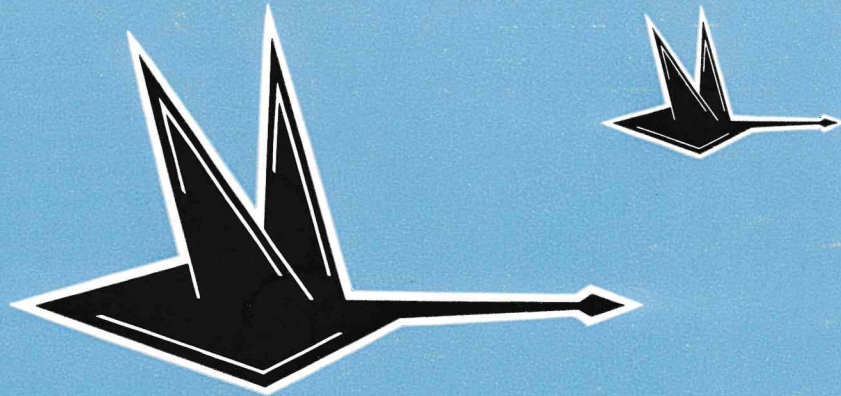


WESTERN AUSTRALIA



S.W.A.N.S.

State
Wildlife
Advisory
News
Service

Vol. 4 No. 1
Summer, 1973



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SUMMER, 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....

Let us not dismiss the moves by the U.S. Government to ban the import of all kangaroo products as being merely the result of effective pressure by extremist conservation movements. If the ban is imposed it will surely be as the result of poor public relations by Australia. As a nation we have only ourselves to blame for our image overseas—an image which reflects Australians as slaughtering hundreds of thousands of kangaroos merely to make toys and souvenirs and feed their pets. Films such as "Wake in Fright" have reinforced this image of the "Ugly Australian".

If Americans consider that "the Red Kangaroo is in danger of world-wide extinction" then Australians are at fault for not demonstrating to other nations that we care for our native fauna.

The sound management programmes operating in Western Australia are designed primarily to ensure the long term conservation of the kangaroo while at the same time providing protection for farmers. The kangaroo is considered to be a renewable natural resource which may be harvested by the cropping of excess populations. If only each of the other States had the same sound legislation and enforcement concerning the commercialisation of kangaroos then Australia's image overseas would surely improve.

The public relations problem is to get the true facts of the Australian situation accepted by the emotive and uninformed conservationist overseas. But fighting through the sickly syrup of sentiment is a mind-bending operation.

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ACQUISITION OF RESERVES IN WESTERN AUSTRALIA

The responsibility for the conservation of native fauna through the reservation of fauna sanctuaries is shared by the Department of Fisheries and Fauna and the Western Australian Wildlife Authority. The objectives of these two bodies are to conserve a cross-section of habitat and by so doing to conserve a cross-section of native fauna.

Few animals are able to live outside their natural environment and any change in their environment normally affects the population numbers and distribution of a particular species. To conserve the diverse fauna of Western Australia it is necessary to set aside representative areas of all environments in their natural state.

In Western Australia, it is considered that 50,000 acres is the minimum size for a reserve which will continue to harbour a full range of plants and animals without being altered drastically by external influences. In practice, it is not always possible to obtain reserves of this size (out of over 400 fauna and flora reserves only 10 are over 50,000 acres) and reserves smaller than this need careful management (see S.W.A.N.S., Vol. 3, No. 2, pp. 41-45).

How then are reserves acquired? Why are some reserves chosen in preference to others? Who surveys the prospective reserves and who makes the decision to create reserves? It is the purpose of this article to answer these and other questions.

The Fauna Research Branch of the Department has thirteen officers who are employed in various fields. Of these, only two officers, Research Officer Norman McKenzie and Technical Officer Ken Youngson are primarily concerned with the survey and acquisition of reserves, but several other officers actively assist with this work, especially on major surveys such as the Kimberley Islands Survey (see S.W.A.N.S., Vol. 3, No. 2).

Although special fauna surveys are carried out, the majority of decisions as to where to look for suitable reserves are based on general bio-geographical considerations, i.e. suitable habitat. Searching for possible reserves is done systematically and, although suitable random reserves are accepted, in practice the Department looks for large areas of vacant Crown land with clearly defined priorities dependent on the land useage trend at the current time.

The Department is primarily interested in creating reserves in areas which are likely to receive increased useage within the next ten years. With only two officers fully employed on this work those areas which may not be used for many decades cannot be given high priority. Opportunities do arise, however, to study areas which are virtually unexplored (e.g. Kimberley Islands), and although these areas are likely to remain untouched for some time they are given a high degree of priority by virtue of the fact that they have not been subjected to human interference. If they are reserved now then they will remain in their virgin state for all time.



Helicopters are used for survey work in the more remote and inaccessible areas.

Near cities or in agricultural areas where man has already destroyed much of the natural environment, there is an urgent need to fill in the gaps in the reserve system before continued development further reduces the size of available undamaged habitat. The smaller the reserves, the less is their value to conservation and the more expensive and difficult is their management. Acquisition in such areas has a high priority.

The third category of land receiving priority includes areas which are likely to be developed in the next decade. At present, large areas of land can be acquired for conservation in the Pilbarra and the Eastern and Northern Wheat-belt. If reserves are acquired in these areas now they can include a range of habitats which are fully representative of the region and large enough to be almost self-supporting when the surrounding country is developed.

The three types of areas receiving the highest priority are, therefore, as follows—virgin areas, "fill-in" areas in already developing regions, and areas subject to possible human interference in the next decade.

Less consideration is given to areas not likely to be developed in the foreseeable future such as Halls Creek, Marble Bar, Nullagine, Meekatharra and Wiluna.

Once an area has been chosen, a pilot survey lasting a few days is carried out. The purpose of this survey is to compare vegetation and landscape (including soils) with large reserves already held in the area—if any. Should the land be found to contain individual characteristics then a more detailed vegetation and fauna survey is undertaken and a case prepared for the acquisition of the land as a reserve. Such a report will contain a full description of the proposed reserve and include lists of species of plants and animals identified and comparisons with other reserves. The proposal is then put before the Reserves Committee of the Western Australian Wildlife Authority and, if approved (modifications are sometimes made), forwarded to the Lands Department seeking final approval.

A report of this nature can take up to six months to complete and in the case of a survey involving a large prospective reserve research staff may spend 4,000-5,000 man-hours collecting and preparing the information. Animal specimens collected are forwarded to the Western Australian Museum and plant specimens to the W.A. Herbarium. At present, the basic botanical work is carried out by Research Officer McKenzie, but the Department does have an urgent need for a full-time botanist to relieve the pressure of work on the Herbarium.

Before surveying remote or primitive regions, considerable research has to be undertaken. Geological maps and Museum records are examined, people who know the area are contacted for information and the diaries of explorers (often dating back to the early nineteenth century) are studied to obtain as clear a picture of the area as possible. Sometimes, more than one visit has to be made; for example, the Kimberley Islands are to be visited for the third time in June, 1973. Time and expense precludes too many of these large surveys and sometimes one visit has to suffice, with as many skilled personnel as are available collecting as much as possible, as quickly as possible. Surveys in these remote, relatively uninhabited regions have great scientific value in addition to their purpose—reserve acquisition.



Museum and Herbarium staff collecting specimens of animal and plant life on the Kimberley islands.

In areas which have been subjected to human interference for some time surveys for "stop-gap" or "fill-in" reserves are basically a study of what is left after man has taken his slice of the cake. The object is to acquire as large a representative area as possible, and because large tracts are no longer available, each prospective reserve has to be examined very closely to ascertain its value. Regrettably, there are and will remain, gaps in our representative reserves, because certain plant and animal associations only occur on soils which are agriculturally attractive, and, as a result, have been almost completely cleared; e.g. in the Shire of York and other wheatbelt shires.

It can be seen, therefore, that the acquisition of fauna reserves is a complex affair which is tackled in a very systematic manner in order that as many areas as possible of a suitable size and containing a cross-section of animal habitat, are reserved for posterity. It is true to say that until Mr McKenzie was appointed in 1970 the acquisition of reserves had been a rather haphazard affair. Even

now with the limited staff and finance at the Department's disposal the situation is far from ideal. However, by working strictly in order of priority in obtaining representative selections of habitat type, it should be possible to slow or even halt the decline in our animal populations which started as soon as the white man set foot in Australia. Let us not forget that man was the first predator. Recriminations against the irresponsible actions of previous generations are useless, but the present generation, better educated and more aware of the environment, will be held responsible by future generations if they destroy what remains of our heritage.



Research Officer N. McKenzie—three weeks in the field does nothing to improve one's appearance!

ACQUISITION OF LAKE MUIR AS RESERVE

Just prior to S.W.A.N.S. going to press the Department was delighted to hear that it had acquired Lake Muir and its surrounding fresh water swamps and lagoons as a reserve vested in the Western Australian Wildlife Authority.

Lake Muir and its surrounding wetland areas are situated 40 miles east of Pemberton and cover an area of 10 400 hectares. They are to be maintained in their original state because of their importance as waterfowl refuges. Aerial surveys during summer months have shown large resident waterfowl populations.

A more detailed article with photographs and a map will be published in the next issue of S.W.A.N.S.

W.A.W.A. TOUR – 1973

In March this year members of the Reserves Committee of the Western Australian Wildlife Authority and observers made a tour of some of the fauna reserves of the South West.

The tour party consisted of—

- Mr B. K. Bowen, Director of Fisheries and Fauna; W.A.W.A. Chairman.
- Mr A. J. Mearns, Department of Fisheries and Fauna.
- Mr D. W. Arnold, Department of Fisheries and Fauna.
- Mr R. F. Ward, Department of Fisheries and Fauna.
- Mr D. Munro, Department of Fisheries and Fauna.
- Mr E. Dell, Department of Fisheries and Fauna.
- Dr A. A. Burbidge, Department of Fisheries and Fauna.
- Mr J. L. Bannister, Deputy Director of W.A. Museum.
- Mr R. D. Royce, Curator of State Herbarium; (W.A.W.A.).
- Mr W. H. Eastman, Deputy Conservator of Forests.
- Mr R. P. Bowe, Chief Bush Fire Liaison Officer, Bush Fires Board.
- Mr L. B. Green, Senior Bush Fire Liaison Officer, Bush Fires Board.
- Mr N. A. Beeck, Western Australian Wildlife Authority.
- Mr A. H. Robinson, Western Australian Wildlife Authority.

The party left Perth on the morning of March 12, and travelled by coach to Tutanning. En route, brief inspections were made of Boyagin Wildlife Sanctuary and Noombling Flora Reserve.



A road hazard encountered in the Boyagin Reserve by the party required the assistance of all hands.

Boyagin Wildlife Sanctuary consists of two reserves (Nos. 19128 and 20610) both vested in the Authority. Over the past decade considerable research work has been carried out on these reserves into the needs of the wildlife occurring there and on the effects of fire on the native fauna. Control burning commenced during the Spring of 1971 and was carried out by the Forests Department which is experienced in this type of work and

which possesses the necessary equipment and manpower. Due to unseasonable conditions, this year's programme of prescribed burning was not carried out and will be added to next year's programme.

The Boyagin Sanctuary harbours a diverse range of fauna. Mammals found there include the Common Dunnart (*Sminthopsis murina*), Grey Kangaroo (*Macropus fuliginosus*), Western Brush Wallaby (*Macropus irma*), Little Bat (*Eptesicus pumilis*) and Gould's Wattle-tail Bat (*Chalinolobus gouldii*). During a fauna survey for animals in 1972, sixty-three species of bird were noted incidentally. The party also visited Noombling Flora Reserve in order that they might assess the value of this reserve being vested in the Authority.

Members had lunch at Tutanning where the Department has a research station, and the afternoon was spent touring the reserve. Tutanning Wildlife Sanctuary covers only about 5,000 acres but contains a wide variety of marsupials, which are the Tamar (*Macropus eugenii*), Red-tailed Wambenger (*Phascogale calura*), Ring-tail Possum (*Pseudocheirus peregrinus*), Woylie Brush Wallaby (*Macropus irma*), Short-nosed Bandicoot (*Isodon obesulus*), Brush-tailed Possum (*Trichosurus vulpecula*), Numbat (*Myrmecobius fasciatus*), Echidna (*Tachyglossus aculeatus*), Common Marsupial Mouse (*Sminthopsis murina*), Yellow footed Marsupial Mouse (*Antechinus flavipes*), and the Pigmy Possum (*Cercartus concinnus*).



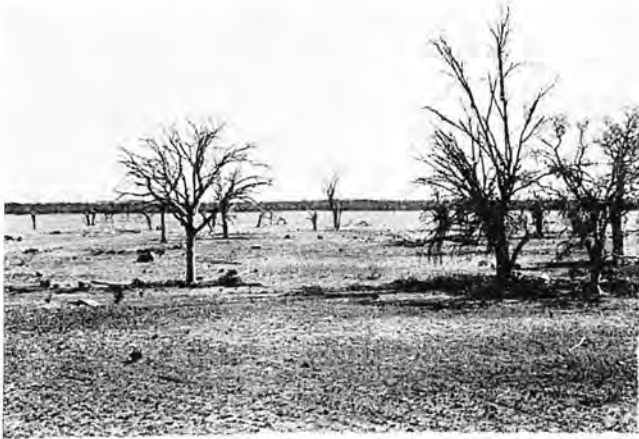
The diverse forms of vegetation on the Tutanning Reserve are protected by firebreaks. Controlled burning ensures adequate regeneration.

The tour party was shown how fire control was vital to the conservation of the habitat of the diverse range of fauna and how prescribed burning of chosen areas was used to regenerate the vegetation.

During the evening a spotlight tour of the reserve was carried out with members taking turns adopting precarious perches on the roofs of landrovers. There was one moment when there was some doubt as to whether this article would appear as your short-sighted Assistant Editor was nearly swept off the roof by an overhanging branch.

The night was spent at Tutanning, and in the morning members visited Toolabin and Taarblin lakes. Both

lakes were found to be completely dry following four years of drought conditions. Taarblin Lake was of particular interest as the possibility of raising the water level is the subject of a feasibility study by members of the Authority. At present outlet pipes drain the lake and also the lakes further north which drain into Taarblin Lake. If a levee was built above the level of the pipes, water would remain in the Lake for a longer period each summer—possibly until January. Consultations are to be held with engineers of the Public Works Department to ascertain whether raising the level of the lake would cause flooding of the surrounding land.



The dry bed of Lake Taarblin.

The highlight of the morning was the sighting of several Yellow-billed Spoonbills and one Royal Spoonbill at "Rushy Swamp" on private property near Woodanilling. Serventy and Whittel give the general southerly limit of the Yellow-billed Spoonbill as Moora although in 1954 one bird was seen at Cannington and in 1958 single birds were observed in the Bunbury district. This sighting at Woodanilling can therefore be considered exceptional.



Wallaby on the property of Mr. Neville Beeck. This animal was rescued during the Ord Noah project.

Authority member and Honorary Warden, Mr Neville Beeck, entertained the party to a splendid lunch at his property at Katanning and showed members his fauna sanctuary which contains Grey Kangaroos, Emus and Boodies, and animals rescued during Operation Ord Noah—Nail-tail Wallabies and an Agile Wallaby.

Camel Lake Game Reserve in the shadows of the Stirling Ranges was the only stopping point in the afternoon and the party arrived hot and tired at Albany at 6.30 p.m. Following dinner at the hotel a Reserves Committee Meeting was held.



Looking across Two People's Bay from the Reserve.

On the Wednesday, an extensive tour of Two People's Bay Wildlife Sanctuary was made. The reserve is famous as being the only surviving habitat of the Noisy Scrub Bird as well as being a popular fishing and picnic spot.



Noisy Scrub Bird (*Atrichornis clamosus*).

The management of the reserve and the protection of the Noisy Scrub Bird's nesting sites has not been compromised by permitting tourist activity. No access is permitted to the Mount Gardner area where the bird is known to nest (an estimated 45 nesting pairs are present at the moment), and access to some other areas is permitted only by walking along the prepared tracks. Near the ranger's residence a delightful picnic and barbecue area has been established; a recent addition is a display board with a photograph of the Noisy Scrub Bird, and details of its relationships and habits. By pressing a button on the display board visitors can hear a recording of the bird's song and further details of its habits.

TREES ARE REGULATORS OF THE ENVIRONMENT



The display unit mounted in the picnic area of the Two People's Bay Wildlife Sanctuary.



This gully is the main habitat of the Noisy Scrub Bird.



CSIRO Research Officer, Dr. Graham Smith (in light coloured trousers) explains to the party details of his research programme on the Noisy Scrub Bird.

Members of the party were most impressed by the efforts of the present ranger Ron Smith and the previous ranger Dick Grayson.

The party left Albany for Perth at 3.30 p.m.

What is a tree worth? You can get many answers, most of which have some merit. One inescapable fact is that they are essential to life on our planet.

They moderate temperature and affect pollution (sometimes pollution affects trees), noise, wind and water.

As trees grow they provide a home for wildlife and products for our daily living. In old age (sometimes earlier) they are cut and in their place is space for a new tree to grow.

The daily evaporation from a single well-watered tree can produce an estimated cooling effect of more than a million BTUs. This is equal to 10 room-sized air conditioners operating 20 hours a day.

Because of the "greenhouse" effect of waste particles in polluted air the air temperature may be 11°C higher in urban settings than it is in nearby rural areas. *This can be an important reason for having tree space in cities.*

Trees absorb polluted air and emit air richer in oxygen and somewhat free of pollutants. A growth of one ton of wood releases at least 1.1 tons of oxygen and absorbs at least 1.5 tons of carbon dioxide according to figures released in the United States.

Fossil fuels

It has been recognized that our oxygen reserve is being reduced by burning fossil fuels. Removal of big areas of plants—for people—is reducing the oxygen supply. It is thought that three-quarters of the conversion of carbon dioxide back to oxygen takes place in the ocean, but trees play an important part on the land. Obviously both sources of oxygen supply are worthy of protection.

Forests and rows of clumps of trees dampen city noise. Each 100 ft. of forest is now believed capable of dissipating about six to eight decibels of sound.

This can be put in perspective by realizing that a human ear has the ability to detect one decibel, ordinary speech is at about 60 decibels, and the range of audibility is considered to be about 130 decibels.

Windbreaks

A windbreak provides full protection to an area 10 times its height and some protection for 20 times its height downwind. A five-row windbreak 35 ft. high will reduce a 35 m.p.h. wind in the lee 100 ft. The wind will have built up to only 15 m.p.h. in the lee 200 ft.

Fuel use in the home can be reduced 20 to 30 per cent. by properly located windbreaks. Livestock, under U.S. conditions gain weight faster and require less feed where protected by a windbreak; and calving and lambing is better.

Wildlife living space and cover are provided by trees. Forest type, productivity, growth rate, trees per acre, age and size, extent of acreage, availability of water and other factors influence the value of various foods that the trees may provide.

(Forest Focus, No. 9, December, 1972.)

EXCITEMENT OVER DUNNART

A Dunnart found at Kalbarri by Mr Don Bellairs and subsequently handed to National Park Ranger, Mr Cyril Cockman has caused excitement among research officers.

The Dunnart was kept by Mr Cockman who fed it on insects. However, he was unable to keep up with the animal's insatiable demands and released it in the capture area. Fortunately a series of photographs were taken and these have been closely examined by departmental research staff and Museum staff.

It is thought that the specimen may have been the uncommon White-tailed Dunnart (*Sminthopsis granulipes*). The basis for this is that the colour closely matches that of specimens at the W.A. Museum. White-tailed Dunnarts are much lighter in colour than the common Fat-tailed Dunnart (*Sminthopsis crassicaudata*). In addition, Mr Cockman says that the tail was about 2½-3 in. long which is considerably longer than *S. crassicaudata*.

On a purely subjective basis the photographs do not look like any *S. crassicaudata* that any of the scientific officers have ever handled. The head seems very long but this could be the angle at which the photograph was taken. *Sminthopsis granulipes* has a very long skull.

In "Native Mammals of Australia" Ride says: "The White-tailed Dunnart was collected first by G. Masters in the collection that he made between 1868 and 1869 at 'King George's Sound and Salt River'. Between 1925 and 1965 nine specimens have been collected . . . at various localities in the drier inland periphery of the south-west of Western Australia".



White-tailed Dunnart (*Sminthopsis granulipes*)

Mr. Cockman has promised to try and capture another specimen so that a positive identification can be made. If he is successful and this specimen is found to be the White-tailed Dunnart it would seem that the specimen is well out of its previously known range, being further north and closer to the coast than any other specimen ever recorded.

Notification of this capture was in Mr Cockman's quarterly report as an Honorary Warden; this shows the importance of these reports.

APPOINTMENTS

HONORARY WARDENS

Mr Joseph Tindall STEWART of Uganda Road, Lake Gngangara.

Mr Albert John CARLISLE of Cocklebidy Motel, Cocklebidy.

Mr Ernest Anthony GIBELLINI of "Vampos", Palgarup, via Manjimup.

Mr Lieth Donald BLAIR of 16 Roberts Road, Attadale.

Mr Peter St. B. CONNOR of 117 Winthrop Avenue, Crawley.

Mr Leslie THOMPSON of 34 Stirling Highway, Nedlands.

Mr David Eric HUTCHISON of 7 Fern Street, Swanbourne.

Mr Brian John HUTCHESON of 11 Birchwood Avenue, Woodlands.

Mr Sean John ROBERTS of Lot 3, 125 Rosanna Drive, Dianella.

Mr Norman Douglas McPHERSON of 141 Croyden Road, Roleystone.

Mr Michael Allister CAMPBELL of 10 Robinson Street, Port Hedland.

Mr Gerald CARTY of 42 Gratwick Street, Port Hedland.

Mr Bevan Edward DOWINTON of Lot 1945 Corbett Place, South Hedland.

Mr Kevin John DUFFY of 24a Gratwick Street, Port Hedland.

Mr John Robert FORD of 64 Sutherland Street, Port Hedland.

Mr Lance HAMMOND of 6 Pilkington Street, Port Hedland.

Mr Colin Ross MANSOM of 3 Grant Place, Port Hedland.

Mr Denis Claude DRAGE of 28 Albany Highway, Mt. Barker.

Mr Sydney Hugh STEWART of Roe Lccation 411, Pingaring.

Mr Anthony Andrew TOMAZIN of 36 Banks Avenue, Hillary Beach.

Mr David Richard GALVIN of 19 Moore Street, Port Hedland.

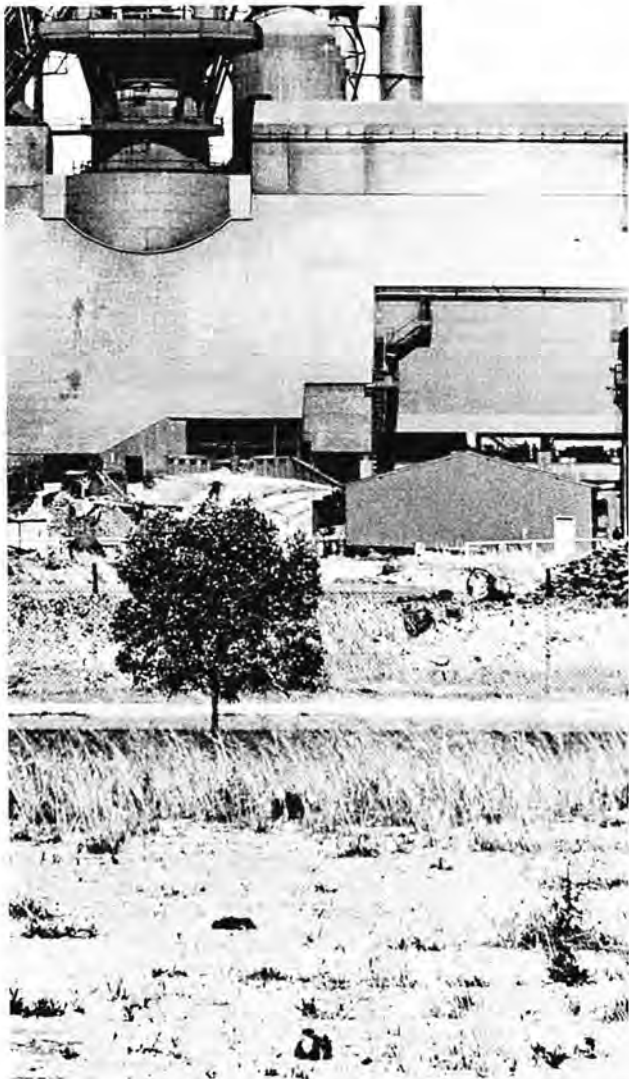
WARDENS

Mr William Kenneth YOUNGSON (gazetted 19/1/73)

Mr Floyd Allen RIFFEY (gazetted 19/1/73)

SOME COMPANIES CARE

In previous issues of this journal we have not used a soft-pedal approach in stating our attitude to mining companies and industries who rape the earth and pollute the environment in the name of progress and in pursuit of the "Holy Dollar". As a result we have, along with other conservation organisations, been termed "alarmists" and "band wagon jumpers". In view of our previous critical attitude, it is doubly pleasing to learn of the responsible attitude of one Australian company at Kwinana.



The banded plover's nest set in the open foreground is dwarfed by the blast furnace of Australian Iron and Steel Pty. Ltd.

Only a few hundred yards from the might of Kwinana blast furnace, workers from Australian Iron and Steel Pty. Ltd. discovered the nest of a pair of banded plovers. This in itself is not unusual but the attitude and subsequent action of the management is to be commended. Within hours a sign had been painted and placed near the nest to warn that it was under official protection.



The parent plovers jealously guard their nest and eggs.



Two chicks out—the third one, just behind Mum, has almost hatched.

A fortnight later two chicks were found to have hatched during the night or early morning and at noon on the same day, a third egg hatched. An official of the company said that it was difficult to say who was the most proud—the parents or the workers.

Many other birds return annually to their ancestral territories at Kwinana to nest. Swallows sweep around the mill and past the sinter plant, pigeons roost in the blast furnace gantry and magpies have established territorial rights over the trees in front of the commercial building. The company says "... At times they are a nuisance. But we are glad they come".

CSIRO DIVISION OF WILDLIFE RESEARCH 1970-72

The C.S.I.R.O. Division of Wildlife Research has published summaries of its work from 1970/72. Much of this research work has been carried out in Western Australia and, with no apologies for adopting a parochial approach, these summaries are reproduced below:

EMU

Field work on the emu (*Dromaius novaehollandiae*) at Mileura Station, Western Australia has continued. The picture that emerges is of the emu as a successful breeding animal in the arid zone. Wherever additional water points have been provided as a result of pastoral settlement, emus have increased in number many times compared with their population in unsettled areas. The importance of water to the species is indicated by the fact that emus drink freely even in periods of low temperature with night minima below 0°C.

In good years the increase in numbers of emus on sheep and cattle stations can be so great that they run short of food in ensuing years. It appears that this food shortage is relative rather than absolute and depends upon dominant birds maintaining large territories that contain all the food, whereas subordinate birds can hold only territories without food. This situation is being examined in detail in a small part of the original study area, where an intensive study of the bird's breeding biology has begun.

Food shortages are most acute in winter when the birds are dependent upon green herbs and grasses. The germination and growth of these depend, in turn, on recent rain, whereas the spring and summer food supply of seeds and fruits of shrubs is generated from rains many months before. Not only is food most likely to run short in autumn and winter but days are shorter and colder then, so that although more food is needed to maintain body temperature, there is less time to collect it and in a dry season, the small quantity of food is more widely scattered. Under these conditions many emus move over long distances.

The birds normally move south-west in the winter, reaching the farming areas in September and October. This south-westerly movement brings the birds into the region of regular winter rainfall but they do not stop moving as soon as they reach abundant green feed. It appears that although shortage of food may be a factor in initiating these movements, abundance of food is not the only factor which stops them. This situation is also to be investigated in the intensive study at Mileura.

A movement out of the farming areas towards the north-east has been observed in most summers, particularly those in which a cyclone has passed through the pastoral areas. Such a movement brings the birds into areas in which grass is germinating after cyclonic rain.

Much attention has been given to the temporal and spatial distribution of rainfall and its effects on emu biology, but recently it has become clear that there are large differences in ambient temperature between different parts of the study area, and that these may have far-reaching effects on the ecology of emus. It appears that

the ambient temperatures by the creeks, where most of the rainfall is concentrated and where most of the food grows, particularly in dry years, are more extreme both in winter and summer than in the upland areas. The difference is of the order of 7 to 8 °C and could be significant in relation both to heat stress in summer and cold stress in winter. Since the birds breed in winter, cold stress might be especially critical for newly hatched chicks. This situation will be investigated in the intensive study now in progress.

Field experiments to capture live emus have been conducted with the drug alphachloralose. The drug was presented to the birds in drinking water and proved effective, especially in narcotizing half-grown chicks which could accommodate a dose rate three to four times larger than adult birds. Experiments are continuing, and the drug seems a promising alternative to pursuing the birds with a Landrover. Captive birds are being maintained at the Division's laboratory at Helena Valley, where three pairs are now breeding.

In addition to the immediate practical results that stem from the study of a pest species it is becoming increasingly clear that the study of emus is the study of a highly successful animal living in an environment where sheep and cattle are far from successful animals. Some of the insights into how the emu is successful in the arid zone could give useful leads for better stock management and land usage in the area.

WEDGE-TAILED EAGLE

The field work which started in 1967 in Western Australia in the western (Rawlinna) and eastern (Carnarvon) parts of the pastoral zone has continued.

Reproduction

The density of breeding birds on the study areas is as follows:

Site	Land Use	Area (Square miles)	Breeding Density (Square miles per occupied nest)				
			1967	1968	1969	1970	1971
Carnarvon	Sheep	250	27	36	50	36	36
Rawlinna	Sheep	160	....	41	41	*	82
"	Cattle	150	....	....	21	*	*
"	Unoccupied	210	....	16	*	*	*

* No occupied nests in area.

While eagles breed more consistently at Carnarvon than on the unoccupied Rawlinna study area, productivity as measured by the number of chicks banded per square mile per year is the same for both areas during the four-year period 1968-71. Whereas two fledglings per nest has been a common occurrence at Rawlinna, it is rare at Carnarvon where there has been only one record where both eggs of a clutch hatched.

Eagles of breeding age at Carnarvon appear to hold territories throughout the year but do not attempt to breed every year. Rawlinna eagles vacate the census area completely during dry periods.

Data collected so far from the agricultural areas show that eagles breed successfully in this zone.

Food

Analysis of food remains collected from nests at Carnarvon indicated that eagles utilise a large range of prey species in the breeding season. Analysis of pellets collected at other times of the year showed a similar number of food sources.

Rabbit density as measured by spotlights and warren counts remained low on all Rawlinna study areas until spring, 1971 when a significant increase occurred on the cattle area. Numbers of rabbits in this area were subsequently reduced by an outbreak of myxomatosis.

Birds (especially *Corvus spp.* and several species of Psittaciformes) constitute an important food source for eagles during the nesting period in the agricultural zone of Western Australia. The remains of a great-winged petrel (*Pterodroma macroptera*) were found at a nest near Corrigin, 125 miles from the nearest coastline.

Movements

A further 96 nestlings and adults were banded during the last two years and the majority of these have also been fitted with coloured wing-tags. During this period, the first movement east from the Rawlinna study areas was demonstrated. An interesting recovery was that of a bird banded as a chick in August, 1968 and recovered twenty miles from the nest site in February, 1972. This bird still showed immature plumage.

Radar Tracking

In co-operation with the staff of the Carnarvon Tracking Station of the Commonwealth Department of Supply, narrow-beam radar is being used to observe eagles and other birds of prey. Radar parameters of various species are being measured and accurate flight paths for wedge-tailed eagles recorded.

Behaviour

Diurnal observations of colour-tagged eagles are continuing at Carnarvon. This study incorporates the effect of a local eagle population on lamb mortality.

WHITE-TAILED BLACK COCKATOO

Taxonomy

Since the work on the white-tailed black cockatoo, *Calyptorhynchus baudini*, began in Western Australia, specimens have been collected from throughout the range of the bird. During 1970-72 this sampling was increased and analysis of the specimens has confirmed that there are two distinct types of white-tailed black cockatoo. One type has a longer bill and slightly longer wing than the other.

There is no difference between the two types in measurements of bill width, tail length, tarsus length or weight. There are no size differences between the sexes within the two different types, and no appreciable differences in colour between the two types. Both display the normal sexual dimorphism described for the white-tailed black cockatoo.

Long-billed birds are found in the heavily forested south-west corner of Western Australia, to the south-west of a line from Perth to Albany. The short-billed birds are found to the south-west of a line from Geraldton to Esperance. At present not enough is known about the breeding distribution of the birds to be able to say what range the different types occupy during the breeding season, but it is suspected that the short-billed birds breed in lower rainfall areas than the long-billed birds. Collections will be made over the next breeding season in an attempt to clarify the breeding distribution of the two types.

Red blood cell agglutination and blood serum tests are being conducted using blood from both types in an attempt to see if there are any differences in the blood of the two types. It is hoped to obtain blood from other *Calyptorhynchus* species to compare the blood of the two subject types with the rest of the *Calyptorhynchus* group.

Biology

Since 1970 specimens of both long and short billed birds have been collected from Mundaring State Forest. This forest has large areas of pine plantations as well as large tracts of natural bush and both types of white-tailed black cockatoo occur in the forest during the non-breeding season. Crop analysis from these specimens has shown some interesting differences in the food preferences of the two types. Long-billed birds eat mainly *Eucalyptus calophylla* (marri) seeds and insect larvae found under the bark of some trees, while short-billed birds eat mainly pine seeds and seeds from Proteaceous shrubs, which have small hard seed pods.

Analysis of birds shot in apple and pear orchards being damaged by white-tailed black cockatoos reveals that the damage is due exclusively to the long-billed type. The long-billed birds depend heavily on *Eucalyptus calophylla* seeds as a food source and orchardists maintain that the damage they cause is worst when the marri fruit crop is poor.

In 1969 a study of the breeding biology of the short-billed white-tailed black cockatoo was begun. The study initially involved four areas which are located at fairly widely separated points over the range of the short-billed birds. An account was kept of the use of specific nest sites by individual birds in these areas. The study of the four areas was conducted for two breeding seasons and enabled some comparisons to be made between the areas. Study in the two southern areas was discontinued in 1971 to enable a more detailed behavioural study to be made in the other two areas at Coomaloo Creek and at Mannering.

The birds return to the breeding areas around June/July and eggs are laid between mid-July and mid-October. The birds return to the same area to breed and in some cases to the same hollow, but studies of nest-site selection and preparation are incomplete. Individually tagged birds are being used to study nest-site selection in the two study areas. Stainless steel wing tags have been developed and in 1971 these were placed on all breeding adults caught on their nests and on all fledging nestlings in the two study areas.

Breeding birds show no preference for any particular species of tree, the only requirement being a suitable sized hole in the tree. As the majority of these holes are

a result of termite damage to the trees, the birds favour those trees that are more susceptible to termite attack.

The usual clutch is two and usually both eggs hatch. The female does all the incubation and broods the nestling for about three weeks. Both parents feed the nestling in the morning and in the evening. The nestling fledges after ten to eleven weeks but it is not known what happens after fledging as the flocks leave the area after the nestlings have fledged.

An intensive study is being made at Manmanning of breeding behaviour, nest site selection and preparation, flock interactions and individual recognition. Breeding studies will continue at Coomallo Creek but not at the same intensity as at Manmanning.

It is planned to find a suitable study area to begin studies of the breeding of the long-billed white-tailed black cockatoo.

Movements

The study of movements in Mundaring State Forest was completed in late 1970. This gave no conclusive results on movement patterns but provided some information on food and flock size. This work together with other observations shows that generally long-billed birds occur in smaller flocks than short-bills.

Studies of short-billed birds have indicated that at the end of the breeding season the short-bill flocks move out of the breeding areas in December or January and amalgamate into bigger flocks near the coast and return to the breeding areas in June or July. The flocks in the non-breeding season can get very large and in some pine plantations the numbers of short-bills can get as high as several thousand birds which will stay around until most of the available pine seed has been eaten.

At this stage very little is known about the movements of the long-billed birds but they appear to be resident and indulge in local wanderings. It is planned to carry out more work on the long-billed birds in the coming season.

GALAH

In 1970, following a request from the Western Australian Government, the Division started a programme of research into the behaviour and ecology of galahs, *Cacatua roseicapilla*, which were regarded as a pest of cereal crops, especially wheat.

Most of the species of birds that are blamed for causing agricultural losses do so when they form flocks. It is therefore of importance to understand the formation, composition, mobility, and general behaviour of such flocks. Besides the immediate pest problem, the galah is a very suitable species for studying social organisation, feeding aggregations, and flock behaviour. The cornerstone of the present project, therefore, is the individual marking of a representative population in a typical wheat-farming area; the subsequent resighting of these easily recognisable birds will provide information about their social ties and movements.

The main study area is located at Manmanning, 120 miles north-east of Perth, where 226 galahs have been individually wing-tagged, and the breeding cycle and productivity are being studied at more than 100 nests each year. More than 1,000 galahs, many of known age, have been banded with metal leg bands under the aegis

of the Australian Bird-Banding Scheme, to give details of their later movements. Monthly food samples are being collected and analysed. Limited complementary studies are being made in an arid environment (Mileura Station, 8 in. rainfall) and in a wetter coastal habitat (Badgingarra, 25 in. rainfall) and these should emphasise the versatility of the species.

Near Perth a number of birds have been marked to study the behaviour and movements of a colonizing population spreading into new localities—a process that has been proceeding for years in Western Australia but which has only recently reached Perth.

When the field ecology of the galah is better understood it is anticipated that there will be several unanswered questions largely of a behavioural nature. These will be best answered under controlled aviary conditions and to achieve this a captive colony of galahs is being established; these birds are already invaluable for testing, marking and monitoring techniques.

NOISY SCRUB BIRD

The noisy scrub bird, *Atrichornis clamosus*, is considered threatened because only one small population is known to exist. Its range was formerly more extensive.

In 1970 a study of the bird's ecology and behaviour was begun at Two People's Bay, Western Australia.

The main aim is to gain an insight into the habitat requirements and factors regulating breeding. This work is being done to assist the Western Australian Department of Fisheries and Fauna to develop a management plan for the preservation of the noisy scrub bird and of five other small passerines.

The main areas of research are an examination of the effects of climatic factors and food resources on breeding and the analysis of habitat in relation to distribution and breeding. Comparative studies on the western whip-bird and bristle-bird are being initiated. Work on the vocalizations of the noisy scrub bird is being continued with an emphasis on the functions of the song. Comparative studies on the vocalizations of the western whip-bird and bristle-bird are being started.

PENALTIES INCREASED FOR RARE SPECIES

In S.W.A.N.S. Vol. 3, No. 2, we gave notice that nine species of bird had been declared "rare and likely to become extinct" and that the penalty for infringing this protection was \$1,000.

By notice in the *Government Gazette* on February 9, 1973 a further six birds have been placed in this category. These are:

- Partridge Pigeon (*Geophaps smithii*)
- Burdekin Duck (*Tadorna radjah*)
- Red-tailed Tropic Bird (*Phaethon rubricauda*)
- Peregrine Falcon (*Falco peregrinus*)
- Grass Owl (*Tyto longimembris*)
- Princess Parrot (*Polytelis alexandrae*).

There are now 16 birds placed in this category. The Western Australian Wildlife Authority is still examining those species of reptiles and mammals which should be afforded this additional protection.

SWEDES VISIT W.A.

In February, the Swedish Minister for the Environment, Mr Ingemund Bengtsson, visited Australia for the Environment '73 Conference in Sydney.

There is no doubt that Sweden is a world leader in the field of environmental protection and Mr Bengtsson was Chairman of last year's United Nations Conference on the Human Environment (U.N.C.H.E.).

Fortunately, the Swedish party found time to visit Western Australia, and this provided the opportunity for our Minister for Environmental Protection, Mr Ron Davies, to meet Mr Bengtsson and discuss matters of common interest.

The Swedish party were entertained on board the Fremantle Port Authority vessel *Challenger* and shown the Cockburn Sound complex. The Department of Fisheries and Fauna was represented by Dr D. A. Hancock, Chief Research Officer.

Members of the Swedish Minister's party shown in the photograph below are (from right to left):

Mr Per Anger, Swedish Ambassador.

Mr Valfrid Paulsson, Head of the National Environment Protection Board.

Mr Ivan Eckersten, Secretary, Department of Environment and Agriculture.

Mr Ingemund Bengtsson, Minister for the Environment.

Mr Ingvar Widen, Head of the National Board of Agriculture.

Mr Lennart Hannerz, Head of Research, National Environment Protection Board.



ASHY-GREY MOUSE AT LAKE GRACE

In February this year Technical Officer Ken Youngson and Honorary Warden K. Morris trapped an Ashy-Grey Mouse (*Pseudomys albocinereus*) between Lake Grace North and Lake Grace South.

The capture is significant because all recent specimens have been trapped on coastal heath and sandplain, and the present range in Western Australia was thought to be



Ashy-Grey Mouse (*Pseudomys albocinereus*)

restricted to Bernier and Dorre Islands, in Shark Bay, and the coastal areas of the South West. The inland limits were defined in 1906 by Shortridge who captured several specimens from the Beverley and Brookton areas. None have been seen or captured so far inland since that time, and it was generally thought that alteration to the inland habitat had reduced their range to the coastal areas.

The specimen captured affirms that the Ashy-Grey Mouse is still present in inland areas, although in limited numbers. No specimen has ever before been captured so far inland.

Possibly the isolated population between the two lakes has remained because of the protection from fire afforded by the lakes themselves on the eastern and western boundaries and by farming properties to the north and south. In addition there are no access roads to the area and the habitat closely resembles the coastal heath and dune country where these animals are normally found.

The Ashy-Grey Mouse is slightly larger than a house mouse and has a velvety smokey-grey coat with a pale undersurface. The feet and tail are pink and the eyes large and black. The tail is about 3 in. long and lightly haired.

OPERATION ORD NOAH— A SUCCESSFUL CONCLUSION

(See map page 26)

Phase 1 of Operation Ord Noah ended on January 16, 1972 due to unseasonable dry weather experienced in the Kimberleys. During Phase 1 hundreds of animals and reptiles were rescued from the catchment area formed by the main Ord Dam.

There was some doubt as to whether Phase 2 would be "on" due to lack of finance, but the Treasurer, Mr Tonkin announced on November 3, 1972 that funds would be made available.

Although Phase 1 had started on December 18, 1972, Phase 2 did not commence until January 17, 1973. This was due to the continuing dry weather experienced in the Kimberleys in the later part of the year.

The Department and the Western Australian Wildlife Authority are delighted with the results of the whole rescue operation. When the operation finally finished on March 2, 1973 the joint co-ordinators, Mr Henry Hall and Mr Neville Beeck announced that few, if any, animals remained to be rescued, and the only islands which may contain animals were low, flat islands in the flood plain which were too large to enable captures to be made.

As in 1971/2 members of the rescue team worked extremely hard in very trying conditions. Much of the work involved long, arduous patrols and many hundreds of miles walking across islands checking for animal life. Despite the dangers of storms on the lake, rogue bulls and poisonous snakes, the team came through, relatively unscathed and remained in excellent spirits throughout, as may be seen from the following extracts from their field diaries.

Jan. 17 (Hall)

Landed at Kununurra with Ian Hall at 11 a.m. and was met by Ian Cooke [Fauna Warden—Wyndham]. Drove to Wyndham where we had lunch and picked up our brand new 4-wheel drive. Left Wyndham for Kununurra to pick up stores but the whole town was shut-up at 3.35 p.m. which was a good thing because when I turned on the 'fridge in the house at the dam site the damn (pardon the pun) thing chucked it in. It was getting late so I inspected the outboards, which were in a disgraceful state, and went to bed.

Jan. 18 (Hall)

Into Kununurra for a new 'fridge, stores and outboard fuel, Ian stayed behind to fix the outboards. Returned, had a bit of lunch and whipped upstream to have a look.

A few of the islands we were anxious about had gone under but saw euros and agiles on nearby islands so they probably swam for it. The ten foot rise has spread the water tremendously, and our main problem will be the big flat islands on the Argyle Plain. These are about 25 miles from the dam, so we will have to do an all day run taking food with us. There has been a big split up of big islands as anticipated, which will make things easier, but a few of our old friends, the wild cattle, gave us the hairy eyeball on islands back (north) of Mt. Misery.

On the trip we saw agiles, euros and rock wallabies. Big water lilies are spreading from the submerged old Argyle Lagoon. Darters, sea gulls and cormorants are prolific, plus a bird I have never seen before, like a miniature cormorant, with long skinny legs.

No more rain to date, but they had an inch in Kununurra last night. Will be doing the Hick's Creek area tomorrow.

Jan. 19 (Hall)

Did one of the biggest runs we've ever done—pushed off at 4 a.m. (it's quite light here at that time), got back to camp at 6 p.m.

Did Hick's Creek area first. Talk about the River of a Thousand Isles, this is it!—except Hick's Creek is drowned out of existence. We've got an awful lot of work to do in this area, as those islands which we actually traversed all had animals.

We ran N.E. on to the plain country and our eyes fairly bugged out as the water appeared to meet the horizon. As we went the bird life got better and better—pelicans, gulls, ducks, ibis, royal spoonbills and countless darters and cormorants. We went right up to Stockade Creek to the old highway, then swung due East till we struck land near the old Rosewood road. It was getting shockingly hot so turned South and came to a huge flat island of approx. 250 acres. This island was about 2 miles behind the old Argyle Station, so you can see how the water has spread. We landed and from the first patch of so-called shade out vomited 2 agiles and a nail tail. They were making pretty heavy going of it in the mud and Ian got enthusiastic and took off after the nail tail. He hadn't done 100 yards when he was completely blinded by sweat running into his eyes and had to chuck it in.

We landed at several of these flat grass plain islands and saw animals on all of them. Islands too big to drive and capture animals on so we will have to try to get the animals in the water. The perimeter of the grass plain water line will be about 50 miles long. We started the run towards home pouring water on the seats to salve our blistered backsides.



Working close inshore presented problems of submerged trees and other debris.

Jan. 20 (Hall)

Storm hit the dam about 3 a.m. probably brewed up by the previous day's intense heat. Picked up mail and extra fuel and met Ian Cooke and Bob Beeton (C.S.I.R.O.) at Cockatoo Springs. The last remaining link of the Durack dynasty at Argyle disappeared in last night's storm. We did a survey near the old homestead and it has now disappeared.

Jan. 22 (Hall)

Did an all day survey of the West bank of the Ord. There were so many islands that we were overawed but its surprising how many you can cover in a day. We have left a red ribbon on a prominent tree on islands which are a dead loss, and a white one when we see an animal.



Marking trees with streamers to indicate presence of animals on the islands.

We got right past the Old Lissadel crossing and it was pretty turbulent. The bird life is fantastic. We had squadrons of pelicans, ibis, egrets, royal spoonbills, broilgas and jabirus in front of the boat all the time and saw about 50 magpie geese.

Jan. 23 (Hall)

Ian Cooke arrived in the morning and I had him hard at it walking islands in the afternoon. Of course, with beginner's luck he caught a beaut nail tail on his first landing.

Jan. 24 (Hall)

Spent most of day up Cooe Creek. Walked all the islands of the mouth of the Cooe in sauna bath heat. Went up Revolver Creek right into the Carr Boyd Ranges. There are two walloping big flat islands between the Ord and the Carr Boyds with animals—these will go under with a 2 foot rise.

It looks as if there could be a water lily problem in the shallow water. Also there are thousands of nesting birds and with "millions" of tons of fish available a bird population explosion seems inevitable.

Jan. 25 (Hall)

Picked up Neville and Geoff Beeck at 5.30 a.m., surveyed more islands in the Hick's and Stockade areas and got a few more animals. Lost my dark glasses today and have sunburnt eyeballs, please tell any visitors to bring dark glasses. We cocky types [farmers] have a feeling that the weather is cooking up.

(Beeck)

Had a sleep as soon as we arrived and after lunch had a run around the Mt. Misery area. Interested to note that the vast beds of algae have gone, so this may not be the problem that we thought. The water temperature is a lot lower than last year. It is most enjoyable now in the water and we jump in clothes and all to cool off.

Jan. 26 (Beeck)

Made run to assess situation up Revolver and Cooe Creeks. Up by "Dortch's Diggings" we found euros and six rock wallabies. Most of the islands here will never be covered in water but will shrink in size as the dam level rises. If there are no dingos the wallabies should be secure. If population levels are not too great we will leave well alone.

On one of these flat islands I stepped into a deep hole while wading knee deep out to the boat and disappeared from sight—rifle, camera, glasses on my nose, hat on head, and all still in place when I finally re-emerged. This trick is called a "Harry Butler" because the said H.B. did exactly the same last year.

In afternoon checked the Banana Springs area.

Jan. 27 (Beeck)

Quiet day. Did survey by vehicle into some country north of dam. Considerable bird life, including red-tailed and yellow-tailed black cockatoos, rainbow lorikeets, broilgas, magpies, etc.

Jan. 28 (Beeck)

Met Ray Smith, who arrived full of enthusiasm. Funny thing, as soon as we arrive on the job the rain stops just like it did last year. Haven't seen rain here up to now and there's only been 17 points since Henry arrived. There is a big colony of flying foxes living in paper bark trees at Banana Springs. I estimate their numbers at several thousand. Checked islands on the way back from Banana Springs and found evidence of wallabies and a bower bird's bower in use. Double bar and Zebra finches are plentiful here too.

Jan. 29 (Hall)

Of course, our famous off-Wyndham rain-bearing depression chucked 3 in. down in Kalumburu and we didn't get a drip. Our main concern is this lack of rain and the subsequent static nature of the dam.

Did a big push up the Behn early this morning, followed by a run right up Hick's Creek. An 18 in. rise here will mean we will have to move quickly to get animals off.

(Beeck)

Sighted many birds today including blood finches, bustards, broilgas, jabirus and one painted snipe. Also egrets, ibis, darters and pied cormorants in abundance. Long hours in the boats, walking islands, dodging tree stumps, logs and rocks in the lake really take their toll. We could easily knock up an 80 hour week, and not cover every corner of this damn lake.

Jan. 30 (Hall)

The difference between full storage level and maximum flood level is 74 feet but I cannot see this dam ever filling to maximum flood level and drowning some of the big "permanent" islands.

(Beeck)

The whole team did a reconnaissance of the vast flooded plain west and S.W. of the old Argyle Homestead.



Bower bird nest.

We checked about 20 islands in this vicinity but there were no animals on them. There are still some large islands here with wallabies on them, but we can leave these as they will be completely safe. Everyday we add to our knowledge of the area.

Jan. 31 (Beeck)

Another day, another patrol. Gradually we are covering every island in the whole dam area. There is a big backwater which runs into the Carr Boyds west of the river. We landed on island after island, but no animals. There are very few birds here too.

Feb. 1 (Beeck)

Henry and Ian Cooke did a traverse of the Mt. Misery sector, while Geoff Beeck, Ray Smith and I gave the back waters adjoining the Hick's Creek area a good combing over. A number of new islands have formed but there is very little life—any animal there will be safe except in the case of extreme flood. We burnt out a small island to try and flush out a planigale or two—but no luck.

Feb. 2 (Beeck and Hall)

Before the cameras of the *Daily News* we rescued a euro. This was done by setting a net across a narrow neck between two small islands. Ian Cooke did a spectacular dive off a cliff face to rescue the euro.

Did a run into the Mt. Misery backwaters. Made several landings and inspected some caves and found several bats. We also found a black bittern's nest with bird and 4 eggs present—not often one finds a bittern's nest.



Some animals were driven into the water and captured by use of nets.

Feb. 5 (Hall)

We tried burning off spinifex during a planigale hunt—no planigales but we rescued a lot of lizards. I think you could burn off a bloody lot of spinifex before turning up one of these tiny animals!

On one of the huge islands on the plain perimeter we rescued a euro.

Feb. 6 (Hall and Beeck)

Did a long run upriver to look at flat islands. We've had a 6 in. rise over the last week and this should facilitate capture. We found agiles and nail tails and also a big bungarra and took photos of capture and release.

Arrived back at 3 p.m. all well and truly sunburnt and very tired. We covered 90 miles in the boat plus numerous landings and much climbing.

Feb. 7 (Hall)

Got a lot of small things like bungs, snakes and lizards, still no planigales.

The water has sneaked up another 2 in.



Burning off of spinifex to flush out some of the smaller marsupials and reptiles.

Ray Smith had an electrifying experience when an 18 in. bungarra shot up his trouser leg.

Ian Cooke staked his foot, but it is healing up very well. Ian Hall has severe bruising of a leg from a bad fall but it is much better now.

Feb. 8 (Beeck)

Decided we would completely scour the Mt. Misery area. This has the makings of many small islands with only a small water rise. Any animals here are on prospective larger islands and in no danger. With a ten foot rise there would be only about three islands left but, if it rose five feet on that, then these three would break down into smaller ones again.

On our return we found a 9 ft. olive python which Henry rescued. We brought him back with us and released him—he was very docile.

We are collecting sundry lizards and bungs, etc., all the time and releasing them in the best places.

Set traps in the evening.

Feb. 9 (Beeck)

Went round animal traps today—but no success—one trap had been sprung.

Geoff will be leaving today as there is much work to be done on our farm.

Work was done on servicing the outboards.

Feb. 12 (Beeck)

On Saturday 10th we found a Rock Wallaby in a trap.

Weather is still dry and the green tinge on the hills is disappearing rapidly.

The dam is still rising slowly but I don't know where the water is coming from.

I will have to pull out and return to the farm at the end of the week, but the remainder of the team will be able to cope from here on in.

Feb. 13 (Beeck)

We did the flat islands on the east bank of the Ord today—no wallabies but some reptiles. We set some traps and checked the boats.

Feb. 14 (Hall)

Spent yesterday morning walking the big flat islands on the left bank of the Ord, well up stream.

Rescued a euro after much swimming about and the Education Department got good film of this.

Feb. 16 (Hall)

The Minister for Works, Mr Jamieson, visited us yesterday and we spent 4½ hours on the dam. It was agreed that when we have cleared out those few islands still containing animals we will wind up the operation. If subsequent rain should occur the rescue of any animals on the plain's perimeter can be handled by departmental staff, i.e., wardens.

Feb. 19 (Hall)

Neville went south yesterday. We had a most successful morning clearing up some of the remaining islands containing animals and rescued quite a few euros.

The scarcity of snakes is remarkable. I got a nice King Brown this morning, but this is only the fifth during the operation.



Members of the team with a rescued euro.

Feb. 20 (Hall)

I think our team are the fittest men in the territory. We started at 5 a.m. this morning and did very well with the wallabies. We have stocked Cattle Island with male and female euros and nail tails. I don't know how the honeymoons are going but guess they will work that out. We would like some dog bait to clear up some of the dingoes before we leave. Ian Hall and Ray Smith tore an island apart chasing a planigale but only came up with a dirty big King Brown snake. Were they disgusted!

Feb. 21 (Hall)

Had a major tragedy today when the motor smashed up on one boat.

Feb. 22 (Hall)

Had another good morning and rescued some wallabies. We have most of the "marked" islands cleared and have developed a system of lighting clumps of grass to drive the wallabies into the water. This saves an awful lot of running.

Feb. 23 (Hall)

Had a big gather up of animals. The best run in Phase 1 and 2. Joey wallabies, nail tails and agiles. I will send them down tonight to save keeping them. On a rough count back we have done a lot better than Phase 1 and can unconditionally guarantee that any islands that will be submerged are cleared.

Feb. 25 (Hall)

We did a big sweep of Mt. Misery. I drew the centre straw which took me across the bloody peak! No animals, but I got chased by a bunch of 11 wild bulls.

Feb. 26 (Hall)

We have started to get our gear together and it is in pretty good order except for our blown motor. Not much news over the weekend. No tourists, no weekenders and not a soul on the dam. This is our vibrant and developing North!

Feb. 27 (Hall)

Pulled boats out and stored motors.

The lack of water rise has been a big disappointment but we've done all that had to be done on the islands, even if it meant doing it the hard way by running instead of boating.

Feb. 28 (Hall)

Took Ray Smith to Wyndham, he has been an excellent man on this caper—a terrific worker. You won't recognise him as he looks like a native with a Van Dyke beard.

March 1 (Hall)

Got up early to finish packing and storing and heard tumult from the Tourist Development Camp where a herd of donkeys and cattle had completely demolished the 20 acre garden.

March 2 (Hall)

Cleared up house, stored everything, took inventory. Left dam after kissing everyone goodbye.

Enclosed are some notes on the whole operation:—

The team has had a very successful season and have totally cleared, or stocked, every island in the rocky terrain area. We have shifted more animals than in Phase 1.

The slow water rise, only 15 in. in the time we were here, made it necessary to hunt the islands on foot, instead of having the animals confined to a small peak on submerging islands. However, the team worked very well and have come out of the stunt incredibly fit.

Having to clear the islands took us longer than anticipated, but they are totally cleared now and need no further attention except for a few dingos.

Any water rise next year will only endanger animals on the Argyle Plains and Warden Cooke from Wyndham and one offsider can handle this by boat rescue.

Neville has taken some animals back with him and the private wildlife park at Bengar have 1 young rock wallaby, 3 young agiles and 2 young nail tails. All the adult animals were released. The South Perth Zoological Gardens have received plumed egrets, black bitterns and night kestrels—all fledglings.

Euros

A definite build-up of these animals on the rocky perimeter of the dam. Can be observed in numbers in early morning.

Boating Hazards

Localised windstorms will undoubtedly be responsible for boating mishaps every year. Would-be admirals getting lost will be the No. 2 hazard.

Weather

It has been observed many times that local thunderstorms collapse before crossing the lake. Many storms around the perimeter of the lake while we were here.

Bird Life

Birds, both water and avian are prolific. A tremendous build-up of darters, cormorants and plumed egrets is evident. All other species of water fowl, indigenous to the area are present.

Fish

Huge concentrations of three varieties which can be caught continuously at any time of day.

Aquatic Weeds

A water lily and a type of water couch are becoming prevalent in 15–20 feet of water.

Tourism

The tourist potential of the area is tremendous. Animals are getting used to watercraft and will be a big attraction. This combined with the magnificent scenery and fishing will act as a magnet to tourists.

The Department would like to express its appreciation of the tremendous efforts of Messrs Beeck and Hall and their team. Their enthusiasm never lagged despite arduous conditions, long hours, injuries and often dangers.

Thanks must also go to the Public Works Department for their continuing co-operation throughout both Phases of the rescue. Without their back-up support of equipment, and accommodation facilities, conditions for the rescue teams would have been unpleasant to say the least.

ABORIGINAL HERITAGE

The Western Australian Museum has distributed a large number of pamphlets explaining the Aboriginal Heritage Act. Since many of our readers, especially Honorary Wardens living in country areas, will come in contact with Aboriginal sites and Aboriginal objects, it was felt that reproduction of this pamphlet would be useful and informative. The information is only a guide to the provisions of the Act and for complete details reference should be made to the Act itself. See photos page 25.

What is the Aboriginal Heritage?

In simple terms, it is all the marks that the Aborigines left after their thousands of years of occupation of the land. Cave paintings, engraved rocks, arrangements of stones on the ground, camp sites scattered with stone artifacts and burial grounds. These represent some of the heritage. Some of the locations where such relics are found, known as Aboriginal sites, are important to Aborigines today. Many remain sacred, just as they were long before European occupation; others have been abandoned for centuries, but nevertheless represent a great store of information for archaeologists searching for an accurate account of the pre-history of people in this land.

Why protect this heritage?

A host of reasons. To begin with, some of it is part of the living culture of the Aborigines, much as a community Church is part of ours. Some is of historic interest to people who recall that their forefathers lived the tribal way. Much will one day become the subject of scientific study; if properly preserved, each separate site is a unique record of the people who once lived in that area. Above all it is a heritage of value, interest and beauty which can bring pleasure and enjoyment to future generations of Australians.

Who has the responsibility for the heritage?

The Western Australian Museum, which has been busy for some years in an endeavour to protect sites, is charged with the responsibility. If you come across an Aboriginal site which you believe to be unrecorded, you should advise the Museum. In time most sites will be marked in some way and if you find that a site has been damaged, the Museum should be advised.

How can the heritage be protected?

The Aboriginal Heritage Act, 1972 is designed to help protect Aboriginal sites, and some Aboriginal objects.

It is an offence to excavate, destroy, damage, conceal or in any way alter an Aboriginal site, even if you own the land on which the site is located. There is abundant protection in the Act for the interests of land owners who may be aggrieved by this rule, which is intended to give people with knowledge and experience the opportunity to decide what should be preserved. If, in the course of developing a piece of land, you realise that you are destroying a burial, or some other site, you must advise the Museum or a police officer at once, and take no further action at the site until approved.

Protected Areas

An Aboriginal site of outstanding importance, whether it is on land that is privately owned, or reserved for another purpose, may be declared a protected area under this Act. The boundaries and features of the Protected Area may be delineated by a fence or notice or other markers. It is an offence to interfere with any such notices or fences. Entry upon protected areas may in some instances be prohibited to unauthorised persons, and although notices to this effect will be erected, a person entering is liable for an offence even if the notice or fence was not in evidence at the time. This degree of control will apply particularly to store areas for sacred and ceremonial objects possessed and currently used by Aborigines.

Although Western Australia is only now entering this field of legislation, much of the experience of other states and of other nations has been considered and used. It is not too late to protect most of the heritage in Western Australia, but to ensure the continued preservation of these sites we need assistance and co-operation from everyone. While laws may be used to prosecute, they cannot rectify the loss by vandalism.

The relics at Aboriginal sites are unique and irreplaceable. Please help us protect them for the future.

Inquiries and information should be directed to the Registrar of Aboriginal Sites, Western Australian Museum, Francis Street, Perth, W.A. 6000. Alternatively a police officer can be notified of the location of a site.

WARDEN'S LONG PATROL

The long and arduous hours spent on patrol work by fauna wardens are exemplified by a report received from Warden Jim Wilson who was stationed at Kalgoorlie.

Warden Wilson left Kalgoorlie in the early hours of December 29, 1972 and returned late on January 4, 1973. His route was as follows: Kalgoorlie — Woolibar — Widgemooltha — Norseman — Frazer Range Station — Balladonia — Caiguna — Madura — Mundrabilla —

Eucla — Mundrabilla — Madura — Caiguna — Balladonia — Norseman — Salmon Gums — Grass Patch — Scaddon — Esperance — Lort River — Esperance — Lort River — Esperance — Norseman — Kambalda — Kalgoorlie.

During the patrol Warden Wilson made detailed notes of all fauna sighted and other relevant information.

Woolibar Dam—dam full; sighted Maned Geese, Grey Teal, Pink and Grey Galahs, Twenty-eight Parrots and one Black-faced Cuckoo Shrike.

Widgemooltha—small bird life prolific; Squeakers and Black-faced Cuckoo Shrikes.

Norseman to Balladonia—all dams en route were dry; bird life was very scarce; kangaroo carcasses by roadside (hit by vehicles).

Madura—Major Mitchell Cockatoos, Squeakers, and small bird life abundant around townsite.

Norseman to Esperance—bird life became more numerous closer to the coast. Most dams had water but salt water lakes were dry. Squeakers, Twenty-eights, Black-faced Cuckoo Shrikes, Black Duck and Grey Teal.

Lort River—small birds numerous, Grass Parrots; one Bustard sighted.

During the patrol Warden Wilson visited several Honorary Wardens and carried out damage inspections on some stations. He travelled a total of nearly 1,700 miles in the seven days.

Long and arduous though this patrol may be, it is not a record for the Department. Some years ago, Supervising Warden Sam Bowler carried out a patrol of the North West policing illegal crocodile poaching—he travelled a total of 5,800 miles.

EXPORT OF CROCODILE SKINS BANNED

In December 1972, the Minister for Customs and Excise, Senator Lionel Murphy announced the prohibition of the export of crocodile skins and products made from crocodile skins. Senator Murphy said that this action was an interim measure pending consideration of the recommendations of the Select Committee on Wildlife Conservation by Commonwealth and State Fauna Authorities. Convincing evidence has been presented that the ban is necessary to ensure the continued survival of the crocodile in Australia; a Commonwealth sponsored research project has revealed that the rate of decline in the crocodile population has increased very greatly in recent years as a result of over exploitation by commercial interests.

The only exception to the ban will be the permitted export of skins from crocodiles raised in duly recognized crocodile farms or export for scientific purposes.

Both Freshwater and Saltwater Crocodiles are protected in Western Australia, but, because crocodile skins could be exported legally, illegal shooting was a profitable business and was difficult to detect in the inaccessible north west of the State. If illegal crocodile shooting is still to continue the skins will now have to be **smuggled** out of Australia. It is easier to detect smuggling than illegal shooting and the penalties are far higher for those who are caught.

Our Diminishing Heritage

The Boodie or Lesueur's Rat Kangaroo is yet another example of an Australian marsupial which has declined in range and numbers since the advent of the white man. It was once found over a large part of the mainland and on some islands off the Western Australian coast, but now appears to be extinct over most of its former range and has not been recorded on the mainland of Western Australia for over thirty years. However, it is still fairly common on Bernier and Dorre Islands in Shark Bay and on Barrow Island, west of Dampier.

Boodies were first recorded during Freycinet's second visit to Shark Bay in 1824 and are unique among the macropods because of their burrowing habits. Boodies live in large colonies in communal burrows with multiple entrances. On Barrow Island a burrow has been found with 30 entrances. Wood Jones (1924), linked the shrinking range of the species in South Australia with the spread of rabbits and foxes; Troughton (1941) suggested that poisoning (combined with foxes) was the reason, but Finlayson (1958) ascribed the decline mainly to foxes, since boodies and rabbits had apparently co-existed for some years before the spread of the fox. It is also probable that the alteration of vegetation brought about by the extensive grazing of sheep was a major factor. In fact, if it was pertinent to apportion the blame, it would be difficult to say who or what caused the decline in the status of the Boodie; unfortunately insufficient studies of the animal were made until the species had nearly reached its present status, by which time of course, it was too late.

The Boodie is a small wallaby and is grey-brown in colour, although this varies between a creamy colour under the belly to a dark brown on the back. The claws of the forefeet are white which distinguishes it from the Western Hare Wallaby which it resembles in colour. The ears are short and the tail is nearly hairless. It is a nocturnal animal and thus is seldom seen except by artificial light at night, or dimly in the late dusk.

If pursued, boodies will emit a succession of grunts and chuckles, and, if handled, will scratch savagely and attempt to bite. Because of their nocturnal habits the behaviour of the Boodie has been studied closely only in captivity. In 1964, Eleanor Stoddart of the Division of Wildlife Research, C.S.I.R.O., Canberra, studied six females and two males from Bernier Island, for about three months. It was found that there was little territorial domination but that the boodies formed into two social groups. The older male was dominant and had four females and the younger male had two females. The males were aggressive towards each other with the younger one usually running away from the older male, but on several occasions they did fight, lying on their sides and lashing out with their feet.

Although it appears likely that the Boodie is now extinct on the mainland, the island populations appear secure. Bernier and Dorre Island are "A" Class Fauna and Flora Reserves and suffer little or no human interference. Only the presence of goats on Bernier Island has presented a threat to the existing population, and periodic attempts to totally eliminate these goats are made by the Department (see S.W.A.N.S., Vol. 2, No. 3, Winter, 1971). Barrow Island on the other hand, although also an "A" Class Fauna Reserve, does receive human usage as the site of an oil exploration programme initiated in 1963 by Western Australian Petroleum Pty. Ltd. (now a commercial oil field). However, as a result of the responsible attitude of this company, and its co-operation with the Department, it would appear that in this case development and conservation can go hand-in-hand. Research officers make regular visits to monitor the status of the vegetation and the fauna, and it would appear that the Boodie is holding its own on Barrow Island.

In December 1972, a Departmental party spent two hours visiting a small unnamed island four or five miles south of Barrow Island. Here they discovered one recently dead Boodie, some skulls and several burrows, indicating a hitherto unknown population.

BOODIE

(LESUEUR'S RAT KANGAROO)

Bettongia lesueur



Entrance to a Boodie's burrow. The hat gives a comparison of the size of the entrance.

DISTRIBUTION:

Western Australia (Islands off the west coast; Bernier, Dorre and Barrow).

Probably extinct on the mainland.

Once common in S.A., N.T., south western N.S.W.

LOOKS:

Resembles small wallaby.

General colour—dark brown to grey.

Belly—cream coloured.

Feet—light tan.

Claws of forefeet—white.

Ears—short.

Tail—almost hairless.

LENGTH:

Head and body—280–450 mm.

Tail—250–330 mm.

A male specimen in the W.A. Museum measures 620 mm overall with a tail length of 305 mm. A female specimen 550 mm (tail 265 mm).

WEIGHT:

Full data is not available, but five females from Barrow Island and two from Dorre Island averaged 1090 g. Two males from Dorre Island averaged 1370 g. A male specimen at the W.A. Museum weighed 1300 g; and a female 1020 g. Weight may vary from island to island.

BREEDING:

Rat Kangaroos in general produce young throughout the year. The Boodie may differ in that it may have a seasonal breeding pattern. (On Bernier Island most births occur between February and September). Nests are of simple construction inside the burrow, although the Boodie expends much energy on construction.

Birth follows 22 days after mating.

Young leave the pouch between 113 and 120 days old.

Where further conception follows closely on birth, the embryo is delayed in its development for up to four months while the previous joey is suckled in the pouch.

DIET:

Not a lot of research has been done but it is likely that boodies are predominantly vegetarians eating grasses and roots; they may also eat insects, etc.

KNOW YOUR SUPERVISING WARDEN

Samuel William (Sam) Bowler was born in Perth in 1918. At the age of 15 he joined Boans where he held numerous positions ranging from salesman to truck driver.

In 1939 Sam joined the volunteer armed services and spent 12 months in the army before joining the Navy in January 1941. Most of his time in the Navy was spent serving on the patrol vessels "Mildura", "Adelaide" and "Shepparton".

Sam joined the Fisheries and Fauna Department as a Fisheries Inspector in 1946. He spent 6 months at a Commonwealth Fisheries Training School at Cronulla, N.S.W., in 1948 and on his return was posted to Geraldton.

On May 17, 1957 Sam became the State Fauna Warden and from his numerous patrols in the bush gained tremendous knowledge of the State and the native fauna. Pick any town in Western Australia and Sam has been there; he'll tell you how to get there, the population and any other details you require.

Sam married his wife Minnie in 1942 and they have two sons aged 23 and 20. He is an enthusiastic spectator of the more active sports—but mainly boxing, Australian Rules, and cricket. He is a member of the Perth Football Club.

When Sam first joined the Department in 1946 he was told that, due to limited finance, he would only be employed for 3 months. At the end of that time he went up to his boss and said, "I guess I'm finished now".



Sam's opportunities for field work are decreasing as the pressures of administration build up with increased staff and the establishment of new fauna districts.

His boss replied sternly, "I'll tell you when you're finished—now get back to work".

Twenty-seven years later he's still going strong.

TESTS PROVE PIGEONS NAVIGATE BY THE SUN

By Dr. Andrew Whiten,
Department of Zoology,
University of Bristol.

The ability of birds to navigate—to set a course for home when released in a strange place hundreds of miles away—has for a long time puzzled both scientists and amateur ornithologists.

A step forward was made when it was realized that the domestic racing pigeon is capable of this feat within the first few minutes after release and over the past 20 years scientists have started to unravel the mystery of homing by simply releasing pigeons and watching them with binoculars.

One of the important discoveries was that birds released under a thick overcast were disoriented; but if the sun was visible they headed for home.

Height of the Sun

As a result the suggestion was made that pigeons use the sun to navigate in much the same way as a human navigator. Latitude would be determined by estimating the height of the sun if, for example, at noon the bird found the sun higher than it remembered it at home it should fly away from the sun.

It could determine its longitude by estimating if the sun were too far along its path or not far enough for that time of day and obviously it would need a "chronometer" for this.

We now know that birds do have a "clock" in their heads which tells them the time of day.

This "sun navigation" theory is not easy to test using free flying birds because it is obviously difficult to alter the apparent path of the sun to see if the bird's orientation is affected.

(continued on page 24)

DECLARATION AND AMENDMENT OF RESERVES

NEW RESERVES

Name	Res. No.	Locality	Plan	Area	Previous Use	Purpose	Vesting	Gazettal
....	31636	....	1054/80	12 626·1900 ha	....	Conservation of Fauna	W.A.W.L.A.	29-9-72
....	31675	....	59/80	About 9550 ha	....	Conservation of Flora & Fauna	W.A.W.L.A.	8-12-72
....	31755	....	421/80 F.2	824·5622 ha	....	Conservation of Flora & Fauna	....	2-2-73

AMENDMENT OF AREA

Name	Res. No.	Locality	Plan	Area	New Area	Purpose	Vesting	Gazettal
....	23128	....	345/80	300a.	About 114 ha	Recreation and Conservation of Flora and Fauna	Kondinin Shire	13-10-72
....	A23756	....	380/80 383/80	1980 ha	About 990 ha	Conservation of Flora & Fauna	....	26-1-73
Holland Rock	29022	....	407/80 E.2	150a.	About 50 ha	Conservation of Flora & Fauna	W.A.W.L.A.	19-1-73

CHANGE OF PURPOSE

Name	Res. No.	Locality	Plan	Area	Previous Purpose	New Purpose	Vesting	Gazettal
....	A23756	....	38/80, 383/80	About 990 ha	Preservation of Flora & Fauna	Conservation of Flora & Fauna	....	26-1-73

VESTING

Name	Res. No.	Locality	Plan	Area	Purpose	Previous Vesting	New Vesting	Gazettal
....	21056	7½m. E.N.E. of Cuballing	378/40 E.4	357a. Or. 33p.	Conservation of Flora & Fauna	....	W.A.W.L.A.	19-1-73

CANCELLATION

Name	Res. No.	Locality	Plan	Area	Previous Purpose	New Purpose	Vesting	Gazettal
Fitzgerald R.	24048	....	419/420/ 433/434/ 447/80	234 145 ha	Conservation of Flora & Fauna	National Park	....	19-1-73

(from page 22)

Placed in Box

Therefore I tried to develop a method which did not involve actually releasing the bird. Instead it was located on the ground and trained to tell me where it estimated home to be.

To do this the pigeon was placed in a box which could be rotated in any direction. Its head stuck out of one end of the box so that it could see all around and in front of it was a button which it could peck to receive a food reward.

The first part of my experiments consisted of training two pigeons so that when they were pointing towards home they could peck the button for a reward. When they were pointed in the opposite direction pecking was not rewarded.

This training was carried out at three locations; at Ombersley, 58 miles north of the Bristol University loft; at Oxford, 60 miles east-north-east, and at Bradnich, 60 miles south-west.

On Clear Days

Training was done only on sunny days, between 11.30 a.m. and 1.30 p.m., and the birds were taken to a different site each day. The birds could see the sun but not the local surroundings as the apparatus was circled by a screen 24 in. in diameter and 8 in. high.

After training on several successive days the pigeons began to show some measure of discrimination, pecking the button to obtain food only when facing Bristol. At the end of a week their performance was so good I decided to investigate what cues they might be using.

To do this I arranged a periscope-like system of mirrors in front of the bird's head to alter the apparent path of the sun; the real sun was hidden by a screen around the periscope.

This arrangement could be used at Bradnich to produce a sun path appropriate to a point north of Bristol and at Ombersley one appropriate to a point south of Bristol.

They were Fooled

The results of these tests showed that the pigeons pecked more in the false home direction than in the true direction. In other words they had been fooled into thinking they were in the opposite direction to their true position.

Obviously they were deciding whether they were north or south of Bristol on the basis of the height of the sun path.

To check this I carried out further tests in my laboratory at Bristol University where an artificial sun can be generated by a special projector lamp. The birds again paid special attention to the height of the sun.

These results show that pigeons are capable of using the sun's altitude to tell them if they are north or south of home.

This is certainly not the full story, for recent research in the United States of America has shown that experienced birds can orient under overcast if they are used to flying round the loft in bad weather and magnets have been shown to have a deleterious effect on homing orientation.

Lost Sense of Direction

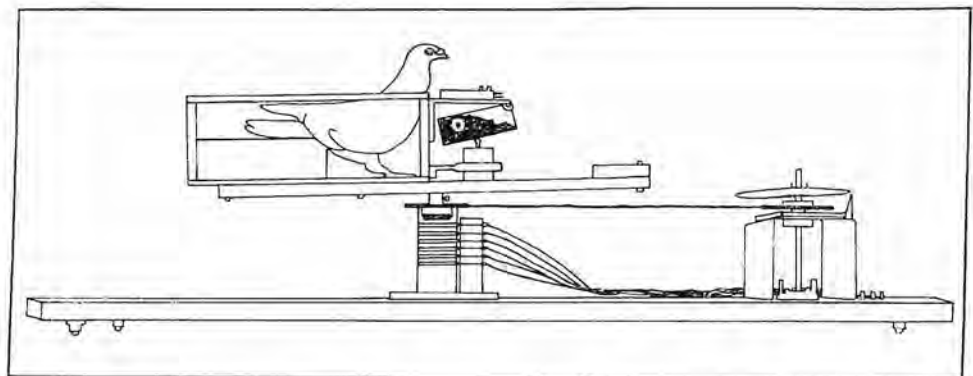
I found that when it was overcast or when the sun went down behind the screen in the evening the pigeon lost all sense of direction, even though in the latter case the direction of the sun could have been estimated from shadows on the wall of the screen.

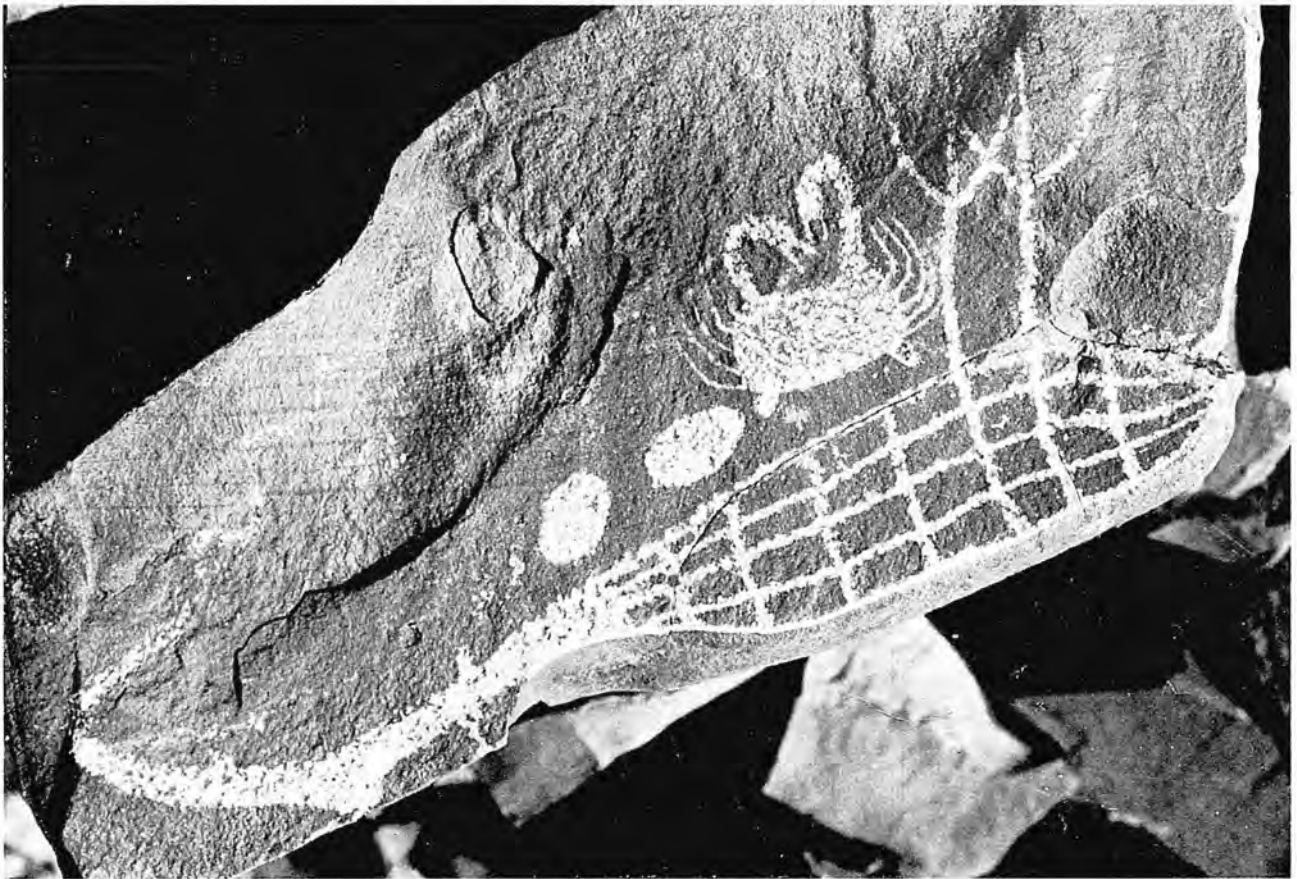
No measure of training could produce any sign that the birds could orientate under complete overcast.

I also placed a small bar magnet over the pigeon's back so that it would reverse the direction of the magnetic field in the region of the bird's head but this had no effect at all on the way the bird responded.

These findings do not contradict those of the U.S. researchers because magnets usually have an effect only under overcast, rather than in sunny conditions. It may be that the bird must be flying before it can orientate under overcast or respond to magnetic fields.

The bird in its box. The pecking keys under its beak produce food from the hopper, operated by the solenoid switch beneath it. The remote control on the right of the picture operates the ring contacts and brushes on the left.

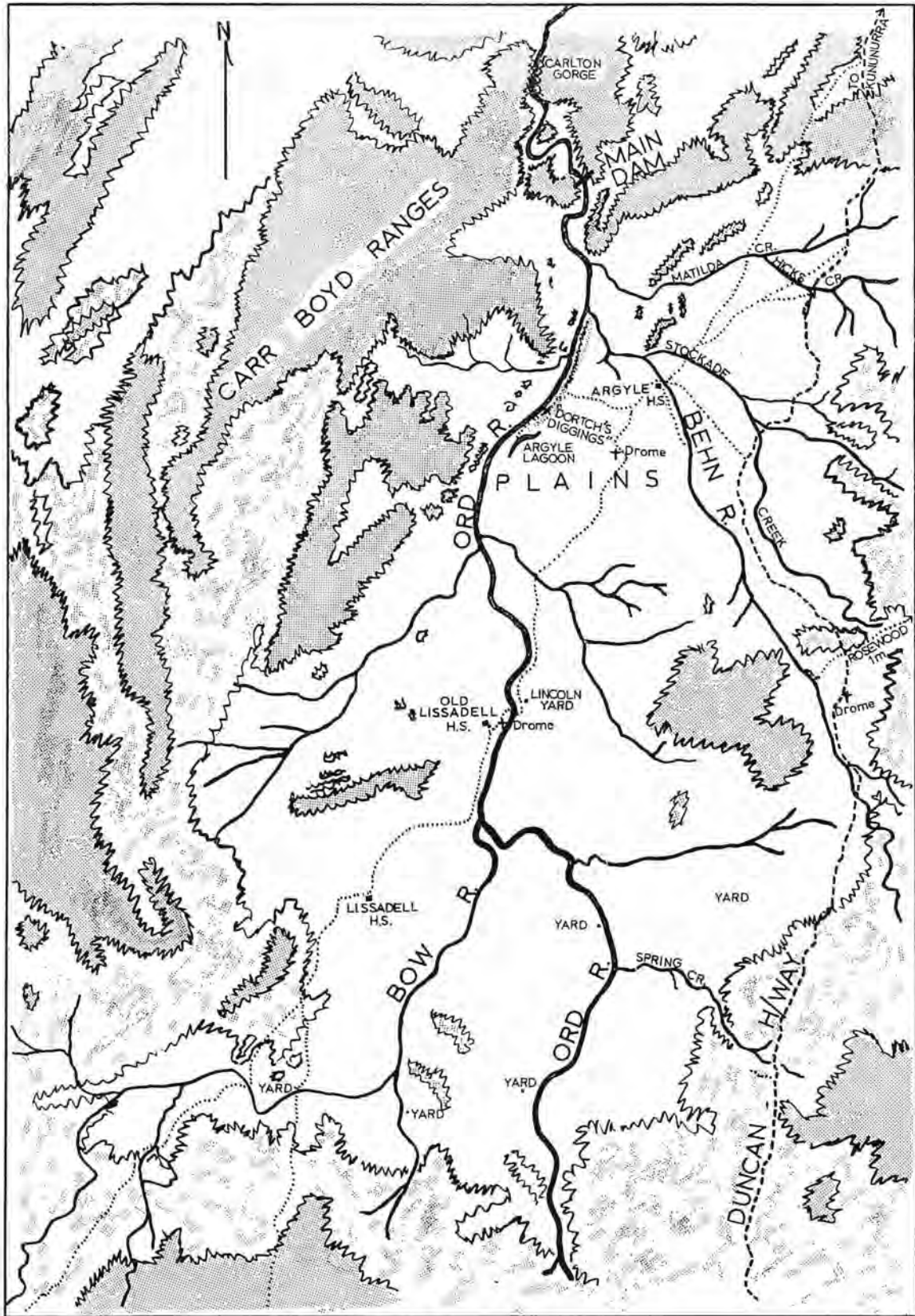




Aboriginal rock paintings



Aboriginal ceremonial grounds



SCALE:

