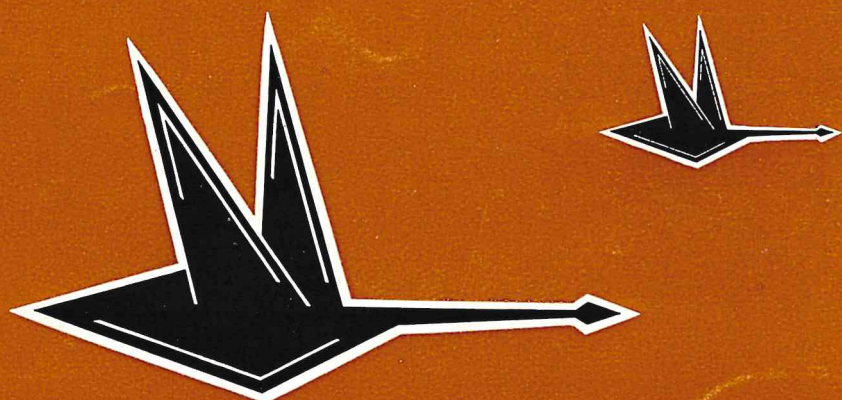


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WESTERN AUSTRALIA



S.W.A.N.S.

State
Wildlife
Advisory
News
Service

Vol. I No. 1
Winter, 1970

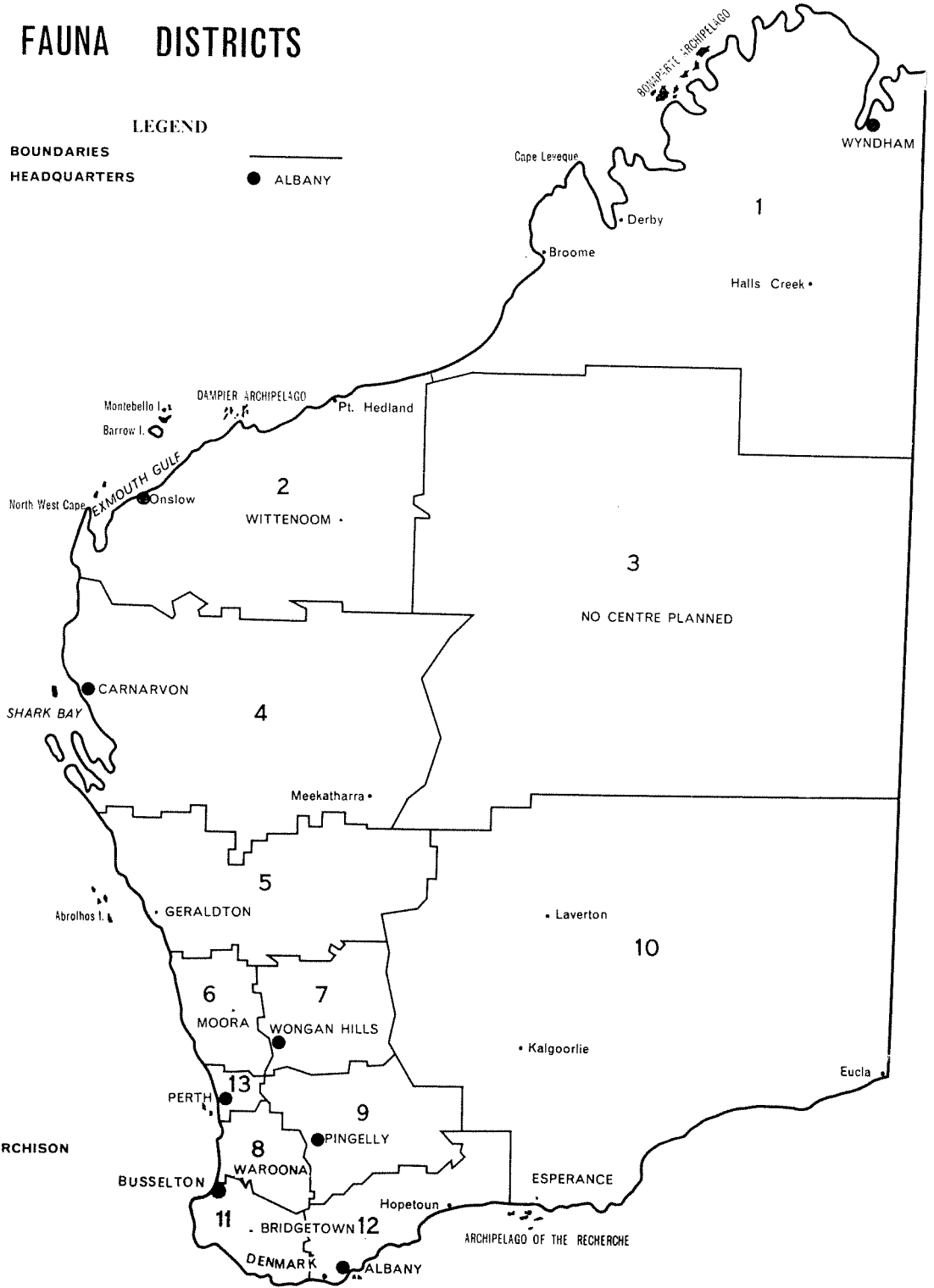


FAUNA DISTRICTS

LEGEND

BOUNDARIES ———
 HEADQUARTERS ● ALBANY

INDIAN OCEAN



KEY TO DISTRICTS

- 1 KIMBERLEY
- 2 NORTH WEST
- 3 EASTERN
- 4 GASCOYNE-MURCHISON
- 5 GERALDTON
- 6 MELBOURNE
- 7 NILGARN
- 8 MURRAY
- 9 AVON
- 10 EUCLA
- 11 SOUTH WEST
- 12 GREAT SOUTHERN
- 13 METROPOLITAN

S.W.A.N.S

Vol. 1 No. 1
WINTER, 1970

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

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**Extension and Publicity Service
Department of Fisheries and Fauna
108 Adelaide Terrace,
Perth, Western Australia**

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.

Director: B. K. Bowen, B.Sc.

Chief Warden of Fauna: H. B. Shugg, A.A.P.A.

Editor: A. C. Waldon, A.A.I.A. (Dip.)

Assistant Editor: J. J. Brennan

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Something

to think about

With the arrival of this inaugural edition there is need for an evaluation of the past and of hope for the future, a time for self-appraisal and critical analysis of our attitudes.

How many of us will gaze in retrospect and admit that we could have contributed more to the efforts of shooting and fishing?

How many will concede that the scope of our interest did not extend beyond the size of the catch, the bag limit, or the price of a license fee?

Four areas come to mind in which we can all take an active part to ensure a stable future for the State's sport fisheries and fauna—which we seem to have taken for granted in the past. We need to develop more interest in conservation and an awareness for maintaining a proper balance between supply and demand of our harvestable natural resources.

Support of the State's fish and wildlife authorities is another area where we can help our own cause. The biologist is a qualified expert dedicated to conservation of our native fauna and its rational exploitation through modern management techniques; the fauna warden co-operates with the biologist, the sportsman and the land owner to ensure the continuation of all species; the fisheries inspector polices the State's waters to guarantee a continuing supply of fish for the amateur and the professional.

Laws controlling fisheries and fauna are a necessary tool of management; we should abide by them in the true spirit of sportsmanship and be openly critical of those who fail to do so.

Finally we must recognise the land owner's rightful place. He can no longer be abused or taken for granted, for the commodity he owns is in demand and, with the progress of industrial and urban development, the supply is gradually dwindling. By taking an active part in all of these areas we will be helping to preserve and improve the sports upon which we depend for outdoor pleasure.

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BERNIER AND DORRE ISLANDS MANAGEMENT PLAN FOR CONSERVATION OF FAUNA

Bernier and Dorre Islands are situated at the north-western edge of Shark Bay and are about 30 miles west of the mainland. Their area totals approximately 26,000 acres. They are a very important fauna sanctuary, being the only sure haven for a number of mammals, particularly the Banded Hare Wallaby (*Lagostrophus fasciatus*), the Western Hare Wallaby (*Lagorchestes hirsutus*), the Boodie (*Bettongia lesueri*), and the Little Marl or Little Barred Bandicoot (*Perameles bougainvillei*). All these marsupials once occurred on the mainland of Western Australia but are now either extinct or nearly extinct there. They are now found commonly nowhere else in the world but on Bernier and Dorre Islands. In addition to the marsupials two native hopping mice occur. The Shark Bay Mouse (*Pseudomys praeconis*) has been found only on Bernier Island. It was known from Peron Peninsular but has not been collected there since 1858 so it is probably restricted to Bernier at this time. The Ashy-Grey Mouse (*Pseudomys albocinereus*) is known from widely scattered sandplain areas in the south-west. Two species of bats are also found on the Islands.

The islands harbour a number of bird species. Nesting species include Wedge-tailed Eagle, White-breasted Sea Eagle and the Osprey as well as distinctive forms of two species of Wren.

The history and biology of these islands were the subject of Fauna Bulletin No. 2 (Ride et al, 1962; Government Printer, Western Australia) which documented the results of an expedition to the islands in 1959. The recommendations made by members of the expedition (p. 120) are as follows:

"That Bernier and Dorre both remain natural reserves for the preservation of fauna and flora; that no part of them be utilized for any other purpose because of the danger of the unwitting introduction of alien species or fire; that no jetty or pier be built from them which, in allowing decked craft to moor alongside, might facilitate transference of alien species (such as rats) from vessels to the wharf; that parties of visitors to the islands be strictly supervised to prevent accidents with fires; that dogs be prohibited; that firearms be prohibited except by special permission of the Chief Warden of Fauna; that a major effort be made to acquaint the fishermen of the bay with the great value of the reserves and the danger of lighting fires on them; and finally, that the goat population on Bernier Island be exterminated without delay."

Since this expedition three major parties have been organised to shoot goats on Bernier Island. These have resulted in 336 goats being killed as follows: March 1962, 71 goats; May 1963, 5 goats; August, 1967, 196 goats; April 1969, 64 goats. After the last trip the population was estimated

at less than 100 but aerial surveys will be made to verify this.

Over the years there has been some pressure to allow the islands to be developed for tourist purposes. However, the public do not appear to use the islands much at the moment. There is a large amount of fishing carried out adjacent to the Islands but this is dependent on boats. Any future sport fishing can be based on high speed craft operating from Carnarvon. The arid nature of the islands and the dense, scrubby vegetation makes them unsuitable for walking or sightseeing. The highly poisonous mulga snake (*Notechis australis*) occurs on both islands.

Aims of the Management Plan

1. To preserve for all time the islands as sanctuaries for the native fauna and flora.
2. To prevent any interference with the animals, plants or soil which might cause the degradation of the area.
3. To prohibit any human activity which is not consistent with the above.

To implement this plan Dorre Island has been made a prohibited area while people are allowed on Bernier Island for day visits. This will allow scientists to measure any disturbance caused by human use against an untouched area. Dorre was picked as the prohibited area because some disturbance to Bernier had already occurred following the introduction of feral goats.

The notice declaring Bernier Island a "LIMITED ACCESS AREA" and Dorre Island a "PROHIBITED AREA" was published in the "Government Gazette" on 3rd July, 1970.

In relation to Bernier Island this restriction means that persons landing on the island must not camp overnight, erect any structure, disturb or injure any plants or animals, disturb the soil, be accompanied by any domestic animals, light fires, carry firearms, carry spears or spearguns or carry out any other activity contrary to the normal regulations governing fauna sanctuaries.

As a "Prohibited Area" Dorre Island is closed to all persons without specific approval from the Department of Fisheries and Fauna. Under the management plan:

- (a) Goats on Bernier Island will be eradicated or reduced to an insignificant level as far as is practicable.
- (b) Research will be carried out into the biology of the native mammals, the regeneration and maintenance of the plants, especially following the lessened grazing by goats, the movements of the sand dune, on Bernier Island, the effects of human activity on Bernier Island compared with Dorre Island and any other factors affecting the maintenance of the reserves and the persistence of the fauna thereon.



KANGAROO SITUATION IN WESTERN AUSTRALIA

There are three major species of Kangaroo found on the mainland of Western Australia, these being:

- (a) the Euro, or Biggada (*Macropus robustus*),
- (b) the Red, or Plains Kangaroo (*Megaleia rufa*), and
- (c) the Western Grey Kangaroo (*Macropus fuliginosus*).

In addition to these species, there is the Antilopine Kangaroo (*Macropus antilopinus*) of the Northern Kimberleys, and the insular form of the Euro (*M. robustus isabellinus*), found on Barrow Island. Some of the larger islands of the adjacent Dampier Archipelago also harbour small populations of Euros.

Protection of the Fauna in W.A. is effected by means of Section 14, subsection 1 of the Fauna Conservation Act, 1950-1969, which states that:—

“Except to the extent which the Minister declares by notice published in the *Government Gazette* pursuant to the provisions of this Section all fauna is wholly protected throughout the whole of the State at all times”, although the Minister also has the power under subsection 2 to declare fauna unprotected, or to vary the provisions of the protection in specified cases. He may also declare closed or open seasons with respect to any of the fauna in either general or specific manner, and restrict the taking and/or disposal of such fauna.

With respect to these Kangaroos, the present situation is being reviewed. The position has been that the Red Kangaroo and Euro, except on sanctuaries, have been unprotected throughout the whole State, while the Grey Kangaroo has only been protected over a relatively small part of its range since 1952, when the former blanket protection of this species was removed. Since this

time, however, a large scale invasion of formerly undisturbed Grey Kangaroo habitat, both within and outside the protected area, has occurred, with a consequent reduction in area of available habitat. This change has contributed to the reduction of populations of this species, and it has also accentuated the problem of management arising from the conflict between the interests of these animals and those of intensive agriculture. The trend towards fragmentation of local populations and the isolation of relic populations in local areas also presents further biological problems.

It is unlikely that commercial exploitation of natural populations of this species, in this State at least, has any but limited prospects at present, and it is likely that these will become more limited with future reduction in populations. Direct commercial utilization of this species has always been limited, and is not being encouraged at present.

The Red Kangaroo and Euro have been declared “vermin” in the pastoral areas of W.A. for many years, under provisions of the Vermin Act, 1918-1965, which is administered by the Agriculture Protection Board, and the unprotected status of these two species in the past has been acknowledgment of the former precedence of the provisions of the Vermin Act relative to the Acts relating to fauna. This situation has since been amended, but it is still acknowledged as Departmental policy that any fauna conservation management programme should take into account all relevant factors.

Despite the fact that both Reds and Euros are at present unprotected, and that existing vermin eradication techniques, if correctly employed, are capable of eliminating the majority of these animals from large tracts of pastoral country, this policy of non-intervention by the Fauna Authorities was not contributory to any serious depletion of populations prior to the advent of an expanded pet meat and skins trade.

Only part of this industry has been registered with the Department of Fisheries and Fauna, and this only since 1957, and statistics collected are unreliable as far as exploitation is concerned with the possible exception of the last three years (1967-1969), but some generalizations are possible.

Firstly, the kangaroo pet meat trade in W.A. was originally based on the exploitation of the Grey Kangaroo, and expanded to include the Red Kangaroo, and some Euros at a later date, although limited trading in dry skins of the former two species has always occurred. The dried skin trade has not accounted for large numbers of animals in the past, and is not likely to do so now. On the other hand, the exploitation of the kangaroos as a source of pet meat has provided the economic incentive for the killing of many more of these animals than would otherwise have occurred. Prior to 1965, the total take of the pet meat and dry skins trade in W.A. may have reached a peak of 100-150 thousand animals per year for a short time, with between 25 and 40 thousand of these animals being Grey Kangaroos. Many of these animals would have originated from areas being cleared for agricultural purposes. Since 1965, and more particularly in the last 2-3 years (1967-1969), this industry has expanded and shifted almost entirely to the exploitation of the Red Kangaroo. The only large scale operation on Grey Kangaroos was terminated midway through 1969. This previously accounted for some 20-25,000 animals per annum.

Trade in Red Kangaroo carcasses and skins by local dealers for the period 1967-1969 was:

1967—173,000
1968—174,000
1969—316,000

The rise in the numbers taken during 1969 can be attributed to an increase in the value of skins, large scale export of meat, both overseas and interstate, and increased vulnerability of the animals due to drought conditions. It is considered that this rate of exploitation is excessive with respect to W.A. populations of the Red Kangaroo, and cannot be sustained without reducing the total populations of the species. Proposals to restrict the harvest are being made as part of a general management plan for this species. It should be remembered when making comparisons between local situations, that conditions differ from place to place, and also from time to time, and that the management strategy to be employed in a particular instance must be appropriate to that situation. In this respect the habitat of the Western Australian populations of the Red Kangaroo comprises much poorer rangelands than those of the N.S.W. pastoral areas for example, and it can be expected that W.A. populations of this species would naturally be less dense than those formerly found in N.S.W. prior to the drought in 1964-65. It should also be noted that areas of favourable habitat for the

Red Kangaroo are generally found in only about one-third of the State (approximately 330,000 square miles), and this area is not uniformly favourable.

The commercial kangaroo trade possesses a capability in excess of any harvest which could be supported by the population of the Red Kangaroos, and it is already evident that over exploitation has occurred in many areas. As far as economics of operation are concerned, it will suffice to say that the net profit per carcass for a shooter taking animals of both sexes with an average weight of 30-35 lb. is about 75c for a fully professional operator; the profit margin is greater for a part-time or casual shooter. In effect the economic situation is such that it is profitable for a shooter to take all but the pre-productive animals in a population, and in these circumstances it is pointless to assume that economic factors could control shooting pressure on a population so that its future survival was assured. The combination of mobile freezers and good roads also ensures that talk of refuges where populations could escape the pressures of commercial exploitation has little validity in practice.

Direct intervention and management is needed in this situation and is to be instituted.

Management recommendations at present under consideration include specific references to the necessity to achieve a biologically acceptable solution in each case and also emphasize the fact that a sustained harvest does not necessarily equate with a stable yield from an exploited population. Provision for adequate data collection to collate information as a basis for management decisions is considered a necessity, and will be incorporated in the final management programme.

AN APPETITE LIKE A 'ROO DOG

Mr. Henry G. Hall of Dangin (Member of the Wild Life Authority) recently had an interesting encounter with a giant petrel.

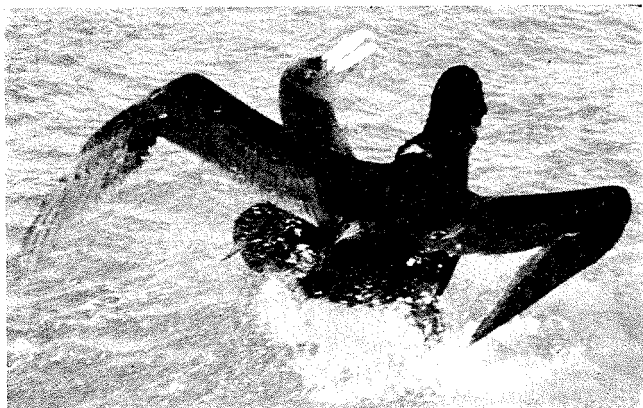
Mr. Hall's letter relating his experience is reprinted here in full.

"Had a remarkable experience with what we think was a giant dusky petrel.

"I was fishing for small fish in a boat seven miles off Mullaloo about 10 at night when this big bird swam up to us. The weather had been very stormy and I'd heard about these birds coming ashore in an exhausted condition, but this one seemed pretty lively. It had a go at our burley bag and generally horsed round so we fed it all our rubbish fish, which it gulped down very smartly. Eventually it got tangled

in my mate's line so we pulled it aboard to untangle it. It appeared very quiet so we put it in the boat and it sat there and pulled its wing feathers through its beak and generally preened itself. It had been there for about an hour when we got two big kingies on at once and in the ensuing fuss it went overboard. As soon as we got the fish in, up came our bird again, so we lifted it in and put it in the outboard motor well, where it remained for another hour, preening itself and eating anything it could lay its beak on.

"When we went to go back to Marmion we tipped it overboard, but it looked pretty lonely so we pulled it in again and took it in.



Giant petrels attempting to take off in rough sea outside Fremantle Harbour

"It remained on our back lawn for three days absurdly tame, with an appetite like a 'roo dog'. On the third day it became restless and as we were going home and my wife was talking about taking it home to the farm, we filled it up with herring, and took it down to the cliffs where there is a strong up-draft.

"As soon as it saw the sea, it started squawking. We held it into the wind and it soared off beautifully, dipping just over the waves. We watched it through the glasses 'til it disappeared past the reefs.

"The amazing thing is how a wild thing could get so tame in such a short space of time. It made no attempt to peck and followed my wife round, even coming inside. I was relieved to see it go, as it would look pretty silly up home in the rain water tanks.

"It had a wing span of 6 ft. 1 in. and had a tunnel sort of arrangement on its bill. The legs were pretty small and it was a very clumsy walker.

"There was no sign of any tags or rings to indicate it had been in captivity. My fishing mate says they are a very quiet bird and will often swim up to boats in the daytime, but this thing was as quiet as a pet chook."

DECLARATION AND AMENDMENT OF RESERVES

"A" Class Reserve 1313 vested in and held by the Minister for Water Supply, Sewerage and Drainage in trust for the purpose of "Water and Conservation of Flora and Fauna".

L. & S. Plan 24/80. Area: 640a. Gaz. 22/5/70.

"A" Class Reserve 26793 (Kent Locations 1843, 1844, 1845, 1851) vested in and held by the Western Australian Wild Life Authority in trust for the purpose of "Conservation of Flora and Fauna".

L. & S. Plan 435/80. Area: 10,818a. 1r. 15p. Gaz. 26/5/70.

Reserve 24599 (Kojonup Location 9086) amended to include Kojonup Locations 8430 and 8431 for the purpose of "Conservation of Flora and Fauna".

L. & S. Plan Katanning 40 Sht. 1. Area abt. 887 acres. Gaz. 27/5/70.

Reserve 29021 (Roe Location 2604) vested in and held by the Western Australian Wild Life Authority in trust for the purpose of "Conservation of Fauna and Flora".

L. & S. Plan 407/80. Area: 264a. 2r. 5p. Gaz. 13/2/70.

Reserve 29025 (Roe Location 2609) vested in and held by the Western Australian Wild Life Authority in trust for the purpose of "Conservation of Flora and Fauna".

L. & S. Plan 407/80. Area: 511a. 1r. 8p. Gaz. 13/2/70.

Reserve 30298 (Avon Location 23913) set apart for the purpose of "Conservation of Flora and Fauna" and vested in the Western Australian Wild Life Authority.

L. & S. Plan 343D/40. Area 70a. 3r. 34p. Gaz. 26/3/70.

Reserve 21521 (Williams Locations 7024 and 11600) vested in and held by the Western Australian Wild Life Authority in trust for the purpose of "Conservation of Flora and Fauna".

L. & S. Plan 384c/40. Area 507a. 3r. 0p. Gaz. 26/3/70.

Reserve 563 (Avon Locations 9380 and 13408) vested in and held by the Western Australian Wild Life Authority in trust for the purpose of "Conservation of Fauna".

L. & S. Plan 25/80. Area: 215a. 1r. 9p. Gaz. 13/3/70.

Reserve 30270 (Ninghan Location 4186) set apart for the purpose of "Conservation of Flora and Fauna".

L. & S. Plan 65/80. Area 15a. 1r. 33p. Gaz. 27/2/70.

"A" Class Reserve 30217 (Nelson Location 2618) vested in the Western Australian Wild Life Authority for the purpose of Conservation of Flora and Fauna".

L. & S. Plan 415c/40. Area 624a. Gaz. 26/6/70.

Reserve 27985 (Esperance Locations 1022, 1887 and 1888) vested in the Western Australian Wild Life Authority for the purpose of "Conservation of Flora and Fauna".

L. & S. Plan 402/80. Area abt. 14,900a. Gaz. 17/4/70.

Reserve 18468 (Plantagenet Location 7156) vested in the Western Australian Wild Life Authority for the purpose of "Conservation of Flora and Fauna".

L. & S. Plan 436, 445/80. Area: 1,697a. 3r. 25p. Gaz. 26/6/70.

Reserve 26569 (Kent Location 1371) changed from "Conservation of Flora" to "Conservation of Flora and Fauna" and vested in the Western Australian Wild Life Authority.

L. & S. Plan 418/80. Area: 313a. 5r. 3p. Gaz. 10/7/70.

"A" Class Reserve 24417 (Roe Location 1112) changed from "Conservation of Flora" to "Conservation of Flora and Fauna" and vested in the Western Australian Wild Life Authority.

L. & S. Plan 375/80. Area: 1,135a. 3r. 9p. Gaz. 10/7/70.

Reserve 17759 (Kojonup Location 7689) vested in the Western Australian Wild Life Authority for the purpose of "Conservation of Flora and Fauna".

L. & S. Plan 437A/40. Area: 1,055a. 2r. 0p. Gaz. 5/6/70.

Class "A" Reserves 2085, 2086, 2087 and 2088 (Wagin A.A. lots 66, 68, 63 and 62) vested in the Western Australian Wild Life Authority for the purpose of "Conservation of Flora and Fauna".

L. & S. Plan 409B/40 Area: 640a. 3r. 24p. Gaz. 5/6/70.

Reserves 1058 and 1059 vested in the Minister for Works for the purpose of "Water and Conservation of Fauna".

L. & S. Plan 1054/80 Area: 7,560a. Gaz. 8/5/70.

Reserve 13494 (Avon Location 20167). The purpose of this reserve changed to "Water and Conservation of Flora and Fauna".

L. & S. Plan 56D/40 Area: 156a. 1r. 0p. Gaz. 5/6/70.

Class "A" Reserve 26837 (Victoria Locations 4347, 4348, 4401, 4402, 5614 and 10671) vested in the Western Australian Wild Life Authority for the purpose of "Conservation of Flora and Fauna".

L. & S. Plan 89/80 Area: about 4,742r. Gaz. 22/5/70.

Reserve 30018 (Nelson Location 13015) vested in the Western Australian Wild Life Authority for the purpose of "Conservation of Flora and Fauna".

L. & S. Plan 443/80 Area: about 105a. Gaz. 12/6/70.

Class "A" Reserve 27928 (Roe Location 2706) vested in the Western Australian Wild Life Authority for the purpose of Conservation of Flora and Fauna".

L. & S. Plan 375/80 Area: 5,180a. Gaz. 12/6/70.

Reserve 17257 (Kojonup Location 4749) vested in the Western Australian Wild Life Authority for the purpose of "Conservation of Flora and Fauna".

L. & S. Plan Woodanilling 40, Sheet I, Area: about 134a. Gaz. 17/4/70.

Reserve 17055 (Kojonup Location 4748) vested in the Western Australian Wild Life Authority for the purpose of "Conservation of Flora and Fauna".

L. & S. Plan Woodanilling 40, Sheet I, Area: about 66a. Gaz. 17/4/70.

Reserve 30305 (Leake Locations 13, 16 and 281) set apart for the purpose of "Conservation of Flora and Fauna".

L. & S. Plan 6/80 Area: 2,102a. 0r. 21 p. Gaz. 17/4/70.

Reserve 29322 (Avon Locations 13007, 15043 and 6777) vested in the Western Australian Wild Life Authority for the purpose of "Conservation of Flora and Fauna".

L. & S. Plan 343d/40. Area: about 555a. Gaz. 13/9/68.

Reserve 24912 (Kojonup Location 9092) vested in the Western Australian Wild Life Authority for the purpose of "Conservation of Flora and Fauna".

L. & S. Plans 409/80 and 416/80 Area: about 70a. Gaz. 17/4/70.

Class "A" Reserve 23825 (Esperance Locations 813, 815-818 and 1479) vested in the Western Australian Wild Life Authority in trust for the purpose of "Conservation of Flora and Fauna".

L. & S. Plan 423/80 Area: about 4,718a. Gaz. 5/6/70.

Reserve 17760 (Kojonup Location 7690) vested in the Western Australian Wild Life Authority for the purpose of "Conservation of Flora and Fauna".

L. & S. Plan 437A/40. Area: 1,362a. Gaz. 5/6/70.

WAS IT A BANDED HARE WALLABY?

Honorary Fauna Warden V. G. Lloyd reported that some friends holidaying at Windy Harbour, near Northcliffe, sighted what they described as a "quokka with light and dark bands on the body and tail". Striking Mr. Lloyd as being rather unusual for a quokka he checked out the identification details which indicated that the animal sighted may have been a banded hare wallaby.

Mr. Lloyd's report was forwarded to Mr. J. L. Bannister, Curator of Mammals at the Western Australian Museum, for his comments. Mr. Bannister said that it may have been a banded hare wallaby as these animals were recorded from several places in the south-west at the turn of the century.

Mr. Bannister also said that the description seemed to fit quite well except that the bands do not show up particularly well in adults and that they are more prominent in juveniles. However, Mr. Bannister remarked that there is no other small Western Australian wallaby with such markings except the brush (which does have very faint bands on the back) and that a brush wallaby would be too big unless, of course, it was a juvenile.

If anyone else has seen this animal we would be very pleased to hear from them.



BANDED HARE WALLABY (*Lagostrophus fasciatus*)

FISHING IN WATER RESERVES PROHIBITED

The Metropolitan Water Supply Board by-laws prohibit fishing of any description, including marron fishing, within catchment areas, water reserves and reservoirs under the Board's control.

Similar bans apply in the Eastern States—the principal reason being that public health may be threatened should the water become contaminated.

In recent months the Board has received many enquiries from individual members of the public proposing to fish in these restricted areas.

The Board has warned that a number of persons are suspected of fishing for marron in these areas and some prosecutions are being pursued.

FAUNA BULLETIN REPLACED

The "Fauna Bulletin" previously published by the Department of Fisheries and Fauna ceased publication with the March 1970 issue—(Vol. 4 No. 1) and will be replaced with S.W.A.N.S., of which this is the first issue.

It is intended to broaden both the scope and distribution of fauna news and information. Future issues will contain reports on the various research and management programmes which are carried out by the Department's fauna research officers, news on overseas developments and problems, new legislation and regulations which are from time to time introduced, and items of specific interest to all those engaged in the various fields of conservation.

If you are not receiving an individual copy of S.W.A.N.S. but wish to do so please write and request that your name and address be placed on the mailing list. The journal will then be mailed to you each quarter at no cost.

All letters and correspondence should be addressed to the Editor, S.W.A.N.S., Department of Fisheries and Fauna, 108 Adelaide Terrace, Perth, W.A. 6000.

PLASTIC AUTUMN

(By Jean R. Smith)

Stagnant stream,

Your silent waters yield no more

The silver-bellied fish that swam your depths.

Like shadows on my mind

the red-gums spread their branches

Where fallen snags sleep—dreaming of
remembered life.

Withered vines o'erlook your mirror of dark
defeat.

Spray-sodden earth
rejects seeds of promised rebirth.

Mist-eyed I watch
drifting by, golden plastic grapes—
silent plastic bird . . .



AUSTRALIAN CONSERVATION FOUNDATION LOOKS FOR WIDER MEMBERSHIP

"If man is to retain what is left of his natural environment in order that he and his descendants can enjoy a quality of life reflected in clear water and with clean air, landscapes of diversity and plentiful opportunities for outdoor recreation, he must begin now to plant for it . . ." (Sir Garfield Barwick . . . "The Challenge of the Seventies")

This foreword by Sir Garfield Barwick in the ACF's latest publication "Where Have All The Flowers Gone?" introduces a drive for wider membership, throughout Australia.

Public interest in conservation was stimulated by H.R.H. Prince Phillip during his visit to Australia in 1963 by his request for help for the World Wild Life Fund.

A quick study revealed that Australia, far from being in a position to help, was itself sadly lacking in a national body concerned with conservation and that Australia's own flora and fauna were seriously threatened.

The Foundation was established in 1965 as a result of these revelations, and set up its secretariat the following year.

From the start, the new body received backing from eminent people. The Governor-General Sir Paul Hasluck is its patron and Sir Garfield Barwick, Chief Justice of Australia, is its president. The A.C.F. is a non-profit organisation controlled by an executive of scientific and business people who are backed up by a council elected by members from all States and the A.C.T.

The Foundation has as its aim "the wisest possible use, over a long term, of all our natural resources, applied for the benefit of man." Its methods are to act as a forum where people involved in the field of conservation can analyse problems, formulate solutions to those problems and spread the understanding of these issues by means of publications, press releases, seminars and direct influence.

Although the A.C.F. has been in existence for only a few years, its views have been heard on many diverse subjects. Its activities have embraced:

- A survey of all National Parks and resources in Australia.
- Publication of viewpoints on such subjects as conservation of the Australian high country, water fowl, kangaroos, the Great Barrier Reef, Norfolk Island and the need for Field Study Centres.

- Conducting of symposia in all States on conservation and pollution—sometimes in association with State conservation groups.
- Letters from the President to government leaders advising on conservation matters.
- Lending assistance to government authorities towards obtaining, extending and retaining reserves.

Although the A.C.F. currently receives a subsidy from the Commonwealth Government, this does not provide enough funds to tackle the staggering variety of conservation problems which face Australia. Some of the urgent problems which the Foundation believes must be dealt with now are:

- Contamination of the air,
- Pollution of water,
- Defacement of the countryside,
- Destruction of natural safeguards against erosion,
- Commercial slaughter of wildlife.

To become more effective, the A.C.F. needs a growing membership; it needs financial support to expand its activities, and support from an informed public to ensure that the land and waters of the Commonwealth are used wisely and with foresight. It needs the type of people who are concerned with the kind of country in which they and their children, and their children's children will have to live.

Enquiries concerning the Australian Conservation Foundation may be directed to Brigadier C. M. L. Elliott of 1 Mosman Terrace, Mosman Park—Phone 31 3329.

The annual membership fee is \$5 for ordinary members and membership bodies, \$500 for benefactor members and \$200 for national sponsors. A single donation of \$200 minimum ensures life membership. Contributions in the latter three categories are tax deductible, as are all donations over \$2.

Joining the A.C.F. is making an investment in the quality of Australian life and ensuring that competing demands are resolved in the best long-term interests of the nation.

Our commitment is summed up in the words of the late J. F. Kennedy;

"Our primary task now is to increase our understanding of our environment, to a point where we can enjoy it without defacing it, use its bounty without detracting permanently from its value, and, above all, maintain a living balance between man's actions and nature's reactions . . ."

HONORARY FAUNA WARDENS report

DISTRICT 1—KIMBERLEY

WARDENS 33—REPORTS 10

G. F. Bell—Argyle Downs Station
H. C. Bromby—Derby
R. F. Condon—Katherine, N.T.
A. J. Davis—Wyndham
D. J. Gibbs—Broome
F. J. Hamlett—Broome
L. G. Hill—Wyndham
D. Ledger—Derby
B. J. Quilty—Wyndham
Illegible—Broome

Dry Season:

Rainfall was well down during the months January to February according to several warden's reports in this region. With many water holes dry, the numbers of waterfowl were much lower than usual.

Bustards:

Although wild turkeys were reported as "common" they were reported as seen only in small groups.

Brolgas:

"Large numbers" of brolgas were reported in the Derby area, together with several sightings in the region of Beagle Bay Mission.

Kangaroos:

Kangaroos generally were reported as few although euros appeared to be common in the Wyndham area. Mr. Quilty of Wyndham is of the opinion that the euro stocks are diminishing because of attacks by dingoes.

Dozens of small wallabies of an unidentified species were reported around the Mabel Downs homestead.

Jabirus:

Two sightings were reported—a pair at a creek crossing at Argyle Downs Station and "occasional birds" in the Derby area.

DISTRICT 2—NORTH WEST

WARDENS 24—REPORTS 6

D. G. Bathgate—Exmouth
B. J. Bolitho—Wittenoom
D. A. Henwood—Onslow
M. J. L. McGrath—Onslow
R. L. Stone—Newman
R. C. Wade—Tom Price

Pelicans:

A long way off course, but from Wittenoom comes a report of a pelican sighted. This was apparently blown in from the coastal region during a cyclone.

Bustards:

Although four reports indicate that wild turkeys are scarce in the area, Mr. Henwood of Onslow reported that Onslow residents consider them to be in greater number than for many years, possibly due to the unusually dry conditions. Mr. Stone of Newman also considers wild turkeys to be "common" in small groups.

Vermin:

A report from Exmouth indicates that foxes and feral cats are prevalent. The cat problem appears to stem from the large transitory population of Exmouth—people leave their pets behind when they depart from the area.

Oriental Pratincoles:

Flocks of up to 2,000 birds were observed in the vicinity of Learmonth and the Vlamingh Lighthouse during February and March. Many of the birds were killed as they constantly flew into the pathway of vehicles. Mr. Bathgate reports that an examination of the crops and stomachs of these birds revealed that the birds fed exclusively on cicadas.

Bower Birds:

Two bower birds have been kept under observation in the Exmouth area for the past 12 months, but nests have not been located.

Rock Wallabies:

Some large colonies have been observed in the deep gullies on the western aspects of Cape Range. They are living in small tunnels on the cliff faces.

Small Mammals:

Both dunnarts and species of notomys have been observed by Mr. Bathgate over a wide area of Exmouth region. The dunnarts frequent the rock outcrops, while the notomys are confined to the red sand dunes.

Red Kangaroos:

These are reported as being generally plentiful in the area.

DISTRICT 3—EASTERN

WARDENS 1—REPORTS 0

DISTRICT 4 — GASCOYNE

WARDENS 33—REPORTS 9

S. Armstrong—Meekatharra
P. M. Butler—Gascoyne
T. F. Fitzgerald—Carnarvon
J. N. Hutchinson—Carnarvon
W. H. B. Lacey—Meekatharra
J. A. Maslen—Carnarvon
W. J. Smith—Carnarvon
C. Wainwright—Carnarvon
Unsigned—Carnarvon

Bustards:

According to a report received by Mr. T. F. Fitzgerald of Carnarvon, wild turkey were in numbers in excess of those seen during the last 30 years.

Many wild turkeys—mostly young—are reported as frequenting the coastal areas of the Carnarvon region. One unsigned report even quotes them as “hundreds upon hundreds—more than I’ve seen in 21 years”.

Several wardens reported on rumours—and some evidence—of wild turkey hunting in the district.

Bronzewing Pigeons:

Mr. Wainwright reported having sighted some 100 bronzewing pigeons at a mill on Mardathuna Station.

Pied Geese:

Two independent and separate reports were made to Mr. Hutchinson in Carnarvon of sightings of 8 pied geese. Assurances were given that these were not black swans!

Brown Honeyeater:

A brown honeyeater, reputed to be the first seen in Carnarvon, was observed over a period of two weeks at the Carnarvon Research Station. This was reported by Mr. Hutchinson.

Feral Cats:

Feral cats are still active in the Carnarvon region and 11 were reported as having been trapped and destroyed by the Tracking Station staff.

Swallows:

An unsigned report from Carnarvon reads “A most unusual sight this year was the swallows which died in hundreds. They huddled on the river bed with ruffled feathers, flying only a few feet when approached. Large numbers died where they sat”.

DISTRICT 5 — GERALDTON

WARDENS 34—REPORTS 8

J. V. Atkinson—Sandstone
R. A. C. Glass—Kalbarri
R. H. Haines—Three Springs
R. Hill—Morawa

D. B. Ross—Sandstone
R. C. Salkilld—Three Springs
N. C. Summers—Dongara
L. Vince—Perenjori

Bronzewing Pigeons:

Although Mr. R. Glass of Kalbarri reports on a *decrease* in the number of bronzewing pigeons over the past three years, there appears to be an *increase* at Dongara according to Mr. N. C. Summers. At Dongara the birds feed on “extensive areas” of acacia.

Bustards:

Reports from many areas indicate an increase in wild turkeys.

Dunnarts:

A “few” dunnarts were sighted in the Three Springs area by Mr. R. Hains—one carried 6 young which appeared old enough to leave the pouch.

Euros:

These appeared to be common in the Three Springs area.

Emus:

“During a recent trip in this country it was a commonsight to see emus in a dying state falling over and unable to get up. In a trip of about 200 miles, I say at least 50 in this condition and a lot of others that could hardly raise a trot”. This was reported by Mr. D. B. Ross of Sandstone, who indicated that only 3½ inches of rain was recorded for the area for the 15 months ending in March.

Echidnas:

Mr. Haines of Three Springs reported on having seen a “few” echidnas in his district.

DISTRICT 6 — MELBOURNE

WARDENS 33—REPORTS 15

J. R. Adamson—Eneabba
W. J. and I. P. Bradley—Cervantes
W. G. Chitty—Toodyay
C. J. Clarke—Bolgart
S. Cook—Toodyay
A. E. Cooper—Wannamal
G. H. Gare—Moorra
J. Haworth—Coorow
A. Hill—Carnamah
A. Hobbs—Coorow
M. J. Horton—Gingin
A. M. Popplewell—Moorra
J. J. Rome—Bindoon
M. J. Russel—Cervantes
C. Thornett—Eneabba

Brush Wallabies:

Mr. S. Cook of Toodyay reports that brush wallabies are breeding well in the district although many are being killed by vehicles on the Red Hill Road.

On the south-west corner on the Regan's Ford Road (Gingin), Mr. M. J. Horton reported seeing 28 brush wallabies although he was of the opinion that up to three times this number may have been present in the area.

Western Rosellas:

From Toodyay, Mr. W. G. Chitty reported on sightings of western rosellas—seen for the first time in 5 years.

Seals:

Seals are still being shot on Beagle and Fisherman's Island according to a report from Mr. A. W. Hobbs of Coorow. Last November he reported the presence of 72 seals on Fisherman's Island, but during the Easter of 1970 he recorded only two. Several carcasses were found which appeared to have been shot and the few seals located on the islands were "generally shy and disturbed in comparison with their usual behaviour".

Grey Kangaroos:

Mr. A. E. Cooper of Wannamal reported sightings of grey kangaroos in his district in groups of 12-15, and that they were fairly tame.

DISTRICT 7—NILGARN

WARDENS 56—REPORTS 12

O. V. Cail—Kalannie
R. E. Curtis—Kellerberrin
G. H. Evans—Dowerin
A. S. Merridge—Goomalling
E. Hind—Burracoppin
S. Johnson—Kellerberrin
Mrs. J. K. Leake—Kellerberrin
J. R. Masters—Northam
A. D. Morgan—Northam
M. Prior—Kalannie
F. E. Pryor—Goomalling
L. A. Sewell—Goomalling

Bustards:

Before cyclone Ingrid passed through the Nilgarn district many wild turkeys were sighted, but after the rains they appear to have dispersed with no subsequent sightings. This was the position in Kalannie district according to a report received from Mr. O. V. Cail.

Maned Geese:

The drought conditions caused many maned geese to congregate at farm soaks, where they remained until after the cyclonic rains, reported Mr. A. Morgan of Northam.

Crested Pigeons:

According to reports received from Mr. E. Hind of Burracoppin, Mr. M. Prior of Kalannie and Mr. F. E. Pryor of Goomalling, there is apparently a widespread increase in the number of crested pigeons in the area. They are reported as plentiful and, in one instance, 4 nests containing young were established adjacent to the homestead.

Kangaroos:

In general kangaroos within the district have been reported a few from the majority of wardens.

Gwardars:

From Mrs. J. Leake of Kellerberrin comes a report that the banded Gwardar was very common in the district during the early part of the year.

Suitable Habitat:

Mr. G. Evans of Dowerin reported—"A considerable area of rock scrub and jam country on my property makes euros, echidna, mountain devil, legless lizards, etc., quite common here, but not general to the district. These conditions, and rock holes containing water, maintain a greater variety of bird life than elsewhere."

DISTRICT 8—MURRAY

WARDENS 67—REPORTS 19

F. Baldisseri—Collie
B. A. Bremner—Waroona
R. L. Brown—Collie
A. Caldwell—Wandering
H. E. Carrotts—Boddington
F. C. Edmonson—Mandurah
J. A. Fetzer—Dardadine
I. Flugge—Darkan
G. F. Horley—Duranillin
R. G. Little—Jarrahdale
I. R. Milroy—Collie
E. Johansson—Pinjarra
R. V. Knapp—Darkan
E. A. Morgan—Bunbury
J. F. Oliver—Darkan
C. M. Robertson—Wagerup
G. A. Stewart—Collie
E. Teede—Bunbury
A. W. Toussaint—Mandurah

Parrots Used as Food:

A report from Waroona indicates the depletion of bird life in areas of the Shire where there is close settlement of migrants. On two known occasions, migrants were in possession of ring-neck parrots which, they intimated, were to be eaten. While this particular species is not protected, it certainly indicates that other *protected* species may be subject to shooting for culinary purposes—especially in view of the absence of other bird life in these areas.

Kangaroos:

Grey kangaroos are reported as generally common in the area with quite a number reported on the far side of the Leschenault Estuary near the old Belvedere Homestead and in the Collie area.

Bronzewing Pigeons:

Although still reported as fairly common in the Collie area, the indications are that the numbers are fewer this year than in previous years.

Numbats:

Numbats appear to be the most common of the small marsupials around the Collie District and reports of sightings are consistently received by Honorary Wardens.

DISTRICT 9—AVON

WARDENS 80—REPORTS 18

A. L. Ainsworth—Pingelly
L. W. Bell—Wagin
D. Bradford—Narrogin
T. Catling—Woodanilling
R. M. Chester—York
P. S. Dawson—Dumbleyung
R. Evans—Brookton
R. D. Giles—Kulin
R. Goldsmith—Wagin
W. L. Keighley—Lake Bidy
J. L. Knox—Wickepin
R. J. Lane—Kulin
E. O. Lange—Pingelly
J. D. McLean—Beverley
A. M. Mutton—Wickepin
N. B. Shenton—Quairading
J. C. Trott—Corrigin
H. Sudholz—Brookton

Echidna:

Mr. R. D. Giles reported on the behaviour of an echidna which had just been disturbed during grading operations. The echidna was lying on its back with a naked baby on its stomach and appeared to be making an effort to return the baby to the pouch.

According to Mervyn Griffiths in his book "Echidnas", a similar action was observed while an echidna was attempting to replace an egg which had fallen from the pouch. It is therefore quite likely that the baby had fallen from the pouch when the mother was disturbed by the grader and her actions were, in fact, those of returning the baby to the pouch.

Bustards:

On a recent tour through the Kimberleys, Northern Territory, Queensland and New South Wales Mr. R. Ainsworth of Pingelly noted that, while he saw many wild turkey in Western Australia, there appeared to be very few in the Northern Territory and none were sighted at all in New South Wales. He saw no evidence of shooting of these birds (although other reports indicate that shooting still takes place), but encountered three dead birds which had been killed by vehicles.

Mr. Ainsworth was four months on the trip and maintained a diary of all fauna sightings and items of interest.

Mr. Trott of Corrigin expressed the opinion that large areas of suitable land should be set aside in his district as reserves for the preservation of wild turkeys—with more stringent protection against the birds being shot.

Banded Anteater:

A banded anteater was noticed travelling along a road in the Narrogin district. The area was devoid of natural cover and Mr. Bradford of Narrogin reported placing the animal over the rabbit proof fence where it would have more chance of locating cover. On the road, the anteater had approached to within two or three feet of him and had merely deviated slightly from its course when he stood in front of it.

Bird Life in Wagin Area:

According to a report from Mr. L. Bell, the drought conditions at the beginning of the year were responsible for an influx of bird life to the district. He reported the presence on the lakes of birds not normally common in the district, e.g., straw-necked ibis and spoon-billed heron. Power lines erected between the lakes took a steady toll on bird life.

DISTRICT 10—EUCLA

WARDENS 33—REPORTS 5

C. N. Collard—Leonora
I. R. Hancock—Esperance
H. A. King—Edjudina
W. Nicholson—Moorine Rock
N. Walmsly—Esperance

Warburton Range Area:

Mr. C. N. Collard of Leonora reported—"I recently made a trip into the country between the Warburton Range and the Western Australian border. Conditions there were the worst I have seen for some twenty years. In ten days I saw only three dingoes, one fox, one rabbit, one domesticated cat gone wild, two crows and only a few insect-eating birds. There were some lizards, but the sandy hill country which normally is alive with the smaller marsupials was devoid of any tracks of these small animals. We removed many dried-up carcasses of kangaroos and dingoes from watering places. Conditions were better in the area north of the Rawlinson Range where the country had received some benefit from the tail-end of the monsoon".

Esperance:

Reports indicate that the number of wild turkeys is increasing in the National Park area and that grey kangaroos are plentiful. "Quite a few" brush wallabies have been sighted and the willy-wagtail appear to be well established in the area.

DISTRICT 11—SOUTH WEST

WARDENS 73—REPORTS 22

G. W. Barron—Boyup Brook
J. A. Bennett—Dardanup
R. A. Breeden—Busselton

A. Chugg—Busselton
 M. Coffey—Margaret River
 F. J. Connor—Boyup Brook
 J. W. Cooper—Balingup
 A. V. Corker—Kulikup
 A. J. Ewart—Balingup
 F. A. Gifford—Bridgetown
 T. C. Hall—Dardanup
 R. C. Johnston—Busselton
 E. J. Kemp—Donnybrook
 M. B. McGregor—Busselton
 G. V. Mitchell—Donnybrook
 H. A. Parker—Busselton
 N. R. Payne—Boyanup
 K. J. Rooney—Manjimup
 E. E. Scott—Elgin
 T. Scott—Margaret River
 T. J. Shine—McAlinden
 L. G. Wilkinson—Busselton

"1080" Baiting:

Reports that "1080" is affecting birdlife in the South-west is further supported by a report that in one instance more than 500 wood ducks were poisoned within a radius of six miles on properties in the Busselton district.

Miss McGregor of Busselton noted that bronzewing pigeons are attracted to, and in the "1080" furrows also; she had not actually seen the birds eating the oats. She reported that the berries of a shrub (since identified as *heptomeria scrobiculata* R. Br) once common to the area, are a favourite food of the bronzewing pigeon. Agriculture in the area had almost eradicated this native plant and it is possible that the pigeons, having to seek alternative food, may resort to the poisoned oats.

One report referred to overhearing rumours of deliberate poisoning of ducks, but no evidence was available.

Feral Cats:

A report that these animals are increasing in the Busselton area has been submitted by Mr. R. A. Breeden.

The status of the domestic cat gone wild is that under the Fauna Conservation Act it is an unprotected species and has also been declared vermin throughout the State.

Brush Wallabies:

Although reported as common throughout the district, there appears to be a fairly high mortality rate from cars. One report stated that only a few of the animals had been sighted and that these had mostly been dead on the road.

Habitat Destruction by Fire:

Mr. M. Coffey of Margaret River reported that early in the year some 30,000 acres of coastland vegetation was destroyed by fire at Gracetown. This took a heavy toll of honey-eaters, finches, wrens and other birds which inhabited the area.

Grey Kangaroos:

These have been reported as "common" and "rapidly building up in numbers" throughout the district. Mr. Shine of McAlinden reported that shooting restrictions appear to have caused an increase in the number of joeys in the district and that these are creating traffic hazards on country roads.

Swans at Collie:

Reports appeared in the press early in the year of interference to swans by water-skiers using the "Stockton" open cut at Collie. Mr. K. T. Rooney of Manjimup reported that he had checked the situation (on several occasions) but had never seen any swans in the locality. He believed, however, that for a period some nine swans were there, although now there is almost a complete absence of any "water life" in or on the open cut.

Yellow-Billed Spoonbill:

Mr. R. Breeden of Busselton reported the daily occurrence of a yellow-billed spoonbill on the Vasse River throughout February. This area is generally beyond that normally encompassed by this species and the sighting was therefore referred to Doctor D. L. Serventy as a matter of interest.

DISTRICT 12 — GREAT SOUTHERN

WARDENS 71—REPORTS 19

J. Andrews—Amelup
 W. A. Beeck—Katanning
 P. J. Bellfield—Denbarker
 H. R. Carter—Albany
 L. Falconer—Bremer Bay
 H. Harper—Rocky Gully
 W. A. Maskell—Albany
 A. R. Jury—Bremer Bay
 F. A. Lilford—Denmark
 S. J. Lilford—Cranbrook
 C. Mitchell—Cranbrook
 H. W. Norris—Jingalup
 W. J. Packard—Coyrecup
 W. G. Pearce—Woogenellup
 S. J. Sagers—Kendenup
 E. Simmons—Albany
 E. F. Smith—Katanning
 F. W. Smith—Cranbrook
 M. C. Toovey—Cranbrook

Wood Duck:

Wood ducks are considered a pest in the Kojonup area where Mr. H. W. Norris has on several occasions been called upon to disperse them. Some 750 were dispersed into three flights of approximately 250 each on the Anna Downs property.

Mr. F. A. Lilford of Denmark also reported wood ducks in pest proportions.

Foxes:

Mr. H. Harper of Rocky Gully reported a decreased number of foxes following an epidemic of mange.

A number of wardens reported "mange" to be fairly widespread among foxes at the beginning of the year.

Pygmy Possums:

Four pygmy possums were sighted during the first quarter by Mr. N. A. Beeck of Katanning, which he considers would indicate a fairly large population in the area.

Willy Wagtails:

Mrs. P. J. Bellfield reported that willy wagtails are again becoming quite common around the Mount Barker area after an absence of many years.

Grey Kangaroos:

Grey kangaroos are a pest in the Rocky Gully area reported Mr. H. Harper. In common with several other reports, he noted that there seemed to be larger numbers of young greys than in previous years. Mr. S. Lilford of Cranbrook reported that a shortage of feed in the paddocks during the quarter had resulted in grey kangaroos becoming a pest on the road during the night.

Marron in Lake Coyrecup:

Several years ago Mr. W. J. Packard of Coyrecup released young marron into the lake. During the quarter Lake Coyrecup was dry apart for some water in the inlet creek (which had a high salt content), but marron were found in "various stages of development". Under normal conditions these animals would have continued to breed, reported Mr. Packard.

"1080" Poison:

Several reports referred to the possible loss of fauna through the laying of "1080" poisoned oats. Many of our animals and birds are grain feeders and, according to Mr. H. C. Toovey of Cranbrook—"I feel as though "1080" is taking a heavy toll on our wild life". Although unconfirmed, one report alludes to possums in some colonies being killed by "1080".

Any specimens which, it is believed, have died from "1080" poisoning may be sent to Doctor A. A. Burbidge of this Department's Reserve Management Section at 266 Hay Street, Perth. The specimen should preferably be frozen and accompanied by a note giving details of the location and all other pertinent information.

DISTRICT 13 — METROPOLITAN

WARDENS 222—REPORTS 39

W. A. Allnutt—Swanview
C. E. Brindley—Armadale
R. C. Burking—South Perth
W. J. Burnett—Wanneroo
L. Corthals—Wanneroo

R. Coulson—West Midland
E. H. Day—Armadale
R. R. Doddemaid—Maylands
J. Double—South Perth
W. A. Farmer—Rottnest
V. W. Fowler—Shenton Park
L. R. Frizzell—South Guildford
C. E. Gibbs—Wanneroo
R. J. Gillzan—Balga
W. H. Gravell—West Perth
J. Harris—Middle Swan
S. A. Hart—Greenmount
G. R. Hartley—Innaloo
S. M. Harvey—Manning
K. A. Holland—Gooseberry Hill
D. J. Ingram—Bedforddale
W. Le Vaux—Glen Forrest
J. A. Longden—Bedford
R. A. P. Noak—East Bullsbrook
C. W. Pearson—Glen Forrest
A. Y. Pepper—Scarborough
J. Philliphoff—Triggs Island
S. N. Reading—Balga
F. A. Rogers—Claremont
J. Rose—Walyunga National Park
W. L. Stevenson—Coolbellup
D. J. Sullivan—Rottnest
M. K. Tarburton—Victoria Park
D. H. Trout—High Wycombe
J. H. Turner—Floreast Park
J. Ward—Jandakot
J. T. Williams—Redcliffe
I. J. Wood—Midland
C. J. Wright—East Victoria Park

Pheasants on Rottnest Island:

According to Mr. W. A. Farmer, the decision of the Agricultural Protection Board to exclude the Rottnest Island colony of ring-necked pheasants from the vermin list pleased both islanders and tourists.

The birds were first introduced in 1880 when, for the three months annually, Government House (now the hotel), Rottnest, was the official Vice-Regal summer residence. Apparently the reason for introducing the birds was to provide something more palatable than the usual game—the banded stilt, which was then called "Rottnest snipe".

In the confines of the island's dune scrub and thickets, the pheasants appear to be becoming more ground runners than fliers. Mr. Farmer reports seeing startled cock birds, attempting to fly over the smallest lake, "run out of steam" three-quarters of the way across and have to paddle ashore.

He also reported on examination of dead birds' crops which were crammed with snails even though seed was in abundance.

Bird Population on Shenton Park Lake:

Mr. V. W. Fowler's report commented on the large number of coots and other waterfowl which inhabit the Shenton Park Lake. He referred to the possibility of translocating some of this wild

life to other lakes, but Officers of the Department's Fauna Research Branch advised that such a move would probably be unsuccessful. The birds are attracted by an abundance of food provided by the public and would, no doubt, return to the lake upon release.

Oil Pollution:

Mr. R. R. Doddmead of Maylands reported increased waterfowl numbers in the district, but is perturbed at the presence of oil on the water adjacent to the power house. According to the report, this oil contamination is increasing.

Increased Bird Life:

Many of the reports received from the metropolitan area refer to the apparent increase of birdlife in the suburbs. In some cases, this is attributed to the increased number of native shrubs and trees which are being planted in home gardens.

Mr. C. E. Brindley of Armadale has observed the preference of birds for different species of eucalypts which he has planted in his garden. It appears that, in addition to providing food for the birds, these trees offer shelter and protection from stray and wild cats.

Coastal Plains Fauna:

Over the Easter period, Mr. S. Reading of Balga undertook a four-day trip from Perth to Sandy Point via the coastal tracks and sandhills. He expressed disappointment at the apparent absence of wildlife which he partly attributed to the very dry conditions then prevailing. The return journey through Gingin was equally unrewarding—only one dead rabbit was seen.

Echidna:

Mr. J. Rose of Walyunga National Park reported occasional sightings of echidnas in the park.

INLAND FISHING LICENSES

On 1st July, 1970, an Inland Fishing License scheme came into operation.

It is now necessary to hold an Inland Fishing License for the taking of marron, trout, perch, freshwater cobbler, barramundi and cherabin.

An Amateur Fishing License is still required for the taking of prawns, lobster or net fishing.

The fee for each license is \$2.

Licenses may be obtained from the head office of the Department of Fisheries and Fauna or district offices located in Albany, Bunbury, Mandurah, Fremantle, Geraldton, Dongara, Denham and Broome.

For the convenience of the general public who are unable to call at the above centres, application cards for either or both licenses are obtainable from all gear and tackle shops, sporting depots and tourist bureaux in both metropolitan and principal country centres.

FUTURE USES FOR SALVAGED GLASS

The following article was featured in the May issue of "Florida Wildlife" and because it is pertinent to the Western Australian scene, is reprinted in full with acknowledgement to the Florida Game and Fresh Water Fish Commission.

"Old bottles salvaged from refuse will be used in the years to come to pave streets, build and insulate homes and to make new bottles.

This forecast was included in testimony in Washington, D.C., by Richard L. Cheney, executive director, Glass Container Manufacturers Institute, before the Subcommittee on Air and Water Pollution of the Senate Committee on Public Works. The Subcommittee is conducting hearings on the Resource Recovery Act and the National Material Policy Act.

Mr. Cheney told Subcommittee members that the glass container industry has concluded that there are "more potential uses for waste container glass than there is glass available from refuse now or in the predictable future."

GCMI and its member companies are currently exploring the means and economics of establishing pilot glass retrieval programs in one or more urban areas, he added.

He said that GCMI is sponsoring research to develop mechanical means of separating bottles and jars from refuse and then sorting it by colour for re-cycling it back into the bottle making process. He added that as much as 30 per cent. of the raw materials for manufacturing new bottles could consist of salvaged glass.

Mr. Cheney said that GCMI has cooperated with the U.S. Bureau of Mines "on its successful development of the means of magnetically separating the glass and metal fractions from incinerator residue. The Bureau also has developed the technology for converting the salvaged glass into building bricks and glass wool insulation. With color sorting and automatic removal of contaminants, which appear to be feasible, this glass could also be used as cullet to make new bottles."

An even larger potential exists in the use of crushed waste glass as aggregate in glasphalt, a product being developed by the University of Missouri, at Rolla, Missouri, in which crushed glass substitutes for crushed limestone in asphalt for paving streets, Mr. Cheney said. He added that estimates indicate that the need for aggregate in most cities would far exceed the available glass.

"The ultimate solution, of course, should be the separation of all the components out of waste and returning them for re-use to their respective industries—such as paper back to paper mills, aluminum back to smelters, and scrap iron back to foundries," Mr. Cheney said.

"We believe that conservation of raw materials demand salvage and that the long-range, efficient management of waste calls for re-use," he continued.

"We also are convinced that salvage will automatically reduce air, land, and water pollution . . . We strongly feel that burying and burning should in the long run be eliminated as primary methods of disposal . . ."

He pointed out that glass at present accounts for only 6 per cent., by weight, of municipal refuse and that all packaging materials account for about 13 per cent. of residential, commercial and industrial waste.

Currently prevalent methods of collection and disposal "cannot possibly cope with the great diversity of packaging materials that have been developed to respond to the requirements of modern society," Mr. Cheney said. "The scientifically-oriented packaging industry, producing some \$17 billion worth of goods a year, should not be required to revert to outmoded packaging systems to accommodate outdated waste disposal methods. We think, rather, that waste disposal systems should join the ranks of the technologically progressive."

He said that the lag in development of modern waste disposal systems was not the fault of public works officials, "but is largely due to insufficient funds, the major changes in our living habits since World War II and the burgeoning population in our urban areas. Unfortunately, the funds which have heretofore been committed to waste disposal have, in most instances, been sufficient only to deal with collection activities.

"Furthermore, the character of refuse has changed radically with the changes in our mode of life. Not so many years ago, solid waste consisted principally of food waste and ashes from coal burning furnaces. Today, these items are a minor factor, having been displaced by a vast quantity of paper, packages, discarded appliances and the like".

CONTROL OF KANGAROO HARVESTING

The 1970 Australian Fauna Authorities' Conference meeting at Darwin in May discussed reports from various States on current measures being taken to deal with the highly important issues of conservation, control and harvesting of kangaroos. It was revealed that real limitations have already been placed, or are about to be imposed, on the harvesting of kangaroos by all States in which the kangaroo industry exists. These limitations differ within the several States but they include the reduction in the number of chillers or freezers by more than half; a reduction in the number of licenses for the commercial taking of kangaroos;

continued on page 20

SALT WATER CROCODILES NOW PROTECTED

Under the Fauna Conservation Act salt-water crocodiles are now fully protected in Western Australia. Fresh-water crocodiles have been protected for eight years.

The protection order was made by the Minister for Fisheries and Fauna in a notice published in the *Government Gazette* on 24th April, 1970. This was done by removing salt-water crocodiles from the list of unprotected reptiles.

In 1969 Dr. H. R. Bustard of the Australian National University was engaged by the Department of Fisheries and Fauna to undertake a survey of crocodiles in Western Australia and, following on his recommendation, the protection order was issued.

The survey showed that the freshwater species, though protected, had been poached to a stage where it faced extinction and that salt-water crocodiles were at a low level and could easily be wiped out.

Consideration was being given to increasing the penalties for poaching.

OPEN SEASON FOR RED AND HILL KANGAROOS

Subject to various conditions an open season has been declared on Red Kangaroos and Hill Kangaroos in specified Shire Districts.

A notice to this effect appeared in the *Government Gazette* on April 17, 1970, which reads:

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.

By notice in the *Government Gazette* on 1st May, 1970 the Shires of Shark Bay, Northampton and Mullewa were added to schedule of the preceding notice.

FAUNA WARDENS CONFERENCES—ON WHAT DAY?

At the fourth regional Fauna Wardens Conference held in Gnowangerup on 20th March, 1970, the question of choosing the most convenient day of the week for a conference was discussed.

It was suggested by most that weekday conferences did present attendance problems because many of those invited could not spare the time from work and other commitments. Saturday was put forward by one representative as a more suitable alternative but it was pointed out in the ensuing discussion that difficulties could be experienced in hiring a hall, engaging caterers, etc. . . . as these facilities would be fully committed with normal weekend social functions and weddings.

Honorary fauna wardens are invited to advise the Department of the day which they consider to be most suitable for future conferences.

All you need do is complete the reverse side of the form at the foot of page 23, tear it out and post it; *no postage stamp or envelope is required.*

DEFINITION OF NATIONAL PARKS

Considering the importance given by the United Nations to the National Park concept, as a sensible use of natural resources, *and considering* the increasing use which has been made during these last few years in some countries of the term "National Park" to designate areas with increasingly different status and objectives, the 10th General Assembly of the International Union for Conservation of Nature and Natural Resources meeting in New Delhi in November, 1969 *recommended* that all governments agree to reserve the term "National Park" to areas answering the following characteristics and to ensure that their local authorities and private organisations wishing to set aside nature reserves do the same:

A National Park is a relatively large area (1) where one or several ecosystems are not materially altered by human exploitation and occupation, where plant and animal species, geomorphological sites and habitats are of special scientific, educative and recreative interest or which contains a natural landscape of great beauty and (2) where the highest competent authority of the country has taken steps to prevent or to eliminate as soon as possible exploitation or occupation in the whole area and to enforce effectively the respect of ecological, geomorphological or aesthetic features which have led to its establishment and (3) where visitors are allowed to enter, under special conditions, for inspirational, educative, cultural and recreative purposes.

Governments have accordingly been requested not to designate as "National Park":

1. A scientific reserve which can be entered only by special permission (strict nature reserve);
2. A natural reserve managed by a private institution or a lower authority without some type of recognition and control by the highest competent authority of the country;
3. A "special reserve" as defined in the African Convention of 1968 (fauna or flora reserve, game reserve, bird sanctuary, geological or forest reserve, etc.);
4. An inhabited and exploited area where landscape planning and measures taken for the development of tourism have led to the setting up of "recreation areas" where industrialisation and urbanization are controlled and where public outdoor recreation takes priority over the conservation of ecosystems (parc naturel régional, nature park, Naturpark, etc.). Areas of this description which may have been established as "National Parks" should be redesignated in due course.

from page 18

a reduction in the number of kangaroos to be taken under permit, the zoning of large areas together with an upper limit on the number of kangaroos that may be taken within those zones in any one year. These severe restrictions are being supported by a stepping up of enforcement activities.

The Conference accepted that the controlled taking of kangaroos is a legitimate utilization of a natural resource which does not conflict with conservation. However, Conference recognised that the conservation of kangaroos is a complicated problem involving a number of species of widely divergent habits. Kangaroos occupy a vast land area and the regional demands for conservation differ greatly.

Management research has been expanded and the Conference anticipates further progress in kangaroo conservation.

Members of Conference discussed the widespread public concern that the exploited species are in danger of extinction and expressed their confidence that there is no such threat.

Much of the concern about the conservation of kangaroos is based on the situation existing in some parts of Australia in the early 1960's but this has changed greatly since then. The interstate nature of the industry is fully recognised and there is consultation and co-operation between the authorities.

ELECTRIFIED FENCES PROTECT AGAINST KANGAROOS

Fauna Warden K. Morrison, who recently inspected an electrified fence operating on the property of Mr. W. E. Cresswell of Darkan, reported:

Some farmers in the State are affected by kangaroos causing damage to fences and crops. A more efficient and perhaps more acceptable alternative to shooting is to install an electrified fence.

The thought which immediately comes to mind is the cost of purchasing and installing the unit. However, when compared with the amount of time and labour involved in shooting kangaroos, the cost of installing the unit and maintaining the fence become highly competitive.

When shooting kangaroos there are many hidden costs which we tend to overlook—the purchase of a weapon and ammunition, and vehicle running costs. The damage to fences and crops caused by the kangaroos must also be taken into account.

The unit operating the electrified fence was a "Speedrite", Low Impedance, transistorised con-

trol unit, available for about \$85. It is powered by a 12 volt battery and is connected to each second wire of a six strand plain wire fence. These wires are then insulated with polythene hose where they pass through each fence post to prevent earthing. Porcelain insulators (about 30c each) are attached to the wires each side of every strainer post and a length of insulated wire is connected to the "live" fence wires at the insulators to divert the current around the strainer post.

The unit operates effectively for 2 to 3 weeks before the battery requires recharging, and is effective over two miles of fence line, one mile each side of the unit.

The only other maintenance involved is a check of the fence about twice a week to ensure that there are no breaks in the wires or obstructions which may cause earthing.

The unit is considered harmless and does not endanger sheep or cattle, which like kangaroos become wary of the fence and keep away from it.

Information on the installation of the unit can be obtained from the suppliers: Dasco Farm Supplies Pty. Ltd., 1280 Albany Highway, Perth.

CONTROL OF BIRDLIFE AT AUSTRALIAN AIRFIELDS

The presence of birdlife at airports has been a constant source of danger—particularly since the introduction of jet aircraft.

A series of papers on gulls and other birds inhabiting airfields was prepared by CSIRO wildlife Research Officers and appeared in the "CSIRO Wildlife Research", Vol. 14, No. 2 in December 1969.

Space does not permit a full reprint of these articles which are published below in a condensed form. The authors' summaries (shown in italics) are however, reprinted in full. Paper 3 will be published in the next issue of S.W.A.N.S.

PAPER 1—SILVER GULLS AT SYDNEY AIRPORT

Summary by G. F. van Tets

The diurnal movement patterns of silver gulls, Larus novaehollandiae, were found to be related to localised sources of food and shelter. Peak movements occurred at dawn and dusk when the gulls flew between roosting and feeding areas. Peak movements also occurred before and after low tide when gulls flew to and from the beach where they fed on intertidal animals. The gull showed a marked tendency to fly over water rather than over land.

Changes in the availability and location of food and shelter were followed by corresponding changes in the movement patterns.

INTRODUCTION

A study of various aspects of the aircraft-bird collision problem in Australia was started during 1963-64. In the first half of 1964, diurnal movement patterns of the silver gull, *Larus novaehollandiae* Stephens, were recorded at Sydney Airport, Mascot, N.S.W., in an attempt to understand why the airport area was attractive to gulls.

This paper reports and discusses the effect of some man-made and natural environmental changes on the movement patterns during the first half of 1964.

STUDY AREA

The study area (Fig. 1), consisting of the airfield and adjacent open areas, was formerly part of the tidal estuary of Cook's River. This area was bordered on the north, east and west by the built-up urban and industrial areas of Rockdale, Marrickville, Mascot and Botany. To the south lay the sandy beaches of Botany Bay.

Most of the airfield and other fully reclaimed areas were covered by grass which was mowed regularly. When rain fell, large amounts of water ran off paved runways, taxi-ways, aprons, and roads. Since the area was only a few feet above sea level at high tide, this water was held temporarily in shallow drainage ponds (S) which drained at low tide through flat valves into Alexandra Canal, Cook's River, and Botany Bay. When the grass-covered area became waterlogged by heavy rain some of the soil fauna, which included mice, insects and worms, were forced to the surface and exposed to predation by gulls and other birds.

The main methods being used for reclamation were tipping of garbage, piping of sand dredged from Botany Bay and Cook's River, and dumping of fly-ash.

The tipping of garbage provided food for large numbers of gulls and when dredging was in progress gulls gathered at the dumping site and fed on animals that were sucked up with the sand.

To prevent fly-ash (a fine grey powder produced from coal-burning) being blown around it was tipped under a sprinkling system. This process produced wide expanses of level silt covered by shallow water. The fly-ash settling ponds (F) and the shallow drainage ponds (S) were used by gulls for roosting at night. Near the lagoon at the former mouth of Cook's River were two deep-water ponds (D) where gulls bathed but did not roost.

At low tide gulls fed on intertidal animals along Botany Beach, while the general public fed gulls along the Rockdale and Mascot beaches.

Gulls also fed occasionally on live fish in Cook's River and Alexandra Canal and on scraps from fish cleaned by owners of small craft in the lagoon and Cook's River.

METHODS

At fortnightly intervals from February to July, 1964, gulls flying up and down the river across line AB and flying north and south over the airfield across line AC were counted to provide a measure of the flow of gulls per hour.

RESULTS—

(a) *Movements at Dawn and Dusk*

Before the middle of May 1964, gulls would roost at night in large numbers in the shallow drainage and fly-ash settling ponds situated north of the lines AB and AC. In May these ponds were drained or wires were strung at 6 ft intervals over undrainable portions and fly-ash sluicing was discontinued. Before the changes most gulls tended to fly north up the river at dusk and south down the river at dawn.

After the changes the gulls flew up the river at sunset and, on finding their roosts either dry or wired, departed south across the airfield towards Botany Bay. At dawn they retraced the previous evening's flight pattern by flying north across the airfield and then turning south down the river.

(b) *Movements before and after Low Tide*

Except for before and after low tide, the movement of gulls during the day was very slight compared to that at dawn and dusk. The timing and extent of beach exposed by low tide depend in part on the phase of the moon, and differ from day to day. From February to May 1964, there was a peak in the net flow of gulls moving south across the airfield 87 minutes before low tide and a peak in the net flow of gulls moving north up the river 151 minutes after low tide. The one-hour difference between the timing of the before and after low tide movement peaks is presumably due to the gulls taking time to digest their food and lighten their load before flying elsewhere.

DISCUSSION

This study concerned an aspect of group behaviour in the silver gull—indicating how the majority of gulls were utilizing the environs of Sydney Airport.

Gulls tend to forage near water, and this habit was reflected in the preference they showed for flying over the river when the airfield was dry. The river may have been a guide to food at the Marrickville tip and shelter on the airfield ponds. By congregating at localised sources of food and shelter they presumably improved their utilisation of the environment, and there may also have been safety in numbers. Changes in the location and availability of food and shelter were followed by corresponding changes in the movement patterns of the gulls. Hence, by changing quantity, quality, and location of resources, gulls may be discouraged from frequenting areas where they are considered a pest and encouraged to go where they might be an asset.

PAPER 2—BIRD HABITAT AT SYDNEY AIRPORT

By G. F. van Tets

SUMMARY

From January 1964 to June 1968 counts were made of the birds seen during the middle of the day at Sydney Airport. Numbers and varieties of birds declined after the following measures were taken: exposure of household refuse near the airport was stopped; airfield drainage was improved; frequency of mowing the airfield was increased; and the airfield was treated with insecticide. There was also a corresponding decrease in reports of bird strikes, and of bird strike damage to aircraft. The numbers of five bird species of about equal size which were killed by aircraft during this period were found to be positively related to the cube roots of their average numbers on the airfield. The implication of this relationship is that bird control measures may be able to produce significant reductions in the incidences of bird strikes only if bird numbers on the airfield are reduced by at least 80%.

INTRODUCTION

A study of the environmental behaviour of birds frequenting Australian airfields was started during 1963-64 (see previous paper) with the hope that this knowledge would suggest means whereby bird numbers could be lowered and thus reduce the risk of strike damage to aircraft. From 1964 to 1968 Sydney Airport was being altered and extended. This paper reports and discusses the changes that took place in the abundance and species composition of the birds in relation to the changes in their environment.

STUDY AREA

The area within which birds were counted is shown in figure I. The area changed in habitat composition and quality, initially because of the attempts to make the area less attractive to birds and later because of extension of the north-south runway and construction of a new terminal which was still in progress at the end of this study. As a result of the drainage and wiring carried out in May 1964 the gulls did not roost on the airfield until November 1965. Then a succession of ponds was created owing to the reclamation of the new terminal area with mud from Cook's River and sand from Botany Bay. Furthermore, the fly-ash was found to be too unstable to support buildings and had to be removed by excavation. Some of these excavations filled with water and attracted gulls. A few still existed in June 1968 at the end of this study. Pond 6 was too deep for gulls to roost in until it was partly filled with fly-ash in October 1965; then it was attractive to gulls for the rest of the study period. Pond 7 was also too

deep for gulls to roost in. It was very attractive to water birds until it became entirely covered by water hyacinth, *Eichhornia crassipes*, in February 1966. A few land birds and a couple of swamphens, *Porphyrio porphyrio* were the only birds that remained on the pond.

Throughout the study period many gulls and waders, Charadrii, congregated in bay 8, formerly the mouth of Cook's River until it was diverted to extend the airfield. Beaches 9, 10, and 11 were relatively steep and there gulls were mainly fed by the public. During the first half of 1967 signs were erected along these beaches asking the public not to feed birds. Gulls were also fed by construction workers from 1965 to 1968.

The dashed lines on Figure 1 indicate the full extension of the shoreline into Botany Bay in 1967. A concrete seawall was built at beach 10 and a rock wall around the runway extension. In November 1965, sand adrift from the runway extension formed an island around a portion of an old breakwater protecting the former mouth of Cook's River. This island became very attractive to gulls, waders, terns, and cormorants. The island and the runway extension sheltered a small harbour in front of beach 11.

Beach 12 had a wide intertidal zone which became more extensive in front of bay 8 during the course of the study. Bay 8 and beach 12 are well known to Sydney bird-watchers for the large numbers and varieties of birds they attract. At low tide the intertidal sand banks form an attractive feeding area for thousands of gulls.

Small craft are moored in areas 8, 13, and 14, and some gulls and cormorants perch on the boats. Gulls were fed by fishermen in areas 8-15.

At area 15 there was a large intertidal sand bank where hundreds of gulls congregated at even moderately low tides, while at high tide gulls rested during the day on the banks of Cook's River. From February 1967 to June 1968 a new channel was dug for Alexandra Canal through the Marrickville tip (dashed lines on Fig. 1). Some of the excavated material was dumped in the west side of pond 5. This area became attractive to hundreds of gulls, especially at point 16 where gulls fed on organic matter floating on the water pumped out of the excavation. The material dumped in pond 5 depressed the remainder of the pond, which then filled with shallow water and again became attractive to roosting gulls.

During wet weather, large numbers of gulls invaded grass-covered portions of airfields to feed on earthworms, grubs, and even mice which were flooded out of their burrows. When the long grass is eventually cut or burned large numbers of birds may come to feed on exposed insects and seeds. In 1964 drainage was gradually improved and the frequency of mowing was increased in order to keep the grass short.

Potential prey for gulls and other insectivorous birds was kept to a minimum even further by regular applications of insecticides. The first

application was in October 1964. No dead birds were found on the airfield after the spraying. The tips and other open areas around the airfield were sprayed with insecticides before and during the course of this study in order to combat Argentine ants, *Iridomyrmex humilis*.

METHODS

Once every 2-4 weeks, usually every third Wednesday, starting about 11 a.m. and finishing about 3 p.m. from January 1964 to June 1968, the numbers of all species of birds seen by an observer walking once around the airfield were recorded. The route was kept as constant as construction and airfield alterations would permit, and the area searched remained essentially the same (Fig. 1). The numbers of birds seen were only an index of those present. During the middle of the day birds tend to be less active and, consequently, less visible. Such birds as would have been concealed by some local patches of thick vegetation, and therefore not recorded, would have been mainly species not likely to venture into the flight path of aircraft.

Most birds are readily recognized as to species, but some species, especially in their non-breeding plumages, cannot be distinguished with confidence. Therefore, when doubt exists, uncommon species have been included in the common species which they resemble. Thus counts of little stint, *Erolia ruficollis*, may have included long-toed stint, *E. subminuta*; counts of sharp-tailed sandpiper, *E. acuminata*, may have included pectoral sandpiper, *E. melanotos*; counts of bartailed godwit, *Limosa lapponica*, may have included black-tailed godwit, *L. Limosa*; and counts of marsh tern, *Chlidonias hybrida*, may have included white-winged black tern, *C. leucoptera*, and white-fronted tern, *Sterna striata*. In bad light some female chestnut teal, *Anas castanea*, may have been confused with grey teal, *A. gibberifrons*.

An indirect measure of airfield densities of birds was the number of birds struck by aircraft. Bird strikes, with and without damage to the aircraft, have been reported to the Department of Civil Aviation by pilots and traffic controllers since 1958.

Since 1964, birds picked up on the runways after being struck by aircraft have been forwarded to the C.S.I.R.O. Division of Wildlife Research at Canberra, for identification and an examination of crop and stomach contents.

A limitation of the bird strike data is that not all strikes are detected and reported. It was assumed, however, that the strikes reported and the birds forwarded formed a representative sample and indication of the kinds and relative numbers of birds struck.

RESULTS

The study showed that there was not only a decrease in the numbers of gulls and other birds after the first half of 1964 but also a net decrease in the number of species of birds at Sydney Airport. This drop was maintained during the subsequent four years. The period from January to June was chosen for comparison for each of the years because the first half of 1964 was the only period studied that gave any indication of conditions prior to most environmental changes. During this period most species were present in maximum numbers. Most birds left the area to breed elsewhere during the latter half of the year. The decrease in silver gulls, starlings, pigeons, ravens, Indian mynas, spur-winged plovers, banded plovers and pipits may be attributed to reduction in availability of food on the mowed portions of the airfield and to the closure of the two tips adjacent to the airfield.

A slightly higher number of gulls existed in 1967 and 1968; partly attributable to the excavation of a new channel for Alexandra Canal

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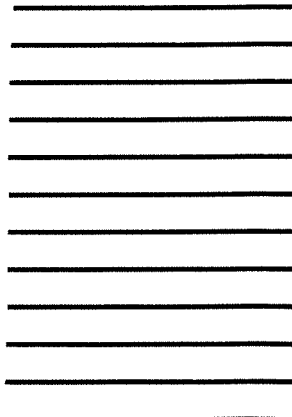
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through the Marrickville tip and to the increased availability of lunch scraps at the construction sites.

The runway extension, by increasing the inter-tidal area and by shielding this area from polluted water may have provided more food for gulls, terns and waders. This may help to explain the increase in numbers of crested terns, marsh terns, sharp-tailed sandpipers, double-banded dotterels, and bartailed godwits.

The newly created shallow water areas in pond 6 attracted the royal spoonbills, yellow-billed spoonbills, little egrets, white-headed stilts, red-kneed dotterels and black-fronted dotterels; these birds were not seen in 1964.

The decrease in chestnut teal, grey teal, dusky moorhen, coot, hardhead and black swan may be explained by the drainage of ponds 1, 4 and 5 and by water hyacinths covering pond 7.

After 1964 there was also a decrease in the number of bird strikes. However, in 1967-68 strikes increased probably due to the temporary attractiveness to birds of the new terminal construction site.

DISCUSSION

Since birds were recognised as a serious hazard to aircraft, attempts to reduce their numbers have mainly consisted of a variety of bird-scaring and killing techniques. These techniques have given only short-lived relief.

The abundance of birds on the airfield is partly a function of its attractiveness to birds in relation to surrounding areas and, furthermore, a function of environmental conditions far beyond the control of the airport authorities. Consequently the only bird control measure open to airport authorities is to manage the airfield environment in the manner least attractive to birds.

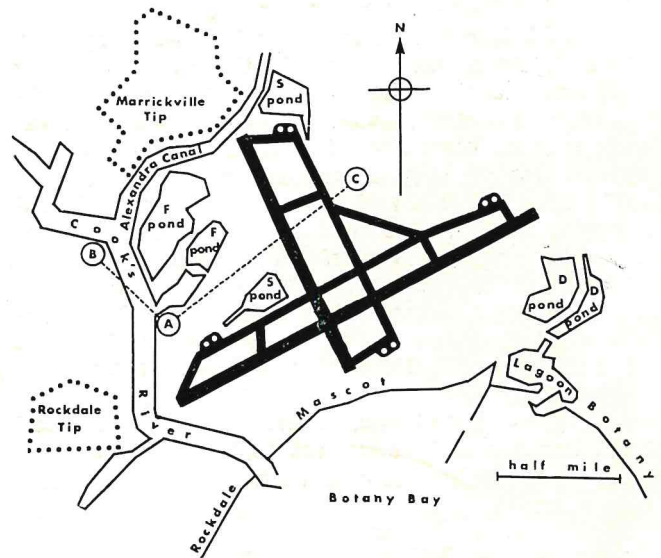
The study revealed that the alterations in habitat did substantially lower bird numbers and the incidence of aircraft striking birds. There were

also indications of how the numbers might be reduced further by switching garbage disposal methods to incineration or to tipping at night; filling of shallow pools or, if this is unavoidable, by maintaining a permanent depth of at least three feet and a complete cover of water hyacinths and, keeping airfield grass short, well-drained and treated with insecticide. Before any major alterations are undertaken at airfields, wildlife biologists should be consulted because bird problems are easier and cheaper to avoid in the design stages than by remedial action afterwards.

CONCLUSION

Because the incidence of aircraft striking birds appears to be a function of the cube root of the density of birds, reductions in bird densities at airfields will only result in detectable and significant reductions in bird strike damage when the bird densities are reduced by at least 80 per cent.

Fig. 1.



(SEE PAGE 19)

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FAUNA DISTRICT