Research Plan for the Malleefowl

in the Gnowangerup/Ongerup/Borden district

(Western Australia)

by

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Thanks are also extended to Graham Hall and Allan Burbidge
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Legend of the photographs (previous page)

Top and bottom: two stages of an active Malleefowl mound in July and September. Corackerup Nature Reserve, photo J.-P. Orsini.

Middle: A pair of Malleefowl on a mound. Photo from 'Handbook of Australian Animals', A. Moffat, ed. Bay Books, Sydney.

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1. INTRODUCTION

The Malleefowl has been declining in Western Australia to such an extent that it is in the process of being added to the West Australian list of Threatened Fauna ('Declared Rare Fauna Schedule', Anon. 1991). The draft Nature Conservation Strategy for Western Australia (CALM 1992a) lists the Malleefowl as one of the 35 most threatened animal taxa in the state; the Malleefowl is one of the only eight birds on this list. In agricultural areas, extensive clearing has resulted in a widespread reduction of the species' habitat. Furthermore, remaining habitat is fragmented, placing additional pressure on the species.

Attempts to preserve the Malleefowl are being hampered by the lack of knowledge of the distribution, habitat requirements and general ecology of the species in Western Australia. Although clearing and grazing by introduced herbivores are two recognised reasons for the decline of the Malleefowl (Garnett 1992 a, b), the respective importance of other potential factors such as predation by foxes and cats, fragmentation of the bird's habitat, fertility decline and food shortages at certain times of the year are not well understood.

In August 1992, the Malleefowl Preservation Group was formed in Ongerup by local residents concerned with the decline of the species in their area. Several actions are being taken to promote the conservation of the species in the Gnowangerup/Ongerup/ Borden district (Orsini 1992).

2. BACKGROUND

2.1 Recovering threatened species

The Australian National Parks and Wildlife Service (recently renamed Australian Nature Conservation Agency), Canberra, administers the federal Endangered Species Program and has formalised the various planning stages involved in the recovery of threatened species (ANPWS 1993).

Species for which information is inadequate such as the Malleefowl are to be the subject of a *Research Plan* (formerly called *Recovery Plan - Research Phase*), which details the research actions required before management actions can be initiated. The results of a Research Plan provide the basis for the ensuing Recovery Plan, which in turn details, schedules and costs the actions required to support the recovery of the species.

2.2 Aims of this Plan

This Research Plan aims to outline the research needed to prepare a Conservation Strategy or Recovery Plan for the Malleefowl in the Gnowangerup/ Ongerup/Borden district. Research is required to establish how much the species has declined in the past, to investigate whether the species is still on the decline, and to identify the major causes of this decline and what actions can be taken to reverse it.

An attempt to cost the various research proposals in this Plan should assist the allocation of funding resources with improved efficiency. Although this Plan has a local focus, some of its recommendations may be extended to other areas of the State.

A Research Plan for the Malleefowl in Australia has been written by Benshemesh (*in press*), with an emphasis on the three states where most Malleefowl research has been carried out so far (New South Wales, Victoria and South Australia). In Western Australia, information on the Malleefowl is not readily available and consists mainly of opportunistic observations and an ongoing research project at the RAOU Eyre Bird Observatory on the south coast.

3. DESCRIPTION OF THE AREA COVERED BY THE PLAN

3.1 Why the Gnowangerup/Ongerup/Borden district?

The Gnowangerup/Ongerup/Borden district was chosen for the present Research Plan because of active community interest and support for the conservation of the Malleefowl in the area. The Malleefowl Preservation Group, an association of local residents concerned by the decline of the Malleefowl, has been developing a range of activities with the support of the Gnowangerup Land Conservation District Committee. As a result, the Malleefowl is now the focus of various community projects in the area. The group has also obtained a grant from the Gordon Reid Foundation for the preparation of a Malleefowl Community Action Plan and various on-the-ground conservation activities.

In addition, the Malleefowl, or 'Gnow' in the Nyungar Aboriginal language, is of particular heritage significance to the Gnowangerup area. The Malleefowl is of cultural and traditional importance to the Nyungar Aboriginal people – in particular Gnowangerup is known as the place where the mythical Mallee Hen made her nest. The bird is the emblem of the Gnowangerup Aboriginal Corporation; it also figures in the Gnowangerup Shire's crest and the Gnowangerup District High School's crest.

3.2 Limits of the district

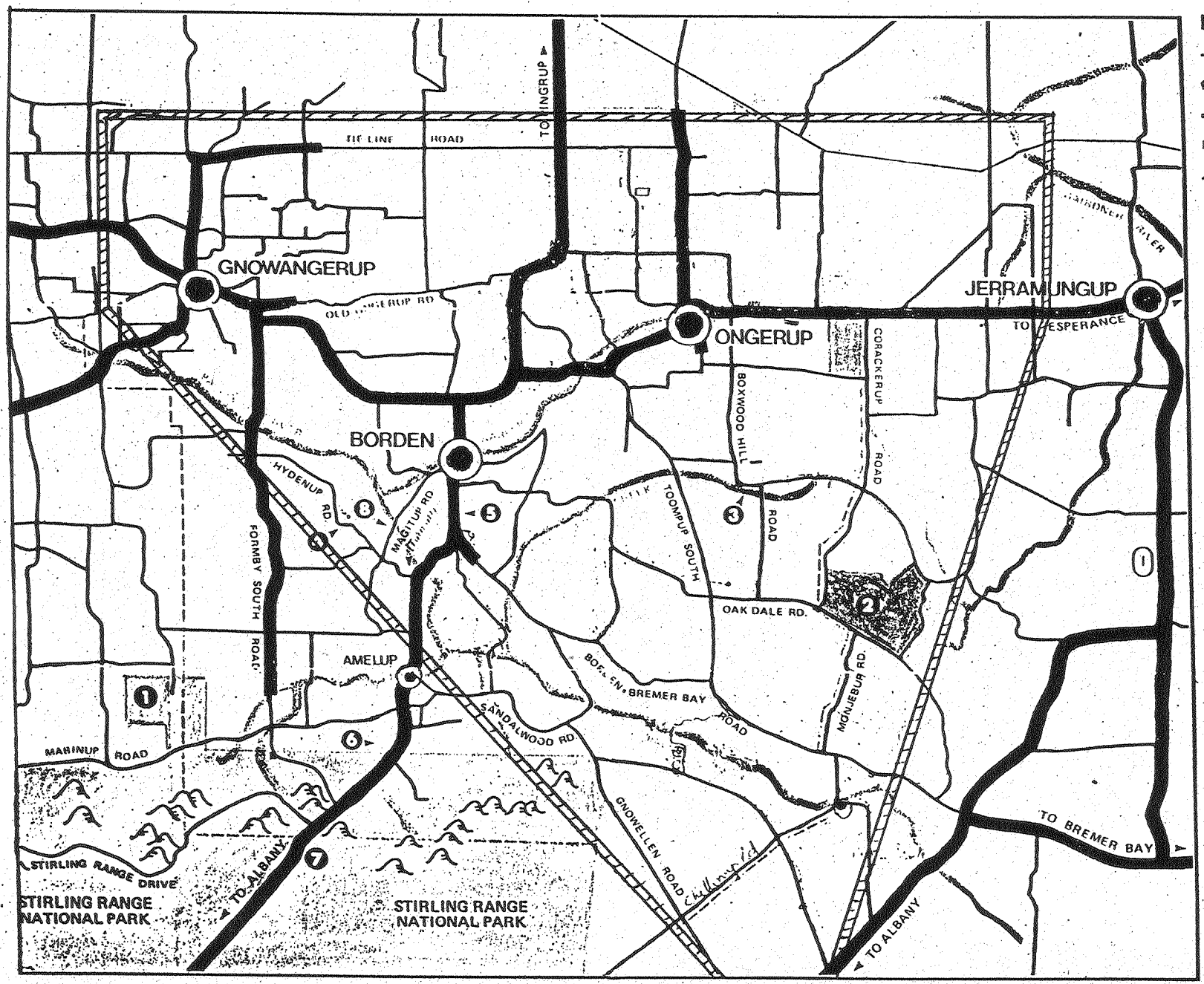
The district covered by this Plan (see Map next page) is defined by the northern boundary of the Gnowangerup Shire to the North (north of the Gnowangerup-Ongerup line), the Corackerup Creek to the south-east and the Gnowangerup-Wellstead line to the south-west (around 4,000 km^2). The main localities within this area are Gnowangerup, Ongerup, Borden and Wellstead.

The district contains most of the Gnowangerup Shire and a small part of the Jerramungup Shire. It overlaps three Land Conservation Districts (Gnowangerup, Jerramungup and Wellstead) and two CALM regions (South Coast and Wheatbelt regions). A 10-year Management Plan has been produced by CALM for the South Coast region (CALM 1992b).

3.3 Natural features

The major natural features of the area are the Stirling Range to the West/South-West and the major drainage systems of the Pallinup River and Corackerup Creek. The district has some outstanding natural values. Over 1,400 species of plants have been recorded in the district, with 576 species in the Corackerup Nature Reserve alone (Newbey 1979).

A total of 180 species of birds are listed for the area (Newbey and Newbey 1984), of which one, the Western Whipbird, is on the declared list of Threatened Fauna and found in several remnants where the Malleefowl is breeding. As many as 15 species of honeyeaters are found in the mallee.



LEGEND

- SHIRE BOUNDARY
- RIVER
- GRAVEL ROAD
- SEALED ROAD
- MOUNTAIN
- (1) HIGHWAY No SIGN
- NATURE RESERVE/ NATIONAL PARK

PLACES OF INTEREST

(see text for details)

1. CAMEL LAKE NATURE RESERVE
2. CORACKERUP NATURE RESERVE
3. COWALELLUP NATURE RESERVE
4. MAILEUP DOWNS FARM HOLIDAYS WILDFLOWER GARDEN & ACCOMMODATIC
5. WILDLIFE HAVEN
6. STIRLING RANGE CARAVAN & CHALET PARK.
7. STIRLING RANGE NATIONAL PARK
8. DOWN-UNDER PLAQUE & PICNIC AREA.

GENERAL ADVICE

Fires should not be lit in the open.

The State prohibits the picking of wildflowers - apart from on private property WITH the owner's permission.

Don't enter farmland without the owner's consent.

Some graded roads may be slippery after rain.

Beware of kangaroos when travelling secondary roads late evening or night.

Dogs and firearms are not permitted in national parks.

Map of the Gnowangerup/Ongerup/Borden district covered by this Plan

3.4 Remnant vegetation

The Corackerup Nature Reserve (4,334 ha) is the largest conservation reserve in the area, followed by Nature Reserve No. 26792 (1,038 ha), the Mailalup Nat. Res. (768 ha), Needilup Nat. Res. (622 ha), Pallinup Nat. Res. (424 ha) and Greaves Nat. Res. (251 ha) (CALM 1992b). The Corackerup Nat. Res. harbours the major breeding population of Malleefowl in the area.

A large vegetation remnant to the north of the area, the Mindaribin Aboriginal Reserve (approx. 1,000 ha), is vested in the Gnowangerup Aboriginal Corporation. A vegetation corridor along the Corackerup Creek (1;680 ha) is an important link between 'Other Res.' No. 29500 (6, 530 ha) and the Pallinup vegetation corridor.

The total area of remnant vegetation on private land in the Gnowangerup Shire is 24,000 ha or 4.8% of the Shire area (DAWA 1992). Out of this total, an area of 18, 600 ha is covered by remnants over 50 ha.

4 MALLEEFOWL DISTRIBUTION

4.1 In Australia

The Malleefowl is distributed patchily throughout the southern half of Australia from New South Wales to Western Australia. In agricultural areas, the species is now restricted to remnant patches of various sizes left after extensive vegetation clearing. The species is now probably extinct in the Northern Territory (Blakers *et al.* 1984, Kimber 1985), but recent reports have been cited from the North-West of South Australia and adjacent Western Australia (Benshemesh, *in press*; D. Pearson *pers. comm.*). Estimates are of 500 to 750 pairs in New South Wales (Brickhill 1987a) and 1000 pairs in Victoria (Garnett 1992b). No estimates are available for South or Western Australia.

4.2 In Western Australia

An outline of Malleefowl distribution in Western Australia is presented in the RAOU 'Atlas of Australian Birds' (Blakers *et al.* 1984), from observations collected from 1977 to 1981. An historical map of early records (pre-1976) is also provided. Other general accounts are given by Serventy and Whittell (1976) and Storr (1985a, b; 1991). Isolated reports are scattered in the Western Australian Bird Notes (RAOU) and the Records of the Western Australian Museum (Dell 1977, 1978, 1981; Dell and Johnstone 1977; Dell and McGauran 1981).

More recent confirmed reports range across the South-West of Western Australia from Shark Bay down to Albany and along the South Coast, and more patchily across the arid interior (Leonora, Paynes Find, Southern Cross, Kalgoorlie, Roe Plains). A small population appears to persist near Northcliffe in the wetter forested part of the State (G. Wardell-Johnson, *pers. comm.*).

The core of the bird's current range in Western Australia appears to be the mallee lands of the South-West, where some relatively large areas of native mallee vegetation remain. In most areas, only 5 to 20% of native vegetation has been retained on private land, with only 12% of that remnant vegetation in a good or fair condition (F. Mollemans, *in prep.*). Clearing of remnant vegetation for agriculture remains a significant threat to the bird's survival in rural areas.

4.3 In the Gnowangerup/Ongerup/Borden district

Although the Malleefowl was widespread in the district earlier in this century, it is only now known breeding from a small number of locations. Three pairs are breeding on a private 130 ha remnant about 15 km north of Ongerup. At least 8 mounds were active in the Corackerup Nature Reserve in 1992-93 (opportunistic searches by local residents). One active mound was found during a biological survey along the Corackerup River north of the Borden-Bremer Bay Road (Leighton and Watson 1992) and another one was active in 1992-93 in the same area (J. Davis, *pers. comm.*). A Malleefowl pair was breeding until two years ago near Chillinup on the Pallinup River. Isolated birds have been observed recently in the vicinity of the Tieline and Pingrup Roads (no evidence of breeding) and along the Pallinup River.

It should be noted that the only data available at present come from local residents and that only one search has been carried out so far; the number of active mounds may increase markedly when systematic surveys are conducted.

5 SELECTED REVIEW OF MALLEEFOWL RESEARCH IN AUSTRALIA

A selected review of research carried out in Eastern Australia is presented here. For more detailed information on Malleefowl population biology and life history characteristics, refer to Frith (1962) and Benshemesh (*in press*).

Caution should be applied when extrapolating research results obtained in eastern Australia to the West of the continent, as significant differences occur in mallee vegetation between the West and the East of the continent. For example:

- a much higher plant diversity and a large proportion of plant endemics in the West, including *Gastrolobium* species that contain monofluoroacetate (the natural equivalent of 1080 poison), likely to modify the bird's diet and ecology.

- differences in the abundance and possibly ecology of feral predators and herbivores, such as goats (abundant in some New South Wales mallee remnants, but absent in the study area).

- the occurrence of Malleefowl in non-mallee habitat in Western Australia.

Common features include: similarities in the structure of the mallee between Western Australia and the Eastern States (Noble and Bradstock 1989; Noble *et al.* 1990); presence of introduced foxes, cats and rabbits; fragmentation of habitat; effect of sheep grazing on understorey vegetation.

One common aspect of most Malleefowl studies is that they have mainly taken place in large conservation reserves in the mallee. Studies of Malleefowl in small vegetation remnants (< 200 ha) are critical to assess the possibility of maintaining viable populations of the species over its current range in the South-West of Western Australia.

The main research work on the Malleefowl has been been carried out by:
- Frith (1962), followed more recently by Brickhill (1987a, b) and Priddel (1989, 1990) in New South Wales,
- Benshemesh (1990, 1992) in Victoria,
- Booth (1985, 1987), Brandle (1989/90) and Copley (unpublished) in South Australia,
- the RAOU-WA Group at the Eyre Bird Observatory in Western Australia.

A detailed review of Malleefowl research is presented in Benshemesh (*in press*).

5.1 Documented changes in Malleefowl abundance

Although it is clear that the species' range has contracted in southern Australia over recent decades due to extensive clearing of the mallee, data on changes in Malleefowl abundance with time at one particular location are limited.

In New South Wales, the severe decline in Malleefowl abundance has been well documented in several nature reserves. At Round Hill Nature Reserve, Malleefowl declined from an estimated 200 pairs in the 1950's (Frith 1962 *in* Priddel 1990) to 5 pairs 30 years later (Brickhill 1987a). At Yalgogrin Nature Reserve, Malleefowl declined from 16 to 10 pairs from 1984 to 1990 and at Pulletop Nature Reserve from 2 pairs to none over the same period (Pridell 1990a).

In Victoria, population levels appear to have been stable over the last 30 years in areas where historical data are available (Benshemesh 1990).

In South Australia, recent survey data (Brandle 1989/90; P. Copley, *pers. comm.*) suggest that populations are stable in the areas currently monitored.

In Western Australia, no baseline survey data are available, apart from one recent study conducted at the RAOU Eyre Bird Observatory where two breeding pairs have been monitored in an area of five square kilometres over the last three years (R. Smith, *pers. comm.*). Presumed current downward trends in the Gnowangerup/Ongerup/Borden area can however be inferred from anecdotal reports from landholders who observed the species breeding on their properties where it is now absent.

At Dryandra State Forest near Narrogin (Western Australia), the number of *known* active mounds appears to have declined from eight in 1978-79 to two in 1990-91 and two in 1992-93 (T. Friend, T. Start, R. Johnstone, R. Smith, *pers. comm.*). Three recent systematic searches by members of the RAOU over 3.5 km^2 have revealed one active mound (R. Smith, *pers. comm.*). As these data are derived from opportunistic records and no systematic search of active mounds has been carried out in the past, it is only possible to speculate on the change in abundance.

5.2 Malleefowl habitat

Malleefowl habitat has been described in New South Wales by Frith (1962) and Brickhill (1987a, b), in Victoria by Benshemesh (1992), in South Australia by Brandle (1989/90) and Booth (1987). No habitat study is available in Western Australia, where the bird inhabits a wide variety of vegetation types: mainly mallee, but also wandoo woodland, karri forest, *Allocasuarina* low woodland and mulga woodland (arid interior).

5.3 Malleefowl diet

No information has been reported on Malleefowl diet in Western Australia. Malleefowl diet has been shown to vary with seasonal availability of food. Studies by Frith (1962) in New South Wales and Benshemesh (1992) in Victoria have indicated that herbs (buds, flowers and seeds) constitute the major part of the Malleefowl's diet (up to 70%) in autumn, winter and early spring. In late spring and summer, fruits of small shrubs as well as acacia and cassia seeds are the major food source (direct observation: Frith 1962; analysis of crop and gizzard content: Booth 1986; faecal analysis: Brickhill 1987a). In addition, Benshemesh (1992) found that lerps, the carbohydrate tests of Psyllid insects attached to mallee leaves, are a major food source for the bird in autumn and winter. Litter invertebrates are eaten whenever encountered.

These studies provide a general profile of the diet of the Malleefowl. However, studies on diet composition in the Eastern states cannot be readily extrapolated to Western Australia, given the high level of floristic richness and endemicity of the West.

5.4 Effect of grazing

Grazing by introduced herbivores modifies Malleefowl habitat which becomes ultimately unsuitable for the bird (Frith 1962, Priddel 1990). Grazing has been shown to degrade and eventually eliminate vegetation understorey. Shrubs gradually disappear and native herbs are replaced by introduced weeds. The amount of organic litter is considerably reduced. These modifications are likely to affect food availability as well as mound construction and maintenance.

5.5 Effect of fire

Fire has been shown by Benshemesh (1990, 1992) to have a major impact on Malleefowl density. Most of Benshemesh's study site in the Victorian mallee was accidentally burnt three months after the beginning of his research. He was then able to investigate the changes in Malleefowl breeding density and activity patterns after fire. Even though the birds were still using the burnt areas for foraging, they became restricted to the rare unburnt patches for breeding, and the number of breeding pairs dropped considerably.

In a wider review, Benshemesh (1990) found that breeding density was less than 0.8 pairs/km^2 in mallee unburnt for less than 30 years and between 1.8 and 2.7 pairs/km^2 in mallee unburnt for 40 years or more. He concluded that fire suppression was the most desirable management to retain high levels of Malleefowl populations in the mallee, although it was possible that patch burning may improve Malleefowl habitat.

5.6 Recruitment of young birds into the adult population

Recruitment of young birds is central to the survival of Malleefowl populations within a particular habitat. Given the longevity of breeding adults (up to 30 years), replacement of adult birds only needs to occur from time to time.

Benshemesh (1992) indeed suggested that given the high reproductive rate of the species (up to 33 eggs for a pair per year), a high natural juvenile mortality would be expected. Benshemesh (op. cit.) believes recruitment of young birds into the adult population may only be an episodic event that would not need to occur every year to allow population levels to be maintained.

Survival of chicks has been linked to the weight of the eggs (Booth 1985). However, too little information is available on territory, home range, dispersal, carrying capacity, fertility (Frith 1962; Benshemesh 1992) to be able to assess the probability of recruitment of young birds to adulthood.

The predation of eggs and young is discussed below:

5.6.1 Egg predation

Frith (1962) found in Griffith (NSW) that 37% of Malleefowl eggs were eaten by foxes. In contrast, Brickhill (1987b) at Yalgogrin Nature Reserve (NSW) and Booth (1987)

near Renmark (SA) found little or no egg predation by foxes. At Yalgogrin however, a large number of eggs appear to be infertile, possibly as a result of the aging of the adult bird population. Monitoring of marked birds showed no recruitment of young birds into the adult population.

5.6.2 Chick predation

Predation of chicks has been studied experimentally by releasing chicks fitted with radio transmitters. Priddel in New South Wales (1990) found that all of the 100 two-week old chicks released into the wild had been killed by predators after 110 days, with 80% mortality within the first two weeks. Between 40 and 60% of all deaths were attributed to foxes, the rest to native predators such as birds of prey. Only a few deaths could be attributed to feral cats.

In contrast Copley (*unpublished*) found in South Australia that, out of 30 five-month old chicks released into the wild in 1989-90, two-thirds were dead after four weeks, but only one of the remaining birds died in the following five months. All deaths were attributed to foxes. Another release of 45 chicks in 1991 was cancelled due to technical problems with transmitters.

These results suggest that chick mortality may decrease with age and that foxes may be an important predator for the young chicks. However, Frith (1962) did not find evidence of fox predation on chicks or adult birds in Griffith (NSW) in the 1950's.

5.7 Reintroduction of Malleefowl into the wild

With a maximum population estimated at 750 pairs in New South Wales (Brickhill 1987a) and rapidly declining, the survival of the Malleefowl in this state is likely to depend on the implementation of an active recovery program (Priddel, *in preparation*) centred on the reintroduction of birds into the wild.

A captive breeding colony of 16 pairs of Malleefowl is housed at the Western Plains Zoo in Dubbo, NSW (D. Priddel, *pers. comm.*). It is hoped that the colony will produce up to 200 chicks a year over the next two years to be released in October 1994 and 1995. The breeding birds, obtained from artificially incubated eggs taken from a wild New South Wales population, are currently four years of age and did not produce the expected clutch size of ten eggs or more during the 1992-93 breeding season, possibly because they had not yet reached full maturity (D. Priddel, *pers. comm.*).

No other captive breeding program for reintroduction into the wild has been attempted in Victoria or South Australia.

6 SIGNIFICANCE OF THE MALLEEFOWL FOR NYUNGAR ABORIGINAL PEOPLE

The Malleefowl is a familiar bird for Nyungar Aboriginals of the South-West of Western Australia. Its significance is both cultural and traditional, as far as the two aspects can be separated.

6.1 Cultural values

The Malleefowl is an important totem animal for the Aboriginal people of the Central Deserts, in the broad region where the Northern Territory and South Australia meet

(Kimber 1985). Kimber documents that Dreaming sites and trails were specifically related to the Malleefowl in Central Australia. He states that, according to senior Aboriginal people, Malleefowl eggs were eaten, but not the birds, and mentions that birds were sometimes eaten in Western Australia.

The Malleefowl is mentioned in the Dreamtime story of the Journeys of the Zebra Finch (Isaacs 1991):

"... the children however kept up their little songs about the mallee fowl.
...
The children sang softly until they fell asleep.

Mallee fowl
Heaping up the sand.
Mallee fowl

Heaping up the sand.
Only one
Only one egg."

The cultural significance of the Malleefowl for the Nyungar Aboriginal people of the South-West has not been documented so far, but it is likely that the bird is an important part of their culture.

6.2 Traditional values

In a CALM report on 'Aboriginal Activities and Nature Conservation in the South-West of Western Australia' (CALM 1991), the Malleefowl is not mentioned amongst the twelve animal species or groups of species used by Aboriginal people. However, the Malleefowl is a familiar bird for the Nyungars who traditionally collect eggs as a food item (author's discussions with local members of the Nyungar community). [Birds have also been hunted by white settlers and rural people for food.]

7 SCOPE OF THE PROPOSED RESEARCH

7.1 Outline of main research topics

Two important questions that arise from the above discussion are:

(i) Is the Malleefowl presently on the decline in the Gnowangerup/ Ongerup/Borden district?
- Is the current range of the species contracting within the district?
- Are numbers of breeding birds declining within existing populations?
- Is the species capable of recolonising areas through natural dispersal when habitat is fragmented and local extinctions occur?

(ii) If a decline is found, can it be attributed to:
- Low fertility due to
  - Aging of breeding adults
  - Inbreeding
- Predation of adults, young, eggs; road kills
- Habitat decline (habitat degradation, food shortage)
- Effect of introduced herbivores (sheep, rabbits)
- Effect of fire

Habitat fragmentation

7.2 Extended list of research topics

One cannot answer the above questions in isolation. A tentative list of topics that cover the life history of the species is suggested below:

(i) Habitat characteristics
- vegetation structure and composition
- soil structure, drainage
- remnant size and condition
- effect of rabbits, domestic stock

(ii) Reproductive biology
- clutch size
- fertility
- hatching rate
- chick mortality
- adult longevity
- mating behaviour

(iii) Fragmentation of habitat
- population structure, mating systems
- genetic variability, inbreeding, gene flow
- dispersal of chicks, adults
- territory, home range
- role of vegetation corridors
- food availability
- use of surrounding agricultural land (pasture, crops, stubbles)

(iv) Effect of fire on
- habitat
- breeding density
- food availability
- mortality of adults and chicks
- predation levels

(v) Predation (eggs, chicks, juveniles, adults)
- foxes, cats
- native predators

(vi) Land practises
- clearing of native vegetation
- grazing by domestic stock
- degradation of remnant vegetation

(vii) Determination of current status and breeding success of the species by monitoring:
- breeding populations
  - survey grids
- individual mounds
  - number of eggs laid, laying period, hatching rate, nest temperature, predation of eggs
- individual birds
  - direct observation, colour banding, radiotracking, DNA fingerprinting, electrophoresis

(viii) Traditional and cultural significance of Malleefowl for Nyungar Aboriginal people

8 RESEARCH PROPOSALS

Research topics listed above have been allocated to five research areas or 'Projects'. Projects 1, 2 and 5 are short-term (one year or less), 3 and 4 are longer term (3 years or more). Projects 1, 2, and 4 are biological surveys, with an ecological component in Project 2. Project 3 involves comprehensive research on the population structure and dynamics of the Malleefowl. Project 5 is related to Aboriginal cultural and social values.

It is not the purpose here to present detailed research proposals with associated itemised costing. Rather, it has been attempted to outline broad research areas and present estimates of some of the costs involved. The costs indicated here represent a minimum below which the described research could not be carried out in adequate conditions. Obviously costs could rise significantly if some level of assistance for use of computer and field equipment, vehicle, laboratory facilities is not available from community groups/ government agencies/universities.

8.1 *Project 1*: Assessment of past and current distribution of Malleefowl in the Gnowangerup/Ongerup/Borden district

Duration: 1 year. Start: Feb. 1994.
Personnel required: one part-time staff with assistance of volunteers.
Salary costs: one staff for 6 months half-time @ $30,000/yr = $7,500.
Operating costs: travel 15,000 km @$0.30/km = $4,500, travel allowance 90 days @$25/day = $2,250, equipment, misc.: $4500 (pickets, tags, compasses, surveying tapes, one hand held satellite GPS system, postage, telephone).
TOTAL: $18,750.

Aims: a) Develop field techniques for rapid search for active mounds
(possible combination of aerial and ground surveys)
b) Establish survey grids and carry out ground searches for mounds
c) Assess past distribution of Malleefowl in district
send questionnaire to local landholders and residents
map past distribution in the district

8.2 *Project 2*: Characterisation of Malleefowl habitat

Duration: 1 year. Start: June 1994.
Personnel required: 1 staff part-time or student (4th year project or work experience).
Salary costs: one staff for 6 months half-time @ $30,000/yr = $7,500.
Operating costs: travel 15,000 km @$0.30/km = $4,500, travel allowance 90 days @$25/day = $2,250, equipment, misc.: $1600 (plant identification manuals, soil measuring kit, maps).
TOTAL: $15,850 if staff involved, $8,350 if student involved.

Aims: a) For a selection of remnants with past and present occurrence of Malleefowl, determine the following characteristics:
corridor links with other remnants
land use around remnant
fire and grazing history
condition of remnant (land degradation, presence of feral predators and competitors, weeds)

b) For the whole remnant and for each mound, determine:
soil, slope, drainage, water runoff
vegetation structure, litter biomass and composition
botanical composition
indicator species (plant, birds, invertebrates)
c) Based on the above results, predict and map potentially suitable Malleefowl habitat in the district using a computerised Geographic Information System.

8.3 *Project 3*: Assessment of long-term viability of Malleefowl populations

Duration: 2 to 4 years. Start: June 1994.
Personnel required: 1 half-time staff or full-time student (Masters or PhD).
Salary costs: one staff for 12 months half-time @ $30,000/yr or a PhD scholarship for one year = $15,000.
Operating costs: travel 8,000 km @$0.30/km = $2,400, travel allowance 180 days @$25/day = $4,500, equipment: $8,000 (transponders + radio tracking equipment, DNA fingerprinting, electrophoresis).
TOTAL year 1: $29,900 if staff involved.
year 2-4: same less costs of radio receivers.

Aims: compare Malleefowl population dynamics on small and large remnants:
fertility
genetic variability, inbreeding
chick survival
predation
dispersal of young and adult birds
daily activities, home range
use of surrounding agricultural land (pasture, crops)
measure seasonal variation in food availability; diet composition.

8.4 *Project 4*: Long term monitoring of Malleefowl populations

Duration: 5 years min., preferably 10 years. Start Sept. 1994.
Personnel required: one part-time staff (3 mths a year + assistance of volunteers).
Salary costs: one staff for 3 months @ $30,000/yr = $7,500.
Operating costs: travel 15,000 km @$0.30/km = $4,500, travel allowance 90 days @$25/day = $2,250, equipment, misc.: $1,800 (pickets, tags, compasses, surveying tapes, maps).
TOTAL per year: $16,050.

Aims: from the results of projects 1 and 2, establish 6 permanent grids to monitor Malleefowl density over time. The aim is to investigate population trends with time in relation with the following factors:
- time since last fire: habitat unburnt for more than 30-40 years (C) *versus* unburnt for less than 10-15 years (T).
- effect of fox control: no baiting and high fox density (C) *vs* intensive baiting and low fox density (T).
- size of remnant: large remnant (>4,000 ha) vs small remnant (<200 ha).
- condition of the habitat.

The grids are to be paired: control (C) and treatment (T). It is unsure whether enough populations could be found to provide the Control/Treatment pairs in each case.

8. 5 *Project 5*: Cultural and traditional significance of Malleefowl for Nyungar Aboriginal people

Duration: 1 year. Start: Feb. 1994.
Personnel required: 1 staff or student for 3 months half-time.
Salary costs: one staff for 3 months half-time @ $30,000/yr = $3,250.
Operating costs: travel 15,000 km @$0.30/km = $4,500, travel allowance 45 days @$40/day = $1,800, equipment, misc.: $1600 (tape recorder, telephone).
TOTAL: $11,150 if staff involved, $7,900 if student involved.

Aims: assess past and current significance of Malleefowl for Nyungar people. Attempt to achieve an understanding of the species' cultural values (Dreamtime stories, mythology, important sites) and traditional values (egg gathering, hunting, other bush activities).

In order to achieve co-operation and understanding from the Aboriginal community for the recovery of the Malleefowl, it is important that Aboriginal people be consulted before the recovery phase be put in place. This will also result in a greater level of communication between the Aboriginal and the non-Aboriginal sections of the local community. The experience and bush knowledge of Aboriginal people should be taken into account and integrated into the recovery process.

8.6 Prioritising research

Since very little is known of the Malleefowl in Western Australia in general and in the Gnowangerup/Ongerup/Borden district in particular, Projects 1, 2 and 4 (Malleefowl survey and monitoring) should be considered as a priority. The establishment of baseline data will serve as a basis for future conservation efforts. More specifically, lacking information includes (i) a knowledge of current trends in Malleefowl abundance and (ii) the characterisation of preferred habitats that need conserving as a matter of urgency.

Project 3 is a project which will not yield rapid answers for the purpose of Malleefowl conservation, but will establish long term fundamental research in Malleefowl biology that will provide ultimately baseline information for a conservation strategy for the species.

Project 5 is important from a social and community point of view as Aboriginal people can play a key role in Malleefowl conservation in the South-West and have a good knowledge of and strong links with the bush.

9 RECOMMENDED INTERIM MANAGEMENT MEASURES

Although this Plan is not intended to specifically address the conservation and recovery of the Malleefowl, some conservation measures can be suggested from the literature review presented above. These measures are aimed at land managers, including local land owners, shires, CALM and other government agencies which have responsibility for land management in this state.

Funding or financial assistance can be sought from a variety of sources: state and federal government — Save the Bush/National Landcare Program, Endangered Species Program, Landcare and Environmental Action Program (LEAP), Contract Employment Program for Aboriginals in Natural and Cultural Resource Management (CEPANCRM), Remnant Vegetation Protection Scheme, Gordon Reid Foundation, Greening Western Australia, etc.

9.1 Fox control

There is sufficient information available now to justify fox control in Malleefowl habitat. Anticipated results may be a reduction in chick mortality and a higher recruitment of young into the adult population. See Research Project 3 and 4. Fox control is also likely to benefit a range of other species (native mammals and other ground nesting birds).

9.2 Fencing of remnant bushland

Fencing remnant vegetation from sheep should result in the marked improvement of Malleefowl habitat. Fortunately, it seems that a significant part of Malleefowl habitat is already fenced in the Gnowangerup area, as it contains various species of poison bush (*Gastrolobium* spp.).

9.3 Preservation of vegetation corridors

Vegetation corridors may prove essential for the long term survival of the Malleefowl in agricultural areas where isolated Malleefowl populations remain. Wide strips of roadside vegetation in the Gnowangerup/ Ongerup/Borden district provide important wildlife habitats and should be preserved as they may contribute to the recolonisation of vegetation remnants that could not be easily reached otherwise.

9.4 Fire control/management

Fire suppression is suggested by Benshemesh (1990, 1992) as the preferred management option. It is not clear whether a mosaic burn would actually increase Malleefowl density. Fire prevention using existing tracks and fire breaks seems a safer option for fire control in the highly flammable mallee than prescribed burning.

9.5 Road kills

Road kills may be one of the major causes of adult mortality of Malleefowl, as adult birds seem to remarkably avoid predation (Frith 1962). Road kills occur where Malleefowl regularly cross roads and also where grain spillage occurs along road sides from loaded trucks after harvest. In the Boxwood Hills and Corackerup Nature Reserve areas, four road deaths have been reported over the past 12 months. Remedial action involves increasing awareness of drivers by erecting road signs and conducting an information campaign for truck drivers to reduce grain spillage.

9.6 Captive breeding/reintroduction

Captive breeding and reintroduction should be considered if:
(i) population decline is demonstrated at a local scale,
(ii) the cause of decline can be found and managed (ie fox baiting if fox predation was shown to be a factor responsible for decline),
(iii) the removal of eggs from wild populations for artificial incubation does not affect the survival of these populations.

10 SHORT LIST OF COMMUNITY GROUPS INVOLVED WITH MALLEEFOWL CONSERVATION IN WESTERN AUSTRALIA

A Malleefowl Research Plan would not be complete without a list of community groups involved with Malleefowl conservation in Western Australia. Malleefowl research, in particular surveys and monitoring studies, can benefit from the assistance of existing support groups and volunteers to achieve results at a lower cost and with greater efficiency. Associating local residents with research efforts also increases community awareness for the need to preserve the species and contributes to attracting the support of local landholders.

10.1 Community groups

(a) Malleefowl Preservation Group (Gnowangerup/Ongerup/Borden area), attached to the Gnowangerup LCDC.
(b) Yilgarn LCDC (Southern Cross, Eastern Wheatbelt).
(c) National Threatened Species Network (WA), Perth.
(d) RAOU-WA Group, Perth.
[The Kalannie Goodlands LCDC (Dalwallinu, North-Eastern Wheatbelt) has expressed interest in Malleefowl conservation].

10.2 Activities

Survey/monitoring of Malleefowl populations (a, c, d)
Fox and cat control (a, c)
Production of a Malleefowl Community Action Plan (a, c)
Community activities: talks, Malleefowl display, circulation of information (a, b, c, d)
Link with local schools, community groups and government agencies (a, b, c, d)
Link with media (newspapers, radio) (a, b, c)
Fundraising, funding submissions (a, b, c)

In addition, many other government agencies and local community groups, including the Department of Conservation and Land Management (Albany Regional Office and Wildlife Research Centre, Woodvale) and the Endangered Species Centre, Perth Zoo, have been supporting efforts to conserve the Malleefowl. They cannot all be mentioned here, but their activities will be the object of a 'Community Action Plan for the Conservation of the Malleefowl' (Orsini, *in prep.*).

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