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Mortality of Captive-raised Malleefowl, *Leipoa ocellata,* Released into a Mallee Remnant within the Wheat-belt of New South Wales

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Abstract

Loss, fragmentation and degradation of mallee habitat within the New South Wales wheat-belt have caused a marked decline in the range and local abundance of malleefowl, *Leipoa ocellata.* Small disjunct populations of malleefowl now occupy small isolated remnants of suitable habitat, and several of these populations have become locally extinct in recent times.

Young captive-reared malleefowl (8–184 days old) were experimentally released in March and June 1988 into a 558-ha remnant of mallee vegetation. The remnant contained a small but declining population of malleefowl. From the first day after release, malleefowl were found dead, and mortality continued at a rapid rate until none remained alive. Of the 31 released, 16 (52%) were dead after 7 days, at least 22 (71%) were dead after 11 days, and none survived longer than 107 days. In all, 94% of malleefowl were killed by predators: 26–39% by raptors, and 55–68% by introduced predators, principally foxes, *Vulpes vulpes.* No improvement in survival was evident when malleefowl were given supplementary food.

Relying principally on camouflage, young malleefowl have no effective defence or escape behaviour to evade ground-dwelling predators such as the fox. By imposing severe predation pressure on young malleefowl, foxes are likely to be curtailing recruitment into the breeding population. Such a situation must inevitably lead to the further localised extinction of small disjunct populations of malleefowl. Foxes are thus a major threat to the continuance of remnant populations of malleefowl within the wheat-belt of New South Wales.

Introduction

The malleefowl, *Leipoa ocellata,* formerly widespread and abundant throughout much of southern and central mainland Australia, has declined markedly in range and abundance since European settlement (Blakers *et al.* 1984; Kimber 1985). The demise of the malleefowl has been attributed to the loss and fragmentation of habitat (Frith 1962*a)*, to the possible impact of introduced predators such as foxes, *Vulpes vulpes,* and feral cats, *Felis catus* (North 1917; Griffiths 1954), to habitat change from grazing by domestic stock and other introduced herbivores (Frith 1962*a*), to predation by raptors (Priddel and Wheeler 1990; Benshemesh 1992), and more recently to changes in fire regimes (Benshemesh 1992). Uncertainty exists as to the relative importance of each of these factors and the degree to which they operate in concert.

The total number of malleefowl in New South Wales was estimated, in 1985, to be around 745 pairs (Brickhill 1987*a*). Of these, 20% occurred as disjunct populations of 2–15 pairs in small, isolated remnants of mallee within the wheat-belt. Malleefowl densities within all but one of these remnants ranged between 0.05 and 2.0 pairs per km^2 (Brickhill 1987*a*). Estimates of malleefowl density in similar habitat 30 years or so earlier (Frith 1962*a*) were 2.6–5.5 pairs per km^2. The difference suggests a substantial decrease in density of local populations over the last three decades.

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Since 1985, the authors have surveyed a number of small, isolated remnants of mallee for the presence of malleefowl nests (see Brickhill 1987*a* for methods). These remnants were all within the NSW wheat-belt in the general vicinity of West Wyalong (see Fig. 1). The results indicate that the malleefowl populations in many of these remnants have become locally extinct in recent times. Surrounded by agricultural land, there is presumably little chance of these reserves ever being recolonised. Gubbata Nature Reserve (33°32′S, 146°33′E; 162 ha) and Charcoal Tank Nature Reserve (33°59′S, 147°09′E; 86 ha), surveyed in 1989, contained only abandoned nests, with no evidence of any recent malleefowl activity. Pulletop Nature Reserve (33°58′S, 146°05′E; 145 ha) contained two active malleefowl nests in the 1984–85 season. In 1989–90, a single pair nested in the reserve and laid eight eggs but all were infertile. No breeding has been recorded since, and malleefowl are now regarded as locally extinct.

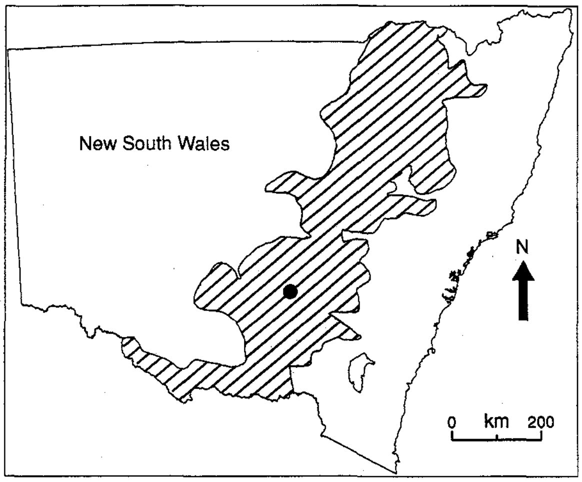

Fig. 1 Location of the release site. Hatched area, the wheat-belt of New South Wales (after Division of National Mapping 1982); solid circle the release site at Yalgogrin, near West Wyalong.

Egg and fertility deficiencies in other remnants suggest that extant populations may have suffered genetic deterioration. Small populations are highly susceptible to genetic drift and inbreeding (Denniston 1978; Frankel 1983). A survey of Buddigower Nature Reserve (34°02′S, 147°05′E; 327 ha) in 1989 located 30 malleefowl nests, of which only two were active. One contained no eggs, the other only two. Although both eggs were fertile, they were considerably smaller (840 × 538 mm) than normal (typically 900 × 595 mm). Both eggs failed to hatch, with development not proceeding beyond the initial stages of embryo formation.

Malleefowl generally have a high fecundity and hatching success (Frith 1959; Booth 1987; Brickhill 1987*b*; Benshemesh 1992); an average of 8–11 chicks hatch from each nest annually. Poor breeding success as a result of genetic deterioration, therefore, has not afflicted all populations. Other factors are involved in malleefowl decline, and these must be manifest in excessive mortality of either adults or young. Malleefowl chicks are precocious and, once hatched, do not require parental assistance, living solitary lives independent of their parents. Little is known regarding the survival of malleefowl between the time of hatching and first breeding at 2–6 years of age.

This study aimed to examine the fate of young malleefowl in a mallee remnant within the NSW wheat-belt. Because of the apparent absence or scarcity of immature malleefowl in the wild, the study relied on examining the fate of young captive-raised malleefowl after release from captivity. Mortality and survival rates were assessed and the causes of mortality were determined. Given the dire situation of this species in NSW, the experiments also sought to test potential re-introduction strategies. In particular, the potential enhancement of the survival of malleefowl by the provision of supplementary food was examined.

Methods

Release Site

Malleefowl were released into a 558-ha remnant of mallee vegetation near Yalgogrin (33°49′S, 146°46′E) in central NSW. The remnant contained a small and declining population of malleefowl (16 breeding pairs in 1985, 11 in 1992). Located within the NSW wheat-belt (Fig. 1), the release site was surrounded by agricultural crop and pasture lands, and was regularly grazed by sheep. The high incidence of fox scats suggested that foxes were numerous throughout.

The soils were stony, heavy-textured red-brown earths with copious calcrete nodules. Canopy vegetation was dominated by green mallee, *Eucalyptus viridis*, blue mallee, *E. polybractea*, bull mallee, *E. behriana*, grey box, *E. microcarpa*, and white cypress pine, *Callitris glaucophylla*. The shrub layer was varied, and included broombush, *Melaleuca uncinata*, wyalong wattle, *Acacia difformis*, golden-topped wattle, *A. tindaleae*, wedged-leafed hopbush, *Dodonaea cuneata*, shiny daisy bush, *Olearia tenuifolia*, and heath daisy bush, *O. floribunda*. Tangle vine, *Cassytha melantha*, grew in profusion in some areas. The herb layer was predominantly perennial grasses with scattered forbs of the genera *Calotis*, *Helichrysum* and *Goodenia*.

For at least the last 60 years, patches of mallee eucalypts and broombush had been selectively harvested for the production of eucalyptus oil and fencing material, respectively (C. Kalms, personal communication). The result of this continual harvesting was a mosaic of mature, long-unburnt (>60 years) vegetation interspersed with regenerating coppice.

Egg Collection

In October 1987 an extensive search of the Yalgogrin site located 12 active malleefowl nests, each a mound of soil 3.9–5.9 m in diameter containing a central core of decaying vegetation. Nests were visited periodically (15–56 days) throughout the period of egg laying (October 1987 to February 1988). At each visit, the nest was excavated, the eggs carefully removed from the egg-chamber, weighed and numbered. Intact eggs were packed in goose down inside padded insulated boxes ready for transportation. Eggs collected between October and January (numbered in the range 206–299) were taken to Yathong Nature Reserve (32°40′S, 145°30′E), and those collected in February (numbered 335–367) were taken to Taronga Park Zoo, Sydney. At each location the malleefowl eggs were incubated artificially.

Egg Incubation

Each egg was placed into an open-topped, cylindrical polystyrene container (113 mm high × 72 mm internal diameter) and maintained in an incubator held constant at 34°C and maximum attainable relative humidity (70–80% at Yathong, 85% at Taronga). The top of each container was partly covered with adhesive tape to prevent hatchings from escaping and damaging other eggs.

Upon hatching, each chick was weighed, fitted with three coloured leg-bands, and placed in a heated brooder to dry. The chick was later transferred to an outdoor holding pen where it was reared on a diet of seed (millet, canary, panicum, linseed and rape), mealworms and green vegetable matter. Birds had access to water at all times. At night, the young malleefowl roosted amongst the foliage of eucalypt branches that had been cut and placed in the pens.

Release of Malleefowl

Malleefowl (8–184 days old) were later transported back to Yalgogrin and liberated adjacent to nests from where eggs had been collected, although not necessarily at their parental nest. A total of 17 malleefowl was released on 1 March 1988; another 15 were released on 14 June 1988.

Radio-tracking of Malleefowl

Malleefowl were fitted with a miniature radio-transmitter of unique frequency (150.8–152.4 MHz), 2–4 days before release. Several transmitters (AVM SM1-1.5V, AVM SM1-3.0V, AVM SB2-3.6V) and several battery types (Varta mercury V675HP, Varta lithium-manganese-oxide CR-½N, singly or two in parallel; Varta lithium-chromium-oxide ER-½AA) were used in various configurations designed to maximise range and life while maintaining weight below 6.0% of the bird's body weight. The transmitter was mounted on a backpack and fastened to the bird by cotton straps passing under each wing. A flexible whip antenna ran along the animal's back, terminating posteriorly. The entire package was painted black and, when fitted, all except the terminal end of the antenna lay concealed below the feathers of the bird's back. Each malleefowl was located periodically after release by tracking the radio-transmitter attached to it. Radio-receiving equipment comprised a Telonics TR-2 telemetry receiver, a Telonics RA-2A antenna, and headphones.

Malleefowl liberated in March were tracked daily for the 6 days immediately after release, and then again 38–39, 46–47 and 106–107 days after release. Those liberated in June were tracked daily for 7 days after release and then again 10–11 and 98 days after releease. Malleefowl were adjudged to be alive if seen or if the direction to, and amplitude of, the signal emitted from the transmitter changed repeatedly. Such signal modulation is indicative of movement of the transmitter. Dead malleefowl were located and retrieved.

Birds of the second (June) release were provided with a handful of seed and mealworms daily, when located. Body weight subsequent to release was monitored by periodically radio-tracking the individuals of both releases to their nocturnal roosts, where they were located, carefully grasped, weighed and then returned to their roosts.

Post-mortem Examinations

If a malleefowl was dead when located, the corpse and any remains were collected for post-mortem examination. The site was also inspected for clues as to the cause of death. By combining these observations with those obtained from a similar study involving the release of malleefowl chicks into fox-free areas (Priddel and Wheeler 1990), it was possible to compile a set of characteristics that was indicative of the fate of each individual (Table 1). These criteria, and any other relevant observations, were used to deduce the cause of death.

Results

Malleefowl Survival

Seven days after the first release, eight of the 17 malleefowl were dead, eight were alive, and one (no. 335) was missing (Table 2). Radio contact with the missing individual was lost after the sixth day. It is possible that this transmitter malfunctioned or that the bird moved out of range. Judging from previous and subsequent reliability of the transmitters, the small movements exhibited by other individuals, the isolation of the habitat, and the massive damage inflicted on some transmitters, it is more likely that the transmitter ceased operating as a result of damage sustained when the bird was killed by a predator on the seventh day after release. Because of the lack of conclusive evidence, however, data from this individual were excluded from all analyses pertaining to the duration of survival.

When the study site was next visited, 38–39 days after release, three more malleefowl were dead, four remained alive, and one could not be located. The latter was eventually located on the 47th day after release, when it was found dead. Of the four individuals known to be alive on the 39th day, one died on the 46th day, and the remaining three were dead when the study site was next visited, 106–107 days after release.

In the second (June) release of 15 malleefowl, all but one were dead after 11 days (Table 2), and this sole survivor was found dead when the study site was next visited, 98 days after release.

The 17 malleefowl released in March were 8–127 days old and weighed 114–474 g; the 15 released in June were 100–184 days old and weighed 341–536 g (Table 2). There was no significant relationship between survival time and age or weight at release, irrespective of whether survival time was taken as the day last seen alive, the day death was first confirmed, or the mid-point of the two (r^2<0.07, P>0.35).

Causes of Mortality

Of the first 17 malleefowl released, 15 were killed by predators: five by raptors, three by foxes, one by a cat, two by either a fox or cat, and four left insufficient clues as to the predator responsible. One individual died of starvation on the seventh day (see later), and one survived for six days but could not be located thereafter.

Fourteen of the 15 malleefowl released in June were killed by predators: 11 by foxes and

Table 1. Characteristics of corpses and kill sites indicative of the cause of death of malleefowl

	Starvation	Fox predation	Cat predation	Raptor predation
Prints	absent	fox prints	cat prints	bird prints
Faeces	absent	fox faeces	cat faeces	bird faeces regurgitated pellets
Diggings	absent	present	absent	absent
Corpse	intact	head removed	mauled	plucked[A]
		partly eaten	partly eaten	partly eaten
	on ground	buried	on ground	on ground, in tree
Skeleton	intact	crushed, holed	chewed	intact[B]
Wounds	absent	present[C]	present[D]	present[E]
Crop	empty	not empty	not empty	not empty
Gizzard	empty	full	full	full
Transmitter	on bird	on ground, buried	on ground	on ground, in tree
	intact	casing damaged	teeth indentation	intact
Antenna	intact	chewed	chewed	intact
Harness	intact	chewed, severed	chewed	intact

[A] Feathers removed from torso with no damage to underlying skin.
[B] Flesh removed from carcass with little or no damage to skeleton other than section of the rib cage severed, presumably to gain access to organs within the thoracic cavity.
[C] Two large puncture wounds to dorsal surface of thorax causing severe haemorrhage into thoracic cavity, often associated with trauma to vital organs.
[D] Numerous small puncture wounds to dorsal surface of neck causing localised haemorrhage.
[E] Three or four small puncture wounds to dorsal surface of neck, head, or back causing localised haemorrhage, often associated with severe trauma to brain or spinal cord.

three by raptors. Individual no. 245 died of exposure within 24 h of being released. Weather during the first night was wet and cold, with 21 mm of rain falling overnight and a minimum ambient temperature of 9°C. The symptoms of exposure were similar to those identified for starvation (Table 1), except that the crop and gizzard were not empty and there was no substantial decrease in body weight.

In the case of 14 corpses that showed clear evidence of being mauled or partly eaten by foxes, the cause of death was attributed to predation by foxes. Nine had unequivocally been killed by the fox, as evidenced by large puncture wounds to the dorsal surface of the thorax, which caused severe haemorrhage into the thoracic cavity and trauma to vital internal organs. The remaining five corpses had been chewed or buried by a fox, but there were insufficient remains to establish that the fox had actually inflicted a fatal attack. Although there exists no supportive evidence, it is possible that these birds died from causes other than fox predation, and their corpses were subsequently scavenged by foxes. Such a possibility cannot be ruled out. Three of these individuals, however, had increased in weight since release, and the other two were seen alive and well the day before their death, so death due to starvation or exposure is unlikely.

On this basis, 14 malleefowl (45%) were taken by foxes, eight (26%) by raptors, one (3%) by a cat, two (6%) by either foxes or cats, four (13%) by predators unknown, one (3%) starved and one (3%) died of exposure. The only raptor to be positively identified as taking malleefowl was a black falcon, *Falco subniger*, that was observed in the process of devouring the freshly killed corpse of individual no. 211. Corpses were recovered from all habitat types, including mature mallee, ironbark forest, dense broombush, and regenerating mallee coppice. No relationship was evident between habitat and cause of death or predator type.

Table 2. Age, weight, survival and causes of death of malleefowl released
No., identification number; Age, age at release; Weight, weight at release; Survival, number of days alive after release; day last known to be alive to day first confirmed dead

No.	Age (days)	Weight (g)	Survival (days)	Cause of death
		March 1988		
345	10	114	0–1	predation by raptor
232	101	293	0–2	predation by cat
210	85	331	0–2	predation by fox or cat
208	112	451	1–2	predation by raptor
226	106	366	3–4	predation by fox
336	22	183	3–4	predation by unknown
207	127	474	4–5	predation by fox
206	102	331	6–7	starvation
335	23	188	6–?	lost after day 6
209	89	299	6–38	predation by raptor
229	80	299	6–38	predation by unknown
338	24	218	6–38	predation by raptor
347	8	124	6–47	predation by fox or cat
211	99	342	46–46	predation by raptor
251	72	295	46–106	predation by unknown
227	101	341	47–106	predation by fox
355	9	129	47–107	predation by unknown
		June 1988		
245	174	454	0–1	exposure
299	145	381	0–1	predation by fox
357	108	365	0–1	predation by fox
260	184	407	1–2	predation by fox
367	100	378	1–2	predation by fox
220	169	536	2–3	predation by fox
214	181	447	3–4	predation by fox
236	172	429	5–6	predation by fox
270	145	372	7–8	predation by raptor
271	161	446	7–10	predation by raptor
290	150	373	7–10	predation by raptor
298	145	397	7–10	predation by fox
348	108	447	7–10	predation by fox
293	142	341	10–11	predation by fox
259	176	388	11–98	predation by fox

Predator-avoidance Behaviour

The malleefowl is well camouflaged, its dappled plumage blending well with its natural surroundings. Malleefowl chicks often remained motionless when approached, relying solely on their camouflage for defence. Juveniles (>30 days old) were more wary, preferring to walk from danger. They ran only when necessary to stay ahead of their pursuer. Although malleefowl are quite capable of flight, they seldom took to the wing. Although no attacks were witnessed, young malleefowl appeared particularly vulnerable to ground-dwelling predators.

Malleefowl were constantly vigilant for raptors, and exhibited a distinct predator-avoidance strategy in response. At the first sign of any movement overhead, malleefowl would become motionless.

At night, all malleefowl roosted 2–4 m above ground. Roost sites occurred in all habitats containing tall shrubs or low trees with dense foliage at the appropriate height. The birds perched at the very extremities of the foliage. Malleefowl remained at roost when approached, and were not readily accessible by predators other than nocturnal raptors.

Effect of Supplementary Feeding

Of the 10 malleefowl captured and weighed six days after release in March, eight differed little from their release weight (Table 3): –5 to +23 g, mean +6.0 g (+3.1%). Two birds still surviving after six days had decreased markedly in weight since release (Table 3). Individual no. 211 lost 37 g (10.8% of body weight at release) during the first six days but by day 38 had increased its weight to 438 g, 96 g (28.1%) more than its weight at release. Individual no. 206 had lost 71 g (21.5% of body weight at release) and was in an obviously weakened state. Malleefowl suffering comparable weight loss at a similar time of year have been known to die (Priddel and Wheeler 1990). This bird was retrieved and returned to captivity where it was nurtured back to good health. For the purposes of this study, it is recorded as having died from malnutrition on the seventh day after release.

Malleefowl of the second (June) release were provided with a handful of seed and mealworms daily when located. All individuals rapidly consumed the mealworms; most also fed upon the seed. Four days after release in June, surviving malleefowl differed from their release weight by –18 to +16 g, mean +2.0 g (Table 4). Of the seven birds alive after one week,

Table 3. Weight (g) of malleefowl at and after release on 1 March 1988

No.	Days after release						
	0	2	3	6	38	46	47
206	331	297	282	260			
209	299			300			
211	342			305	438		
226	366	348	362				
227	341			364	570		606
229	299			302			
251	295			290		426	
335	188			198			
338	218			216			
347	124			135			
355	129			136	213		239

Table 4. Weight (g) of malleefowl at and after release on 14 June 1988

No.	Days after release				
	0	2	4	7	10
214	447	419			
236	429		414		
259	388		402	431	449
270	372		384	410	
271	446		462	487	
290	373	361	355	383	
293	341		346	372	354
298	397		405	419	
348	447		441	455	

all had increased in weight since release: range +8 to +43 g, mean +27.6 g (+7.1%). In neither release was the gross weight change during the first week after release, nor the corresponding percentage weight change, a useful predictor of future survival (March, $r^2<0.03$, $P>0.72$; June, $r^2<0.32$, $P>0.19$).

Discussion

Habitat loss, fragmentation and degradation within the New South Wales wheat-belt have caused a marked decline in the range and local abundance of malleefowl. Small disjunct populations of malleefowl now occupy small isolated remnants of habitat. Several such populations have already become locally extinct, and others are in decline, apparently because of a lack of recruitment of young into the breeding population. Egg and fertility deficiencies suggest that these populations are susceptible to genetic deterioration.

Young captive-reared malleefowl experimentally released into mallee vegetation containing a resident adult population did not survive. From the first day after release birds were found dead, and mortality continued at a rapid rate until none remained alive: 52% were dead after seven days, at least 71% were dead after 11 days, and no malleefowl survived longer than 107 days. Predation by foxes was the predominant cause of mortality. Relying principally on camouflage, young malleefowl had no effective defence or escape behaviour to evade ground-dwelling predators. Consequently, young malleefowl were easy prey for foxes.

Originally from Europe, foxes became successfully established in Victoria in the early 1870s and spread into central NSW at about the turn of the century (Rolls 1969). Concern that foxes were severely reducing the size of malleefowl populations in many areas of inland NSW was raised as early as 1916 (North 1917). In 1951, the Fauna Protection Panel undertook a survey of the distribution and abundance of malleefowl in NSW (Griffiths 1954). It concluded 'The species has declined during the past 50 years owing to shrinkage of natural habitat, shooting for food, and the depredations of foxes. At present the principal enemy of the Lowan (malleefowl) is the fox'. This survey and its findings stimulated Frith to embark on a series of detailed studies of the malleefowl that focused largely on the species' breeding success, and its unusual method of egg incubation and temperature regulation (Frith 1956, 1957, 1959, 1962*a*, 1962*b*). Frith questioned the alleged impact of the fox on malleefowl populations, concluding that 'the fox is not the main cause of the decline of the malleefowl in uncleared areas. It is more probable that sheep, and perhaps rabbits, enter into direct competition with the birds for food.' (Frith 1962*a*). Clearly, Frith underestimated the vulnerability of malleefowl to foxes.

The aim of releasing captive-raised malleefowl was to provide insight into the fate of wild-hatched malleefowl. The intent was never one of re-introduction to supplement the existing population. Nonetheless, the release of captive birds has, in itself, important implications for future management options for the species' *in situ* conservation. Given the poor survival of the malleefowl released in March, an attempt was made to enhance the survival of those released in June by providing them daily with food. Malleefowl chicks are more vulnerable to predation when deprived of sufficient food (Priddel and Wheeler 1990). Despite the provision of supplementary food, no improvement in survival was evident. On the contrary, although the older and heavier individuals of the June release fared somewhat better in maintaining body weight, the rate of mortality in June was higher than that in March. This difference in malleefowl mortality may have occurred because those released in June had spent several months longer in captivity than those released in March, and were perhaps therefore more accustomed to captivity, less wary of predators, and consequently less fit for introduction back into the wild. Alternatively, the higher mortality may have been the result of a higher incidence of fox predation due to temporal differences in either fox density or the predatory habits of the fox rather than any behaviour associated with malleefowl.

Although it is possible to document the extent of fox predation on malleefowl, the long-term detriment of this predation on the status of the malleefowl population can only be surmised. Malleefowl have an exceptionally high reproductive rate; a single female can lay to 34 eggs in a single season (Booth 1987). Yet, with foxes killing 45–65% of malleefowl within days of hatching, and the rest mostly falling to natural predators, there may be little or no recruitment into the breeding population. Indeed, juvenile malleefowl are rarely, if ever, seen in the wild, and there is no evidence of any recent recruitment of breeding adults into the population in this particular remnant. On the contrary, the number of breeding pairs has declined by one third in the last seven years. Populations in other small NSW mallee remnants have suffered similar declines in recent times. Clearly, without any recruitment into the breeding population, the species must continue to decline locally. The birds released at Yalgogrin did not disperse widely, and it is unlikely that malleefowl could safely traverse the cleared areas between mallee remnants.

Clearance of mallee lands for agriculture, principally for wheat cropping and sheep grazing, has caused significant loss of habitat and fragmentation of much that remains. This activity alone has resulted in a substantial contraction in the range of the malleefowl and a reduction in number throughout much of the current range. The added impost of foxes within isolated mallee remnants poses a serious threat for the long-term survival of malleefowl within the NSW wheat-belt. At worst, by severely curtailing recruitment, the fox alone may drive the malleefowl to extinction. At best, the fox is likely to severely deplete population numbers of the malleefowl in the remnants to a level where random local extinction through catastrophe (such as fire) or loss of genetic viability is a real possibility. Already, egg and fertility deficiencies suggest that the small populations of malleefowl in mallee remnants are unable to maintain population levels above that necessary to sustain genetic variability and population fitness. Without any interchange of malleefowl between remaining populations, hatch rates are unlikely to improve.

The suppression of malleefowl population size by foxes curtailing recruitment can only lead to further extinction of local populations. Foxes are thus a major threat to the continuance of remaining populations of malleefowl within the wheat-belt of NSW. Without effective fox control, the further extinction of remaining populations of malleefowl within the NSW wheat-belt appears inevitable.

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