

18. MALLEEFOWL SEARCHES AT YEELIRRIE STATION IN ARID WESTERN AUSTRALIA: A VALUABLE COLLABORATION BETWEEN INDUSTRY AND VOLUNTEERS

Joe Benshemesh¹, Susanne Dennings², Carl Danzi³ and Angela Saunders²

1 La Trobe University, School of Biological Sciences, Bundoora, Vic.

2 Malleefowl Preservation Group, Ongerup, WA

3 WA Malleefowl Network Facilitator, WWF-Australia, Perth

Abstract

Between 2000 and 2006 the Malleefowl Preservation Group undertook systematic surveys for Malleefowl at Yeelirrie Station, a 2750 km² pastoral property managed by BHP Billiton Nickel West and located 400 km north-north-west of Kalgoorlie, Western Australia. The primary objective of this study was to describe the distribution of Malleefowl at Yeelirrie and to provide information on population trends. Volunteers walked over 800 km of systematic transects in search of Malleefowl footprints and other signs, and located at least 24 mounds. Six widely separated areas were inhabited by Malleefowl and breeding was confirmed in four of these areas. Malleefowl are highly localised at Yeelirrie, but we found no evidence of declines: footprints of Malleefowl were found in all five areas in which old mounds were found during our surveys, suggesting that Malleefowl range had not contracted over the past few decades, and in 2006 the birds still occupied areas in which their footprints were detected in 2000 and 2003. Recent management of Yeelirrie thus appears to have been beneficial for Malleefowl, although the frequency and extent of wildfire during the past five years (in particular) is a concern and may have removed some favourable habitat. We estimate that there are probably 10-20 breeding pairs on the property and conclude that the most important contribution that managers can make toward the conservation of Malleefowl at Yeelirrie is to continue to manage the property in an ecologically sensitive way, and to continue to monitor this important Malleefowl population in order to assess the success or otherwise of management actions.

Introduction

The Malleefowl (*Leipoa ocellata*) is gazetted in Western Australia as a species that is rare or threatened with extinction, and regarded as vulnerable nationally (Benshemesh 2000, Garnett & Crowley 2000). The species is best known from the semi-arid zone where clearing, overgrazing, and inappropriate fire regimes have caused substantial decline in its distribution and abundance. In the arid zone, few Malleefowl studies have been conducted and the species' distribution and abundance is poorly known. Scattered historical records from early this century suggest that Malleefowl were found in the south-west of the Northern Territory as far north as the Tanami Desert, throughout much of the western half of South Australia, and through much of southern and central Western Australia (Figure 1). Since then, Malleefowl appear to have declined substantially in the arid zone of Australia and they are probably extinct in the Northern Territory. These declines, and the increasingly uncertain future of Malleefowl, clearly indicate an urgent need to describe the distribution of the species, understand its habitat requirements, and to monitor its population trends in arid Australia. Such studies are regarded as being of utmost importance to the conservation of Malleefowl nationally (Benshemesh 2000, Garnett & Crowley 2000).

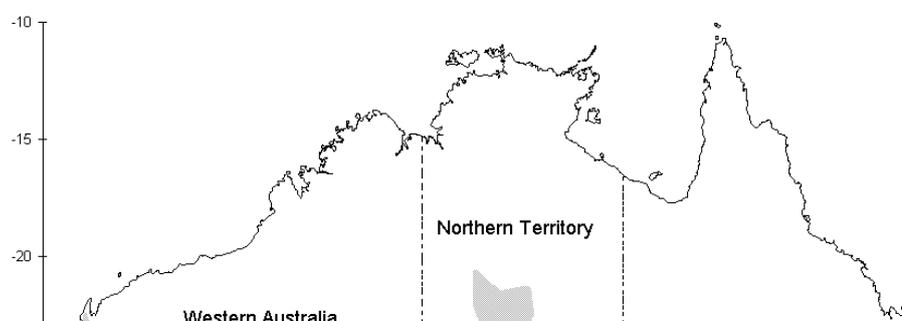


Figure 1. Estimated historical and current range of Malleefowl across Australia (from Benshemesh 2000)

While describing the distribution and trends of Malleefowl in the arid zone is of great importance, gathering the required information is a challenge. Conventional methods of survey and monitoring, such as sightings or trapping, are not efficient for detecting Malleefowl as the birds are shy and cryptic and often elude detection. Malleefowl nests, or mounds, are conspicuous and are used to monitor Malleefowl in southern areas where their densities are relatively high, but are widely dispersed in arid environments and difficult to find. Whereas in southern areas it is not unusual to find 10-20 old Malleefowl mounds per square kilometer, mound densities in arid areas are often tens or even hundreds of times more dispersed, and systematic searches for mounds are ineffective if not futile. However, there are some advantages as well. Where Malleefowl occur in arid areas, substrates are typically sandy, loose and exposed and these characteristics make tracking especially useful for detecting large

ground-dwelling species such as Malleefowl. In fact, searching for the bird's footprints is often the best way of detecting Malleefowl in arid areas: Malleefowl prints are distinctive and conspicuous, and during mild weather these prints accumulate for days or even weeks to form a recent record of a bird's presence and movements.

Yeelirrie station is a pastoral lease owned by BHP Billiton Nickel West (formerly WMC Resources) and is an example of the pastoral properties in central Western Australia that still retain much of their natural vegetation and provide important areas for the conservation of threatened species, such as Malleefowl. Yeelirrie has been sensitively managed for conservation in the past and this is likely to continue into the future. Increasing our knowledge of the distribution and abundance of Malleefowl at Yeelirrie will further encourage sensitive management and provide important information on the ecology and conservation of the species across the arid zone. Since 2000, the Malleefowl Preservation Group and WMC Resources/BHP Billiton Nickel West have been working together successfully on Malleefowl research at Yeelirrie. This partnership has enabled the Malleefowl Preservation Group to conduct searches for Malleefowl using community volunteers and provide information and management recommendations to enhance the conservation of Malleefowl at Yeelirrie.

The Yeelirrie Malleefowl project aimed to map and monitor the occurrence of Malleefowl within the station boundaries, and in nearby areas of particular interest. This aim was ambitious (Yeelirrie itself covers 2,750 km²) and of great importance to the conservation of Malleefowl throughout the arid zone. While methods of survey and monitoring Malleefowl in semi-arid areas are well established, these methods do not work well in arid habitats because of the scale of these areas and the characteristically low densities of Malleefowl. The Yeelirrie project was the most thorough attempt to develop methods for use by community volunteers for survey and monitoring for Malleefowl in the arid zone. In this regard, the methods developed may be of interest to any group wishing to conduct

similar work, while the results obtained in the study provide a basis for interpreting the ecology of Malleefowl in the arid zone.

Methods

Study area: Yeelirrie Station

Yeelirrie Station is an operational pastoral property leased by BHP Billiton Nickel West. The property spans some 275,000 ha and is located about 80 km south of Wiluna, 400 km north-north-west of Kalgoorlie, and 670 km north-east of Perth in the 'mulga-belt' of central Western Australia (Figure 1). The climate is typically dry with an average rainfall of about 210 mm per annum with high yearly variation. Most rain (about 64%) falls in heavy summer storms, and occasionally the area also receives substantial downpours from dissipating tropical cyclones. Rain is received during the winter with the passage of southern cold fronts. The landform comprises a raised plateau (Old Plateau) that has eroded to form granitic breakaways or 'jump-ups', and pediments and alluvial plains of the valley floor. Acacia woodland and shrubland, and spinifex grasslands (*Triodia basedowii*), dominate the vegetation. The property was developed for pastoral production in 1925, but between 1974 and 1986 Yeelirrie was largely destocked by Western Mining Corporation (now BPH Billiton, Nickel West). Subsequently the property ran a relatively small number of sheep until quite recently when it was once again destocked due to intractable predator (dingo/dog) problems.

Malleefowl are known to occur on Yeelirrie Station and have been seen there on several occasions by staff and other observers over the past few decades (see Benshemesh and Malleefowl Preservation Group 2001). In 2000 the Malleefowl Preservation Group began Malleefowl surveys at Yeelirrie and these have continued every few years to 2006. The specific aims of the Malleefowl project at Yeelirrie were to:

- Describe the distribution of Malleefowl
- Assess the likelihood of recent declines
- Provide a foundation for monitoring

Training

Training of volunteers involved instruction on the recognition of animal tracks, the use of equipment (GPS, palm handheld computers, digital cameras, radios), and safety procedures. In particular, volunteers were provided with scaled photographs of the prints of various animals likely to be encountered at Yeelirrie, and a manual that detailed methods. Before searching for Malleefowl prints, volunteers were taken to areas in which Malleefowl prints could be seen on the ground so that each person had a clear search-image of the target of the surveys.

Tracking

Malleefowl are difficult animals to survey because they are rare, secretive and well camouflaged. However, their footprints are relatively large and distinctive and Malleefowl can be readily tracked in suitable habitat. To sample the habitats at Yeelirrie, we walked predetermined transects in search of the birds footprints. Transects were rectangles with long sides of about 4 km and short sides of 750-1000m, and orientated such that the long sides were orientated east-west to maximise lighting from the side and ahead.

Volunteers were instructed to record every Malleefowl track encountered. In 2006, volunteers photographed at least the first three Malleefowl prints encountered on each transect or part transect completed for later verification. Every 200m, volunteers stopped and recorded: 1) general habitat (open, shrubby, or woodland) and canopy height (less than 2m, 2-4m, and over 4m); Tracking conditions (good, fair, poor, impossible); prints of other animals observed in the past 200m; and obtained a habitat photograph.

Selection of Transects

Transects were selected on the basis of a number of considerations using available satellite imagery and GIS mapping (kindly provided by David Gifford of BHP Billiton Nickel West, Breton Clifford, and Google Earth):

- Access: Track access is limited in Yeelirrie and priority was given to areas near tracks
- Previous knowledge: To measure the persistence of Malleefowl in the landscape, we revisited all areas in which they had previously been recorded. Historical records were included where possible, although the accuracy of the records, especially the associated locations, was often uncertain
- Habitat: Stony granitic areas and wash plains were avoided as tracking is generally not possible on these substrates. At Yeelirrie, these areas were usually very open and were less suitable for Malleefowl that tend to prefer sandy, well vegetated habitat (Frith 1962a, b, Benshemesh 2000). However, stony and open habitats were nonetheless sampled on many transects which unavoidably included a range of habitats
- Spread: We spread transects as widely as possible, other considerations notwithstanding

Revisiting mounds

Malleefowl Preservation Group members routinely re-visited all previously known mounds at Yeelirrie in order to assess their recent or current use. Mounds were monitored using standard national monitoring protocols for Malleefowl.

Electronic data capture: Cybertracker™

All data were recorded on Palm handheld computers connected to GPS units. We used an application named Cybertracker to program a series of screens on the Palm devices for data collection. Cybertracker also records GPS coordinates with every data record. Data were downloaded from palms every evening in the field and were later transferred to a Microsoft Access database.

Photos

Digital cameras were used to record prints for later verification, and in 2006 digital photos were also used to photograph habitat for reference. Volunteers photographed the habitat every 200m along transects, and the first three Malleefowl footprints they encountered on a transect. Digital photos were downloaded from cameras in the field and filed by date and transect. To provide ready access to these photos, we later renamed all photos in regard to the transect name, date, and a code that uniquely identified each photo with its associated record on the database. This provided a very quick, easy and objective means of recording habitat condition that we used during the analysis of data, and a valuable photographic reference to monitor habitat changes in the future.

2000-2006 surveys

2000 - The Yeelirrie project began in 2000 with a team of Malleefowl Preservation Group volunteers (Benshemesh & Malleefowl Preservation Group 2001). For the most part, this trip concentrated on developing methods that were suitable for volunteers and which could be easily taught, although there were a number of notable achievements and foundations were laid for subsequent surveys. Over 200km of transects were searched for Malleefowl signs, resulting in nearly 200 signs of Malleefowl (mostly prints) and over 750 site descriptions. Site descriptions involved information on the frequency of various large-animal prints, tracking conditions and habitat and were obtained every 200m along search transects. Seventeen mounds were found during these surveys, and one of these was fully active (i.e. completed and likely to contain eggs).

2003 - The Malleefowl Preservation Group returned to Yeelirrie in 2003 and completed over 300km of transect searches (Sanders *et al.* 2003). However, heavy rain severely impaired tracking conditions and this resulted in few signs of Malleefowl (11 prints and 10 mounds) being recorded. Similarly, few site descriptions were also recorded. On the positive side, ten mounds were located at Yeelirrie in

2003, two of which were active, and Malleefowl prints were located in many areas where they were recorded in 2000, and in several new areas as well.

2004- George and Joan White monitored the 27 known mounds at Yeelirrie in November 2004 and recorded three of these as fully active.

2006 - The focus in 2006 was to consolidate the information collected to date and improve our knowledge of the distribution, abundance and conservation of Malleefowl at Yeelirrie (Benshemesh *et al.* 2007). Over 300km were searched for signs of Malleefowl in 31 transects that were selected to both monitor the persistence of Malleefowl in areas in which Malleefowl were previously recorded, and to sample in new areas or where sampling was judged to have previously been equivocal (usually due to rain before previous surveys). Nearly 1500 site descriptions were obtained for which we recorded habitat type, tracking conditions, and the occurrence of a range of animals every 200m along transects, and over 100 signs of Malleefowl were recorded. Habitat photos were obtained for virtually all 200m stops along transects and cross indexed with the data from these locations on the database.

Results and Discussion

While we have conducted surveys in search of Malleefowl footprints and mounds on three occasions since 2000, the data collected in 2006 represent the culmination and consolidation of previous surveys (especially as the 2003 surveys were hampered by rain). The following discussion focuses on the most salient results obtained in 2006, although mapping the distribution of Malleefowl was a progressive task.

General tracking

The average number of species detected in 200m sections of transects was not greatly influenced by habitat type and was fairly consistent at 2.1 to 2.6 species in different general habitat and canopy height habitat classes. Likewise, the average number of species recorded under most tracking conditions ('good', 'fair' and 'poor') was similar, although the worst condition ('impossible' category) was associated with much lower species counts than other categories and was omitted.

Kangaroos were the most frequently recorded species during transects, occurring in 79% of the 1423 sites (200m sections of transects). Echidna, emu and goanna were also commonly recorded and occurred in 49%, 46% and 42% of sites respectively, whereas rabbits occurred in 14% of sites. Malleefowl, dogs, foxes and cats were all recorded in only 4-5% of sites along transects. Sheep, camels and bustards were also recorded along transects, but rarely (less than 1% of sites).

Malleefowl distribution

The surveys by the Malleefowl Preservation Group have shown that there are at least six widely separated areas on Yeelirrie in which Malleefowl are resident. In 2006 we were lucky enough to find five mounds that were being prepared for breeding in four of these widely separated areas, but we expect that we also missed at least a similar number of active mounds. This is because our searches were not designed to find mounds (a much more laborious process), but rather to detect footprints and intercept Malleefowl ranging paths. While we did find some active mounds, it was clear from the patterns of footprints that there were also several clusters of Malleefowl prints that were distant from known active mounds. These clusters of prints probably represent resident pairs, and we suspect a more thorough search of these areas would reveal at least another five active mounds in these areas in good rainfall years. It should also be noted that our transects did not sample all of the apparently suitable habitat as some potential sites were inaccessible, and that we may have missed some clusters of prints (due to windy or rainy weather, poor substrate, etc.). Given these considerations, we suggest the entire breeding population at Yeelirrie is probably around 10-20 pairs.

The distribution of Malleefowl at Yeelirrie appears to be associated with the edges of the old plateau where there is relatively tall shrublands (over 2m) of bowgada, mulga and other acacias. These areas support a gradient of soil type and vegetation, ranging from the open spinifex grasslands on deep sand (typical Bullimore land system), often with shrubby sugar brother (*Acacia coolgardiensis*), through to bowgada (*A. ramulosa* var. *linophylla*) and eventually mulga (*A. aneura*) on the hardpan

soils (typically Yanganoo and Kalli land systems) near breakaways (Sherwood land system). Malleefowl appear to occupy all of these habitats to some degree.

The major association of Malleefowl and habitat types, however, was not with land systems but with habitat structure and recent fire history. Malleefowl showed a strong preference for shrubby habitat with a 2-4m canopy, the most common association at Yeelirrie, and an avoidance of other habitats. Kangaroos, emus, echidnas, sheep rabbits and goannas also tended to prefer habitats recorded as shrubby and avoid those regarded as open, although emus showed a distinct preference for open and shrubby habitat with less than 2m canopy. Mammalian predators (dogs, foxes and cats) showed little preference with habitat-canopy classes. Interesting and plausible as these associations are, it should be noted that volunteers received only brief training on identifying animal prints other than Malleefowl and some people stated their confusion in distinguishing between dog, fox and cat prints, and occasionally between emus and bustards.

Malleefowl also showed a strong avoidance of areas that were burnt within the past decade or so. This result is not unexpected given the preference of the birds for shrubby and tall vegetation in this study, and Malleefowl responses to fire elsewhere (reviewed in Benshemesh 2000), and highlights the importance of protecting the known Malleefowl areas from further losses due to fire. Although we were unable to source satellite images showing the extent of the recent fires, the photographic record of habitats obtained during this study show that about 40% of sites had been burnt in the last five years and that these fires have encroached on Malleefowl

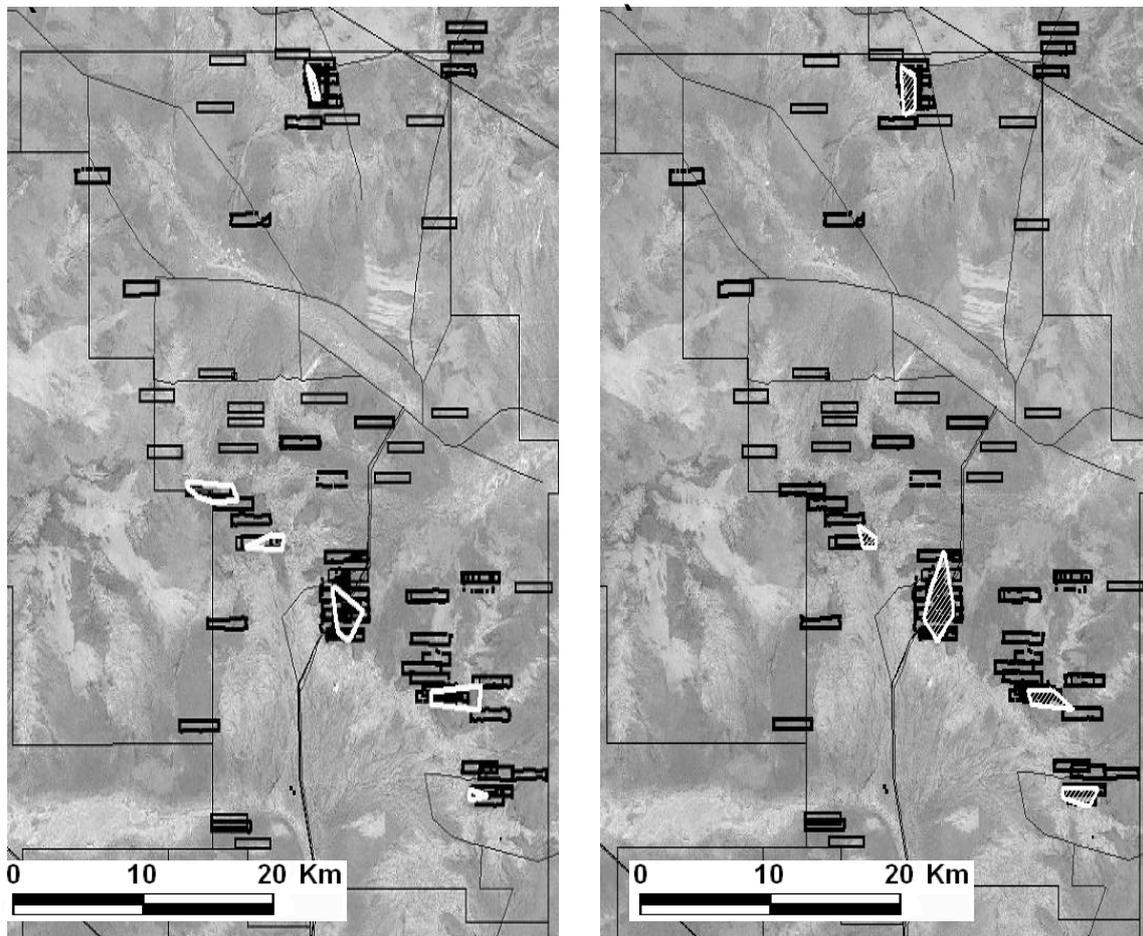


Figure 2. Transect search coverage (black rectangles, typically 4km long) of Yeelirrie over the three survey periods in 2000 (a), 2003 and 2006 (b) showing the minimum convex polygons enclosing a) Malleefowl prints (white polygons) where more than a single print has been recorded, and b) Malleefowl mounds (white crosshatched polygons). Based on 826 km of search transect on which 269 Malleefowl prints were recorded, and 35 mounds (24 confirmed). Property boundaries and tracks are also shown (thin black lines). Background satellite (LandSat) imagery obtained in 2001 before

the widespread fires in the following years. Note that at one site at which prints were recorded along the transects there were no mounds encountered.

habitat. Fortunately, Malleefowl still occurred in all the general areas in which they were detected in 2000 before the extensive fires, although habitat loss was considerable and some habitat was burnt that was previously utilized by the birds. It is likely that the proximity of all the Malleefowl sites to the granitic breakaways conferred some protection from fire. Nonetheless, given that most records of Malleefowl in 2006 were obtained from highly flammable habitats with spinifex ground-layer (Bullimore land system), it was lucky that more areas occupied by Malleefowl were not burnt.

Knowledge of where Malleefowl occur within the landscape is essential information for devising strategies for protecting such areas from fire, and documenting this information is a major achievement of Yeelirrie Malleefowl project. This information should now be used to devise fire management strategies. Mapping and digitising the extent and dates of all fires in the past 30 years would be an excellent way to start this process. Apart from providing a bias from which to develop fire management plans, such maps would provide useful information for analysis of the degree to which Malleefowl utilize habitat of different age since fire in the Yeelirrie landscape.

Overall, the survey and monitoring information obtained over the past six years suggests that the prognosis for Malleefowl at Yeelirrie is positive. Continued monitoring of these sites will provide the feedback that managers need to assess the success (or otherwise) of management actions.

Malleefowl persistence

Monitoring is generally recognised as being of critical importance for conserving Malleefowl, and this is especially true at Yeelirrie where the distribution of the species is now probably better known than anywhere else in the arid zone. The Malleefowl Preservation Group searches have provided a wealth of information on Malleefowl, as well as other species and habitats that occur at Yeelirrie, but arguably the greatest value of the project is in laying foundations and providing information on trends in Malleefowl populations.

In general, Malleefowl appear to be doing well at Yeelirrie. All of the three areas in which the birds were detected in 2000 were still occupied by Malleefowl in 2006. Similarly, all the areas surveyed in 2003 in which more than a solitary sign of Malleefowl was recorded were still occupied in 2006. There were two areas in which Malleefowl prints were recorded in 2003 but not in 2006, but in both cases these were solitary and unconfirmed records (i.e. not photographed) and most likely represented either wandering birds or errors.

Another way of looking for evidence of decline is to compare the distribution of mounds with that of prints (Figure 2). Mounds are persistent features of the landscape and suggest that Malleefowl have bred in an area within the last few decades, whereas prints indicate the current presence of the birds. While over 800 km of transects have been searched for signs of Malleefowl since 2000, equivalent to about 2,000 km walked by individuals (as there were usually 2-3 people on a transect search), only 35 mounds have been recorded and of these 24 have been confirmed as Malleefowl mounds. These mounds occur in five clusters and Malleefowl prints were confirmed at each of these in 2006. In terms of search effort, more than half the distance walked since 2000 has been in areas where no nests have been found. There was however, one site at which clusters of prints were found but no nests were encountered. This was a site first visited in 2006 and the pattern of prints suggested that active and old nests would be found in this area.

These data indicate that Malleefowl are highly localised at Yeelirrie, that birds are still occupying areas in which they were detected in 2000, and that they are still occupying areas in which they built mounds over the past few decades.

However, it is also true that Malleefowl have not been detected at a number of sites for which historical records exist. These data are more difficult to interpret because in most cases the records were of single sightings and may have been of wandering birds, and because the precision of many of these locations from the 1970s-1990s is uncertain (before GPS). Nonetheless, in most cases where signs of Malleefowl were not found, where they were once reported to have been seen, habitat

appeared unsuitable for Malleefowl breeding, often because it had been burnt in the meantime (many of these records are discussed in Benshemesh and Malleefowl Preservation Group 2001).

Mitigating threats to Malleefowl

Current management practises at Yeelirrie are clearly sensitive to, and are generally appropriate for, the conservation of Malleefowl. Low stocking rates in particular have maintained habitats in relatively pristine condition, and this is apparent in the healthy shrub layer (Figure 3). Assuming these benevolent practises continue, the major threat to Malleefowl would appear to be that of wildfire which has the potential of suddenly eliminating the species over large areas and rendering habitats unsuitable for the birds for several decades. This threat has been temporarily mitigated by the recent fires in some areas: fuel loads are currently low in recently burnt habitat and the continuity of fuel has been disrupted. However, the degree to which the six main areas in which Malleefowl occur are vulnerable to further fires is unclear, and whatever the degree of protection the recent fires may provide, this is likely to be short lived. A careful consideration of the vulnerabilities of the Malleefowl habitats, and the development of a fire management plan in regard to Malleefowl conservation, are urgent priorities.



Figure 3. Photographs of Malleefowl mounds on Yeelirrie station (left) and on a neighboring property that has been heavily grazed (right) showing the pronounced differences in shrub layers. With little shelter from the elements or predators, and few food sources, it is unlikely that Malleefowl would survive for long in the more open and degraded habitat.

Mammalian predators, particularly foxes, are often regarded as presenting a threat to Malleefowl (Priddel *et al.* 2007), although the evidence at the population level is not strong and the need for control is questionable. This uncertainty is exemplified at Yeelirrie: on one hand the continued presence of Malleefowl might be attributed to many years of predator control; on the other hand there is no evidence of a decline in Malleefowl that might be expected due to the high dog/dingo numbers that over the last few years have necessitated the destocking of the property of sheep (Lucy Browlie, *pers. comm.*). While this uncertainty does not provide clear management directions in regard to the need for predator control, it does highlight the need for monitoring of the Malleefowl population. Whatever management actions are taken, the effects of these actions can at least be observed on the resident Malleefowl populations if they are appropriately monitored for change.

One possible downside of the control of predators, particularly dogs, is the benefit provided to large herbivores such as kangaroos and emus. While Yeelirrie has been destocked of sheep, kangaroos in particular are at high numbers and are seemingly ubiquitous, having been recorded in nearly 80% of over 1400 sites. Detrimental effects on Malleefowl have been documented due to high numbers of sheep (Frith 1962a, b), and similar effects might occur due to kangaroos where their numbers are unusually high. Kangaroos are culled at Yeelirrie and this practice should continue while their numbers are high, and while their natural predators are controlled and water is artificially provided.

Improvements: how we'd do things better next time

Much of the success of the Yeelirrie Malleefowl project can be attributed to the commitment and determination of the volunteers who applied themselves conscientiously and methodically to the work at hand. For the most part, we felt the field techniques made good use of this dedicated workforce,

especially the use of electronic data-capture (Cybertracker), GPS, digital photography and the partitioned, rectangular transects which worked well at Yeelirrie.

Nonetheless, there were some important things we would recommend for future surveys at Yeelirrie or similar projects elsewhere. First, while the training that volunteers received was thorough and adequate in most cases, few volunteers probably needed additional instruction. In the future, we recommend that the ability of volunteers to identify Malleefowl prints be tested in the field as part of the training regime, perhaps by having individuals walk a few hundred meters along which a known number of Malleefowl prints occur. A simple test such as this would quickly identify the volunteers that require additional instruction or practice.

Secondly, more photographs of Malleefowl and other animal prints would be advantageous. Photographing prints is quick and easy in the field and provides a means of verifying the identifications made by volunteers, and would not add greatly to the workload in the field or in processing the information. Given that we were able to mesh the field data with the large number of digital photographs more easily than we expected, we would strongly recommend that a much larger sample of prints that are recorded be photographed in order to assess the accuracy of identifications, and correct misconceptions wherever possible.

The Future: Monitoring Malleefowl at Yeelirrie

Assuming that Yeelirrie continues to be managed in an ecologically sensitive way, the most important contribution that volunteers or managers can make toward the conservation of Malleefowl at Yeelirrie is to carefully monitor the existing population. This is not to say that other management activities are unimportant, but rather that whatever management is applied, it is essential to have some means of assessing its impact on Malleefowl. Without monitoring at some level, management is blind.

In light of our findings, monitoring could most efficiently be achieved at Yeelirrie by using a hierarchical approach, targeting the occurrence of the species in areas rather than the breeding density which is the metric of choice in southern areas where Malleefowl are more common (Natural Heritage Trust National Malleefowl Monitoring Project 2007). In this regard, the 35 mounds recorded at Yeelirrie provide an excellent basis for monitoring the occurrence of Malleefowl both because the presence of mounds is strong evidence that Malleefowl once resided and bred in the area, and because Malleefowl appear to habitually visit old mound sites in their home range, making these structures ideal places to find Malleefowl footprints. If recent signs of Malleefowl are detected near known mounds, it is likely that the birds are resident in the area and have intentionally visited the mound. However, if signs are not detected it would be necessary to search for signs more widely (several km²) in the surrounding area before being able to conclude with any confidence that Malleefowl are not in the local area. Thus, while a fresh Malleefowl sign at a mound provides evidence of occupancy, systematic searches for prints and other signs is necessary to demonstrate that the birds are absent. Ideally, monitoring the Malleefowl occupancy in an area should be associated with survey for new sites. However, for the time being at least we feel that developing a systematic monitoring system for known sites is most urgent.

Although mounds provide a useful focus for the monitoring of persistence, it should be clear that knowing where mounds are is not a prerequisite of this type of monitoring. Areas in which Malleefowl are resident can be identified by their footprints and could be monitored even without knowing the location of mounds. At its simplest, this may simply involve searching for prints along a few selected transects where Malleefowl have been frequently encountered in the past.

Where there are concentrations of prints, active mounds are also likely during years of good winter rainfall, and it may be beneficial to focus on finding these mounds in the future. Techniques were described for finding active mounds in the 2006 project work plan, but in the field we gave priority to searching transects to obtain a better coverage of Yeelirrie. As this has now been achieved, the priorities should tip toward searching for active mounds during the next monitoring visit.

In conclusion, the Malleefowl population at Yeelirrie appears healthy and, given the size and location of the population, is of national significance. It is not known whether Malleefowl still occur in properties neighbouring Yeelirrie; occasional sightings are reported to wildlife authorities that may indicate breeding populations elsewhere, but the scarcity of sightings suggests that sizeable

populations of Malleefowl are rare in central Western Australia. In any case, Yeelirrie has clearly been sensitively managed over the past few decades (especially in regard to low stocking rates), and is an excellent example of Malleefowl populations in the mulga lands of Western Australia. The number and persistence of Malleefowl on the property is a credit to its managers.

References

- Benshemesh, J. (2000). *National Recovery Plan for Malleefowl*. Malleefowl Recovery Team and Department of Environment and Heritage, Adelaide.
- Benshemesh, J., Dennings, S. & Danzi, C. (2007). *Malleefowl Searches at Yeelirrie Station 2006*. Unpublished report to the Malleefowl Preservation Group and BHP Billiton Nickel West, Ongerup and Perth, WA.
- Benshemesh, J., & Malleefowl Preservation Group. (2001). *Community searches for Malleefowl at Yeelirrie, August 2000*. Unpublished report, Malleefowl Preservation Group, Ongerup, Western Australia.
- Frith, H. J. (1962a). Conservation of the Mallee Fowl, *Leipoa ocellata* Gould (Megapodiidae). *CSIRO Wildl. Res.* 7:33-49.
- Frith, H. J. (1962b). *The Mallee Fowl*. Angus and Robertson, Sydney.
- Garnett, S. T., and Crowley, G. M.. (2000). *The Action Plan for Australian Birds*. Environment Australia, Canberra.
- Natural Heritage Trust National Malleefowl Monitoring Project. (2007). *National manual for the Malleefowl monitoring system*. Victorian Malleefowl Recovery Group and Mallee Catchment Management Authority, Melbourne.
- Priddel, D., Wheeler, R. & Copley, P. (2007). Does the integrity or structure of mallee habitat influence the degree of Fox predation on Malleefowl (*Leipoa ocellata*)? *Emu* **107**:100-107.
- Sanders, A., Benshemesh, J. & Malleefowl Preservation Group. (2003). *WMC Operation Malleefowl Mulga to Mallee Research Project: A report on community searches for and monitoring of Malleefowl at Yeelirrie Station, August 2003*. Malleefowl Preservation Group, Ongerup, Western Australia.