

## Long-term Observations of the Diet of the Malleefowl *Leipoa ocellata* near the Little Desert, Western Victoria

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### Summary

The diet of Malleefowl *Leipoa ocellata* living in the Little Desert area of western Victoria was studied by close observations of several habituated free-ranging birds over a period of 26 years (1980–2005). A total of 19 flowering plants, four fungi and seven invertebrate taxa was detected being consumed; 16 of the plants (including three wattle, one mallee and three heath species), *Paxillus* fungus and hepialid moths had not been reported in previous studies. When compared with other studies, these observations confirm that the diet of the Malleefowl is markedly locality-specific.

### Introduction

The Malleefowl *Leipoa ocellata* is the only species of extant megapode to live in arid and semi-arid environments (Jones *et al.* 1995). Although formerly encompassing a vast area of the southern part of the Australian continent (Marchant & Higgins 1993), the species' distribution has reduced dramatically since European settlement, primarily because of wide-scale habitat clearing and the impact of grazing and feral predators (Harlen & Priddel 1996). Several recent surveys have confirmed that in many locations Malleefowl numbers continue to decline, with many populations becoming extinct as others are increasingly isolated and vulnerable (Benshemesh 2005).

Despite considerable interest and several intensive studies, many components of the species' ecology and behaviour remain poorly understood. One crucial aspect that has received relatively limited attention is its feeding ecology. Apart from numerous anecdotal accounts, virtually all that is known of its diet comes from five studies from different parts of its range. Both Frith (1962) and Benshemesh (1992) made detailed observations of free-ranging Malleefowl in mallee near Griffith, New South Wales, and in the Wyperfeld National Park, Victoria, respectively. Indirect information was obtained by Booth (1986) and Kentish & Westbrooke (1994), who reported on the crop and gizzard contents of road-killed Malleefowl from Renmark, South Australia, and Ouyen, Victoria, respectively. Finally, Brickhill (1987) analysed faecal material from birds near Yalgogrin, central New South Wales.

In general, these studies reveal that the Malleefowl tends to be remarkably opportunistic and catholic in its dietary range, with a wide variety of species and plant parts being consumed (Marchant & Higgins 1993; Kentish & Westbrooke 1994). Despite the apparent scarcity of nutritious foods in the Malleefowl's dry and harsh habitat, Harlen & Priddel (1996) found that the species was able to utilise useful food types from available resources, even during drought. Harlen & Priddel (1996) concluded that the availability of food resources in marginal habitat was not a significant factor in the demise of the species, although Priddel & Wheeler (1990) did find that starvation was a major cause of mortality among chicks.

Although these studies have provided valuable insights into the diet of the Malleefowl, all were of limited duration and were typically confined to specific locations.

Since the early 1980s, several pairs of Malleefowl have been observed on an almost daily basis on private land adjacent to the Little Desert National Park, near Nhill, in western Victoria (36°20'S, 141°40'E) (Jones *et al.* 2006). Over this extended period, these long-lived, normally shy birds had become habituated to the presence of the main observer (RCR), enabling extremely close observations of all aspects of their activities. Here we present qualitative findings on food items taken during regular observations between 1980 and 2005, as part of a wider study of the Malleefowl's ecology and behaviour (Jones *et al.* 2006). Particular attention was paid to the plant parts and non-plant items ingested. These findings are compared with other available reports.

## Methods

Observations of four pairs of Malleefowl were carried out by RCR in the vicinity of three incubation mounds accessible from the Little Desert Lodge, Nhill, Victoria, between 1980 and 2005. Visits were typically 20–30 minutes in duration, and, although mounds were visited during all daylight hours, > 80% were made between 0800 and 1100 h (Jones *et al.* 2006). Despite this obvious bias toward late-morning observations, the total of 3875 observational sessions included about 300 sessions from between 1400 and 1900 h. Because of the familiarity of the birds with the observer, observations could be made within a few metres, allowing accurate identification of food items.

Plants eaten were identified to species level, and each food item was classified as foliage, flowers, buds, green pods, seeds or unidentified (see Table 1, which gives scientific names). For non-plant items, general descriptions were made without disturbing the birds, and specimens were collected for later identification where possible. However, no attempt was made to estimate the quantity consumed or availability of the food item in the vicinity.

## Results

Table 1 lists 19 plant taxa and four fungi that were observed being consumed by the focal Malleefowl over the period of the study. All but one of the plants — thistles — were reliably identified to species level, and two of the fungi were identified to genus. Of the plants, only three species (Grey Mulga, Scented Mat-rush and 'thistles') had been mentioned in previous studies. Of the fungi, only *Mycena* had been previously mentioned (Benshemesh 1992) although 'fungi' have been referred to without further detail elsewhere (Chandler 1913; Marchant & Higgins 1993).

Malleefowl were observed ingesting flowers and seeds of all of the four *Acacia* species that occurred locally, as well as buds and green pods of two and three of these species respectively (see Table 1). Foliage of the wattles was not consumed, but the leaves of five other species (Yellow Mallee, Scarlet Mint-bush, Wedge-leaf Hop-bush, Slender Cypress-pine and thistles) were eaten. In the case of the Cypress-pine, only seedlings were targeted, sometimes resulting in the plant being killed.

The extent to which flowers were consumed is especially noteworthy: Malleefowl were observed eating flowers from 12 of the 19 flowering plant species listed, both directly from the plant and from the ground when the flowers had fallen.

**Table 1. Plant and fungal taxa and parts consumed by Malleefowl observed at the Little Desert, Victoria, 1980–2005. \* Species not recorded previously.**

<i>Species name or group</i>	<i>Foliage</i>	<i>Flowers</i>	<i>Buds</i>	<i>Green pods</i>	<i>Seeds</i>	<i>Other</i>
*Gold-dust Wattle <i>Acacia acinacea</i>		√	√	√	√	
*Wallowa <i>Acacia calamifolia</i>		√	√	√	√	Crystallised sap
*Golden Wattle <i>Acacia pycnantha</i>		√			√	
Grey Mulga <i>Acacia brachybotrya</i>		√		√	√	
*Flame Heath <i>Astroloma conostephioides</i>		√				
*Cranberry Heath <i>Astroloma humifusum</i>		√				Fruits
*Brush Heath <i>Brachyloma ericoides</i>		√				
*Dumosa Mallee <i>Eucalyptus dumosa</i>		√				
*Yellow Mallee <i>Eucalyptus incrassata</i>	√					
*Sticky Goodenia <i>Goodenia varia</i>		√				
Scented Mat-rush <i>Lomandra effusa</i>		√				Roots
*Scarlet Mint-bush <i>Prostanthera aspalathoides</i>	√	√				
*Dwarf Greenhood <i>Pterostylis nana</i>						Tubers
*Moonah <i>Melaleuca lanceolata</i>					√	
*Slender Cypress-pine <i>Callitris gracilis</i>	√					
*Wedge-leaf Hop-bush <i>Dodonaea cuneata</i>	√					
*Golden Pennants <i>Glischrocaryon behrii</i>		√				
*Twinging Fringe-lily <i>Thysanotus patersonii</i>						Tubers
Thistles	√					
*Fungi <i>Paxillus</i> spp.						Pileus, stipe
Fungi <i>Mycena</i> spp.						Pileus, stipe
Toadstools						Pileus, stipe
Mushrooms						Pileus, stipe



**Malleefowl on mound, Little Desert, Vic.**

**Table 2. Plant genera and parts reported to be consumed in six diet studies of the Malleefowl. F = flowers, f = foliage, b = buds, p = pods, berries or other fruit, s = seeds, t = tubers; C & G = crop and gizzard contents, F = faecal remains, O = observation.**

<i>Genus</i>	<i>Present study Little Desert, Vic. (O)</i>	<i>Frith (1962) Griffith, NSW (O)</i>	<i>Booth (1986) Renmark, SA (C &amp; G)</i>	<i>Brickhill (1987) Yalgogrin, NSW (F)</i>	<i>Benshemesh (1992) Wyperfeld, Vic. (O)</i>	<i>Kentish &amp; Westbrooke (1994) Ouyen, Vic. (C &amp; G)</i>
<i>Acacia</i>	F, b, p	s		s		
<i>Astroloma</i>	F					
<i>Brachyloma</i>	F					
<i>Eucalyptus</i>	F, f					
<i>Goodenia</i>	F					
<i>Lomandra</i>	F				F	
<i>Prostanthera</i>	F, f					
<i>Pterostylis</i>	t					
<i>Melaleuca</i>	s					
<i>Callitris</i>	f					
<i>Dodonaea</i>	f		s			
<i>Glischrocaryon</i>	F					
<i>Thysanotus</i>	t				f	
<i>Beyeria</i>		p				p
<i>Philothea (Eriostemon)</i>		f				
<i>Pittosporum</i>		f				
<i>Senna</i>		s				
<i>Anthropodium</i>			F, f, p			
<i>Cassutha</i>			s	f, s		
<i>Enchylaena</i>			s			
<i>Sclerolaena (= Bassia)</i>			f			
<i>Zygophyllum</i>			f, s, p			

**Table 2 continued**

<i>Genus</i>	<i>Present study Little Desert, Vic. (O)</i>	<i>Frith (1962) Griffith, NSW (O)</i>	<i>Booth (1986) Renmark, SA (C &amp; G)</i>	<i>Brickhill (1987) Yalgogrin, NSW (F)</i>	<i>Benshemesh (1992) Wyperfeld, Vic. (O)</i>	<i>Kentish &amp; Westbrooke (1994) Ouyen, Vic. (C &amp; G)</i>
<i>Carthamus</i>				s		
<i>Einadia</i>				f, s		
<i>Ranunculus</i>				s		
<i>Sida</i>				s		
<i>Solanum</i>				s		
<i>Triticum</i>				s		
<i>Brassica</i>					s	p
<i>Brachycome</i>					f	
<i>Helichrysum</i>					f	
<i>Stenopetalum</i>					f	
<i>Silene</i>						F, f, p
<i>Hypochoeris</i>						F, f
<i>Daucus</i>						f, p
<i>Triglochin</i>						p
<i>Bertya</i>						p
<i>Wahlenbergia</i>						p



**Malleefowl, Raymond C. Reichelt in background**

Plate 6

Photo: Raymond C. Reichelt

Malleefowl often excavated the underground tubers of the Dwarf Greenhood and Twining Fringe-lily, primarily during summer.

Animal material consumed included grey hepialid moths *Abantiades* sp., sugar ants *Calomyrmex* sp., small brown ants and flying ants (Hymenoptera), termites (Isoptera), dragonflies (Odonata), and beetles (Coleoptera). For both the moths and dragonflies, only the abdomens were consumed; in the case of the latter, a female Malleefowl was seen flying off the mound in pursuit of a dragonfly.

## Discussion

This study adds to our fragmentary knowledge of the foods and feeding ecology of the Malleefowl by substantially increasing the list of items known to be consumed, and especially by indicating the extent to which the species utilises different components of the plants. For example, these findings show that Malleefowl ate many different parts of all the *Acacia* species present in the area but did not consume the leaves of any of these species. However, the most frequently used plant part overall was flowers. In contrast, Benshemesh (1992) found that in Wyperfeld National Park Malleefowl neglected abundantly flowering Needle Wattle *Acacia rigens* shrubs but did eat the flowers of Scented Mat-rush, as did the birds studied in the present work. Apart from Scented Mat-rush, flower eating has been previously reported only from Chocolate Lily *Anthropodium strictum* (Booth 1986) and White Everlasting Daisy *Helipterum corymbiflorum* (Chandler 1913).

The two previous observational studies of Malleefowl feeding ecology (Frith 1962 and Benshemesh 1992) provided remarkably differing accounts of the general

dietary preferences of the species. Frith (1962), summarising a total of 436 'observational periods' over a 5-year study in central New South Wales, concluded that the species was primarily granivorous: seeds, mainly from a range of legumes including *Senna* and *Acacia* species, were the main food items throughout the year, with foliage and buds being consumed in quantity only during the spring when seeds were unavailable. Benshemesh (1992), however, found that the female Malleefowl, which he followed intensively for a 5-month period in north-western Victoria, consumed relatively little seed. Instead, this bird concentrated on foliage derived largely from herbs, especially Fringed Lily *Thysanotis baueri* and Small Paper-daisy *Helichrysum leucoptera*. Both Booth (1986) (crop and gizzard contents) and Brickhill (1987) (faecal remains) found the diet of the Malleefowl to be dominated by seed (especially of Coarse Dodder-laurel *Cassytha melantha* and, in the latter case, also Wheat *Triticum*) but more fragile non-seed material is likely to have been far less evident than seeds (Jones *et al.* 1995). The crop and gizzard contents examined by Kentish & Westbrooke (1994) were predominantly (dry weight) made up of calyx and leaf material (which take relatively longer to digest) of ephemeral weed species abundant beside the road on which the bird was killed.

The contribution of each of the five previous dietary studies (Frith 1962; Booth 1986; Brickhill 1987; Benshemesh 1992; and Kentish & Westbrooke 1994) to our understanding of Malleefowl feeding ecology can be illustrated by listing the genera of plants and plant parts consumed that were mentioned in each (Table 2). The most obvious pattern here is the lack of overlap in the genera listed; each study found a different and relatively limited array of plants being consumed at each location. Although there will be obvious local differences in the plant species present at each of the sites, the list provided here is of genera, many of which are present over extremely broad expanses of arid southern Australia. For example, the mallee landscapes throughout the region are dominated by a wide range of *Acacia* species yet these species were absent from three of the five studies examined here (Booth 1986; Benshemesh 1992; and Kentish & Westbrooke 1994). Apparently Malleefowl in each locality subsist on a relatively small proportion of potential food-plants available.

The diet of the Little Desert Malleefowl appears to be qualitatively different from that of those studied in the other locations; although seeds and foliage were important components, the predominance of flowers especially, as well as other plant parts such as buds, green pods, berries and other fruits, roots and tubers, indicates that the Little Desert Malleefowl had an exceptionally broad diet. However, it is important to appreciate that these findings were accumulated over several decades; the diet of individual birds is likely to be far more restricted over shorter time periods and in different seasons.

The consumption of a wide variety of invertebrates by Malleefowl is well recognised, with ants, termites, cockroaches and beetles being commonly mentioned (Chandler 1913; Frith 1962; Booth 1986; Benshemesh 1992; Marchant & Higgins 1993; Jones *et al.* 1995). The most extensive list of animal items comes from Booth's examination of the crop and gizzard contents of two fresh road-killed birds. As well as the taxa already mentioned, Booth found spiders, dragonflies, grasshoppers, bugs, wasps and bees. [Interestingly, the crop and gizzard of the freshly killed Malleefowl examined by Kentish & Westbrooke (1994) contained no animal items.] The present study adds hepialid moths to this list, with the important observation that the lipid- and protein-rich abdomens were especially targeted.



Finally, Benshemesh's study was the first to recognise the extensive use of lerps, the carbohydrate-rich tests of psyllid insects (Homoptera), by Malleefowl observed intensively in the Wyperfeld National Park. However, this was not evident in the current study on the Little Desert birds.

These long-term observations from the Little Desert add to our growing understanding of the diet of the Malleefowl and establish that flowers are an important component among a variety of plant parts exploited. This study adds further evidence to the impression that the diet of the species is significantly locality-specific, even though the birds may be using a range of locally abundant plants.

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