Crop and Gizzard Contents of a Road-dead Malleefowl

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The few studies of the diet of Malleefowl *Leipoa ocellata* demonstrate the importance of both plant and insect material and suggest that they may be opportunistic foragers whose diet is related to the seasonal availability of food (Frith 1962; Booth 1986). A road-dead Malleefowl provided an opportunity to gather additional information on this species' diet.

A freshly killed adult male Malleefowl (2800 g) was found on 20 September 1991 on the Sunraysia Highway 17 km south of Ouyen (35°04′S, 142°19′E). At this point the highway divides the 12 415 ha Bronzewing Flora and Fauna Reserve and the Melbourne–Mildura railway runs parallel and 50 m west of the highway. This Reserve is important Malleefowl habitat with areas of mallee that have remained unburnt for at least 40 years (Benshemesh 1989).

The body was frozen for storage and the crop and gizzard were later removed and dissected. All food material was removed and stored in 40% alcohol. Plant material was identified according to Jessop & Toelken (1986). Fractions were oven dried at 40°C for 66 hours and weighed to 0.001 g.

The vegetation in 4 ha of the Bronzewing Flora and Fauna Reserve, including disturbed areas parallel to the railway and adjacent to the highway, was assessed on 14 September 1992. All species present were recorded and their cover abundance value estimated based on a modified Braun-Blanquet (1928) scale.

Results

Table 1 presents the identified food items and their dry weights; all were vegetable matter. Contents of both crop and gizzard were dominated by fruits of the exotic weed French Catchfly *Silene gallica* many of which still had the calyx attached; the inflorescences of Cat's Ear *Hypochoeris radicata* were the next most significant component of the diet.

Effectively, two plant communities were present: the natural mallee vegetation of the reserve; and the cleared easements of road and railway (Table 2). The natural vegetation consisted of mallee scrub to 5 m with a 10-15% cover and associated shrubs to 1 m with hummocks of Common Porcupine Grass *Triodia irritans* on deeper sands. A sparse ground layer to 30 cm included a diverse range of largely native herbs. The cleared area either side of the railway was dominated by a range of native and exotic herbs together with scattered shrubs (Table 2).

Discussion

Gut analysis is inherently biased because of the difference in digestibility of food items. Soft bodies of invertebrates and fruits quickly break down beyond recognition, so that seeds and hard parts of insects (e.g. elytra) may be over represented in any gizzard analysis. The crop and gizzard contents of this bird suggested a catholic, opportunistic and entirely herbivorous diet that was consistent with earlier studies of Malleefowl (Frith 1962; Booth 1986). Most species listed in Table 1 have not been identified previously as components of Malleefowl diet (Table III, Booth 1986).

The preponderance of calyx and leaf material associated with fruit and flowers suggested that these food items were probably taken directly from the plant. Ephemeral weed species formed a high proportion of gut contents at the time of death. These species were associated with disturbed areas alongside the road and railway, which suggests that this Malleefowl had been foraging in that habitat before its death.

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Table 1 Crop and gizzard contents of a male Malleefowl collected 20 September 1991 (* denotes exotic species).

Species	Crop		Gizzard			
	Dry wt. (g)	Part of plant	Dry wt. (g)	Part of plant	Total wt. (g)	%
*Silene gallica**	2.373	Fruit/calyx/leaves	1.075	Fruit/calyx	3.448	49.14
*Hypochoeris radicata**	0.702	Flowers/leaves	0.243	Flowers/leaves	0.945	13.47
Daucus glochidiatus	0.242	Fruit/leaves	0.065	Fruit/leaves	0.307	4.38
Beyeria opaca	0.000		0.112	Fruit	0.112	1.60
*Brassica tournefortii**	0.000		0.005	Fruit	0.005	0.07
Bertya mitchellii	0.035	Fruit	0.003	Fruit	0.038	0.54
Triglochin calcitrapum	0.001	Fruit	0.001	Fruit	0.002	0.03
Wahlenbergia sp.	0.000		0.001	Fruit	0.001	0.01
Unidentified vegetable matter	0.579	Leaves	0.398	Leaves	0.977	13.92
Grit	0.000		1.182		1.182	16.84
Totals	3.932		3.085		7.017	100.00

Table 2 Species recorded from study sites with cover-abundance values based on a modified Braun-Blanquet scale (Braun-Blanquet 1928). Nomenclature according to Ross (1993) (* denotes exotic species; 1 = < 5% cover – any number of individuals; + = < 5% cover – few individuals).

	Sites			Sites	
	Mallee	Disturbed		Mallee	Disturbed
Trees			*Brachyscome lineariloba*	1	1
Eucalyptus calygogona	1	—	*Brassica tournefortii**	+	1
E. foecunda	1	—	*Calandrinia eremaea*	1	1
E. incrassata	1	—	*Calotis hispidula*	1	+
E. oleosa	1	—	*Crassula colorata*	1	1
Shrubs and tussock perennials			*Critesian murinum**	+	1
Acacia brachybotrya	1	+	*Daucus glochidiatus*	1	1
A. rigens	—	1	*Helipterum pygmaeum*	+	+
Bertya mitchellii	1	—	*Hypochoeris radicata**	+	1
Beyeria opaca	1	—	*Myriocephalus stuartii*	+	1
Halganea andromedifolia	1	—	*Onopordum acaulon**	—	1
Hibbertia virgata	+	+	*Podolepis capillaris*	1	1
Leptospermum coriacium	1	—	*Senecio glossanthus*	—	+
Lomandra leucocephala	+	+	*Silene gallica**	+	1
Olearia ramulosa	1	—	*Stipa* sp.	1	+
Triodia irritans	+	—	*Triglochin calcitrapum*	—	1
Westringia rigida	1	—	*Vittadinia cuneata*	+	+
Herbs and grasses			*Wahlenbergia* sp.	—	+
Actinobole uliginosum	+	1	*Zygophyllum apiculatum*	+	—

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Dispersal of Germinable Seeds by Emus in Semi-arid Queensland

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It is well established that Emus *Dromaius novaehollandiae* are agents of seed dispersal (Noble 1975; Willson 1989), and are capable of moving seed large distances (Dawson *et al.* 1984). That the seeds dispersed by Emus are viable has been demonstrated for only a few species with fleshy fruits (Clifford & Monteith 1989; Noble 1975), however, folklore in inland Australia asserts that seeds of Quandong *Santalum acuminatum* (which also has a fleshy fruit) must pass through the gut of an Emu before they will germinate, and it is claimed by pastoralists that Emus disperse viable weed seed. Willson (1989) considered the possibility of Emu dispersal of seeds and fruit and some possible adaptations of seed and fruit for Emu dispersal. Very large numbers of seeds can be egested by Emus; Noble (1991) reported 1000 seeds of *Nitraria billardieri* in a single pat.

Dispersal of seeds is likely to be important not only in terms of weed invasions but also in the maintenance of populations of those trees and shrubs which do not form long-term seed-banks in the soil, or in those circumstances in which soil seed banks have been exhausted, especially areas subject to severe or long-term disturbance. Emu dispersal is therefore possibly important in conservation and regeneration of plant communities. Given the interest in Emus as dispersal agents and their possible role in the spread of weeds in arid lands, a study of the seed actually present in Emu dung, and its germinability, is significant.

Methods

In order to examine the role of Emus in dispersing seed in and about Idalia National Park (85 km south-west of Blackall, Queensland), 30 Emu dung pats that had not started decay were collected and taken back to the laboratory. The pats were divided into quarters, two of which were spread out to be germinated on a layer of vermiculite and kept well watered for a month. Seedlings of herbaceous plants were grown until they flowered and fruited to permit identification, those of woody plants were identified on the basis of vegetative morphology and remaining fruit structures. One quarter of each dung pat was broken up and sorted for seed and fruit contents under a dissecting microscope.

Results

All the sorted dung contained identifiable seeds or fruit, but only 14 of the 30 pats produced seedlings. The species reported and the number of samples containing those species, together with the total number of individual seeds or fruits in all samples, are shown in Table 1.

Of all the species in the dung only the fruit of *Eremophila longifolia*, *Enchylaena tomentosa* and *Solanum* sp. produce fleshy fruit of the kind usually associated with bird dispersal (O'Dowd & Gill 1986). The other fruits are small and dry, and in the case of *Sclerolaena*