Corella, 2004, 28(2): 40–42

DIET OF THE BARN OWL *Tyto alba* NEAR LAKE FROME IN ARID SOUTH AUSTRALIA

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Received, 9 February 2003

This paper presents an analysis of 56 whole pellets and fragments of approximately 200 pellets of the Barn Owl *Tyto alba*, collected in August 1981 from the arid pastoral zone of north-eastern South Australia. The owl's diet consisted of 67 per cent mammals (62% rodents), 3 per cent birds, 30 per cent lizards and less than 1 per cent insects by number, and 82 per cent mammals (74% rodents), 8 per cent birds, 10 per cent lizards and less than 1 per cent insects by biomass. The introduced House Mouse *Mus domesticus* was the predominant mammal, and only rodent, recorded.

INTRODUCTION

The near-cosmopolitan Barn Owl *Tyto alba* is one of the most intensively studied owls in the world (reviewed in Taylor 1994; del Hoyo *et al.* 1999 and König *et al.* 1999), and the best-studied owl in Australia in terms of diet (16 detailed dietary analyses, many involving hundreds of pellets, from six states: Higgins 1999 and references therein; Debus *et al.* 1999; Palmer 2001a,b; Heywood and Pavey 2002). Many of these studies were conducted in the Australian arid zone, particularly north-eastern South Australia and contiguous parts of adjoining states. One study from arid South Australia (Smith 1977) included *Tyto* owl pellet material that might have antedated or coincided with first European settlement, thus providing, with the other relevant studies, a comparison of the historic and recent small-mammal fauna of the region. The Barn Owl is a specialist on small mammals; recent papers (e.g. Palmer 2001a,b) have considered the owl a specialist on rodents, even in the presence of dasyurid marsupials, although Heywood and Pavey (2002) found that the owl preys mainly on dasyurids when rodents are scarce. This paper reports on the contemporary (i.e. post-European settlement) diet of the Barn Owl in the arid pastoral zone of north-eastern South Australia.

STUDY AREA AND METHODS

Pellet samples were collected by J. Olsen from doggers' huts, where the owls had been roosting in the shower recesses, in South Australia south and south-east of Lake Frome, between the North Flinders Ranges and the New South Wales border, in late August 1981. Fifty-six fairly fresh pellets, and fragments representing approximately 200 additional pellets, were collected at three sites: (1) between Frome Downs Station (31°13'S, 139°46'E) and Mulyungarie Station (31°33'S, 140°47'E) (11 pellets plus fragments); (2) Lake Charles Bore (31°08'S, 140°43'E) (18 pellets plus fragments); (3) Mudros extension to Mulyungarie Station (31°18'S, 140°41'E) (27 pellets plus fragments). The pellets were assigned to the Barn Owl by their typical *Tyto* 'glazed' mucous coating and the presence of Barn Owl flight-feathers at roost-site 2. While in storage, the fur and feathers in the pellets were destroyed, probably by tineid moth larvae (which consume keratinous remains such as fur and feathers: ABR, pers. obs.).

The pellets were analysed by A. B. Rose. Whole pellets were measured then dissected to search for remains of the heads or skulls of prey and the pellet fragments were similarly searched. Mammal skulls were identified by comparison with a reference collection and relevant literature (Thomas 1888; Hall and Richards 1979; Watts and Aslin 1981; Churchill 1998); rodent skulls were carefully re-checked (unsuccessfully) for native species, and dunnart skulls were carefully checked for other dasyurids. Mammal skulls were assigned age-classes (adult or juvenile) on relative size and dentition. Bird skulls were identified by comparison with a limited reference collection, using literature as a guide to size and distribution of potential species (Disney 1974; Blakers *et al.* 1984; Slater *et al.* 1986), then by comparison with the collection in the Australian Museum, under the guidance of experts (J. Disney, I. McAllan and P. Rowland). Reptiles were not identified below suborder level (lizards: Sauria), as the frontal bone in the skull is similar across the potential families (geckos, Gekkonidae; dragons, Agamidae; skinks, Scincidae; R. Sadlier, pers. comm.). The minimum number of prey individuals in each sample was determined by counting mammal skulls or paired jaws, bird skulls, lizard frontal bones, and arthropod heads or jaws. Mean body weights of prey species were obtained from relevant literature (mammals: Strahan 1995; birds: Higgins 1999 and later volumes or related references; lizards: Read and Owens 1999).

Small arthropods, detected only by jaws, were assumed to be from the stomachs of the owls' prey (dasyurids, lizards), on the basis that the remains had been finely fragmented. Only those insects likely to have been captured by the owls, on the basis of the size and condition of regurgitated remains, were counted as owl prey.

RESULTS

The 56 whole pellets measured 24–57 × 16–33 millimetres (mean 36.0 × 24.5 mm). The owls took a variety of mammals (67% by number), birds (3%), lizards (30%), and a few insects (<1%), but predominantly rodents (House Mouse *Mus domesticus* 62%). No native rodents were found in the sample, although specifically searched for, and likewise no dasyurids besides Fat-tailed Dunnart *Sminthopsis crassicaudata* were recorded. The importance of mammals, and particularly introduced rodents, is reinforced by the relative biomass contributions (mammals 82%, mice 74%: Table 1), and by percentage occurrence in pellets: mammals in 52 whole pellets (93%), *Mus* 47 (84%), dunnarts 11 (20%), birds 12 (21%), lizards 40

(71%), and insects 4 (7%). Lizards contributed ten per cent to dietary biomasss, and birds eight per cent (Table 1).

In the largest pellet and fragment sample, from site 3, about half of 320 mice were juveniles and four of ten dunnarts were juveniles; otherwise, remains of these species were from adults. The juvenile Rabbits *Oryctolagus cuniculus* were represented by post-cranial bones, but no skulls. The *Vespadelus* bat was either the Inland Forest Bat *V. baverstocki* or the Inland Cave Bat *V. finlaysoni*, on distributional grounds (from Strahan 1995; Churchill 1998). Bird prey were mostly terrestrial or woodland species, but included multiple records of cluster-roosting species. The lizard prey are likely to have been mostly geckos (Gekkonidae), which are nocturnal, but could have included crepuscular or nocturnal skinks, or even diurnal dragons that might remain active after dusk (from proportions of lizard types in Barn Owl diets reviewed in Higgins 1999; lizard habits from Cogger 2000).

Of the 56 whole pellets, there were 0–6 mammals per pellet (mean 1.9), 0–6 *Mus* (1.6), 0–1 dunnarts (0.2), 0–1 birds (0.2), 0–12 lizards (1.8), and 0–1 insects (0.1). On this basis, the number of *Mus* (432) and dunnarts (35) in the pellet fragments translates to about 200 whole pellets. The modal number of individuals in each prey category per pellet was: mammal 1; *Mus* 1; lizard 1. The modal number of prey individuals (all species combined) per pellet was 2. However, there were frequently three, four or five (range 1–13) prey individuals per pellet; mostly a combination of mammal(s) and lizard(s), or sometimes bird with mammal(s) or lizard(s). From the above mean numbers of prey items per pellet, and assuming that one pellet equals a successful night's hunting, the average pellet represented about 50 grams live-weight intake (calculated from weights in Table 1).

Arthropods considered to have been in the stomachs of dunnarts and lizards, rather than caught by the owls, were: two very small scorpions (Scorpionida); two spiders (Araneida); 74 grasshoppers (Orthoptera); 36 beetles (Coleoptera); and five unidentified insects. If counted, they would contribute one per cent to total dietary biomass (from Table 1).

DISCUSSION

The results of this study are broadly similar to those of other studies of the Barn Owl's diet in the Australian arid zone, in terms of the predominance of small mammals and particularly rodents and, in the southern arid zone, the predominance of *Mus* (Higgins 1999 and references therein; Debus *et al.* 1999; Palmer 2001a,b; Heywood and Pavey 2002). The results are particularly similar to those of Morton and Martin (1979) for the Lake Eyre Basin, except for the greater proportion of lizards in the present study. The estimated daily intake is also within the range of previous estimates (reviewed in Higgins 1999).

This study supports the view that the Barn Owl is a specialist on small mammals, and that the owl concentrates on rodents when they are abundant. However, the results

TABLE 1

Diet of the Barn Owl at three sites in arid north-eastern South Australia (see text), August 1981: minimum number of individuals in 56 whole pellets and fragments of approximately 200 pellets, by skull/jaw count. *Introduced species. Mean prey weights from Strahan (1995), Higgins (1999) and subsequent volumes or related literature, and Read and Owens (1999).

Species	Mass (g)	n	% number	Biomass (g)	% biomass
MAMMALS					
Fat-tailed Dunnart *Sminthopsis crassicaudata*	15	37	4	555	5
Little Mastiff-Bat *Mormopterus planiceps*	11	1	<1	11	<1
Bat *Vespadelus* sp.	5	1	<1	5	<1
*House Mouse *Mus domesticus*	17	526	62	8 942	74
*Rabbit *Oryctolagus cuniculus* (juv.)	200	2	<1	400	4
Total mammals		567	67	9 913	82
BIRDS					
Budgerigar *Melopsittacus undulatus*	29	1	<1	29	<1
Black-eared Cuckoo *Chrysococcyx osculans*	30	1	<1	30	<1
Thornbill *Acanthiza* sp.	10	1	<1	10	<1
Yellow-throated Miner *Manorina flavigula*	60	1	<1	60	<1
Gibberbird *Ashbyia lovensis*	18	1	<1	18	<1
Chestnut-crowned Babbler *Pomatostomus ruficeps*	50	5	1	250	2
Woodswallow *Artamus* sp(p).	40	6	1	240	2
Richard's Pipit *Anthus novaeseelandiae*	23	2	<1	46	<1
Welcome Swallow *Hirundo neoxena*	15	1	<1	15	<1
Unidentified passerine	30[a]	8	1	240	2
Total birds		27	3	938	8
LIZARDS	5	253	30	1 265	10
INSECTS					
Cockroach (Blattidae)	1	2	<1	2	<1
Scarab beetle (Scarabaeidae)	1	2	<1	2	<1
Total insects		4	<1	4	<1
Total		851	100	12 120	100

[a]Mean of identified passerines.

of Heywood and Pavey (2002) refute the contention by Palmer (2001a,b) that the owl is a rodent specialist that avoids dasyurids, even in conditions of scarce rodents and available dasyurids. It seems likely that Barn Owls take whichever small rodents or rodent-like terrestrial marsupials are most abundant, a conclusion supported by a study of Grass Owl *Tyto capensis* diet in the Lake Eyre Basin (Read 1995). Those owls took small mammals approximately in proportion to their local abundance, suggesting that the Barn Owl's diet near Lake Frome reflects an abundance of *Mus* and scarcity of native mammals, rather than selection for *Mus*. The Barn Owls might have been hunting in areas to which *Mus* were attracted, such as buildings.

The owls in this study took more lizards than those in previous Australian studies, suggesting a degree of dietary flexibility in the Barn Owl. This study is also noteworthy for the absence of native rodents in the pellet samples, in a region where some (though not all) previous studies have identified several native rodents as well as a range of dasyurids in the owl's diet. The prevalence of native rodents and small marsupials in historic *Tyto* pellets from the North Flinders Ranges (Smith 1977) suggests, in combination with the present study, that on the plains east of the ranges more than 100 years of pastoralism and feral animals have impoverished the native small-mammal fauna (indeed some species are extinct or regionally so, e.g. Strahan 1995). However, our results might also reflect seasonal conditions that could have caused a relative scarcity of small mammals, including *Mus* given that the owls were taking exceptional numbers of lizards.

ACKNOWLEDGMENTS

We thank Walter Boles for granting ABR access to the bird skull collection of the Australian Museum, and John Disney, Ian McAllan and Peter Rowland for assistance; also Ross Sadlier (Herpetology, Australian Museum) for advice on lizard remains. We also thank Chris Pavey, John Read and an anonymous referee for comments on a draft.

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