

Notes on the Diet of the Barn Owl *Tyto alba* in New South Wales

by A.B. ROSE, Associate, The Australian Museum, 6-8 College Street, Sydney, N.S.W. 2000 (present address: 61 Boundary Street, Forster, N.S.W. 2428)

Summary

The diet of the Barn Owl *Tyto alba* in New South Wales was examined by the analysis of pellets (2 sites, n = 9), pellet material (2 sites), and the stomach contents of owls found dead on roads (10 sites, n = 10) and away from roads (5 sites, n = 6). The introduced House Mouse *Mus domesticus* was by far the predominant prey item, although a small bat *Vespadelphus* sp., native and introduced rats *Rattus* spp., dasyurid marsupials *Planigale*, *Sminthopsis* and *Antechinus* spp., a juvenile Cat *Felis catus*, birds and invertebrates were represented. The stomachs of owls found dead away from roads were empty; autopsies of those owls suggested poisoning by anticoagulant rodenticides.

Introduction

The diet of the Barn Owl *Tyto alba* is varied in Australia, with mammals, birds, reptiles, amphibians and invertebrates having been recorded. However, rodents predominate, in particular the introduced House Mouse *Mus domesticus* (Schodde & Mason 1980 and references therein, Valente 1981, Baker-Gabb 1984, Smith & Cole 1989, Dickman et al. 1991, Hollands 1991, Johnson & Rose 1994). Most detailed dietary studies have been conducted in arid Australia or Victoria, with the few data for New South Wales comprising small samples analysed from the inland plains (Hermes & Stokes 1976) and the south coast (Smith 1984). This paper collates opportunistic dietary records for the Barn Owl from various locations within New South Wales, determined from the analysis of pellet collections and the stomach contents of owls found dead. In addition, the opportunity is taken to correct a misidentification of one prey animal in the sample reported by Johnson & Rose (1994).

Concern has been expressed about the possible impact of rodenticides on owls in Australia (Hollands 1995). Overseas, anticoagulant rodenticides (in particular brodifacoum, the active ingredient in 'Talon' and 'Klerat') have been implicated in deaths and population declines of the Barn Owl and other owls. Rodents die from internal bleeding after consuming the poison, but before death they are easy prey for owls; the owls ingest unmetabolised poison in the rodents' tissues and are in turn poisoned (see Newton et al. 1990 and references therein). This study provides evidence suggesting such secondary poisoning of Barn Owls by anticoagulants in Australia.

Methods

Pellet samples were received from the following sites and collectors:

- (1) Goura Nature Reserve, south of Narooma (36°10'S, 150°07'E): four pellets collected by J. Russack on 2 November 1979.
- (2) Halls Lake, Willandra National Park near Hillston (33°27'S, 145°33'E): a mass of flattened pellets from a fallen hollow tree, collected by R. Crouch and J. Johnston in December 1980.
- (3) Mudgee area (32°35'S, 149°33'E): five pellets collected by D. Smedley on 1 October 1982.
- (4) 'Pinegroves' property, Tyagarah near Byron Bay (28°38'S, 153°36'E): remains of pellets collected by R. Moffatt from a roost in a hollow tree in wet pasture adjoining a paperbark *Melaleuca* sp. swamp on 26 August 1988.

Barn Owls found dead or injured on roads, here treated as 'road kills', were examined from the following localities which are mostly in agricultural districts:

- (1) Moree (29°30'S, 149°51'E), 24 August 1971 (ABR).
- (2) Royal National Park, Sydney (34°05'S, 151°05'E), July 1971 (L. Cairns).
- (3) Epping, suburban Sydney (33°46'S, 151°05'E), 15 March 1973 (T. Barratt). Bird hit by car (fractured wing, head injury), died a week later. (This bird is ignored in the analysis because

its stomach contents and fat condition at the time of injury were unknown; on dissection it had no congealed blood in its digestive tract.)

- (4) Gunnedah (30°58'S, 150°15'E), 17 August 1974 (K. Blade).
- (5) Temora (34°25'S, 147°30'E), 1975 (J. Brickhill).
- (6) Pitt Town, outer Sydney (33°35'S, 150°51'E), 10 August 1975 (ABR).
- (7) Jerilderie (35°20'S, 145°45'E): (a) 20 km north on 8 August 1979 (J. Brickhill); (b) 8 km north on 8 June 1980 (K. McNee).
- (8) Griffith (34°16'S, 146°05'E), June 1980 (J. Johnson).
- (9) Cowra (33°49'S, 148°42'E), 6 March 1981 (M. Bate).
- (10) Lower Hunter River region (32°45'S, 151°45'E), 1983 (collector unknown).

Owls found dead away from roads (thereby suggesting a cause of death other than collision with a vehicle) were examined from the following localities:

- (1) Royal National Park: (a) 8 September 1970 (L. Cairns), (b) 19 September 1972 (W. Small).
- (2) Kurnell, suburban Sydney (34°00'S, 151°13'E), 15 September 1970 (N. Carter).
- (3) Dorrigo (30°18'S, 152°44'E), mid 1973 (Mrs Darley).
- (4) Myall Lakes National Park (32°25'S, 152°20'E), August 1972 (R. Walker).
- (5) Ku-ring-gai Chase National Park, Sydney (33°40'S, 151°10'E), 14 September 1980 (J. Noble).

Pellets and fragments were not weighed, as in one case (pellet site 2) tineid moth larvae had eaten much of the fur. Pellets were stored in glass tubes or plastic bags with naphthalene crystals. Stomach samples were stored in alcohol. Owl bodies, if in good condition, were stored frozen and later lodged with the Australian Museum and other institutions. Samples were identified by comparison with reference material, and the minimum number of individuals per pellet determined by counting skeletal parts (for mammals, pairs of lower jawbones in small samples and the number of left lower jawbones in large samples). The cat in one diet sample was aged according to its skull size in comparison with skulls of adult cats.

The owls' body fat was assessed subjectively as the amount in the abdominal cavity, from 'thin' (no fat) to fat 'present' to 'very fat'. Owls found dead away from roads were autopsied according to my prior work for the Game Conservancy in the U.K., which required me to examine wildlife species for causes of death including diseases and poisoning (by herbicides and rodenticides). Owls in this study were examined for symptoms of those in the U.K. poisoned by warfarin ('Ratsak' anticoagulant): blood vessels evident in the skin, congealed blood in the stomach and intestine.

Results

Pellets and pellet material

The samples from the four sites show that rodents were the predominant prey (Table 1). For sites with sufficient sample sizes (>10 prey items, localities 2 and 4), rodents comprised 95-97% and dasyurid marsupials 2-3% of the prey items by number, collectively 98-99% small mammals. At these and site 1, the balance consisted of birds, invertebrates or other small mammals (a bat and a juvenile cat). For site 1, the pellets contained (a) a House Mouse, a bat and two invertebrates; (b) and (c) mouse only; (d) a mouse, part of a rat and two invertebrates. For site 3, the number of mice per pellet ($n = 10$ mice in 5 pellets) ranged from one to three (mean, median and mode 2.0). The cat from site 2 was represented in the pellet debris by a lower jawbone and part of the upper jaw and skull; it was a young animal newly emerged from its natal den.

Road kills

House Mice were the predominant prey found in owl stomachs, being found in all 10 owls examined and contributing 15 of the 18 prey items (83%) recorded; the balance consisted of one dasyurid marsupial and two insects (Table 2; 89% small mammals). The number of mammals per owl ranged from one to three, most commonly one ($n = 5$ owls) or two ($n = 4$ owls; mean 1.6 per owl, median 1.5, mode 1.0). Road-killed owls were invariably fat: all 10 had fat scored as present; four were 'very fat'. Reflecting the collection sites, the owl stomach contents were dominated by animals (i.e. House Mice) that live in disturbed areas such as crops, pasture and roadsides (e.g. Strahan 1983).

Table 1: Number of prey individuals (and % total prey individuals) in Barn Owl pellets from four sites in New South Wales (1: Narooma, 2: Hillston, 3: Mudgee, 4: Byron Bay; see text). Number of intact pellets in sample shown in brackets for the relevant sites, otherwise sample was a mass of pellet debris.

Species	Site			
	1 (4)	2	3 (5)	4
Paucident Planigale <i>Planigale gilesi</i>		5 (1)		
Common Planigale <i>Planigale maculata</i>				2 (3)
Fat-tailed Dunnart <i>Sminthopsis crassicaudata</i>		5 (1)		
Stripe-faced Dunnart <i>Sminthopsis macroura</i>		1 (<1)		
Little Forest Bat <i>Vespardelus vulturnus</i>	1			
House Mouse <i>Mus domesticus</i>	4	534 (97)	10	11 (19)
Bush Rat <i>Rattus fuscipes</i>	1			
Swamp Rat <i>Rattus lutreolus</i>				12 (20)
Black Rat <i>Rattus rattus</i>				33 (56)
Cat <i>Felis catus</i> (juvenile)		1 (<1)		
Scrubwren <i>Sericornis</i> sp.				1 (2)
Bird sp. 1		1 (<1)		
Bird sp. 2		1 (<1)		
Bird eggshell		1 (<1)		
Net-casting spider <i>Deinopis</i> sp.	1			
Mole cricket <i>Gryllotalpa</i> sp.	2			
Beetle (Elateridae)	1			
Total individuals	10	549	10	59

Table 2: Number of prey items found in the stomachs of dead Barn Owls from roads in New South Wales (see text for locations).

Species	Site									
	1	2	4	5	6	7a	7b	8	9	10
Brown Antechinus <i>Antechinus stuartii</i>		1								
House Mouse <i>Mus domesticus</i>	1	1	3	2	1	2	2	1	1	1
Grasshopper (Tettigoniidae)		2								

Pellets versus stomach contents

There was close agreement between pellets and stomach contents. One to three small mammals were represented per owl stomach and also per individual pellet (Table 1, sites 1 and 3; Table 2). However, the mean number of mammals was slightly greater per pellet than per stomach (2.0 vs 1.6). This probably reflects the likelihood that a pellet represents a night's hunting whereas road traffic (and hence the risk of collision) is heaviest in the first half of the night, before foraging is completed.

Owls found dead away from roads

The owls found dead away from roads mostly contained no food items and showed no outward signs of the cause of death; they are detailed according to their locality numbers in the Methods section.

- (1) Owl (a) was thin and had congealed blood in its stomach lining and intestine; (b) had an empty stomach (except for insect remains scraped from it) and its intestine was infested with tapeworms. Potential prey was abundant at the site (Rose 1972).
- (2) As for site 1, owl (a). There were many potential prey animals in heathland in

**Fledgling Barn Owl**

Plate 55

Photo: G.A. Cumming

nearby Royal National Park at that time (Rose 1972).

- (3) Owl was thin and had congealed blood in its stomach.
- (4) As for site 3.
- (5) The gall bladder was distended, the stomach green with fragments of grass and other plant material, and blood vessels were prominent in the skin (the last consistent with poisoning).

Discussion

The results on diet are consistent with previous studies, and confirm that the Barn Owl preys mostly on small mammals in New South Wales as elsewhere in Australia (e.g. Schodde & Mason 1980 and references therein, Valente 1981, Baker-Gabb 1984, Smith 1984, Smith & Cole 1989, Dickman et al. 1991, Hollands 1991, Johnson & Rose 1994). Rodents, especially the House Mouse, were found to dominate the diet, though supplemented by other small vertebrates and some invertebrates. Virtually all of the prey items in this study, or (for mammals) their equivalent congeners (*Planigale*, *Vespadelus* spp.), have been recorded in the Barn Owl's diet previously (above sources; also Barker & Vestjens 1989). The only exception, a juvenile cat, is equalled by juvenile Rabbit *Oryctolagus cuniculus* previously recorded; such larger items are probably taken rarely. The other 'new' species recorded in this study (Common Planigale *Planigale maculata*, Little Forest Bat *Vespadelus vulturnus*, scrubwren *Sericornis* sp.) reflect the locations of sites in this study, and the previous lack of Barn Owl diet data for New South Wales.

The stomach contents provide some corroboration of the number of individual prey items counted per pellet, and thereby support the assumption that Barn Owl pellets fairly accurately reflect what was eaten. The egg (Table 1) may have been in the oviduct of the bird eaten. Similarly, the plant material (owl found dead, site 5) may

have been in the gut of a prey animal, or may have been accidentally swallowed with a prey item.

Poisons such as dieldrin and anticoagulant rodenticides cause bleeding in Barn Owls. Symptoms of dieldrin poisoning include bleeding of the internal organs such as the foregut (Newton et al. 1991). Symptoms of anticoagulant poisoning also include bleeding of the internal organs (Newton et al. 1990). From my prior experience of warfarin poisoning in British Barn Owls, I consider that anticoagulant poisoning was a likely cause of death of the owls in this study that were found dead away from roads. For three of those owls, starvation should not have been a primary cause of death because prey was abundant. However, poor body condition in those birds may reflect the pre-death lethargy and failure to eat that results from secondary poisoning by rodenticides (Newton et al. 1990). If rodenticides, and in particular brodifacoum, are to blame for such Barn Owl deaths, then 'raptor-friendly' rodenticides such as coumatetralyl ('Racumin' by Bayer) deserve greater consideration than they at present receive in Australia (e.g. Olsen 1995).

Correction

One prey item in the sample discussed by Johnson & Rose (1994) was identified in that paper as the Carpentarian Dunnart *Sminthopsis butleri*; in fact it was the Stripe-faced Dunnart *S. macroura* (J. Woinarski and S. Van Dyck pers. comm.).

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