

THE DIET OF THE WEDGE-TAILED EAGLE, *Aquila audax* BREEDING NEAR MELBOURNE

CINDY HULL

Dept of Zoology, Monash University, Clayton, Vic. 3168

Received 11 July, 1985

Wedge-tailed Eagles, *Aquila audax*, were not protected for many years in Australia because of their supposed impact on sheep, *Ovis aries*, and the livelihood of farmers (Aumann 1982). They are still not protected in much of Western Australia. Therefore, the diet of this eagle was studied by Leopold and Wolfe (1970) in Australian Capital Territory and New South Wales and by Brooker and Ridpath (1980) in Western Australia, to determine the effects of these raptors on the sheep industry. Both these studies concluded that predation upon sheep was slight in comparison with natural mortality. They found that rabbits, *Oryctolagus cuniculus*, comprised the major proportion of the Wedge-tailed Eagles' diet. For similar reasons, I studied the diet of the Wedge-tailed Eagle in the Yellingbo pastoral area of Melbourne, Victoria.

STUDY AREA

Seven nest sites were studied within a 64 km² area of the Yellingbo district, approximately 50 km east of Melbourne. The eighth nest site was 5 km from Yellingbo at the 614 ha Yarraloch Wildlife Research Station in the Warramate Hills (Figure 1).

The predominant habitat type in the Yellingbo district and Warramate Hills is open farmland, bordered by *Eucalyptus cypellocarpa*, *E. obliqua*, *E. dives* forests, termed Open Forest 1 and Open Forest 1 and Open Forest 2 communities (Gullan *et al.* 1979, Smales 1981).

METHODS

Regurgitated pellets and other prey remains (such as skulls and other skeletal remains) were intermittently collected from beneath roosting and nesting trees at the eight nest sites for three years from December 1980 to October 1983. Pellets and prey remains were collected from September to February during the three years. (Collection was carried out during this time as the eagles were observed to spend more time around the nesting territory, making location of prey items easier.)

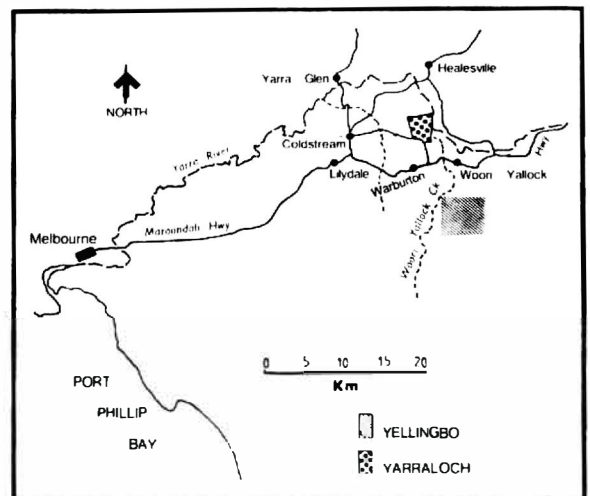


Figure 1. Map showing study areas where the diet of Wedge-tailed Eagles were studied.

To determine the species present in pellets and prey remains, skulls and skeletal remains were compared with a reference collection (Zoology Department, Monash University). Hair and feathers in the pellets were identified using the techniques of Chandler (1916), Day (1966), and Brunner and Coman (1974). This involved microscopic examination of whole-mounted feathers and hairs, cross-sectioned hairs and scale-prints of hairs. It was not always possible to identify an avian prey item to the species level.

RESULTS AND DISCUSSION

The difficulties encountered using this form of dietary analysis were similar to those discussed by Errington (1932), Glading *et al.* (1943), and Floyd *et al.* (1978). In particular, there is the problem of qualitative data from dietary analysis, i.e. the difficulty in estimating the number of prey items; small prey items are often over-represented due to their higher surface area to volume ratio, and certain prey items not being regurgitated.

TABLE I

Prey items recorded in pellets and prey remains of Wedge-tailed Eagles

Species	Summer (Dec. Jan. Feb.)		Spring (Sept. Oct. Nov.)		Total No.	% diet overall
	No.	%	No.	%		
Mammals						
Ring-tailed Possum <i>Pseudocheirus peregrinus</i>	22	42.3	30	57.7	52	20.1
Brush-tailed Possum <i>Trichosurus vulpecula</i>	4	50	4	50	8	3.1
Swamp Wallaby <i>Wallabia bicolor</i>	1	12.5	7	87.5	8	3.1
Eastern Grey Kangaroo <i>Macropus giganteus</i>	0	0	1	100	1	0.4
Gould's Wattleed Bat <i>Chalinolobus gouldii</i>	1	100	0	0	1	0.4
Bush Rat <i>Rattus juscipes</i>	0	0	1	100	1	0.4
Black Rat <i>Rattus rattus</i>	0	0	1	100	1	0.4
Rabbit <i>Oryctolagus cuniculus</i>	76	60.3	50	39.7	126	48.7
Hare <i>Lepus capensis</i>	0	0	3	100	3	1.2
Cat <i>Felis catus</i>	0	0	1	100	1	0.4
Goat <i>Capra hircus</i>	0	0	5	100	5	1.9
Sheep <i>Ovis aries</i>	0	0	6	100	6	2.3
Total Mammals	104		109		213	82.2
Birds						
Sacred Ibis <i>Threskiornis aethiopica</i>	2	100	0	0	2	0.8
Black Swan <i>Cygnus atratus</i>	1	50	1	50	2	0.8
Pink-eared Duck <i>Malacorhynchus membranaceus</i>	1	100	0	0	1	0.4
Anseriformes-unidentified	3	25	9	75	12	4.6
Domestic Fowl <i>Gallus gallus</i>	6	100	0	0	6	2.3
Galliformes-unidentified	2	100	0	0	2	0.8
Feral Pigeon <i>Columba livia</i>	1	100	0	0	1	0.4
Crimson Rosella <i>Platycecrus elegans</i>	2	100	0	0	2	0.8
Tawny Frogmouth <i>Podargus strigoides</i>	1	100	0	0	1	0.4
Laughing Kookaburra <i>Dacelo novaeguineae</i>	0	0	3	100	3	1.2
Blackbird <i>Turdus merula</i>	1	33.3	2	66.7	3	1.2
Pied Currawong <i>Strepera graculina</i>	0	0	2	100	2	0.8
Australian Raven <i>Corvus coronoides</i>	3	100	0	0	3	1.2
Passeriformes-unidentified	2	33.3	4	66.7	6	2.3
Total Birds	25		21		46	17.8
Total Mammals and Birds	129		130		250	100

However, Glading *et al.* (1943) state from research conducted on captive raptors that the occurrence of a species in a pellet may be expected to represent one prey item. Thus, of the 172 pellets and prey remains collected, 259 different prey items were recorded, representing a minimum of 259 individual prey specimens.

Of the 172 pellets and prey remains collected, 64 (37.2%) were from the Yarraloch nest site and 108 (62.8%) were from the seven nest sites at Yellingbo. The majority (98, 62%) of the 158 pellets contained only one prey species, 46 (29%) contained two, 13 (8%) contained three and one (1%) contained four different species.

There were more bird species (14) consumed by the Wedge-tailed Eagles than mammalian species (12). The fact that no reptiles were recorded contrasts with several other studies (Fleay 1952, Hobbs 1962, Leopold and Wolfe 1970, Brooker and Ridpath 1980, Cupper and Cupper 1981), but not with that of Baker-Gabb (1984). Most of these studies were conducted in more arid areas where more of the larger reptiles are found than would be expected in the Yellingbo district (Cogger 1975). Thus, the absence of reptiles as a prey in this study may be a function of the area differences and prey availability.

Mammalian prey

The abundance of mammals in the Wedge-tailed Eagles' diet is higher than that of birds and reptiles (Leopold and Wolfe 1970, Brooker and Ridpath 1980, Baker-Gabb 1984). Similarly, I found that 82% of prey taken was mammalian, despite a wider variety of bird species being recorded as prey. At Yellingbo (including Yarraloch), rabbits (49%) were the most important mammalian prey (Table 1). This concurs with the findings of Fleay (1952), Mackenzie (1964), Leopold and Wolfe (1970), Brooker and Ridpath (1980), and Baker-Gabb (1984). The Ring-tailed Possum, *Pseudocheirus peregrinus* (20%) was the second most important mammalian food. Although this possum has been recorded previously in the eagles' diet, it has never before been recorded with such a high frequency (Barnard 1925, Fleay 1952, Leopold and Wolfe 1970). Brush-tailed Possums, *Trichosurus vulpecula* (3%) and Swamp Wallabies, *Wallabia bicolor* (3%) were taken at Yellingbo slightly less often than recorded by Leopold and Wolfe

and Brooker and Ridpath (1980). Macropods have often been recorded in the diet of these eagles (Carter 1923, Barnard 1925, Geary 1932, Neil 1936). Leopold and Wolfe (1970) reported that, of the kangaroos found in the diet, they were taken as carrion if large, and as live pouch-dependent joeys if small. Among the remaining minor sources of mammalian prey, only the Gould's Wattled Bat, *Chalinolobus gouldii*, has not been previously recorded in the eagles' diet.

Avian prey

The most common avian prey at Yellingbo were the 'unidentified Anseriformes'. Domestic fowl, *Gallus gallus*, (2%) were not recorded in the diet of Wedge-tailed Eagles by Leopold and Wolfe (1970) or Brooker and Ridpath (1980). At Yellingbo there are several poultry farms, some of which dispose of dead chickens by discarding them in the fields. This would almost certainly provide a carrion food source for the eagles (T. Aumann, pers. comm.). Brooker (1983) found that only birds larger than 100 g in weight were taken as live prey by Wedge-tailed Eagles and the data from Yellingbo agree with this result. Leopold and Wolfe (1970) stated that the majority of birds taken were those that fed on the ground such as corvids and magpies. Several waterfowl were also taken at Yellingbo. Some of the remaining avian species recorded infrequently at Yellingbo have not been previously recorded in the Wedge-tailed Eagles' diet. These include the Sacred Ibis *Threskiornis aethiopica*, Black Swan *Cygnus atratus*, Feral Pigeon *Columbia livia*, Crimson Rosella *Platycercus elegans*, Laughing Kookaburra *Dacelo novaeguineae*, Blackbird *Turdus merula*, and Pied Currawong *Strepera graculina*.

The results from Yellingbo support Brooker and Ridpath's (1980) description of the Wedge-tailed Eagle as the occupant of a broad ecological niche, which results in a wide range of live prey and carrion taken throughout the Australian continent.

The role of sheep in the diet of Wedge-tailed Eagles at Yellingbo

Adult sheep and lambs (2%) were eaten less often at Yellingbo than were recorded by Leopold and Wolfe (1970) (7%) in parts of south-eastern Australia, and by Brooker and Ridpath

(1980) (7%) in Western Australia. Unlike the above two studies, it was not possible to determine whether sheep were taken as carrion in the present study. Brooker and Ridpath (1980) calculated that 50 per cent of sheep consumed were carrion. Dennis (1964) noted that death of sheep (adults and lambs) due to both avian and mammalian predators was 1.3 per cent and therefore not an important contributing factor. Similar findings have been cited in the reports of Alexander *et al.* (1955), Moule (1954), and McHugh and Edwards (1958). They stated that approximately one-fifth of lambs die in paddocks, providing food as carrion. Observations of Wedge-tailed Eagles by Neil and McGilp (1921), Lashmar (1936), and Cain (1976) have shown that sheep are taken as prey; however, other studies (Leopold and Wolfe 1970, Brooker and Ridpath 1980, Alexander *et al.* 1955, Moule 1954, McHugh and Edwards 1955, Dennis 1964) have contradicted the impact of these eagles.

In the Yellingbo district, sheep were a minor component of the diet of the Wedge-tailed Eagle, as was observed in the studies of Eddy (1959), Napier (1969), Rowley (1970), and Debus (1978).

ACKNOWLEDGEMENTS

I would like to thank the M. A. Ingram Trust for a grant to complete this research. Also, my supervisor Rob Wallis at Victoria College, Rusden Campus, for his help throughout the project. Thanks also to David Baker-Gabb for his advice and editing during the writing of the manuscript and to Tom Aumann for his help in the field.

REFERENCES

- Alexander, G., McLance, I., Watson, R. H. (1955). Some observations on losses among Merino lambs. *Aust. Vet. J.* 31: 85-90.
- Aumann, T. (1982). The legal status of raptors in Australasia. *Australasian Raptor Assoc. Newl.* 3: 3-9.
- Baker-Gabb, D. J. (1984). The breeding ecology of twelve species of diurnal raptor in north-western Victoria. *Aust. Wildl. Res.* 10: 145-160.
- Barnard, C. A. (1925). A review of the bird life on Coomboolaroo Station, Ovaringa district, Queensland, during the past fifty years. *Emu* 24: 252-265.
- Brooker, M. G. (1983). Further food items of the Wedge-tailed Eagle. *Aust. Birds* 17: 63.
- Brooker, M. G., and Ridpath, M. G. (1980). The diet of the Wedge-tailed Eagle, *Aquila audax*, in Western Australia. *Aust. Wildl. Res.* 7: 433-452.
- Brunner, H., and Coman, B. (1974). The Identification of Mammalian Hair. Inkata Press, Australia.
- Cain, C. (1976). Notes on the Wedge-tailed Eagle, *Uroaetus audax*, in the Farina district, South Australia, during 1934-1935. *S. Aust. Ornith.* 13: 169-170.
- Chandler, A. C. (1916). A study of the structure of feathers with reference to their taxonomic significance. *Zoology (University of California Publishers)* 13: 243-446.
- Cogger, H. G. (1975). Reptiles and Amphibians of Australia. A. H. and A. W. Reed, Australia.
- Cupper, J., and Cupper L. (1981). Hawks in Focus, T. and V. James, Melbourne, Australia.
- Day, M. G. (1966). Identification of hair and feather remains in the gut and faeces of stoats and weasels. *J. Zool.* 148: 201-217.
- Debus, S. J. (1978). Notes on Wedge-tailed Eagle behaviour. *Corella* 2: 54-55.
- Dennis, S. M. (1964). Tales from dead lambs: results of a survey of lambing losses. *J. Agric. (Western Australia)* 5: 200-203.
- Eddy, R. J. (1959). The Wedge-tailed Eagle in Bendigo, Mandurang, and Big Hill Ranges. *Aust. Bird Watcher* 1: 19-22.
- Errington, D. (1932). Technique of raptor food habits study. *Condor* 34: 75-86.
- Fleay, D. (1952). With Wedge-tailed Eagle at nest. *Emu* 52: 1.
- Floyd, T. J., Mech, L. D., Jordan, P. A. (1978). Relating Wolf scat content to prey consumer. *J. Wildl. Manage.* 42(3): 528-532.
- Geary, N. (1932). Notes of Wedge-tailed Eagles. *Emu* 32: 288.
- Glading, B., Tillotson, D., Selleck, P. M. (1943). Raptor pellets as indicators of food habits. *California Fish and Game* 29: 92-121.
- Gullan, P. K., Parkes, D. M., Morton, A. G., Bartley, M. J. (1979). Sites of botanical significance in the Upper Yarra Valley region, Upper Yarra Valley and Dandenong Ranges Authority.
- Hobbs, J. N. (1962). Food of Wedge-tailed Eagle, *Emu* 62: 180.
- Lashmar, A. F. C. (1936). Birds noted in the eastern portion of Kangaroo Island, *South Aust. Ornith.* 13: 200-203.
- Leopold, A. S., Wolfe, T. O. (1970). Food habits of nesting Wedge-tailed Eagles (*Aquila audax*) in south-east Australia. *CSIRO Wildl. Res.* 15: 1-17.
- McGilp, J. Neil (1921). Eagles and Hawks. *South Aust. Ornith.* 6: 65-70.
- McGilp, J. Neil (1936). Wedge-tailed Eagles. *Emu* 36: 99-102.
- McHugh, J. F., Edwards, M. S. H. (1958). Lamb loss investigations at Rutherglen Research Station, *J. Agric. (Victoria)* 56: 425-438.
- Mackenzie, D. (1964). King of Birds; the story of the Wedge-tailed Eagle. *Geelong Nat.* 1: 12-15.
- Moule, G. R. (1954). Observations on mortality among lambs in Queensland. *Aust. Vet. J.* 30: 153-171.
- Napier, J. R. (1969). Birds of the Breako' Day Valley, Tasmania. *Aust. Bird Watcher* 3: 179-192.
- Rowley, I. (1970). Lamb predation in Australia, incidence, predisposing conditions, and the identification of wounds. *CSIRO Wildl. Res.* 15: 79-123.
- Smale, I. (1981). The Herpetofauna of Yellingbo State Faunal Reserve. *Vict. Nat.* 98: 234-246.