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Nest-site characteristics and breeding productivity of Wedge-tailed Eagles (*Aquila audax*) near Perth, Western Australia

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Abstract. Between 1997 and 2006, nest-site characteristics and breeding productivity were determined for five territories of the Wedge-tailed Eagle (*Aquila audax*) in the Perth region of south-western Australia. Nest structures (n = 32; 3–8 per territory) were located in remnant bushland in rugged terrain, on slopes or ridges, and placed in large or emergent eucalypts, at heights of 4–25 m (mean 15.5 m ± s.d. 4.6 m) above ground. Over 12 active territory-years, 2001–2006, average annual breeding success was 0.92 young fledged per clutch laid, and 1.1 young per successful nest. Including three years when one pair lined nests did not lay eggs, productivity was 0.73 young per pair over 15 occupied territory-years, assuming that the number of territories was not underestimated.

Keywords. Wedge-tailed Eagle, nest sites, breeding success, south-western Australia

Introduction

Nest-site selection or nest-site characteristics have been documented for the Wedge-tailed Eagle (*Aquila audax*) in various parts of Australia, most comprehensively in the arid zone. Otherwise, studies in the temperate or semi-arid zones have been confined mainly to eastern Australia and Tasmania (Mooney and Holdsworth 1991; Brown and Mooney 1997; Dennis 2006; Debus *et al.* 2007; Parker *et al.* 2007; Foster and Wallis 2010), with one study in the Mediterranean zone of Western Australia (Ridpath and Brooker 1987). The present study documents the nest-site characteristics of Wedge-tailed Eagles breeding in bushland around outer suburban Perth in south-western Australia, as a contribution towards understanding this species' nest-site requirements in a different region of the country. This study was part of a larger study documenting the eagles' diet (Cherriman 2007; unpublished data), nest-building behaviour (Cherriman *et al.* 2009), and video-recording the eagles' biology, including the breeding cycle from egg to fledgling at several nests (Cherriman 2008, 2011).

Breeding productivity of the Wedge-tailed Eagle has also been studied extensively in various parts of Australia, most recently in relation to the effects of the rabbit calicivirus (rabbit haemorrhagic disease) on prey availability (e.g., see Fuentes *et al.* 2007 for a recent review). The eagle breeding productivity data presented here were recorded during a study of diet, nest-site characteristics and density, in a region where many native mammals are available as prey. The eagles preyed mainly on introduced Rabbits (*Oryctolagus cuniculus*) at one study site, and on native marsupials at another (unpublished data; Whiteman Park and Karakamia sites respectively: see below).

This paper therefore focused on investigating the characteristics of Wedge-tailed Eagle nest sites, and breeding productivity, in the Perth region.

Methods

Study area

The study was conducted in the Perth region in the south-west of Western Australia, extending from Whiteman east to Chidlow, and from Kalamunda north to Bullsbrook (Figure 1). The area consists of two major landforms, the Swan Coastal Plain and the Darling Scarp. The Swan Coastal Plain is a

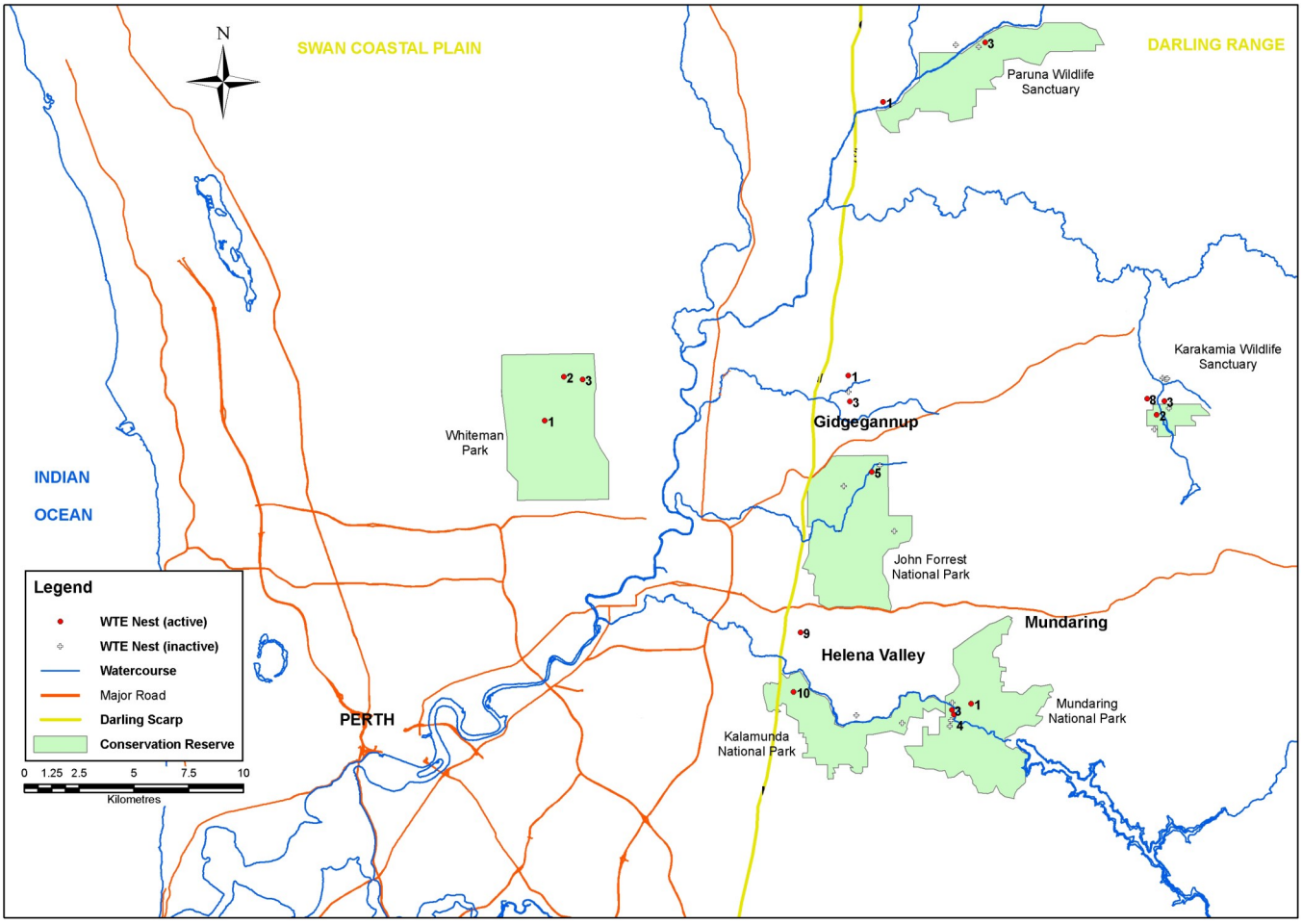

Figure 1. Wedge-tailed Eagle nests (active nests are numbered) and study sites in the Perth region.

narrow belt extending from Jurien Bay (30°06′S) to Dunsborough (33°45′S). Vegetation is highly diverse, including Eucalyptus and Banksia woodlands, various shrublands and damplands (Gibson *et al.* 1994). The Darling Scarp extends from Bullsbrook (31°40′S) to south of Dardanup (33°24′S), rising to ~250 m asl on the Darling Plateau (Figure 1). The escarpment is 1–3 km wide, grading from coastal sandplain communities to Jarrah (*Eucalyptus marginata*) forest on the Darling Range (Markey 1997).

The Wedge-tailed Eagle territories occurred in five main study areas (Figure 1): Whiteman Park on the Swan Coastal Plain; and Karakamia Wildlife Sanctuary, Paruna Wildlife Sanctuary, Gidgegannup (which includes John Forest National Park) and Helena Valley (which includes Mundaring and Kalamunda National Parks) on the Darling Scarp.

Whiteman Park

Whiteman Park (>4300 ha), situated ~20 km north of Perth, is one of the largest areas of extensive natural bushland on the Swan Coastal Plain, with ~2000 ha in a conservation zone. The landscape is mainly undulating sand dunes, vegetated with occasional large Jarrah and Marri (*Corymbia calophylla*) trees among Banksia (*B. menziesii*, *B. attenuata* and *B. ilicifolia*) woodland and associated shrubs, interspersed with damplands of Melaleuca species and sedges. Occasional mature eucalypt trees occur on dune crests that provide the eagles with potential nest sites. Three nests were located in the conservation zone (Figure 1; Table 1). Nest 1 was an older structure, used successfully in 1997 and 1999 (Brooker 2006). Two new nests were since constructed: nest 2 constructed in 2004 and used in 2004 and 2005, and nest 3 constructed and used in 2006.

Karakamia Wildlife Sanctuary

Karakamia Wildlife Sanctuary, owned by the Australian Wildlife Conservancy (AWC), was established in 1991, and consists of 260 ha of bushland in the Perth Hills. The vegetation consists of upland Jarrah and Marri woodland, Wandoo (*Eucalyptus wandoo*) woodland, granite outcrop shrubland, has some areas of open grassland, and is surrounded mostly by cleared farmland for grazing stock. The main drainage system forms a deep valley where eight eagle nests were found, three of which were active during the course of this study (Figure 1; Table 1).

Paruna Wildlife Sanctuary

Paruna Wildlife Sanctuary was established by AWC in 1998, creating a 2000 ha riverine wildlife corridor between Walyunga National Park and Avon Valley National Park. This major watercourse and its associated valley system is deep and rugged, with vegetation generally dominated by upslope Wandoo woodlands and heathland communities on the steep valley slopes, and mixed Jarrah and Marri forest on the hilltops (Markey 1997). The rugged Avon Valley, with its large, mostly Wandoo trees, provides nesting habitat for Wedge-tailed Eagles, with four nests known, two of which active during this study (Figure 1; Table 1).

Gidgegannup

This study site, at the edge of the Darling Scarp, consists of two valley systems divided by a major highway. The vegetation is similar to that in Paruna, with dominant Wandoo trees and open heathland on steep terrain, but less rugged than the Avon Valley. Seven Wedge-tailed Eagle nests were located: two clusters of three each, in valleys, and one (nest 7) somewhat isolated. Two were active during this study: one in each cluster of three (Figure 1; Table 1). Both clusters were not active simultaneously in any one year and, given their proximity compared with distances between alternative nests of other pairs in the region, they were assumed to belong to the same pair of eagles.

Helena Valley

Helena Valley, between the Darling Range and the Swan Coastal Plain, includes Kalamunda and Mundaring National Parks. The valley is steep-sided, with vegetation similar to that of Paruna in the Avon Valley. Ten Wedge-tailed Eagle nests are known from this valley system (Figure 1; Table 1), with six clustered in a small area ~5 km from the remainder, some of which were considered to be very old and likely built by an earlier generation of eagles. These widely spaced nests were not active simultaneously in any one year, and thus were assumed to be in the one territory at the time. However, nests 9 and 10 (Figure 1) were subsequently (in 2011) found to belong to a different pair from nests 1–4.

Nest location and characteristics

Wedge-tailed Eagles have been studied in the Perth region since 1999 (Cherriman 2004, 2007). Thirty-two nest structures were located and monitored within the five study sites to determine territory status and record breeding activity during each breeding season from 2004 to 2006. Records in this study were supplemented by earlier observations made between 1997 and 2003. It is assumed that the clusters of nests in the five study sites represented five territories, but it is recognised that the number of non-breeding pairs in any given year, and hence the number of territories, may have been underestimated (see clarification regarding Helena Valley nests 9 and 10, above).

Nests were located by strategic surveys conducted in each territory, by walking through bushland along the ridge of one side of a valley and periodically searching trees on the opposite side of the valley with binoculars. Once a nest was detected, all ridges within at least a 5 km radius were searched thoroughly for other nests. In addition, eagle behaviour (including territorial displays) was recorded to gain information on habitat use and possible locations of other nests. Observations were made from prominent locations overlooking known nesting locations from at least 0.5 km distant, and repeat visits to each territory made until no new nests could be found. Nests were checked for recent eagle activity, and other likely areas within each territory were inspected for newly built nests. On discovery of a nest, its approximate height above ground and dimensions (width × depth) were recorded by visual estimate; dimensions were confirmed by climbing to the nest and measuring it with a tape-measure 1–4 weeks after young had fledged. Nest trees were measured in order to characterise eagle nest sites, but as random trees were not measured, this study does not definitively describe nest-site selection. Eagles were not marked.

Surveys were conducted from May to July each year, to determine whether pairs were present and at which nests breeding activity had commenced. According to established definitions, the distinction was made between occupied nests/territories (pair present, nest(s) may be lined), active nests and successful nests (i.e. fledged young). A nest was deemed active if it contained eggs, or if adult eagles were observed incubating. All active nests were observed with binoculars from a distance of at least 0.5 km, to minimise disturbance and avoid the risk of researcher-induced failure. Fortnightly visits were conducted from July to December as applicable (e.g. the Whiteman Park eagles laid in late June, Gidgegannup eagles in late July) to confirm activity, to monitor the development of young, and to confirm that fledging had occurred.

Productivity was calculated for the years 2001–06 only, represented by the red dots in Figure 1 for Whiteman Park (nests 2 and 3 only), Karakamia, Paruna, Gidgegannup and Helena Valley. For Helena Valley, it was not certain that nests 1, 3 and 4 were in the same territory as nests 9 and 10, but these two nest clusters were occupied in different years (2002–04 and 2005–06, respectively). As noted above, these clusters were later found to represent two territories, but the number of monitored pair-years, and hence productivity data, are unaffected for the purposes of this study.

Table 1. Characteristics of Wedge-tailed Eagle nests in the Perth region. * = old nest; u = unknown; # = fledglings/breeding attempt where eggs were laid. Helena Valley nests 1, 3 and 4 occupied (lined but eggs not laid) in 2003, 2002 and 2004, respectively; nests 9 and 10 later found to be in a neighbouring territory to nests 1–4.

Study site	Nest no.	Tree species	Nest height (m)	Width × depth of nest (m)	Year active	Young fledged
Whiteman Park	1	*C. calophylla*	20	1.5 × 1.8	1997, 1999	u
	2	*E. marginata*	10	1.2 × 0.5	2004, 2005	1, 1
	3	*C. calophylla*	12	1.2 × 0.8	2006	2
Karakamia	1*	*C. calophylla*	12	u	u	–
	2	*E. marginata*	22	1.5 × 1.2	2005	1
	3	*E. wandoo*	10	1.2 × 0.6	2004	u
	4*	*C. calophylla*	15	1.3 × 1.5	u	–
	5*	*C. calophylla*	16	1.0 × 1.2	u	–
	6*	*E. marginata*	18	1.2 × 1.5	u	–
	7*	*C. calophylla*	19	u	u	–
	8	*C. calophylla*	20	1.2 × 1.8	2006	1
Gidgegannup	1	*E. wandoo*	10	u	2001	1
	2*	*E. wandoo*	12	1.5 × 0.5	u	–
	3	*E. wandoo*	12	1.2 × 0.4	2005	1
	4*	*E. wandoo*	18	1.5 × 1.6	u	–
	5	*E. wandoo*	15	1.5 × 0.5	2004	0
	6*	*E. wandoo*	10	u	u	–
	7*	*C. calophylla*	20	1.5 × 0.5	u	–
Paruna	1	*E. wandoo*	18	1.8 × 2.1	2001, 2002	1, u
	2*	*E. wandoo*	20	1.4 × 1.8	u	–
	3	*E. wandoo*	15	1.8 × 1.8	2006	1
	4*	*E. wandoo*	25	u	u	–
Helena Valley	1	*E. wandoo*	15	1.0 × 1.2	u	–
	2*	*E. wandoo*	18	u	u	–
	3	*C. calophylla*	10	1.2 × 1.5	u	–
	4	*E. marginata*	20	1.0 × 1.8	u	–
	5*	*E. wandoo*	18	1.0 × 1.5	u	–
	6*	*E. wandoo*	16	1.2 × 1.0	u	–
	7*	*C. calophylla*	20	1.0 × 1.2	u	–
	8*	*E. wandoo*	10	1.2 × 1.1	u	–
	9	*C. calophylla*	15	1.4 × 0.8	2005	1
	10	*C. calophylla*	4	0.9 × 0.4	2006	0
	Mean		15.5	1.3 × 1.1		0.92 #

Results

Nest location and characteristics

Over all five study sites, Wedge-tailed Eagles used all three of the dominant large tree species as nest sites; Jarrah (n = 4), Marri (n = 12) and Wandoo (n = 16). Nest dimensions averaged 1.3 m wide (range 0.9–1.8 m, s.d. = 0.24 m) by 1.1 m deep (range 0.4–2.1 m, s.d. = 0.53 m), mean height above ground was 15.5 m (range 4–25 m, s.d. = 4.6 m), and each territory held an average of 6.0 nests (range 3–8, excluding Helena Valley nests 9 and 10), although some nests may not have been built by the current pair.

Nest 10 in the Helena Valley territory (eggs laid) was particularly small (0.9 × 0.4 m) and low to the ground (4 m) compared with other nests in the region, and built in a stunted Marri close (<300 m) to human habitation. All other Darling Scarp nests in the Perth region were high in large trees on ridges or at least halfway up steep hills, and nests on the Swan Coastal Plain at Whiteman Park were found in the largest available trees, often on dune crests.

Breeding productivity

Breeding success, for nests where the outcome was known, averaged 0.92 young fledged per attempt in which eggs were laid over 12 pair-years 2001–2006 (Table 1). Helena Valley nests 3, 1 and 4 (Table 1) were lined with greenery, but no eggs laid, in 2002, 2003 and 2004, respectively, and no other nests in that territory were confirmed as active in those years. Including those occupied but non-active nests, productivity was 0.73 young per territorial pair per year over 15 pair-years, assuming that the number of non-breeding pairs was not underestimated. One of 10 successful broods (10%) was of two young (mean brood

size at fledging = 1.1).

Some nest failures were probably caused by chronic human disturbance (recreational off-road vehicles: Cherriman *et al.* 2009). Helena Valley nest 10, in the low Marri near human habitation, was built late in the year (August–September), incubation was in progress in early October, and subsequently the nest was found empty (breeding failed) in late October.

Discussion

Nest location and characteristics

The number per territory and characteristics of nests in the Perth region were consistent with previous findings on the Wedge-tailed Eagle in Australia (Ridpath and Brooker 1987; Mooney and Holdsworth 1991; Sharp *et al.* 2001; Dennis 2006; Collins and Croft 2007; Debus *et al.* 2007; Silva and Croft 2007; Foster and Wallis 2010), and the closely related Golden Eagle (*Aquila chrysaetos*) in Europe and North America (Dixon 1937; Brown and Watson 1964; Cramp 1980; Haworth *et al.* 2006).

The Karakamia, Gidgegannup and Helena Valley Wedge-tailed Eagle pairs had an unusually high number of nests in their territory (eight, seven, and eight respectively), compared with the other pairs in this study (three and four), and with Wedge-tailed Eagles in general (usually two or three), although there is a record of 11 nests in one territory, built up to 5 km apart over 15 years (Marchant and Higgins 1993). These high nest numbers could be attributed to an underestimated number of non-breeding eagle pairs present during this study (Gidgegannup, and Helena Valley as noted), or to inactive old nests that possibly belonged to former pairs of eagles before the present pairs took up residence (Karakamia). Eagle nests are bulky, robust structures that can persist in the environment for at least 20–40 years (Debus *et al.* 2007; Fuentes *et al.* 2007), and it was unlikely that every nest in this study was built by each pair of eagles currently active in the territories. A new pair occupying an inactive territory may prefer to build new nests, despite the presence of older structures potentially suitable for nesting (see Cherriman *et al.* 2009). Some nest structures may be used only for display, or as feeding platforms.

Nest dimensions and height above ground (Table 1) were also consistent with previous findings (Marchant and Higgins 1993; Ridpath and Brooker 1987; Sharp *et al.* 2001; Collins and Croft 2007; Silva and Croft 2007; Foster and Wallis 2010). The average dimensions of nests in this study (1.30 × 1.10 m) were comparable with nests in western New South Wales (1.14 × 0.83 m: Silva and Croft 2007; 1.88 × 1.00 m: Collins and Croft 2007). Nests may not reach substantial sizes until added to for several years (Gaukrodger 1924; Pizzey 1958; Olsen 2005). However, Karakamia nest 8 and Paruna nest 1 were both newly built, reaching their respective sizes of 1.2 × 1.8 m and 1.8 × 2.1 m in one season. The nature of the fork probably influences initial nest size (Mooney and Holdsworth 1991), with nests in vertical forks being deeper and those built on horizontal forks being shallower.

Characteristics of nest trees, including species, size and topographic position (e.g. large emergent eucalypts on slopes), and nest heights, were also consistent with previous findings, for example, in the Mediterranean zone of Western Australia, arid New South Wales, and temperate Victoria and Tasmania (Ridpath and Brooker 1987; Mooney and Holdsworth 1991; Sharp *et al.* 2001; Silva and Croft 2007; Foster and Wallis 2010). Large trees below ridgelines, with a prominent view of the surrounding landscape, are probably chosen for easy access, vigilance, security and shelter from prevailing weather conditions (Mooney and Hold-sworth 1991; Silva and Croft 2007; Foster and Wallis 2010). Presumably, Wedge-tailed Eagles near Perth select the tallest trees in their territories in which to build nests, and do not prefer any particular tree species (see Sharp *et al.* 2001; Silva and Croft 2007; Foster and Wallis 2010). However, many nest trees were Wandoo. Rather than selecting Wandoo trees as such, the eagles may have selected Wandoo woodland as foraging habitat, preferring to nest in the more rugged valleys of the Darling Scarp where Wandoo, with an open understorey, dominates (especially at Gidgegannup, Paruna and Helena Valley). The less steep terrain, where Jarrah and Marri trees dominate, has a denser understorey (see Markey 1997).

Breeding productivity

Breeding productivity near Perth was within the known range for Wedge-tailed Eagles in various parts of Australia (reviewed by Marchant and Higgins 1993; Olsen 2005; more recent data by Collins and Croft 2007; Debus *et al.* 2007; Fuentes *et al.* 2007; Parker et al. 2007; Silva and Croft 2007). Given the small sample size of pairs near Perth (n = 5), productivity was similar to that recorded in temperate or Mediterranean south-eastern Australia (0.8–1.0 young per pair per year: Marchant and Higgins 1993; Dennis 2006; Debus *et al.* 2007; Fuentes *et al.* 2007), and in Mediterranean south-western Australia (1.2 young per clutch at banding age: Ridpath and Brooker 1986).

Further work might usefully refine nest-site selection (by including random trees), and investigate breeding productivity of a larger sample of pairs in relation to dietary aspects (e.g. rabbits versus native mammals) or site fertility. Individual marking and radiotelemetry would also elucidate the number of eagle pairs per unit area and their territory or home-range sizes.

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References

Brooker, M. G. (2006). 'Whiteman Park bird surveys 1990–2004'. (Western Australian Planning Commission: Perth.)

Brown, L. H. and Watson, A. (1964). The Golden Eagle in relation to its food supply. *Ibis* **106**, 78–100.

Brown, W. E. and Mooney, N. J. (1997). Modelling of the nesting habitat of the Wedge-tailed Eagle *Aquila audax fleayi* in Tasmania. Report to Tasmanian Regional Forest Agreement Environment and Heritage Technical Committee, Hobart.

Cherriman, S. C. (2004). The diet of the Wedge-tailed Eagle *Aquila audax* during the breeding season in the Jarrah forest and on the Swan Coastal Plain, Western Australia. Third Year Biology Thesis. Curtin University, Western Australia

Cherriman, S. C. (2007). Territory size and diet throughout the year of the Wedge-tailed Eagle *Aquila audax* in the Perth region, Western Australia. B.Sc. (Hons) Thesis, Curtin University, Western Australia.

Cherriman, S. (2008). DVD: A King on Outstretched Wings. Perth, Western Australia.

Cherriman, S. (2011). Eagle Insight: Wedge-tailed Eagles in the Perth region. *Boobook* **29**, 24.

Cherriman, S. C., Foster, A. and Debus, S. J. S. (2009). Supplementary notes on the breeding behaviour of Wedge-tailed Eagles *Aquila audax*. *Australian Field Ornithology* **26**, 142–147.

Collins, L and Croft, D. B. (2007). Factors influencing chick survival in the Wedge-tailed Eagle *Aquila audax*. *Corella* **31**, 32–40.

Cramp, S. (Ed.) (1980). 'Handbook of the Birds of Europe, the Middle East and North Africa', vol. 2. (Oxford University Press: London.)

Debus, S. J. S., Hatfield, T. S., Ley, A. J. and Rose, A. B. (2007). Breeding biology and diet of the Wedge-tailed Eagle *Aquila audax* in the New England region of New South Wales. *Australian Field Ornithology* **24**, 93–120.

Dennis, T. E. (2006). Status and distribution of the Wedge-tailed Eagle on the Fleurieu Peninsula, South Australia, in 2005. *South Australian Ornithologist* **35**, 38–46.

Dixon, J. B. (1937). The Golden Eagle in San Diego County, California. *Condor* **39**, 49–56.

Foster, A. and Wallis, R. (2010). Nest-site characteristics of the Wedge-tailed Eagle *Aquila audax* in southern Victoria. *Corella* **34**, 36–44.

Fuentes, E., Olsen, J. and Rose, A. B. (2007). Diet, occupancy and breeding performance of Wedge-tailed Eagles *Aquila audax* near Canberra, four decades after Leopold and Wolfe. *Corella* **31**, 65–72.

Gaukrodger, D. W. (1924). The way of an eagle. *Emu* **24**, 3–12.

Gibson, N., Keighery, B. J., Keighery, G. J., Burbidge, A. H. and Lyons, M. N. (1994). A floristic survey of the southern Swan Coastal Plain. Unpublished report for the Australian Heritage Commission prepared by Department of Conservation and Land Management and the Conservation Council of Western Australian Inc.

Haworth, P. F., McGrady, M. J., Whitfield, D. P., Fielding, A. H. and McLeod, D. R. (2006). Ranging distance of resident Golden Eagles *Aquila chrysaetos* in western Scotland according to season and breeding status. *Bird Study* **53**, 265–273.

Marchant, S. and Higgins P. J. (Eds) (1993). 'Handbook of Australian, New Zealand and Antarctic Birds. Vol. 2: Raptors to Lapwings'. (Oxford University Press: Melbourne.)

Markey, A. (1997). Floristic survey of the northern Darling Scarp. Unpublished Report to the Department of Conservation and Land Management, the Department of Environmental Protection and the Western Australian Conservation Council Inc. for the Australian Heritage Commission.

Mooney, N. and Holdsworth, M. C. (1991). The effects of disturbance on nesting Wedge-tailed Eagles (*Aquila audax fleayi*) in Tasmania. *Tasforests* **3**, 15–31.

Olsen, P. (2005). 'Wedge-tailed Eagle'. (CSIRO Publishing: Melbourne.)

Parker, B. D., Hume, I. D. and Boles, W. E. (2007). Diet of breeding Wedge-tailed Eagles *Aquila audax* in south-central Queensland. *Corella* **31**, 50–62.

Pizzey, G. (1958). 'A Time to Look'. (Heinemann: Melbourne.)

Ridpath, M. G. and Brooker, M. G. (1986). The breeding of the Wedge-tailed Eagle *Aquila audax* in relation to its food supply in arid Western Australia. *Ibis* **128**, 172–194.

Ridpath, M. G. and Brooker, M. G. (1987). Sites and spacing as determinants of Wedge-tailed Eagle breeding in Arid Western Australia. *Emu* **87**, 143–149.

Sharp, A., Norton, M. and Marks, A. (2001). Breeding activity, nest site selection and nest spacing of Wedge-tailed Eagles (*Aquila audax*) in western New South Wales. *Emu* **101**, 323–328.

Silva, L. M. and Croft, D. B. (2007). Nest-site selection, diet and parental care of the Wedge-tailed Eagle *Aquila audax* in western New South Wales. *Corella* **31**, 23–31.