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The Australian Hobby *Falco longipennis*: A Review

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Summary

The literature concerning field recognition, habitat, physical characters (size, weight), diet, hunting/feeding behaviour and breeding biology of the Australian Hobby *Falco longipennis* is reviewed and supplemented with field observations. Some comparisons with the Peregrine Falcon *Falco peregrinus* are made; these demonstrate some ecological separation between the two species in respective prey sizes. It is concluded that most of the Hobby's avian prey is small passerines c. 10-75 g in weight (c. 3-35% of Hobby body weight), and that there is insufficient proof that Hobbies take birds much over 200 g, construct their own stick nests or habitually line nests. In diet, hunting behaviour and breeding biology the Australian Hobby closely resembles the other hobbies. Data on the biology of the Australian Hobby are limited and require further investigation.

Introduction

Cade (1982) summarised the little information on the Australian Hobby *Falco longipennis* that was available to him. Much of this information, derived from second- or third-hand quotes of the early literature, conflicts with recent first-hand observations (e.g. Price-Jones 1983, Hollands 1984) and with our own field experience. Some dubious statements, for example on the size of prey taken, appear to be based on misidentified Peregrine Falcons *Falco peregrinus*; some observers may also have mistaken mobbing or territorial defence for attempted predation. Other statements, for example on supposed nest building, appear to be based purely on assumption.

The purpose of this paper is to assemble and critically review the literature on the Australian Hobby, to summarise information on the species and to supplement this with our own field observations and with data from the RAOU Nest Record Scheme (NRS).

Field recognition

The differences between the Australian Hobby and the Peregrine Falcon have been reviewed in a number of guides (Condon 1973, Morris 1976, Storr & Johnstone 1979, Slater 1970, Pizzey 1980, Price-Jones 1983, Hollands 1984). Nevertheless, confusion between these two species is still possible and great care is needed in separating them in the field. We have observed small male Peregrines that appeared to be Hobbies at first sight, and required further careful scrutiny before a positive identification could be made. Ross (1985) has shown how even a female Peregrine can be misidentified as a Hobby by an experienced observer.

Misidentifications of Peregrines and Hobbies are especially critical when published reports of Hobby behaviour and ecology (e.g. maximum prey size) are being examined (see below). Initially, early observers in Australia faced a situation less clear-cut than that with which they were familiar in Europe,

because Australian Peregrines are smaller than European Peregrines and Australian Hobbies are larger than Eurasian Hobbies *Falco subbuteo* (size data from Cade 1982, Baker-Gabb 1984a). Consequently, early observers may have unwittingly been led to misidentify similar-sized Peregrines and Australian Hobbies (male Peregrines 355-380 mm in length, female Hobbies 340-350 mm: Calaby 1976, Pizzey 1980). For instance, in Finney (1984) there is an early illustration of a Peregrine captioned by the artist 'Falco, Van Diemen Hobby'.

Most observations tend to be made of birds in flight, and it is then that confusion is most likely. Some of the more useful identifying flight characteristics of the Hobby versus the Peregrine are summarised herein (Table 1, Figures 1A-1D), based on published guides and our own field experience. Small size differences mean little in the field; the most obvious differences are in build, shape and flight behaviour. The Peregrine is much the more heavily built and compact, with proportionally shorter and broader wings, and its flight is strong, measured and powerful; the Hobby is slender with long, narrow, pointed wings, and its flight is sometimes more dashing and at other times more leisurely and graceful.

In soaring flight the Peregrine's wings are held level with a slight upcurve towards the tips, and in certain attitudes may have a squared trailing edge to the primaries. The trailing edge to the wing is usually quite straight. In side view, a soaring or gliding Peregrine has little of the wing visible. Note, however, that begging juvenile Peregrines may glide on noticeably drooped wings (the 'flutter-glide', see Sherrod 1983 for discussion). The Australian Hobby soars and glides on level to slightly drooped wings, and often holds them more flexed at the carpals whereas the Peregrine often holds its wings out stiffly from the body. The trailing edge of the Hobby's wing is usually curved, thus accentuating the narrow, pointed wings and producing a 'scimitar' shape. Most of these differences are well illustrated by the photographs in Cupper & Cupper (1981) and Hollands (1984). Pizzey (1980) incorrectly stated that the Peregrine has a squarer tail than the Hobby. In fact both have square tails (note especially the photographs in Hollands 1984), although the tail of the Hobby is proportionally narrower and longer than the Peregrine's.

Colouration is not a reliable character for separating Hobbies from Peregrines in flight, at a distance, or especially in poor light. The Hobby is sometimes stated not to show the Peregrine's white bib (Pizzey 1980), but this claim is misleading: adult Hobbies can show a distinct pale throat, sides of neck and upper breast. In fact, some individuals in eastern Queensland exhibit a quite striking white throat and breast due to relatively dark upper and underparts (GVC pers. obs.). Furthermore, adverse light conditions may obscure or selectively highlight aspects of colouration [note the heightened rufous appearance in the eighth plate in Hollands' (1984) series of Peregrine photographs], while stooping Peregrines may appear to be small and dark (Ross 1985).

Cade (1982) erroneously considered that the juvenile Australian Hobby differs more from the adult than is the case with other hobbies. Fledgling Australian Hobbies resemble their parents except for the rufous edges to the feathers of the upperparts, somewhat richer rufous hue to the underparts and more buffy throat/sides of neck/upper breast (see photographs in Cupper &

Cupper 1981, Hollands 1984). Feather wear may contribute to an overall brown tinge as juveniles approach their first moult. Feather wear can also produce this effect in adults (P. Olsen in litt.).

Table 1

Selected flight characteristics of Australian Hobbies *Falco longipennis* and Peregrine Falcons *Falco peregrinus*

Characteristic	*Hobby*	*Peregrine*
Relative wing shape	Long, narrow	Broad, triangular
Wing tip	Tapered	Trailing edge can appear squared
Trailing edge of wing	Curved	Usually straight
Wing attitude when soaring or gliding	Flat to slightly drooped	Flat to slightly upswept at tips
Relative tail shape	Long, narrow	Short, broad

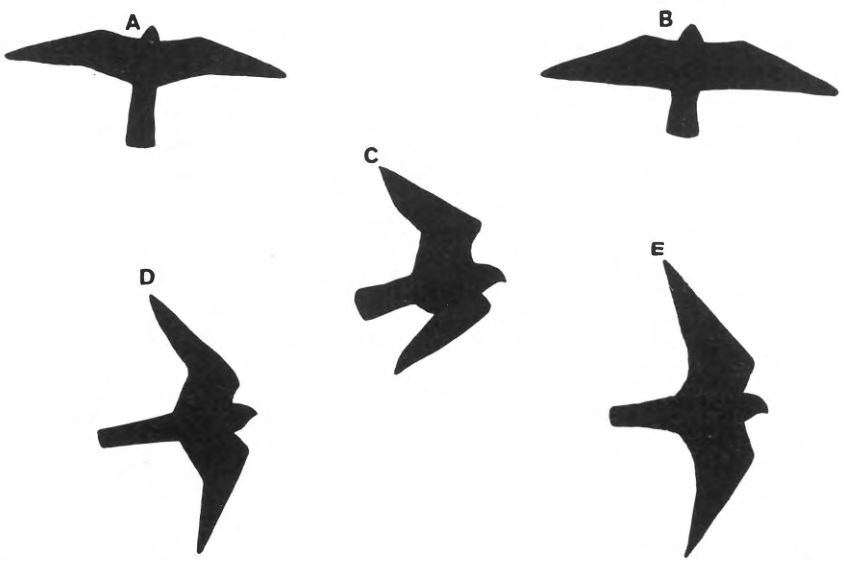


Figure 1. Diagrammatic views of Australian Hobby *Falco longipennis*, Peregrine Falcon *Falco peregrinus* and Oriental Hobby *Falco severus*.

A. Australian Hobby flight silhouette: note narrow, curved wings.

B. Peregrine Falcon flight silhouette: note broader wings and straight trailing edge.

C. Peregrine Falcon gliding rapidly: note heavy-set appearance and squared trailing edge to wing tip.

D. Australian Hobby gliding rapidly: note slender build and pointed wing tip.

E. Oriental Hobby: flight silhouette based on data supplied by B.W. Finch. Compare with Australian Hobby (D). Note broader wings and more compact shape.

Drawing by G.V. Czechura

The Peregrine clearly represents the most likely source of confusion with the Australian Hobby. Nevertheless, it should be noted that Australian Kestrels *Falco cenchroides* may pose identification problems in certain circumstances. Kestrels, owing to their similar size and proportions, may be mistaken for Hobbies under poor or adverse light conditions and in low visibility. In general, the broader (not scimitar-shaped) wings, rounded wing tips and 'heavier', less tapered tail of the Kestrel should prove diagnostic. Furthermore, Kestrels may on occasion indulge in uncharacteristic rapid, agile tail-chasing of small birds (Czechura 1971)) and could easily be assumed to be Hobbies at such times unless closely observed. The flight action of Kestrels during such direct pursuit is deeper and more laboured than that of a Hobby in similar circumstances, and the Kestrel has a proportionally longer tail.

Slater (1970) has raised the (unlikely) possibility of the Oriental Hobby *Falco severus* occurring in Australia. Adult Oriental Hobbies may be separated from Australian Hobbies by their overall darker colouration, black face and crown, broad, square-ended moustachial streak, much less extensive rufous colouration on neck, and unmarked richer rufous underparts (Brown & Amadon 1968, Slater 1970, Finch 1981, Coates 1985). Separation of immature and subadult birds may be more difficult (Finch 1981), although head pattern appears to be a consistent feature in all plumages. Immature Oriental Hobbies are very dark brown above and lack a broken collar, but the underparts are lightly streaked and can appear similar to immature Australian Hobbies (B.W. Finch in litt.). However, the two hobbies show distinct flight characteristics. Coates (1985) noted that Oriental Hobbies show a 'swift-like outline . . . at certain angles' (Plate 156). According to B.W. Finch (in litt.), the Oriental Hobby has broader wings with a less attenuated appearance and a relatively shorter tail, more closely approaching the Peregrine in silhouette (Figure 1E); it flies with rapidly winnowing, shallow wing beats resulting in a parrot-like flight action (note that the Australian Hobby may perform a winnowing flight action in display: see later). Finch considers that the difference in flight silhouette of Oriental versus Australian Hobbies is comparable to that between swifts of the genera *Hirundapus* and *Apus*.

Habitat

The Australian Hobby has been reported to inhabit 'timbered ranges' (e.g. Pizzey 1980) although the general consensus (e.g. Hollands 1984) is that Hobbies favour lightly timbered country, often in the vicinity of watercourses. In part, the former view may reflect subjective classifications of vegetation types and altitude ranges, but it should be noted that in our experience Peregrines are characteristic of the heavily forested, rugged eastern fall of the Great Dividing Range and subcoastal ranges (see also Czechura 1984a). In the subcoastal Blackall-Conondale Ranges near Brisbane, despite the presence of extensive open areas >500 m a.s.l. and the fairly low altitudes here (relative to the Great Divide), Australian Hobbies are largely confined to the adjoining lowlands and foothills (Czechura 1985).

Although Peregrines are the characteristic falcon of cliffs and rugged country, they overlap considerably with Hobbies in other habitats: there are populations of Peregrines breeding in tree hollows in the Murray-Darling

Basin and in old stick nests in mallee (Cupper & Cupper 1981, Olsen 1982, SD pers. obs.), in areas where the Australian Hobby also breeds (e.g. Blakers et al. 1984). Hobbies breed in large parks in cities (A. Fleming and D. Baker-Gabb in litt.), but Peregrines will also venture into cities (Czechura 1984a, b; SD pers obs.). There is thus considerable scope for Peregrines to be misidentified in what might be thought of as typical Hobby habitat.

In New Guinea Australian Hobbies are usually found in open country, grasslands, savannah, lagoons or towns, whereas the Oriental Hobby is an 'uncommon bird of the forest' (Finch 1981, Coates 1985). Coates reported that most if not all Australian Hobbies (and Australian Kestrels) collected in New Guinea are females. In Tasmania Australian Hobbies have been observed over dense forest where they perch on emergent trees and hunt over the canopy or over a river that dissects the forest, but this is considered unusual (Mooney 1986).

Physical characters

Baker-Gabb (1984a) gave the weight of male Australian Hobbies as 177-250 g (average 213 g, n=8) and females as 201-340 g (average 293 g, n=14). Larger individuals occur: a captive female from South Australia weighed 400 g (J. Olsen pers. comm.). Using Baker-Gabb's morphometric data, the formula in Cade (1982, Table 4) gives a calculated (though somewhat underestimated) wing loading of 0.27 g/sq. cm for males and 0.30 g/sq. cm for females. The Australian Hobby is somewhat heavier than its direct equivalents on other continents - the Eurasian Hobby, African Hobby *Falco cuvieri* and Oriental Hobby - and is amongst the most sexually dimorphic in weight of the hobbies (male 73% of female weight cf. 76-83% in the other species: see Cade 1982). The Australian and Oriental Hobbies have the highest calculated wing loadings among these four falcons.

The Australian Peregrine is much heavier than the Australian Hobby: male Peregrines weigh 505-675 g, av. 588 g and females 703-950 g, av. 875 g (Baker-Gabb 1984a); the male Peregrine is thus twice the weight of the female Hobby. These weight differences are of critical importance when comparing the prey killing and carrying capabilities of the two species. Falcons may kill prey up to or greater than their own weight but can carry prey up to about half their own weight (Cade 1982). These restrictions on the maximum prey sizes available to Australian Hobbies mean that even the largest females could kill prey not much in excess of 400 g and could carry prey of not more than about 200 g. The female Hobby's wing length and culmen length are 92% and 77% that of the male Peregrine's respectively (Baker-Gabb 1984a), and it has more slender tarsi and toes than a male Peregrine (hand-held specimens: GVC and SD pers. obs.). The Hobby is thus not only smaller but has relatively weaker prey-catching apparatus (bill and feet) than the Peregrine; its much lower body weight also means that it can deliver less force from a blow with the talons. The Peregrine's greater weight also enables it to reach a greater velocity in a stoop (see Cade 1982), thus increasing the force of impact even further.

Prey

The literature has repeatedly claimed that the Australian Hobby kills birds larger (or supposedly larger) than itself. Reports of unusually large prey include Feral Pigeons *Columba livia* (North 1912, Mellor 1924, Boehm 1934),

Table 2 Bird species recorded as prey of the Australian Hobby *Falco longipennis*, excluding those records considered doubtful (see text). Criteria for inclusion: species captured, carried and/or eaten (e.g. stomach contents, prey at nests).

Species	*Weight (g)*[a] *Range (mean)*	*Source(s)*
Stubble Quail *Coturnix novaezelandiae*	99-128(104)	Hyett 1959, Price-Jones 1983, Cam 1984
Brown Quail *Coturnix australis*	75-106(95)	White 1917[b], Czechura 1979
King Quail *Coturnix chinensis*	c. 50	Czechura 1979
Quail sp.		North 1912, Barnard 1925, Hyett 1959, Hall 1974, Tom 1985
Little-button Quail *Turnix velox*	41	Czechura 1979, Rolls 1981, Johnstone 1981
Red-capped Plover *Charadrius ruficapillus*	31	N. Mooney
'Plover' (*Charadrius* sp.?)	28-52	Diggles 1875
'Snipe' (=sandpiper *Calidris* sp.?)	24-60	Diggles 1875
Feral Pigeon *Columba livia*	(194-)285-347(324)[c]	Mellor 1924, E. Metcalf
Spotted Turtle-Dove *Streptopelia chinensis*	105-205(152)	Smith 1984
Laughing Turtle-Dove *Streptopelia senegalensis*	64-134(98)	Masters & Milhinch 1974
'Introduced doves' *Streptopelia* sp(p).		Slater 1960
Peaceful Dove *Geopelia placida*	47	White 1917[b], Baldwin 1975
Bar-shouldered Dove *Geopelia humeralis*	105-134(118)	M. Strong
Crested Pigeon *Ocyphaps lophotes*	133-257(199)	North 1912, Baldwin 1975, SD
Galah *Cacatua roseicapilla*	215-260(236)[c]	D. Story
Scaly-breasted Lorikeet *Trichoglossus chlorolepidotus*	71-83(78)	Czechura 1984a
Purple-crowned Lorikeet *Glossopsitta porphyrocephala*	35-55	North 1912, Slater 1960
Little Lorikeet *Glossopsitta pusilla*	41	Barnard 1925, Czechura 1984a
Cockatiel *Nymphicus hollandicus*	83-114(95)	North 1912, D. Jones
Budgerigar *Melopsittacus undulatus*	c. 30	North 1912, Macgillivray 1929, Cox & Pedler 1977, Pizzey 1984, GVC
Crimson Rosella *Platycercus elegans*	122	Price-Jones 1983
Eastern Rosella *Platycercus eximius*	110	Bedggood 1973, Baldwin 1975, Price-Jones 1983
Pale-headed Rosella *Platycercus adscitus*	121	Frauca 1980
Mallee Ringneck *Barnardius barnardi*	126-150(137)	North 1912
Port Lincoln Ringneck *Barnardius zonarius*	121-180(142)	Masters & Milhinch 1974
Red-rumped Parrot *Psephotus haematonotus*	53-70(63)	Baldwin 1975, Cupper & Cupper 1981, SD
'Small parrot'	<75	Mathews 1917[b]
White-throated Needletail *Hirundapus caudacutus*	61-113(88)	Hollands 1984
Singing Bushlark *Mirafra javanica*	23	Hall 1974[b]
'Larks'	<50	Hyett 1959
Welcome Swallow *Hirundo neoxena*	c. 15	North 1912, Taylor 1984, GVC
Tree Martin *Cecropis nigricans*	15	Slater 1960
Fairy Martin *Cecropis ariel*	10	Hollands 1984
'Swallows'	c. 15	Storr 1977
Richard's Pipit *Anthus novaeseelandiae*	23	Boehm 1934, Masters & Milhinch 1974, Price-Jones 1983, Hollands 1984
Grey Shrike-thrush *Colluricincla harmonica*	49-70(61)	Brooker et al. 1979
Clamorous Reed-Warbler *Acrocephalus stentoreus*	18	Bedggood 1973
Brown Songlark *Cinclorhamphus cruralis*	33-70(54)	North 1912
Brown Treecreeper *Climacteris picumnus*	27	J. Hobbs (NRS)
Little Wattlebird *Anthochaera chrysoptera*	44-83(65)	Sutton 1937[b]
Yellow-throated Miner *Manorina flavigula*	57	North 1912
Yellow-throated Honeyeater *Lichenostomus flavicollis*	29	N. Mooney
White-throated Honeyeater *Melithreptus albogularis*	11	GVC
Brown Honeyeater *Lichmera indistincta*	10	GVC
Rufous-throated Honeyeater *Conopophila rufogularis*	12	Slater 1961
Scarlet Honeyeater *Myzomela sanguinolenta*	c. 10	GVC
White-fronted Chat *Ephthianura albifrons*	12	Carter 1923
Chat *Ephthianura* sp.	10-12	Brandon 1938
Silvereye *Zosterops lateralis*	12	Bedggood 1972, Hollands 1984
European Goldfinch *Carduelis carduelis*	17	Price-Jones 1983
'Introduced finch'	12-28	Veerman 1985
House Sparrow *Passer domesticus*	25	Calaby 1951, Baldwin 1975, Price-Jones 1983, M. Strong, GVC, SD
'Sparrow(s)' *Passer* sp(p).	25	Brandon 1938, Hobbs 1961, Bedggood 1973, Veerman 1985
Crimson Finch *Neochmia phaeton*	10	Rix 1970
Zebra Finch *Poephila guttata*	12	Morgan 1930[b], Sutton 1937[b], Rix 1970, Cupper & Cupper 1981, Close & Jaensch 1984
Grassfinches (Ploceidae)	<20	Keartland 1896, North 1912, Storr 1977
Common Starling *Sturnus vulgaris*	55-96(75)	Brandon 1937, Pearse 1938, Calaby 1951, Bedggood 1973, Price-Jones 1983, Hollands 1984, Veerman 1985, M. Strong
Australian Magpie-lark *Grallina cyanoleuca*	66-130(90)	North 1912
White-breasted Woodswallow *Artamus leucorhynchus*	43	Cupper & Cupper 1981
Black-faced Woodswallow *Artamus cinereus*	35	Hall 1903
Woodswallow *Artamus* sp. (not above spp.)	40	SD
Unidentified passerine		E. & R. Metcalf (NRS)
Total identified species: 51		
Total species ≤ 150 g: 47(92%)		
Total species ≤ 75 g: 34(67%)		

[a] sources for body weight data: Boehm (1972), Lane (1973), Hall (1974), Serventy & Whittell (1976), Ford & Bell (1981), Long (1981), Baker-Gabb (1982), Henderson & Green (1982), Saunders et al. (1984), specimens in the Australian Museum. Note that for a few species a range and mean had to be obtained from different sources (quail, some parrots and pigeons).

[b] species recorded in Hobby stomach contents

[c] weights of birds caught by Peregrine Falcons *Falco peregrinus* (Olsen & Olsen 1983; see text)

Grey Teal *Anas gibberifrons* (Hyett 1959), unspecified ducks (Anon. 1973), White-faced Heron *Ardea novaehollandiae* (Barnard 1925) and domestic chickens (North 1912, Brandon 1948). Other reports exist of Hobbies pursuing and allegedly hunting Black Ducks *Anas superciliosa* (Bryant 1919), Feral Pigeons (Weidenbach 1928), Galahs *Cacatua roseicapilla*, unspecified ducks, pigeons and cockatoos (McGilp 1934), in which kills were not recorded. These reports have been questioned; for instance claims that Hobbies take large birds such as herons are considered by Hollands (1984) to be suspect, while Slater (1978) considered that alleged Hobbies taking Feral Pigeons are in fact misidentified Peregrines. We could find few unequivocal accounts of Hobbies actually killing such large prey, and then only Feral Pigeons and Galahs, the smaller individuals of which are lighter even than some male Hobbies (see below).

In none of the above literature reports is there sufficient information to confirm that Australian Hobbies rather than Peregrines were involved. Indeed McGilp (1934) admitted to some difficulty in identifying the Hobby, but only remarked on separation of it from the Kestrel and Collared Sparrowhawk *Accipiter cirrhocephalus*. Reports of a White-faced Heron being decapitated (Barnard 1925) and a teal being almost decapitated (Hyett 1959), both from blows delivered in flight, bear a strong similarity to reports of Peregrines damaging their prey when striking it (e.g. Illingworth 1964). Hyett's identification was based on relative lengths of teal (370-477 mm: Frith 1977) and falcon (the latter 2.5-5 cm shorter) and the pale rufous rather than pale chestnut underparts, viewed in the late afternoon (J. Hyett in litt.); these features provide insufficient reason to dismiss the Peregrine from consideration (see above). Furthermore, his description of the Hobby (Hyett 1959) is very suggestive of a Peregrine. Bryant (1919) quoted a hearsay report of a supposed Hobby capturing and carrying a 'full-sized' (but surely immature) Rabbit *Oryctolagus cuniculus*. Since Peregrines do take rabbits (Calaby 1951, Pruett-Jones 1981, Olsen & Olsen 1982), and in view of the lack of other observations of the Hobby taking rabbits, this record must be considered dubious. A record of an alleged Hobby striking down a duck, landing on it and commencing to feed (Anon. 1973) not only suggests a Peregrine at work but was also made in Tasmania where the Hobby is quite rare (e.g. Blakers et al. 1984). Brandon (1948) claimed that the Hobby takes many chickens although the local name 'ring hawk' in this context suggests one of the *Accipiter* species (Brown Goshawk *A. fasciatus* or Collared Sparrowhawk).

We are aware of a recent verbal report of an alleged Hobby striking down and apparently killing (but not retrieving) a Glossy Ibis *Plegadis falcinellus*. The 20 or so observers (mainly visitors from overseas) concurred that the falcon was a Hobby (G. Wilson in litt.), but in view of the episode related by Ross (1985) this identification is open to doubt: if a leading falcon biologist can mistake a female Peregrine for a Hobby in the field (even if momentarily), then the general bird-watcher can surely err on occasion.

Reasons for doubting the above reports come from an examination of the weights of these species: Grey Teal 350-670 g (Frith 1977); White-faced Heron 412-706 g and Glossy Ibis 509 g (Hall 1974); adult rabbits c. 1500 g (Baker-Gabb 1982). These waterbirds would be too large for a Hobby to subdue, and healthy Galahs and Feral Pigeons at 284-454 g and 332-465 g respectively (Long 1981, Baker-Gabb 1982, P. Olsen pers. comm.) may also be beyond the

capabilities of most Hobbies; Galahs are particularly difficult prey because of their determined self-defence (J. Olsen in litt.).

D. Story (in litt.) has twice found fresh Galah remains under an active Hobby's nest in coastal South Australia. This is an area where Galahs are affected by psittacosis and the Hobbies seem particularly large individuals (J. Olsen pers. comm.). E.C. Metcalf has observed a Hobby eating a white Feral Pigeon in a tree in Canberra, A.C.T. (feathers collected for identification; R. Metcalf in litt.). It is known that Peregrines select Galahs and Feral Pigeons that are significantly lighter than a random sample of these species (Olsen & Olsen 1983). Peregrine-caught Galahs and Feral Pigeons weighed 215-260 g, av. 236 g and 285-347 g, av. 324 g (Olsen & Olsen 1983 and pers. comm.). Given that Feral Pigeons can weigh as little as 194 g (Long 1981), it seems likely that Hobbies are similarly restricted in taking the smallest individuals. The largest female Hobbies could even carry the smallest individuals of these species for a short distance; details on capture technique are required.

The above observations by Story and Metcalf lend credence to earlier reports of Hobbies taking Galahs and Feral Pigeons, for example Mellor (1924) observed a Hobby plucking a Feral Pigeon on a tree and then carrying the bird off. However, Galahs and Feral Pigeons appear to be at the upper limit of the Hobby's predatory capabilities and seldom successfully captured. M. Bliss (pers. comm.) has observed a Hobby deliver a direct strike on a Feral Pigeon which dislodged feathers and temporarily stunned but did not kill the pigeon; we are aware of other reports of Hobbies unsuccessfully attacking Feral Pigeons (Weidenbach 1928, H. Nix per. J. Olsen in litt., R. Metcalf in litt., I. Falconer pers. comm.). It seems unlikely that the Hobby takes 'many' Feral Pigeons as claimed by Boehm (1934), and it would be physically impossible for Hobbies to carry off the 'strongest' homing pigeons (c. 400 g) as claimed by Keartland (in North 1912). There are reports of Hobbies ineffectually attacking and striking Australian Magpies *Gymnorhina tibicen* (205-387 g) and failing to overpower smaller birds (Australian Magpie-lark *Grallina cyanoleuca*, 66-130 g and Common Mynah *Acridotheres tristis*, 82-138 g) that were grasped or cornered (Le Souef 1918, Price-Jones 1983, North 1912, Smith 1984; weights from Hall 1974, Long 1981, Ford & Bell 1981, Baker-Gabb 1982).

Table 2 lists avian species unequivocally recorded as prey of the Australian Hobby. 67% of these species are 75 g or less, and 92% are 150 g or less. The relative number of reports of each species suggests a further bias towards prey of 75 g or less. Those species recorded in analyses of stomach contents further support the view that the Hobby does not prey on birds larger than itself. In addition to Table 2, two Hobby specimens in the Australian Museum contained (a) two birds, one a probable Zebra Finch, and (b) a bird the size of a miner *Manorina* sp. All of the birds from Hobby stomachs are less than 120 g.

There are few quantitative data on the Australian Hobby's diet. In south-eastern Australia the Hobby takes mainly Richard's Pipits, Goldfinches, House Sparrows and Common Starlings (c. 10-75 g) and some Stubble Quail, Crimson Rosellas, Eastern Rosellas and Red-rumped Parrots (c. 65-120 g) (Price-Jones 1983). In Victoria, Calaby (1951) recorded many House Sparrows and an occasional Common Starling as prey of a pair of Hobbies, however Hollands (1984) stated that the Hobby takes 'many' Common Starlings. In south-east Queensland, observations (M. Strong pers. comm.) indicate that

while House Sparrows and Common Starlings are the most frequently taken prey of a pair of Hobbies, birds up to the size of the Bar-shouldered Dove (105-134 g) are also taken occasionally. In south-western Australia the Hobby preys heavily on introduced doves, evidently mainly the smaller Laughing Turtle-dove (64-134 g) (Slater 1960, Masters & Milhinch 1974). In the inland the Hobby especially favours Budgerigars (c. 30 g), and also takes 'a lot' of Brown Songlarks (33-70 g) and evidently many grassfinches (c. 10-15 g) (Keartland 1896, North 1912, Storr 1977, White in Close & Jaensch 1984).

Data in Table 2 suggest that the upper limit of Hobby prey is somewhere in the order of 250-350 g (Feral Pigeon 194-347 g, Galah 215-260 g, Crested Pigeon 133-257 g). Maximum weight values for species in this range are consistent with restrictions imposed on prey size by Hobby body weight (see above). As mentioned, it is likely that only the smaller individuals of the species in this size range are taken. Approximate upper loading capacities should be in the order of 105 g for male Hobbies and 150 g for females; the heaviest prey item we have seen carried is the Crested Pigeon (SD), minimum 133 g. All species in Table 2 have mean or minimum weights <75% of mean female Hobby body weight and <55% that of the largest female Hobbies (c. 400 g).

The Hobby's small size and light weight confer difficulty in capturing large prey, and it prefers to seize prey and carry it off in a single movement rather than striking a blow in the manner of a Peregrine (Robinson & Franklin 1985). These differences in capture technique are consistent with the Hobby's smaller and relatively weaker prey-catching apparatus (see above). It must be emphasised that seemingly large prey, such as Feral Pigeons, Crested Pigeons and Galahs, may be substantially lighter than the Hobby itself. Even the smallest Grey Teal are in fact lighter than the largest female Hobbies.

Other factors contributing to an overestimation of Hobby prey sizes include attempted predation by inexperienced, immature Hobbies as well as misinterpreting of defence or mobbing behaviour (see below). An observation of a juvenile Hobby unsuccessfully attacking a Common Bronzewing *Phaps chalcoptera* (Metcalf 1983) may be an example of the former case. The weight of this pigeon (293-400 g: Long 1981) is equalled only by the heaviest female Hobbies.

In addition to birds, Australian Hobbies are known to take small insectivorous bats (Key 1938, Fleay 1950, Johnstone et al. 1977, Storr 1977, 1980, Czechura 1981, Wilson 1982, Johnstone 1983, Price-Jones 1983, Metcalf 1983, SD pers. obs.). In some cases, such predation is clearly fortuitous but several instances suggest that bats are taken quite frequently (e.g. Czechura 1981, Johnstone 1983). Flying insects also feature prominently in the diet of Australian Hobbies. Winged ants, termites, beetles, moths, dragonflies, grasshoppers, locusts, cicadas, mantids, flies and cockroaches are frequently taken and are usually eaten on the wing, although some may be eaten at a perch (North 1912, McGilp 1934, Lea & Gray 1935, Rolls 1981, Price-Jones 1983, Hollands 1984, GVC and SD pers. obs.). Small birds and bats may also be eaten on the wing (Czechura 1981, Price-Jones 1983, SD pers. obs.), but are more commonly plucked and eaten on a perch (Morris 1983, Kloot & McCulloch 1980, Rolls 1981, Cam 1984, Smith 1984, Hollands 1984, Taylor 1984, GVC and SD pers. obs.). We have not located any references to Hobbies feeding on large prey on the ground, which would surely be observed if

Hobbies habitually take prey too heavy to carry (i.e. greater than about half their own body weight). There is one record of a Hobby carrying a small (35 g) bird to the ground after catching it (Hall 1903). Captive Hobbies show great distress if they are on food on the ground; they continually try to carry it off whereas Peregrines, especially females, show much less distress and will eat prey calmly on the ground (J. Olsen in litt.).

Some prey may be taken from the ground (House Mice *Mus musculus* during plagues: Hayward & McFarlane 1971, or when disturbed by farm machinery: Rolls 1981) and possibly from foliage (lepidopteran larvae: Lea & Gray 1935). Hobbies have been observed snatching insects on or near the surface of water bodies (Sedgwick 1973, GVC and SD pers. obs.).

There is one report of an Australian Hobby allegedly eating carrion (a dead rabbit on a road: Taylor & Davey 1985). The bird was clearly a Hobby and was pecking at the carcass (R. Mason in litt.). If this was a case of true carrion feeding and not hunting for carrion-feeding insects, it is most exceptional.

Hunting behaviour

Australian Hobbies sometimes search for prey from high soaring flight, by quartering at lower levels and occasionally by hovering (McGilp 1934, Hyett 1959, Rich 1977, Czechura 1979, Cam 1984, Hollands 1984, SD pers. obs.). Hobbies also prospect for prey from prominent, elevated perches (Morris 1976, Chatto 1973, Hollands 1984, Robinson & Franklin 1985, E. & R. Metcalf/NRS, GVC and SD pers. obs.). The most commonly observed technique involves the falcon flying rapidly at low levels, often passing just above tree tops, standing vegetation, buildings etc. (Pizzey 1980, Price-Jones 1983, Cam 1984, Hollands 1984, GVC and SD pers. obs.). In open country (e.g. grassland, woodland) such flights often involve these falcons passing very close to the ground (North 1912, Czechura 1971, Morris 1977, Metcalf 1983, SD pers. obs.). Nine records of Hobby hunting behaviour involved either fast contour hunting or perch hunting (Veerman 1985). In somewhat exceptional circumstances in Tasmania, Mooney (1986) observed six hunting attempts by Hobbies over a dense rainforest canopy. All attempts started from perches in emergent eucalypts, and consisted either of a rapid acceleration and glide after prey above the canopy (between emergents), or an exploratory sortie over a river dissecting the forest.

Flying insects and some small birds are snatched from soaring or quartering flight or by the perch-and-sally method; considerable energy may be expended while pursuing them in direct flight (Metcalf 1983, Nix 1983, Hollands 1984, Mooney 1986, GVC and SD pers. obs.). Insects are also taken in a glide attack (Veerman 1985). Wallace & Gosper (1967) have described the aerial capture of insects by the Hobby: the falcon flies at its quarry and when a metre or so away from it, the pelvis is swung forward so that the body axis is vertical and the feet thrust foward to grasp the prey. Insects are occasionally taken by terrestrial pursuit (grasshoppers: Garnett & Bredl 1985).

The Australian Hobby sometimes flushes prey from cover by flying or stooping low over or at vegetation (Brandon 1937, Czechura 1971, 1979, Cam 1984) or by landing heavily on bushes in which prey are sheltering (Schrader 1974, Rich 1977). It also flushes ground-feeding birds by flying low over them (Macgillivray 1929). Hobbies readily take advantage of other agents to flush

prey, e.g. stock (Macgillivray 1914, North 1912), farm machinery (Boehm 1934, Hyett 1959, Rolls 1981, Tom 1985), trains (Smith 1984, GVC pers. obs.), motor vehicles (SD pers. obs.), humans (Czechura 1979) and notably Pied Butcherbirds *Cracticus nigrogularis* (Le Souef 1918, Barnard 1925, Slater 1961, Schrader 1974, Hawtin 1984, SD pers. obs.), though in this feeding association it is the Butcherbird that may benefit (Rich 1977). On some occasions attacks by Hobbies may be exploited by other raptors such as the Black Falcon *Falco subniger* (Czechura & Debus 1985).

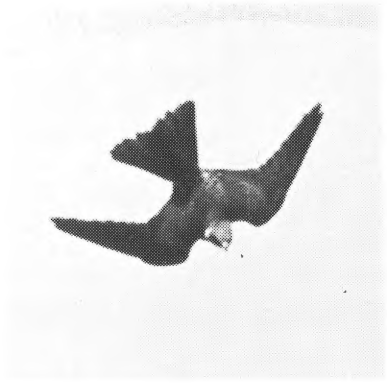
Co-operative hunting by pairs of Hobbies is known (Keartland 1896, Macgillivray 1929, Bedggood 1972, Rich 1977, Chatto 1983, Hollands 1984, SD pers. obs.). Regular co-operative hunting of House Sparrows and Common Starlings has been observed in south-east Queensland (M. Strong pers. comm.): in some cases both falcons have been observed in the air together, and at other times one member of the pair attempts to flush prey from cover while the second waits on a convenient perch to intercept any birds that break cover. A small catch is not necessarily shared (Hollands 1984, M. Strong pers. comm., SD pers. obs.).

Some birds are pursued and taken over water (Macgillivray 1929, Chatto 1983, Hollands 1984) as is the case with Eleonora's Falcon *Falco eleonorae* (Walter 1979a) and Sooty Falcon *Falco concolor* (Walter 1979b), both members of the hobby group, and also with the Peregrine (Hollands 1984, Ross 1985, P. Olsen in litt., C. Corben pers. comm.).

Attacks on prey may be delivered from a height in the manner of a Peregrine (Hollands 1984). A. Fleming (in litt.) has observed an almost vertical dive from a height at prey on the ground. However, a short shallow stoop (often near the ground) or a rapid direct approach at unsuspecting prey, sometimes appearing suddenly from behind cover, seem to be the most commonly observed types of attack (Hall 1903, Brandon 1938, Wilson 1982, Price-Jones 1983, Hollands 1984, Czechura 1971, 1979, 1981, SD pers. obs.). The Hobby may be outflown in a level chase, sometimes very easily, by birds such as Stubble Quail, swifts and Common Starlings, and needs the advantage of height and/or surprise (P. Slater pers. comm., GVC and SD pers. obs.).

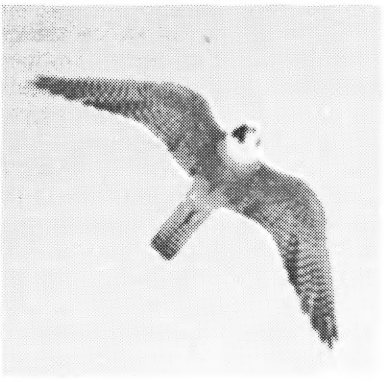
Australian Hobbies occasionally indulge in kleptoparasitism: Fletcher (1918) observed a Hobby unsuccessfully attempting to steal a snake from a Brown Falcon *Falco berigora*; van Tets (1966) observed a Hobby seize an unidentified plover-sized bird from a group of ravens *Corvus* sp. and carry it off; Czechura (1985) observed an immature Hobby attempting to steal a large grasshopper from an Australian Kestrel, and SD has observed a Hobby steal a mouse from a Kestrel. Similar interactions between the Eurasian Hobby and Eurasian Kestrel *Falco tinnunculus* are known (Cade 1982).

McGilp (1934) claimed that the Hobby chatters loudly when attacking prey; this view continues to be accepted in the literature (e.g. Cade 1982). In our experience the Hobby is silent when hunting, though it sometimes chatters after an unsuccessful attack (Rich 1977, SD pers. obs.) - perhaps in frustration. Chattering also accompanies display, mobbing or territorial defence (SD pers. obs.). Mobbing or harassing of large birds (Lord 1948), especially other raptors (e.g. Spotted Harrier *Circus assimilis*: Hollands 1984) in the vicinity of the nest, occurs frequently and may be conducted with much chattering. Since vocalisation would spoil the element of surprise which is a major feature of Hobby hunting tactics (Price-Jones 1983, Robinson &

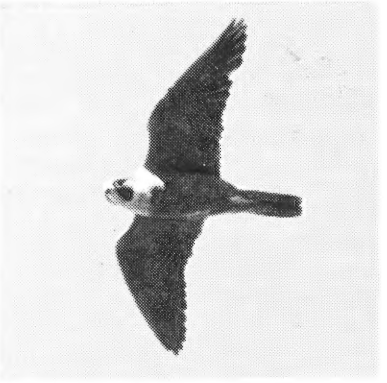


A

B



C



D

E

F

Australian Hobby *Falco longipennis*

Plate 46 A, B & C
Photos A & B: David Hollands
Photo C: Lindsay Cupper

Peregrine Falcon *Falco peregrinus*

Plate 47 D, E & F
Photos D, E & F: David Hollands

Franklin 1985), it seems reasonable to interpret claims of vocalisation during hunting as misinterpretations of other forms of behaviour. McGilp clearly mistook courtship behaviour and calling of some raptors for hunting behaviour (D. Baker-Gabb in litt.).

Brown & Amadon (1968) and Cade (1982) considered the Australian Hobby to be less crepuscular than other hobbies. Evidence clearly shows that Australian Hobbies forage at dusk, well into the evening when light is failing (Robinson 1952, Morris 1973, Czechura 1981, Metcalf 1983, Hollands 1984, SD pers. obs.), 'after dark' (Storr 1980) and even on moonlit nights (Price-Jones 1983). Hobbies have been observed in the late evening hawking insects around street lights (September, approximately 1930 h: GVC and R.E. Czechura pers. obs.; January, 2030 h when 'quite dark': Nix 1983), hunting at 1945 h (March) and chasing swifts at 2045 h (January) 'in the dark' (E. & R. Metcalf/NRS). P. Slater (pers. comm.) has known a Hobby to hunt at a light intensity of 2 lux (0.2 foot-candles). Hobbies have also been recorded hunting at or before dawn (Morris 1977, Spiteri 1985). Hollands (1984) commented on the Hobby's large eyes, which may be an adaptation for crepuscular hunting.

In summary, using the terminology of Baker-Gabb (1980), the Australian Hobby's repertoire of hunting techniques include fast contour hunting, perch hunting, high quartering, soaring and prospecting, flushing from cover, mediated flushing, co-operative hunting and ground hunting. Attack techniques include stooping, direct flying attacks, tail chasing, glide attacks and dive attacks.

Courtship and advertisement displays

Little has been recorded on the Australian Hobby's displays. Morris (1973) mentioned aerobatics and calling by pairs or single birds as well as a mutual soaring display: the male makes a series of dives at the female which may then engage in a 'mock battle' with the male. Hollands (1984) stated that pairs perform high-speed chases with calling. SD has observed several types of display:

(1) An apparent advertisement flight in which a single bird of undetermined sex flew with rapid, shallow wing beats then glided on markedly drooped wings (more so than in normal gliding flight), giving a loud chuckling call; its mate was flying about in the general vicinity. B.W. Finch (in litt.) has also mentioned a 'winnowing' display flight.

(2) A pair flying rapidly about on an erratic course mostly at c. 10-20 m above trees and buildings, sometimes together and sometimes apart, with rapid jerky wing beats at times Peregrine-like and at times erratic and reminiscent of a Feral Pigeon or a Cockatiel; this may have been what R. Weatherly (pers. comm.) referred to as the Hobby's 'pigeon-flap' display flight.

(3) A pair in mutual soaring, stooping and chasing flight, accompanied by rapid, shrill chattering calls (cf. the 'mock battle' of Morris 1973).

(4) A pair perching together high on dead trees, whereupon the male flew rapidly over the tree tops for perhaps 50 m and returned to perch near his mate; this appeared to be a horizontal figure-of-eight display flight (cf. Cade 1982). D. Baker-Gabb (in litt.) has also observed a fast courtship flight: a pair in 'racing' flight 20 m above the ground and 5 m apart; they then raced 300 m back to the nest tree where the female perched on the nest rim.

Courtship provisioning has been recorded: Morris (1973) stated that during aerial nuptial displays, the male sometimes offers prey to the female in an aerial pass. Fleming (1976) observed a male Hobby pluck a small bird and carry it to the nest tree, calling, whereupon the female joined him although she was not seen to take the food prior to departing. Subsequently they were observed flying together, chattering, and then soaring up until lost to view. These observations were made at the start of breeding activities. Key (1938) heard a male call while carrying food to the nest; in response the female stood and begged with outspread wings. Little has been recorded on mating behaviour: Owen (1975) reported mating with 'much chatter' after a male Hobby flew in to join a female perched on the nest tree; E. & R. Metcalf (NRS) observed Hobbies mating frequently on the nest and on nearby perches, in early to mid morning in the days before laying.

Nests

Based on some dubious early reports, standard references (e.g. Calaby 1976) have repeatedly stated that the Australian Hobby sometimes constructs its own nest. We have obtained no personal evidence that Hobbies build nests; some observers have simply stated that the Hobby appropriates an existing nest, while others have also stated that no nest is built or have otherwise expressed doubt that Hobbies build nests (Morris 1976, Beruldsen 1980, Price-Jones 1983, Hollands 1984). We have found no eyewitness accounts of Hobbies observed constructing a nest in its entirety. Some early observers made statements like 'When these falcons [Australian Hobbies] build their own nest . . .' (Barnard in North 1912) or '. . . building in high trees' (Robinson 1939), but gave no observation details. Diggles (1875) simply stated that these falcons build their own 'rather large but shallow nest' which is lined with 'grass and c.', but no supporting observations of nest-building were provided. McGilp (1923) stated that 'It [Australian Hobby] usually constructs its own nest . . . small, like that of the [Australian] Kestrel', which he described under that species as 'of "crow" construction'. He stated Hobbies' nests to be made of small sticks and lined with green leaves, and made such claims on the basis of an examination of only one nest's contents. Similarly, he later stated (McGilp 1934) that the Hobby will build a new nest 'in preference to taking possession of any old nest'. He observed a pair breaking off small dry twigs by landing on them, and carrying them to the nest in their talons. This nest was 'about the size of a small Crow's nest' at the time of this observation. Significantly, no large sticks were carried to the nest while it was under observation. McGilp then noted that the nest is lined with leaves or bark. Close & Jaensch (1984) reported a Hobby carrying a stick and frequenting a nest. P. Slater (pers. comm.) has also observed a pair of Hobbies landing heavily on twigs to break them off, then carry them to a nest which was already in an advanced stage of construction (and could therefore have been built by another species). Hyett (1959) stated that the Hobby's nest is 'built in a high tree'; he has since informed us (in litt.) that he has never observed Hobbies actually constructing nests. It appears that adding of sticks to (existing?) nests, as described by McGilp and Slater, is quite infrequent in the Australian Hobby and that there is no proof of this species constructing entire nests. However, there are enough reports of stick-carrying to make such (for a falcon) exceptional behaviour worthy of further investigation.

Alleged nest building by the Australian Hobby probably a myth.

Plate 48 Photo: Lindsay Cupper

Some descriptions of nest site, materials and construction sound suspiciously like corvid nests (e.g. North 1912, McGilp 1923); some observers (e.g. Pizzey 1980) have remarked that the nests supposedly constructed by Hobbies are large for the size of the bird. This is hardly surprising since Australian corvids range from 387 to 615 g (averages for female Little Crow *Corvus bennetti* and Australian Raven *C. coronoides* respectively: Rowley 1970), and are considerably larger than female Hobbies.

Appropriation of the nests of other species is the most likely source of nest sites used by the Australian Hobby, although occasional tree-hollow nestings have been reported (Hollands 1984). Schodde & Hitchcock (1968) also reported tree-hollow nesting by the related Oriental Hobby. Corvid nests figure prominently among those appropriated by Australian Hobbies (North 1912, Carnaby 1933, Brandon 1938, Roberts 1955, Fleming 1976, Boekel 1980, Cupper & Cupper 1981, Metcalf 1982, Hollands 1984, J. Hobbs and R. & M. Brown/NRS, A. Fleming in litt., GVC and SD pers. obs.), although raptor nests are also used (Whistling Kite *Haliastur sphenurus*: Macgillivray 1914, Brandon 1938; Little Eagle *Hieraaetus morphnoides*: Carnaby 1933) and nests of the Chestnut-crowned Babbler *Pomatostomus ruficeps* are occasionally used (Hobbs 1979). Brown & Amadon (1968) considered that Australian Hobbies do not evict the rightful owners as some other falcons do (including the Eurasian Hobby), but in fact Australian Hobbies do sometimes usurp occupied corvid nests (as soon as completed: P. Slater pers. comm.) or appropriate them as soon as the corvid fledglings have left and while the adults are still defending the nest (North 1912, Boekel 1980, Metcalf 1982, SD

pers. obs.). A pair of Hobbies in concert can drive off Torresian Crows *Corvus orru* and Australian Ravens (Boekel 1980, Metcalf 1982, P. Slater pers. comm.). Hobbies as a group seem particularly dependent on corvid nests, since the Eurasian Hobby uses them extensively (>90% of recorded nests) and the Oriental and African Hobbies also use them (Cade 1982, Brown et al. 1982, Steyn 1982).

Opinion also varies on the question of whether Australian Hobbies line the nests after they have appropriated them. Some observers state that repair or lining of the nest does not occur (Beruldsen 1980, Hollands 1984), others (Morris 1976) report that any existing lining is removed (cf. Eurasian Hobby: Cramp & Simpson 1980; African Hobby: Steyn 1982) while others report that the nest may be lined, using wool (Brandon 1938), grass, leaves or shredded bark (Diggles 1875, North 1912, McGilp 1923, Hyett 1959). Repair or lining of the nest may be one explanation for the observation of stick-carrying (McGilp and Slater, above). In general, hard evidence for nest-lining is lacking. Some material (e.g. grass, bark, wool) is characteristically used by corvids; the presence of fresh leaves in the nest could simply indicate recent usurpation from another raptor rather than placement there by the Hobbies, while bark may be shredded from the sticks of the nest by the adults while incubating (cf. Black Falcon: Slater 1979). Clearly more field data are required before the issue of nest lining by the Australian Hobby can be satisfactorily resolved.

Little has been recorded on the Australian Hobby's nest-selecting behaviour. Bright (1935) observed a pair suddenly land on an occupied Whistling Kite nest, chattering, after the Kites had been flushed by the observer. Boekel (1980) also observed a pair of Hobbies apparently prospecting for a nest. The birds approached an occupied crow's nest, calling, and one (sex unknown) perched on the rim; after some skirmishing with a crow the male Hobby landed on the nest. Subsequently the female landed on the nest (displacing him) and crouched in it, turning around. After driving off the crows, both Hobbies left and did not return. Over several days, Maddeford (1975) observed a pair of Hobbies apparently investigating an unoccupied corvid nest. The birds repeatedly flew to and from the nest tree with much excited chattering. The female landed on the nest several times. On one occasion she flew out of sight to return with the male, which then perched a few metres away while she was on the nest. Prior to leaving this nest, which was not subsequently used, the pair flew around, calling to each other. Carnaby (1933) reported that Hobbies brood for some time on a selected nest before laying.

Breeding biology

Though a reasonably common and widespread species, little is known of the breeding biology of the Australian Hobby. There are virtually no data on breeding density [Mace (1981) recorded one pair in 20 km of watercourse or c. 6 000 ha in central Australia, and D. Story (in litt.) found two pairs 3 km apart in coastal South Australia] and few data on incubation and nestling periods. Incubation has been recorded as at least 32 days (one nest: Hollands 1984), 30+ and 31+ days (two nests: E. & R. Metcalf/NRS) and 35 days (two nests: P. Slater pers. comm.). The nestling period has been recorded as about 35 days (one nest: Hollands 1984), between 28 and 32 days (one nest: J. Hobbs/NRS)

and 30+, 34 and a maximum of 35 days (three nests: E. & R. Metcalf/NRS). Confirmation of these values is required. The male shares incubation (Hollands 1984, E. McNabb and E. & R. Metcalf/NRS) and may also do some brooding and feeding of chicks: a widowed male assumed sole care of nestlings from about the two-week stage (Waterman 1984). Both sexes defend the nest vigorously if the nest tree is climbed (Olsen & Olsen 1980, Cupper & Cupper 1981, Hollands 1984); the female tends the chicks closely until they are at least ten days old and feeds them on (plucked) prey supplied by the male, often transferred in an aerial pass; the young can feed themselves on delivered prey when they are half-feathered, and can take prey (apparently whole and unplucked) from the parents in an aerial pass soon after leaving the nest (Cupper & Cupper 1981, Hollands 1984). The frog-like croak attributed by Hollands to nestling Hobbies is probably the female's food-presentation call to the young (cf. Cade 1982). Young may roost on the nest up to two weeks after fledging; the post-fledging dependence period appears to last 6-7 weeks and young may associate with their parents for up to 12 weeks (E. McNabb and E. & R. Metcalf/NRS).

The above incubation and nestling periods compare favourably with those of other small, 'aerial' falcons. In particular, the Australian Hobby appears to have similar incubation and nestling periods to the smaller Red-necked Falcon *Falco chicquera* [33 days (for a replacement clutch) and 37 days respectively: Brown et al. 1982]. The incubation period of the Australian Hobby is slightly longer than the Eurasian Hobby (28-31 days) and the Merlin *Falco columbarius* (28-32 days: Cramp & Simmons 1980). The nestling period appears to be only marginally longer than that of the Eurasian Hobby (28-34 days) and African Hobby (c. 30 days) but within the range (25-40 days) of Eleonora's Falcon (data from Cramp & Simmons 1980; Brown et al. 1982). The only data available on the Oriental Hobby is for an incubation period of 26 days (Ali & Ripley 1978), considered erroneous (Cade 1982).

Discussion

It is apparent that some statements in the literature concerning the Australian Hobby are insufficiently substantiated. We advise observers seeing an apparent Hobby attacking a large bird to carefully check whether it might not be a Peregrine instead. We also advise caution in interpreting the intentions of an attacking Hobby: is it predation or some other reason? Further authentic records of the Hobby's maximum prey size (i.e. species actually taken and carried) are needed, as indeed are detailed, quantitative studies on its diet and breeding ecology.

The Hobby and Peregrine are extensively sympatric and should therefore show ecological separation (Gause's principle). From their size difference, one would expect the two species to take prey in different size classes. In fact, from its proportionally more powerful bill and feet one would expect the Peregrine also to take prey larger relative to its own body size than does the Hobby. This appears to be the case: evidence reviewed herein suggests that most of the Hobby's avian prey is small passerines up to 75 g, 5-35% of the male Hobby's weight and 3-25% of the female's weight. In contrast, most of the Peregrine's prey (Feral Pigeons, Galahs, broad-tailed parrots and Common Starlings: Pruett-Jones et al. 1981, Olsen & Olsen 1981, 1982, Baker-Gabb 1984b, Czechura 1984a) are in the order of 11-79% of male Peregrine

and 7-53% of female Peregrine weights; depending on locality 45-81% of the Peregrine's avian prey species are 75 g or more (average prey weights from Hall 1974, Baker-Gabb 1982). We conclude that like other hobbies, the Australian Hobby preys mainly on songbirds, flying insects and bats, and that it is not built to deal with the larger birds that it is alleged to kill; it would thus appear to fit firmly into Cade's (1982) category of 'aerial insect and bird feeders'.

The heaviest species (Feral Pigeon, 324 g and Galah, 236 g) reliably recorded as prey of the Hobby are 81-111% of the average female Hobby's weight (assuming average weights of Peregrine-caught birds); these percentages may be an overestimation, as it is likely that only the smaller individuals are taken (minimum 194 g and 215 g respectively) and only by the larger female Hobbies. From the recorded unsuccessful attacks on birds greater than 200 g and its apparent reluctance to take prey that it cannot carry, it appears that the Hobby's maximum prey size is little more than 200 g. In contrast, the heaviest recorded prey of Australian Peregrines is the Sacred Ibis *Threskiornis aethiopica* (Pruett-Jones et al. 1981, Czechura 1984) at 1244 g plus (minimum weight from Hall 1974), 142% of the female Peregrine's weight. Many of the common duck and heron species at c. 500-1000 g are therefore easily within the capability of the Peregrine and are indeed sometimes taken by them (sources as above; weight from Hall 1974, Baker-Gabb 1982). We contend that Peregrines, and not Hobbies, are the falcons preying on these larger birds and that statements to the contrary by earlier writers are in error. Furthermore, prey supposedly larger than the Hobby (Galahs, Feral Pigeons) may in fact be considerably lighter. While we may seem overly critical of the early observers, it should be noted that their primary interests were often oology and specimen collecting rather than field study, and that at least some early naturalists shared the prevailing negative attitudes towards raptors. We suggest that the more unlikely statements on the Hobby be treated as requiring confirmation since it was clearly confused with the Peregrine on many occasions (and still is).

From the limited observations on its aerial displays, it appears that the Australian Hobby performs diving displays, aerobatics, mutual soaring and chasing and figure-of-eight displays common to many falcons (Cade 1982), and is very vocal. Some of its displays particularly resemble those of some other members of the hobby group: the Eurasian Hobby performs aerial courtship chases, aerobatics and figure-of-eight flights, and its food-presentation call in courtship is very similar to the Australian species (cf. Fleming 1976, Cramp & Simmons 1980); the Oriental Hobby performs an ascending flight with rapid, shallow wing beats and then a gliding descent, accompanied by calling (Brown & Amadon 1968); the African Hobby performs few aerial displays: 'despite very swift flight, its display [is] largely vocal' (Brown et al. 1982).

As pointed out by Cade (1982), the Australian Hobby probably forms a superspecies with its related ecological equivalents on other continents. Observers with experience of the Australian and other hobbies (e.g. Hollands 1984) consider the former to be a true hobby, although a few have suggested some (convergent?) similarity to the Merlin. All four members of the superspecies are very alike in their diet and their dashing, aerial and often crepuscular hunting behaviour. The Australian Hobby is described in Hall

(1974) as being identical with the Eurasian Hobby in flight and stance; the Australian Hobby resembles the African Hobby in its use of fast contour hunting, and the Oriental Hobby with similar wing-loading in its use of perch hunting and sallying (see Cade 1982). The Australian species closely resembles the other hobbies in plumage, dependence on corvid nests and in other aspects of breeding biology, and its apparently close relationship would appear to vindicate the decision to call it 'Australian Hobby' in preference to 'Little Falcon', a move foreshadowed by Diggles (1875). The latter name was apparently bestowed because the Hobby was regarded as a small Peregrine in every aspect, which it is not. We have tried to demonstrate that there are substantial physical and ecological differences between the two species.

Further study is needed, but alleged nest-building by the Australian Hobby is probably one of the myths that should be discarded since falcons in other countries have not been proved to build their own stick nests, and falcons in general lack a nest-building instinct (Brown & Amadon 1968, Cade 1982). Accurate data are also needed on most aspects of its breeding biology. We may have laboured the point about the more questionable statements on the Hobby's biology, but this is intended to encourage further detailed and critical field study. A comprehensive and accurate data base is important for conservation and management purposes.

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