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Breeding Behaviour of the Brown Goshawk *Accipiter fasciatus*

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Summary

Brown Goshawks *Accipiter fasciatus* were studied near Melbourne, Victoria during the 1980-83 breeding seasons. Pre-laying displays including conspicuous perching, unilateral and mutual soaring and pair pursuit are described, as are courtship feeding and copulation. Both sexes were involved in nest construction. A territory of 200-300 m diameter around the nest was defended against conspecifics and certain other raptors. Nests were also defended against human visitors and avian predators, however the manner and intensity of defence was variable. Females played the main role in nest and territory defence, although it was not determined which sex initially established the territory.

Males provided all food for themselves and their mates during the late pre-laying and incubation periods. Egg coverage was near-constant from about the time of clutch completion to hatching. Although males usually covered the eggs while their mates fed, >90% of incubation was undertaken by females. Female attachment to the nest remained high in the days after hatching, declining from 89% to 10% of observation time from the first to the third week of the nestling period. Males continued to provide all food in the early nestling period, the stage of female foraging recommencement varying from nest to nest. Rates of prey delivery declined from approximately 4-5 to 3-4 meals/day during the nestling period. Various other aspects of adult and young behaviour are also described.

Of 55 breeding females, two were in first-year plumage and two were identified as second-year birds. All 23 breeding males appeared to be in full adult plumage. No evidence was found for polygamy or polygyny. At one nest a male (grey morph) Grey Goshawk *A. novaehollandiae* replaced a male Brown Goshawk as the mate of a female Brown Goshawk at about the time of laying.

Introduction

The secretive accipiters breed at lower densities than most birds, and many nest in tall trees in remote vegetation. Pairs are difficult to locate, particularly early in the reproductive cycle. Breeding biology is well known only for the European Sparrowhawk *A. nisus*, Northern Goshawk *A. gentilis*, Cooper's Hawk *A. cooperi* and the Sharp-shinned Hawk *A. striatus*. A few African species have also been closely observed at the nest in limited parts of their range.

The breeding biology of the Australian accipiters is known only in general terms. Previous studies have been restricted to a single year, to one or a few nests, and usually the nests concerned have been discovered after the hatching of the young (Tonge 1925; Slater 1961; Hough 1972; Cupper & Cupper 1981; Metcalf 1982; Hollands 1984; Metcalf & Metcalf 1986).

Methods

During 1980-83, breeding Brown Goshawks were studied near Macclesfield (37°54'S, 145°30'E), 50 km east of Melbourne, Victoria. Although approximately 65% of the area concerned has been cleared for pasture, shade trees remain in most paddocks, and tall eucalypts (*Eucalyptus* spp.) and wattles (*Acacia* spp.) occur beside fences and watercourses and in stands of up to 25 hectares. Nests and their environs were watched from hides mounted on trees 15-40 m from the nest tree, and occasionally from a car parked 20-50 m from the nest tree. Individual observation sessions ranged in length from 2.5-12.5 hrs, total observation time being approximately 50, 55, 130 and 70 hrs for the pre-laying, incubation, nestling and post-fledging periods respectively.

Data presented here were largely derived from 12 nests, although all pairs located were watched to some extent. To minimise disturbance, climbing was restricted to the nestling period at four territories. The nests concerned were visited 3-4 times in

one or more years, ten nestlings being fitted with stainless steel bands supplied by the Australian Bird & Bat Banding Scheme.

To the extent possible, the age of breeding Brown Goshawks was estimated using the criteria of Aumann (1988). The nomenclature and phonetic transcription of vocalisations follow Cramp & Simmons (1980). An attempt was made to estimate territory size through observation of occupied territories from vantage points.

Results

Discounting failed nests where replacements were subsequently used in the same season, but including those replacements, 62 active Brown Goshawk nests were found: 11, 20, 18 and 13 in 1980, 1981, 1982 and 1983 respectively. Within any breeding season, all matings appeared monogamous. However, because most breeders could not be recognised as individuals, polygamy or polygyny may have occurred. Mate replacement was noted in only one case. A grey morph Grey Goshawk *A. novaehollandiae* replaced a male Brown Goshawk in pairing with a female Brown Goshawk at about the time of laying in 1982. Other intraseason mate replacement may have occurred.

Most breeding goshawks could be aged only as 'first year' or 'adult'; female age was known at 55 nests and male age at 23 nests. Two first-year females were found incubating (one in 1980 and one in 1981). The remainder were adults; of these, two were recognised to be second-year birds. All breeding attempts by first- or second-year females were successful. No first-year males were found breeding, and no breeding males were identified as second-year birds.

Pre-laying period

Brown Goshawks of both sexes were seen infrequently at Macclesfield in early and mid winter. By late winter, both sexes were often found on territories, and I was unable to attribute initial territory establishment to either sex. Many displays occurred in late winter and early spring, elements of courtship and pair bond formation/maintenance probably integrated with the advertisement of territory occupancy.

Both sexes perched for long (>20 min) periods on high exposed branches in late winter/early spring. Positions used were mostly <100 m from the nest site ultimately used. Commonly recorded from 0700 to 0930 h, conspicuous perching also occurred in the late afternoon and evening. Perches used were generally well lit by the sun. Although usually silent, one or both of a perching pair sometimes called loudly. In two instances, females used a relatively slow, loud *ee..ee..ee...* approximately every 30 s for 30-40 min. Duetting was usually sustained using this call for 1-5 min. As for all parallel calls, the male voice was higher pitched than that of the female. Duetting also occurred with one or both goshawks of a pair at concealed perches within or close to the nest woodland.

Soaring displays were observed in the 4-5 weeks before egg laying, and following intruder exclusion throughout the breeding season. Pairs circled over the territory in the pre-laying period, separating and drawing together repeatedly. Physical contacts in these displays were fleeting and light. Mutual soaring flights often reached great heights, culminating in lateral drifts or gradual slanting descents to a position sometimes >2 km from the territory. Alternatively, the male sometimes followed his mate back to the nest woodland in a slow or accelerating slanting descent on closed wings. Such mutual descents culminated in rapid pair pursuit through the territory. During female unilateral soaring males often watched from a perch in the territory below, sometimes

calling a relatively slow *ee..ee..ee...* for the duration of the flight. On four occasions a soaring female drifted to a position over the nest, lowered first one wingtip then the other, then immediately drifted off. On ten occasions in late winter/early spring a mixed-sex group of 3-4 goshawks soared over an area between traditional territories. These interactions involved high circling, shallow diving, little or no physical contact and no overt antagonism, and they ended with the birds involved drifting apart.

In contrast to pair pursuit, much slower following displays were also observed at territories during the pre-laying period. These were of the type described by Debus (1980). In a variant the pair flew side by side 1-3 m apart along and slightly above the margin of the nest woodland.

Courtship (supplementary) feeding was observed 11 times, and on at least seven of these occasions it preceded copulation. Four such events occurred >2 weeks before egg laying. Typically, the male flew in with prey in his claws to either the nest or (more often) a nearby perch. As he arrived he food called *ee-oo..ee-oo..ee-oo...*, the first syllable drawn out, the second sharp and accentuated. The syllables became less distinct if the female was slow to respond. Sometimes males called rapidly *e..e..e...* as they approached the territory with prey, before food calling. Food was either taken from the male in a foot-to-foot pass, via a drop, or most commonly from the branch where the male perched on arrival. One specific transfer perch was favoured at most territories, 15-120 m from the nest, and 2-15 m above ground. In response to the food call the female flew low (sometimes <1 m above the ground) and directly to the male, calling a loud, slow *ee..ee..ee...* as she neared him. The male either remained momentarily at the food transfer perch as the female collected the food, or flew to a nearby perch just before female arrival. Some 10-90 s later he flew to a different perch (often <5 m from the nest, and once to the nest) closely followed by his mate. Copulations lasting 5-15 s followed, generally as described for accipiters elsewhere (Cramp & Simmons 1980). The male then flew to another perch, and the pair duetted loudly *ee..ee..ee...* for 2-5 min, after which the male flew slowly away at treetop height. His departure did not appear triggered by any dismisal behaviour or call, although the female sometimes continued to call for up to 20 min. Copulation also occurred in the absence of courtship feeding during the pre-laying period.

Nest building was observed on five occasions, all before 1000 h. Sticks from the ground and from dead or partly dead trees were taken up and carried in the claws, then positioned using the feet and bill, by both sexes. Females also stood on the partly constructed nest for periods >30 min in the afternoon. New nests appeared to be constructed within 3 weeks. During the days before laying, females used the bill to break living *Eucalyptus* sprays from trees 20-100 m from the nest tree. These were then carried in the bill or in one foot and placed carefully on the nest.

During the 6 weeks before egg-laying both sexes chased Laughing Kookaburras *Dacelo novaeguineae*, Grey Currawongs *Strepera versicolor*, Australian Ravens *Corvus coronoides* and Little Ravens *C. mellori* 30-60 m away from nests. Conspecifics (one male, three females) were expelled from territories by the resident female, as were Wedge-tailed Eagles *Aquila audax* and Peregrine Falcons *Falco peregrinus* (twice each). These raptor expulsions occurred at various stages of the breeding cycle. In each case the resident goshawk flew rapidly from the nest or nearby to intercept the intruder 50-150 m away, chasing it 200-300 m from the nest. Such stringent defence was not applied against Black-shouldered Kites *Elanus notatus* or Swamp Harriers *Circus approximans*, although the latter were chased short (<50 m) distances after intrusions <50 m from the nest. These species successfully nested <250 and <80 m from Brown Goshawks, respectively. Human visits to goshawk territories during the pre-laying period usually produced rapid alarm calling *e..e..e...* from one or both residents as

they flew 20-50 m from tree to tree. If I followed one of the goshawks these flights became unidirectional, drawing me >300 m from the nest. The bird concerned then flew rapidly, silently, and low back to the nest vicinity.

Incubation period

For 3-5 days before clutch completion, female Brown Goshawks sat on the nest or stood on the nest rim or nearby for periods >2 hrs. From about the time of clutch completion egg coverage was virtually total. Females undertook >90% of incubation, in stretches sometimes >5 hrs. For undetermined reasons they had preferred sitting orientations at all nests. Sitting position was changed infrequently during the first fortnight of incubation, but later the incubating goshawk often rose to peer at and/or move the eggs before resettling. The sitting orientation also became more variable.

Females left the nest during incubation to respond to intruders, to collect eucalypt sprays (3-4 times/day during late incubation), or in response to male food calls (3-5 times/day). Males continued to supply all food in the manner described previously, covering the eggs while their mates fed. In the first 2-3 weeks of incubation females remained off the nest for periods of 5-120 min. Watched by the incubating male, they rested at the food transfer perch or made short perch to perch flights in the nest vicinity. In the final week before egg-hatching they were more reluctant to leave the nest, remaining off it for only 3-10 min. On two occasions, once during light rain, the male brought food directly to the nest edge, where the female fed. Pairs were rarely at the nest simultaneously during incubation, and then for periods of only a few seconds: most often during incubation 'changeovers'.

Incubating Brown Goshawks sometimes flew silently from the nest when I approached 70-100 m from the nest tree and I did not see them again during 5-15 min territory visits. Less commonly they flew from tree to tree in the nest vicinity for the duration of the visit, alarm calling frequently. Many remained on the eggs, sitting low. Although this 'sitting tight' increased as incubation progressed, the tendency did not account for all of the response variability recorded.

Nestling period

Breeding female Brown Goshawks spent approximately 90% of observation time on the nest during the first week after their eggs hatched, but nest attendance decreased progressively thereafter (Table 1). By the week before fledging, nest visits were of <30 min duration and were made only to feed the nestlings, shelter them from rain, or to provide fresh eucalypt sprays. While prey deliveries decreased only slightly (from approximately 4 to 3 deliveries/10 hrs observation) over the nestling period, provision of greenery declined from 4-5 deliveries/10 hrs observation to approximately 1 delivery/10 hrs observation (Table 1).

Table 1
Maternal Brown Goshawk activity during the nestling period

		% maternal time					
nestling age (days)	*observation time (hrs)*	*off nest*	*sitting on nest*	*standing on nest*	*feeding young*	*no. deliveries/hr prey*	*greenery*
7	31.2	11	65	25	9	0.38	0.29
8-14	40.9	46	21	33	13	0.42	0.27
15-21	27.2	90	0	9	4	0.29	0.22
21	30.5	97	0	3	3	0.30	0.07

The male goshawk continued to provide all food in the first fortnight of the nestling period. In response to food calling, his mate collected the prey from a transfer perch and returned to the nest to feed the young 30 s to 17 min later. While one or two morsels of flesh were presented to each nestling in turn during the first week post-hatching, by the second week it was usual for a single youngster to receive 30-50 morsels in succession. Meals lasted 2-28 min, during which time the nestlings often swapped position. This occurred particularly when one became sated and moved away. Food sharing was further facilitated by the dispensing female shifting position several times around the nest rim while delivering a large item. By the third week, food proffered retained fur or feathers. After meals the nestlings settled within or on the nest, and their mother generally swallowed any remaining prey. Excess food was not seen to be cached at Macclesfield, although I have seen this occur at Brown Goshawk nests elsewhere. Breeding females did not resume foraging until at least a fortnight after their eggs hatched, and at some nests female foraging did not appear to occur until the fourth week of the nestling period.

In their first week young Brown Goshawks spent >90% of each day down within the nest, and they appeared to sleep a great deal. Deliveries of meals and greenery were the only periods of intense general activity. However, movement within the nest increased throughout the first fortnight, and by the end of the second week the nestlings had become much more active. Their white down was replaced by a buff second down during this period, and by the end of the second week most nestlings had dark brown feathers on their wings, scapulars, breast, face, back and tail.

During their third week the nestlings became considerably more active. Much time was spent preening, and they also used their bills to pick up and reposition fresh and old eucalypt sprays and other items on the nest. They periodically flapped their wings vigorously for 5-45 s. Though still dozing for periods >90 min, they were quickly roused by food or alarm calling. By the start of the fourth week they spent 40-50% of the observation time standing on the nest, and this increased to 55-65% by the middle of that week. Much of this time and some of the sitting time was occupied with preening. By the middle of their fourth week the nestlings were well feathered, though down was still conspicuous on the head and in the wing coverts, and the tail was less than half grown. More advanced nestlings were able to move onto nest support branches and perch there (sometimes on one leg) for short periods. Intensive periods of wing flapping, sometimes involving all siblings, occurred from time to time. The youngsters were occasionally very vocal during parent absence in this period, using variations of a rapid *e..e..e...* call. By the end of the fourth week most engaged in 5-10 min periods of jumping into the air from the nest and jumps and runs back and forth between the nest and nearby branches. More advanced individuals perched 1-8 m from the nest for periods >1 hr. A few were able to fly short (<10 m) distances by this time, however others did not fly until late in the fifth week. On average, males fledged earlier than females, and an individual at one nest fledged 11 days after the last of its siblings.

Post-fledging period

For 2-3 days after fledging, Brown Goshawks spent most of the daylight hours standing on the nest or in the upper foliage of the nest tree or its neighbours. They slept for much of the time, often with one leg drawn up. They also preened frequently. Short (3-15 min) bursts of activity involved running and jumping along and between branches and short (usually <30 m) flights. They were vocal at these times, using loud, rapid *e..e..e...* calls. Both parents delivered prey to the top of the nest a total of 6-8 times/day in the first post-fledging week, and there was no sexual difference in delivery

rate. The fledglings returned to the nest immediately they heard or sighted an incoming parent, sometimes alighting >30 s before the food was delivered. Parents remained 2-10 s before flying off, leaving a short flurry as the youngsters competed for the prey. Usually one fledgling gained control, and the others sat or stood nearby and facing away from their feeding sibling. When sated, often after a >20 min meal, the first fledgling to feed moved to one side, allowing a second to take up any remaining food.

By 3-4 days after fledging the young goshawks began to move within a 50-80 m radius of the nest tree, however extensive rest periods continued to occupy most of the day. Diagonal branches and trunks were often used as resting platforms, whereupon the fledglings assumed a reclining posture with the head resting on the wood. Noisy perch to perch flights became more frequent towards the end of the first post-fledging week, and the young goshawks spent periods >45 min on the ground, manipulating sticks, stones and leaves with the bill and feet and clutching objects in the claws while rolling over and jumping.

In the second post-fledging week prey was often delivered to nests used in previous years within the same territory, or sometimes it was dropped as the chattering youngsters flew towards their incoming parent. The young goshawks began to engage in fast 'tail-chases' through the upper canopy of the nest woodland, especially in the early morning and the evening. They now travelled up to 200 m from the nest tree, although they did not venture outside the nest woodland in the first 10 days after fledging. They continued to be very vocal and visible during this period, but from then on many were hard to locate, and monitoring activity was difficult. Parents were also observed much less often from this stage. However at some territories fledglings could be found >5 weeks after fledging, and one was captured in a goshawk trap approximately 100 m from the nest tree 15 weeks after being banded as a nestling.

Discussion

Before this study there was only a single record of an Australian accipiter breeding in other than adult plumage (Hollands 1984), although this is known for seven congeneric species (Bannerman 1956; Höglund 1964; Henny & Wight 1972; Steyn 1972; Tarboton 1978; Brown & Brown 1979; Fischer 1984). Yearlings represented 0% (males, n = 23) and 3.6% (females, n = 55) of breeding Brown Goshawks at Macclesfield: a lower estimate than any for the European Sparrowhawk (6-50%, males; 4-26%, females), the only other *Accipiter* species for which comparable data exist (Newton 1979). Henny & Wight (1972) estimated 19% of Cooper's Hawks to breed in their first year. Although not comparable with this finding, the Macclesfield data suggest that a much smaller fraction of first-year Brown Goshawks breed. However, if the nesting of young raptors is limited by their comparative inability to acquire and hold a territory (that is, if they breed most often in 'good' years when marginal territories become viable), then the 1982/83 Victorian drought may have depressed yearling breeding. Yearlings bred in 1980/81 at Macclesfield.

Monogamy is usual in *Accipiter*, as is further evidenced by the data presented here, although bigamy occurs (Newton 1979). The sole Australian report of apparent bigamy in the genus concerned a male Grey Goshawk and two female Brown Goshawks at separate nests (Cupper 1976).

There is some evidence that migrating male Brown Goshawks precede females in returning to Macclesfield breeding grounds (Aumann 1986). However, sexual responsibility for initial territory establishment could not be determined in this study. Traditionally, European students of accipiters have attributed territory establishment to females. More recently it has been suggested that males of some species occupy

and advertise territories before being joined by females (Grobler 1981; Marquiss & Newton 1981). Resolution of this problem will be easier in places and seasons where a population is wholly migratory, rather than partially so as at Macclesfield. As was the case for Brown Goshawks at Macclesfield, accipiters defend territories throughout the breeding season (Liversidge 1962; Tarboton 1978; Newton 1987). No authors have had sufficient data points to accurately find the size or shape of *Accipiter* territories.

Several of the Brown Goshawk pre-laying displays described here have been reported previously for the species (Debus 1980) and most are known for other accipiters (Bent 1937; Smeenk & Smeenk-Enserink 1977; Brown & Brown 1979; Newton 1987). However, there is no previous record for the 'wing-dipping' behaviour noted at Macclesfield for females soaring over nests. Furthermore, apart from a single previous record for Brown Goshawks (Debus 1980) and others described here, displays involving >2 conspecific accipiters have been reported only for the European Sparrowhawk (Hume & Garvey 1970; Jones 1974).

Courtship feeding allied to copulation has not previously been described for wild Brown Goshawks, although Boekel (1980) reported a pair to copulate near a nest. Accounts of food transfers, copulation and associated vocalisation for other accipiters conform to those here (Liversidge 1962; Smeenk & Smeenk-Enserink 1977; Cramp & Simmons 1980). Copulation generally occurs up to clutch completion or thereabouts (Kemp & Kemp 1975; Smeenk & Smeenk-Enserink 1977; Tarboton 1978). However, Liversidge (1962) reported a pair of Little Sparrowhawk *A. minullus* to copulate only infrequently in the fortnight before laying, whereas Metcalf (1982) found a Collared Sparrowhawk *A. cirrocephalus* pair to copulate throughout the nestling period.

As reported here and previously for Brown Goshawks (Slater 1961; Hough 1972; Olsen et al. 1982) both *Accipiter* sexes construct/refurbish the nest (Owen 1936; Liversidge 1962; Tarboton 1978). Construction is almost exclusively a morning activity, although Brosset (1981) found a captive Black Sparrowhawk *A. melanoleucus* pair to reposition sticks during the afternoon. Although not known for Macclesfield, Brown Goshawks sometimes appropriate nests (McGilp 1934; Roberts 1955). The 2:3 ratio for appropriated:constructed nests suggested for Western Australian Brown Goshawks (Serventy & Whittell 1976) is far higher than that found in south-eastern Australia. For none of the accipiters does nest appropriation appear common, although it has been recorded for several (Brown & Amadon 1968).

All accipiters defend their nests against human and other predators. Passive aspects of this include selection of nest sites with good concealment and difficult access, and secretive behaviour. Both sexes also fly, stoop and strike at intruders, often using alarm calls similar to those described here (Bent 1937; Slater 1961; Liversidge 1962). However, I am not aware of a previous record for any *Accipiter* species of the 'leading-off' behaviour described here. The greater female responsibility for nest defence may simply be a consequence of the maternal tendency to spend more time than her mate in the nest vicinity, although the larger size of females might render them better adapted for this function (Reynolds 1972). The ferocity and style of defence against humans by accipiters varies seasonally to an extent (Barrett 1925; Brosset 1981); non-seasonal local variation noted at Macclesfield and elsewhere for Brown Goshawks and other accipiters (Bent 1937; Cupper & Cupper 1981) may represent individual variation.

As reported here and previously for Brown Goshawks (Slater 1961; Hough 1972), female accipiters undertake most of the incubation of the eggs (Brown & Amadon 1968). Incubation by the male is largely restricted to periods when the female is eating (Bent 1937; Tarboton 1978; Grobler 1981). Male accipiters supply all food during

incubation. Although it is normally transferred at the nest in some species (Brown & Brown 1979), the use of transfer perches is far more typical of the genus (Brown & Amadon 1968). As incubation progresses females become more reluctant to leave the nest, particularly in the early morning, late evening or in poor weather (Smeenk & Smeenk-Enserink 1977). However, before this study there was only one report of a female Brown Goshawk feeding in the nest during the incubation period (Hough 1972). The incubation period food delivery rate at Macclesfield (3-5 deliveries/day) is intermediate in the *Accipiter* range, with estimates from 1-7 deliveries/day for the Black Sparrowhawk (Brown & Brown 1979) and Shikra *A. badius* (Tarboton 1978) respectively.

Male Brown Goshawks provided all food for their mates and their young in the early nestling period at Macclesfield, with the females actually feeding the young. This is the usual pattern in *Accipiter*, although nestlings occasionally receive food directly from their fathers in some species (Liversidge 1962; Brosset 1981). As found here, maternal attendance at the nest declines as the nestlings age, and female accipiters often recommence foraging 2-4 weeks after their young hatch (Owen 1916-22; Schnell 1958; Cramp & Simmons 1980). As was the case at Macclesfield, the level of female foraging varies, and may be related to seasonal conditions and the effectiveness of their mates as providers (Newton 1979). As found here for Brown Goshawks, the rate of prey delivery to *Accipiter* nestlings remains fairly stable from week to week, possibly decreasing somewhat as fledging approaches (Meng 1959; Liversidge 1962; Kenward 1978; Brown & Brown 1979). Any marked pre-fledging 'hardening up' (reduction of food), reported for young Northern Goshawks by Dixon & Dixon (1938), has neither been confirmed for that species by other studies nor found here for Brown Goshawks. Female Brown Goshawks often ate excess food after the nestlings were sated at Macclesfield. This maternal behaviour is typical in *Accipiter*, although caching is also characteristic (Schnell 1958; Metcalf 1982; Newton 1987).

In general, the physical and behavioural aspects of Brown Goshawk nestling development described here confirm previous accounts (North 1901-4; Slater 1961; Hough 1972; Cupper & Cupper 1981; Hollands 1984) and accounts for other accipiters (Bent 1937; Liversidge 1962; Tarboton 1978; Brown & Brown 1979; Cramp & Simmons 1980).

Previous literature contains little information on the Brown Goshawk post-fledging period. Hough (1972) reported fledglings to return to an observed nest for at least a few days after fledging, and Hollands (1984) was able to find them in the natal territory for a fortnight after fledging. Post-fledging observations on other accipiters generally accord with those presented here for the Brown Goshawk, although few studies contain much of detail (Smeenk & Smeenk-Enserink 1977; Reynolds & Wight 1978; Cramp & Simmons 1980; Grobler 1981; Mueller et al. 1981; Newton 1987). Estimates of the period of fledgling dependence range from 1 week for the Northern Goshawk (Gromme 1935) to a report of a Bicoloured Sparrowhawk *A. bicolor* calling for food from a branch near its natal nest nearly 9 weeks after fledging (Mader 1981). As reported here for Brown Goshawks, Metcalf (1982) and Metcalf & Metcalf (1986) described a widening range of operation for Collared Sparrowhawks after fledging. Though known for many raptors, this phenomenon is rarely assessed quantitatively. Most young accipiters appear to remain within or near their natal territory for at least 2-3 weeks after fledging, some for more than 8 weeks (Smeenk & Smeenk-Enserink 1977; Cramp & Simmons 1980).

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■

Short Notes—

The Turquoise Parrot *Neophema pulchella* in East Gippsland

In the early part of the century the Turquoise Parrot *Neophema pulchella* suffered a severe decline in numbers, with some observers even regarding it as extinct (e.g. Campbell 1915). Populations recovered from the 1930s onward (Chaffer & Miller 1946, Frith 1952, Forshaw 1981, Blakers et al. 1984) and in Victoria populations in the north-east of the state are still increasing in range and numbers (B. Quinn pers. comm.). However, the species is still regarded as restricted and rare in Victoria (Forshaw 1981, Anon. 1987).

Turquoise Parrots have been recorded near Mallacoota, east Gippsland, Victoria, for a number of years. The population is of interest, as it is very isolated from other known populations, and because it uses coastal heathland, an atypical habitat for the species (Forshaw 1981, Blakers et al. 1984). In this note I describe the status and distribution of the species in far-east Gippsland.

There have been irregular records of Turquoise Parrots in far-east Gippsland since a sighting in 1950 (L. Robinson pers. comm.). Until 1984 all records were from the coast near Mallacoota, mostly at Shipwreck Creek, 15 km west of Mallacoota (K. Morrison pers. comm., L. Robinson pers. comm., M. Ruff pers. comm., H. Beste pers. comm.). In addition it is possible that some records of Blue-winged Parrots *Neophema chrysostoma* from the district (e.g. Pascoe 1979) may have been misidentified Turquoise Parrots. Blue-winged Parrots are absent, or are at best very rare visitors to east Gippsland (Emison et al. 1987).

Numbers of Turquoise Parrots around Mallacoota are quite low. The highest number of birds recorded at one time was of six birds at Shipwreck Creek in 1986 (M. Ruff pers. comm.). At this site they have been observed in both coastal heathland and adjacent lowland sclerophyll forest (sub-community 17.1 and community 16 in Forbes et al. 1982).

In December 1984 and March 1985, Turquoise Parrots were observed in a separate area 30 km north of the Mallacoota sites (Drummond 1985, pers. obs.). Pairs of adults inspecting nest sites were observed in December and a group of eight juvenile-plumaged birds was observed in March. All observations were along the Wingan River (north of the Princes Highway) and the adjacent catchments of Jones Creek and Genoa Creek. All of the parrots observed were in coastal heathland or nearby lowland sclerophyll forest (sub-communities 17.1, 17.4 and 16.2 in Forbes et al. 1982). Most of this area