

## MORPHOLOGICAL NOTES FOR *Accipiter* SPECIES IN NORTHERN QUEENSLAND

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Morphological data are given for some forms of *Accipiter* species and a few other raptors captured in northern Queensland. The complexity of tropical Australian *Accipiter* assemblages is briefly discussed in terms of intraspecific and interspecific differences.

### INTRODUCTION

Throughout much of northern Australia the Brown Goshawk *Accipiter fasciatus*, Collared Sparrowhawk *A. cirrhocephalus* and Grey Goshawk *A. novaehollandiae* are sympatric, together with the Red Goshawk *Erythrotriorchis radiatus*. Moreover, for part of each year two subspecies of the Brown Goshawk (*fasciatus* and *didimus*) coexist in the far north, and the same may be true for the Collared Sparrowhawk (*cirrhocephalus* and *quaesitandus*). Although mensural data are few for these taxa in the tropics, all forms are certain to be strongly dimorphic, with females probably 15–25 per cent larger and 70–95 per cent heavier, on average, than males. Thus, the *Accipiter* assemblages in northern Australia are particularly diverse.

Here some measurements are presented for accipiters (and a few other raptors) captured live in northern Queensland. The data are relatively few, however they will be of interest to banders working in the area, and also have a wider usefulness. Elucidation of morphological differences is integral to studies of *Accipiter* assemblages and, although the genus is richest in the tropics, the ecology of tropical assemblages in Australia and elsewhere is largely unstudied.

### METHODS

From 16 May–1 August 1986, six 600×600×900 mm traps similar to the 'falling lid' traps of Kenward and Marcström (1983) were used to capture raptors near Kuranda (16°50'S, 145°38'E), northern Queensland. The traps, baited with live white Feral Pigeons *Columba livia*, were placed

on the ground in 18 positions on tracks and other clearings (including orchards and pastures to 50 ha) within a 50 sq km area of tropical rainforest. They were set for periods of 60–100 hrs for a total of c. 850 hrs/trap.

The raptors captured were weighed and measured for up to 11 linear parameters, and most were banded before release\*. Measurement procedures followed those of Baldwin *et al.* (1931) and Gurr (1947). Mass was recorded to the nearest 5 g, wing and tail length to the nearest 5 mm, and other linear parameters to the nearest 0.1 mm. Characteristics of plumage and bare parts were noted. Captured accipiters were sexed by size using criteria developed from museum specimens collected in Queensland and sexed by dissection. To be sexed as female, captives needed to equal or exceed at least two of the following measurements: Brown Goshawk, wing length 285 mm, tail length 215 mm, mass 350 g; Collared Sparrowhawk, wing length 225 mm, tail length 175 mm, mass 170 g; Grey Goshawk, wing length 280 mm, tail length 200 mm, mass 500 g. Other captured raptors were sexed by comparing their measurements with those given by Condon and Amadon (1954) and Baker-Gabb (1984).

Brown Goshawks, Collared Sparrowhawks, a Little Eagle *Hieraaetus morphnoides*, a Spotted Harrier *Circus assimilis* and Brown Falcons *Falco berigora* were aged to the degree possible following the criteria given by Aumann (1988a), Slater (1970), Debus (1984), Simpson and Day (1984)

\*Bands were supplied by the Australian Bird-banding Scheme, CSIRO Division of Wildlife and Rangelands Research, Canberra.

and Weatherly *et al.* (1985), respectively. Grey Goshawks captured were not aged because the available ageing criteria were considered inadequate. Brown Goshawks and Collared Sparrowhawks were identified to subspecies following the plumage descriptions (but not the measurements) given by Condon and Amadon (1954) and Wattel (1973).

## RESULTS

Twenty-six accipiters were captured a total of 31 times: 15 Brown Goshawks, five Collared Sparrowhawks and six Grey Goshawks. Discounting retraps, the average capture rate was *c.* 0.5 accipiters/100 trap hrs.

All Brown Goshawks captured (nine first-year males, three first-year females and three third-year or older females) appeared to be referable to *A. f. fasciatus*, indistinguishable in plumage and bare parts from those captured previously by the author in Victoria (Aumann 1988a). Compared with those calculated for Victoria, means for northern Queensland Brown Goshawks (Table 1) were 0.4–10.6 per cent smaller for nine of 11 linear measurements, and northern Queensland individuals averaged 9.6 per cent (males) and 21.1 per cent (females) lighter than those from Victoria captured in winter. Of the six females captured in northern Queensland, four were as light or lighter (440, 420, 420 and 375 g) than any captured in the Victorian study (range 440–700 g, *n*=121). However, at 565 and 540 g the others were as heavy as 'typical' Victorian females. Despite the relatively small number captured, northern Queensland Brown Goshawks also exhibited considerable variation in linear measurements: 7.7–23.0 per cent (males) and 3.5–25.3 per cent (females). On average, males were smaller than females for all measurements, although there were range overlaps for seven of 12 parameters.

All Collared Sparrowhawks captured (three first-year and two second-year or older females) appeared referable to *A. c. cirrhocephalus*. For all parameters, mean values calculated for Collared Sparrowhawks were lower than those for male Brown Goshawks (Table 1). Nevertheless, range overlaps existed between female Collared Sparrowhawks and male Brown Goshawks for all

parameters except mass, and claw measurements for some Collared Sparrowhawks exceeded those recorded for all of the male Brown Goshawks captured.

Although all Grey Goshawks captured (five males and one female) were of the grey morph, their irides varied greatly in colour and their plumage in both colour and pattern. The extent and distribution of brownish colouration in the plumage was particularly variable. The female had red irides. She was entirely grey above and white below, apart from fine horizontal grey barring on the chest and grey areas at the sides of the throat. No brownish feathering was present. At 755 g she was more than twice as heavy as any male captured. One male also had red irides. He had a substantial brownish tinge on the upper tail and wing feathers, throat, chest, abdomen, nape and back. In another male with dark brown irides, the brown colouration was restricted to the upper surfaces of the central rectrices, underwing coverts, under surfaces of primaries and secondaries, and throat. While both of these males had horizontal grey barring on the chest, this was lacking in two others. Both of these, one with chestnut-brown and one with dark brown irides, were completely white on the throat, chest and abdomen. Brownish tinges were restricted in the former to patches at both sides of the throat and in the latter to the upper wing and tail surfaces and back. The remaining male had bright yellow irides. Grey dorsally, he had broad brownish-grey barring on the chest, abdomen and underwings. For both sexes, on average, Grey Goshawks were heavier than Brown Goshawks captured, although their wings and tails were shorter.

Five other raptors were captured. These were a light morph first-year female Little Eagle (tail length 215 mm, wing length 400 mm, mass >1 000 g), a third-year or older female Spotted Harrier (tarsus 104.7 mm, tail 295 mm, wing 450 mm, mass 760 g) and three Brown Falcons (a first-year male, tarsus 71.7 mm, tail 200 mm, wing 350 mm, mass 380 g; a second-year or older male, tarsus 67.0 mm, tail 200 mm, wing 315 mm, mass 440 g; and a second-year or older male, tail 170 mm, wing 310 mm, mass 390 g).

## DISCUSSION

At c. 0.5 captures/100 trap hrs versus 0.7–1.5 captures/100 trap hrs, the capture rate for accipiters in northern Queensland was lower than those found for Brown Goshawks in southern Victorian habitats where other accipiters are scarce (Aumann 1988b). The difference may have reflected relative population densities. Alternatively, it may have been due to the smaller area (c. 50 v. 64 sq km) and fewer trapping positions (18 v. 49) used in the Queensland study, to differences in prey availability, to different lure visibility in different habitats, or a combination of these. Capture rates in Victoria were lowest in relatively forested areas.

Ford *et al.* (1981) noted *A. f. didimus* to occur as far south in eastern Queensland as the Chillagoe area (c. 17°S, 144°E), however, it was not recorded in this study. It is possible that this form partially or totally vacates some of the southern parts of its eastern range for the winter, as has been suggested for the Kimberleys in Western Australia (Storr 1980). It is unlikely that *A. f. didimus* females were misidentified here as *A. f. fasciatus* males because those captured lacked the pale plumage characteristically associated with the former taxon, and because their measurements were more in keeping with those of the latter. Females of *A. f. didimus* are generally larger than males of *A. f. fasciatus*, although range overlaps occur for most measurements

TABLE 1

Mass\* (g) and linear measurements (mm) for *Accipiter* spp. captured near Kuranda, Queensland.

Parameter	Sex	Brown Goshawk				Collared Sparrowhawk				Grey Goshawk			
		Mean	SD	Range	n	Mean	SD	Range	n	Mean	SD	Range	n
Hind toe length	M	22.7	1.5	20.9–25.7	8								
	F	25.4	1.9	22.9–27.0	4	20.7	2.0	18.8–23.5	4				
Inner toe length	M	24.6	1.7	22.9–27.5	8								
	F	27.5	2.3	24.5–30.7	5	22.5	2.2	21.0–25.8	4				
Middle toe length	M	38.1	2.4	35.7–42.9	8								
	F	41.5	1.6	40.0–43.1	4	36.8	2.9	33.9–40.9	4				
Outer toe length	M	27.4	1.7	25.5–29.6	8								
	F	29.5	1.5	27.2–31.4	5	25.5	1.7	23.1–26.9	4				
Hind claw length	M	19.2	0.4	18.6–19.8	7								
	F	22.0	1.0	21.2–23.4	4	18.2	1.7	16.2–20.4	4				
Inner claw length	M	18.6	0.5	18.2–19.6	7								
	F	21.3	0.9	20.8–22.7	4	18.2	1.6	16.1–19.9	4				
Middle claw length	M	14.7	0.5	14.1–15.5	7								
	F	16.7	1.0	15.5–17.9	4	14.3	1.4	13.1–15.9	4				
Outer claw length	M	12.9	0.4	12.4–13.5	7								
	F	14.4	0.6	13.7–15.1	4	12.5	1.1	11.1–13.8	4				
Tarsus length	M	73.4	1.9	70.7–76.2	9					66.7	3.9	60.1–70.3	5
	F	77.4	2.0	74.7–79.0	5	72.0	3.3	67.1–74.9	5	76.4			1
Tail length	M	201.1	6.0	190–210	9					182.0	5.7	175–190	5
	F	225.0	5.0	220–230	5	192.0	6.7	185–200	5	215			1
Wing length	M	259.0	12.2	235–280	9					249.0	2.2	245–250	5
	F	291.0	4.2	285–295	5	252.0	7.6	240–260	5	285			1
Mass	M	330.0	26.5	315–380	7					354.0	20.4	325–370	5
	F	460.0	75.2	375–565	6	270.0	12.2	260–290	5	755			1

\*The mass measurement used is that recorded at the time of first capture for each individual.

Masses recorded at recaptures were as follows:

Brown Goshawk first-year male: first capture 13 June, 345 g; second capture 25 June, 330 g.

Brown Goshawk first-year female: first capture 25 May, 440 g; second capture 28 May, 415 g.

Collared Sparrowhawk first-year female: first capture 23 July, 270 g; second capture 29 July, 260 g.

Grey Goshawk female: first capture 8 June, 755 g; second capture 7 July, 670 g.

Grey Goshawk male: first capture 1 July, 370 g; second capture 11 July 360 g.

(Condon and Amadon 1954; Wattel 1973; Aumann 1988a). Nevertheless, many museum specimens labelled as *A. f. didimus* are similar in plumage to many *A. f. fasciatus* specimens, and further work is needed to establish definitive distinguishing criteria. This is particularly necessary given Ford's (1986) suggestion that the taxa may be sympatric year-round in some areas, and that they may, in fact, be separate species.

The data presented here are consistent with a very variable wintering *A. f. fasciatus* population, possibly involving two size classes. There is considerable evidence that the nominate subspecies is migratory over much of Australia (Aumann 1986), and Storr (1984) reported it to invade northern Queensland in winter. A winter sympatry of *A. f. fasciatus* size classes would occur if northern Queensland residents are smaller than those from more southerly latitudes (as suggested by the data given here and in accordance with Bergman's Rule), and they are joined during winter by goshawks from the south. Thus, the *Accipiter* assemblage in parts of northern Queensland may be more complex than has been perceived. Far more morphometric data, preferably augmented by banding recovery data, are needed to clarify the situation.

In contrast to both male and female Brown Goshawks, the female Collared Sparrowhawks captured showed little (c. 10%) variation in mass, and (like the female Brown Goshawks) their wing and tail lengths varied by less than ten per cent. The overlaps recorded in the ranges of many measurements between female Collared Sparrowhawks and male Brown Goshawks imply that care must be taken in identifying the species in the hand. As illustrated by Disney (1963), the Collared Sparrowhawk has a far longer middle toe (relative to the other toes) than the Brown Goshawk, and this remains the ideal defining characteristic. That no male Collared Sparrowhawks were captured in this study may indicate that the lures used were too large to attract them. Further evidence for this is that nine first-year but no older male Brown Goshawks were captured. Mueller and Berger (1970) reported immature Sharp-shinned Hawks *A. striatus* to be similarly less discerning than adults in attacking too-large lures.

There is much to be learned regarding the plumage and bare parts of grey morph Grey Goshawks, at least in tropical Australia. Formerly known, perhaps appropriately, as the 'Variable Goshawk', the species occurs in numerous forms on the islands north of Australia. At least three features warrant further study, particularly as they vary with age: 1) colour of the irides; 2) presence/absence/degree of grey chest barring; and 3) amount and distribution of brownish colouration in the plumage. Most references list the eye colour of the Grey Goshawk as red or dark red, although Morris (1976) noted adults and juveniles to have ruby-red and olive-grey eyes, respectively. The yellow-eyed Grey Goshawk captured at Kuranda was probably a first-year bird, and red irides may denote maturity. The eye colour of many (probably all) accipiters changes progressively in the weeks after fledging, and in some species obvious changes continue to occur for years after the 'adult' plumage is acquired (Snyder and Snyder 1974). Adult grey morph Grey Goshawks are invariably illustrated with grey chest barring, but North (1901-14) described adults as all white on the undersides. Whether this difference is geographic, age-related or purely individual is presently unknown. However, the existence of ventrally unbarred individuals in northern Queensland raises the possibility of confusion with the Grey-headed Goshawk *A. poliocephalus*, a New Guinean species occasionally rumoured but not confirmed for Cape York Peninsula. The species are superficially similar, and some female Grey-headed Goshawks (e.g., ANWC 8416) are as large as many male Grey Goshawks.

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## OBSERVATIONS ON BREEDING YELLOW-EYED CUCKOO-SHRIKES *Coracina lineata*

On 3 January 1983 I observed an adult Yellow-eyed Cuckoo-shrike *Coracina lineata* perched in a wattle *Acacia* sp. at Macquarie Nature Reserve, Port Macquarie, New South Wales. The vegetation of the Reserve is comprised of wet sclerophyll forest, rainforest, and a eucalypt plantation developed as a Koala sanctuary. A limited number of exotic species occur in close proximity to the historic homestead 'Roto'. An adult Cuckoo-shrike was also present at the Reserve on 7 January and 8 January 1983. On the latter date the bird was perched in a Camphor Laurel *Cinnamomum camphora* and held an orange-yellow fruit, probably a Port Jackson Fig *Ficus rubiginosa*, in its bill. It flew to another Camphor Laurel, still carrying the fruit, and from its rather secretive behaviour I suspected that it may have been feeding a young bird there. The following day two Cuckoo-shrikes were perched in a Lilly Pilly *Acmena smithii* in the same general area. One was an adult, but the other was partly obscured, and its age could not be determined. One was making a churring call somewhat like the typical call of the Black-faced Cuckoo-shrike *C. novaehollandiae*. Later that morning an adult was observed feeding in a Port Jackson Fig. An adult and a juvenile were present in a Camphor Laurel in the afternoon, the latter being fed by the adult. The juvenile had a short tail, a dark line through the eye and lacked barring on its ventral surface. Single adult Yellow-eyed Cuckoo-shrikes were present at the Reserve between 10 and 24 January. On 4 February an adult was observed feeding an immature bird in a eucalypt. The immature was distinguished from the adult by whiter underparts with incomplete barring. An adult seen flying from a Pink Bloodwood *Eucalyptus intermedia* to a Port Jackson Fig on 6 February was the last observation of the species at that location for 1983.