

Sexual Dichromatism in Nestling and Juvenile Treecreepers

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Introduction

Most sexually dimorphic passerines are monomorphic in plumage when young. Some familiar Australian examples are the fairy-wrens, whistlers and bowerbirds. In such species, the male is the more brightly coloured sex among adults, while juveniles of both sexes resemble the female. The dull plumage of the young male undoubtedly affords him more protection during this vulnerable stage of life than the bright colours he later assumes. Presumably also there is little advantage in advertising his sex until he is capable of breeding.

This paper reports on the unusual phenomenon of sexually dimorphic plumages in juveniles of the Australasian treecreepers (Climacteridae). Sexual dichromatism is weak in this family, and the male is not necessarily the more brightly coloured sex. Females of all six Australian species have chestnut markings on the cheek or upper breast, whereas in males, these markings are absent (in three species) or black (Keast 1957, Disney et al. 1974). During a long-term study of treecreepers, I collected data on the development of plumage in three species — the White-throated *Cormobates* leucophaea* (Boles & Longmore 1983), Red-browed *Climacteris erythroptis* and Brown *C. picumnus* Treecreepers. These birds have exceptionally long nestling periods for such small birds — 26 days in all species. They are also capable of breeding in their first year (Noske 1982a, b).

Methods

Colour-banded populations of White-throated and Red-browed Treecreepers were established at Wollomombi Falls (40 km east of Armidale, N.S.W.), and of White-throated and Brown Treecreepers at Swan Vale (100 km north-west of Armidale) and 'Stringybark Hill' (2 km north of Armidale). Each site was visited monthly for three years or more from March 1977, and every known individual checked. Accessible nests were inspected as frequently as possible with the aid of a 12 m aluminium extension ladder. Nestlings were extracted from nest holes by hand where possible, but as most holes were too deep or narrow to permit this, a noose of fishing line (housed in a rigid but malleable metal tube) was used to extract, as well as return, them by the neck. This procedure never resulted in injury to the bird. Nests with well-developed young were usually not inspected because of the possibility of causing premature fledging.

* *Climacteris* in the Interim List of Australian Songbirds, 1975.

Results



White-throated Treecreeper

Mellor (1915) and White (1915, p.142) were among the first to suggest that the conspicuous patch of orange-chestnut on the rump and upper-tail coverts of young White-throated Treecreepers was peculiar to females. Howe (1921) reported a nest containing two young, one of which had an orange cheek spot (diagnostic of females) and 'bright red rump', and the other having 'no cheek patch and a grey rump . . . slightly washed with rufous'. Another nest contained four young, all with the rich rufous rump, but Howe neglected to mention whether they had orange cheek spots. Nevertheless, his observations indicated that this species acquired sexually diagnostic markings before leaving the nest.

My examinations of young at many nests had indicated that nestlings became dimorphic during the first half of the nestling period, so I watched two nests closely to determine the age at which sexes began to differentiate in appearance. Nine days after hatching, quills emerged from the skin of the cheeks; they were either deep reddish-orange (in females) or pale buff (in males). Yet the feathers of the rump and upper-tail coverts burst from their dark quills one to two days earlier. At the first nest with three eight-day-old young, these feathers were entirely rufous on the two females (sexed the next day by cheek colour) but grey on their brother. At the second nest, one female nestling had rufous on only four of its ten upper-tail coverts, and pale grey tips to some of the rufous rump feathers; her sister and brother, however, resembled the female and male young of the first nest respectively. Plate 42 shows the latter siblings three days before they fledged.

Data for 70 sexed nestlings or fledglings (31 male : 39 female) show that the rufous on the rump (and upper-tail coverts) was uniform on the majority of females, but patchy on the remainder (13%); none had entirely grey rumps (Table 1). Males had all-grey rumps in 68% of cases; two birds showed extensive rufous and the remainder had chestnut edges to some of the rump feathers. The sex of two handled birds was indeterminate; one had a grey rump and the other a rufous rump, but both possessed cheek patches of an intermediate colour (deep buff). Determination of rump colour of fledglings in the field was probably less accurate than that of nestlings in the hand. One fifteen-day-old male nestling possessed chestnut flecks near the tips of twelve rump feathers, but these were not apparent eleven days later when he fledged.

The age at which White-throated Treecreepers lose the rufous colouring on the rump is not clear. This is partly because few birds of known age have been recaptured and because banders generally failed to record the methods used to assess age and sex. Of 221 'juveniles' (including nestlings and 'immatures') banded through the Australian Bird-Banding Scheme up to 30 June 1979, 51 (23%) were subsequently recovered (D. Purchase, in litt.) but only one of these was banded as a nestling. All but six of these 51 birds were banded between October and March inclusive, the period over which young of the season (mainly September to



Nestling female (left) and male (right) White-throated Treecreepers, 23 days after hatching.

Plate 42

Photo: R. A. Noske

December) could be expected. Thirty birds banded as 'juveniles' were re-trapped as 'adults' within four months of banding. Assuming the former were distinguished by rufous on the rump, and the latter by their lack of it, these data suggest that the rufous disappears within the first few months of life, as stated by Wilson (1969, p.375). However this reasoning is somewhat circular as it assumes that all rufous-rumped birds are in their first year.

Table 1
 Sexual dimorphism in rump coloration of young* White-throated Treecreepers

Sex†	Amount of Rufous on Rump†			Total
	Uniform	Patchy	None	
Male	2	8	21	31
Female	34	5	0	39
Total	36	13	21	70

* includes nestlings examined in the hand, as well as fledglings mist-netted or observed closely in the field.

† sexed on basis of colour of lower cheek.

† includes upper-tail coverts.

My observations indicate that the rufous on the rump of some White-throated Treecreepers persists for longer periods. On one female at Wollomombi Falls, traces of rufous were visible in the field for over four years from the time of her discovery till her disappearance. Another female retained the rufous for at least 14 months, though it was not discernible in the field after the first six months. A third female, banded as a juvenile in February at Stringybark Hill, showed gradual diminution of rufous when re-trapped in April and July, but this colour was still visible in the field in September just before she disappeared. Unfortunately, all birds banded as nestlings or fledglings at the study sites disappeared within two months of fledging and were never recaptured.

Juvenile White-throated Treecreepers of both sexes typically possessed creamy or buffish-white streaks with black edges, along the feather shafts of the lower scapulars and occasionally the back. North (1906) described similar markings on the greater wing coverts of immature birds, but I have only found inconspicuous white tips to these feathers. Although scapular streaks were evident on all juveniles handled, they were not always noticeable in the field. The distinctness and number of streaks varied considerably between individuals, even siblings of the same sex. Moreover, several adult females at Wollomombi retained whitish shafts on their scapulars for at least two years. Apart from this feature, and occasionally rufous patches on the rump, juvenile males were difficult to distinguish from adult males. This fact possibly explains, in part, why approximately four times more juvenile females have been banded than juvenile males according to banding records (supplied by D. Purchase).

Other plumage features I noted on well-feathered nestlings were: thin grey margins to the white feathers of the lower throat and chest giving a scaly effect; reduced area or absence of white on the lores; and a strong cinnamon wash to the under-tail coverts and occasionally the breast and abdomen on some birds. A few females had a cinnamon tinge on the crown and ear coverts, or on the tips of the outer tail feathers. North (1906) stated that young birds just before leaving the nest have the forehead and crown 'dull dark brown without any paler margins to the feathers', but all nestlings I handled had the 'scaloped' forecrown typical of older birds. Late nestlings also had blackish-brown legs with bright yellow behind the 'knees', on the tips of the toenails, and on the underside of the toes. The bill was blackish-grey with a yellow cutting edge and base to the lower mandible, while the gape was pale cream. Most of these features remained on birds after they fledged.

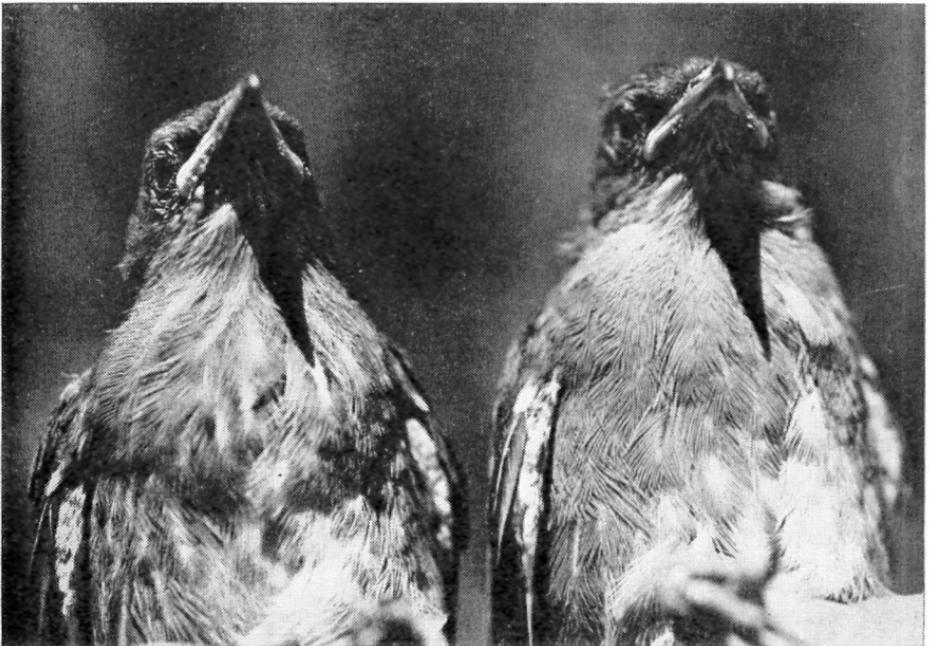
□

Red-browed Treecreeper

In contrast to the bold black-, white- and brown-striped belly of adult Red-browed Treecreepers, juveniles of this species have a plain brownish-grey under-surface, though often with some whitish streaks, mainly visible in the hand (Plate 43). Additionally, the rufous-orange or deep brick red region on the face of adult males and females respectively, is mid-grey in juveniles of both sexes.

Although most nests of Red-browed Treecreepers at Wollomombi Falls were inaccessible, I eventually located a nest outside the study site, situated in a stump only 1.8 m high. The two nestlings were colour-banded 13 days after hatching, and when inspected eight days later, one had faint reddish markings, partly hidden, on the chest, but the other did not. Four months later, these two birds were clearly identifiable as female and male respectively. Young from nests at the study site could not be reliably sexed in the field until at least 30 days after fledging. A few reddish-chestnut stripes were noted on two non-sibling females at 35 and 36 days post-fledging, while on another bird of the same age (later sexed as female) these markings were not apparent.

The reddish facial markings of this species developed slowly in both sexes. Two males at 50 and 60 days post-fledging showed little evidence of colour on the face in the field. One female showed reddish specks on the forehead at 52 days, but two others (one in the hand) did not at 85 and 87 days post-fledging. Incomplete facial markings were noted on males up to 108 days post-fledging, and on females up to 153 days. One male and one female were apparently indistinguishable from adults of their sex at 120 and 145 days respectively. Thus adult facial plumage was attained between fifteen and twenty weeks after fledging, but the diagnostic chest markings of females became apparent as early as five weeks after fledging. Young nestlings had flesh-grey legs, with paler claws, but older birds had blackish-grey legs. The bill and gape were cream-coloured, with slate-grey along the top of the culmen and tip of the mandible. Fledglings had a predominantly pale bill in contrast to the mainly dark one of fledgling White-throated Treecreepers.



Nestling Red-browed Treecreepers, 21 days after hatching. Note faint pale stripes on under-surface of female (left).



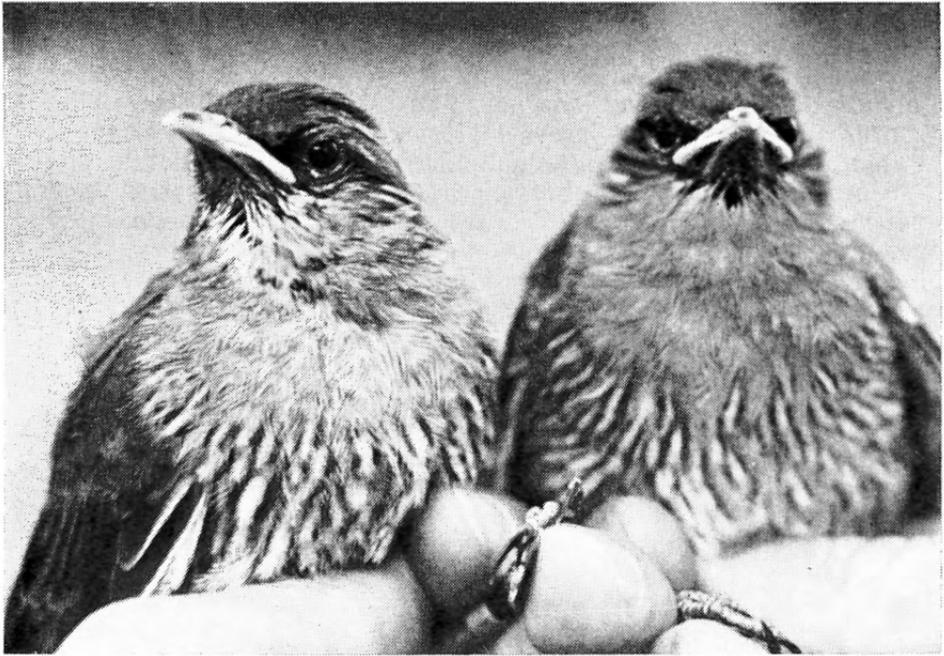
Brown Treecreeper

North (1906) and later texts (e.g. Disney et al. 1974, Orenstein 1976) described the immature Brown Treecreeper as having ill-defined streaking on the underparts and a rufous wash to the flanks and under-tail coverts. They failed to note the dark dorsum of young birds, in which the dark grey crown contrasts with the chocolate-brown back and wing coverts, resembling the plumage of Red-browed Treecreepers (both juvenile and adult). On adult Brown, these parts are brownish-grey and dull medium brown respectively. Moreover the eyebrows and cheeks of juveniles are grey rather than sandy-buff. The underparts are more or less similar to those of adults, except for the rufous wash on the sides and belly. In addition, young males have a white throat marked with black on most of the lower feathers. Interestingly, after collecting a young male Brown Treecreeper, White (1917a, b) considered it so distinctive in coloration as to name it a new species — the 'Cooper's Creek Treecreeper (*C. waitei*)'. Fortunately others (e.g. Howe 1921, Campbell 1923) realized his mistake.

Despite the weak sexual dimorphism in the plumage of adult Brown Treecreepers, nestlings of this species could be sexed at an earlier age than Red-browed, because of the distinctive markings of the male. Between 14 and 16 days after hatching, the feathers emerging from the lower throat quills of males had black freckles, which eventually developed into a black-spotted white 'bib' on fledglings of this sex (Plate 44). The rufous markings on the lower throat of females were discernible on 20-day-old nestlings in the hand, but generally invisible on fledglings in the field. Adult plumage was acquired by about two months after fledging except for a cinnamon suffusion on the flanks, which remained for over a year on some birds. As in the Red-browed, nestling Brown Treecreepers had flesh-grey legs, darkening with age, and a predominantly pale bill (see also Boehm 1957). The pale gape was visible in the field for at least three months after fledging.

Discussion

As sexual dichromatism in Australasian treecreepers is relatively weak, there is probably no strong selection pressure to decelerate the development of sexually diagnostic characteristics. Except for the coloured rump of juvenile White-throated, the sex markings of treecreepers are situated ventrally, and would therefore be inconspicuous to potential predators. That juvenile White-throated Treecreepers display their bright rump even while in the nest probably relates to the relative safety of their enclosed nests. Similarly, the long nestling periods of hole-nesting species like treecreepers are presumably permitted because the nestlings are less vulnerable to predators than those of species nesting in open cups (Haartman 1957). It is noteworthy that most species of woodpeckers (Picidae), also hole-nesters, exhibit sexually dimorphic plumages as nestlings (e.g. Bent 1939). Goodwin (1968) suggested that adult coloration in young woodpeckers might be advantageous in the acquisition of territories. On the other hand, such plumage might provoke aggressive responses from



Nestling male (left) and female (right) Brown Treecreepers, three days before fledging.
Plate 44 Photo: R. A. Noske

parents. Indeed, Johnston (1967) argued that sexual dimorphism in young birds has no adaptive value.

The pronounced sexual dimorphism of juvenile White-throated Treecreepers may be adaptive in the context of dispersal. This species is strongly territorial and young are evicted as soon as they reach independence, 30 to 40 days after fledging. Dispersing youngsters search for an unoccupied space, or a vacancy within an established territory. Juvenile females probably subdue territory-holders, or attract potential mates by displaying their bright rump patch, which they accentuate by drooping their wings (Noske 1982b). Perhaps also juvenile males are incapable of giving sexually diagnostic calls, and thus cannot advertise their sex vocally as can adult males. Since no consistent sex-based dominance hierarchy occurs in this species, there is presumably no advantage in concealing gender.

Unlike the White-throated, the Red-browed and Brown Treecreepers have no sexually diagnostic territorial calls, and a rigid dominance hierarchy exists, where females are subordinate to males, regardless of age (Noske 1982a, b). In these social species, young males may remain in their natal territory for several years, but females usually disperse during their first year. Thus dispersing birds are most likely to be female, and need not advertise their sex. In the Red-browed Treecreeper, the slow development of adult plumage seems to be correlated with a protracted period of juvenile dependency. Juveniles of this species are fed for up to 80 days after fledging, suggesting that young are dependent for a least ten weeks. In the Brown Treecreeper, however, juveniles become independent between 30 and 40 days post-fledging (Noske 1982b).

The remaining three Australian species of treecreepers are probably also sexually dimorphic in plumage as juveniles, particularly since the Rufous *Climacteris rufa* and Black-tailed *C. melanura* Treecreepers show a greater degree of sexual dimorphism as adults than the Brown. Sexual dichromatism in the White-browed Treecreeper *C. affinis*, as in the Red-browed, probably increases gradually during the first six months of life. By contrast, juvenile White-throated display marked dimorphism but this weakens with age. This reversal of the normal pattern of plumage development in dichromatic species is also seen in the 'Orange-winged' (Varied) *Sittella Daphoenositta c. chrysoptera* (Noske 1980), although this may not be the case with all races of this species (Short et al. 1983).

Conclusions

The White-throated, Red-browed and Brown Treecreepers all exhibit some degree of sexual dichromatism as juveniles, but only the White-throated is markedly dichromatic in the field. In the hand, White-throated can be sexed as early as nine days after hatching using the adult criterion. Although juvenile females invariably have rufous on the rump, juvenile males do not always have grey rumps. Thus juvenile White-throated Treecreepers should not be sexed on the basis of rump coloration alone. Red-browed Treecreepers cannot be sexed reliably in the field until at least 30 days old, at which age the female's characteristic reddish chest stripes become apparent. The Brown Treecreeper is less dichromatic than the Red-browed when adult, but more dichromatic when young, with males displaying their diagnostic markings as early as 14 days after hatching.

Juveniles of the Red-browed and Brown Treecreepers resemble each other in the colour of their soft parts and dorsal plumage. Both these species have a readily distinguishable juvenile plumage, though it lasts much longer in the Red-browed. The pattern of the under-surface (plain, except for some whitish shaft streaks) in juvenile Red-browed is more reminiscent of the pattern in the Rufous Treecreeper than that of its nearest relative, the White-browed, in which juveniles have a striped belly (pers. obs.). Thus it is difficult to guess the ancestral ventral condition in *Climacteris*. Age differentiation in *Cormobates* is less marked than in *Climacteris*, as juvenile male White-throated are barely distinguishable from adults of their sex. Sex differentiation in this species, however, is pronounced (albeit variable) in juveniles. The rufous patch on the rump of juvenile females seems to be adaptive because it is accentuated during submissive displays performed by dispersing birds. On the other hand, sexual dichromatism in juveniles of *Climacteris* probably has no selective value.

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