

H.L. Bell commented on an earlier draft of this paper.

REFERENCES

- BOEHM, E.F. 1957. Perching birds (Passeriformes) of the Mount Mary Plains, South Australia. *Emu* 57: 311-324.
- DOW, D.D. 1980. Communally breeding Australian birds with an analysis of distributional and environmental factors. *Emu* 80: 121-140.
- GASTON, A.J. 1977. Social behaviour within groups of Jungle Babblers (*Turdoides striatus*). *Anim. Behav.* 25: 828-848.
- HARRISON, C.J.O. 1969. Helpers at the nest in Australian passerine birds. *Emu* 69: 30-40.
- HYEM, E.L. 1937. Notes on the birds of Mernot, Barrington, N.S.W. *Emu* 36: 109-127.
- IMMELMANN, K. 1961. Beiträge zur Biologie und Ethologie australischer Honigfresser (Meliphagidae). *J. Orn., Lpz.* 102: 164-207.
- LORD, E.A.R. 1956. The birds of Murphy's Creek District, Southern Qld. *Emu* 56: 100-128.
- ROWLEY, I. 1976. Co-operative breeding in Australian birds. *Proc. XVI Int. Orn. Congr.*: 657-666.
- SERVENTY, V. 1958. Bird notes from the Dumbleyung Campout, 1956. *Emu* 58: 5-20.

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MORPHOLOGY AND DEVELOPMENT OF NESTLING GREY-CROWNED AND HALL'S BABBLERS

Information on the morphology and development of nestlings is available for few Australian passerines. Yet this knowledge is valuable because details such as the arrangement of natal down may prove to be useful taxonomic characters, particularly at supra-specific levels. In this note we describe and compare nestling Grey-crowned and Hall's Babblers, *Pomatostomus temporalis* and *P. halli* (Timaliidae).

Between August and December 1980 we repeatedly examined twenty-one nestling Grey-crowned Babblers. Most nests were on a pastoral property ('The Dell') 8 km south-east of Meandarra in south-east Queensland. This is currently the main study site of the Meandarra Ornithological Field Study Unit of the University of Queensland. From 30 August to 8 September 1980, during an expedition to 'Goonamurra', a property near Eulo in south-west Queensland, we examined eight nestling Hall's Babblers aged between 0 and 10 days. The nomenclature of the patches of natal down (neossoptiles) follows Saunders (1956) and the naming of the tracts of feathers (teleoptiles) follows Lucas & Stettenheim (1972). We called the day of hatching Day 0.

The nestling periods of twelve Grey-crowned Babblers were 17-22 days (mean 19.3 days, s.d. 1.37). Brown (1979) reported the age of fledging of the oldest in a brood to be 20-22 days. Five oldest nestlings in our sample fledged at 19-22 days (mean 19.8 days, s.d. 1.31) (excludes single nestling fledging at 17 days as it obviously lacked opportunity for any developmental manifestation of social behaviour and Brown's sample

did not contain any such birds). These estimates agree well; our daily examinations of the young may have slightly hastened fledging. We were unable to determine the nestling period of Hall's Babbler.

Newly-hatched Grey-crowned Babblers weighed about 3.7 g, Hall's Babblers about 3.0 g. Adult Grey-crowned Babblers, both sexes combined and birds at least two years of age, averaged 75.0 g (SE = 0.275, N = 321); Hall's Babblers, at least one year old, averaged 41.5 g (SE = 0.456, N = 15). In both species the colour of the skin varied slightly, even within broods, but it was usually orange or pink-orange and brighter ventrally than dorsally. The bill was the same colour as the skin or more yellow, the buccal lining and tongue yellow-orange, the rictal flanges yellow or bright yellow, and the egg-tooth white. Usually the tip of the mandible protruded beyond that of the maxilla by about 1 mm.

The following six patches of natal down were common to both species: coronal, occipital, dorsal, humeral, secondary and femoral (Fig. 1). In addition, Hall's Babblers possessed an ocular patch, above and behind the eye. The dorsal patch was median, the others bilaterally paired. In both species, down was restricted to the dorsum, except that one nestling Hall's Babbler showed traces of an abdominal patch. In some Hall's Babblers, both parts of the coronal patch were discontinuous, giving four elements altogether.

Natal down was fine and rather sparse. That on the body and wings was grey. All down on the head of Grey-crowned Babblers was white, whereas in Hall's

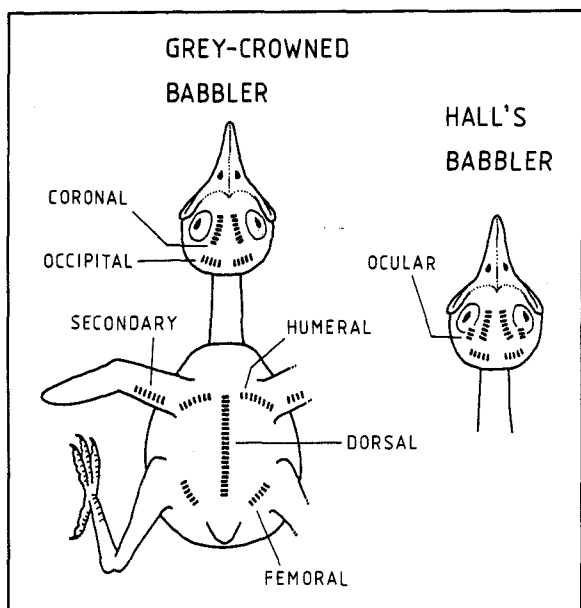


Figure 1. Down-patches of the neonate Grey-crowned and Hall's Babblers shown schematically. The diagram does not show the precise orientation or relative size of patches, nor the number of neossophtiles in each.

Babblers the anterior neossophtiles of the coronal patch were grey, and remaining neossophtiles on the head were white basally and grey distally. This variegated down perhaps anticipates the prominent stripes that develop in the later plumage of the crown of Hall's Babblers.

The dorsal skin of Grey-crowned Babblers became melanised during the first three to four days, and darkened further as feather-germs developed beneath the epidermis. On Day 1 only bristles were evident on the wings and tail, but by Days 2-5 these projected as the tips of developing pin-feathers. By Day 4 the length of the primary pin-feathers to the tip of the bristle was up to 4 mm; by Day 7 up to 11 mm, there being much individual variation. Natal down was reduced to traces by about Day 5 but what remained often persisted until just before fledging.

The tips of the alar pin-feathers were first to erode, on Day 7-10, the secondaries just ahead of the primaries. Caudal pin-feathers began eroding on Days 9-12, by which time most feathers were erupting from their sheaths in all pterylae. The sheaths of the pin-feathers representing the ten upper tail coverts, and those of the central pair of rectrices were black, whereas those of the ten other rectrices were white. From Days 15-17 no, or very little, sheathing was visible externally on the folded wing, and the head looked fully feathered. Usually some sheathing remained on the rectrices until

fledging. On Day 15 all but a 5-10 mm width of the ventral apterium was covered. After Day 18 this apterium was exposed only about the vent.

The protruding tip of the mandible often became more accentuated (a difference of up to 2 mm) after hatching. Then between Days 3 and 11 (usually 8-11) the bill grew so that the tips met at the same point. After this the maxilla came to protrude slightly, the adult condition. Darkening of the bill (especially dorsally and at the tip) was evident from Day 7. By Days 15-18 the bill was almost black, though often there were pale yellowish blotches laterally and ventrally. The skin covering the eyes slit on Days 2-7 and gradually the lids parted. The buccal lining remained orange throughout the nestling period and the egg-tooth was retained.

Nestling Hall's Babblers developed similarly to their congener, though we documented it less thoroughly and only to Day 10. On Day 1 or 2 the germs of the feathers of the alar, humeral and spinal tracts showed darkly through the skin. On the head, two bands of feather-germs were pale in contrast to the remaining dark germs of the capital tract. These yielded bands of pale pin-feathers and eventually the white stripes on the crown of juveniles and adults. Alar and caudal feathers were usually first to erupt from their sheaths, on Days 6 or 7, rather earlier than in Grey-crowned Babblers. Feathers of the capital, spinal and pectoral tracts were next to erupt, usually on Day 8. By Day 10, feather-sheaths were eroding in most pterylae, with least development on the head and throat.

The maxilla and mandible became equal in length between Days 6 and 8, again somewhat earlier than in Grey-crowned Babblers. The bill began to darken noticeably from Day 7, especially dorsally. Rictal flanges remained bright yellow or darkened to orange-yellow. The skin covering the eyes slit on Days 4 or 5, and the eyes opened on Days 6 and 7. At 10 days the egg-tooth was still present.

This study showed that nestling Grey-crowned and Hall's Babblers develop morphologically along similar lines, as one would expect, though Hall's Babblers seem to develop slightly faster. In both species there was much individual variation in the ages at which developmental changes occurred. In natal down both Babblers are sparsely feathered compared with, for example, the Willie Wagtail *Rhipidura leucophrys*, which has ventral patches as well as dorsal (Gill 1982). An important detail to emerge is the presence of ocular down-patches in Hall's Babbler and their absence in the Grey-crowned Babbler. It would be interesting to investigate the natal pterylography of the other Australian Babblers, and indeed to make comparisons with other

Timaliidae. The initial inequality in length of the mandible and maxilla of Grey-crowned and Hall's Babblers is another character that might have taxonomic value at familial level. We know of this condition in the Brown Creeper *Finschia novaeseelandiae* of New Zealand (Gill *et al.* 1980) and in the Australian Noisy Miner *Manorina melanocephala* (M.J. Whitmore, unpubl.).

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REFERENCES

- BROWN, J.L. 1979. Growth of nestling Grey-crowned Babblers, with notes on determination of age in juveniles. *Emu* 79: 1-6.
- GILL, B.J. 1982. Description of the newly-hatched Willie Wagtail *Rhipidura leucophrys*. *Emu* 82: 112-113.
- , M.H. POWLESLAND & R.G. POWLESLAND. 1980. Notes on the Brown Creeper (*Finschia novaeseelandiae*). *Notornis* 27: 129-132.
- LUCAS, A.M. & P.R. STETTENHEIM. 1972. Avian Anatomy - Integument. Part 1. U.S. Department of Agriculture Handbook 362.
- SAUNDERS, A.A. 1956. Descriptions of newly-hatched passerine birds. *Bird-banding* 27: 121-128.

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THE MARBLED FROGMOUTH *PODARGUS OCELLATUS PLUMIFERUS* IN THE NIGHTCAP RANGE, NORTH-EASTERN N.S.W.

Terania Creek basin (28°34' S, 153°19' E) in the Nightcap Range is a mixture of warm temperate and subtropical rainforest (Floyd 1977). The surrounding broken cliff-line carries wet sclerophyll forest which extends down into the basin on spurs. The southern part of the basin has been selectively logged between the 1920's and 1960's, resulting in a mosaic of regeneration of different ages.

While spotlighting along a logging road in the basin from January to March 1980, I made a number of sightings of the Marbled Frogmouth *Podargus ocellatus plumiferus*. One was observed on 15 January, one on 16 February and three on 7 March. Two birds seen on 30 December 1979 were also probably Marbled Frogmouths, but both flew off before their identities could be confirmed. All birds were recorded singly, perched mostly in understorey trees or on the horizontal sections of water vines *Cyssus* sp within 10 m of the road and from 3 to 30 m above the ground.

The Marbled Frogmouth was identified by its relatively long, graduated and pointed tail; delicate moth-like patterning of the body plumage; unstreaked throat and upper breast; and buff and black-banded

plumes above the bill. When viewed with a 100 watt spotlight, the eye appeared a lustrous, deep orange-red. These characters separate it from the Tawny Frogmouth *P. strigoides*, which was also seen along the road, whereas brown body colour, whitish eyebrow, white blotches on the wing coverts and orange-yellow or orange eye colour, which have been given as diagnostic for the Marbled Frogmouth (Slater 1970; Roberts & Ingram 1978; Pizzey 1980), are unreliable. Size was also of little use in separating Marbled and Tawny Frogmouths, because male Marbled Frogmouths exceed some Tawny Frogmouths in length and can appear quite bulky in the field.

Because there are few *P. o. plumiferus* in Australian collections, I collected a specimen from Terania Creek on 16 January 1981. Details of the bird, a male (Aust. Mus. reg. no. 0.54599), are as follows: total length 460 mm, wing span 750 mm, wing 239 mm, tail 250 mm, tarsus 33.5 mm, culmen (to base of skull) 42.5 mm, weight 286 gm. The eye was orange-yellow in daylight. In total length the specimen exceeds measurements given in Readers Digest (1976) and Pizzey (1980) and is comparable with large Tawny Frogmouths. However measurements of total length and wing are within the