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THE DOWNY YOUNG AND JUVENILE OF THE CHESTNUT RAIL, WITH NOTES ON DEVELOPMENT

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We describe the downy young and juvenile stages of the Chestnut Rail, a large, little-known rail of tropical mangrove forests, and provide notes on development. The information was obtained from four birds of two clutches hatched in the wild but raised in captivity. Young are precocial. Moult from downy to juvenile plumage commences at about three weeks of age and is substantially complete by six weeks of age. Juveniles are separable from adults mainly or solely on the colour of the eyes, bill and legs, distinctions which disappear well before one year of age.

INTRODUCTION

The Chestnut Rail *Eulabeornis castaneoventris* is a large rail of mangrove forests and adjacent mudflats of northern Australia and the Aru Islands. A combination of secretiveness, an evidently patchy and mostly inaccessible distribution, and the difficulties and dangers of working in its habitat have combined to render this a little-known species. Knowledge of its reproductive biology and development is confined almost entirely to information about nests and eggs (White 1917; Ragless 1977; Barnes and Franklin, in press), with a single description of day-old young (Richard Noske, in Marchant and Higgins 1993) and no certain knowledge of the young beyond this. In this note we provide a description of the downy young and juvenile of the Chestnut Rail, along with notes on their development and the post-juvenile moult.

METHODS

Four chicks (two from each of two broods) were taken from the wild shortly after hatching and raised in captivity at the Territory Wildlife Park at Berry Springs 40 km south-east of Darwin, Northern Territory. One brood was collected under permit from the lower Blackmore River in Darwin Harbour (12°42'S, 130°57'E) in December 1995. The other was handed in by a member of the public in October 1996 after the parents were illegally shot, and is presumed also to have come from Darwin Harbour.

Details of captive husbandry have been provided by Barnes (1997). One of each brood survived, and their development was followed to beyond the completion of the post-juvenile moult. The second bird of the first brood died during the post-juvenile moult, whilst the second bird of the second brood died at a younger age.

During the downy young and early juvenile stages, the young of the first brood were frequently examined in the hand, photographed and described complete with colour matches from Smithe (1975). As birds approached adult proportions they became increasingly distressed by handling, so thereafter and for the second brood descriptive work was mostly restricted to observations of birds in aviaries.

For the surviving bird of the second clutch, staff at the Wildlife Park collected feathers as they were moulted during the post-juvenile moult. To test the theory that adult rails can be distinguished from juveniles by the width of the primaries (Peter Fullager, per Danny Rogers, pers. comm.), we measured the maximum width of the leading and trailing edge of each available moulted right wing primary and primaries 1, 3, 5, 7 and 9 of the replacement feathers on the same bird, to the nearest 0.5 mm.

The format of our formal descriptions follow Marchant and Higgins (1993). This includes the Smithe colour codes, which, however, we found to be poor matches and often contrary to our intuitive selections.

RESULTS

Downy young

The following description was prepared from a 10-day-old chick from the first brood, supplemented by observations of other individuals and ages.

PLUMAGE

Densely silky, fairly short down throughout except for the bare outer wing. Back, belly and wings dark brown, appearing blackish-brown until examined closely; chest dark brown; face, crown, nape and throat brown with pale bases evident and conveying an overall pale brown appearance, the paleness especially evident around the lores.

BARE PARTS

Eyes open from outset. Iris dark brown, initially clouded. Bill uniformly jet black; egg-tooth white. Feet and legs, dark brown. Claws, pale flesh pink.

Juvenile

The following description was prepared from a 59-day-old chick from the first brood. It was in full juvenile plumage except that the juvenile primaries were not fully developed. The description was corroborated by comparison with the other individuals.

PLUMAGE

Body feathers have concealed light grey bases. **Head and neck:** face and crown slaty-grey (c83); nape slaty-grey (c83), grading to brown on the mantle; throat pale pink-chestnut. **Upperparts:** back and rump brown (c119A), richly tinged hazel. **Underparts:** breast,

flanks, belly and undertail coverts uniformly rich pink-chestnut (c223). **Tail:** uniformly chestnut-brown above and below. **Upperwing:** primaries, secondaries, inner primary coverts and greater wing coverts chocolate-brown (c121); outer primary coverts and alula chestnut-brown; lesser and median wing coverts brown (c119A), strongly tinged hazel (as back). **Underwing:** coverts pink-chestnut; primaries and secondaries chocolate brown.

Bare parts: iris, pale brownish-orange, becoming darker and browner at outer edge; bill, olive-yellow (between 57 and 58) for basal two-thirds, becoming pale pink-brown towards tip, the entire bill tinged white; feet and legs, mostly pale yellow tinged pink (c124) especially on upper tarsus, with indistinct darker markings especially on the toes; back of ankle and back of lower (unfeathered portion of) crus, brown; claws, pale flesh-pink, becoming even paler at tip.

Development of plumage and bare parts

When collected, chicks of the first brood, which were estimated to be two days old, had eyes that were open and somewhat smoky in appearance. This smokiness had virtually disappeared by eight days of age. The egg-tooth was shed at about ten days of age. The downy plumage became a little paler with age, especially about the head. Pin feathers were first noted at 24 days of age, on the ear coverts and wings. At 32 days of age, the birds were well into the transition from downy to juvenile plumage. By 46 days of age, the transition was complete except for the wing, where there was some persistent down and some feathers had not fully emerged. At 59 days of age all down had been shed and replaced by fully-formed pennaceous feathers except that the primaries had not fully elongated.

When examined in the aviary at 121 days of age, the eyes, bill and legs of the first brood had changed to characteristic adult colouration, and the birds were not separable from adults at that level of examination. The surviving bird of the second brood could be recognized as juvenile in the avairy by the colour of its legs and bill and possibly the eye until at least mid-February 1997 (age approximately 130 days) but not by any character in mid-May 1997 (age approximately 220 days).

Behavioural development

From the outset, the young were active and fed themselves. By at least day 12 they preened, were fast runners and chased insects. By at least day 17 they were efficient at climbing and jumping. During the August following hatching, the surviving bird of the first brood, then aged about 230 days, was noted giving adult calls for the first time, and began pacing the aviary in a restless manner.

Post-juvenile moult

When one of the Rails of the first clutch died during May 1996 at the age of 163 days, examination revealed extensive moult of the chest, back and uppertail and undertail covert feathers, but there was no moult occurring in the primaries or tail feathers.

Moult of the surviving bird of the second brood was first noted by Park staff in early April 1997 when the bird was approximately 180 days old. Feathers continued to be shed during most of April. All flight and tail feathers were shed apparently more or less simultaneously; numerous body feathers were also shed.

Width of the primaries

The leading edge of the primaries was narrowest on the outer primary (P10), becoming progressively broader towards P1, but there was no progressive change in the width of the trailing edge (based on post-juvenile primaries, Table 1). We were able to identify

TABLE 1

Maximum width of the leading edge and trailing edge of juvenile and post-juvenile primary feathers of a Chestnut Rail individual.

	Width (mm)	
Primary feather no.	Leading edge	Trailing edge
Juvenile primaries		
? (1 or 2)	9	19
? (2 or 3)	9	19.5
? (3 or 4)	8.5	19.5
? (4 or 5)	8	19
? (5 or 6)	7.5	18
? (6 or 7)	7.5	18
? (7 or 8)	7	18.5
? (8 or 9)	6.5	19
imaries		
1	10	20.5
3	10	20.5
5	8.5	19.5
7	8	19.5
9	6.5	20

eight right wing primaries amongst the shed feathers collected by Park staff, the missing two being P10 and one other. These we have arranged according to the width of the leading edge (Table 1). There was no consistent difference in the width of the leading edge of the juvenile and post-juvenile primaries, but the trailing edge of the juvenile primaries was approximately 1 mm narrower than that of the post-juvenile primaries (mean widths 18.8 mm *cf* 20.0 mm).

DISCUSSION

As in other members of the rail family (Rallidae), the young of the Chestnut Rail are precocial. This is demonstrated by the active nature of two-day old young and their ability to feed themselves, as well as by the lack of records of young in the nest beyond several days of age.

As juveniles and adults, our birds resembled the intermediate (olive-brown) morph adult illustrated in Marchant and Higgins (1993), differing only in the rich hazel tinge to the back and the pale pink-chestnut (*cf* white) throat. There is no indication that these plumage characters are 'juvenile'. Indeed, the juvenile plumage of the Chestnut Rail is apparently inseparable from that of the adult, except perhaps by feather size (Marchant and Higgins 1993). Our study demonstrated a small difference in the width of the trailing edge of the primary feathers, a difference we do not think is attributable to wear. However, the difference is slight and not categoric, and the character is likely to be of little use even in distinguishing juvenility in museum skins.

However, live juveniles were readily separable from adults by the coloration of the bare parts, as summarized in Table 2, differences that had disappeared by four to seven months of age.

Our evidence suggests that the post-juvenile moult occurs at or shortly after the end of the tropical Wet season regardless of the age of the juveniles. It also suggests that young hatched late in the breeding season, which lasts approximately from September to February (Marchant and Higgins 1993), undergo only a partial post-juvenile moult, retaining their juvenile flight feathers and rectrices, whereas early-hatched young may undertake a complete post-juvenile moult of body, flight and tail feathers. However, more evidence is required to confirm these propositions.

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TABLE 2

Comparison of bare parts of juvenile and adult Chestnut Rail. Adult characteristics from Marchant and Higgins (1993).

Character	Juvenile	Adult
Eye colour	pale brownish-orange	red
Colour of base of bill	olive-yellow	greenish-yellow or light green*
Colour of tip	pale pink-brown	whitish
Leg colour	pale yellow tinged pink, with indistinct darker markings especially on the toes; back of tibio-tarsal joint and back of lower tibia, brown	yellow or yellow-green
Claw colour	pale flesh-pink	light cream-brown

*lime green in our birds.