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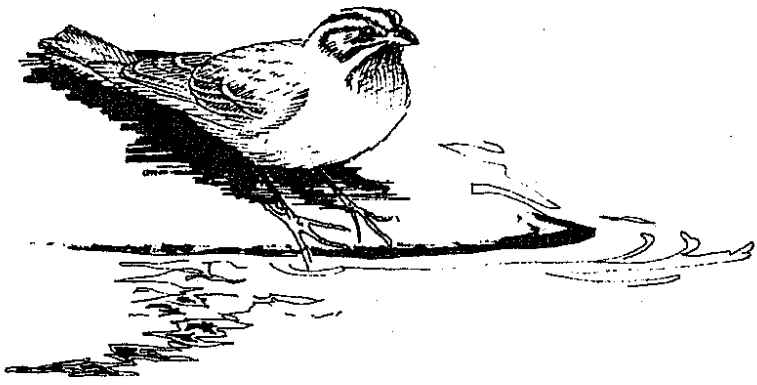

SOME ASPECTS OF THE BREEDING BIOLOGY OF THE CINNAMON-BREASTED ROCK BUNTING Emberiza tahapisi

by M. E. Gartshore

INTRODUCTION

The Cinnamon-breasted Rock Bunting Emberiza tahapisi is a common and conspicuous breeding bird at Zaria, northern Nigeria. Little is known of its breeding biology in West Africa, but the species has been studied in Rhodesia by Haydock (1949) and Cumming & Steyn (1966).

Small clutch size, slow growth rates of nestlings and high perinatal mortality are some of the characteristics of the breeding biology of tropical altricial birds (Skutch 1967, Ricklefs 1969, Foster 1974). With this in mind, data were collected on these parameters of the Rock Bunting at Zaria.

METHODS AND MATERIALS

The study area consisted of about 100 ha of deep erosion gullies at Samaru, near Zaria. The Northern Guinea Savanna there has been severely degraded by human activities such as cutting, burning and over-grazing, but is presently uncultivated. That area was chosen simply because Rock Buntings were numerous.

Nests were studied between 24th October and 11th December 1974, and information was taken on clutch size, incubation and nestling periods. Perinatal mortality was recorded only for those nests found intact. Weights of known-age young were taken in the field with a 50-gram Pesola spring balance. Nestlings were not disturbed after 11 days of age for fear that they would be induced to fledge prematurely. From January to April 1975 birds were mist-netted, ringed with coloured or numbered cellulose bands, and their age, sex and breeding condition and moult were determined.

The identification of individuals as to age and sex was important for the study. Adults have bright yellow lower mandibles; males have black and white head stripes, females dark brown and cream. Males in breeding condition exhibit enlarged cloacal protuberances which atrophy when breeding ceases. Females which have recently laid eggs have a swollen abdomen and vascularised brood patch.

Juvenile birds under one year are difficult to sex, but could be aged according to bill colour: those recently fledged (within about four weeks) had solid grey bills, whereas older juveniles develop flesh coloured lower mandibles. Washed out brown head stripes on juveniles help to distinguish them from adults.

RESULTS

Breeding Season

The first nest with eggs was recorded on 24th September. Some netted adults were in breeding condition until mid-February, suggesting that Rock Buntings have a lengthy breeding season. Bannerman (1953) gives December and January as the breeding season in northern Nigeria, but Mackworth-Praed & Grant (1973) suggest a longer season, from October to February in Nigeria. Although breeding may have begun in late August, most nests at Zaria were constructed after the last rainfall on 14th October. Fledglings suddenly became numerous after the end of November, both in the study area and elsewhere near Zaria. After the end of December the number of very young fledgings that I observed declined somewhat. No nests were found after December, and no males were heard singing in March. Of 83 birds caught and ringed in February and March about 70% were juveniles of the current breeding season.

Clutch Size

Of 29 nests where clutch size was established, eight contained two eggs and 21 contained three. One nest containing a single egg was abandoned, possibly before the clutch was completed. No clutches of four were found, and no decrease in clutch size as the season progressed was observed.

Incubation, Fledgling and Weaning Periods

Because of high predation rates and the difficulty of locating recently constructed nests, the incubation period was determined for only three clutches. These each hatched in twelve days' time. The nestling period was more variable, with some young fledging at 13 days while most left at 15 days, being able to fly well by that age. It was difficult to determine for how long fledglings were dependent upon their parents. Colour-ringed individuals were observed feeding within parental territory three weeks after fledging, but they still solicited for food - usually unsuccessfully. One juvenile was retrapped less than 150 metres from its nest site 61 days after fledging.

Fledging Success

Many nests were found during the study period, the contents of which disappeared unaccountably before I discovered them. 13 nests out of 34 found intact (38%) fledged successfully. It was somewhat easier to find nests which were intact for perhaps 30 days, than those which were destroyed shortly after egg-laying. For this reason a fledging success of 38% is probably high. Figure 1 gives a percentage breakdown of sources of mortality at the nest. Clutches of two appeared to survive to fledging better than clutches of three, despite the higher incidence of the latter (Table 1).

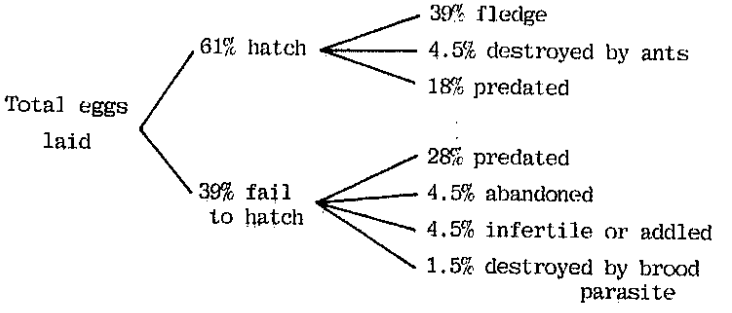

Figure 1 Fate of eggs laid by Cinnamon-breasted Rock Buntings at Zaria

Table 1. Comparison of survival of clutches of two and three of Cinnamon-breasted Rock Buntings at Zaria

Clutch size	Number of nests	Total no. of eggs	Number fledged	Average fledged per nest	Percentage success
2	8	16	10	1.25	62.5
3	21	63	23	1.09	36.4

Growth Rate

The average adult weight during the breeding season was 14.7 g (n=16; 8 males, 8 females). Nestlings reached 90% of adult weight in about 12 days. 55 fledged juveniles of various ages weighed 12.0 to 16.5 g (average 13.5g). A plot of daily average weights of nestlings from the day of hatching is given in Figure 2, with data of pulli from clutches of two and three separated. Applying the Students' t test, there is a significant difference in weights between nestlings from clutches of two and of three for each of the first four days of life, but the differences from day 5 to day 11 are not significant (Fig. 2). The lightest or youngest pulli were never observed to have starved to death. In only one instance was the youngest ejected by its two siblings, probably because the crevice in which the nest was placed was too small.

DISCUSSION

Tropical birds must contend with high perinatal mortality arising from predation. Nesting successes of tropical American birds ranged from 10.2% to 58.7%, with heavier predation occurring in humid forest situations (Foster 1974). At Zaria, the Rock Bunting had an observed nesting success of 38.2%, which in actual fact is probably low. Although egg and nestling mortality is high, once fledged tropical birds are generally long lived and are not usually subject to high mortality rates. This is in contrast with temperate zone species, which must produce a surplus to offset mortalities incurred during inclement weather and long migration. The evolutionary significance of reproductive strategies of tropical altricial birds may lie not so much in maximising individual fitness by relatively high and rapid reproductive output, as in producing fewer but fitter progeny.

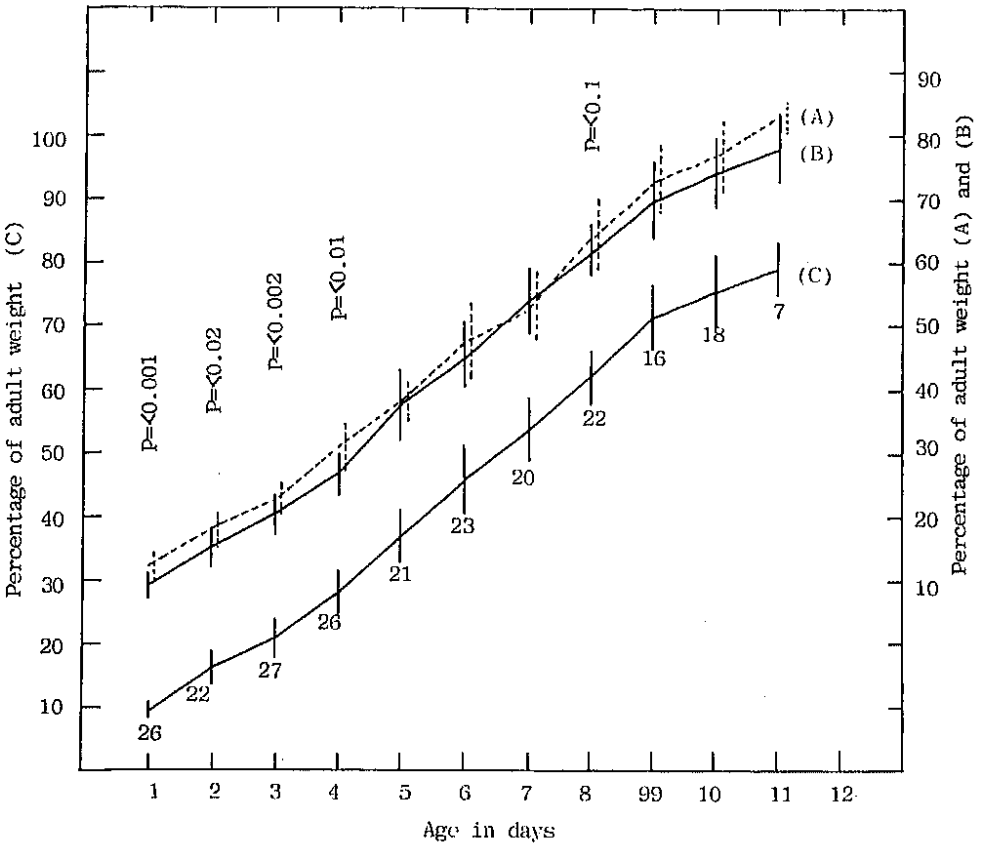

Figure 2 Growth curves of nestlings from nests with two pulli (A); three pulli (B); and overall average (C). Bars indicate standard deviations, and sample sizes are shown under (C). The difference P between (A) and (B) is shown only for those days when it is significant (Students' t test of significance).

Long breeding seasons, long incubation and nesting periods, and extended dependence of young after fledging have been observed for other tropical passerines (Foster 1974, Skutch 1967). A growth rate of 12 days to reach 90% of adult weight for Rock Buntings is similar to the values that Ricklefs (1968) gives for tropical American species and contrasts with 7.6 and 8.5 days for two Arctic passerines, respectively the Snow Bunting Plectrophenax nivalis and Lapland Bunting Calcarius lapponicus.

The clutch size of Rock Buntings at Zaria (11° N) is 2 - 3, but at Essexvale, Rhodesia (20° S), where the species was studied by Cumming & Steyn (1966), the clutch size was 3 - 4. Cody (1966) demonstrated that clutch size of the genus Emberiza increases from 2 to 6 with increase of latitude from 0° to 60°. Generally clutch sizes of tropical birds tend to be small (the average for most is two), but they increase with distance from the Equator (ibid.).

In tropical climates a long breeding season is not only possible but may also be a necessity to offset high perinatal mortality. Small clutches may be advantageous because they are less costly in terms of reproductive effort than large ones. The condition of the adult is therefore retained for perhaps several nesting attempts. Although clutches are small, tropical birds allot more time and energy to producing fewer and probably fitter young than do temperate zone species.

In this study pulli from clutches of two had significantly higher weights than pulli from clutches of three, at least during the first few days after hatching. This may be because hatching was somewhat asynchronous for clutches of three, giving the third pullus a slight disadvantage. The weight at fledging was not known, but if pulli from clutches of two were heavier they would have a better chance of survival.

Clutches of three had a much lower fledging success than clutches of two, which suggests that predators may detect larger clutches. Skutch (1949) considered larger clutches to be more prone to predation, since they required more feeding trips which might attract predators.

Tropical birds tend to produce fewer broods in a breeding season, either by breeding only once or by renesting until a brood is raised successfully (Skutch 1967, Foster 1974). A large number of fledgling Rock Buntings was observed in November and early December about one month after the onset of breeding. It is possible that after this time only unsuccessful birds attempted to renest. This would account for there being fewer newly fledged offspring recorded later on in the breeding season. As this species may require over two months successfully to rear a brood, only two broods would be possibly in the course of a season.

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