Moult and seasonal occurrence of birds ringed on the New Delhi Ridge in 1971–1974

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Abstract: From July 1971 to May 1974 intermittent mist-netting was carried out on the New Delhi Ridge, in an area of dry woodland and scrub. Although the main targets of trapping were babblers (*Argya* spp. and *Chrysomma sinense*) many other species were captured incidentally. The vast majority of the 1,783 birds caught were weighed, measured and examined for moult. Wing formulae were recorded for hard-to-identify species of genera *Phylloscopus, Acrocephalus,* and *Iduna*. Prebasic moult among migrant species and winter visitors occurred regularly only in Blyth's Reed Warbler. Most residents showed prebasic moult during August-October, with the slower-moulting babblers and bulbuls *Pycnonotus sp.* starting earlier than the faster-moulting prinias *Prinia sp.* The results provide insights into the seasonal occurrence of migrants and winter visitors, as well as the periodic absences of some resident species, perhaps because the habitat becomes relatively inhospitable during March–May. The information is presented to provide a baseline for future trapping studies.

Introduction

During July 1971 to May 1974, I was engaged full-time in collecting data for my D. Phil research on *Argya* spp. and Yellow-eyed Babbler *Chrysomma sinense* on the New Delhi Ridge (28.618°N, 77.186°E). This work included trapping my study species for banding. However, as this was done with mist-nets, I trapped many other species incidentally. Captured babblers were subject to an intensive examination for morphometrics, moult, mass, presence of brood-patch, external parasites, etc. Other species were treated in the same way, as far as time allowed, but did not always receive the same attention devoted to the babblers. Some results of these incidental captures were published previously (Gaston 1981) but this paper has never been referred to by authors on Delhi birds. In view of the apparent obscurity of this publication, I have attempted here to provide a more extensive account of the data obtained by mist-netting on the Delhi Ridge in the 1970s to allow the data to be used by current and future workers interested in assessing changes in breeding seasons, moult schedules, morphometrics, and body mass. Only passing attention is paid to Yellow-eyed Babbler and *Argya* spp. here because those were the subject of my thesis and their biology in my study area has been extensively described already (Gaston 1977, 1978a, b, c). All Appendices mentioned in the manuscript and the full data set is made available to interested researchers via the Zenodo Data Repository (https://zenodo.org/records/13227987).

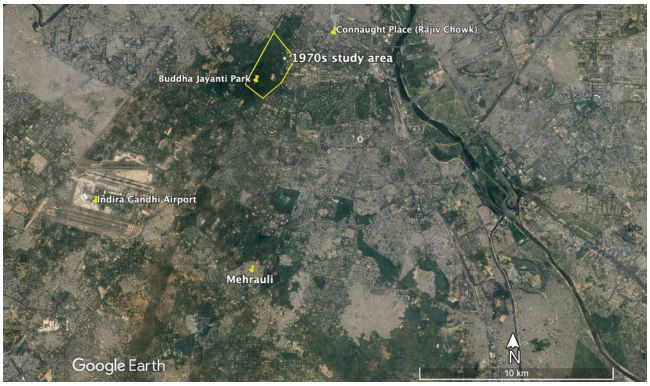

Fig. 1. Position of the study area in Delhi. All of the mist-netting was performed within this boundary.

Methods

Details of the study site on the forested parts of the New Delhi Ridge are given in (Gaston 1978a, 1981, 2024 see Fig. 1). Mist-nets were deployed on 68 days in 1971, 70 in 1972, 39 in 1973 and 18 in 1974. Most mist-netting was performed in the early morning, often from first light, but nets were sometimes deployed in the evening, and, in winter, occasional sets were used in the afternoon. Mist netting sessions lasted from one to four hours. Little or no habitat modification was performed to accommodate nets, most being positioned in natural gaps in the vegetation, although the clearance of small areas of *Zizyphus* bushes was carried out occasionally, as the recurved spines of these plants sometimes resulted in very severe tangling of nets. The lowest panels were generally set so that small birds captured in them would hang well clear of the ground, as attacks by monitor lizards and snakes on trapped birds could otherwise occur. Trapping involving leaving nets set overnight was attempted initially but was discontinued because it resulted in the capture of fruit bats (*Cynopterus*) which were very hard to disentangle without damaging the nets.

Birds captured were ringed with Bombay Natural History Society rings; weighed in a cloth bag on a 50 g or 100 g Pesola spring balance to the nearest 0.1 g; wing (flattened), tail, tarsus and culmen measured with wing-ruler or calipers, as appropriate, to the nearest 0.1 mm; and the plumage examined for signs of moult. Primary moult was scored from 0 (an old feather) to 10 (a fully developed new feather) with primaries numbered in ascending order (outermost = 10), secondaries in descending order and rectrices from inmost outwards. For hard-to-identify warblers (*Phylloscopus*, *Acrocephalus*, *Iduna*) wing formula was recorded for the primary feathers by measuring the distance between the tip of the longest primary and the tips of the other primaries on the closed wing (Svensson 1992). The extent of emargination on the primaries was also noted. For some difficult species the colour of soft parts was recorded. Not all birds received the full set of measurements and descriptions, depending on the number captured, and the prevailing weather. All birds were released within 30 minutes of capture. The only mortality consisted of two birds seized by monitor lizards and one killed in the net by a Shikra *Accipiter badius*.

Seasonal distribution of occurrence was compared using numbers trapped per day of mist-netting (birds/day). I have also used eBird records for the period 2018-2022 for the region surrounding my study area (details in Gaston 2024) to compare the incidence of some species in the trapped sample to the likelihood of the species being included on recent eBird lists.

Results

Capture frequencies

Altogether, 1,783 birds of 69 identified species were trapped during 1971–1974 (Appendix 1) over a total of 195 days when mist nets were deployed, a mean of 9.1 birds/day. Trapping was most intensive in August–November and in February. The most frequently captured species was the Common Babbler *A. caudata* (351 trapped), but this was the most frequent target species: nets were set where Common Babblers were expected to feed or fly and, in some cases, birds were deliberately driven towards the nets. Jungle Babblers *A. striatus* (165) and Yellow-eyed Babblers (184) were also targeted. Among non-target species, the most commonly caught were Indian Robin *Saxicoloides fulicata* (218), Red-vented Bulbul *Pycnonotus cafer* (176), Lesser Whitethroat *Curruca curruca* (107), Yellow-throated Sparrow *Gymnoris xanthocollis* (61), and Common Tailorbird *Orthotomus sutorius* (48). The remaining 638 birds comprised 61 species. Thirty-three species were caught ten or more times. Species richness was greatest in August–November and markedly lower in December–February (Fig. 3). The relatively close logarithmic fit (Fig. 2, $R^2 = 0.83$) suggests that in months of peak trapping the majority of susceptible species were being sampled.

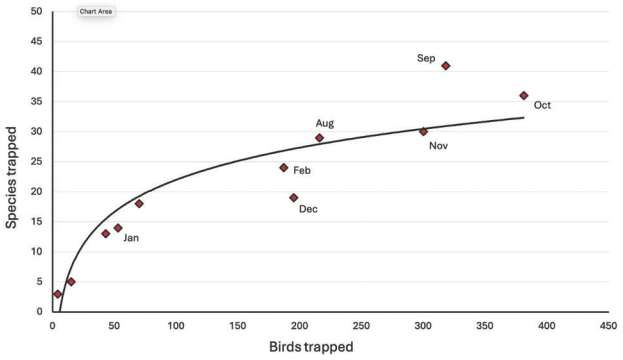

Fig. 2. Numbers of species captured in relation to the total number of birds captured.

Recaptures in more than one year

Two out of 31 Black Redstarts *Phoenicurus ochruros* and three out of 107 Lesser Whitethroats were trapped in successive winters (Table 1), suggesting that these species have a tendency to return to the same wintering areas in successive winters.

Table 1. Repeat captures of winter visitors in successive winters

Species	Ring number	Date of first capture	Date of recapture
Black Redstart	A13254	09 October 1971	28 October 1972
Black Redstart	A90751	23 November 1971	18 December 1972
Lesser Whitethroat	A135279	23 October 1971	19 December 1972
Lesser Whitethroat	A121613	22 February 1972	04 December 1972
Lesser Whitethroat	A90735	23 November 1971	19 December 1972

Seasonality

The use of capture data to analyze migration timing is affected by the relatively small sample sizes, compared with observational data. Consequently, for the most part, I only analyzed the most frequently captured migrants and winter visitors: those trapped on ten or more occasions.

Prinia warblers – Three species of *Prinia* were trapped. Although all are resident in the Delhi region, Rufus-fronted *P. buchanani* was trapped only in July-December (15; only 1 in December), while Ashy *P. socialis* (28) was not trapped in March-May and Grey-breasted *P. hodgsoni* (31) was mainly caught in October–January. The most striking deviation from year-round presence was exhibited by Rufous-fronted Prinia and coincides with the withdrawal of White-eared Bulbul, which was not trapped after November. Both these species are characteristic of dry thorn scrub, but both breeds locally.

Phylloscopus leaf warblers – All these are passage migrants or winter visitors. The earliest passage migrant trapped was Western Crowned *P. occipitalis* (14), which was caught in July–September, followed by Greenish *P. trochiloides* (14) and Large-billed *P magnirostris* (1), caught only in September, and Sulphur-bellied *P. griseolus* (5), caught in September–November and in March. The fact that Greenish Warbler was not trapped in spring, supports the conclusion of Harvey et al. (2006) that spring occurrence in Delhi has increased lately. Among the putative winter visitors, Plain *P. neglectus* (3) was trapped only in October and November, and Hume's *P. humei* (3) in November and December whereas the Common Chiffchaff *P. collybita* (21), the most frequently trapped, was caught in all months from October–February, although only two were caught in October. In the trapping sample, Common Chiffchaffs were caught less frequently after January than the eBird records for South Delhi as a whole would suggest (Fig. 3). This suggests that, like some of the prinias, Chiffchaffs became less common in the trapping area as spring advanced.

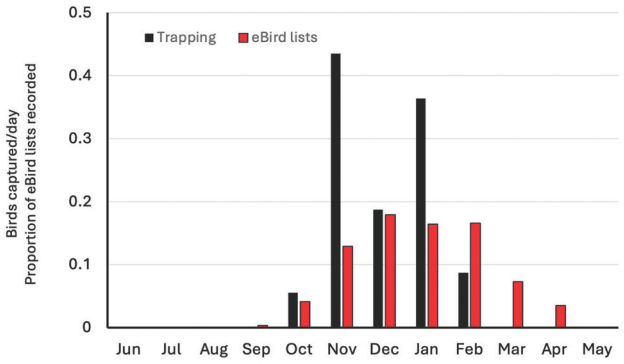

Fig. 3. Rates of capture (birds/day) for Common Chiffchaffs compared to the proportion of eBird lists on which the species was reported during 2018–2022.

Other small insectivores – Lesser Whitethroat *C. curruca* (107) and Black Redstart *Phoenicurus ochruros* (31) were both trapped in all months from September to February. Blyth's Reed Warbler *Acrocephalus dumetorum* (37) was caught in August–October and a single individual was caught in April (Fig. 7). The frequency of trapping for Blyth's Reed Warbler in spring was much lower than in fall and much lower in relation to the frequency of observations on eBird (Fig. 4).

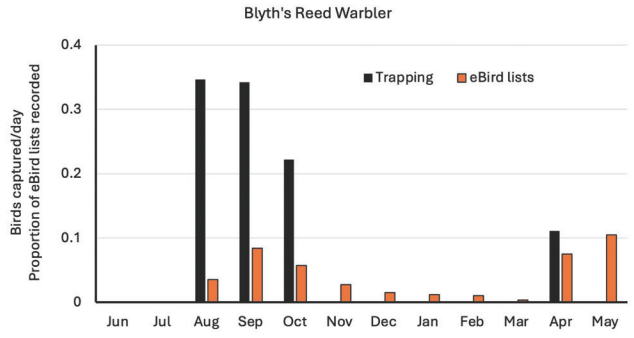

Fig. 4. Rates of capture (birds/day) of Blyth's Reed Warbler compared to the proportion of eBird lists on which the species was reported during 2018–2022.

Pycnonotus bulbuls – Three species of *Pycnonotus* were trapped, with Red-vented *P. cafer* (176) and Red-whiskered *P. jocosus* (17) caught throughout the year, but the second-commonest, White-eared *P. leucotis* (33) was trapped only during July–December (Fig. 5). The absence of White-eared Bulbul after midwinter is puzzling and suggests that the species may withdraw from the Ridge in spring, perhaps because preferred fruits are no longer available.

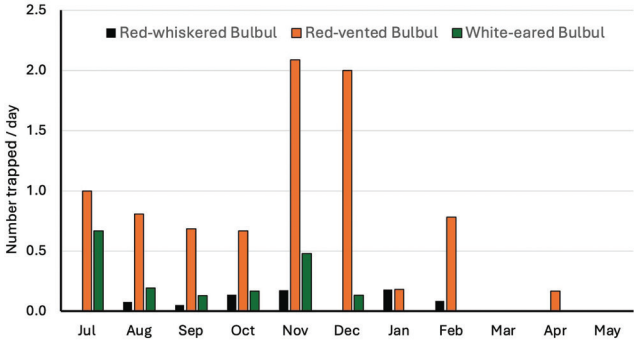

Fig. 5. Seasonal distribution of trap frequencies for bulbuls *Pycnonotus spp*.

Seed eaters – Yellow-throated Sparrow (61) was trapped mainly in July and August, Indian Silverbill *Euodice malabarica* (26) in July–November and House Sparrow *Passer domesticus* (15) in August-November. The absence of seed-eaters among birds trapped in winter was striking (Fig. 6) and suggests that their presence in autumn is associated with abundant seed availability after the rains.

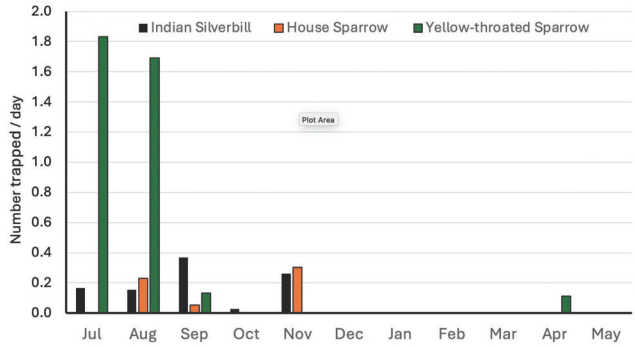

Fig. 6. Seasonal distribution of trap frequencies for seedeaters.

Others – Common Hoopoe *Upupa epops* (11) was trapped only in July–September, Eurasian Wryneck *Jynx torquilla* (10) during September–April and Purple Sunbird *Cinnyris asiaticus* (10) from August–February (Fig. 10). As sample sizes were small, these distributions may not accurately reflect seasonal occurrence, but the concentration of hoopoes and sunbirds, which occur in Delhi throughout the year, in the wet season suggests that they visited the area mainly in response to the flush of insects brought on by the monsoon.

Moult

The only migrant or wintering species found moulting were Wryneck (only 1, with irregular moult, suggesting this was not a normal event), Lesser Whitethroat (1 in February), Eastern Orphean Warbler *Curruca crassirostris* (1 in body moult, 1 with body and wing moult, both November), and Blyth's Reed Warbler (23/36 in August-October). The propensity for Blyth's Reed Warblers to moult while on passage in North India has been described elsewhere (Gaston 1976). Among the 20 resident species for which 10 or more birds were trapped, the majority exhibited flight feather moult during July–November with only very few species showing any moult outside of that period (Fig. 7).

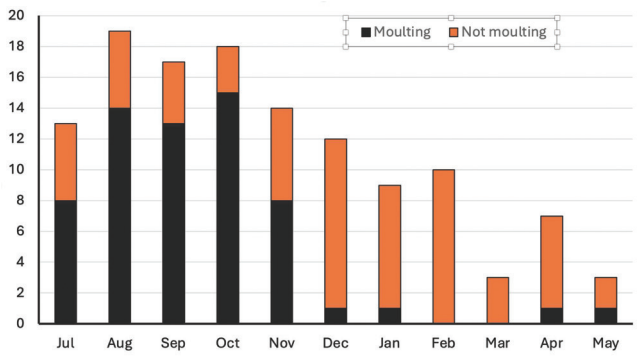

Fig. 7. Monthly distribution of the numbers of species moulting/not moulting for the 20 resident species where at least ten individuals were captured.

Pycnonotus and *Argya* species exhibited prolonged moult periods, with the majority of birds trapped from August–October having at least one primary feather partially grown (July–November in the case of *P. cafer*). Moult appears to happen faster and later in Common Tailorbird (October only) and the *Prinia* species (October and November only). The difference in moult timing between babblers and bulbuls on one hand and tailorbirds and prinias on the other may occur because the former commence moulting before nesting, partially or completely arresting during chick-rearing (Gaston 1981), whereas the smaller birds do not commence moult after the completion of the breeding cycle.

Mass and morphology

Mean mass and measurements are given for all species captured in Appendix 2. Practically all measurements and masses recorded fell within the range given in (Ali & Ripley 1969, 1970, 1971, 1972, 1973a, b) and Williamson (1964, 1967). A notable exception is the Common Chiffchaff, where wing length given by Williamson (1967) based on 106 specimens of *P. c. tristis* in the British Museum (Natural History) was 60.4 ± 3.0 mm (SD)

compared to 57.4 ± 2.7 mm (N = 21) in my sample (t = 4.25, P<0.0001). This strongly hints that the two *P. c. tristis* populations being sampled were different, either in sex composition or area of origin. Further examination of the source of chiffchaffs wintering in Delhi might be rewarding.

Discussion

Because the main intention of the netting was to capture *Argya* species and Yellow-eyed Babblers, the mixture of other species caught incidentally was probably determined, in part, by how much their habitat preference reflected that of the target species, as well as by how high in the vegetation they traveled and foraged and other aspects of their vulnerability to mist nets. As is often the case with mist-netting in wooded areas, strictly canopy species are under-represented in the capture sample. This applied especially to Small Minivet *Pericrocotus cinnamomeus*, recorded in every week during my studies (Gaston 2024) but never captured. Likewise, birds of rocky, barren areas were under sampled (e.g. Brown Rock Chat *Oenanthe fusca*). One factor that could affect within-year comparisons is the degree to which trap-susceptibility may have been affected by moult status. For example, although Common Woodshrikes *Tephrodornis pondicerianus* were present in the study area year-round (Gaston 1978a), they were (except for one bird caught in February), only trapped during July–October. Ten of the 13 birds caught in July–October were moulting and it is possible that moult may have made them more susceptible to capture. However, with this caveat, other biases probably remained more or less constant throughout the year, so that capture frequencies in different months should give an idea of seasonal occurrence.

To a large extent, the captures of winter visitors and passage migrants reflected the seasonal distribution given by (Gaston 1978d), Harvey et al. (2006) and Vyas (2019). However, there are a few instances where the recapture data gave a different picture. As detailed above, the seasonal distribution of capture records for Rufous-fronted Prinia, Common Chiffchaff, White-eared Bulbul, Yellow-throated Sparrow, and Common Hoopoe deviated a lot from their seasonality based on my own sighting records (Gaston 1978d), on generalizations made by previous authors, and from the distribution of eBird records for South Delhi as a whole. This probably indicates that their density on The Ridge changed seasonally, relative to other parts of Delhi. Overall, my results suggest that my study area hosted more species in the monsoon and post-monsoon periods than during the drier month from December onwards. The area has a small secondary peak of insect production in spring, when several species, especially *Argya* species, have a short breeding season (Gaston et al. 1979). However, most migrants and winter visitors (apart from Black Redstart and Lesser Whitethroat) seem to desert the area after November and conditions for breeding only occur in and after the rains for the majority of residents and summer visitors.

If it was possible to repeat the trapping carried out in 1970s much might be learnt about changes in the local avifauna. However, as mentioned by Gaston (2024), the extent of tall *Prosopis* canopy in the study area has increased since the 1970s and the extent of scrub and open ground correspondingly reduced. This would pose problems for potential mist net sites, and a better comparison might be provided by a nearby area with suitably short vegetation.

Acknowledgements

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