GENERAL NOTES

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Dispersal of recently fledged Mourning Doves from nest sites.—Reports of fledgling Mourning Dove (*Zenaida macroura*) movements have been vague and variable because of difficulty following unmarked birds (e.g., Mackey 1954). Other studies using marked Mourning Doves did not investigate the relationship between dispersal and fledgling age (e.g., Tomlinson et al. 1960). Our research has focused on behavioral interactions between fledgling Mourning Doves and their parents (Hitchcock and Mirarchi 1984a, b, 1985). Herein, we report on dispersal of juvenile Mourning Doves from nest sites.

Methods.—We located Mourning Dove nests in east-central Alabama from March through September 1980–81. Nestlings were aged by daily growth stages (Hanson and Kossack 1963). The oldest nestling of 35 normal broods was fitted with a radio transmitter at 7–8 days of age (Hitchcock and Mirarchi 1984a). Movement data were collected from only 24 of these nestlings due to nestling mortality prior to fledging. Nestlings usually fledged at 15 days of age.

We observed radio-tagged doves during 3 daily periods (period 1, 15 min before to 2 h after sunrise; period 2, 12:00–14:00 h; and period 3, 2 h before to 15 min after sunset) when fledglings were 15–21, 24, 27, and 30 days of age. We observed fledglings at distances (30–60 m) that did not appear to interfere with their normal behavior. We also observed them on the roost at least ½ h after dark on each observation day using a 200,000 candlepower spotlight.

We recorded the initial, final, and maximum distance from the location of the fledglings back to the trunk of the nest tree during each daytime observation period and calculated the maximum distance that fledglings were found from the nest tree on any given day from these data. Three or more daily locations of a fledgling were required to establish this value. We also recorded distances from roost sites to nest trees. Locations where fledglings were found for 3 or more observation periods (consecutive or otherwise), and which were used

TABLE 1

DISTANCES ($\bar{x} \pm$ SE) BETWEEN FLEDGLING MOURNING DOVE REFERENCE AREAS AND NEST TREES RELATIVE TO AGE, EAST-CENTRAL ALABAMA, 1980–81

Age (days)	*N*	Distance (m)
15	22	6 ± 3^{a}
16	23	11 ± 3^{ab}
17	23	16 ± 3^{ab}
18	23	20 ± 3^{bc}
19	22	21 ± 3^{bc}
20	22	23 ± 3^{bc}
21	22	28 ± 3^{cd}
24	20	39 ± 3^{d}
27	15	41 ± 4^{d}

[abcd] Column means not having a common superscript are different (Tukey test, $\alpha = 0.05$).

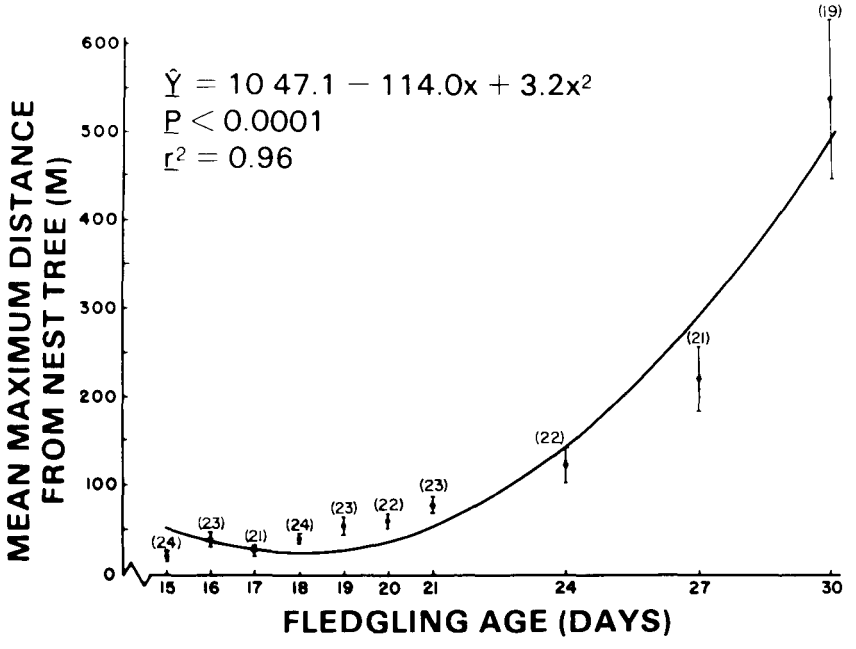

FIG. 1. Regression (calculated from means) of the maximum distance fledglings moved from nest trees. Numbers in parentheses represent number of fledglings sampled.

for interactions with parents, were designated as reference areas. We averaged distances from the nest tree to reference areas by age for each fledgling. Distances of less than 250 m were measured by pacing. Longer distances were measured using 61 × 61-cm (linear scale 2.5 cm = 201.2 m) aerial photographs. We used only the central areas of the photographs to ensure accuracy of measurements.

We tested the maximum distance in each daily time period against daily time period and age, and distances to reference areas against age using 2 and 1 factor within-subject designs, respectively (Keppel 1982). In both analyses, 30-day-old birds were eliminated because they were no longer centering their activities around former nest trees. Pairwise comparisons between means were obtained using Tukey's test (Familywise error rate = 0.05; Keppel 1982). Separate quadratic regressions were calculated from the means for maximum distance moved each day and distance to the roost sites, and were analyzed by fledgling age (Neter and Wasserman 1974). Because we used mean values, coefficients of determination do not reflect the relatively high variation associated with the movements of individual birds.

Results and discussion.—Fledglings generally loafed in reference areas within 45 m of the nest tree through 27 days posthatching (PH) where they were fed frequently by the male parent (Table 1). These findings are similar to those of other studies on fledgling Mourning Doves (Moore and Pearson 1941, Webb 1950, Mackey 1954, Morrison 1969), Wood Pigeons (*Columba palumbus*) (Murton 1965), White-winged Doves (*Zenaida asiatica*) (Cottam and Trefethen 1968), and White-crowned Pigeons (*Columba leucocephala*) (Wiley and Wiley 1979). Fledglings used more than one reference area ($\bar{x} = 3.1$) during the dependency period.

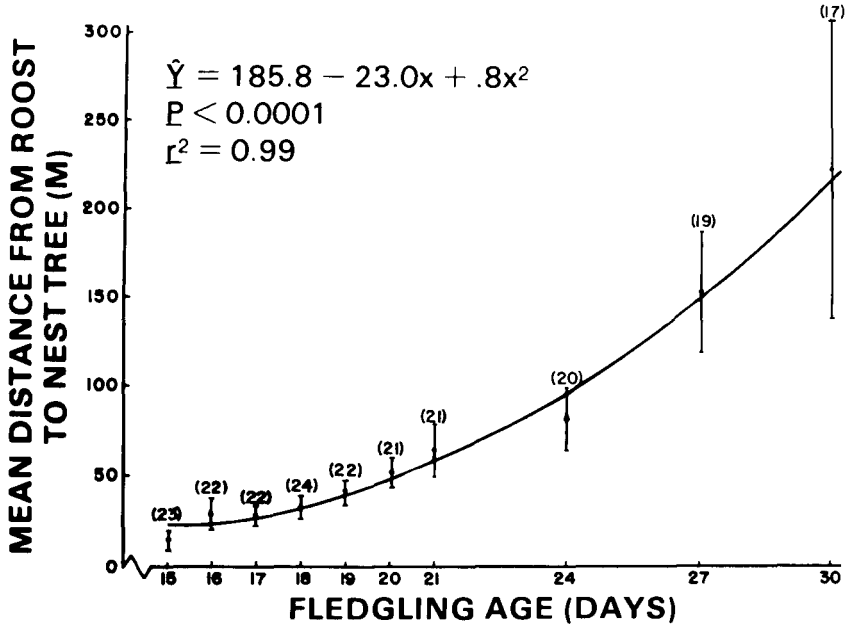

FIG. 2. Regression (calculated from means) of distance fledglings moved between nest sites and roost trees. Numbers in parentheses represent number of fledglings sampled.

Reference areas (approx. 3 m^2) were in trees (often on particular limbs) and on the ground and were characterized by dense overhead cover interspersed with openings that facilitated parent-young feeding interactions (Grand 1984). Fledglings used reference areas farther from the nest tree as they grew older (Table 1), and at 24 and 27 days of age they loafed farther from the nest tree ($P < 0.05$) than did 15–20-day-old young. As the older fledglings became self sufficient (Hitchcock and Mirarchi 1984a) they moved among different openings on the ground and often established new reference areas.

The maximum distance moved each day increased with age, the rate of increase being greatest after 21 days PH (Fig. 1). This probably reflects completion of feather development at 20 to 21 days of age (Moore 1940), which results in a noticeable improvement in flight. The maximum distance moved by fledglings ≤21 days old was 257 m, but at this age fledglings rarely moved more than 70 m from the old nest site except when disturbed. Movements of >70 m were achieved by several short flights. Fledglings driven from reference areas by predators or human disturbance, and who were still dependent on parental care, always returned to those areas within 24 hours.

By 21 to 24 days of age some fledglings moved from their reference areas and centered their daily activities around abundant food supplies (Hitchcock and Mirarchi 1984a). The maximum distance moved by fledglings at this age was 345 m, and such fledglings generally were unable to fly with older juveniles in flocks. Fledglings moved greater distances at 27 and 30 days of age, usually in association with flocks of juveniles flying to feeding sites. Maturation of flight capabilities, greater sociability, and declining parental care contributed to increased fledgling mobility at this age (Hitchcock and Mirarchi 1984a).

Distances moved from nest trees to roost sites increased steadily with age (Fig. 2). During the period of fledgling dependency (ages 15–27 days) the maximum distance moved each day was usually to the roost site (61% of 199 observations). Roost sites often provide protection from predators (Pettingill 1970). The low frequency of use of the same roost site by fledglings that were dependent upon parental care may be an adaptation to prevent nocturnal predators from locating areas consistently used for roosting and may explain the relatively great distances flown by such fledglings each evening (Grand 1984).

Fledglings were found farther from nest trees during observation periods 1 (56 ± 4 m [SE]) and 3 (65 ± 4 m) than during period 2 (36 ± 4 m; $P = 0.05$) because of longer movement to and from roosts as well as general activity patterns during the morning and evening hours. Fledglings were most active at times previously reported for adult Mourning Doves (Duever and Fatora 1968).

This study indicates that Mourning Dove fledglings generally loaf in reference areas within 45 m of former nest sites through 27 days of age. However, development of flight capabilities and increasing ability to forage independently allows fledglings >21 days of age to establish new reference areas farther from the nest site and to travel greater distances to feed when necessary. Generally, fledglings do not abandon reference areas until they are 27 to 30 days old, at which time they are mobile enough to join juvenile flocks that may travel up to 1500 m from the nest site. During the period of fledgling dependency, maximum distances moved each day are usually to roost sites which are changed frequently, possibly to avoid nocturnal predators.

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Observations on the breeding biology of Emerald Toucanets in Costa Rica.—Emerald Toucanets (*Aulacorhynchus prasinus*) are abundant in montane forests of Central America, but their breeding biology has received little study (Wagner 1944; Skutch 1944, 1967). Here I provide data on the roles of sexes in parental care of young Emerald Toucanets and describe nestling diet.

Study area and methods.—The study was conducted in and around Monteverde, Costa Rica (10°18′N, 84°48′W) in scattered cattle pastures and small- to moderate-sized woodlots in montane wet forest. For a more detailed description of the area, see Lawton and Dryer (1980) and Holdridge (1967).

Observations were made during July–August 1984 and March–July 1985. Nests were monitored daily for 1–2 h (alternating mornings and afternoons) with 8 × 35 binoculars for a total of 107 h by me and 5 assistants. During each visit, percent time each sex spent in each activity (e.g., excavation, incubation, waste removal) was calculated. Based on a morphometric analysis of museum specimens (Riley 1986), I could reliably sex most toucanets in the field. Food items delivered to nestlings were classified as either insect or fruit, and more accurate identifications were made when possible. I calculated percent fruit in the nestling diet as well as percent of nests that fledged at least one chick.

Results.—Courtship feeding was first observed in mid-March. I saw males, perched next to a female, offer fruit on 3 occasions. Acceptance of the fruit was followed by copulation in 2 cases. Nest excavation began within a few days of courtship. A total of 13 nests was found, 3 in 1984 and 10 in 1985. All nests were in pastures or forest edges in old snags, except for one in a wooden utility pole along a roadcut. Nests were either enlarged wood-