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NESTING CHRONOLOGY OF THE COMMON GROUND-DOVE IN FLORIDA AND TEXAS

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Abstract.—Descriptions of the nesting season of the Common Ground-Dove (*Columbina passerina*) exist for many states; however, most are based on only a few nest records collected over broad geographic areas. We characterize the nesting season at one locality in Florida based on numerous records accumulated from year-round intensive field work. We compared our results with results from records obtained elsewhere in Florida and from Texas, and with small samples of records from several other states. Ground-doves in south-central Florida nested from late February–early October, with more than 50% of all clutches completed during a 44-d span from early April–mid-May. A slight increase in nesting occurred during late August–early September. Elsewhere in Florida, the nesting pattern was similar, but the peak was slightly longer and no second pulse was evident. Nesting began earlier and lasted longer in Florida than in Texas. Although of similar duration, peak nesting occurred 3–4 wk earlier in Florida than in Texas. Many seed-eating doves have multiple broods; Common Ground-Doves eat tiny grass and weed seeds. Using one month as the average duration of one complete nesting cycle, the nesting season of Common Ground-Doves in Florida, Texas, and apparently other states could accommodate the fledging of three or four broods. Unfortunately, data on the reproductive performance of individual ground-doves remain lacking. The true number of nesting attempts remains unknown.

CRONOLOGÍA DE ANIDAJE DE *COLUMBINA PASSERINA* EN FLORIDA Y TEXAS

Sinopsis.—Se ha descrito, en muchos estados, la época de anidaje de la palomita de suelos, *Columbina passerina*. Sin embargo, en la mayoría de los casos esto está basado en pocos registros tomados en una región geográfica amplia. En este trabajo caracterizamos la época de anidaje de este colúmbido en una localidad de la Florida. El estudio esta basado en la acumulación de registros a través muchos años de trabajo de campo. Comparamos nuestros resultados con registros obtenidos en otras localidades de la Florida y en Texas, y de muestras pequeñas tomadas en otros estados. En la parte sur-central de Florida, la palomita de suelos, anida desde finales de febrero hasta principios de octubre, completándose más del 50% de las camadas durante un lapso de 44 días entre principios de abril y mediados de mayo. Ocurre un pequeño incremento en el anidamiento de finales de agosto hasta principios de septiembre. En otras localidades de la Florida, el patrón de anidaje fué similar, pero el pico fué algo más largo y no se observó una segunda época de anidaje. En Florida, el anidamiento comienza mś temprano y ocurre en un periodo de mayor tiempo que en Texas. Aunque de duración similar, el pico del anidaje ocurrió de 3–4 semanas más temprano en la Florida que en Texas. Muchos colúmbidos que se alimentan de semillas producen varias camadas al año. La palomita de suelos se alimenta de muchas semillas de gramíneas. El tiempo promedio de un ciclo completo de anidaje de ésta ave es de un mes. Utilizando esta información como base, es probable entonces, que en lugares como Florida, Texas y en otros estados, el ave pueda producir de 3–4 camadas. Desafortunadamente, no hay datos sobre la reproducción particular de individuos y por tanto se desconoce cuantos intentos de anidaje puede llevar a cabo la especie.

The breeding range of the Common Ground-Dove (*Columbina passerina*) extends from northern South America to the southern United States (American Ornithologists' Union 1983). Two subspecies breed in the United States, *C. p. pallescens* from extreme southern California east

through southern Texas, and *C. p. passerina* from extreme eastern Texas (Oberholser 1974) east along the Gulf coast, throughout Florida, and north to southern South Carolina (American Ornithologists' Union 1983). Common Ground-Doves are more abundant in Florida and Texas than elsewhere in the United States (Price et al. 1995). Since 1966, the species has been declining throughout much of its range in the United States, including Florida, although it has remained relatively stable in Texas (Sauer et al. 1996).

Most species in the family Columbidae, especially seed-eaters, have lengthy breeding seasons during which they may produce multiple broods. Numerous nest records of the Common Ground-Dove exist; however, we find no detailed description of the complete nesting season for any locality. Nesting season accounts for several southern states—based primarily on nests found incidental to other field work and over large geographic areas—are, appropriately, very general. Duration of the nesting season calculated from nest records may be biased because search effort by observers may not encompass the entire season (Peakall 1970). A summary of nest records obtained throughout the year in native habitat at one locality would provide a more representative estimate of the annual breeding cycle of the Common Ground-Dove. We report on the nesting season estimated from ground-dove nests found at Archbold Biological Station during the past 30 yr. We characterize the nesting season of the species at Archbold and compare our results with nest records accumulated from Florida, Texas, and several other states.

METHODS

Field work began in the early 1960s at Archbold Biological Station in south-central Florida (Highlands County; 27°10′50″N, 81°21′00″W). Although effort varied, standard research protocols required extensive time in the field during every month of the year in a variety of habitats occupied by Common Ground-Doves. All active bird nests encountered were recorded, which to date includes 75 records for Common Ground-Doves. We suspect the distribution of these records was similar to the true annual distribution of ground-dove nests at this locality during these several decades.

For comparisons with our data from Archbold, we used nest records of Common Ground-Doves from the North American Nest-Record Program stored at the Cornell Lab of Ornithology (n = 163, 1951–1991) and from data slips for egg sets at the Western Foundation of Vertebrate Zoology (n = 118, 1882–1973), of which most were from Florida and Texas (157 of 163, Cornell; 85 of 118, Western Foundation). We also used 27 dated nest records from the Florida Breeding Bird Atlas Project and 17 nest records collected by RB in the Florida Keys. We determined the nesting season for Archbold and compared it with the nesting season for elsewhere in Florida. Next, we pooled all Florida data and compared them with records from other states. None of the Texas nest records was from extreme eastern Texas, therefore, we suspect our comparisons of the nest-

ing season in Florida with that in Texas pertain to *C. p. passerina* and *C. p. pallescens,* respectively.

Ground-doves lay two eggs (Goodwin 1967). We estimated the date of clutch initiation for each nest record. If only one visit was made and eggs were noted, we estimated the nest was found on the fourth day of incubation. If young were found in the nest, we estimated the nest was found on the fifth day after hatching. We backdated from these dates to determine the day of clutch initiation, assuming 14 d for incubation (Goodwin 1967). We established these criteria on the assumption that, because of relatively high nest failure rates, the probability of finding a nest decreases with each day after laying. Furthermore, because egg losses are generally higher than nestling losses in columbids (Goodwin 1967, Skutch 1991), we assumed nests with eggs were more likely to be found earlier is the incubation period than were nests with nestlings in the nestling period. Using these criteria, the maximum error in estimating the date of clutch initiation was one week. For 104 of the 399 total nest records, we were able to refine further our estimate of date of clutch initiation because nests were visited more than once or the appearance of the young was described.

For certain analyses we assigned each date of clutch initiation a 10-d period that represented the early, mid, or late trimester of a month. We defined the peak of breeding activity for each locale as the time span that included all clutches from the 25th percentile to the 75th percentile. We used the Levene Test to compare homogeneity in variances among the different samples and the Kolmogorov-Smirnov Goodness of Fit Test to test for normality. Although nesting dates for Texas and for Florida excluding Archbold were normally distributed, the nesting dates for Archbold and for all of Florida were not. Thus, we tested for differences in the median laying date between locales using the Mann Whitney U-test.

RESULTS

Extreme dates for clutch initiation by Common Ground-Doves in south-central Florida, at Archbold Biological Station, were 22 February and 7 October. Ninety percent of clutches were completed during a 181-d period from early March–early September. Peak nesting occurred from 3 April–16 May, a span of 44 d (Fig. 1a). During the five 10-d intervals included in this peak, 56% (42 of 75) of all clutches were completed. Nesting activity was low during June and July, but increased slightly during the last two trimesters of August and the first trimester of September. Clutch initiation dates at Archbold were significantly skewed (KS = 1.92, $P = 0.001$) toward the end of the season as a result of the late summer increase in nesting. The median date of clutch initiation was 24 April.

Extreme dates for clutch initiation by Common Ground-Doves in Florida excluding the Archbold data were similar to those from Archbold, 18 February and 20 September. However, 90% of the clutches were completed during a shorter 140-d period from late March–mid-August. Peak nesting occurred from 21 April–12 June, a span of 53 d (Fig. 1b). During

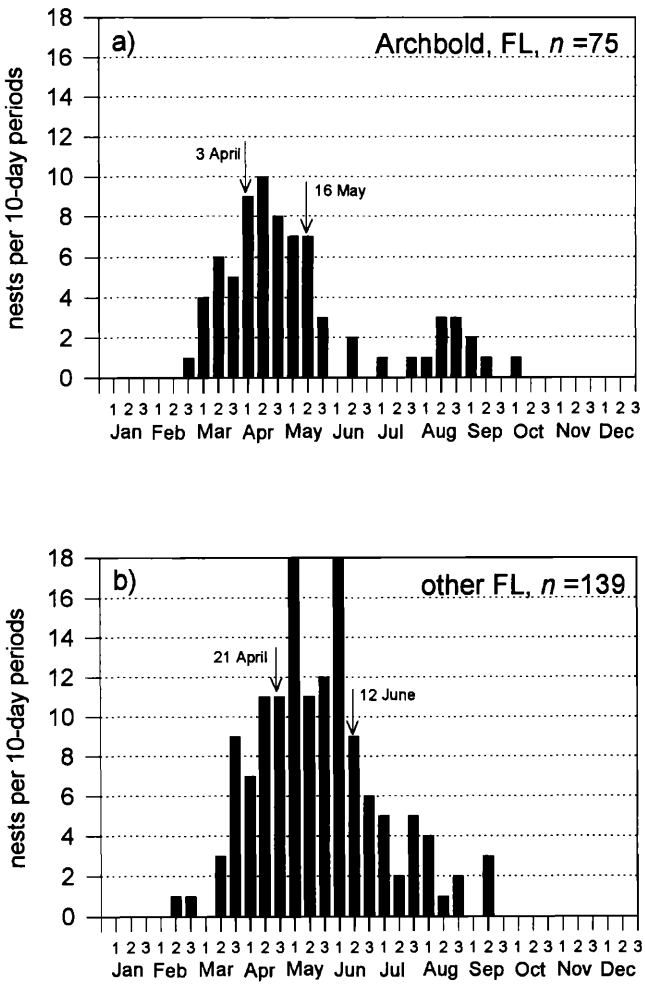

FIGURE 1. Frequency distribution of clutch initiation dates for Common Ground-Doves from a) Archbold Biological Station in south-central Florida, and b) elsewhere in Florida. Arrows indicate the dates by which 25% and 75% of all nesting attempts occurred.

the six 10-d intervals included in this peak, 57% (79 of 139) of all clutches were completed. Nesting activity declined gradually from the second trimester in June through the second trimester in September. Clutch initiation dates were normally distributed around a mean of 22 May and a median of 18 May. The median laying date was significantly ($Z = -3.15$, $P = 0.002$) later than at Archbold.

For all Florida records combined, extreme dates for clutch initiation by Common Ground-Doves were 18 February and 7 October. Ninety percent of the clutches were completed during a 165-d period from mid-

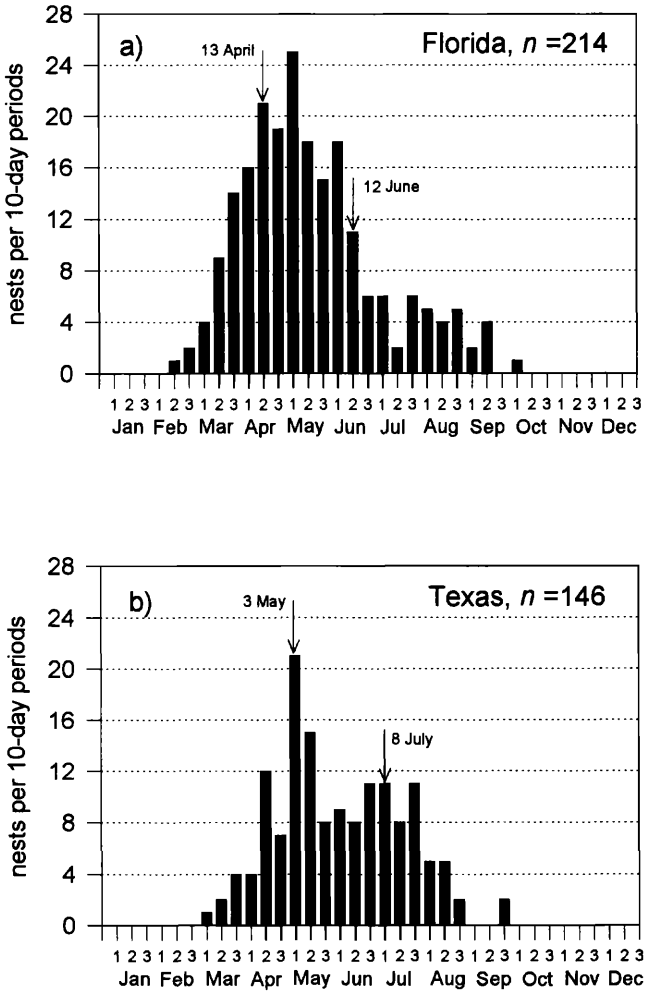

FIGURE 2. Frequency distribution of clutch initiation dates for Common Ground-Doves from a) Florida (nest records from Archbold and elsewhere in Florida combined), and from b) Texas. Arrows indicate the dates by which 25% and 75% of all nesting attempts occurred.

March–late August. Peak nesting occurred from 13 April–10 June, a span of 59 d (Fig. 2a). During the six 10-d intervals included in this peak, 53% (114 of 214) of all clutches were completed. Nesting activity declined gradually from the second trimester in June through the first trimester in October. Clutch initiation dates for the pooled Florida data were significantly skewed (KS = 1.78, $P = 0.004$) toward the end of the season, especially because of the late summer increase in nesting activity recorded at Archbold. The median date of clutch initiation was 9 May.

TABLE 1. The nesting season of the Common Ground-Dove based on nest records from seven states. The space separates southeastern and southwestern populations.

State	*n*	Clutch initiation		Duration of nesting season (days)	Range of peak		Duration of nesting peak (days)
		Mean	Median		25%	75%	
AL	2	8 May	8 May	—	—	—	—
FL	214	17 May	9 May	231	13 April	10 June	59
GA	13	8 May	12 May	95	16 April	24 May	39
SC	7	28 April	1 May	53	9 April	19 May	41
AZ	13	31 May	3 June	95	30 May	20 June	22
CA	3	9 July	1 Aug	—	—	—	—
TX	146	4 June	30 May	213	3 May	8 July	67

Extreme dates for clutch initiation by Common Ground-Doves in Texas were 1 March and 30 September. Ninety percent of the clutches were completed during a 139-d period from early April–mid-August. Peak nesting occurred from 3 May–8 July a span of 67 d (Fig. 2b). During the seven 10-d intervals included in this peak, 57% (83 of 146) of all clutches were completed. Nesting activity declined after the peak. Clutch initiation dates were normally distributed around a mean of 4 June and a median of 30 May.

The median date of clutch initiation for Florida (9 May) was significantly earlier ($Z = -4.12$, $P < 0.001$) than for Texas (30 May). Ninety percent of all clutches were completed within 165 d in Florida, compared to only 139 d in Texas. Nesting not only began earlier in Florida but also lasted longer than in Texas.

Differences in the nesting seasons between other southeastern and southwestern states, where sample sizes were small, were consistent with the differences between Florida and Texas. The median date of clutch initiation was consistently later in Arizona and California than in Alabama, Georgia, and South Carolina (Table 1), and the difference was significant when the data were pooled by southeastern and southwestern states ($Z = -5.63$, $P < 0.001$). Peak nesting occurred over approximately a 2-mo span in both regions, but occurred 1 mo later in the southwest (Table 1).

DISCUSSION

Published accounts of the nesting season in the United States suggest that Common Ground-Doves very rarely nest in December, rarely nest in November and January, and regularly nest from February–October (Bailey 1925, Bent 1932, Burleigh 1958, Howell 1932, Imhof 1976, Oberholser 1974, Post and Gauthreaux 1989, Sprunt 1954, Stevenson and Anderson 1994). Evidence of nesting during the late fall and winter comes from several sources. For California, Fortiner (1920) reported a "Ground-Dove

brooding a single young in its nest. . . ." on 21 December and another on 22 January in which the young fledged the next day. For Georgia, Landers and Buckner (1979) reported seven active nests during November, the latest of which fledged two young on 12 December, and Hopkins (1958) reported an early nest date of 23 January. He concluded that "nesting is taking place probably throughout the year but is of small consequence during the winter months." For Florida, Bailey (1925) stated "They breed from January to November. . . ." Although Baynard (1909a *in* Howell 1932) claimed he found nests "in every month of the year," he listed 5 February and 26 November as extreme egg dates. Based on a six-month-old specimen he collected in June in the Florida Keys and on the observation that ground-doves breed year-round in subtropical lowlands, Johnston (1962) suggested that ground-doves may breed commonly in December and January in Florida. However, we find no other published reports of ground-doves in Florida or elsewhere in North America initiating nesting during December. In contrast to in the United States, Common Ground-Doves may breed regularly throughout the year in Central America (Dickey and van Rossem 1938, Skutch 1964).

To date, few authors have discussed the frequency of nesting within the seemingly long nesting season. For Florida, Bent (1932) mentioned that half (37 of 73) the egg dates he studied fell between 16 April and 2 June. For Alabama, Burleigh (1958) stated most active nests occurred from mid-April–early June. For Texas, Passmore (1981) estimated that 33% of all juveniles captured during June–August had hatched during the first trimester of May. Our Florida data show that more than 50% of all clutch initiations occur during a seasonal peak of 50–70 d between 13 April–10 June.

Common Ground-Doves require about one month to complete a successful nesting cycle (incubating 14, nestling care 12, recycling 6), therefore, between February and October, pairs could fledge a theoretical maximum of seven or eight broods. Based on our data from Florida, most individuals do not begin nesting until mid-March, and most quit by mid-June. Only a relatively small percentage continue into early October. Using one month as the average duration of one nesting cycle, our data suggest that ground-doves in the United States regularly produce no more than three to four broods annually. As early as 1925 Bailey came to a similar conclusion that "three and sometimes four broods are raised a season. . . ." Unfortunately, data on the reproductive performance of individual ground-doves remain lacking. However, nest failure rates for columbids typically exceed 50% (Goodwin 1967, Sayre and Silvy 1993); therefore the true number of broods raised annually is likely less than three.

The data we present raise several interesting questions. First, why did the Archbold data differ from incidental nest records collected elsewhere in Florida? Nest records from elsewhere in Florida were collected through seven degrees of latitude (31°00′–24°30′). Only 12% of the Florida nest records were from the southern third of the state, whereas 38% and 50% were from the central and northern third of the state, respectively. Arch-

bold is located at the southern end of the central third of the state. The larger latitudinal range and the relatively large proportion of nest records from the northern part of the state may explain the broader seasonal peak in breeding and the later median date of clutch initiation from the Florida nest records excluding Archbold when compared with only the Archbold nest records.

A second question is what is the nature of the late breeding observed at Archbold and why was it not observed elsewhere in Florida? The time of nesting calculated from nest records, many of which were obtained incidentally, may be biased (Peakall 1970). In Florida, by mid-summer most landbirds have finished breeding, residents are molting and silent, migrants have yet to arrive, it is hot and pest insects are abundant. A decrease in observer activity probably occurred and may account for the lack of a second discernable increase in nesting among nest records from elsewhere in Florida. At Archbold, extensive field activity occurred throughout the year, thus a late summer–early fall increase in nesting was more likely to be detected. Juvenile Common Ground-Doves in Texas (Passmore 1984) and in Florida (Johnston 1962) are capable of breeding as young as three or four months old. We suggest that the second breeding peak at Archbold, which began four months after the start of the first nesting peak, may result from precocious reproduction by young of the year. This pattern may have been apparent only at Archbold because our searches were conducted throughout the year or possibly because precocial reproduction occurs only at southern latitudes (Johnston 1962) and the pattern was masked by the more northern latitudinal range of the other data sets.

Lastly, what causes the difference in nesting patterns between Florida and Texas? At Archbold, the maximum number of newly fledged young probably occurs 1–2 mo after peak clutch initiation during May–July. This peak coincides with the flowering and seeding of many grasses and weeds that grow on road shoulders, open sandy scrub, and sandy pond margins, all habitats where ground-doves are seen regularly. The seeds of several of these plant species (e.g., *Croton* spp., *Panicum* spp., *Portulaca* spp.) are important foods for ground-doves in Florida (Howell 1932) and Texas (Passmore 1981). The timing of the second breeding peak at Archbold also may coincide with a fall peak in grass and weed seed production (E. Menges, pers. comm.). Differences in the timing of breeding between Florida and Texas, and the southeast and southwest in general, may relate to differences in the seasonal availability of food.

Most nesting occurs during a shorter time interval in Texas than in Florida. However, the peak, which occurs 3–4 wk later in Texas than in Florida, is of similar duration. Based only on the number of possible nesting attempts, productivity of ground-doves in both regions should be similar or slightly higher in Florida. However, ground-dove populations appear to be declining in Florida (Cox 1987) and stable in Texas (Sauer et al. 1996). We know little about the actual number of young produced or about juvenile and adult survival of ground-doves. In the southeast,

Mourning Doves (*Zenaida macroura*) average from three to six nest attempts, 90% of which occur between February and August (Sayre and Silvy 1993). Nationwide, productivity averages 3.6 young per breeding pair annually (Sayre and Silvy 1993). Other studies of marked individuals report similar productivity (Blockstein 1986, Westmoreland and Best 1987). Annual adult survival rates range from 35–50% (Martin and Sauer 1993, Reeves et al. 1993, Tomlinson and Dunks 1993) leading Sayre and Silvy (1993) to estimate that, at least during 1950–1980, this production was sufficient to balance Mourning Dove mortality. To understand differences in the regional population trends of Common Ground-Doves, we need a better understanding of demography and habitat requirements throughout their range.

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