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**Double-brooding by Florida Burrowing Owls.**—While conducting a study to determine the impact of urban development on Florida Burrowing Owls (*Athene cunicularia floridana*), we discovered five instances of double-brooding (defined here as raising two broods in the same calendar year). Double-brooding has not been previously documented in Burrowing Owls (Bent 1938, Butts 1973), but most information on the breeding biology of this species comes from studies of Western Burrowing Owl (*A. c. hypugaea*) populations that are migratory or breeding in areas where climate probably precludes multiple breeding attempts

(Best 1969, Coloumbe 1971, Martin 1973, Gleason 1978, Collins 1979). Studies of non-migratory populations of *A. c. hypugaea* by Thomsen (1971) and Butts (1973) revealed occasional renesting following the destruction of burrows or the loss of eggs or hatchlings. Wesemann (1986) suggested the subtropical climate and stable prey densities in southern Florida might allow double-brooding by *A. c. floridana,* but he observed no double broods during a two-year study in southwestern Florida. This paper describes double-brooding in the same southwestern Florida Burrowing Owl population studied by Wesemann (1986).

*Study area and methods.*—Observations were made between 1 January 1987 and 1 July 1988 on a 36.2-km$^2$ study area in Cape Coral, Lee County, Florida. The study area consisted mainly of single-family homes interspersed with vacant lots. Vacant lots, where most nest burrows were situated, were maintained as disclimax grasslands by regular mowing. Climate in Cape Coral is subtropical, with an annual mean temperature of 23.1°C. Temperatures below 0°C are rare; lowest daily mean temperature for January (the coldest month) is 10.9°C. Precipitation averages 125.7 cm annually, and 75% of rainfall occurs between May–September (climate data from NOAA climatological data summaries for Fort Myers, Florida, 20 km southeast of the study area).

From January through March in both years, we drove all roads in the study area searching for Burrowing Owl nest burrows. This approach is known to locate all but a small percentage of nests (Wesemann 1986). Burrows attended by two adult owls or decorated with shredded paper and grass were considered occupied nest sites. Adult and juvenile Burrowing Owls were captured with noose carpets placed at the burrow entrance and were banded with U.S. Fish and Wildlife Service bands. When banded owls were reencountered, we confirmed identification by reading band numbers with spotting scopes or binoculars or by retrapping. The sex of breeding adults could usually be determined at a distance by plumage (males were lighter than females due to increased sun-bleaching [Thomsen 1971, Butts 1973, Martin 1973]) or behavior (Thomsen 1971). Breeding females could be distinguished in the hand by the presence of a large, conspicuous incubation patch. Clutch initiation dates were estimated at successful nest sites (occupied nest sites that fledged at least one young) by back-dating 70 days from the fledging date (assuming an incubation period of approximately 30 days and a nestling period of 40 days; Collins [1979], Henny and Blus [1981], pers. obs.). Juveniles were considered fledged if, when approached, they flew away rather than retreated into the burrow. Nests were examined weekly, and the midpoint of the interval between the observed fledging date and the last previous visit was used as the actual fledging date.

*Results.*—We located 149 occupied Burrowing Owl nest sites in 1987 and 160 in 1988. Egg laying occurred from about 10 December to 18 April, in the 1986–1987 breeding season, and from about 2 October to 9 May in 1987–1988 (Fig. 1). The median clutch initiation date was 15 March in both years.

In 1986, at least three Burrowing Owl pairs laid eggs about 10 December, before we initiated surveys. We banded both adults at each of these nests in January 1987, as well as three of four juveniles in February 1987. One juvenile fledged at each of two nests (nests A and B), and two young fledged at the third (nest C). Fledging occurred on about 25 February 1987. Adults at nests A and C remained paired, and by mid- to late March 1987 exhibited signs of renesting (e.g., burrow decoration). The pair at B separated on about 22 February 1987, when the banded male from nest B paired with a different banded female at a new burrow (nest D) 30 m away. His previous mate and the fledged juvenile remained at nest B.

On 22 May 1987, nonflying young were observed again at nests A and C. In both cases, these juveniles were attended by the same adults that attended the earlier broods. Five young fledged at nest C about 21 May 1987, and three fledged at nest A about 3 June 1987. We estimated that second clutches were initiated at nests C and A on 13 March 1987 and 26 March 1987, respectively. Juveniles from the first brood were not observed at nest A after

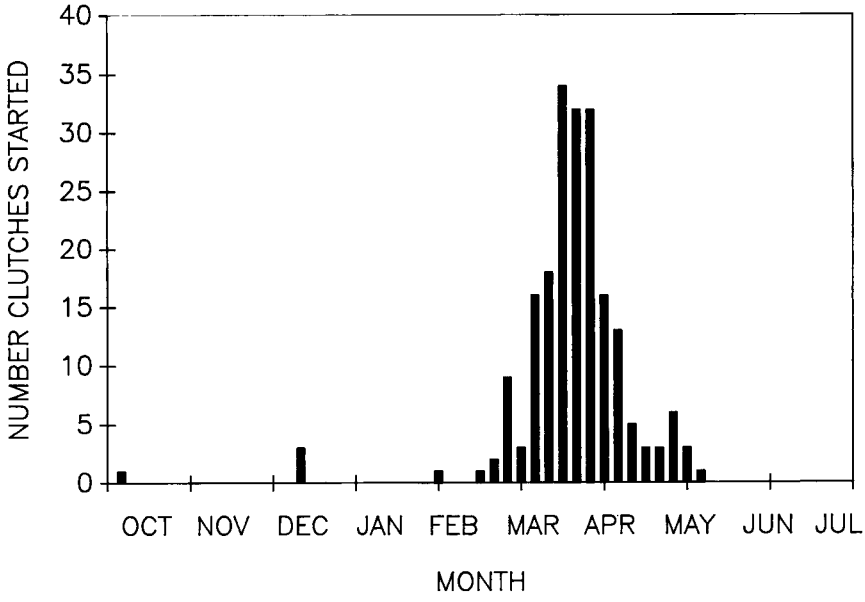


FIG. 1. Nesting chronology of Florida Burrowing Owls in Cape Coral, Florida, December 1986–July 1988. Data for both years are pooled since the median laying date (15 March) was the same.

mid-March 1987. The single juvenile from the first brood at nest C moved to a new burrow 50 m away in mid-March; we observed no subsequent interactions between this owl and the adults at nest C.

We observed nonflying young at nests B and D on 23 May 1987. The brood at nest D was attended by the male that had earlier nested at B and his new mate. Nest B was attended by the adult female present earlier and her son from the first brood (the sex of this juvenile was confirmed in the 1987–1988 breeding season). The juvenile actively defended nest B from human intruders, but he was not observed bringing food to his mother or to the second brood. The male at nest D actively defended that nest and captured food for that brood, but he showed no attachment to nest B or to his previous mate after 22 February 1987. Four juveniles fledged at nest B and three fledged at nest D on about 31 May 1987. We estimate that clutches at both nests were initiated about 23 March 1987.

A fourth pair of Burrowing Owls (nest E) fledged three young on about 2 May 1987 (egg laying occurred about 23 February 1987). The same male and a different unbanded female initiated a clutch at nest E about 2 October 1987. Two young fledged at this nest about 12 December 1987. There were no subsequent breeding attempts at this nest in the 1987–1988 breeding season.

The approximate interval between fledging of first broods and initiation of second clutches was 29 days at nests A and D, 26 days at nest B, and 16 days at nest C. The interval at nest E was approximately 150 days.

*Discussion.*—Our observations confirm Wesemann's (1986) prediction that double-brooding could occur in Florida Burrowing Owls, although it appears to be a rare event (1% of

occupied nests in our study population over two years). Additional observations will be required to identify circumstances that lead to double-brooding in this population.

The paternity of the second brood at nest B is uncertain. The original pair at this nest separated 29 days before the second clutch at B was initiated. The only male Burrowing Owl observed at nest B during this 29-day interval was the son from the earlier brood. Thus, there are four possibilities regarding paternity: (1) the original male at nest B mated polygynously with females at both nests B and D; (2) the second clutch at nest B was fertilized by sperm stored from copulations prior to 22 February 1987; (3) the clutch was fertilized by the male offspring of the first brood; or (4) fertilization resulted from extra-pair copulation(s) with an unknown male.

While we cannot rule out possibilities (1) and (4), they are not consistent with our observations (i.e, on our weekly visits between 22 February and 23 March 1987 we observed no interactions between the original pair and saw no foreign males in the vicinity of nest B). Possibility (2) is contingent on sperm storage capabilities in female Burrowing Owls. Although sperm storage glands have not been described in this species, they are present in many avian orders (Hatch 1983). In species that have been studied, sperm remains viable in the storage glands for 6 to 60 days, although fertilization capability appears to decrease with time (Hatch 1983).

Even if fertilization resulted from stored sperm, it is unlikely that the female at nest B could produce a full clutch of eggs without a mate to supply her with food. Our observations indicate that females at successful nests gain so much weight prior to egg laying that some are unable to fly for several days prior to clutch deposition. During this time and throughout the laying period, females seldom leave the nest burrow and are probably totally dependent upon the male for food and nest defense. Newton (1986) reports a similar dependence on males by female Eurasian Sparrowhawks (*Accipiter nisus*) during egg laying. Unassisted female Burrowing Owls would be hard-pressed to reach the physiological condition necessary for egg laying or to lay a clutch of normal size. For this reason, we believe that the son from the first brood at nest B probably provisioned his mother during laying and incubation, whether or not he was the father of the second brood. The adult female at nest B died in July 1987, and her son subsequently paired with an unbanded female. Thus, we were unable to confirm whether the mother and son were a mated pair.

Parent-offspring matings are not uncommon in our study population. During the 1987–1988 breeding season, four such pairs were found; three males paired with their mothers and one female paired with her father. This represents 13% of all pairs where both adults were identified (N = 31). The age at which Burrowing Owls become sexually mature is unknown, but we have observed copulation attempts between 80-day-old siblings, and one-year-old males and females (including one of the mother-son pairs noted above) nested successfully on our study area in the 1987–1988 breeding season.

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**Was the Socorro Mockingbird (*Mimodes graysoni*) a predator on small birds?**—The endemic avifauna of Isla Socorro, of the Revillagigedo archipelago, Mexico (lying ca 400 km SW of the tip of Baja California), includes four passerines: the Socorro Wren (*Thryomanes sissonii*), which looks as much like a House Wren as a Bewick's Wren; a distinctive form of the Tropical Parula (*Parula pitiayumi graysoni*) that was considered a full species as recently as the 5th edition of the AOU Check-list (AOU 1957); a small (30 g) race of the Rufous-sided Towhee (*Pipilo erythrophthalmus socorroensis*), also given species status in that check-list; and the Socorro Mockingbird (*Mimodes graysoni*), considered an endemic monotypic genus. Formerly called "Socorro Thrasher," this bird appears in the field to be more similar to mockingbirds. However, in a cladistic study of the Mimidae, Gulledge (1975) was unable to resolve a trichotomy that included *Mimus* (the typical mockingbirds), *Mimodes,* and *Toxostoma* (the thrashers).

Once considered "the most abundant and widely distributed species" on Isla Socorro (McLellan 1926), *Mimodes graysoni* was almost completely extirpated by 1981, probably by feral cats descended from pets brought to the island after the establishment of a military base in the late 1950s (Jehl and Parkes 1982, 1983).

Almost nothing is known of the life history of *Mimodes,* particularly its feeding behavior, in a natural state. The only published statement on foraging I have found is that of Brattstrom