NESTING OF SOUTHERN SONORAN BIRDS DURING THE SUMMER RAINY SEASON

LESTER L. SHORT
American Museum of Natural History
and
City University of New York
New York, New York 10024

My interest in the avifaunas of xeric regions prompted me to visit Alamos, Sonora, from 21 July to 9 August 1971. The Alamos region is just south of the Sonoran Desert, the southern limit of which is generally placed at, or just north of, the Mayo River. It is within an ecotone formed by the gradual merging of thorn forest, desert, and short tree forest (Shreve 1951). I timed my visit to coincide with the period following the onset of the summer rainy season. My objective was to ascertain which avian species were nesting at this time. Although many species were breeding, it was of course impossible to establish the proportion of a given species that was nesting, and which of the nestings represented second broods or renestings. Hence, the results presented below are preliminary, and intended to stimulate further studies in that interesting region. Nevertheless, it is shown that many species breed in the period of the summer rains, and that some species are occupied with nesting activities until late August or September.

Alamos, an old town once the capital of Sonora, and a famous locality for early collectors, is situated in low foothills between the isolated, rugged Sierra de Alamos southwest of town, and the Sierra Madre Occidental 25 miles to the east. Its elevation is 1345 ft, and the Sierra de Alamos rises to over 5800 ft. I characterize the vegetation of the region about Alamos as: short tree forest in a few places in the hills and near the Cuchujaqui River, south of Alamos; thorn forest on less disturbed slopes and along some arroyos; thorn scrub near areas of cultivation, in heavily pastured sites, and in drier situations generally; and mixed desert and thorn scrub in very dry sites, in badly overgrazed or otherwise very disturbed areas, and in increasing abundance as one proceeds north and west from Alamos toward the Mayo River and Navojoa [for example, I found scattered, large saguaro cacti (*Carnegiea gigantea*) on Cerro Prieto, a hill a dozen miles out of Navojoa along the Alamos road, and the only stand of this desert species known to me to occur outside Shreve's (1951) limits of the Sonoran Desert]. This largely ecotonal region about Alamos is occupied by birds that may be characterized as: (a) cosmopolitan species, widely distributed in diverse habitats; (b) species of xeric regions generally that occupy both the Sonoran Desert to the north and the thorn forest to the south; (c) tropical, thorn forest, and short tree forest species which reach southern Sonora from the south, but penetrate the Sonoran Desert little, if at all; and (d) northern, xeric-adapted species which reach their southern limit in southern Sonora or in northern Sinaloa (coastal northern Sinaloa, especially).

When I arrived in Alamos on 21 July, the vegetation was verdant and luxuriant, totally unlike the xeric aspect of that countryside I witnessed some years ago in early June, at the end of the spring dry season. Local residents informed me that the rains commenced about 1 July 1971, with heavy but generally brief rains about every fourth day. On 20 July a long, heavy rain fell in the morning although rains usually occur during afternoons or evenings. During my 3-week stay, rain fell on 7 days, mainly within a 2-hour period or less, but on 30 July successive storms resulted in intermittent rain all day. Temperatures exceeded 32°C on all but 2 days and usually exceeded 38°C in the afternoon. Humidity, although not measured, was high most of the time, even on days without rain; about half the nights were uncomfortably humid and hot. Summer temperatures average 30.3°C for June, the hottest month, 27.8°C for July, and 27.5°C for August (based on average for 28 years, see Hastings 1964). The summer rains ordinarily commence abruptly in late June or early July, peak in July and August, and gradually diminish in September. About three-quarters of the annual precipitation of 643.5 mm (Hastings 1964) falls in these 4 months, mainly in July and August. Winter rains fall mainly in December and January, accounting for a small portion (16%) of the annual rainfall, which nevertheless is important because these

The Condor 76:21–32, 1974

TABLE 1. Nonbreeding birds observed near Alamos, July–August 1971.

Species	Number	Date	Habitat or site
Phalacrocorax olivaceus Neotropic Cormorant	1	27 July	Cuchujaqui River
Coccyzus minor Mangrove Cuckoo	1	25 July	arroyo, 3 mi. E Alamos
Coccyzus minor Mangrove Cuckoo	1	27 July	arroyo, 14 mi. NW Alamos
Myiarchus cinerascens Ash-throated Flycatcher	common	26 July+	various sites
Empidonax d. difficilis Western Flycatcher	5; 1 specimen	29 July (specimen)	Cuchujaqui River
Icterus (bullockii) galbula Bullock Oriole	1	22 July	arroyo near Alamos
Icterus (bullockii) galbula Bullock Oriole	1	5 August	arroyo near Alamos
Pheucticus melanocephalus Black-headed Grosbeak	4–5	25 July+	various arroyos
Chondestes grammicus Lark Sparrow	20+	26 July+	15 mi. W Alamos

rains fall steadily over a longer span of time, and hence are more beneficial than the summer "downpours." April and May receive almost no precipitation (average 2.7 mm, May rainless or with but traces in 22 of 27 years), and February, March, and November also are very dry months. According to local residents, the winter and early summer rains of 1971 were about normal, but the winter had been marked by several unusually cold periods, with local frosts killing many trees, in some places within 2 miles of Alamos.

The following list of species includes all resident and breeding or presumed breeding birds that I observed within a 15-mile radius of Alamos. Some comparative data are provided from Guirocoba, 17 miles SE of Alamos in short tree forest at an elevation of 1450 ft (see van Rossem 1945:307). Nonbreeding migrants or vagrants are listed in table 1, for the sake of completeness; few ornithologists have worked in the region in July and August. Primary emphasis is placed on those species for which positive or negative evidence for nesting was obtained. Subspecific determinations reflect the collecting of specimens; these are deposited in the American Museum of Natural History and the Instituto de Biología, Mexico City. My own data herein are supplemented by data from the labels of specimens in the collections of the Western Foundation of Vertebrate Zoology (referred to as WFVZ below) at Los Angeles, and the Neotropical Ornithological Foundation (NOF below) at Tucson, Arizona.

SYSTEMATIC LIST

The names used in the following list, and their order, follow that of Friedmann et al. (1950), Miller et al. (1957), and Eisenmann (1955), for the sake of convenience, but a few generic and specific names are changed following views I have expressed elsewhere (Mayr and Short 1970). A few taxonomic comments at the subspecies level also are offered.

Dendrocygna autumnalis. Black-bellied Tree Duck. Pairs of this widespread duck were twice seen along the Cuchujaqui River. On 26 July we flushed a pair from a large, broken tree along a dry arroyo in thorn scrub NW of Alamos, 6 miles from surface water. Their occurrence in pairs and the persistence of the arroyo pair in returning to the vicinity of the large tree, which had several crevices in it, suggest nesting activity.

Coragyps atratus. Black Vulture. Vultures were uncommon except along the Alamos-Navajoa highway, where patrolling birds and groups at road kills were observed frequently. Up to 34 individuals, including 22 at one carcass (dead burro), were noted along this road on one day. This species was more numerous than the next. Although its breeding status in the Alamos region is uncertain, a two-egg clutch (WFVZ) was taken at Guirocoba on 12 May.

Cathartes aura. Turkey Vulture. One or at most two seen occasionally. Breeding status undetermined.

Buteo albicaudatus. White-tailed Hawk. Several noted on 29 July and 1 August over open, cultivated, or pastured fields NW of Alamos along Navajoa road.

Buteo nitidus. Gray Hawk. I saw this hawk daily in all wooded areas. There was no indication of nesting, although pairs were noted. Two downy young birds were found by L. Huber in a nest high in a tree along the Cuchujaqui River on 10 June (specimen, NOF, downy bird with secondaries 20 mm long). Eighteen clutches from the Guirocoba region (WFVZ) represent dates between 5 May and 9 June.

Buteogallus anthracinus. Common Black Hawk. I saw this hawk only along the Cuchujaqui River. A lone young bird, apparently not having full power to fly, was encountered on 23 July. In the same general area L. Huber collected a male (NOF) having enlarged testes on 4 June. Three clutches of one to two eggs were taken 13 May–4 June at Guirocoba (WFVZ).

Polyborus plancus. Caracara. Uncommon (up to four on any one day; none seen on half the days), mainly in pairs. One pair was observed regularly at or near a nest with unknown contents high in an hecho cactus (*Pachycereus pectenaboriginum*) between Alamos and the Cuchujaqui River. According to Richard Crossin (pers. comm.), this species usually nests in March and April in this region. Fifteen clutches in WFVZ, all but two (one egg, three eggs) containing two eggs, were taken near Guirocoba from 1 May to 8 June.

Falco sparverius. American Kestrel. I found American Kestrels rather uncommon, despite readily available food in the form of large grasshoppers (an irruption of at least two species of grasshoppers was under way, with swarming in such numbers that the highway was made slippery by their carcasses). The kestrels were paired, and several were seen near holes in cacti, but no birds entered the holes, and none was carrying food. They were more common in open areas north of Alamos than in thorn forest.

Ortalis (poliocephala) wagleri. Wagler Chachalaca. Chachalacas called on several occasions in well-wooded hills, such as those NE of Alamos, and from the slopes of the Sierra de Alamos. A male with large testes was taken by L. Huber (NOF) on 4 February 7.4 miles SE of Alamos. Eleven clutches, in WFVZ, all of three eggs, were taken between 8 and 13 June at Guirocoba.

Callipepla (Lophortyx) douglasii douglasii. Douglas Quail. Although it barely penetrates the dense vegetation at the southern and eastern edges of the Sonoran Desert, this quail was common to abundant in all areas. Except for two large groups (family parties and young birds half-grown), the birds were alone or in pairs. Individuals frequently circled the observer, giving alarm calls, and allowing close approach. The female of a pair found dead in a road SE of Alamos on 22 July had a shelled egg in its oviduct; the male's testes were badly damaged. These observations and calling by many males indicate general nesting activity. It is not clear when the breeding season commences. A male taken by L. Huber (NOF) SE of Alamos on 10 April had slightly enlarged testes. Douglas Quail were most numerous in moderately dense thorn forest and at edges of thorn forest and cultivated fields. Few were seen in very open, xeric situations such as those prevailing 15–20 miles NW, N, and NE of Alamos. Gambel Quail (*Callipepla gambelii*) did not seem to replace Douglas Quail in these areas, but were found slightly to the NW, about 10 miles toward Alamos from Navojoa. Nowhere in the entire region did I find both species together; I was told that hunters rarely take Gambel Quail near Alamos in late fall.

Columba flavirostris. Red-billed Pigeon. Solitary individuals or small groups of these pigeons were seen flying overhead daily. In WFVZ are four single-egg clutches taken 6–16 June in the Guirocoba region.

Zenaida asiatica. White-winged Dove. This dove was abundant, only pairs were seen, and males were calling everywhere. Nest construction was observed, but the several nests seen were too high to be examined. Two eggs were found on a tree limb a meter above a ravine on 26 July. Thus, midsummer seems to be a major period of nesting, although in the Guirocoba region the species is known to lay one- and two-egg clutches in May and June (WFVZ). The related Mourning Dove (*Z. macroura*) was not seen, except for one observed 21 miles E of Navojoa and northward, where it was abundant (as it is near Alamos in fall and winter, according to local hunters) along the Navojoa-Ciudad Obregón highway both in late July and early August.

Columbina passerina. Ground Dove. Nests of this common to abundant dove were noted on branches of large trees over an arroyo NW of Alamos on 2 August. One nest that I could reach contained two eggs. Most birds were paired. Earlier nesting is indicated by two-egg clutches taken on 25 May and 7 June near Guirocoba (WFVZ).

Columbina (Scardafella) squammata. Scaled (Inca) Dove. Only slightly less abundant generally than *C. passerina,* this dove was more common than the latter species in dooryards and near houses. Pairs and small groups were encountered. The greater frequency of calling of *squammata* compared to *passerina* suggested more breeding of the former, but R. S. Crossin points out (pers. comm.) that *squammata* is more vocal than *passerina,* calling throughout the year. I found no nests, but Crossin mentioned a breeding female with enlarged oviduct and large ova collected by L. Huber on 8 April near Alamos, and two clutches in the WFVZ collection were taken at Guirocoba on 11 and 14 June.

Leptotila verreauxi. White-fronted Dove. This locally common but inconspicuous dove reaches its northern range limit in southern Sonora. Its nesting was indicated by its frequent calling and an observation of nest construction 2 m above a ravine on a branch that touched the ravine wall S of Alamos on 2 August. Earlier nesting is suggested by a male with very large testes taken by L. Huber along the Cuchujaqui River on 5 February (NOF).

Ara militaris. Military Macaw. Pairs and groups of up to six birds were seen about every other day. Most were in flight, but twice we flushed quietly feeding groups from trees near the Cuchujaqui River. Local hunters said that they do not find nests in the Alamos region, but in the Sierra Madre Occidental. However, Crossin (pers. comm.) reports a female, taken by L. Huber on the Mayo River 12 miles NE of Alamos, that had a shelled egg in the oviduct. On the same date, 6 June, a set of three eggs were taken there from a cavity in a large sycamore tree. In WFVZ are seven clutches of one to three eggs each taken 5–11 June in the Guirocoba region. Sporadic breeding along the Cuchujaqui River seems likely.

Forpus cyanopygius pallidus. Blue-rumped Parrotlet. This locally common parrot, which reaches its northern limit near Alamos, was encountered in small (4 to 6 birds) to large (up to 30 birds) flocks foraging either quietly or noisily in fruiting trees, and also in bushes only 4 ft high. Three males among four molting specimens taken from three different flocks on 6 August had moderately large, apparently regressing testes. Two of them had crops distended with white seed or fruit particles. Nesting probably occurs just prior to the rains, in May and June. Suggesting this are a female with an enlarged ovary

and a male with slightly enlarged testes taken by L. Huber on 8–9 April SE of Alamos (Cuchujaqui River, NOF). No parrotlets were noted in the Alamos plaza, where Alden (1969) reported them in great numbers, presumably in fall and winter.

Amazona albifrons. White-fronted Parrot. Groups of 3–15 parrots were observed almost daily, chiefly in thorn scrub and mixed desert and thorn scrub where numerous pitahaya cacti (*Lemaireocereus thurberi*) were fruiting. On 27 July a male taken from a group feeding in these cacti had pieces of the fruit in its bill. It was in full molt and had regressing testes. L. Huber obtained a male with enlarged testes SE of Alamos on 9 April (NOF). I did not encounter the Finsch Parrot (*A. finschi*) along the Cuchujaqui River or elsewhere, although Huber found it common along that river from April to June in 1967 and 1968 (Crossin, pers. comm.).

Coccyzus americanus. Yellow-billed Cuckoo. Common to abundant and singing everywhere; eight nests with eggs were found. Van Rossem (1945:104) cited Sonoran specimen records from 9 June to 22 September, and clearly this cuckoo is a summer wet season breeder in that state. *Contra* van Rossem, it was not entirely riparian in distribution, although undoubtedly it is most numerous along watercourses. One female obtained on 25 July showed large ova and two ruptured follicles.

Crotophaga sulcirostris sulcirostris. Groove-billed Ani. Locally abundant near cultivated fields and other open places along arroyos near Alamos. Anis occurred strictly in pairs, and males were singing. Displays involving two birds (presumed pairs) were noted frequently, and one bird displaying on 25 July proved to be an adult male with moderately enlarged testes. This cuckoo probably is mainly a summer rainy season breeder. Van Rossem (1945) gave dates of occurrence commencing in May and June, and he reported breeding in late June at the start of the rainy season near the Mayo River. L. Huber collected (NOF) a male with moderately larger testes and a female with a large, granular ovary on 5 June.

Geococcyx californianus. Roadrunner. Common in more open thorn forest, thorn scrub, and desert areas, but no breeding activity observed. Clutches of three, four, and five eggs from the Guirocoba region in WFVZ were all taken from 3 to 12 June.

Geococcyx velox melanchima. Lesser Roadrunner. Although probably common locally, this shy bird is unobtrusive, and can be confused with the larger Roadrunner, hence it is reported infrequently. It tends to occur in densely wooded, hilly terrain, and seems somewhat arboreal. Sightings were in dense thorn forest of hills NW of Alamos, and in the lower slopes of the Sierra de Alamos, as at Aduana Mine. I collected a male 4.5 miles NW of Alamos on 6 August (testes 9 × 4.5 mm, left, and 6 × 4 mm, right; heavy molt, presumably postbreeding), and a female in the Sierra de Alamos on 30 July (ovary 21 mm, ova to 3 mm, had not laid). Both birds were in trees 10 ft and 8 ft above the ground, and the female seemed to be foraging. The bare skin of their heads was mainly violet-blue, this color extending from the eyes to the back of the head, where a small bright red occipital patch was evident. The male's gizzard contained two lepidopterous larvae over two inches long. The duration of the breeding season is unknown, but it extends into late summer for at least some individuals. Clutches of two eggs on 7 June and one egg on 13 June are in WFVZ. Possibly it tends to breed later than *californianus.*

Glaucidium brasilianum cactorum. Ferruginous Owl. Two seen perched close together on a tree branch in thorn forest N of Alamos on 2 August proved to be a very gray adult male with slightly enlarged testes, and a female. A male (NOF), taken by L. Huber 6 miles SE of Alamos on 6 June, also had somewhat enlarged testes. Nine clutches of three to five eggs in WFVZ were collected near Guirocoba 10 May and 13 June.

Chordeiles acutipennis. Lesser Nighthawk. Common, no breeding data.

Caprimulgus ridgwayi. Buff-collared Nightjar. Heard twice. Local residents report that it is more vocal early in the summer. Four clutches of two eggs each in WFVZ were obtained 20 May–16 June near Guirocoba. This nightjar was not calling in February 1968 when L. Huber took a male that had small testes along the Cuchujaqui River SE of Alamos (NOF).

Cynanthus latirostris. Broad-billed Hummingbird. This was by far the more common hummingbird in all habitats. A male with slightly enlarged testes, obtained on 5 August 16 miles W of Alamos, was feeding at a ripe, broken pitahaya cactus fruit. This hummer is a late winter and spring breeder as indicated by a female with an unshelled egg in the oviduct, taken by L. Huber on 4 February 4.4 miles SE of Alamos; he also collected a male with small but enlarged testes on 5 February near Alamos (NOF). A single egg was obtained near Guirocoba on 5 May (WFVZ).

Amazilia violiceps. Violet-crowned Hummingbird. At least three were seen on different occasions in hilly thorn forest. R. S. Crossin provided the following information concerning this species, from the field notes of the late L. Huber, and from specimens in NOF. In 1968, Huber, working along the Cuchujaqui River 7.4 miles SE of Alamos, obtained males with small testes on 7 April and 10 April and a female with an enlarged ovary on 10 April. He also obtained a female with an unshelled egg in the oviduct at a nest containing one egg on 9 April. The nest, 6 ft up in a thorny bush, was composed of whitish, downy plant material and, on the outside, various weed seeds and a single green leaf, all bound into the nest with spider "silk." Although I did not see the species, Huber also took three females of the Constant Starthroat (*Heliomaster constantii*) on 9–10 April 1968 at the same Cuchujaqui River site; the ovaries of all were enlarged, and Huber suggested that the species probably breeds there.

Trogon elegans canescens. Coppery-tailed Trogon. Common throughout the region. They called frequently, and probably were breeding, but I located no nests. A male collected on 25 July had moderately large testes, as did a male taken by L. Huber on 4 June SE of Alamos (NOF). Huber also obtained a female with large ova at the same site on 4 June. Seven nests containing two, and in one instance three, eggs were found near Guirocoba between 5 May and 16 June (WFVZ).

Chloroceryle americana. Little Green Kingfisher. Common about rivers and arroyos containing water. Seven specimens, collected by L. Huber along the Cuchujaqui River SE of Alamos between February and June, indicate late winter and spring nesting; an April male had enlarged testes, and females taken

on 4 February, 8 April, and 10 April all had very large ova (NOF).

Momotus mexicanus vanrossemi. Rufous-crowned Motmot. I saw and heard motmots along the Cuchujaqui River; they were noted near several arroyos between Alamos and the river; and one was seen in the foothills of the Sierra de Alamos near Aduana. A male, obtained as it called beside an arroyo one mile from the Cuchujaqui River on 29 July, was molting, a fact which, with its moderately-sized testes, suggests that it had already bred. L. Huber took the following specimens 7.4 miles SE of Alamos: three males, testes slightly enlarged, 9 April; and testes moderately large, same date; and testes moderately large, 9 June; and a female with a large, granular ovary on 8 April (NOF).

Colaptes auratus tenebrosus. Common Flicker. Common in all habitats, but especially numerous in areas with many hecho cacti, and at the edges of cultivated or pastured fields. Four males, including one juvenile, and one female were collected. All were in molt, and the adults had regressing gonads (males with testes less than 5 mm; female's ovary enlarged, and oviduct regressing) and partly feathered brood patches. No active nests were located, and apparently wandering lone birds were seen frequently. However, I did observe a number of family groups, and twice saw adults feeding young birds. Nesting occurs in spring, as indicated by clutches of three eggs taken on 11 May and five eggs, on 12 June at Guirocoba (WFVZ). The stomach contents of two birds were ants and of three others, ants and fruits, the latter mainly pitahaya cactus (one male was feeding at this fruit when collected). The taxonomy followed for this species is that of Short (1965).

Melanerpes uropygialis fuscescens. Gila Woodpecker. The most common woodpecker, its breeding season extends beyond that of the Common Flicker into August, for small young were calling in the cavity of an hecho cactus on 1 August. Three specimens were obtained, including two females with a regressing, but still large, ovary and a refeathering brood patch. Three April specimens, collected (NOF) by L. Huber at the Cuchujaqui River 7.4 miles SE of Alamos on 7–10 April, had large testes or large ova. Eleven clutches of three, four, and six (one instance) eggs from Guirocoba (WFVZ) represent dates between 25 May and 14 June.

Picoides (Dendrocopos) scalaris sinaloensis. Ladderbacked Woodpecker. Less conspicuous than the Flicker, but nearly as common. Ladderbacks had completed nesting prior to late July. No family groups or feeding of fledged young was observed, although pairs were seen frequently. Three specimens taken were in heavy molt; two males examined had small testes, and none showed evidence of a brood patch. A female, collected (NOF) by L. Huber on 4 February, had a granular, enlarged ovary, and another, taken also at 7.4 miles SE of Alamos on 7 April, showed a large ovary and regressing oviduct. WFVZ contains two clutches, each of two eggs, taken near Guirocoba on 5 May and 10 June.

The three woodpeckers reported herein are broadly sympatric, and they comprise the entire picid fauna of most of the desert Southwest from Baja California and Arizona south on the mainland to Sinaloa (all three range outside of this region, also). Their habits are compatible, for they forage for different foods. *P. scalaris* forages chiefly for insects in trees, bushes, and cacti; *M. uropygialis* is omnivorous; and *C. auratus* mainly eats ants obtained on the ground. They differ in body size, and are not very closely related taxonomically.

Both the Lineated Woodpecker (*Dryocopus lineatus*) and the Pale-billed Woodpecker (*Campephilus guatemalensis*), large neotropical woodpeckers which reach their northern limit in the Alamos region, are rare there at present; I saw neither. Local residents say *lineatus* is more common than *guatemalensis,* but the two can be confused in the field. Perhaps removal of large trees around Alamos in recent years has restricted both to the tropical deciduous forest on the lower slopes of the Sierra Madre Occidental east of that town. WFVZ contains two clutches of two eggs each of *D. lineatus* taken 7 and 9 June near Guirocoba.

Xiphorhynchus flavigaster. Ivory-billed Woodhewer. Two heard about a third of a mile apart in hilly thorn forest N of Alamos.

Lepidocolaptes leucogaster. White-striped Woodhewer. I saw a lone, singing White-striped Woodhewer at an elevation of 1800 ft in the Sierra de Alamos on 30 July. It was in tall trees along the steep slope of an arroyo in mixed thorn-short tree forest. This is apparently the first time this species has been detected away from the foothills of the Sierra Madre Occidental, although it has been obtained there at elevations below 1800 ft (van Rossem 1945:142).

Platypsaris aglaiae. Rose-throated Becard. Uncommon in open riparian situations. Becards were nesting, as nest construction was observed W of Alamos on 1 August, and the male of a pair collected on that date had very large testes. Earlier nesting is suggested by large testes of a male taken on 9 April SE of Alamos by Huber (NOF), and clutches of two to five eggs collected between 11 and 13 June near Guirocoba (WFVZ).

Sayornis nigricans. Black Phoebe. Locally common wherever water was present in stream beds with steep or rocky sides, the Black Phoebe appears to breed in spring near permanent streams. A female with a brood patch and large ovary and ova was taken (NOF) along the Cuchujaqui River by Huber on 9 April.

Tyrannus vociferans. Cassin Kingbird. Common, apparently not breeding. One female specimen had a regressing ovary and oviduct.

Tyrannus verticalis. Western Kingbird. A few seen in cultivated fields near Alamos, but common only in the desert-thorn scrub region 15 miles and more WNW of Alamos. In the latter region it far outnumbered *T. vociferans,* and no Tropical Kingbird (*T. melancholicus*) or Thick-billed Kingbird (*T. crassirostris*) was observed there. Nesting, if it occurs in this region, seemed to have been completed, although pairs were encountered frequently. One male specimen had slightly enlarged testes.

Tyrannus melancholicus. Tropical Kingbird. Two seen N of Alamos, and two others noted in thorn forest edges near the Cuchujaqui River. A female with a large, granular ovary was taken by Huber at the Cuchujaqui River on 10 June (NOF).

Tyrannus crassirostris pompalis. Thick-billed Kingbird. This was the most conspicuous kingbird due to its loud, persistent vocalizations and utilization of exposed perches. It was also completely dominant over other kingbirds. About the same as *T. vociferans* in abundance (common), *T. crassirostris* seems to prefer riparian situations. However, it is found

along small as well as large arroyos, and in scattered pairs away from arroyos. It is also common in village trees. Nesting was in full progress at the time of my visit. Nests were detected readily because of their frequent location in tops of taller, prominent trees, often in dead, unconcealed branches, and because the adults usually were seen actively defending the vicinity of the nest tree. Young birds were visible in several nests. Two adults were obtained: a male with large testes and a large cloacal protuberance, and a female with a large ovary and unused oviduct. The male was at its nest 25 ft above an arroyo on 24 July. A male (NOF), taken 5 June by Huber 7.4 miles SE of Alamos, had very large testes.

Myiodynastes luteiventris. Sulphur-bellied Flycatcher. Locally common in short-tree forest, in thorn forest in hills, and in dense riparian woods, especially on the slopes of the Sierra de Alamos. Like many birds tending to favor riparian habitats, this flycatcher was nesting. A pair secured on 24 July included a female with an enlarging ovary and ova, and a male with large testes. A male with large testes also was collected 5 June by L. Huber 7.4 miles SE of Alamos (NOF).

Myiozetetes similis. Vermilion-crowned Flycatcher. Observed rarely near the Cuchujaqui River, but did not appear to be nesting. Its breeding season is uncertain. There are (NOF) Huber specimens from SE of Alamos: a female with a large, granular ovary taken 27 December, and a male with small testes taken 4 February.

Myiarchus nuttingi. Nutting's Flycatcher. Common, and even less vocal than *M. cinerascens*, this flycatcher breeds prior to the summer rains. Two males and two females, collected by L. Huber (NOF) between 8 and 10 April, had very large testes or a large ovary and regressing oviduct.

Myiarchus tyrannulus. Brown-crested Flycatcher. Uncommon, noted at some of the larger arroyos. Birds seemed to be in pairs, and were the most vocal of the *Myiarchus* species, but none was seen at possible nesting cavities, and I found no positive evidence of breeding. L. Huber collected (NOF) the only individual he saw in the Alamos area which was a male with enlarged testes taken 7 April 7.4 miles SE of Alamos. Between 16 May and 12 June the Guirocoba area is represented by 18 clutches of from two to five eggs (WFVZ).

Myiarchus tuberculifer olivascens. Olivaceous Flycatcher. Common, somewhat vocal, and the *Myiarchus* species seen about cavities in trees and cacti. A male perched near such a cavity on 22 July was obtained, and proved to be molting; its testes were small. Dr. W. E. Lanyon kindly provided the racial determination. WFVZ contains three clutches from Guirocoba, taken 5 May to 7 June. Three males from 7.4 miles SE of Alamos, obtained by L. Huber on 7 to 9 April, have moderately large to large testes, and two females, taken there on 8 and 9 April, show indications of breeding (large ovary and enlarged oviduct in one, large ovary and enlarged ova in the other).

Camptostoma imberbe. Beardless Flycatcher. A few pairs were seen along open, dry arroyos. I flushed a female from a ball-shaped, stick nest 15 ft up a tree over an arroyo near the Cuchujaqui River on 7 August. The bird's damaged ovary measured at least 8 mm in length and its oviduct appeared large; it may have been incubating. R. S. Crossin (pers. comm.) suggests that this nest may have been a Verdin's (*Auriparus flaviceps*) nest appropriated by the flycatcher. He mentions a male with enlarged testes, and a female with large ova and ovary, constructing a nest among leaves of a large cypress tree, and a female with a large, granular ovary, all obtained by L. Huber 7.4 miles SE of Alamos on 10 April. Clutches in WFVZ from Guirocoba include three eggs taken 14 May and three eggs obtained 16 June.

Petrochelidon pyrrhonota melanogaster. Cliff Swallow. Found along most streams containing water, and having steep, rock walls along their margins. Nests not in use were observed at several sites along the Cuchujaqui River and arroyos leading into it. An active nesting colony was located along a large arroyo 4 miles E of Alamos (within 3 miles of the Cuchujaqui River type locality of *P. p. minima* van Rossem and Hachisuka, which is not separable from *melanogaster*) on 3 August. About 80 nests comprised the colony, but only some 50 pairs were engaged in nesting at that date. Most nests were in one mass, side by side, under a projecting ledge of rock 45 ft above the stream, and about 60 ft below the top of the rock cliff. The three birds taken from this colony on 3 August include a male, with slightly enlarged testes, which was bringing food to a nest, and two females, also apparently feeding young; each female had a large, regressing ovary with small ova and a large oviduct. L. Huber noted several colonies within a mile of the Cuchujaqui River, and he collected a male with enlarged testes and a female with a shelled egg in the oviduct along the river 7.4 miles SE of Alamos on 7 June (NOF). The time of nesting may vary between colonies along or near the river and those farther from permanent water.

Stelgidopteryx ruficollis. Rough-winged Swallow. Sporadically seen along the Cuchujaqui River, and over cultivated fields near Alamos.

Tachycineta thalassina. Violet-green Swallow. Flocks of up to 15 birds seen occasionally along the Cuchujaqui River on 23 and 29 July.

Corvus corax. Holarctic Raven. Lone Holarctic Ravens and pairs observed regularly in all areas, especially along the Alamos-Navojoa road where they foraged for carcasses. It is unlikely, but conceivable, that a few distant sightings were of White-necked Ravens (*C. cryptoleucus*), but all birds seen closely, and all birds heard were Common Ravens. Nests containing four and five eggs were obtained at Guirocoba on 10 June (WFVZ).

Corvus imparatus. Mexican Crow. Common to abundant throughout the region, usually encountered in small flocks of four, six, or occasionally up to a dozen birds. They compete with vultures, ravens, and Magpie-Jays (*Calocitta formosa*) for road kills. A female with a very small bill (compared with southern Sinaloan birds) was taken from a flock of four birds on 26 July. Its incipient wing molt, large, regressing ovary (ova to 2 mm), and remains of a brood patch suggest that it was one of a family group of two adults with two young. Nesting occurs in May and June, and young birds are able to forage on their own after the onset of the rainy season. No evidence of nesting or of feeding of fledged young was observed during my stay. Crossin (pers. comm.) obtained many clutches in Sinaloa during late May, and he mentions three birds from Navojoa taken by Huber from flocks of more than 35 birds on 7 and 10 April. These include a male with slightly enlarged testes and two females with large, granular ovaries.

There are 21 clutches of two to five eggs taken near Guirocoba between 4 and 15 June (WFVZ).

Cissilopha beecheii. Beechey Jay. One apparent pair encountered on 29 July along an arroyo near the Cuchujaqui River. One of these birds was collected, and proved to be an adult female with a large, regressing ovary. There may have been a nest in the area. The female had yellow irides and orange-yellow legs and feet, in contrast to the black legs of the species shown in plate 6 of Alden (1969). Crossin (pers. comm.) notes that adults he has collected all have yellow legs, feet, and irides and a black bill, and immatures are similar but have a yellow bill. Apparently, the Beechey Jay is uncommon in the Alamos region during the summer. Nests containing three to five eggs were found near Guirocoba between 4 and 15 June (WFVZ).

Calocitta formosa colliei. Magpie-Jay. Seen in all habitats, usually in flocks; encounters with occasional, stealthy, single birds and pairs in woods suggest that breeding might still have been under way. Magpie-Jays feed at carcasses along the Navojoa-Alamos road. A bird collected from a group of three jays in a dense tree along an arroyo on 29 July had egg fragments in its esophagus and gizzard; the egg appeared to be that of *Coccyzus americanus.* The heavily molting specimen was a male with large, asymmetrical testes. The group from which it was taken may have consisted of a pair and their young of that year. Another male obtained on 2 August was molting, and had large testes. The small group of jays of which it had been a part may also have been a family group. Although employing the trinomen *colliei,* the possibility should not be discounted that birds of Sonora and northern Sinaloa are subspecifically distinct (*arguta* van Rossem) from Nayarit and southern Sinaloan Magpie-Jays. I have not seen sufficient material to permit me to clarify the matter. Crossin (pers. comm.) found eggs of this species at Concordia, Sinaloa, on 24 May. He also reports a male with small testes taken 5 February, one with small testes taken on 7 April, and one with large testes obtained 7 June, all taken by Huber 7.4 miles SE of Alamos (NOF). One of these birds has a pure black chest and throat, another shows flecks of white in black of the throat and chest, and the third has the entire throat and chest white, with only a thin collar of black, like Oaxacan birds, according to Crossin (pers. comm.). Thirty-three clutches from WFVZ were obtained near Guirocoba; these contain one to seven eggs and were taken between 4 and 15 June.

Auriparus flaviceps fraterculus. Verdin. Uncommon in more open thorn forest, and common in arroyos in thorn scrub and desert-thorn scrub. Most birds that I encountered were lone individuals, but a few pairs were seen. A heavily molting adult female with a small ovary was collected on 1 August. I obtained an adult male and three nestlings from a nest 5 ft above the ground in a mesquite tree 8 miles NW of Alamos on 27 July. The adult was in full molt (primaries, body feathers), and its gizzard contained several indeterminate larvae one-half inch long. No other nests were found, and there was no other evidence of nesting, so this instance may represent a renesting or a second brood. A clutch from Guirocoba in WFVZ bears the date 3 June 1950. As Crossin notes (pers. comm.), Arizona Verdins commonly nest in March.

Campylorhynchus brunneicapillus brunneicapillus. Cactus Wren. Uncommon, strictly confined to xeric situations in desert-thorn scrub, and in open, disturbed thorn forest where there are cacti (e.g., along roads). I saw no pairs, but observed only solitary individuals, often detected by their songs. A male in fresh plumage with spotted crown and fine spotting below with no concentration of black on the breast (juvenal?), taken on 27 July as it sang a typical (adult) song from an hecho cactus, had small testes and large, unossified areas at the rear of the skull. According to Selander (1964:30), cranial ossification is complete within 6 months after the postjuvenal molt, hence this was a bird of the year. Anderson and Anderson (1962) indicated that young Cactus Wrens sing fully adult songs within 3–4 months after fledging. Although most breeding doubtless occurs in the spring, a singing adult male collected on 1 August still showed enlarged testes. Four clutches from Guirocoba date from 3 to 10 June (WFVZ).

Thryothorus sinaloa cinereus. Sinaloa Wren. Locally common in rocky, well-wooded arroyos. In such sites either *T. sinaloa* or *T. felix* was encountered, but I never found both together, or even in the same section (see below) of an arroyo. *T. sinaloa* was about twice as common as was *T. felix.* A few individuals seemed to be postbreeding wanderers, but in most places birds were paired and singing repetitively. Three of four singing wrens that I obtained and examined for gonadal condition proved to be males, two with enlarged and one with small testes; the first two had large cloacal protuberances. None showed signs of molt. The species breeds at least partly during the summer rainy period. L. Huber obtained four specimens (NOF) SE of Alamos: a male with small testes on 5 February; a male with large testes on 7 April; a male with large testes taken at a nest containing two eggs on 10 June; and a female with a large, granular ovary on 4 June.

Thryothorus felix. Happy Wren. It was difficult to predict whether *T. felix* or *T. sinaloa* would be found in a suitable area of their preferred (arroyo) habitat. Grant (1966) found no consistent habitat difference between them in Nayarit, although he noted a tendency for *felix* to occur in more dense, and *sinaloa* in sparser, vegetation. The seemingly greater abundance of *sinaloa* in the xeric, northern edge of the thorn forest in southern Sonora may reflect this tendency. However, *sinaloa* also may require more rocky surroundings than does *felix.* The fact that both are restricted to arroyos in southern Sonora probably is due to the xeric nature of the thorn forest there, and consequent restriction of dense shrubbery to riparian situations. I obtained only one specimen of *felix,* a male with slightly enlarged testes that had been singing in undergrowth on the bank of a large arroyo in flat, xeric surroundings W of Alamos on 1 August. It is noteworthy that two pairs of *sinaloa* and no *felix* were found about one mile upstream from the singing male *felix* that I collected, but they were in a very different setting, namely, in a boulder-strewn ravine in hills on the lower slopes of the Sierra de Alamos supporting rather dense thorn forest.

Catherpes mexicanus meliphonus. Canyon Wren. Locally common in large arroyos with steep, rocky walls. Foraging birds, occasionally singing, were seen commonly among the old buildings in Alamos. Canyon Wrens seem to tolerate both Sinaloa Wrens and Happy Wrens in their territories, for singing males of two species (*C. mexicanus* and either of the

others) were seen within 30 ft of one another. In contrast, intraspecific hostility was great among Canyon Wrens, as evidenced by singing bouts and fights between males along arroyos (e.g., large arroyos leading into the Cuchujaqui River) affording continuous habitat. Several times a male entered an isolated, low, and partly broken, old Cliff Swallow nest, carrying food in its bill, apparently feeding young, on 3 August. It proved to have regressing testes. Two other males, taken 29 July and 30 July, had small testes. The former had been engaged in a singing duel, and either chasing, fleeing from, or fighting (using bill, wings, legs) with another Canyon Wren. The wren obtained on 30 July was singing, and had been foraging inside of the abandoned Aduana Mine W of Alamos. L. Huber took a male with small testes on 5 February, and a female feeding large young on 5 June SE of Alamos (NOF). The two skins that I obtained (other bird preserved in spirits) clearly differ from comparably plumaged *C. m. mexicanus*, in which *C. m. meliphonus* is almost universally merged (but see Phillips, 1960: 353). They more closely resemble *C. m. conspersus* in their pale coloration and small size. I assign them to *meliphonus* because they are topotypes of that form, and to call attention to this taxonomic problem.

Melanotis caerulescens. Blue Mockingbird. I did not observe this mimid, but Huber (Crossin, pers. comm.) saw five birds including two pairs on 9–10 April along the Cuchujaqui River SE of Alamos. He collected a male with slightly enlarged testes, and a female with a large ovary. WFVZ contains a nest with two eggs taken 7 June at Mirasol, near Guirocoba.

Mimus polyglottos. Northern Mockingbird. Few seen, all in the vicinity of habitations, in brush around cultivated fields, and especially in open thorn scrub and mixed desert-thorn scrub.

Toxostoma curvirostre maculatum. Curve-billed Thrasher. Common and nesting throughout the area. Many pairs were noted, and songs frequently were heard. I obtained a male, with large testes and a very large cloacal protuberance, that had been singing in the top of an hecho cactus in open thorn scrub on 27 July. I found another, with large testes and cloacal protuberance, in a tree along an arroyo on 25 July. This thrasher nests in the summer rainy season, probably in continuation of (second brood?) a breeding season that commences in the spring, for Miller et al. (1957:176) reported nesting in March and in May in central Sonora (El Plomo) and northern Sinaloa (El Fuerte), respectively. Crossin (pers. comm.) mentions a Huber specimen taken 10 April 2 miles W of Alamos; the bird, a female, had a large, granular ovary. Eighteen clutches of two to four eggs from near Guirocoba in WFVZ represent dates from 4 May to 14 June.

Turdus rufopalliatus grisior. Rufous-backed Robin. This western Mexican species, which reaches the northern limit of its range in southern Sonora, was common but inconspicuous due to its shyness and tendency to frequent dense trees. Many nests and young robins up to the age of recently fledged birds were observed. A male with large testes and a cloacal protuberance, taken 26 July, was with its mate at a nest in a dense riparian tree. A male feeding fledged birds in thorn scrub on 30 July had large testes, and its mate had a large, regressing ovary. Although Miller et al. (1957:182) cite a May record from Sinaloa, breeding in the Alamos region probably occurs mostly in late June to August during the summer rainy season. Three adult males (NOF), collected between 2 and 8 April 7.4 miles SE of Alamos by L. Huber, have only slightly enlarged testes.

Polioptila albiloris nigriceps. White-lored Gnatcatcher. Decidedly local in occurrence, it reaches the northern limit of its range in the Alamos region. In a few places, especially the slopes of the Sierra de Alamos, it was rather common. A male obtained on 25 July apparently had regressing testes, and a female taken on 30 July had small ova and regressing ovary but the oviduct was still large. There was no evidence of nesting, and only a few paired birds and family groups of up to five birds were encountered. Nesting probably occurred in the spring and in early summer, as suggested by a clutch of three eggs taken at Guirocoba on 3 June (WFVZ).

Phainopepla nitens. Phainopepla. Very few seen, all in pairs along several dry washes in open thorn scrub and in mixed desert and thorn scrub on 24, 26, and 27 July. A male of a pair, collected on 27 July 8 miles NW of Alamos, showed a cloacal protuberance and enlarged testes, suggesting nesting, but I found no nest.

Vireo olivaceus hypoleucus. Red-eyed Vireo. Found throughout the region, although common only in heavier thorn forest and riparian trees, especially along arroyos in foothills. Its late arrival in the region (earliest record, 29 May) has been noted by van Rossem (1945:215). All birds observed in late July and early August were paired, several nests were found but all beyond my reach, and their songs were heard frequently. It clearly is a summer rainy season breeder. Two singing males were collected on 24 July, both with enlarged testes and a cloacal protuberance.

Parula americana (*"pitiayumi"*). Parula Warbler. Several songs of this warbler, with which I am familiar, were heard in late July in the Sierra de Alamos. No birds were seen, however, and its breeding status is uncertain. A female with a granular, enlarged ovary was obtained by Huber along the Cuchujaqui River SE of Alamos on 4 June (NOF), and a nest containing one egg was obtained at Guirocoba on 3 June (WFVZ).

Icteria virens tropicalis. Yellow-breasted Chat. Locally common in a few areas along open arroyos, e.g., the Arroyo La Aduana, as it passes south from Alamos, and where it could be heard singing nocturnally. It seemed to be nesting, for I noticed aerial displays and singing whenever I was in the areas where it occurred. A male taken on 25 July had enlarged testes and a very large cloacal protuberance. L. Huber obtained a male with similarly sized testes on 4 June SE of Alamos (NOF). The very small size of my specimen (chord of wing 76 mm, tail length 77 mm), and its grayish underparts prompt me to note the possible validity of *I. v. tropicalis*. The Huber specimen, according to Crossin, is even smaller, measuring 74 mm in wing chord, and 71 mm in tail length. These specimens are smaller than all comparably plumaged male specimens of *I. v. auricollis* in the American Museum of Natural History.

Molothrus aeneus. Bronzed Cowbird. Common throughout the region; courtship observed occasionally, suggesting that it was still breeding. No specimens obtained.

Molothrus ater. Brown-headed Cowbird. Observed throughout my stay, almost as frequently as Bronzed Cowbirds, but I saw no courtship. Many flocks were noted, including several containing mostly juvenile

birds. Adults observed were in small flocks and groups of from 4 to 12 or so birds. Juvenile birds formed larger flocks of up to 60 birds. Both age groups roosted in the Alamos plaza's palms.

Quiscalus mexicanus nelsoni. Boat-tailed Grackle. Common to abundant around buildings and in cultivated and otherwise open areas, elsewhere seen only passing overhead. Males were singing, many displaying groups were noted, and young birds apparently were being fed in nests, usually in palms. Four specimens were collected from a group of about 15 individuals along the Cuchujaqui River on 31 July. Two females had not yet laid; the large ovary in each case bore large ova. Two males had very large testes and a large cloacal protuberance. Females of the group from which specimens were taken probably were constructing nests in dense vegetation along the river. Nesting of this grackle thus seems to occur in late July and August, and probably earlier as well because a WFVZ clutch of six eggs from Guirocoba was taken 12 June, although I observed no fledged young during my visit.

Icterus spurius. Orchard Oriole. A fully adult male was encountered 29 July 8 miles SW of Alamos, near the Cuchujaqui River. It did not sing, but foraged in large trees at the base of a cliff along an arroyo. It flew to the top of the cliff as I pursued it, then perched momentarily before disappearing on the other side; a lengthy search failed to disclose it again. This oriole seems to be unreported for Sonora, although noted by Miller et al. (1957:283) as possibly breeding at Culiacán, not very far to the south in Sinaloa.

Icterus wagleri. Wagler's Oriole. One seen, an adult perched beside a road in the Sierra de Alamos on 30 July. L. Huber collected a male (NOF) with large testes on 5 June 7.4 miles SE of Alamos.

Icterus cucullatus. Hooded Oriole. Palm trees seemed a requisite for the occurrence of this oriole, and thus it was found close to villages and ranches, but not elsewhere. Hooded Orioles were common in Alamos, and I observed nest construction in a palm growing in the town plaza. Surprisingly, it was not observed in well-wooded arroyos or along the Cuchujaqui River.

Icterus pustulatus microstictus. Scarlet-headed Oriole. Abundant, ubiquitous, and nesting during my visit. I saw nests under construction, and occupied nests were as close to one another as 100 m in favorable habitat along larger arroyos. No immature birds, including fledged young, were observed, and hence nesting of this species at the northern extreme of its range in southern Sonora may be confined largely to the summer rainy season. Enlarged testes were noted in a male obtained at its nest in an arroyo tree on 24 July, and its mate showed a brood patch, an ovary with large ova, and an enlarging oviduct. A nest examined on 8 August contained four fresh eggs. Eight clutches of three to six eggs in WFVZ from Guirocoba bear dates of 10–16 June. Specimens (NOF), collected by Huber 7.4 miles SE of Alamos, are: males taken 5 February with tiny testes, 4 April with enlarging testes, 4 June with large testes, and 5 June with large testes; and a female with a small ovary was taken 5 February, another was taken 5 June with a somewhat enlarged, granular ovary.

Piranga rubra. Summer Tanager. Scattered pairs occurred in riparian sites with large trees present. Many such sites seemed unoccupied, however. Birds observed were paired, and apparently breeding. The male of a pair taken on 3 August was in full breeding condition.

Carpodacus mexicanus ruberrimus. House Finch. Seen foraging in small groups; only a few, nonrepetitive songs were heard. A lone, foraging male collected on 30 July was in heavy molt, and had small testes. Most House Finches seemed to have nested prior to my visit. One WFVZ clutch from Guirocoba was taken on 3 June. The single specimen is essentially topotypical of *C. m. sonoriensis* Ridgway, but its molting condition (wing and tail molt in progress) precludes racial comparisons. It is nevertheless small like *ruberrimus* and *sonoriensis*, which generally is treated as a synonym of *ruberrimus*.

Carduelis (*Spinus*) *psaltria.* Dark-backed Siskin (or Goldfinch). Scattered flocks of this siskin (*C. psaltria* is a member of the wide-ranging siskin group with Neotropical relatives, and not close to the American Goldfinch, *C. tristis*; see Mayr and Short 1970) were encountered in cultivated areas and along open arroyos. It did not appear to be nesting.

Cardinalis cardinalis affinis. Cardinal. Foraging pairs, singing males, nests, and recently fledged young indicated the breeding of this abundant species. Whether or not it breeds earlier in the year as well, and I saw no immature, unattended birds suggesting this, all adults encountered were breeding at the time of my visit. A pair, collected 2 miles from Alamos (topotypical *affinis*) on 6 August, was alarmed as I approached and probably had a nest nearby, as the female's large ovary showed three recently ruptured follicles, and a brood patch was evident. The male had both large testes and cloacal protuberance. Fifteen clutches of two to four eggs from Guirocoba in WFVZ date from 5 May to 16 June. Huber collected (NOF) two males with enlarged testes on 8 and 9 April. The related Pyrrhuloxia (*Cardinalis sinuata*) was not observed in the Alamos region, but I noted this desert species three times along the main highway, 6–7 miles toward Alamos from Navojoa.

Pheucticus chrysopeplus dilutus. Yellow Grosbeak. Abundant along arroyos and common in all other habitats except thorn scrub. Nesting was in full progress at the time of my visit. Males were singing, nests were seen, and calling young birds just out of the nest were noted in several areas. A singing male with large testes was collected on 22 July. An adult female with a large ovary showed enlarging ova and a large oviduct on 24 July. On the latter date a juvenile male just out of the nest was caught by hand as it rendered its *whee-a* begging call. I took an adult male just after it had fed a fledged young bird in a xeric arroyo west of Alamos on 1 August. Thus, widespread breeding coincides with the summer rainy period. A male with large testes was taken 4 June, and a female with a large, granular ovary was obtained 6 June SE of Alamos by L. Huber (NOF).

Passerina (*Guiraca*) *caerulea.* Blue Grosbeak. Pairs seen along some brushy arroyos, but spottily distributed in habitat that seemed suitable. Invariably, paired birds were perched close to one another, and the frequent singing of males suggested nesting. A singing male of a pair was collected beside its presumed mate on 27 July; large testes and a large cloacal protuberance indicated breeding activity. The species seems to nest during the summer rains in southern Sonora. L. Huber took a male with small testes on 10 April 7.4 miles SE of Alamos (NOF). It is known to breed during the summer in Arizona,

where it does not appear until May (Phillips et al. 1964).

Passerina versicolor dickeyae. Varied Bunting. Songs heard commonly, and birds strictly paired throughout the area. Although found in all habitats, even dense thorn forest, it was most abundant along arroyos. No fledglings or immature birds were encountered, suggesting that the species begins to nest in July. Miller et al. (1957:337) reported juveniles at Guirocoba on 5 August. A singing male in full adult plumage, taken on 22 July, had large testes, as did a singing, apparently territorial subadult male with large testes, black bill, and fully brown plumage secured on 24 July. L. Huber took a male (NOF) with small testes on 7 April and another with somewhat enlarged testes on 4 June SE of Alamos.

Passerina ciris pallidior. Painted Bunting. A single, fully adult male Painted Bunting was collected on 25 July as it wandered through the territories of two singing male Varied Buntings. The latter paid no attention to the silent Painted Bunting. Apparently an early, postbreeding migrant, the Painted Bunting showed no fat; its testes were somewhat enlarged (regressing?). This represents an early record for Sonora; Miller et al. (1957) reported specimens from 2 August onward, and van Rossem (1945) failed to record the species from Sonora. Phillips et al. (1964) noted records for Arizona as early as 18 June.

Volatinia jacarina splendens. Blue-black Grassquit. Cited as "local and rare" in southern Sonora by Miller et al. (1957:344), and not listed for Alamos by Alden (1969), but common locally in bushes and fields along arroyos, especially, but not exclusively, near cultivation. I suspect that it has not been reported more frequently because it occurs in the Alamos region only in mid- and late summer as a rainy season breeder. Displaying males that somersaulted above perches in bushes and trees were observed frequently, singing was heard almost continuously in areas where they occurred, and males often were seen chasing each other about. A female accompanying its mate was taken on 3 August; it had not yet laid, but its ovary was somewhat enlarged and its ova and oviduct were small. A singing male taken on 25 July had a cloacal protuberance and moderately large testes.

Pipilo fuscus intermedius. Brown Towhee. Paired and breeding at the time of my visit. No juvenile birds were seen. Two male specimens had very large testes (29 July, 6 August) and a female with a brood patch showed a large, but regressing ovary and oviduct (5 August). The species is known to breed from February to September in Arizona (Phillips et al. 1964; Crossin, pers. comm., two eggs from Tucson on 9 February). Two clutches of three eggs each were taken on 4 May and 15 May at Guirocoba (WFVZ).

Aimophila quinquestriata septentrionalis. Five-striped Sparrow. Common at an elevation of about 1700 ft in thorn forest and short tree forest 3–5 miles N of Alamos, and in such forests on the slopes of the Sierra de Alamos at elevations of 1600–2200 ft and probably higher. Males sang frequently, and two singing males, taken 30 July and 2 August, each had a cloacal protuberance and large testes. A female taken on 30 July had two ruptured follicles of the ovary, and egg in the oviduct, and a fully developed brood patch. The absence of fledged young birds suggested that nesting had just commenced, but whatever the duration of the breeding season, breeding is common in the summer rainy period.

Aimophila carpalis. Rufous-winged Sparrow. As expected (see Phillips 1951), this species was breeding during the summer rainy season. It was common to abundant in open thorn scrub and thorn scrub-desert NW of Alamos, where pairs were seen, and singing males could be counted by driving slowly along the road (up to 10 heard per mile). A male obtained 10 miles NW of Alamos on 26 July had a large cloacal protuberance and large testes. Nesting birds have been reported from northern Sinaloa on 31 August and 11 September (Miller et al. 1957:373). The specimen is pale and presumably would be assignable to *A. c. distinguenda* Phillips (1966:159), but I have had no opportunity to compare it with proper material.

DISCUSSION

The above data suggest that 16 species of the Alamos region may nest exclusively or mainly during the summer rainy season, and 5 others possibly nest at this time. About 21 species seemed to have terminated nesting prior to the rains, that is, in June or earlier. Seventeen species breeding prior to the summer rainy season apparently have a nesting period extending into late summer. An additional 22 species probably breed in the Alamos region, but their nesting period is not precisely known.

The 16 species that seem to nest mainly or exclusively during the summer rainy season are: *Callipepla douglasii, Coccyzus americanus, Crotophaga sulcirostris, Tyrannus crassirostris, Myiodynastes luteiventris, Turdus rufopalliatus, Vireo olivaceus, Icteria virens, Quiscalus mexicanus, Icterus pustulatus, Piranga rubra, Pheucticus chrysopeplus, Passerina caerulea, Passerina versicolor, Volatinia jacarina, Aimophila quinquestriata,* and *Aimophila carpalis.* Of these, only the last-named species may be considered a desert bird, although it is atypical in adjusting its breeding season to take advantage of spring rains, summer rains, or both (Phillips 1951). Thus, it is the only species of this group with a possibly bimodal seasonality in breeding. A few of the other species, namely, *Coccyzus americanus, Vireo olivaceus,* and *Quiscalus mexicanus,* are widespread in diverse habitats, and local populations in Sonora seem specifically adapted to breed during the summer rainy season. The remainder of the species are either more or less widespread riparian species such as *Myiodynastes luteiventris, Piranga rubra, Passerina caerulea,* or they are southern species approaching their northern range limit in Sonora, and thus are adapted to the summer rains of the thorn forest region to the south. These southern species are *Callipepla douglasii, Crotophaga sulcirostris, Tyrannus crassirostris,*

Turdus rufopalliatus, Icterus pustulatus, Pheucticus chrysopeplus, Volatinia jacarina, and *Aimophila quinquestriata.*

Other possibly exclusively summer-breeding species are *Dendrocygna autumnalis, Geococcyx velox* (both southern species in terms of the above discussion), *Phainopepla nitens* (a widespread xeric species), *Parula americana* (widespread, but the tropical population reaches its northern limit in this region), and *Pipilo fuscus* (possibly bimodal in breeding, as *Aimophila carpalis*).

Nesting in late summer, but with a longer breeding season that includes the spring as well, are: *Polyborus plancus, Zenaida asiatica, Columbina passerina, Leptotila verreauxi* (bimodal season, spring and late summer?), *Melanerpes uropygialis, Platypsaris aglaiae, Camptostoma imberbe, Petrochelidon pyrrhonota, Cissilopha beecheii, Calocitta formosa, Auriparus flaviceps, Thryothorus sinaloa, Catherpes mexicanus, Toxostoma curvirostre, Icterus cucullatus* (?), *Carpodacus mexicanus* (?), and *Cardinalis cardinalis.* This list includes species of diverse distributions. There are widespread species such as *Petrochelidon pyrrhonota* and *Cardinalis cardinalis*; widespread xeric species typified by *Zenaida asiatica, Melanerpes uropygialis, Auriparus flaviceps,* and *Toxostoma curvirostre*; and southern (e.g., thorn forest) species attaining their northern range limit in Sonora, such as *Leptotila verreauxi, Cissilopha beecheii, Calocitta formosa,* and *Thryothorus sinaloa.*

The following species appear to nest prior to the summer rains, rarely nesting as late as July: *Buteo nitidus* (?), *Buteogallus anthracinus* (?), *Columbina squammata, Forpus cyanopygius, Amazona albifrons, Geococcyx californianus* (?), *Glaucidium brasilianum, Caprimulgus ridgwayi, Cynanthus latirostris, Amazilia violiceps, Heliomaster constantii* (?), *Chloroceryle americana, Momotus mexicanus* (?), *Colaptes auratus, Picoides scalaris, Sayornis nigricans, Tyrannus melancholicus* (?), *Myiarchus nuttingi, M. tuberculifer, Corvus imparatus,* and *Polioptila albiloris.* Like the other groups this assemblage includes a mixture of cosmopolites (e.g., *Colaptes auratus, Sayornis nigricans*), widespread xeric species (e.g., *Geococcyx californianus, Picoides scalaris, Myiarchus tuberculifer*), and tropical or southern species reaching their limits in Sonora (e.g., the parrots *Forpus* and *Amazona, Amazilia violiceps, Momotus mexicanus, Corvus imparatus*). The latter group is especially numerous (11 of 21 species). It is also noteworthy that the majority (15 of 21) of these species represent nonpasserine orders.

Evidence concerning the timing and duration of the breeding season is insufficient for characterization of the following species which I observed in the Alamos region, and which almost certainly nest there: *Coragyps atratus, Cathartes aura, Buteo albicaudatus, Falco sparverius, Ortalis wagleri, Columbia flavirostris, Chordeiles acutipennis, Trogon elegans, Xiphorhynchus flavigaster, Lepidocolaptes leucogaster, Tyrannus vociferans, Myiozetetes similis* (winter breeding?), *Myiarchus tyrannulus, Stelgidopteryx ruficollis, Tachycineta thalassina, Corvus corax, Thryothorus felix, Melanotis caerulescens, Mimus polyglottos, Molothrus aeneus, Icterus wagleri,* and *Carduelis psaltria.* More data concerning these and the other species would be welcome.

It is understandable why species favoring riparian habitats (over half the species in all categories combined either reach their peak of abundance in arroyos, or are entirely riparian in distribution) breed during the summer rains, when water frequently is available at the surface and the vegetation bordering streams is fully leafed out. Similarly, the many summer breeders that inhabit the thorn forest and extend only slightly or moderately into southern Sonora generally favor more dense vegetation than is found in the Sonoran Desert. Hence they nest when the thorn forest is luxuriant, not during the dry season.

Other stratagems may have evolved to insure successful breeding such as: maintaining a long breeding season with an attempt at spring breeding, followed by summer rainy season breeding if the earlier attempt fails; double broods (spring and summer, perhaps with bimodality imposed by the intervening dry period); and probably in the case of parrots and woodpeckers, nesting immediately before the summer rains, utilizing certain available foods, with young fledged in time to benefit from the augmented and different food supplies (fruits, different seeds, different insects) resulting from the summer rains. R. S. Crossin (pers. comm.) suggests that young of species usually found in wetter habitats may benefit from the higher humidity of the rainy season in southern Sonora. The two distinct rainy seasons permit the evolution of seasonal isolation of closely related species, with selection favoring spring breeding in one species and summer breeding in the other. This has not seemed to develop, perhaps because of the rigorous, variable, and historically shifting environment in the region. Too few data are

available to preclude its occurrence, however, and obvious possibilities exist among the species of *Myiarchus* and *Tyrannus*, for example.

Studies in the early spring, following the winter rains, and in the subsequent late spring dry season are necessary to clarify the overall breeding biology of birds in the ecotonal area around Alamos. Such investigations would facilitate an understanding of desert and tropical scrub avifaunas.

SUMMARY

Among the approximately 85 avian species recorded as summer or permanent residents of the desert thorn forest-short tree forest ecotone near Alamos, southern Sonora, in late July and early August, positive or negative evidence of nesting activity was obtained for 59 species. Breeding was indicated or suggested for 38 species, whereas 21 species seem to have nested mainly or entirely before late July. Rainy seasons occur in southern Sonora during December to February, and especially from June to September, with almost rainless periods in between. At least 16 species (*Callipepla douglasii, Coccyzus americanus, Crotophaga sulcirostris, Tyrannus crassirostris, Myiodynastes luteiventris, Turdus rufopalliatus, Vireo olivaceus, Icteria virens, Quiscalus mexicanus, Icterus pustulatus, Piranga rubra, Pheucticus chrysopeplus, Passerina caerulea, P. versicolor, Volatinia jacarina, Aimophila quinquestriata,* and *A. carpalis*), and probably five more (*Dendrocygna autumnalis, Geococcyx velox, Parula americana, Phainopepla nitens,* and *Pipilo fuscus*), appear to nest only during the summer rainy period, or have bimodal, spring-summer (one, the other, or both) breeding seasons. The widespread nesting activity during the summer rainy season seems related to the rains and correlated lush vegetation and abundance of food. A majority of the summer wet season breeders are riparian species or Neotropical species of the thorn forest and other forest zones to the south, which barely range north into Sonora.

A total of 94 species is reported from the Alamos region, and data concerning another 7 species seen or reported nearby also are included. *Icterus spurius* is recorded for the first time for Sonora, based on observation of an adult male. The taxonomy of several species is discussed briefly, and ecological information is provided for certain species, especially *Thryothorus felix* and *T. sinaloa.*

ACKNOWLEDGMENTS

Ed Harrison and Lloyd Kiff kindly supplied information from pertinent specimens in the WFVZ collection, and Richard S. Crossin graciously offered data from specimens (mainly collected by the late Larry Huber) representing the Alamos region in the NOF collection. The kindness of these gentlemen in providing me with unpublished data from collections under their charge is much appreciated, and this information adds substantially to the value of this report.

Thanks are due to Rip Torn, José María Rosas, Laurie and Penny Short, and Mrs. Sheila C. Short, who provided assistance in the field. Richard S. Crossin and Allan R. Phillips kindly read the manuscript and made helpful suggestions. I am grateful to Bernardo Villa R. of the Mexican Dirección General de la Fauna Silvestre for permission to collect in Sonora.

LITERATURE CITED

ALDEN, P. 1969. Finding the birds in western México. Univ. Arizona Press, Tucson.

ANDERSON, A. H., AND A. ANDERSON. 1962. Life history of the Cactus Wren. Part V: Fledging to independence. Condor 64:199–212.

EISENMANN, E. 1955. The species of middle American birds. Trans. Linnean Soc. New York 7:1–120.

FRIEDMANN, H., L. GRISCOM, AND R. T. MOORE. 1950. Distributional check-list of the birds of México. Part I. Pacific Coast Avifauna no. 29, p. 1–202.

GRANT, P. R. 1966. The coexistence of two wren species of the genus *Thryothorus.* Wilson Bull. 78:266–278.

HASTINGS, J. R. [ed.]. 1964. Climatological data for Sonora and northern Sinaloa. Tech. Rept. on Meteorology and Climatology of Arid Regions, Univ. Arizona Inst. Atmospheric Physics, no. 15, 152 p.

MAYR, E., AND L. L. SHORT. 1970. Species taxa of North American birds. A contribution to comparative systematics. Publ. Nuttall Ornithol. Club no. 9, p. 1–127.

MILLER, A. H., H. FRIEDMANN, L. GRISCOM, AND R. T. MOORE. 1957. Distributional check-list of the birds of México. Pt. II. Pacific Coast Avifauna no. 33, p. 1–436.

PHILLIPS, A. R. 1951. The molts of the Rufous-winged Sparrow. Wilson Bull. 63:323–326.

PHILLIPS, A. R. 1960. La accrecencia de errores acerca de la ornithologia de México, con notas sobre *Myiarchus.* Anales Inst. Biologia 30:349–368.

PHILLIPS, A. R. 1966. Further systematic notes on Mexican birds. Bull. Brit. Ornithol. Club 36: 125–131; 148–159.

PHILLIPS, A. R., J. T. MARSHALL, AND G. MONSON. 1964. The birds of Arizona. Univ. Arizona Press, Tucson.

SELANDER, R. K. 1964. Speciation in wrens of the genus *Campylorhynchus.* Univ. California Publ. Zool. 17:1–259.

SHORT, L. L. 1965. Hybridization in the flickers (*Colaptes*) of North America. Bull. Amer. Mus. Nat. Hist. 129:307–428.

SHREVE, F. 1951. Vegetation of the Sonoran Desert. Carnegie Inst. Washington Publ. no. 591, 178 p.

VAN ROSSEM, A. J. 1945. A distributional survey of the birds of Sonora, Mexico. Occ. Papers Mus. Zool., Louisiana State Univ. no. 21, p. 1–379.

Accepted for publication 20 June 1973.