

tripartite population. A review of the literature gathered by Tomlinson (1972a) suggested that none of the early authors who mentioned variation in head patterns had had material from more than one population available as he wrote. The earliest descriptive papers on *ridgwayi* (Brewster 1885, Allen 1886a, 1886b, 1887, 1889) all related to birds in the western segment, from Arizona to the Benjamin Hill area (fig. 1). Brewster (1887), Ridgway (1887), Beckham (1888), and Bendire (1892) all wrote about the Bacoachi-Cumpas portion of the range. Although W. W. Brown collected a long series of birds in the southern part of the range of *ridgwayi* for the Thayer collection in 1905 and 1906, his specimens and that region were not mentioned until much later (Phillips 1929).

Through the courtesy of the curators of several collections, I was able to assemble, at the Field Museum, a series of more than 60 adult and first-year birds taken during the months of October through February, when the birds were in fresh plumage. All three populations shown in figure 1 were represented.

Examination of this larger and more comprehensive series showed that the geographic correlation of color variation that I anticipated seeing on the basis of the preliminary studies does not exist. Male birds from Calabasas, Tubac, and the Baboquivari Mountains, Arizona, as well as males from 90 miles south of Nogales, Bacoachi, Cumpas, Las Arenas, and Tecoripa, Sonora (fig. 1) had ear coverts ranging from chestnut to light brown or greyish brown, some with black feathers interspersed. Only one male from Tecoripa and the birds from the captive population originating at Benjamin Hill (and the type from Sasabe, not reexamined at this time) had fully black auriculars. Other color characters of the back and underparts that had seemed to be correlated with auricular color vanished in a maze of variability. *Colinus virginianus ridgwayi* must continue to be considered a single, highly variable subspecies.

Lester L. Short (American Museum of Natural History), Robert B. Payne (Museum of Zoology, University of Michigan), and Stephen M. Russell (University of Arizona) sent selected specimens, in response to a request with short notice, to the Field Museum of Natural History where, through the courtesy of Melvin A. Traylor, I was able to study them along with birds from the National Museum of Natural History and the Field Museum's extensive series. J. David Ligon (University of New Mexico) and Curtis S. Adkisson (Virginia Polytechnic Institute and State University) had previously loaned me material. Roy Tomlinson, Bureau of Sport Fisheries

and Wildlife, provided me with much information on the Masked Bobwhite and kindly made available the plate used here as figure 1. I further thank David Snow and colleagues at the British Museum (Natural History) for courtesies extended during my visit to examine specimens in 1970. John W. Aldrich, Marshall Howe, John Weske, and Roy Tomlinson read and commented on an early draft of the manuscript.

LITERATURE CITED

- ALLEN, J. A. 1886a. The Masked Bob-white (*Colinus ridgwayi*) in Arizona. *Auk* 3:275-276.
- ALLEN, J. A. 1886b. The Masked Bob-white (*Colinus ridgwayi*) of Arizona, and its allies. *Bull. Amer. Mus. Nat. Hist.* 1:273-290.
- ALLEN, J. A. 1887. A further note on *Colinus ridgwayi*. *Auk* 4:74-75.
- ALLEN, J. A. 1889. Note on the first plumage of *Colinus ridgwayi*. *Auk* 6:189.
- BECKHAM, C. W. 1888. Observations on the birds of southwestern Texas. *Proc. U. S. Natl. Mus.* 10:633-696.
- BENDIRE, C. 1892. Life histories of North American birds. *U. S. Natl. Mus., Spec. Bull.* no. 1.
- BREWSTER, W. 1885. Additional notes on some birds collected in Arizona and the adjoining province of Sonora, Mexico, by Mr. F. Stephens in 1884; with a description of a new species of *Ortyx*. *Auk* 2:196-200.
- BREWSTER, W. 1887. Further notes on the Masked Bob-white (*Colinus ridgwayi*). *Auk* 4:159-160.
- BUREAU OF SPORT FISHERIES AND WILDLIFE. 1966. Rare and endangered fish and wildlife of the United States. *Resource Publ.* 34.
- PHILLIPS, J. C. 1929. An attempt to list the extinct and vanishing birds of the Western Hemisphere with some notes on recent status, location of specimens, etc. *Verh. VI Int. Ornithol. Kongr.*, p. 503-504.
- RIDGWAY, R. 1887. A manual of North American birds. Philadelphia, J. B. Lippincott Co.
- RIDGWAY, R., AND H. FRIEDMANN. 1946. The birds of North and Middle America. Part X. *U.S. Natl. Mus. Bull.* 50, part X.
- TOMLINSON, R. E. 1972a. Review of literature on the endangered Masked Bobwhite. *U.S. Bur. Sport Fish. Wildl., Resour. Publ.* 108.
- TOMLINSON, R. E. 1972b. Current status of the endangered Masked Bobwhite Quail. *Trans. 37th North Am. Wildl. and Nat. Resour. Conf.*, pp. 294-311.

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OBSERVATIONS ON ROOF-NESTING KILLDEERS

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Killdeers (*Charadrius vociferus*) have been known to nest on roofs but in researching I could find no mention of the transfer of the chicks from the roof to the ground. Bent (*U. S. Natl. Mus. Bull.* 146:206, 1929) and the Cornell Laboratory of Ornithology Newsletter to Members (Summer 1969)

both noted roof-nesting Killdeers but with no knowledge of the transfer of the chicks.

From 1967 through 1972, I observed Killdeers nesting on the roof of the Superlite Building in Phoenix, Arizona. The building is located on a main street about 6 mi from the Salt River, the nearest other known nesting place of Killdeers. The roof is 22.6 × 48.8 m, essentially flat and covered with pale gravel. Beds of dense vegetation 1.5 m tall surround the building. The only other vegetation is a small grassy area to the north of the building, across from the parking lot.

The Killdeers laid two 4-egg clutches in each of the years 1967 through 1971. Only one clutch was

laid in 1972, and in 1973 the Killdeers failed to return to the roof. The season extended from early March (two eggs found in a nest on 3 March 1968) to late May (three chicks hatched 23 May 1971), the usual nesting period in southern Arizona according to Phillips et al. (Birds of Arizona, Univ. Ariz. Press, Tucson, 1964, p. 33). From 1967 through 1970, I observed the Killdeers two or three times a week during the nesting period. During April and May of 1971 I conducted 31 watches, ranging from 15 min to 14 hr. A trap door provided a good view point of the roof.

The nests were all unshaded and during May the roof-surface reached 53°C in the sun. Temperatures were recorded by placing a mercury thermometer on the roof beside the nests. At roof-surface temperatures above 48°C, the incubating bird would cease incubating and stand at the side of the nest shading the eggs. The eggs were left unattended for only a brief period between 05:30 and 06:05 and again around 17:00.

An incubation period of 26 days was noted for the nest observed in 1971. Bent (1929:207) quoted incubation periods ranging from 24 to 28 days and Nickell (Wilson Bull. 55:27, 1943) showed periods ranging from 24 to 26 days. In 1971 the first egg in the second clutch was laid 22 April and the fourth egg, 27 April, when incubation began. Both adults incubated. The male usually spent 3–4 hr incubating in the morning and 3–4 hr in the afternoon. When not incubating he was usually either in the grassy area or on the roof. Three eggs hatched 23 May. As soon as a chick hatched, the male carried the egg shells off the roof. The fourth egg did not hatch and I removed it from the nest 25 May. It had developed about 20 days according to Robert Ohmart, who examined it.

The first egg in the 1971 second clutch was laid the same day that the surviving chick from the first clutch began flight, (its 20th day after hatching). Reilly (The Audubon Illustrated Handbook of American Birds, 1968, p. 153) stated that the age of first flight is unknown. Nickell (1943) mentioned a second clutch laid 34 days after the hatching of the first clutch, at which time the chicks were able to fly short distances.

The adult birds were quiet when eggs were present in the nest. When I entered the roof area, the incubating bird would run noiselessly from the nest and hide near an air vent which projected approximately 1 m above the roof. If I approached the adult bird within 2 m, it would fly from the roof. When the eggs began to hatch, there was much activity and calling, both adults flying to and from the nest area. I had only to raise the trap door

slightly and the adults would call rapidly and feign a broken wing in the manner common to the species.

All-night lighting on the four corners of the roof attracted many insects, and the adult Killdeers fed on the roof as did a Mockingbird (*Mimus polyglottos*). The chicks were never seen to feed on the roof. I often saw the male at night sitting under the lights but could not tell whether he fed at night. The birds also fed on the grassy area, where water was available. No water was on the roof and, during one hatching, a pan of water that I placed near the nest was untouched by the adults and chicks.

Some chicks left the roof on the first day after hatching and the others on the second day. Three eggs in the 1971 first clutch hatched between 11:00 and 12:00 on 2 April. The remaining egg hatched at 15:30. The chicks stayed close to the nest that day. On 3 April at 11:00 the female called the chicks from the nest to the shade of the air vent. One chick was much more precocious than the others and at 16:45 went to the north edge of the roof and looked over. At 17:00 the female led the remaining chicks to the north edge but none went off. The male was calling excitedly from the grassy area. At 18:10 the precocious chick tumbled from the roof into the shrubbery and was led by the male to the grassy area. On 4 April at 08:40 the female led the three remaining chicks to the north edge of the roof. She began flying back and forth from the roof to the grassy area calling all the time. The male remained in the grass calling excitedly. At 09:05 one chick walked off the edge and tumbled down, flapping its partly-developed wings. The two remaining chicks went off the roof at 12:00 after much calling by the adult birds. All dropped from the north side of the building (height 6.8 m) where the shrubbery grew at the base (except in a 2 m space). During the observation period I watched six chicks leave the roof. Two that landed in the planted area became active immediately and were led by the male to the grass. Three that seemed to survive the fall were found dead in the shrubbery 2 days later. One chick was killed upon impact with the concrete paving.

Of the 44 eggs laid, two did not hatch (suggesting that roof-surface temperatures were not excessive). All the chicks left the roof except for one that I found dead of dehydration on the roof. Six were killed in the parking lot. I know of only two chicks that developed to flight stage. The fate of the other 30 was unknown.

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ROLE OF THE CHICK'S BEGGING BEHAVIOR IN THE REGULATION OF PARENTAL FEEDING BEHAVIOR OF *LARUS GLAUCESCENS*

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Norton-Griffiths (1969) suggested that parental feeding (defined as the behavior of the parents feeding

their young) in the European Oystercatcher (*Haematopus ostralegus*) occurred only if the parents were sufficiently motivated to feed for themselves. Once parental feeding had begun, its maintenance on a short term basis depended on how long the young took to seize the presented food; there was a "waiting-time threshold" within which the chicks must take the presented food before the parent would give another item. Von Haartman (1953) demonstrated with a Pied Flycatcher, *Ficedula hypoleuca*, that what regulated parental feeding frequency was not the number of young but rather the hungriest chick's behavior.