

sallying after large flying insects which are spotted. However, I was not able to determine whether the kites capture the insects in the air or after they land.

A. L. Rand (*Feldiana: Zoology*, 36: 20-24, 1954) reviewed situations in which birds take advantage of "beaters" which flush prey, and included references to such behavior among other diurnal birds of prey.

I express appreciation to my wife, Violet, who accompanied me on Barro Colorado and aided me in making observations. I also thank Edwin Willis, who suggested this note and allowed me to use his observations, and Dean Amadon and Jeff Swinebroad for their criticisms of the manuscript.—JON S. GREENLAW, *Department of Biological Sciences, Douglass College, New Brunswick, New Jersey.*

Breeding behavior of the Roadrunner, *Geococcyx californianus*.—A. L. Rand (*Auk*, 58: 57-59, 1941) described the courtship behavior of the Roadrunner as consisting of five acts, in a sequence as follows: the posing of the male with food, the invitation of the female, copulation, the passing of the food item from the male to the female, and the circling of the female by the male. Rand concluded (p. 59): "The act of copulation . . . is the only part of the ceremony which is peculiar to it. All the other components of the ceremony are also used under other circumstances, for other purposes." In observing the courtship of captive Roadrunners I have noted a display which Rand apparently did not observe, and which, as far as I know, does not occur elsewhere in the behavioral repertoire of the species.

From 1964 to 1967, hand-reared Roadrunners were kept in 3 × 6 m outdoor pens at Duke University. The courtship and nesting of two pairs were observed. Within a sex, no differences in behavior were apparent.

The territorial song of the males was like that of the wild Roadrunners, as described by G. M. Sutton (pp. 39-40 in A. C. Bent, *U. S. Natl. Mus., Bull.* 176, 1940). Confrontations of the two males, at a fence separating them, included a crouching, threat posture, with the wings being extended slightly and the tail being cocked almost vertically; this, also, is similar to the behavior I have observed of wild Roadrunners in southeastern Arizona.

In the courtship ceremony of the captive birds, a piece of beef kidney or a live mouse or baby rat served as the food item to be offered. A mouse given to one of the males often seemed to act instantly as an aphrodisiac. First the male stunned or killed the mouse by holding it in its mouth and slamming it against the pavement. Bearing this food, the male went to the female, usually approaching from the rear. Sometimes the female begged, like a Roadrunner chick, fluttering her wings and uttering a buzzy, squeaking call.

The male then performed a display which seems not to have been described before. His crest feathers were raised and the colored areas of skin posterior to his eyes were maximally exposed. He wagged his cocked tail from side to side, while rapidly stepping or patting his feet in place. A rapid, vocal *kuk-kuk-kuk-kuk* accompanied this. After a short period of wagging and stepping he made a deep bow in which the tip of his bill nearly touched the floor. With this bow, the tail-wagging ceased and the tail was lowered until it was horizontal, with the feathers partly spread. A low, almost growling, *coo* was made during the bow. Tail-wagging and bowing occurred alternately, two or three times if the female was not moving away. Mounting was attempted by combined hopping and wing-flapping.

After copulation, the food item was given to the female. The female was then circled by the male, as described by Rand, but this was interrupted by a halting in which both birds raised their heads and cocked their tails simultaneously, and flicked their tails from side to side, in a manner characteristic of startled Roadrunners.

The crest-erection and tail-wagging of the male Roadrunner are similar to those of the Striped Cuckoo, *Tapera naevia* (H. Friedmann, *Ibis*, ser. 13, 3: 537-539, 1933). *Tapera* has been placed in the same subfamily, Neomorhinae, as the Roadrunner (J. L. Peters, *Checklist of birds of the world*, vol. 4, Cambridge, Harvard Univ. Press, 1940; see pp. 58-59), but is a nest parasite. Friedmann (*op. cit.*: 533) regarded the Striped Cuckoo as being a critical species in the study of the evolution of social parasitism in birds. Considering the similarities noted in the displays of that species and the Roadrunner, it seems that a more detailed study of the Roadrunner's behavior would be valuable.

A few additional observations on these captive birds should be mentioned since the information is not available from field studies. Several clutches of eggs were laid by two females, in the spring and summer of 1966. The nests were similar to those of wild Roadrunners. The female occasionally begged from the nest. The male responded by bringing nesting material, which the female placed in the nest by passing it under her breast and between her legs. Although both sexes took turns in continuous incubation, the 1965 and 1966 nestings were unsuccessful.

In 1967, four eggs which were artificially incubated at 37.4°-37.7°C hatched in 17-18 days. Hand rearing was unsuccessful. Subsequently, four chicks were hatched after parental incubation. As the clutch and nestlings increased in bulk, the nest walls were built up by the parents to accommodate them. When the chicks did not gape for offered food, the parents invariably uttered a series of soft, low, rolling *coos* to elicit gaping. (I have heard a similar sound from an adult when a young bird was apparently called to fledge from a nest, in the wild in Arizona.) There was no indication that food was regurgitated by the adult. In the early post-hatching period, the adult remained motionless with mandibles inserted in the chick's mouth after the food had been received. On one occasion a flow of clear fluid was observed as it passed down along the parent's bill. Perhaps this contained digestive enzymes; if so it would explain the failure of artificial hand-rearing with the same diet. When feeding was followed by defecation, the adults immediately removed the wastes by ingesting them.

One of these chicks was successfully raised to fledging, which occurred 29 days after hatching. Food was at least as plentiful as in the wild so this period probably approximates that for optimal development. This chick has now attained adult size.

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Occurrence and nesting of the Hook-billed Kite (*Chondrohierax uncinatus*) in Texas.—On 1 May 1964, one of us (Fleetwood) observed a male and a female Hook-billed Kite about 65 miles upstream from the mouth of the Rio Grande, at the point where the river forms the southern border of the Santa Ana National Wildlife Refuge and approximately nine miles south of Alamo, Hidalgo County, Texas (elevation 90 feet above sea level). This appears to be the first record of this species from the United States.

The male was seen first, perched in a dead tepehuaje tree (*Leucaena pulverulenta*) with a snail in its bill. A few minutes later the female flew out of a leafy black