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OBSERVATIONS OF THE RED-BILLED GROUND-CUCKOO (*NEOMORPHUS PUCHERANII*) IN ASSOCIATION WITH TAMARINS (*SAGUINAS*) IN NORTHEASTERN AMAZONIAN PERU[1]

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Key words: Commensalism; Amazonia; Neomorphus; Saguinas; *nutrition; ornithology; ecology.*

The neotropical ground-cuckoos (*Neomorphus*), reviewed by Haffer (1977) are rare, terrestrial birds which range from Nicaragua to southeastern Brazil. In Amazonian Peru, they inhabit forested, hilly areas including terra firme forest with palms. Their postures and shape remind one of the better-known *Geococcyx* roadrunners of the arid scrub regions of Mexico and southwestern United States. Ground-cuckoos are nonparasitic, utilizing their own nest and investing in offspring (Sick 1949, 1962; Roth 1981). These birds are known to associate with army ant swarms, eating exposed insects and small vertebrates in a manner similar to several formicariid antbirds (Willis and Oiniki 1978, Willis 1982). In many parts of their range, ground-cuckoos are commonly called "peccary-birds," because of their habit of following bands of forest pigs, *Tayassu* sp. (Sick 1949; Haffer 1977; J. P. O'Neill, pers. comm.). In southern Peru, Rufous-vented Ground-Cuckoos (*Neomorphus geoffroyi*) are known to associate with primates such as *Saimiri* and *Cebus* (Terborgh 1983, p. 173). The authors opportunistically observed an adult Red-billed Ground-Cuckoo (*N. pucheranii*) in temporal association with a mixed-species troop of tamarins (*Saguinas*) while conducting other long-term studies in the forest understory at the Estación Biológica Quebrada Blanco (EBQB) in northeastern Amazonia Peru.

STUDY SITE

The EBQB stands on moderately hilly, well-drained soils on the eastern margin of the Amazon River, approximately 70 km south of Iquitos (04°23′ SL, 73°17′ WL). The principal tributaries are the whitewater Quebrada Blanco and its effluent, the clear-water Quebrada Choroy. Annual temperature averages 25.7°C, with annual and monthly variations of 2°C. Annual mean precipitation is over 2,600 mm with annual variations

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ranging from 1,803 mm to 5,183 mm. Estimated canopy height is 20 m with taller trees of about 25 m and some emergent trees over 30 m. Dominant plant families—those which contribute most in terms of individual numbers—are: Palmae (30%), Leguminosae (9%), and (each 4%) Myristicaceae, Bromeliacaea, Rubiaceae, Sapotaceae, Moraceae, Annomaceae, Chrysobalanaceae, Euphorbiaceae, Burceraceae, Lauraceae, Meliaceae, and Melastomataceae. Visibility into the vegetation at eye level was 10–15 m, obscured primarily by palms, including *Lepidocarium tessmani, Geonoma* sp. ("palmiche"), and *Chamaedora* sp. ("palmiche arbustivo"). Several kilometers of narrow trails have been cut in a grid at 100-m intervals in the terra firme forest. A detailed description of the study site will be presented elsewhere (Castro, unpubl.). The EBQB has been the site of several studies since 1984, including behavioral ecology of two tamarin species (Castro, unpubl.), rodent and ungulate frugivory (Bodmer 1989), and avifaunal composition (Siegel, unpubl.).

OBSERVATIONS

On three occasions, an adult *N. pucheranii* was observed in temporal association with a mixed-species group of tamarins (*Saguinas fusciollis* and *S. mystax*; Callitrichidae, Primates). In the field, the bird was recognized by its orange-red bill and postocular bare patch; photo-documentation provided further verification. The observed times of association lasted over 7 hr (07:50–15:50) on 31 May 1985, 5 hr (09:00–14:10) on 23 July 1985, and for approximately 40 min (12:00–12:40) on 5 August 1987. We are not certain whether the same ground-cuckoo was observed on all three occasions, but we know that the tamarins were the same troop. All observations occurred in the same and adjacent quadrats within the home range of the tamarin "Troop B," which was part of long-term studies (June 1984 to September 1985) on the behavior and ecology of tamarins (Castro, unpubl.). Observations were made from a distance of 10–15 m, and were concluded when the authors left the sites.

The ground-cuckoo followed the tamarins and coordinated the direction and speed of its movements with the activities of the monkeys. The bird walked and ran on the ground more or less directly below or behind the tamarins, who moved slowly in the canopy and on tree trunks, between 0.3 and 25 m high. While locomoting, the bird made loud bill-snapping noises, akin to the breaking of sticks. The nearest neighbor between the bird and tamarins was 1 to 25 m. On the first occasion, the ground-cuckoo continued its movements alone after 15:50, because the tamarins entered their sleeping trees and the observation was concluded. On the second occasion, the bird was lost from the observer's view after 14:10, but the observations on tamarins continued. On the third occasion, the observers left the site at 12:40 while the ground-cuckoo and tamarins were still resting.

The bird was observed to feed upon the same fruits which the tamarins used as a food resource. The feeding tamarins dropped used or partially used fruits, and the bird immediately picked these up when they fell to the ground. The species of fruits included *Inga punctata, Salacia juruana, Abutta* sp., *Rheedia* sp., Sapotaceae, Flacourtaceae, Leguminosae, Hyppocrataceae, Myrtaceae, and Menispermaceae. In addition, the bird ingested the tamarin's fecal droppings which often contained fruit seeds. The bird also consumed some unidentified insects flushed by the movements of the tamarins in trees. Terborgh (1983, p. 173) reported that *N. geoffroyi* routinely associated with *Saimiri* and *Cebus* to eat insects flushed by the primates.

The ground-cuckoo rested and sunned in coordination with the long resting periods of the tamarins. On the first two occasions, the tamarins rested in the canopy at 15 and 13 m above ground, respectively, while the bird spent most of this time seated on the ground, partially hidden in thick bushes. On the third occasion, bird and tamarins rested in a leafless fallen tree in a sunny clearing (approximately 25 m^2). The bird perched atop the horizontal trunk 1.5 m above ground level, within 3 m of the tamarins. While the monkeys allo-preened and sunned, the ground-cuckoo preened itself by "feather stripping" the rectrices. No agonistic or affective behaviors were observed between bird and primates on any occasion. Tolerance, but noninterference, was the predominant characteristic of the temporal association.

DISCUSSION

The temporal association of ground-cuckoos and primates is a simple form of interaction with a one-sided functional mechanism. The relationship between the Red-billed Ground-Cuckoo and the tamarin species appears to be a case of commensalism in which only the bird gains nutritional benefits from its association with tamarins. We do not have evidence to support the hypothesis that the ground-cuckoo and the tamarins temporarily associated for some measure of antipredator security. The fact that ground-cuckoos can synchronize their feeding, resting, and locomotory activities with some species of primates, ants, and peccaries suggests that the behavioral plasticity of these birds facilitated their successful radiation into a variety of forested habitats. These habitats may differ in the plant and animal species that the bird consumes, and in the animal species with which the birds associate.

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ROOST AND NEST SITES OF COMMON NIGHTHAWKS: ARE GRAVEL ROOFS IMPORTANT?[1]

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Key words: Common Nighthawk; nest-site selection; diurnal roosts; rooftops; radiotelemetry; British Columbia.

It is well-known that Common Nighthawks (*Chordeiles minor*) regularly use flat, gravel roofs for roosting and nesting throughout their range (Gross 1940, Sutton and Spencer 1949, Dexter 1961, Armstrong 1965, Grazma 1967). Thus, much of our knowledge of the nesting and incubation behavior of this species is derived from observations of individuals nesting on rooftops. For example, Armstrong (1965) studied *C. minor* nesting on rooftops in an urban area and found a significant correlation between home-range size and the number of available flat roofs.

The purpose of this study was to determine the nature of roost and nest sites used by individual *C. minor* carrying radio transmitters. Currently, there are no published data concerning the preference by individual *C. minor* for rooftop nest and roost sites vs. natural sites. If the prevalence of reports describing the use of rooftops accurately reflects actual site preference by this species, then I predict a significant proportion of radio-tagged individuals should roost or nest on roofs when such sites are available.

MATERIALS AND METHODS

The study took place near Okanagan Falls, British Columbia, Canada (49°20′N, 199°37′W) from May to August in 1985, 1986, and 1987.

I defined suitable man-made sites as rooftops with an area greater than 35 m² and surfaced with gravel. The criterion of 35 m² was chosen to exclude garages, tool sheds, and other small structures since there are no reports of nighthawks using these. To assess rooftop availability, I identified all suitable sites within 1 km of the location where birds were captured. This area encompassed the village of Okanagan Falls, the only major concentration of buildings within 10 km. Since *C. minor* will potentially use any flat, relatively open area as a roost or nest site (Gross 1940, Godfrey 1986), the availability of natural sites was not quantifiable.

Foraging *C. minor* were captured in mist nets set over the Okanagan River at Okanagan Falls Provincial Park (henceforth "the Park"). Females were distinguished by a buff-colored throat patch compared with the white patch of males, and by the absence of a conspicuous white subterminal tail bar (Selander 1954). All tagged individuals were adults based on plumage. Juveniles retained their immature plumage until September when they molt (Selander 1954).

I glued radio transmitters (Holohil Systems, RR #2 Woodlawn, Ontario, Canada—model PD-2) to a "backpack" made of two elastic hair bands knotted in a figure-eight pattern with epoxy cement (Mills 1986). The transmitter packages had a mean mass of 5.4 g (n = 8), representing about 7.0% of the body mass of a nighthawk.

I tracked individuals with a Merlin 12 receiver (Custom Electronics, Urbana, Illinois) and collapsible five element Yagi antenna. In 1985 I tracked individuals to a precise roost or nest structure on a daily basis, while in 1986 and 1987, after a specific site was located for each bird, I used telemetry to confirm that individuals were in the same area (within 100 m) each day. If individuals continued to roost in the same area, I assumed that they were using the same site. Whenever the signal coming from a tagged individual indicated

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