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BEHAVIORAL NOTES ON THE COMMON PAURAQUE (*NYCTIDROMUS ALBICOLLIS*)

Walter A. Thurber[1]

Laboratory of Ornithology, Cornell University, 159 Sapsucker Woods Road, Ithaca, New York 14850, USA.

Resumen. – Notas sobre el comportamiento del Pucuyo (*Nyctidromus albicollis*). – Varios aspectos del comportamiento del ampliamente distribuido Pucuyo (*Nyctidromus albicollis*), una especie crepuscular y nocturna, siguen siendo poco conocidos. En El Salvador, Centroamérica, se estudiaron sus vocalizaciones y comportamiento de búsqueda de presas. Los Pucuyos individuales dan una variedad de llamados y tipos de canto y muestran respuestas distintas a las vocalizaciones de otros individuos. En algunos casos cuando varios Pucuyos vocalizan al mismo tiempo en un área se imitan entresí: si un individuo empieza a cantar con una variación distinta, los demás lo imitan. La actividad de cantar y de cazar es mayor cuando la luna está llena. En El Salvador, los Pucuyos cantan frecuentemente durante todo el año, aún durante la estación lluviosa y al terminar la estación reproductiva, aunque en otros países se reporta que la especie canta poco durantes estos períodos. Este reporte presenta la primera documentación de un Pucuyo vocalizando durante el vuelo. Se describen varios casos de su comportamiento al buscar presas. Algunas parejas cazan juntas durante Febrero y Octubre. Los individuos de mayor tamaño (aparentemente machos) ocupan puestos más expuestos para cazar, mientras que los individuos de menor tamaño (aparentemente hembras) están menos expuestos y son más tímidos. Además, se describen casos de algunas aves cazando bajo iluminación artificial, lo cual no ha sido reportado previamente para el Pucuyo. Se reporta también un nido con dos huevos.

Abstract. – Many aspects of the behavior of the widely distributed, crepuscular and nocturnal Common Pauraque (*Nyctidromus albicollis*) are still poorly known. I studied vocalizations and foraging behavior of this species in El Salvador, Central America, over several years. Individual pauraques give a variety of different calls and song-types, and show distinct responses to the calls of other pauraques. Several pauraques calling nearby may mimic each other, such that if a new bird joins the chorus with a distinct call, others will change their calls to match the new call. Singing and hunting activity is highest when the moon is full. In El Salvador, birds sing frequently throughout the year, even at the height of the rainy season and following breeding, although in other countries the species is reported to be mostly silent during these periods. I provide the first report of pauraque vocalizing during flight. I describe several instances of hunting behavior, and note that apparent male-female pairs sometimes hunt together in February and October. The larger birds (presumed males) occupy more exposed hunting positions, while the smaller birds (presumed females) are less exposed and more timid. I also describe hunting under artificial lights, which has not been reported previously for the Common Pauraque, and I report one nest with two eggs. *Accepted 24 August 2002.*

Key words: Caprimulgiformes, Common Pauraque, *Nyctidromus albicollis*, goatsuckers, nightjars, song recordings, artificial light, El Salvador.

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[1]*Current address:* P.O. Box 16918, Temple Terrace, Florida 33687, USA.

INTRODUCTION

The Common Pauraque (*Nyctidromus albicollis*) is an abundant lowland crepuscular nightjar (Caprimulgidae) distributed from Texas in the United States, south through Middle America and South America, to northern Argentina. Despite the widespread distribution and abundance of the Common Pauraque, many aspects of its biology are still poorly understood (Latta & Howell 1999). Literature on vocalizations and foraging behavior have come from scattered parts of the species' range; Latta & Howell (1999) provide a life history and summary of published information about the species in the Americas. Little on this species has been published from the Pacific coast of northern Central America (Dickey & van Rossem 1938). Here I augment previous accounts with some detailed observations of vocalization and hunting behavior recorded over several years while carrying out ornithological investigations in El Salvador, Central America.

METHODS

Much of my data on pauraques was obtained at the Hacienda Los Pinos, Usulután Department, El Salvador (13°20'N, 88°40'W; elevation 50 m), where I spent six 2-week periods from 1971–1976. The hacienda was a dry season pasture for cattle, flooded during the wet season with a great variety of woody growth including large trees. I spent two 2-week periods in 1972 at the Hacienda La Chapina, Sonsonate Department, El Salvador (13°42'N, 89°49'W; elevation 300 m), a working cattle hacienda where second-growth woody plants grew along streams and steep banks. I spent five 2-week periods during 1974–1976 at Las Minas de San Cristobal, Morazán Department, El Salvador (13°35'N, 88°05'W; elevation 300 m), a tract once cleared to fuel mine machinery, now mostly scrub except along streams and about the few dwellings where large trees remained. I also spent most of May 1979 at Parque Nacional Walter Thilo Deininger, La Libertad Department, El Salvador (13°28'N, 89°15'W; elevation 10–75 m), where I obtained my only nest record of pauraque; this was an area of well-established second growth semi-deciduous forest with some open areas.

I generally visited observation sites in clearings shortly after sundown before pauraques became active and, by remaining quiet, could note the behavior of the birds as they arrived, and until they departed. Observations were made without optical aids because of low light intensity. All times given are CST. Times of sunrise and sunset were taken from Servicio Meteorológico (1975). I recorded vocalizations with an Uher 4000 RL tape recorder and an 18-inch Gibson parabola. Original recordings were filed in the Macaulay Library of Natural Sounds, Cornell Laboratory of Ornithology, New York (MLNS).

RESULTS AND DISCUSSION

Vocalizations. Pauraques have a large repertoire in El Salvador and presumably elsewhere in their range (Latta & Howell 1999). The most frequent vocalization is the three-syllable call which has given the English name "pauraque" and the local name "pucuyo" in El Salvador. This call may be described as "wit-wheeeeeo." It sometimes is preceded by several short notes, such as "wit-wit, wit-wit," especially just as the birds become active in the early evening. A sonic diagram is given by Smithe (1966), and recordings are commercially available from MLNS. Many observers are misled to think that the opening sound is an explosive consonant such as "p" thus giving rise to such names as pauraque and pucuyo. Recordings such as MLNS Cat. #05959, made at Hacienda Los Pinos on 25 January 1972, shows that Smithe (1966) gave a more correct

representation with introductory sounds denoted as "wh." The familiar three-syllable call is remarkably variable. At times it is bright and clear, audible for more than 1 km on calm nights or downwind. Sometimes the first syllable is shortened and in extreme cases may be little more than a grace note. The third syllable is often shortened and sometimes is difficult to separate from the second syllable. In these cases the call may seem to be of two syllables or of one syllable only.

There may also be a difference between the calls of individuals but this is difficult to determine because calls of one individual may change from time to time. My notes for a 2-min recording made at Hacienda Los Pinos (MLNS Cat. #05959) read: "*Note the gradual change – shortened phrases, a slightly lower pitch and a lesser difference in pitch between beginning and end. The calls become progressively softer and gruffer, the last call being little more than a featureless growl.*" Presence of another pauraque may have pronounced effects. My notes for MLNS Cat. #05958 (26 January 1972, 22:30) read: "*A playback of this pauraque's calls caused it to circle me twice in the bright moonlight. It returned to the same bush and began calling at a faster rate but gradually slowing. Another bird began calling [nearby]. The [first bird] flew towards the other and, from trees about 40 m apart, they engaged in this agitated duet.*"

Presence of two or more pauraques seems to stimulate mimicry and variation in song form as documented by recording MLNS Cat. #05956 made at Hacienda Los Pinos, 26 January 1972: "*Here are presented three song-forms by the same individual [taped] within a 2-h period together with vocalizations of at least two others. A bird may start with one song form and others join with the same form. Or one bird may change the song form and others follow suit. A different bird may enter the chorus with a different song and the others change to that form. And sometimes two birds persist with different songs for several minutes.*"

Certain early evening vocalizations of this species are odd and interesting. They may begin with a soft, low pitched guttural "quawk" repeated leisurely three or four times. After a brief interval another series may be repeated with increasing intensity, then another series and so on. Sometimes the series ends with a drawn-out, guttural "wa-a-a-a-aw," descending in pitch, not unlike certain human intestinal rumblings which I shall call a groan. Or the bird may sharpen the notes and deliver them in a staccato, somewhat mechanical fashion, not fast enough to be called a trill, the quality of each note frog-like. On one occasion I was able to isolate a series of these croaks or grunts on a recording (MLNS Cat. #05961) made 26 January 1972 at 18:30 at Hacienda Los Pinos. The bird began its three-note calls in a bush some 10 m from me; after several of these calls it paused and began a series of grunts, paused again for a minute or so, and then resumed its typical three-note calls.

The introductory period of soft vocalizations tended to be much longer when evenings were moonlit. On 26 January 1972 I timed one frog-series which continued for 1 min 25 s and this was a small part of the entire performance. One evening at Hacienda Los Pinos I tracked a pauraque from its first notes one-half hour after sundown, at 18:30. The period of soft vocalizations extended about 10 min with "witts," groans, and frog-calls. At about 18:40 the pauraque sharpened its notes and made a transition to its typical loud call "witt-witt, witt-witt, witt-wheeeeeeeeoo." For over 2 h this bird sat high in the bushes giving this call or variants, seemingly stimulated by neighboring pauraques. At 21:30 the bird dropped to the ground with a "witt" to a moonlit section of a lane and began to hunt; I had not seen it feeding previously that evening.

At Hacienda La Chapina a flock of 10 or more pauraques spent the day in a clump of

brushy woodland. Their process of resuming activity after sundown was much more complex than that noted for single or isolated birds. One evening the flock vocalized for more than 10 min seemingly stimulating each other; in addition to groans and frog-calls they produced a variety of bizarre vocalizations that might frighten anyone alone in the woodland after nightfall. The following evening, 21 November 1972, I recorded this activity (MLNS Cat. #05963).

I frequently heard pauraques during dawn. Once, at Las Minas de San Cristobal, 26 February 1976, I was sitting before dawn in a patch of brushy woodland hoping to record the "whisper song" of a Clay-colored Robin (*Turdus grayi*). At 05:40 as dawn was beginning to develop, a pauraque flew into a shrub 4 m away and vocalized briefly. At 06:00 it or another plopped to the ground within 1 m of my feet; it uttered three low notes followed by the typical three-syllable call, then jumped up as though in pursuit of an insect, and flew vocalizing into the brush (MLNS Cat. #20798b).

Little information exists on the place of vocalizing for pauraques (Latta & Howell 1999). I observed pauraques singing from the ground and in bushes up to 1 m above the ground. Birds perched in brush up to 1.5 m from the ground vocalized (call notes only) before departing for feeding areas. Once I observed a pauraque call during flight.

I noted pauraques singing during every month except June, when I rarely visited the field sites. My notes do not support other authors' reports that birds are mostly silent during several months following breeding (Wetmore 1968, Skutch 1972, Oberholser 1974, Quesnel 1990, summarized in Latta & Howell 1999). In El Salvador, egg laying takes place in April and May (Dickey & van Rossem 1938), thus breeding should be completed by early July. Yet I heard pauraques frequently in August, September, and October. This time corresponds with the peak of the rainy season. Thus, Skutch's (1972) supposition that little singing takes place during the wet season is not supported by observations in El Salvador.

Hunting under natural light conditions. The hunting behavior of pauraques was dependent in large part upon sky conditions. On moonless nights or in densely shaded sites pauraques became active shortly after sunset and continued until dusk ended and only starlight remained; this was the period of most intense hunting and vocalization. During periods when the moon was full or waxing pauraques tended to remain vocally active during the night while the moon was above the horizon. I have little data on their activities during the waning moon but Smithe (1966) considered them "more active [vocally?] in semi-moonlight periods than in either full moon or complete darkness."

On 22–26 February 1976, at Las Minas de San Cristobal, I observed a pauraque, which I presumed to be a male, hunt each evening along a 30-m segment of road narrowly bordered by dense brush and tall trees. Most evenings this pauraque was joined by a second pauraque, smaller and more timid, which I assumed from size and behavior to be a female. This second pauraque was very suspicious of my movements and the sounds I caused. Although she sometimes hunted near me if I "froze," as soon as she noticed me she fled and did not return. These pauraques made no high sallies and rarely ascended over 1 m. They made no circuitous return flights, probably because the space was too narrow. Instead, after a sally a pauraque glided along the road away from the take-off site. In comparison with hunting beneath lamps (described below) their sally rate was notably low but I did not obtain quantitative data.

The presumed male began its hunting sessions similarly each evening. At about 18:15,

some 5–10 min after sundown, it began to vocalize with gruff notes (MLNS Cat. #20798a and MLNS Cat. #20799) in the brush border where it may have spent the day. After vocalizing briefly, timed one night at 40 s, it flew to the road and dropped heavily with a sharp "witt." Time of arrival ranged from 18:10–18:25. While alone it vocalized softly and sporadically.

Arrival of the presumed female brought on a flurry of soft vocalizations (MLNS recordings noted above). The two might then hunt, sometimes in relative silence, or they might continue to vocalize while hunting, first one, then the other, or both together. As they worked back and forth along the road they sometimes separated and sometimes sat side by side. The presumed female always left before the other usually because she was frightened by some noise. The presumed male continued to hunt until there remained only a trace of light in the sky, so dark I could barely see the bird 10 m away; it then flew away giving a brief note. Departure time ranged from 18:30–18:40.

The life history account by Latta & Howell (1999) does not describe pairs foraging together. I observed two birds feeding together, as close as 1 m apart, on several occasions in February and October (possibly other months as well). In these cases I perceived that one bird was both smaller and shyer, which I presumed was the female. This bird also spent more time hidden in the brush. Although sexes could not be determined with certainty, these observations suggest that pauraques may maintain associations as pairs both before and after the breeding season. Of potential interest is the increased exposure of the larger, presumed male. These observations lead me to predict that males have evolved to vocalize from and/or feed from exposed positions, as part of courtship, and that females choose their mates. Females, on the other hand, would achieve greatest probability of survival by feeding in hidden situations. Although these predictions are speculative, I present them in hope of inspiring future investigation into the roles and behaviors of males and females in this species.

Hunting under artificial light. Almost all observations under artificial light were made during October 1974 and October 1975 in the patio of a dwelling at Las Minas de San Cristobal where a 100-watt lamp was suspended in a mango tree (*Mango indica*) at a height of about 2.5 m. The patio was about 20 x 35 m, bordered by an irregular hedge of shrubs. People and dogs passed frequently beneath the mango tree. One pauraque seemed to dominate the patio; others were seen but briefly. However, I noticed often a smaller pauraque which tended to remain within the shrub border. It is tempting and not unreasonable to conclude that the larger pauraque was a dominant male and the smaller a female; males of the local subspecies *N. a. albicollis* tend to be larger than females but there is overlap (Ridgway 1914). Illumination made activities of the pauraques easy to follow but also made notable any movements of an observer; I found that even looking at my watch or moving my notebook could put a pauraque in flight after which it might not return.

Observations of pauraques in the lighted patio provided insights about some aspects of behavior noted under natural conditions. When I lay on the ground beneath the patio lamp the advantages to pauraques of an overhead light were immediately obvious; a multitude of small insects, more than I had supposed, plus an occasional large moth or beetle, became plainly visible. The critical factor appeared not to be the intensity of illumination of the insects but the brightness of the background against which they were silhouetted. This explains why in nature pauraques choose open areas for hunting, sites where

they can see passing insects silhouetted against the sky. This also explains why pauraques can hunt after sunset as long as there is a trace of light in the sky, and why moonlight extends their hunting period.

By seating myself beforehand as close as 6 m from the cone of light from the patio lamp I had excellent views as pauraques hunted. The dominant pauraque arrived quite regularly between 18:10 and 18:25. On two occasions only (out of 20) did I see it depart seemingly of its own volition (dogs and people were usually responsible); departure time on these two occasions were 19:30 and 20:05, respectively. Pauraques under the lamp enjoyed a rich food supply. I counted up to eight sallies in a 10-min period with an average of about one sally per 2 min.

Hunting techniques varied according to the height of passing insects. The pauraques showed no interest in insects on the ground. Twice I saw a motion of a pauraque's head as though the bird snapped at an insect flying below its eye-level but generally prey was taken above head-level. To obtain a low-flying insect a pauraque might hop vertically 10–20 cm, the wings partly open seemingly more for balance than for propulsion, but movements were too rapid for careful analysis. Dickey & van Rossem (1938) commented that "the well developed legs permit a vertical leap of 18 inches or more, apparently aided somewhat by a flip of the wings." Most sallies for higher flying insects seemed to be propelled by a single downward wing thrust lifting a bird 30–100 cm; leg action may contribute but this was not clear. These jumps were inclined forward from the vertical and if a bird took no corrective action it might land well in advance of the take-off point. Not uncommonly after making, or failing to make, a capture a pauraque gave a wing stroke and glided in a circular path back to the take-off point.

Pauraques occasionally sallied up to 3+ m above ground. Insects thus pursued were often visible to me and I gained the impression that pauraques made such sallies only when larger prey repaid the extra effort. Pauraques in pursuit did not "lead" their prey, possibly because the prey was not noted until almost directly overhead. Thus the attack path curved increasing toward the horizontal and high-flying insects were often approached from behind rather than from below. Some of the high-flying insects took evasive action; perhaps these had more time to react or perhaps their sense organs were more effective rearward than downward. The pauraques often (but not always) returned to the take-off site, by banking sharply and gliding, the curvature depending upon height and velocity, thus the "circuitous" flights reported by Latta & Howell (1999).

Nest and eggs. I found one pauraque nest with two eggs at 08:30 on 3 May 1979 in Parque Nacional Walter Thilo Deininger in a bit of open space in early succesional growth near Rio Amaya. The eggs occupied a shallow depression among leaf litter. They seemed cool to the touch so I assumed that the nest was abandoned and made photographs and measurements without taking precautions. The eggs were pinkish buff with irregular light brown spots. They measured 30.6 x 21.9 mm and 30.2 x 21.6 mm, respectively. On the following day at 09:00 I noted that the eggs were still there but this time warm to the touch showing that an adult was incubating. On 7 May at 08:00 and on 8 May at 11:00 an adult sat tightly on the eggs. On 10 May the eggs were gone. A. Skutch, quoted in Bent (1940), noted that he usually found the male incubating in early morning and that male and female relieved each other every 2 or 3 h during the day with the female incubating at night. Dickey & van Rossem (1938) reported two nests in El Salvador, giving similar measurements and colors for the egg sets, each of which contained two eggs. In dates and loca-

tions, those nests were similar to the one I described.

Conclusions. In summary, I have described some behaviors of pauraques already known from other parts of its range, and other behaviors never before reported, such as giving call notes while in flight and feeding under artificial lights (Latta & Howell 1999). In El Salvador, pauraques appear to vocalize actively all year long, in contrast to reports from Texas, Costa Rica, and Trinidad (references cited above). Much of the biology of this species has yet to be described (Latta & Howell 1999). For example, female vocalizations are not well understood. My observations suggest differences in male and female foraging behavior that require confirmation. I hope that this contribution might inspire biology students in tropical American countries to study the pauraque, as it is abundant and offers convenient opportunities for study.

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