

NOTES ON BIRDS THAT FOLLOW ARMY ANTS IN THE NORTHERN ANDES

Margarita Rios^{1,3}, Gustavo Londoño^{1,4}, & Luis Biancucci²

¹Fundación EcoAndina, Programa Colombia de Wildlife Conservation Society, Apartado Aéreo 25527, Cali, Colombia.

²Montana Cooperative Wildlife Research Unit, University of Montana, Missoula, Montana 59812, USA. *E-mail*: luis.biancucci@gmail.com

Nota sobre las aves que siguen hormigas legionarias en los Andes del norte.

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Army ants flush small arthropods, which are important source of food for Neotropical birds (Willis & Oniki 1978, Swartz 2001). In Neotropical forests, there are two army ant species that are most often followed by birds: *Eciton burbelli* and *Labidus praedator* (Coates-Estrada & Estrada 1989, Swartz 2001). These two species have different activity patterns and life cycles (see below; Swartz 2001, Willson 2004). Such differences might play an important role in shaping the ecological relationships between birds and army ants. In addition, *E. burbelli* and *L. praedator* have different distributions in tropical forests

(Willson 2004). Both ant species inhabit lowland forests, but only *L. praedator* is found in highland forests (Hilty 1974, Willson 2004).

Birds vary in their dependence upon the ants for prey, ranging from occasional or irregular to obligate or specialist followers (Willis & Oniki 1978). Birds that specialize in following army ants are found primarily in lowland forests (Dobbs & Martin 1998), and have been studied extensively (Willis 1968, 1969, 1986a, 1986b; Gochfeld & Tudor 1978, Coates-Estrada & Estrada 1989, Willson 2004). Specialist refers to army ant followers that depend on army ants to flush the majority of their food and that are most often found with army ants (Swartz 2001). In highland forests, however, no specialist ant followers have been identified. Highland birds that follow army ants are thought to do so only opportunistically (Vallely 2001). Relatively few studies have been carried out in highland forests (Hilty 1974, Gochfeld & Tudor 1978, Vallely 2001). Here we present

³*Current address:* Instituto de Ecología, Universidad Autónoma de México. A. P. 70-275, México 04510, D.F., México. *E-mail:* gmargaritarios@gmail.com

⁴*Current address:* Department of Zoology and Florida Museum of Natural History, University of Florida, Gainesville, FL 32611-8525, USA. *E-mail:* galondo@ufl.edu

TABLE 1. Bird species following army ants in the Colombian (C1: SFFOQ, C2: San Antonio) and Venezuelan (V) highland forest. The number in parenthesis represents the number of individuals observed at the same time following army ants. *Species not previously reported in studies following army ants.

Species	Season	Observations	Locality
Cauca Guan (<i>Penelope perspicax</i>)	Rainy/Dry	24 (1-8)	C1
Sickle-winged Guan (<i>Chamaepetes goudotii</i>)	Rainy	4 (1-2)	C1
Squirrel Cuckoo (<i>Piaya cayana</i>)	Dry	1 (2)	C1
Blue-crowned Motmot (<i>Momotus momota</i>)	Rainy/Dry	2 (1)	C1
Moustached Puffbird (<i>Malacoptila mystacalis</i>)*	Rainy	1 (1)	C1
Emerald Toucanet (<i>Aulacorhynchus prasinus</i>)*	Rainy	1 (3)	C2
Groove-billed Toucanet (<i>Aulacorhynchus sulcatus</i>)*	Rainy	1 (2)	V
Acorn Woodpecker (<i>Melanerpes formicivorus</i>)*	Rainy	1 (1)	C1
Plain-brown Woodcreeper (<i>Dendrocincla fuliginosa</i>)	Rainy	> 5	V
Plain Antvireo (<i>Dysithamnus mentalis</i>)	Rainy	> 2	V
Slaty Antwren (<i>Myrmotherula schisticolor</i>)	Rainy	> 5 (2)	V
Long-tailed Antbird (<i>Drymophila candata</i>)*	Rainy	1	V
Immaculate Antbird (<i>Myrmeciza immaculata</i>)	Rainy/Dry	> 10 (5-6)	V
Black-faced Antthrush (<i>Formicarius analis</i>)	Rainy	> 3	V
Euler's Flycatcher (<i>Latrotriccus euleri</i>)*	Rainy	2	V
Andean Cock-of-the-rock (<i>Rupicola peruvianus</i>)*	Rainy	1 (1)	C1
Red-ruffed Fruitcrow (<i>Pyroderus scutatus</i>)*	Rainy/Dry	4 (1)	C1
Green Jay (<i>Cyanocorax yncas</i>)	Rainy	4 (1-5)	C1, V
Gray-breasted Wood-Wren (<i>Henicorhina leucophrys</i>)	Rainy	3 (1)	C1, C2, V
Orange-billed Nightingale-Thrush (<i>Catharus aurantiirostris</i>)	Rainy/Dry	> 5	V
Pale-eyed Thrush (<i>Turdus leucops</i>)*	Rainy	3 (2-6)	V
Black-hooded Thrush (<i>Turdus olivater</i>)*	Rainy	> 5 (2-4)	V
Gray-headed Tanager (<i>Eucometis penicillata</i>)	Rainy/Dry	> 9 (2)	V
White-lined Tanager (<i>Tachyphonus rufus</i>)*	Rainy	1	V
Silver-beaked Tanager (<i>Ramphocelus carbo</i>)*	Rainy	1	V
Chestnut-capped Brush-Finch (<i>Buarremon brunneinucha</i>)	Rainy	2 (1)	C1
Ochre-breasted Brush-Finch (<i>Atlapetes semirufus</i>)*	Rainy	> 5	V
Buff-throated Saltator (<i>Saltator maximus</i>)*	Rainy	> 5	V
Canada Warbler (<i>Wilsonia canadensis</i>)*	Rainy	1	V
Slate-throated Redstart (<i>Myioborus miniatus</i>)	Rainy	3 (1-2)	C2, V
Three-striped Warbler (<i>Basileuterus tristriatus</i>)	Rainy	> 5	V
Crested Oropendola (<i>Psarocolius decumannus</i>)	Rainy/Dry	6	V

new observations of army-ant following in highland birds. We also discuss the frequency of army ants in highland forest and their relationship with army-ant follower birds.

We made observations of ant-following birds during June 2002 and September 2004 at Santuario de Fauna y Flora Otún Quimbaya ('SFFOQ', 04°43'11"N, 75°57'35"W, 1800–2100 m a.s.l.), west of Pereira, Risaralda Department, on the western slope of the Central Cordillera (Andes), Colombia. Yearly average temperature and precipitation at this site over the past 15 years are 15.24°C and 2559 mm, respectively, with peaks of rain in October–November and March–May. Currently, the SFFOQ comprises a variety of habitats: secondary forest of different ages (87%), oak (*Quercus humboldtii*) Andean plantations (5%), ash (*Fraxinus chinensis*, 4%) and pine plantations (< 0.1%), and early stages (4%). For further details about the study site, see Rios *et al.* (2006).

We (M. M. Rios & G. A. Londoño) walked the SFFOQ path system monthly, noting birds following army ants. We also made *ad libitum* observations in two other highland forests. One of these observations was made in "San Antonio", located on the Cordillera Occidental in the Valle del Cauca crest, at 1800 m a.s.l. The third location was Yacambú National Park (YNP), Lara state, Venezuela, between 1350–1650 m a.s.l. In this place, observations were carried out by L. Biancucci between March and June 2006, and 2007.

Labidus ants show strong seasonal patterns of behavior. During the rainy season they forage on top of the litter during the day whereas, during the dry season, they tend to look for food below ground surface (Willis & Oniki 1978, Willson 2004). To determine if birds follow army ants more often during the rainy season, we used data from the Cauca Guan (*Penelope perspicax*) following army ants from Rios *et al.* (2006). We chose this diurnal and omnivorous species because it was easily

detected, follows army ants, and its breeding period is similar to the rest of the avian community (Rios *et al.* 2006).

During 27 months of observations at SFFOQ, we found 38 raiding swarms of *L. praedator* with associated birds, 18 of which were observed during the rainy season. We detected 12 bird species following the army ants (Table 1), five of which had not been previously reported (Vallely 2001, Rios *et al.* 2006, Londoño *et al.* 2007). The species most often observed following army ants was the Cauca Guan. We observed this species using this resource more often (67% of the Cauca Guan records) during the dry season (June to August). The other species that we saw following army ants showed the opposite pattern, with 71% of the observations during the rainy season. Although in Venezuela our data are from March to June, the end of the dry season and the beginning of the rainy season, we also found active swarms in both seasons with attending birds. These results agree with Willson (2004) who noted that there is less variability in *L. praedator* density than is generally assumed to occur between wet and dry seasons.

In YNP, the former year we detected 12 bird species following army ant swarms (*L. praedator*) and the latter year we registered 11 species. Nine of these species had not been reported before. In YNP, the Immaculate Antbird (*Myrmeciza immaculata*) and the Gray-headed Tanager (*Eucometis penicillata*) were the most frequent species observed following army ants. The former species often was seen with 5–6 individuals at the same time. The next species most commonly seen following army ants were the Buff-throated Saltator (*Saltator maximus*), the Chestnut-capped Brush-Finch (*Buarremon brunneinuchus*), the Plain-brown Woodcreeper (*Dendrocincla fuliginosa*), the Slaty Antwren (*Myrmotherula schisticolor*), the Orange-billed Nightingale-Thrush (*Catbarus aurantirostris*), the Black-hooded

Thrush (*Turdus olivater*), and the Crested Oropendola (*Psarocolius decumanus*). The remainder of the species had lower numbers of observations. The Plain Antvireo (*Dysithamnus mentalis*) and the Slaty Antwren, were commonly seen in pairs, and the Three-striped Warbler (*Basileuterus tristriatus*) and the Black-hooded Thrush were typically found in groups of 2–4 individuals.

In SFFOQ, 11 of the 12 species we detected following army ants swarms were observed four or fewer times. The remaining species, the Cauca Guan, was recorded 24 times. Willis & Oniki (1978) suggest that Cracidae species are rarely observed following army ants but in SFFOQ the Cauca Guan was the only species following army ant swarms regularly. However, this species is neither obligate nor specialist army ants follower (Willis & Oniki 1978). While the Cauca Guan was following ants, we saw no other bird species in the same swarm. Similarly, when the Crested Oropendola followed ants in YNP, we never saw other birds associated with them. Furthermore, when a Crested Oropendola flock started to follow a swarm, other birds left.

For the Neotropical highland forest, there are five previous studies reporting army ant followers (Hilty 1974, Gochfeld & Tudor 1978, Willis & Oniki 1995, Vallely 2001, Nieto & Ramírez 2006, Rios *et al.* 2006, Londoño *et al.* 2007). Almost 50% the 32 species listed here were never reported following ants before (Table 1).

Our observations agree with the few studies of army ant followers in highland forests (Hilty 1974, Gochfeld & Tudor 1978, Vallely 2001, Nieto & Ramírez 2006) about the lack of specialized army ant following birds. In SFFOQ, only one species makes regular use of this resource (Swartz 2001), but this is not a specialized army ant follower because arthropods (obtained following army ants) represent just the 9% their diet (Muñoz *et al.*

in press). The other 11 are irregular or indirect followers of army ants (Willis & Oniki 1978, Swartz 2001, Vallely 2001). In YNP, four species are regular army ant followers (Table 1); the rest of the species do so in an opportunistic way. Some inhabitant species in SFFOQ such as the Crested Ant-tanager (*Habia cristata*), the Montane Foliage-gleaner (*Anabacerthia striaticollis*), the Plain Antvireo, the Spotted Barbtail (*Premnoplex brunnescens*), the Black-billed Thrush (*Turdus ignobilis*), the Slaty Antwren, the Strong-billed Woodcreeper (*Xiphocolaptes promeropyrhyynchus*), the House Wren (*Troglodytes aedon*), the Black-and-white Warbler (*Mniotilta varia*), the Slate-throated Redstart (*Myioborus miniatus*), and the Three-striped Warbler were never seen following army ants. However these species have been reported in other highland forest. It is possible that these species use this resource in this forest, but their use is so irregular and occasional that we did not register them.

To understand how the highland forest birds use army ants, it is necessary to know the behavior of the army ant members. Hilty (1974) and Gochfeld & Tudor (1978) argue that the army ant swarms are more frequent in lowland than in highland forests. The highland army ant species (*L. praedator*) has subterranean bivouacs, and usually have seasonal activity patterns and nocturnal habits (Scheineirla 1971). Nonetheless, according to Coates-Estrada & Estrada (1989), these ants are occasionally active above ground during both dry and rainy seasons as at our study sites, which suggests “sporadic” rather than seasonal activity. Such sporadic activity would preclude specialization of ant following birds and therefore birds can not depend exclusively on this resource in these places. Probably, because there are no specialist ant followers in highland forest, some species may use regularly these resources without depending on them.

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