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Source: The Wilson Journal of Ornithology, 129(4):871-874.

Published By: The Wilson Ornithological Society

<https://doi.org/10.1676/16-208.1>

URL: <http://www.bioone.org/doi/full/10.1676/16-208.1>

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The Wilson Journal of Ornithology 129(4):871–874, 2017

First Observation of a Disturbance Foraging Association between Obligate Ant-following Birds and a Tamandua Anteater in Central Panama

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ABSTRACT.—Disturbance foraging – the use of disturbances created by other animals to locate cryptic or sedentary prey – is a widespread phenomenon, particularly in birds. In the Neotropics, a prominent example of disturbance foraging in birds is their relationship with army ants (*Eciton burchellii*). Numerous bird species attend army ant swarms and forage on the prey that the ants flush from the leaf litter. Here, I document a previously undescribed disturbance foraging association between two species of obligate ant-following birds and a small anteater, the northern tamandua (*Tamandua mexicana*). I observed both bird species approach and forage on fallen termites underneath the anteater, which was excavating a termite nest. The foraging association appeared to be a commensal relationship – the antbirds obtained a foraging benefit from the anteater, which was in turn unaffected by the birds. My observation suggests that ant-following birds may respond to other disturbances in addition to army ant swarms to find food. Received 19 November 2016. Accepted 18 March 2017.

Key words: antbirds, beater effect, disturbance foraging, foraging association, *Tamandua mexicana*.

The “beater effect” (Powell 1985) is a widespread phenomenon observed in nature whereby animals forage opportunistically at disturbances created by other animals. Disturbance foraging has been documented frequently among birds, which exhibit interspecific foraging associations with various mammals (Boinski and Scott 1988, Silveira et al. 1997, Ruggiero and Eves 1998, Komar and Hanks 2002, Tomazzoni et al. 2005, Beisiegel 2007, King and Cowlshaw 2009; reviewed in Heymann and Hsia 2015), other birds (Powell 1985, Kamler et al. 2008, John and Lee 2012), and even arthropods such as army ants (Willis and Oniki 1978, Brumfield et al. 2007; reviewed in Rettenmeyer et al. 2011). Generally, birds appear to capitalize on heterospecific disturbances to detect cryptic or sedentary prey, providing tangible foraging benefits to the attendant bird species (Powell 1985).

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In the Neotropics, one of the most common examples of disturbance foraging is ant-following birds foraging at swarms of army ants (*Ecton burchellii* and *Labidus praedator*; reviewed in Willis and Oniki 1978). In particular, *E. burchellii* (hereafter, army ants) form massive swarm raids (>500,000 individuals) that course through the leaf-litter and flush terrestrial arthropods and small vertebrates (Otis et al. 1986), providing a concentrated and profitable food resource for ≥ 200 species of attendant birds (Rettenmeyer et al. 2011). Birds kleptoparasitize the ants by stealing their prey (Wrege et al. 2005), and certain bird species ('obligate' ant-followers) depend almost exclusively on ant swarms for food and spend the preponderance of their time foraging at swarms (Willson 2004, Chaves-Campos 2011, O'Donnell et al. 2012).

In addition to foraging at ant swarms, ant-following birds have also been reported to forage at other disturbances, including those created by peccaries (Willson 2004), monkeys (Boinski and Scott 1988, Rodrigues et al. 1994), armadillos (Di Giacomo and Di Giacomo 2006), and even humans (Skutch 1996). Here, I report the observation of a novel disturbance foraging association between two species of obligate ant-following birds (Ocellated Antbird – *Phaenostictus mcleannani*; Bicolored Antbird – *Gymnopithys bicolor*) and a species of Neotropical anteater, the northern tamandua (*Tamandua mexicana*), in central Panama. I observed the birds approach and forage at a disturbance created by the anteater, which was excavating a termite nest and consuming the termites. My observation suggests that ant-following birds may respond to other disturbances in addition to army ant swarms to find food in their environments.

OBSERVATIONS

My observation took place on 3 March 2014 at ~0900 hrs Eastern Standard Time (EST) on Pipeline Road in Soberania National Park (09° 09' 35" N, 79° 44' 36" W; elevation = 80 m a.s.l.) in central Panama (Robinson et al. 2000). I heard a loud scraping noise ~30 m away, and when I approached the noise I observed a northern tamandua anteater excavating a large hole in the side of a termite (*Nasutitermes corniger*) nest and

consuming the termites. The nest was situated 1.5 m above the ground in a small liana tangle. After observing the anteater ~15 mins, I heard the calls of a pair of Bicolored Antbirds, an obligate ant-following species (Willis 1967). The pair approached and began foraging underneath the anteater on the termites that were falling to the ground while it was excavating the nest. The birds continued to call sporadically for several minutes and eventually, a pair of Ocellated Antbirds, a second obligate ant-following species, arrived and began to forage alongside the pair of Bicolored Antbirds. The two pairs of bird species foraged in close proximity (~2 m) from each other throughout the duration of my observation, which lasted for ~30 mins. I did not witness any agonistic competitive interactions between the birds and the anteater or between the two bird species while they were foraging together.

DISCUSSION

To my knowledge, this is the first reported observation of ant-following birds foraging in association with an anteater (but see Boinski and Scott [1988], Rodrigues et al. [1994], Skutch [1996], Willson [2004], Di Giacomo and Di Giacomo [2006] for examples of associations with other mammalian 'beater' species). Consistent with this observation, birds have been recorded previously foraging in association with numerous other mammal species, including primates (reviewed in Heymann and Hsia 2015), coatis (Beisiegel 2007), armadillos (Komar and Hanks 2002, Di Giacomo and Di Giacomo 2006), capybaras (Tomazzoni et al. 2005), elephants (Ruggiero and Eves 1998), wolves (Silveira et al. 1997), and even dolphins (Pitman and Ballance 1992) and whales (Harrison 1979). Thus, bird-mammal disturbance-related foraging associations are a widespread phenomenon that occurs in species of varied ecologies across a range of habitats. The observation took place during the height of the dry season, when many arthropod prey are at their lowest abundance (Wolda 1978, Levings and Windsor 1985, Poulin et al. 1992), consistent with other studies that have found an increased prevalence of disturbance foraging during periods of low food availability (Boinski and Scott 1988, Ferrari 1990). However, more data

are needed to investigate potential seasonal dynamics and also the general extent/prevalence of this behavior. Given that this foraging interaction between ant-following birds and anteaters has not been documented previously in the literature, it is likely not a particularly common or stable species association.

The lack of interaction between the anteater and the foraging birds suggests that this foraging association is a commensal relationship (Morin 1999). The birds obtained an obvious benefit from the anteater – protein-rich termites that they would normally not be able to access. Conversely, the anteater did not obtain any benefits from the birds but did not seem to be affected negatively by the birds either. Although most of the disturbance-based foraging associations described in the literature are commensal, they can also be mutualistic or even parasitic. For example, Powell (1985) proposed that disturbance foraging and the “beater effect” provided mutual aid among birds foraging in mixed-species flocks. Conversely, ant-following birds are actually kleptoparasites, stealing up to 30% of the large prey items that army ants capture while swarming (Wrege et al. 2005). Thus, despite the prevalence of disturbance-based foraging associations, these ecological interactions are heterogeneous in nature and context-dependent.

The sound of the anteater excavating the termite colony was audible from a moderate distance (~30 m), and it is possible that the birds used these acoustic cues to locate the disturbance. Birds have excellent hearing (Dooling 1982) and the first species to arrive (*G. bicolor*) may have heard the anteater scraping at the termite-nest and approached to investigate the noise. Because the pair of *G. bicolor* began to call back and forth as they were approaching the disturbance, it is unclear whether the second species (*P. mcleannani*) was responding to the scraping of the anteater or the calls of *G. bicolor*. Nevertheless, these observations are consistent with the idea that birds use acoustic cues to locate disturbances. For example, eavesdropping birds respond preferentially to vocalizations of obligate ant-followers (Chaves-Campos 2003; Batcheller 2017; Martínez et al., in press) and *P. mcleannani* has been reported to respond to vocalizations by *G. bicolor* (Chaves-Campos 2003, 2011) to suggest that *P. mcleannani* may have been responding to a

putative swarm. Given that this study was observational, however, it is impossible to exclude the influence of visual or olfactory stimuli on recruitment to the anteater’s disturbance. Furthermore, even if the birds were responding to the acoustic stimuli, it is unclear whether the birds were able to recognize specific stimuli (e.g., the anteater scraping or the vocalizations by *G. bicolor*) or whether they were simply responding to a novel disturbance in their environments. Because of their unique life history that involves tracking and foraging almost exclusively at army ant swarms (Willis 1967, Chaves-Campos 2011), obligate ant-followers possess a variety of behavioral, cognitive, and sensory specializations (O’Donnell et al. 2012), and they may be predisposed to respond to generalized disturbances in the environment as a means of finding food. This hypothesis is supported by observations of ant-following birds responding to mammalian beater species in addition to ant swarms (Boinski and Scott 1988, Rodrigues et al. 1994, Skutch 1996, Willson 2004, Di Giacomo and Di Giacomo 2006). Our results contribute to a growing body of literature suggesting that ‘obligate’ ant-following species may not depend exclusively on ant swarms for food, and demonstrate the need for re-evaluating the traditional paradigm for classifying avian level of dependence on ant swarms (Swartz 2001, O’Donnell et al. 2012).

ACKNOWLEDGMENTS

I thank my advisor Jeff Brawn for providing the funds that allowed me to travel to Panama which gave me the opportunity to document this foraging association. I also thank Johel Chaves-Campos, an anonymous reviewer, and my friends N. D. Sly and E. J. Williams for helpful comments on the manuscript.

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