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Consumption of Müllerian Bodies by Golden-olive Woodpecker (*Colaptes rubiginosus*) in Nicaragua's Highlands

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ABSTRACT.—The Golden-olive Woodpecker is a generalist species found in a wide range of habitats, being particularly common in coffee plantations within Nicaraguan cloud forests. Observations of an individual feeding at the base of Cecropia leaves revealed it was consuming Müllerian bodies that the Cecropia produces to feed Azteca ants as part of a host-inhabitant mutualistic symbiosis. This record further documents the plasticity of some species as they search for alternative sources of energy. *Received 4 February 2015. Accepted 24 July 2015.*

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INTRODUCTION

Woodpeckers are mainly insectivorous birds widely distributed in America (Gorman 2014) that also feed on fruits (Hilty and Brown 1986, Stiles

FIG. 1. Study site showing the location of Santa Maura farm within the Juan Roberto Zarruk Biological Station (13° 10′ 5.42″ N, 85° 51′ 39.24″ W) in Nicaragua's highlands.

and Skutch 1989, Mickich 2002, Winkler and Christie 2002, Leite et al. 2013). Recent taxonomic changes (Benz et al. 2006, Banks et al. 2008) placed the genus *Piculus* (comprised mostly of Neotropical species) into the genus *Colaptes* (Banks et al. 2008).

In Nicaragua, *Colaptes* Woodpeckers are present in diverse habitats, such as coffee plantations, cloud forests, lowland evergreen forests, and Pine-Oak forests (Martínez-Sánchez 2007, Howell 2010). The target species of our study, the Golden-olive Woodpecker, (*Colaptes rubiginosus,* hereafter GOWO) is common in Nicaragua's northern highlands (Martínez-Sánchez 2007, Arendt et al. 2012, Tórrez and Arendt 2013). Its diet is comprised mostly of insects (Hilty and Brown 1986, Stiles and Skutch 1989), but it also feeds on a wide variety of fruits (Wheelwright et al. 1984).

Cecropia spp. are pioneer species present in a wide variety of ecosystems (Lamprecht 1990) and characteristically produce Müllerian Bodies (MB). The MB are pearl bodies rich in glycogen (Rickson 1971) formed by trichilia pads located at the bases of leaf petioles of several plant species (Rickson 1971), and *Cecropia peltata* is one of the species that possesses MB (Wetterer and Dutra 2011). The MB provide food for Azteca ants, creating a mutualistic relationship (Folgarait et al. 1994). The tree provides shelter and safe breeding sites for the ants, while the ants defend the *Cecropia* plant against herbivorous and wood-boring insects (Schupp 1986, Rocha and Bergallo 1992) as well as predatory plants, e.g., strangler vines (Janzen 1969, Schupp 1986).

Feeding on MB has been documented previously in other taxa besides Azteca ants (Skutch 1945, Isler and Isler 1987, Stiles and Skutch 1989, Naoki and Toapanta 2001), which demonstrates that *Cecropia* spp. are not a source of food exclusive to these ants. We have been conducting a long-term study in landscapes dominated by coffee plantations in Nicaragua's northern highlands, in part to provide further observations on avian diets and other behaviors that complement our knowledge and biological information on avian species inhabiting the region.

METHODS

Our observation took place during April 2013 in Nicaragua's central highlands (Fig. 1), within the Juan Roberto Zarruk Biological Station (JRZB, 13° 10′ 5.42″ N, 85° 51′ 39.24″ W). The JRZB is a field research facility located within the Santa Maura farm, an 800-ha sun coffee plantation with an overstory of *Inga* trees dispersed over the landscape. About 40% of the farm is dedicated to the protection of cloud forest remnants. We have been conducting avian point-count surveys since November 2009 to present in five habitats

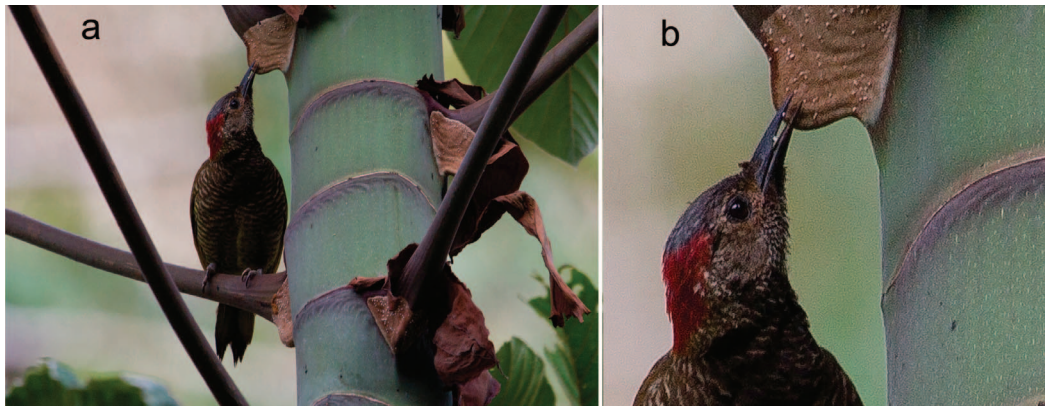

FIG. 2. Golden-olive Woodpecker (GOWO) consuming Müllerian Bodies (MB) from *Cecropia peltata,* a) general view, b) close up showing the woodpecker ingesting the MB.

scattered throughout the farm. Point count results are complemented by occasional observations in other areas not covered by the survey points.

RESULTS

On 29 April 2013 at 1630 Central Standard Time, we hiked into the coffee plantation to observe birds. During that time, we observed a GOWO feeding at the base of leaves of a Cecropia (*Cecropia peltata*). The bird was searching for food, jumping from one branch to another, and always focusing on the base of the leaves. After identifying the bird, our attention was drawn to the fact that the bird was not pecking at the bark or gleaning macro insects. After discarding the possibility that the woodpecker was consuming insects, we began taking pictures using a zoom lens (SLR 400 mm). The photos were clear in detail and revealed that the bird was gleaning Müllerian Bodies (MB) from the base of each leaf (Fig. 2). We continued watching the woodpecker for 5 mins more, and the GOWO continued using the same strategy of gleaning MB one at time. Afterwards, the woodpecker flew out of sight.

DISCUSSION

Colaptes woodpeckers complement their mainly insectivorous diet with other food sources (Short 1982, Wheelwright et al. 1984, Stiles and Skutch 1989, Gorman 2014), but to our knowledge, there is no previously published record documenting the consumption of MB by the GOWO. The MB are consumed primarily by Azteca ants, but evidence has shown consumption by birds such as Tanagers (Naoki 2003) and the Yellow Warbler (Leck 1972). Our observation is a single event, occurring after a period of 5 years of investigation. Thus, we question whether this behavior is common in the GOWO. It is plausible that the GOWO adopted this dietary strategy to supplement its primary diet of insects. We offer this observation to augment the list of birds that use this additional food source in the Neotropics.

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Prothonotary Warblers (*Protonotaria citrea*) Break Their Beaks During Attacks on Wooden Conspecific Decoys

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ABSTRACT.—Researchers often use wooden conspecific decoys paired with playback of audio recordings to capture individuals of territorial avian species. Agonistic responses elicited by these decoys can be violent at times; however to our knowledge, there have been no previously recorded instances of physical attacks on a decoy causing injury. In April 2014, we witnessed two cases of male Prothonotary Warblers (*Protonotaria citrea*) breaking their beaks while attacking a conspecific wooden decoy used during target-netting. Upon recapture 6–8 weeks after initial breakage, beak damage had healed and both males' mass was virtually unchanged (<1% change from their mass at initial capture). We also observed no detrimental effects of the broken beaks on within-season survival, mate attraction, or territory maintenance. Despite the lack of effect of the breakage on the birds, we suggest the use of softer materials in decoys. In addition to the development of

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