Mourning Dove (*Zenaida macroura*) and Eastern Bluebird (*Sialia sialis*) Found in Diet of the Non-native Cane Toad (*Rhinella marina*) in Florida

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Abstract - *Rhinella marina* (Cane Toad) is a generalist predator that has been found to consume both invertebrate and vertebrate prey. Herein, we detail the first confirmed consumption of hatchling *Zenaida macroura* (Mourning Dove) and *Sialia sialis* (Eastern Bluebird) by the non-native invasive Cane Toad in Florida. Although birds are not known to be a large part of the Cane Toad diet, opportunistic consumption of hatchlings that likely fell from nests suggests that ground-nesting birds could also be at risk of predation by Cane Toads.

Introduction. Non-native herpteofauna are a challenge for native species in many areas of the world (Kraus 2015). *Rhinella marina* (L.) (Cane Toad) is a non-native, invasive amphibian species in Florida. Original introductions from its native range in the Neotropics (Zug and Zug 1979) to Florida in the 1930s as pest control in fields of *Saccharum officinarum* L. (Sugar Cane) failed to result in sustainable populations (Krakauer 1968), but subsequent accidental and deliberate releases by pet traders during the 1950s and 1960s successfully resulted in population expansions (King and Krakauer 1966). Cane Toads have since become established in many of the human-modified areas of southern and central Florida (Wilson and Johnson 2017), as well as on many islands in the Caribbean and Oceania and in Australia (Dodd 2013). The diet of the Cane Toad consists primarily of invertebrates (Evans and Lampo 1996, Meshaka and Powell 2010, Shine 2010) and, to a lesser extent, vertebrate prey (Kelehear 2014, Pizzatto et al. 2012, Schuman and Bartoszek 2019). Beckmann and Shine (2012) compiled the documented cases of birds in the diet of Cane Toads, noting the rarity of occurrence. Herein, we report 2 instances of hatchling bird species in the diet of the Cane Toad: *Zenaida macroura* (L.) (Mourning Dove) and *Sialia sialis* (L.) (Eastern Bluebird). Both bird species are widespread and common native species in Florida (Gowaty and Plissner 2020, Otis et al. 2020).

Observations. As part of a 2-year dietary study, Cane Toads were collected during nighttime hours from 2 residential golf course communities in Naples, FL. Collections were done by a local pest-control company, Pesky Varmints, LLC, and took place at site 1 (26°12'33.30"N, 81°45'34.25"W) on 04 December 2018 and 12 June 2019 and at site 2 (26°11'13.29"N, 81°44'56.13"W) on 20 November 2018 and 23 July 2019. From these collections, we took a random subsample of stomachs from 240 adult Cane Toads (30 males and 30 females from each site visit). Six stomach samples contained bird material (5 single feathers, and 1 embryo/hatchling), including eggshell fragments (Fig. 1). Using microscopy (Dove and Koch 2011) and whole-feather comparisons with museum specimens at the National Museum of Natural History (USNM), Washington, DC, we identified 4 of the single feathers as adult ducks (Anatidae) and 1 identifiable to family Columbidae using microscopic characters of node shape and barbule length. No other bird evidence was found with these single-feather specimens, therefore they could have been ingested incidentally by the

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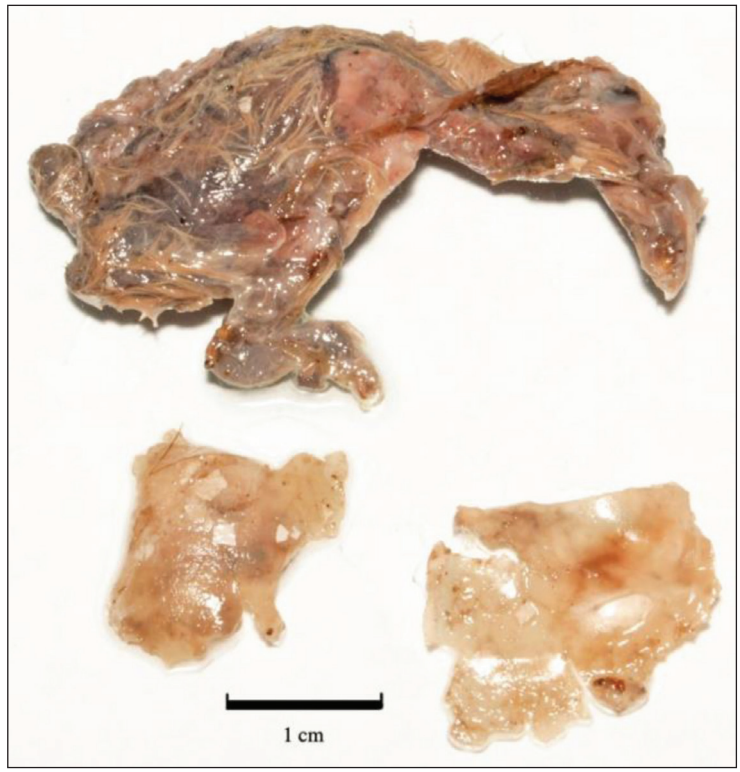

Figure 1. Mourning Dove found in stomach contents of a Cane Toad.

Figure 2. Eastern Bluebird hatchling being scavenged by a Cane Toad.

toads while consuming other prey items or scavenging. We used DNA barcoding (Kerr et al. 2007) at USNM to definitively identify the embryo/hatchling as a Mourning Dove.

During the evening of 08 June 2021 in a residential golf-course community in Naples, FL (26°11'17.96"N, 81°45'36.75"W), employees of the pest-control company observed and photographed an adult Cane Toad ingesting a bird hatchling (Fig. 2). No specimen was collected, but we obtained a positive identification of Eastern Bluebird using color photos that showed the blue feathers and morphological features of the bill on the hatchling bird. We narrowed down the potential bird species in Florida to those with blue plumage and known distributions in Naples (The Cornell Lab of Ornithology Birds of the World data; https://birdsoftheworld.org/bow/home). We made final comparisons and identifications using bill proportions and relative size comparisons with museum bird specimens (at USNM) from the same stage of development as the hatchling in the photographs. The Eastern Bluebird hatchling was likely already dead when eaten by the Cane Toad, as it was described as falling apart by the eyewitnesses.

To our knowledge, this is the first observation of either a Mourning Dove or Eastern Bluebird in the diet of the Cane Toad and underscores that although adult birds have the ability to fly and avoid predation, nestlings and fledglings may be more vulnerable to being consumed by Cane Toads. There has been documentation of Cane Toads preying on live nestlings and fledglings (Beckman and Shine 2012), including ground-nesting bird eggs and nestlings (Boland 2004). Although both instances reported here were birds likely scavenged after being injured or killed from other causes such as falling from a nest, ground-nesting species and their nestlings could also be at risk of predation where their range overlaps with the invasion range of the Cane Toad.

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