REPTILES & AMPHIBIANS

Notes on the Diet of the Cuban Flat-headed Frog, *Eleutherodactylus planirostris* (Eleutherodactylidae) from Two Understudied Habitats in Western Cuba

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The Cuban Flat-headed Frog (*Eleutherodactylus planirostris*) occurs naturally in Cuba, the Cayman Islands, and the Bahamas, and has become widely established far beyond its native range (e.g., Kraus 2009). These frogs often are associated with human-modified habitats (see Henderson and Powell 2009 for review), but few reports document the presence of this species in subterranean environments (Schwartz and Henderson 1991; Meshaka et al. 2004; Olson and Beard 2012; García-Padrón 2022). Several publications (Olson and Beard 2012; Ferreira et al. 2015; Ramírez-Valverde et al. 2020) describe the diet of *E. planirostris* in urban situations outside Cuba, but little is known about urban frogs in Cuba (Goin 1947). Herein we describe diets of Cuban Flat-headed Frogs in an urban environment and in a natural cave in Cuba.

We collected frogs at night (2000–2200 h) on 10 August 2018 in a residential backyard in Guanajay, Artemisa Province (22.92480°N, 82.68742°W; elev. ~120 m asl) (Fig. 1), and on 6 June 2021 in Infierno Cave, Pinar del Río Municipality, Pinar del Río Province (22.22921°N, 83.43158°W; elev. ~75 m asl) (Fig. 2). We measured SVL of each individual with calipers and flushed stomachs using methods of Solé et al. (2005). We released frogs at the site of capture, stored stomach contents in 70% ethanol, and later counted and identified prey items to the lowest taxonomic level possible.

We determined the number (N) and percentage (N%) of prey items along with the frequency of occurrence (F, number of stomachs in which a given type of prey occurred) and percentage (F%). We used Chi-square (χ^2) tests to compare SVLs and numbers of prey items per stomach a the two study sites. We present means ± one standard deviation. To calculate trophic niche breadth we used Levins' index (B) (Krebs 1989) standardized according to Hurlbert (1978) (B_A), which ranges from 0 (no diversity, exclusive use of a single prey type, specialist) to 1 (highest diversity, prey items of all categories used equally, generalist).

Fig. 1. A residential backyard in Guanajay, Artemisa Province, Cuba (left), and a Cuban Flat-headed Frog (*Eleutherodactylus planirostris*) released after having its stomach flushed (right). Photographs © C.A. Borrego (left) and L.Y. García-Padrón (right).

Reptiles & Amphibians ISSN 2332-4961
https://doi.org/10.17161/randa.v29i1.17956

Fig. 2. Forest adjacent to Infierno Cave, Pinar del Río Municipality, Pinar del Río Province, Cuba (left), the entrance of the cave (center), and a Cuban Flat-headed Frog (*Eleutherodactylus planirostris*) on the ground in Infierno Cave prior to capture (right). Photographs © L.Y. García-Padrón.

Frog SVLs at Guanajay (20.6 ± 2.2 mm, 17.0–23.7 mm) and Infierno Cave (23.9 ± 4.8 mm, 18.6–32.8 mm) did not differ significantly (χ^2 = 1.75, P = 0.19). All frogs examined contained at least one prey item. We recorded a total of 223 prey items belonging to 12 prey types and inorganic material (a nylon strand in Guanajay and thread, possibly from garbage deposited about 30 m from the cave) presumably ingested adventitiously (Table 1). The number of prey items per stomach at Guanajay (12.5 ± 11.1, 1–33) and Infierno Cave (11.9 ± 10.0, 2–33) did not differ significantly (χ^2 = 0.007, P = 0.93). The diversity of prey in the cave (91.7%) was higher than in Guanajay (50.0%), as was Levins' index (B_A = 0.38 vs. 0.21).

Ants (Hymenoptera: Formicidae) were the most important prey item at both sites (F% = 20.93, N% = 40.57), where the invasive Little Fire Ant (*Wasmannia auropunctata*) dominated both samples. The second most abundant prey item was mosquitoes (Diptera: Culicidae) (F% = 9.30, N% = 4.72). Burrowing bugs (Heteroptera: Cydnidae) were more abundantly represented (F% = 37.93, N% = 68.85), but were present only in the cave.

That Cuban Flat-headed Frogs in the cave population consumed more prey types than those in the urban population suggests that the diversity of available prey was higher in natural habitats compared to anthropogenic habitats. The high frequency of Little Fire Ants taken by frogs in both habitats likely reflects opportunistic consumption of an abundant prey species. *Wasmannia auropunctata* is listed among the 100 worst invasive alien species in the world (Lowe

Table 1. Diets of Cuban Flat-headed Frogs (*Eleutherodactylus planirostris*) from an urban situation in Guanajay (Artemisa Province) and Infierno Cave (Pinar del Río Province), showing number (N) and percentage (N%) of prey items and frequency of occurrence (F, number of stomachs in which a given type of prey occurred) and percentage (F%).

	Guanajay		Infierno Cave	
Prey	**F (%)**	**N (%)**	**F (%)**	**N (%)**
Insecta				
Hymenoptera (Formicidae)	7 (50.0)	82 (91.1)	2 (6.9)	4 (3.3)
Hymenoptera (Formicidae) eggs	0	0	4 (13.8)	10 (8.2)
Diptera (Culicidae)	2 (14.3)	3 (3.3)	2 (6.9)	7 (5.7)
Diptera (Culicidae) larvae	0	0	1 (3.5)	1 (0.8)
Heteroptera (Cydnidae)	0	0	11 (37.9)	84 (68.9)
Coleoptera (Phalacridae)	0	0	2 (6.9)	2 (1.6)
Coleoptera (Hydrophilidae)	0	0	1 (3.5)	1 (0.8)
Unidentified insects	1 (7.1)	1 (1.1)	0	0
Arachnida				
Acari	1 (7.1)	1 (1.1)	3 (10.3)	10 (8.2)
Araneae	2 (14.3)	2 (2.2)	1 (3.5)	1 (0.8)
Opiliones	0	0	1 (3.5)	1 (0.8)
Diplopoda	1 (7.1)	1 (1.1)	1 (3.5)	1 (0.8)
Inorganic material	1	1	3	3

et al. 2000) and can be extremely abundant in both natural and anthropogenic habitats in Cuba. This is the first time this invasive ant has been reported in the diet of *E. planirostris*.

Cuban Flat-headed Frogs are known to feed largely on ants, but will eat a variety of prey depending on habitat (Olson and Beard 2012; Ferreira et al. 2015; Ramírez-Valverde et al. 2020). Burrowing bugs (Cydnidae) are not commonly encountered in caves, but when present, usually are associated with guano of fruit-eating bats (Kłys and Lis 2013). To the best of our knowledge, no cynids have been documented in Cuban caves. That they were the most frequently taken prey of *E. planirostris* in the cave indicates that they were present at high abundance and also that dietary studies contribute not only to the knowledge of the trophic ecology of the target species but also indirectly provide insights into the faunal composition of a study site.

Acknowledgements

We thank CABQ parents and Daciel Gutiérrez Báez and his family for invaluable help during fieldwork. Tomás M. Rodríguez-Cabrera reviewed an early version of this manuscript.

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