

SHORT COMMUNICATION

Feeding habits, microhabitat use, and daily activity of *Cycloramphus brasiliensis* (Anura: Cycloramphidae) from the Atlantic Rainforest, Brazil

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ABSTRACT. We analyzed the feeding habits, microhabitat use, and daily activity period of the anuran species *Cycloramphus brasiliensis* (Steindachner, 1864), endemic to the Atlantic Rainforest biome. The only previous studies on this species focused on the systematics and new altitudinal records. This study was conducted in a large forest remnant located in the municipalities of Guapimirim and Cachoeiras de Macacu. We captured frogs through visual encounter surveys and recorded the frequency of microhabitat types used by them, and the time of capture. Diet was analyzed in terms of number, volume and frequency of occurrence of items. Individuals of *C. brasiliensis* occurred in association with fast-moving rocky portions of clear freshwater rivers, indicating a rheophilic habit, and were active mainly at night. Such as most anuran species, the diet of *Cycloramphus brasiliensis* was mainly based on arthropods, and included Blattodea, Formicidae, and Coleoptera as most important prey items.

KEY WORDS. Activity period; conservation; diet; rheophilic habit; threatened amphibians.

Cycloramphus brasiliensis (Steindachner, 1864) is an anuran species endemic to the Atlantic Rainforest of Serra dos Órgãos and Serra da Mantiqueira, in the state of Rio de Janeiro, southeastern Brazil (FROST 2011), where it inhabits elevations ranging from 150 to 1200 m (MAIA-CARNEIRO *et al.* 2012). *Cycloramphus brasiliensis* is considered a near threatened species, and is close to be qualified as vulnerable due to decreasing populations (IUCN 2011). Actually, the only available information about this species is a systematic study of *Cycloramphus* (HEYER 1983) and new altitudinal records (MAIA-CARNEIRO *et al.* 2012). Herein we add information on the diet, microhabitat use, and daily activity period of *C. brasiliensis*, broadening the scarce knowledge on the biology of this species.

We sampled two Atlantic Rainforest areas in the state of Rio de Janeiro, southeastern Brazil: the Estação Ecológica Estadual Paraíso (EEEP, 22°29'S, 42°55'W) and the Reserva Ecológica de Guapiaçu (REGUA, 22°24'S, 42°44'W). The vegetation in both areas is predominantly low montane and sub-montane tropical forest. The climate in the EEEP is wet and warm, the total annual precipitation ranges between 2000 and 3000 mm, and the mean annual temperature is ca. 23°C (KURTZ & ARAÚJO 2000). At REGUA, the annual rainfall varies from 2000 to 2500 mm, and the mean annual temperature is about 24°C (ROCHA *et al.* 2007, 2011).

We collected individuals of *C. brasiliensis* in September and October 2004 and between July 2007 and March 2010 using visual encounter surveys conducted at the diurnal, crepuscular, and nocturnal periods. The sample effort totaled 411 hours of active search (69 hours during the day, 69 hours at dusk, and 273 hours during the night). We recorded the microhabitats occupied by the frogs when they were first seen, in order to estimate their frequency of microhabitat use. The daily activity period of *C. brasiliensis* was determined by the number of individuals found during the visual encounter surveys.

We measured the snout-vent length (SVL) (precision of 0.01 mm) of the individuals captured, and analyzed their stomach contents. Prey items were identified to order or family level, counted, and measured (precision of 0.01 mm). The diet of *C. brasiliensis* was analyzed in terms of number, volume (in mm³) and frequency (%) of occurrence of items. Prey volume was estimated using the formula of the ovoid-spheroid (DUNHAM 1983). The frequency of occurrence of each prey category represents the number of stomachs that contained that category. We calculated an Index of Importance Value (I_v) as the sum of the proportions of number, volume and frequency of occurrence of each item divided by three (HOWARD *et al.* 1999).

We collected 11 individuals of *C. brasiliensis* in association with two microhabitat categories: on rock (N = 8 or 72.7%) and under rock (N = 3 or 27.3%), both associated with fast-

moving freshwater rivers. Hence, our data indicates that individuals of *C. brasiliensis* have a rheophilic habit, as other congeneric species (HADDAD *et al.* 2008). Ten (90.1%) of the frogs were found during the nocturnal transects and only one (0.9%) at dusk. Therefore, as reported for other species of the same genus (GIARETTA & CARDOSO 1995, HADDAD *et al.* 2008), analysis of our data indicates that the activity period of *C. brasiliensis* is predominantly concentrated at night. However, the difference in sampling effort (with a greater effort at night in our study) might have led to differences in the likelihood of finding and capturing individuals, once the sampling effort was higher during the nocturnal period.

The SVL of the anurans averaged 41.5 ± 9.9 mm, varying from 24.6 mm to 58.4 mm (N = 11). Of all individuals sampled, only one (9.0%) had an empty stomach. In numerical terms, the diet of *C. brasiliensis* was composed mainly by Formicidae (27.5%) followed by Gastropoda (22.5%). Volumetrically, Blattodea was the most important item (47.2%), followed by Coleoptera (13.9%). In terms of frequency of occurrence, coleopterans and plant remains were found in 45.5% of the stomachs examined, followed by Formicidae (36.4%). The highest values of I_x were recorded for Blattodea (0.229), followed by Formicidae (0.142) and Coleoptera (0.139) (Tab. I). The ingestion of a relatively wide array of prey types (11) suggests a generalist diet and an opportunistic foraging behavior. This species fed exclusively on invertebrates, similarly to most anuran species from the Atlantic Rainforest (e.g., TEIXEIRA & VRCIBRADIC 2003, SIQUEIRA *et al.* 2006). Moreover, we also found the prey items Trichoptera and Chironomidae (both in larvae stage) in the diet of *C. brasiliensis*, both typical inhabitants of freshwater environments. This suggests that the frogs might forage both in and out of the water.

Evaluation of our results indicate that *C. brasiliensis* occurs mainly in association with fast-moving rocky portions of clear freshwater rivers within remnants of Atlantic Rainforest where they live. These frogs are mainly active at night and have a carnivorous diet composed exclusively of invertebrates found both in terrestrial and freshwater environments.

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Table I. Diet composition of *Cycloramphus brasiliensis* (N = 11) in the Atlantic Rainforest in the state of Rio de Janeiro, southeastern Brazil, containing the number (N) of prey consumed, volume (V, in mm³) of prey, frequency (F) of occurrence of each category of prey (percentages in parentheses), and Index of Importance Value (Ix).

Item	<i>Cycloramphus brasiliensis</i> (N = 11)			
	N (%)	V (%)	F (%)	I _x
Gastropoda	9 (22.5)	23.94 (0.7)	3 (27.3)	0.108
Arachnida				
Scorpiones	1 (2.5)	211.16 (6.3)	1 (9.1)	0.118
Araneae	1 (2.5)	194.95 (5.8)	1 (9.1)	0.038
Hexapoda				
Odonata	1 (2.5)	170.48 (5.1)	1 (9.1)	0.035
Orthoptera	3 (7.5)	90.08 (2.7)	1 (9.1)	0.044
Blattodea	5 (12.5)	1584.43 (47.2)	3 (27.3)	0.229
Coleoptera	5 (12.5)	467.91 (13.9)	5 (45.5)	0.139
Hymenoptera				
Formicidae	11 (27.5)	106.08 (3.2)	4 (36.4)	0.142
Trichoptera (larvae)	1 (2.5)	2.26 (0.1)	1 (9.1)	0.019
Diptera				
Imago	2 (5)	16.43 (0.5)	2 (18.2)	0.039
Larvae (Chironomidae)	1 (2.5)	2.14 (0.1)	1 (9.1)	0.019
Arthropod remains	–	477.21 (14.2)	5 (45.5)	–
Plant remains	–	13.21 (0.4)	5 (45.5)	–
Total	40 (100)	3360.28 (100)	–	–

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