Food habits of *Stereocyclops incrassatus* (Anura, Microhylidae) from Povoação, Espírito Santo State, southeastern Brazil

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ABSTRACT: We report data on body size (snout-vent length – SVL), diet and female fecundity of *Stereocyclops incrassatus*, a microhylid frog endemic to Atlantic forest areas of eastern Brazil. Mean SVL of males (41.2 ± 2.0 mm) and females (41.1 ± 2.2 mm) did not differ significantly. Examination of stomach contents revealed that all 77 individuals had full or partially filled stomachs. The diet of *S. incrassatus* was composed of a diverse array of small terrestrial invertebrates, with ants, beetles and isopods being the dominant prey items. The data suggest an opportunistic feeding strategy for *S. incrassatus*, judging by the variety of prey types found in the stomachs.
Key-words: *Stereocyclops incrassatus*, Microhylidae, diet, Atlantic Forest.

RESUMO: **Aspecto da história natural de *Stereocyclops incrassatus* (Anura, Microhylidae) de Povoação, Espírito Santo, sudeste do Brasil**. Nós registramos dados sobre o tamanho corporal (comprimento rostro-cloacal), dieta e a fecundidade de *Stereocyclops incrassatus*, um microhilídeo endêmico da Mata Atlântica do leste do Brasil. O comprimento rostro-cloacal médio não diferiu significativamente entre machos (41,2 ± 2,0 mm) e fêmeas (41,1 ± 2,2 mm). A análise do conteúdo estomacal revelou que todos os 77 indivíduos tiveram os estômagos total ou parcialmente cheios. A dieta de *S. incrassatus* foi composta de uma variedade grande de pequenos invertebrados terrestres, com formigas, besouros e isópodas sendo as presas dominantes. Os resultados sugerem uma estratégia alimentar oportunista para *S. incrassatus*, julgando pela variedade de presas encontradas nos estômagos.
Palavras-chave*: Stereocyclops incrassatus*, Microhylidae, dieta, Mata Atlântica

Limited information is currently available on the food habits of microhylid frogs from South America (e.g. Duellman 1978; Schlüter & Salas, 1991; Vitt & Caldwell, 1994; Solé *et al*., 2002; Morales & Vargas, 2003; Vaz-Silva *et al.*,

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2003; Van Sluys *et al.*, in press). All those studies evidence that diets of such frogs tend to be dominated by colonial insects (i.e. ants and termites). In the present study, we report data on body size and diet of *Stereocyclops incrassatus*, a microhylid frog endemic to Atlantic forest areas of eastern Brazil (Feio *et al.*, 1998). Nothing is currently known of the ecology of the two currently recognized species of *Stereocyclops*, except that they have explosive reproduction, as in other Neotropical microhylids (Feio *et al*., 1998; Carvalho e Silva *et al*., 2000).

Frogs were collected by two of us (RLT and GIA) on 05 November 2001, between 2100 and 2300 h, at the borders of a cacao plantation near Povoação (19º25'S, 39º57'W), in Linhares Municipality, Espírito Santo State, southeastern Brazil. A total of 77 specimens (45 males and 32 females) of *S. incrassatus* were collected among the hundreds that were seen crossing a dirt road, during a thunderstorm, apparently at the event of a breeding explosion. All specimens collected were killed in 10% alcohol and transferred to 10% formalin in the laboratory, being posteriorly washed in water and preserved in 70% alcohol. In the laboratory, individuals were measured in their snout-vent length (SVL, in mm) with a caliper. Then, all frogs were dissected for sexing and removal of the stomachs. Prey items found in each stomach were identified to Order, when possible. All prey items were counted, measured along its longer axis with a caliper (0.1 mm accuracy), and had their wet mass taken in an electronic balance (0.1 mg accuracy). The importance of each prey category in the diet of *S. incrassatus* was assessed by calculating their frequency of occurrence (%F - proportion of stomachs containing a given prey category), numeric proportion (%N - number of individual items of a given category divided by the total number of prey items consumed) and mass proportion (%M - total mass of items belonging to a given category divided by the total mass of prey items consumed).

One-way analysis of variance (ANOVA) was used to test if there was a difference in mean SVL between sexes. Simple regression analysis was used to test the relationship between prey size (based on the length of the largest prey found per stomach) and frog SVL.

Eight voucher specimens of *S. incrassatus* were deposited at the Museu de Biologia Prof. Mello Leitão, in Santa Teresa, Espírito Santo State, Brazil (collection numbers: MBML 2003-2010).

Males of *S. incrassatus* collected in the present study averaged 41.2 ± 2.0 mm in SVL (range 36.8-45.8 mm), whereas females averaged 41.1 ± 2.2 mm (range 37.5-45.3 mm). Mean SVL did not differ between sexes (ANOVA: $F_{1, 75} = 0.11$; $p = 0.74$). The apparent absence of sexual

dimorphism in size observed for *S. incrassatus*, contrasts with what is known for other Neotropical microhylids, which are sexually dimorphic with females growing larger than males (e.g. Cruz *et al*., 1997; Rodrigues *et al*., 2003; Van Sluys *et al*., in press).

Huey *et al*. (2001) considered that the proportion of empty stomachs in a sample of a given species/population of lizards could be a good estimator of energy balance. Thus, a low proportion of empty stomachs would be indicative of positive energy balance, whereas a high proportion of empty stomachs could indicate an alternation between "feast" and "famine" scenarios (i.e. populations are subject to considerable fluctuations in food availability). Examination of stomach contents of *S. incrassatus* in the present study revealed that all 77 individuals had full or partially filled stomachs, which suggests that the studied population may be in positive energy balance. Nevertheless, the entire sample of *S. incrassatus* was collected during a single day during a explosive breeding ‑event (*sensu* Wells, 1977), so that we do not have evidence that these frogs maintain such a high food intake during the whole year. Solé *et al.* (2002) and Van Sluys *et al*. (in press) recorded low proportions of empty stomachs for *Elachistocleis ovalis* and *Chiasmocleis capixaba*, respectively. On the other hand, Schlüter & Salas (1991) mentioned a very high incidence of empty stomachs for a large sample of *Chiasmocleis ventrimaculata* from a Peruvian rainforest, which indicates that not all Neotropical forest-dwelling microhylids may be constantly benefitting from a "feast" scenario (*sensu* Huey *et al*., 2001).

The diet of *S. incrassatus* was composed of a diverse array of small invertebrates, with ants, beetles and isopods being the dominant prey items (Table 1). All these are typically ground-dwelling organisms, which reflects the strictly terrestrial habits of *Stereocyclops*. Intact prey found in stomachs varied from 4.0 to 11.4 mm in length, and there was no significant relationship between prey size and frog SVL ($r = 0.30$; $p > 0.05$; $N = 68$), presumably due to the frequent ingestion of colonial insects (i.e. ants and termites) with little individual variation in size.

The data suggest an opportunistic feeding strategy for *S. incrassatus*, judging by the variety of prey types found in the stomachs. Nevertheless, ants were the most important items in the diet, as in most other Neotropical microhylids studied so far (Duellman, 1978; Schlüter & Salas, 1991; Solé *et al*., 2002; Van Sluys *et al*., in press). Still, it appears that *S. incrassatus* does not rely as heavily on terrestrial colonial insects (i.e. ants and termites) as do other medium-sized Neotropical microhylids such as *Elachistocleis ovalis* (Solé *et al*., 2002) and *Dermatonotus muelleri* (Vaz-Silva *et al.*, 2003).

Table 1. Absolute values and percentages (%) for each prey type found in the stomach contents of *Stereocyclops incrassatus* from Povoação, Espírito Santo, southeastern Brazil. F = frequency of occurrence; N = number of prey items; M = wet mass of prey items (in mg).

PREY	F	%F	N	%N	M	%M
ANNELIDA						
Oligochaeta	2	2.6	2	0.4	266.8	2.0
ARACHNIDA						
Acarina	1	1.3	1	0.2	2.8	<0.1
Araneae	3	3.9	3	0.7	177.1	1.3
Opilionida	5	6.5	5	1.1	964.0	7.3
Pseudoscorpionida	1	1.3	1	0.2	3.7	<0.1
CRUSTACEA						
Isopoda	28	36.4	41	9.0	1256.7	9.5
INSECTA						
Blattodea	5	6.5	5	1.1	400.1	3.0
Coleoptera	34	44.2	46	10.1	2427.4	18.4
Dermaptera	1	1.3	1	0.2	13.8	0.1
Diptera	2	2.6	2	0.4	2.9	<0.1
Hemiptera	5	6.5	5	1.1	706.1	5.3
Homoptera	2	2.6	2	0.4	6.5	<0.1
Hymenoptera						
ants	71	92.2	323	70.8	5025.5	38.0
non-ants	1	1.3	1	0.2	12.3	0.1
Isoptera	2	2.6	2	0.4	4.5	<0.1
Larvae						
Coleoptera	2	2.6	2	0.4	5.2	<0.1
Lepidoptera	3	3.9	3	0.7	819.3	6.2
Neuroptera	1	1.3	1	0.2	1.8	<0.1
Orthoptera	4	5.2	4	0.9	350.2	2.7
MYRIAPODA						
Chilopoda	3	3.9	3	0.7	291.9	2.2
Diplopoda	3	3.9	3	0.7	492.8	3.7
Total	-	100.00	456	100.00	13231.4	100.00

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