

**ANTS AND TERMITES ARE THE DIET OF THE MICROHYLID FROG
ELACHISTOCLEIS OVALIS (SCHNEIDER, 1799) AT AN *ARAUCARIA* FOREST
IN RIO GRANDE DO SUL, BRAZIL**

MIRCO SOLÉ^{1,2}, JOCHEN KETTERL^{1,2},
MARCOS DI-BERNARDO³ and AXEL KWET^{1,2,3,4}

¹ *Laboratório de Pesquisas Biológicas (LPB), Faculdade de Biociências, PUCRS, Porto Alegre, Brazil*

² *Zoologisches Institut, Universität Tübingen, Auf der Morgenstelle 28, D-72076 Tübingen, Germany*
[author for correspondence]

³ *Museu de Ciências e Tecnologia e Faculdade de Biociências da PUCRS, Porto Alegre, Brazil*

⁴ *Staatliches Museum für Naturkunde Stuttgart, Zoologie, Rosenstein 1, D-70191 Stuttgart, Germany*

ABSTRACT.— The diet of *Elachistocleis ovalis* was studied based on material from the Serra Geral in the Brazilian state of Rio Grande do Sul. Stomachs of 16 frogs captured in their natural environment were flushed. *Elachistocleis ovalis* had an insectivorous diet composed exclusively of Hymenoptera and Isoptera. Ants of the subfamilies Myrmicinae, Dolichoderinae, Ponerinae and Ecitoninae were the most common prey items. Feeding experiments in the laboratory showed that *E. ovalis* has a defensive reaction which consists of crouching and attempting to burrow its head into the ground when offered ants of the subfamily Formicinae.

THE anuran fauna of the subtropical Rio Grande do Sul in the south of Brazil is remarkably diverse. Braun & Braun (1980) recorded 62 species and subspecies for this state. The most recent checklist (Kwet, 2001) comprises 79 species. The greatest number of species in the region is found in the state's northeastern mountains of the Serra Geral, at altitudes of around 1000 m, and on the adjacent Atlantic-facing slopes. About 50 species of frogs and toads occur in the rain forest of these upland areas (Kwet, 2000). The local anuran community has been intensively studied, and 36 taxa alone have been found in the *Araucaria* forest reserve Pró-Mata (Kwet & Di-Bernardo, 1999). Most of these species belong to the Hylidae (19) and Leptodactylidae (12) with, in addition, two microhylids, two bufonids and one pseudid. The two Microhylidae are *Elachistocleis erythrogaster* Kwet & Di-Bernardo, 1998 and *E. ovalis* (Schneider, 1799). The taxonomic status of the latter is unresolved (Frost, 1985) and we follow Klappenbach & Langone (1992) and Kwet & Di-Bernardo (1998, 1999) in considering *E. bicolor*

(Valenciennes, 1838) a junior synonym of *E. ovalis*. Data available on the natural history of this small microhylid are limited and little is known about its diet. Cei (1980) called the species termitophagous whereas Langone (1994) mentioned ants as typical prey. Kwet & Di-Bernardo (1999) described *E. ovalis* as a fossorial form, feeding mainly on termites and ants. In order to obtain more precise information on presumed prey selection, we studied the stomach contents of this frog at the Pró-Mata reserve.

MATERIALS AND METHODS

The study was carried out December 2000 through March 2001 in the Pró-Mata reserve, located in the municipality of São Francisco de Paula, Rio Grande do Sul, at 29°S and 50°W. At the collecting site near the entrance of the reserve are small temporary ponds in an area of open grassland (campos); these fill with water after rains in springtime and may dry out in summer. Average annual precipitation, as measured at the nearby reserve's weather station, is about 2200 mm.

Sixteen adult *E. ovalis* were collected after heavy rainfall. Their stomachs were flushed as described by Patto (1998) and prey items identified under a stereomicroscope to genus level. In a feeding experiment, ten frogs were kept for 48 hrs in a terrarium at the field station. All specimens were placed in separate plastic boxes measuring 10 x 10 x 8 cm, containing earth and small stones as hiding places. After a period of two hours, all frogs had burrowed into the earth with only their snouts visible. Prey tests were conducted with ants of the nine most abundant species at Pró-Mata (four Myrmicinae, two Formicinae, one Ectoninae, one Ponerinae and one Dolichoderinae) and termites of two species. Single prey items were offered with forceps to the frogs at 5 mm distance from the head and left in this position for ten seconds. If the prey was not taken during this time, it was removed and the next item was presented. The tests were run at intervals of one minute. If a frog attempted to feed upon the item, its reaction time was recorded.

RESULTS

In most of the frogs (15 out of 16), the flushed stomachs contained food. On average about 10 prey items were found per stomach. The maximum

Prey taxa	n	%
Insecta		
Hymenoptera		
Dolichoderina		
<i>Linepithema</i>	12	8
Ectoninae		
<i>Neivamyrmex</i>	14	9
Formicinae		
<i>Paratrechina</i>	4	3
Myrmicinae		
<i>Cyphomyrmex</i>	25	16
<i>Pheidole</i>	22	15
<i>Solenopsis</i>	20	13
<i>Wasmannia</i>	1	1
Ponerinae		
<i>Gnamptogenys</i>	1	1
<i>Hypoconera</i>	2	1
Isoptera	50	33
Total	151	100

Table 1. Stomach prey content of 16 adult *Elachistocleis ovalis*. The four most frequent (>10%) items are given in bold italics.

content comprised remnants of 34 insects. One stomach contained only one prey item. Based on the identification of 151 items, 10 prey categories could be distinguished (Table 1). Ants

Feeding tests with individual frogs	Prey items presented to the frogs, adult <i>Elachistocleis ovalis</i> , and the lag time in seconds until the insect was captured										
	<i>Solenopsis saevissima</i>	<i>Pheidole</i> sp.	<i>Acromyrmex crassispinus</i>	<i>Cyphomyrmex</i> sp.	<i>Cyphomyrmex</i> sp.	<i>Brachymyrmex</i> sp.	<i>Neivamyrmex</i> sp.	<i>Hypoconera</i> sp.	<i>Linepithema humile</i>	Termite sp.1	Termite sp.2
1	6	7	-	-	dr	dr	-	6	-	-	-
2	7	8	-	-	dr	dr	3	5	-	-	3
3	5	6	-	-	dr	dr	-	6	-	-	3
4	5	9	-	-	dr	-	-	-	-	-	6
5	10	-	-	-	dr	dr	10	10	-	-	8
6	3	5	-	-	dr	dr	4	4	-	-	7
7	6	6	-	-	dr	dr	-	8	-	-	8
8	-	5	-	-	dr	dr	-	10	-	-	6
9	5	6	-	-	dr	dr	-	8	-	-	6
10	-	3	-	-	dr	dr	9	-	-	-	3

Table 2. Reactions of 10 laboratory-maintained adult *Elachistocleis ovalis* to live ants and termites. The test items were offered in sequence to the same frog, and thereafter the next frog was tested. For those items not accepted by the frogs, their alternative reaction, as dr = defensive reaction or - = no feeding attempt, was recorded.

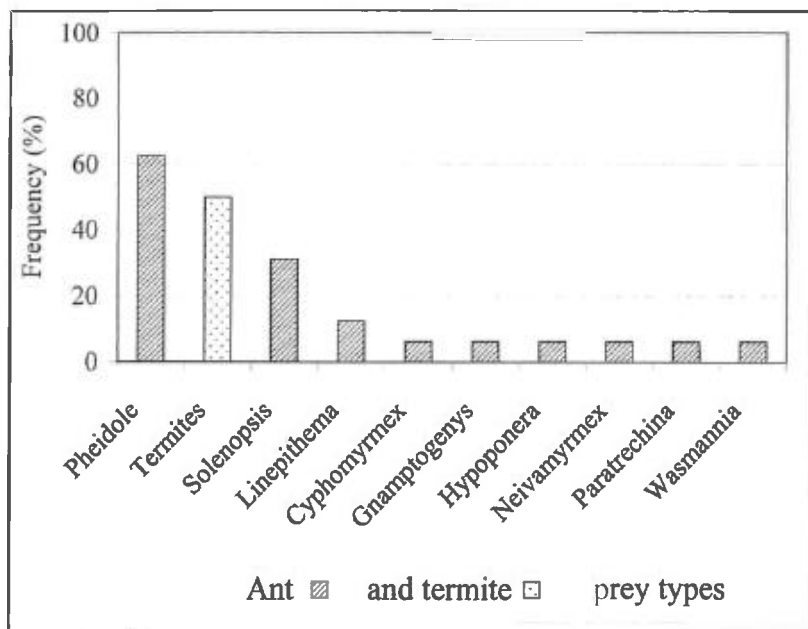


Figure 1. Diet composition in *Elachistocleis ovalis*.

predominated in the diet, representing (2/3) of all items. All the rest were termites. The latter were found in half of the stomachs. Of the ants, workers of two taxa were frequently found: about (2/3) of the stomachs contained *Pheidole* and about (1/3) *Solenopsis* ants (Figure 1).

In our feeding experiments, most of the ten adult *E. ovalis* accepted ants of the subfamilies Myrmicinae, Ponerinae and Ecitoninae. In contrast, when ants of the subfamily Formicinae were presented, they showed defensive behaviour, which consisted of crouching and attempting to burrow their head into the earth. Of the two undetermined species of termite, the workers of one were accepted whereas the others were ignored. The minimum time from presenting the prey until the frog made a feeding attempt was three seconds. During the first three seconds fast movement of the nostrils were observed in all frogs, suggesting that prey selection in *E. ovalis* is in part olfactory.

DISCUSSION

At our study site, the south Brazilian *Araucaria* forest reserve Pró-Mata, the diet of adult

Elachistocleis ovalis was found to consist of ants and termites only. Ants of the genera *Pheidole* and *Solenopsis* were the most frequent prey. Only two stomachs contained ants of the genus *Cyphomyrmex*; one individual contained 23 *Cyphomyrmex*. Two species of this genus, *minutis* and *olitor*, are common in Pró-Mata and occur syntopically. In one stomach, remnants of 14 individuals of the ant genus *Neivamyrmex* were found, a group of relatively rare taxa due to their nomadic life (Gotwald, 1995).

According to our data based on stomach contents, the microhylid *Elachistocleis ovalis* should be regarded an ant and termite specialist, as indicated by Simon & Toft (1991). Specialisation on ant prey is documented for various species of the subfamily Microhylinae, e.g., *Chiasmocleis ventrimaculata*, *Hamptophryne boliviana* (Schlüter & Salas, 1991) and *Microhyla ornata* (Hirai & Matsui, 2000), and may be a common pattern of nutrition in adults of this group.

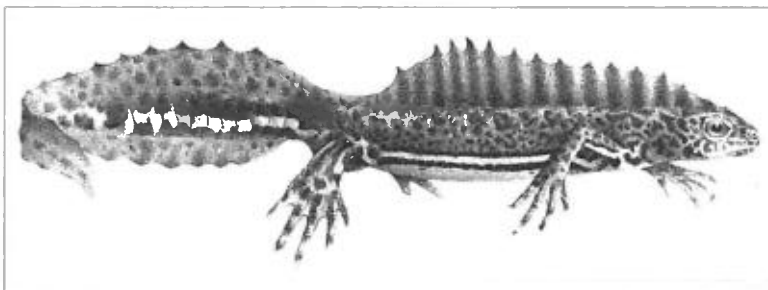
In our feeding experiments, *Elachistocleis ovalis* accepted ants of the subfamilies Myrmicinae, Ponerinae and Ecitoninae. However, they showed defensive reactions towards Formicinae which may be due to the strong formic acid secretion in ants of this subfamily. Similar defensive behaviour when handled has been observed in *E. erythrogaster* (Kwet & Solé, in press). Defensive behaviour against ants has been also recorded for the African microhylid *Phrynomantis microps* (Rödel & Braun 1999) when placed in containers with the ant species *Paltothyreus tarsatus*; the frogs immediately crouched and, after some seconds, elevated the posterior part of the body and laid their heads between their forelegs.

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Molga vittata (= *Triturus vittatus*). From *Proceedings of the Zoological Society of London*, 1896. Reproduction courtesy of the Zoological Society of London