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SHORT COMMUNICATION

Indirect evidence of predation and intraspecific agression in three sympatric lizard species from a semi-arid area in northeastern Brazil

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ABSTRACT. We analyzed the frequency of tail autotomy, toe amputation and integument scars in three sympatric lizard species, *Ameivula ocellifera*, *Tropidurus hispidus* and *T. semitaeniatus*, from a Neotropical area of semi-arid Caatinga, in northeastern Brazil. We evaluated intraspecific differences in the frequency of injuries between the sexes within each species. Only in *A. ocellifera* there were differences in frequency of toe amputation and integument scars between males and females, with more injured females than males. This highest frequency of body injuries in females of *A. ocellifera* might be attributed to the mating behavior of the species, in which males bite and scratch the females. None of the species analyzed presented intersexual differences in frequency of tail autotomy. These findings might be due to similar predation pressure upon males and females as suggested for other lizards species.

KEY WORDS. Amputation; autotomy; caatinga, integument scars; non-lethal injuries.

In lizards, toe and tail loss can frequently result from agonistic encounters among conspecifics (Vitt *et al*. 1974, Gvozdik 2000), such as intraspecific competition (Zweifel & Lowe 1966, Brown & Ruby 1977, Langkilde *et al*. 2005). Concurrently, unsuccessful predatory attempts can result in lizards escaping alive with minor or non-lethal injuries on their bodies (Schoener & Schoener 1980, Bateman & Fleming 2009). Nonetheless, intraespecific aggressive encounters and predation events are not easily observed in natural conditions. Therefore, accessing non-lethal body injuries can be useful to ascertain the frequency of these interactions in lizard populations (Vervust *et al*. 2009).

Behavioral and morphological traits may affect predation and intraspecific aggression rates directly (Schoener & Schoener 1980, Whiting 2002). In this sense, it is thought that male and female lizards have distinct social roles, thus intersexual differences in the chance of being attacked by a predator and/or by conspecifics might be expected. Herein we present data on the frequency of tail autotomy, toe amputation and integument scars in three sympatric lizard species: the teiid *Ameivula ocellifera* (Spix, 1825) (formerly *Cnemidophorus ocellifera*), and two tropidurids, *Tropidurus hispidus* (Spix, 1825) and *T. semitaeniatus* (Spix, 1825), from a semi-arid area of the Caatinga Brazilian biome. Our specific goals were to evaluate whether the rates of tail autotomy and other injuries differ between the sexes within each species.

The study was carried out from February to March 2010 at the Fazenda Experimental do Vale do Curu of Universidade Federal do Ceará (FEVC), Pentecoste municipality, state of Ceará, northeastern Brazil (03.42°S, 39.33°W). The FEVC has an area of 142 ha of typical Caatinga vegetation, where the annual average temperature is 26.8°C and the mean annual rainfall is 723.3 mm, with most rainfall occurring from February to June (Leão *et al*. 2004).

We searched for lizards by walking through the habitat from *ca*. 0700 h to *ca*. 1600 h. Individuals were collected by hand, air rifles or rubber bands. Collected animals were deposited in Coleção Herpetológica da Universidade Federal do Ceará (voucher specimens: CHUFC L5055 to L5063). In the lab, we inspected lizards under a stereoscopic microscope searching for injuries over the body and also to record evidence of tail autotomy. For the analysis, toe amputations and integument scars throughout the lizards' body were regarded as 'body injuries'. Superficial scratches were not considered as injuries because they might be the result of natural friction with hard substrates. Thus, only deep-healed skin injuries were considered. Individuals were measured with a digital caliper (nearest 0.01 mm) in their snout-vent length. Differences in the frequencies of body injuries and evidence of tail regeneration between the sexes were evaluated by the G-test (Sokal & Rohlf 1995).

The body injuries of 424 lizards were analyzed : 150 in *A. ocellifera* (63 females and 87 males), 144 in *T. hispidus* (87 females and 57 males) and 130 in *T. semitaeniatus* (77 females and 53 males). The frequency of body injuries was highest for *T. semitaeniatus* (82%) when compared with *A. ocellifera* (57%) and *T. hispidus* (21%) ($G = 110.40$, $p < 0.01$). In all species, injuries were more frequent in females than in males (*A. ocellifera*: female = 68%, male = 49%; *T. hispidus*: female = 23%, male = 18%; *T. semitaeniatus*: female = 59%, male = 41%). However, only for *A. ocellifera* the difference was statistically significant ($G = 5.37$, $p < 0.05$).

Some lizards lost their tails during capture, thus we were able to analyze tail autotomy data only for 390 lizards, 135 *A. ocellifera* (57 females and 78 males), 127 *T. hispidus* (73 females and 54 males) and 128 *T. semitaeniatus* (76 females and 52 males). The frequency of tail autotomy was highest for *T. semitaeniatus* (49%), followed by *T. hispidus* (24%), whereas the values for *A. ocellifera* were smaller (10%) ($G = 52.07$, $p < 0.01$). In *A. ocellifera*, tail loss was more frequent in females (14%) than in males (8%). Otherwise, females (16%) of *T. hispidus* presented a low frequency of tail loss when compared with males (28%). Regarding *T. semitaeniatus*, the frequency of tail autotomy was similar for both males (50%) and females (49%). However, for none of the species studied the difference in the frequency of autotomy between the sexes was statistically significant (respectively: $G = 1.41$, $p = 0.24$; $G = 1.86$, $p = 0.17$; $G = 0.02$, $p = 0.88$).

Females of *A. ocellifera* had more body injuries than males. Scars and toe amputations might result from aggressive intraspecific interactions among lizards (e.g., Zweifel & Lowe 1966, Gvozdik 2000). Nevertheless, aggression in teiids might occur during infrequent encounters, as these lizards did not form contestant neighborhoods and did not defend any geographic area (see Martins 1994). On the other hand, male teiids bite and scratch females during mating (e.g., Anderson & Vitt 1990, Ribeiro *et al.* 2011), thereby, we suggest that the high frequency of body injuries found for females of *A. ocellifera* might be attributed to the courtship behavior of the species.

Intersexual differences in the frequency of tail breakage could be expected due to different social roles of males and females (Schoener & Schoener 1980), which might result in individuals of each sex having different levels of susceptibility to predators and/or propensity for intraspecific aggressive interactions. Similarly to findings for other species of *Tropidurus* and *Ameivula* (= *Cnemidophorus*) (Vitt 1983, Van Sluys *et al.* 2002), there were no intersexual differences in frequency of tail autotomy for the studied species. It is possible that, in this case, males and females of the *Tropidurus* species studied are exposed to similar predation pressures, in a similar way as suggested for *Platysaurus broadleyi* Branch & Whiting, 1997 (Cordylidae) from South of Africa (Whiting 2002). Additionally, aggression might occur with low frequency in the social environment of the studied *Tropidurus* species, thus accounting for the evenness in the frequency of tail autotomy.

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