ISSN 1517-6770

Revista Brasileira de
ZOOCIÊNCIAS
8(2): 193-197 , dezembro 2006

Scientific Note

Court and copulation behaviors of *Enyalius perditus* Jackson, 1978 (Squamata, Leiosauridae) in captivity conditions[1]

André Felipe Barreto Lima[2] & Bernadete Maria de Sousa[2]

[1] CAPES
[2] Programa de Pós-Graduação em Ciências Biológicas, Comportamento e Biologia Animal, Universidade Federal de Juiz de Fora. Campus Universitário, Bairro Martelos, Juiz de Fora, Minas Gerais, Brazil, CEP. 36036-900. afblima@hotmail.com; bernadete.sousa@ufjf.edu.br

Abstract. There are few studies on the genus of lizards *Enyalius*, endemic in forests of Brazil. Then, it is limited the understanding of the biology of these species. *Enyalius perditus* is a species with a status of few known because basic notions on biology and behaviour of this species are not abundant or inexistent in the literature. This note aims to describing the court and copulation behaviour of *E. perditus* noted experimentally in captivity conditions. The results indicated there is a behavioural pattern for court and copulation of this species which maybe is shared with other species of the genus *Enyalius*.

Key words: lizards, reproductive behavior, court, copulation, *Enyalius*.

Resumo. Comportamento de corte e cópula de *Enyalius perditus* Jackson, 1978 (Squamata, Leiosauridae) em condições de cativeiro. Estudos sobre o gênero de lagartos *Enyalius*, endêmico de florestas do Brasil, são escasssos. Assim, o conhecimento sobre a biologia dessas espécies é bastante limitado. *Enyalius perditus* é uma espécie cujo status é pouco conhecido, porque estudos básicos sobre a biologia e comportamento dessa espécie são poucos ou inexistentes na literatura. Esta nota teve como objetivo descrever os comportamentos de corte e cópula de *E. perditus* observados experimentalmente em condições de cativeiro. Os resultados indicaram a ocorrência de um padrão comportamental para corte e cópula dessa espécie de lagarto, o qual pode ser compartilhado por outras espécies do gênero *Enyalius*.

Palavras-chave: lagartos, comportamento reprodutivo, corte, cópula, *Enyalius*.

Enyalius Wied, 1821 is an arboreal lizard genus, diurnal, and insectivorous, which lives in old forests in the East Side of South America, Regions of Atlantic Forest, South of Amazon Forest, and Brazilian Central Region (Etheridge 1969; Vanzolini 1972; Jackson 1978; Ávila-Pires 1995; Vitt *et al*. 1996). Almost nothing is known about the ecology of the lizards, the main information available for *Enyalius* species is restricted to account of feeding habits and microhabitat use (Vanzolini 1972; Jackson 1978; Sazima & Haddad 1992; Vitt *et al.* 1996; Sousa 2000; Zamprogno *et al.* 2001; Van Sluys *et al.* 2004). *Enyalius perditus* Jackson, 1978 is a small arboreal tropical lizard restricted to the forest areas, its history is unfamiliar (Jackson 1978; Sousa 2000). This lizard species, which is scarce and endemic in Brazilian East Coast, may be found in forests pertaining to the Atlantic Forest biome, in limited areas of Southeast (predominantly) and South regions of Brazil. This leiosaurid lizard occurs in the states of Rio de Janeiro, São Paulo, Minas Gerais, and Paraná (Jackson 1978; Sousa 2000). However, little information is known and/or published on biological, ecological, and, mainly, behavioral aspects of this species, that can be considered insufficiently studied. Therefore this study aimed to elucidate the court and copulation

behaviors of *E. perditus,* by describing the main behavioral actions performed during captivity observations.

From October to December 2003, 14 mature specimens of *E. perditus* were collected in order to perform ecological and parasitological studies. They were caught using pitfall traps in a forest section of secondary regeneration, in the Atlantic Forest's territory, at biological Reserve of Santa Cândida (21°45'35" S, 43°20'50" W) in Juiz de Fora (470-1100 m elevation), Minas Gerais state. The reserve has 113 ha of area, the climate is classified as Cwb of Köeppen, with hot and rainy summers, the annual average of precipitation is higher 1500 mm, the annual average of temperature is 18.9 °C, and the altitude ranges between 760 to 960m (LAFETÁ 1998). Some lizards, which were kept in terrarium (50 x 30 cm) at Laboratório Biotério-II (Mestrado em Comportamento e Biologia Animal/UFJF), were caught in copulation and posteriorly used in this study. Information about the snout-vent length (SVL, to the nearest 0.1 mm) and weighed (to the nearest 0.1 g) of each lizard (Tab. 1), was measured using a vernier calipter and Pesola® balances, respectively.

Table 1. Relation of SVL (mm) and mass (g) of each adult *E. perditus* used in the experiment

Lizard (♂)	SVL (mm)	Mass (g)	Lizard (♀)	SVL (mm)	Mass (g)
A	72,0	6,0	A	80,0	15,3
B	72,0	6,4	B	80,0	12,9
C	69,0	7,0	C	80,0	10,5
D	68,0	6,0			
E	70,0	6,5			

In November and December 2003, 5 males and 3 females of *E. perditus* were put as rotary couples in the terrarium for the reproductive behavior observations (n = 170 h), which were recorded (Tab.2) according to the focal animal method (ALTMANN, 1974). When copulation did not happen in a period of 15 minutes, the animals were taken from the captivity places and new couples were formed. Behavioral acts were described and photographed, considering court, failure, success and duration of the number of copulations.

Averages of temperature and relative humidity were 24.4 °C ± 0.7 and 86% ± 10.1, respectively. The average of duration of copulation was about 24 min ± 14.4 (amplitude 15-45, n = 4). It always occurred during the vespertine period, between 02:00 to 05:00 PM. Among the lizards used in the experiment (n = 8), 6 lizards copulated in all 5 copulation attempts observed, 4 of them were well succeeded, while in one of them a female rejected a male few minutes after copulating with a first male (Tab. 2). It aggressively avoided the three persistent assaults of the second male, running from it and biting it on its mouth. Just one copulation, which naturally occurred between 02:35 and 02:53 PM, was photographed (Fig. 1A, B, C, D) and followed without manipulation of the choice of the couples and the determination of its schedule.

During court and copulation processes we recorded behavioral acts in common in the following sequence of events: 1) male courts female by following it and rapidly biting it on the neck in order to immobilize it (Fig.1A); 2) male inserts its hemipenis in female's cloaca, laterally in its inferior part (Fig.1B); 3) male changes its natural color from light green to olive green (Fig.1A), going through an intermediate tonality of moss green until it gets close to a tonality similar to dark brown (Fig.1D), in around five minutes of copulation (it characterizes, for the first time in this process, the recording of nuptial coloration in *E. perditus* males); 4) couple remains motionless in most of the time; 5) female slowly shakes its tail in lateral moviments after about 10 minutes of copulation; 6) couple presents expanded pupil, specially the female (Fig. 1C); 7) male gets out from female quickly (Fig. 1D); 8) male recovers its natural color from 10 to 20 min after copulation.

There were copulations or attempts of copulation (in the case of the rejected male) with more than one partner, with two males and one female, which *a priori* supports the idea of polygamy for *E. perditus*. The most amphibians and reptiles have polygamous mating systems, but the precise form of these mating systems varies (POUGH *et al*., 2001). However, since one of the females did not want to copulate with the second male just after has copulated with the

Table 2. Relation of *Enyalius perditus* couples, presenting the observed behavior answers, beyond hour interval and duration of each successfull copula.

Formation of couples	Behavior answers observed in relation to copula	Hour interval of copulation (PM)	Duration of copula (min)
male A X female A	Success	02:25 - 03:10	45
male B X female B	Success	02:35 – 02:53	18*
male B X female C	Success	03:44 – 04:00	16
male C X female A	Success	04:52 – 05:07	15
male C X female C	Failure (3x)**	-	-
male D X female B	Indifferent	-	-
male D X female C	Indifferent	-	-
male E X female B	Indifferent	-	-
male C X female B	Indifferent	-	-

* Observed copula naturally occurring in the period.
** Female C rejects male C soon after have copulated with male B.

first one, showing an antagonical response concerning the other female (which copulated with more than one partner). *A priori*, it is probable that the males adopt the tactics of forced copulation, biting on the neck to immobilize the females. Although the males are a little smaller and less heavier than the females, so it is difficult to know until that point "forced copulation" occurs or if the female also chooses the male, allowing copulation. Nevertheless, the more problematic is the female choice of mates based on morphological or behavioral traits of males, and it is difficult for investigators to detect because the traits are hard to manipulate experimentally (Pough *et al*., 2001).

Thus, due to the small number of animals observed during this study, it is not prudent to suggest the general tendency of reproductive strategy used by this lizard species. Since this study approaches for the first time to court and copulation behaviors in *E. perditus*, there is no more information on this species "nuptial" coloration. The darkening of the color of the male may be a defensive adaptation against predators, because the couple always is vulnerable during the copulation, with no movements for some minutes. If the copulating occurs on the foliage and the male on the female with a darker coloration, they would be hidden and more criptic in relation to the environment. Clearly more investigations are necessaries to a conclusive explanation of these questions. In literature, there are rare studies on copulation behavior for the genus *Enyalius*. Only Grantsau (1966) reported in a short communication a fast copulation that occurred in captivity conditions with a couple of *E. catenatus*, which male also bites female on the back. And Vitt *et al*. (1996) observed something akin to an ending of a copulating of *E. leechii*, because they were sleeping together (both with closed eyes), in lowland tropical rain forest of Amazonia, and the male still was on the back of the female biting her neck (Ávila-Pires, personal communication). There is the chance of the animals are trying to hide themselves of the researchers, because in captivity conditions, was possible to observe sometimes the *E. perditus* without moving and closing its eyes when people came near to the terrarium. In other genus, the similar posture of biting the neck during the copulation was observed in the polychrotid lizard *Polychrus acutirostris* (Vitt & Lacher, 1981).

The results in this study mark the existence of a "nuptial" coloration for males, and a behavioral pattern for court and copulation in *E. perditus,* that may be apparently similar to the others species of this genus.

Aknowledgements

The present study was done concomitantly with the master science research of the first author: "Diet, foraging, morphology and microhabitat use of *Enyalius perditus* Jackson, 1978 (Squamata,

Figure 1. Court and copulation behaviors of *Enyalius perditus* in captivity. In the sequence of events: A) male, still in its natural color (light green to olive green) rapidly follows and bites female on the neck (court); B) male inserts its hemipenis in female and starts its natural color tonality's darkening; C) couple remains motionless for a few minutes (hemipenis in detail), female laterally and slowly shakes its tail, couple's pupil is expanded; D) male, still in dark tonality, rapidly detaches from female, and then recovers its natural color tonality (Photos: André F. B. Lima).

Leiosauridae) in the Reserva Biológica Municipal Santa Cândida, Juiz de Fora, Minas Gerais", under orientation of the second author. Thanks to CAPES and to the Coordenação de Pós-Graduação do Mestrado em Comportamento e Biologia Animal – Universidade Federal de Juiz de Fora, for the financial support, the physical structure, and for the support on the equipment involved in the different stages of this study, and the license IBAMA 227/ 2003 - Fauna/MG. We thank to Dr. Juliane Floriano Santos Lopes (UFJF), Dr. Fábio Prezoto (UFJF), and Dr. Márcio Martins (FZB/RS) for reading the manuscript.

REFERENCES

ALTMANN, J. 1974. Observational study of behaviour: sampling methods. **Behaviour 49**:227-267.

ÁVILA-PIRES, T.C.S. 1995. Lizards of Brazilian Amazonia (Reptilia: Squamata). **Zoologische Verhandelingen 299**: 1-706.

ETHERIDGE, R. 1969. A review of the iguanid lizard genus *Enyalius*. **Bulletin of the British Museum (Natural History) Zoology 18**: 231-260.

GRANTSAU, R. 1966. *Enyalius catenatus,* das brasilianisches "Chamaleon". **Aquarium Terriarium Zeitschrift 19**: 217-219.

JACKSON, J. F. 1978. Differentiation in the genera *Enyalius* and *Strobilurus* (Iguanidae): implications for pleistocene climatic changes in eastern Brazil. **Arquivos de Zoologia 30**: 1-40.

LAFETÁ, R. C. A. 1998. **Espécies lenhosas de *Solanum* (Solanaceae) da Reserva Biológica Santa Cândida**. Dissertação de Mestrado. Universidade Federal do Rio de Janeiro. 82p.

POUGH, F. H.; R. M. ANDREWS; J. E. CADLE; M. L. CRUMP; A. H. SAVITZKY & K. D. WELLS (eds.). 2001. **Herpetology**. New Jersey, Prentice-Hall. 612p.

SAZIMA, I. & C. F. B. HADDAD. 1992. Répteis, pp. 212-236. *In* "L. P. C. MORELLATO (org.), **Historia Natural da Serra do Japi: ecologia e preservação de uma área florestal no sudeste do Brasil**. Campinas, Fapesp, 321p.

SOUSA, B. M. 2000. **Aspectos ecológicos, comportamentais e morfológicos associados à alimentação de *Enyalius perditus* Jackson, 1978 (Sauria; Polychrotidae)**. Tese de Doutorado. Universidade Federal Rural do Rio de Janeiro. 168p.

VAN SLUYS, M.; V. M. FERREIRA & C. F. D. ROCHA. 2004. Natural history of the lizard *Enyalius brasiliensis* (Lesson, 1828) (Leiosauridae) from an Atlantic Forest of southeastern Brazil. **Brazilian Journal of Biology 64**: 353-356.

VANZOLINI, P. E. 1972. Miscellaneous notes on the ecology for some Brazilian lizards (Sauria). **Papéis Avulsos de Zoologia 26**: 83-115.

VITT, L. J. & T. E. LACHER. 1981. Behavior, habitat, diet, and reproduction of the iguanid lizard *Polychrus acutirostris* in the caatinga of northesastern Brazil. **Herpetologica 37**: 53-63.

VITT, L. J.; T. C. S. ÁVILA-PIRES & P. A. ZANI. 1996. Observations on the ecology of the rare amazonian lizard, *Enyalius leechii* (Polychrotidae). **Herpetological Natural History 4**: 77-82.

ZAMPROGNO, C.; M. ZAMPROGNO & R. L. TEIXEIRA. 2001. Evidence of terrestre feeding in the arboreal lizards *Enyalius bilineatus* (Sauria, Polychrotidae) of south-eastern Brazil. **Revista Brasileira de Biologia 61**: 91-94.

Recebido: 25/11/2005
Revisado: 8/5/2006
Aceito: 18/5/2006