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Reproductive behavior in *Liolaemus manueli* (Reptilia, Liolaemidae) and its relevance in an *ex situ* conservation program

Conducta reproductiva en Liolaemus manueli *(Reptilia, Liolaemidae) y su relevancia en un programa de conservación* ex situ

Pablo Valladares Faúndez[1], *Wilfredo Briones Godoy*[2]

ABSTRACT

In this note we report the first case of courtship, mating and birth of *Liolaemus manueli* in captivity. Specimens were captured near their *Terra typica*, as a product of human intervention in the area, and were deposited in a terrarium for later release. However, in the following days we observed courtship behavior and copulation in a pair of individuals of this species. According to these observations we discuss the potential of an *ex situ* conservation program for this species, since their natural habitat is strongly threatened.

Key words: *Liolaemus manueli*, reproduction, conservation, threatened.

RESUMEN

En la presente nota reportamos el primer caso de cortejo, cópula y parto en condiciones de cautividad en Liolaemus manueli*. Los especímenes fueron capturados cerca de su* Terra typica*, producto de la intervención antrópica de la zona, y fueron depositados en un terrario para su posterior liberación. Sin embargo, a los pocos días ocurrió el cortejo y cópula de una pareja de individuos de esta especie. De acuerdo a estas observaciones, discutimos la potencialidad de criar en cautiverio a esta especie con fines conservacionistas, dado que su hábitat natural está fuertemente amenazado.*

Palabras clave: Liolaemus manueli*, reproducción, conservación, amenazada.*

Reproduction in lizards of the genus *Liolaemus* has been widely studied. At least half of the *Liolaemus* species have viviparous reproduction (Schulte *et al*., 2000), which appears to be a characteristic of lizards that inhabit cold and high latitudes (Guillette, 1993). However, this feature can be reversed to oviparity (Crocco *et al*., 2008). In the case of lizards of the genus *Liolaemus* the viviparous condition is not monophyletic, nor is it in the subgenera *Liolaemus* or *Eulameus* (Schulte *et al*., 2000).

Other issues discussed about the reproduction of these lizards include their sexual dimorphism (Valladares *et al*., 2002; Cánovas & Marinero, 2003; Laspiur & Acosta, 2007; Verrastro, 2004; Vega, 1997), birth (Ibargüengoytía *et al*., 2002; Minoli *et al*., 2010), sexual maturity (Valdecanto *et al*., 2007), physiology, gestational chronology and sexual cycle (Lemus, 1966; Lemus, 1967; Leyton *et al*., 1980; Leyton *et al*., 1982; Ramírez-Pinilla, 1994; Rocha, 1992), ethology and parental care (Halloy *et al*., 2007), spatial distribution (Robles & Halloy, 2009), ecology (Belver *et al*., 2010, Aun & Martori, 1998) and reproductive apparatus anatomy (Lobo, 2000). However, there is very little literature about courtship and mating, particularly in lizards of the *montanus* series.

The aim of this study is to describe recent observations about reproductive behavior of *Liolaemus manueli* (Núñez *et al*., 2003), a small and slender lizard which does not exceed 60 mm length, belonging to the *montanus* series, *montanus* section (*sensu* Schulte *et al*., 2000; Lobos *et al*., 2010) and characterized by phrynosaurian forms (*sensu* Valladares, 2004). This small lizard inhabits arid environments in sand and stones of different sizes in which the lizard makes small cavities and hides

[1] Departamento de Biología, Facultad de Ciencias, Universidad de Tarapacá. Velásquez 1775, Arica. Chile.
[2] Unidad de Medio Ambiente, Departamento de Obras, Ilustre Municipalidad de Chañaral, Calle Merino Jarpa Nº 801. Provincia de Chañaral, Región de Atacama.
Autor por Correspondencia: pvalladares@uta.cl

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(Núñez *et al*., 2003). Its distribution is restricted to the surroundings of Diego de Almagro city, Atacama region (26º 22' 34 S, 70º 04' 44 W, 840 masl), and 10 km north and 16 km south of the city. Apparently the population density of this species is very low (Núñez *et al*., 2003), consistent with our field observations.

The reproductive behavior of *L. manueli* was studied from specimens that were deposited in a terrarium under conditions similar to those of their natural environment. On September 24, 2011, an adult female was captured in the field of Sierra Aspera, near Diego de Almagro, at 17:13, which was close to a shrub of the genus *Cinthante* on a sandy substrate. The next day, at 16:28, a young-looking male specimen was captured while sitting on a rock of medium size, in the same geographic area of the previously captured female. Both specimens were placed in a cage of 66 X 40 X 31 cm with substrate of sand, stones and supplied with heat by means of a heating rock (Reptile Heat Rock, Brown, 18 X 12.5 X 3.5 cm). The female was captured in a state of pregnancy; she gave viviparous birth on December 11, 2011 to three offspring (Figure 1). Close to 02:00 the female began the birthing process, beginning with anterior and posterior pelvic and body movements which allowed the expulsion of the offspring. At the time of delivery the female arched her head and opened the hind limbs laterally. The offspring were delivered head first with limbs folded antero-posteriorly against their bodies. The first offspring was born at 02:12, the second at 02:26 and the third at 03:15. Each delivery occupied 3:20- 4:30. Offspring at birth were lethargic for about 10 to 20 seconds, and later moved, made circular movements and then returned to the female.

The female stopped eating five days before the birth. Only a week after giving birth, on December 18, did she ingest food. Postpartum the female and offspring moved away from the male, so they were separated from the male to avoid possible cannibalism or aggressive behavior. Following calving, the female suffered substantial anatomical changes demonstrating a profound weakness, which lasted until 30 days after delivery. The two adults were later maintained in the same cage, and Tuesday April 17, 2012 the male began to court the female, giving gentle bites on the sides of the chest cavity, a behavior which lasted about 20 minutes. Then male proceeded to mount female (Figure 2a, b and c), starting at 15:15 and lasting until 16:30. The male copulate with the female dorsolaterally, holding her with the left hand and biting the neck. This is the first record of courtship and copulation for the *Liolaemus montanus* series from Chile.

Figure 1. Newborn of *L. manueli*.

Figure 2a. Copula of *L. manueli*. Posterior view.

Figure 2b. Copula of *L. manueli.* Dorsal view.

Figure 2c. Copula of *L. manueli*. Frontal view.

The implications of the observed behavior opens new avenues of research, particularly related to the *ex situ* conservation of the species, since this species can be effectively reproduced in captivity and since the young at birth and require no parental care.

It is noteworthy that the Atacama region, and particularly the Chañaral Province, has a high demand for natural resources. This economic activity is very important for the region, therefore it is absolutely necessary to develop conservation programs for different species associated with this province, to protect their populations and prevent local extinction.

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