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NOTA CIENTÍFICA

Notes on the ecology of a relict population of the Lomas´s Lizard *Microlophus tigris* (Tropiduridae: Sauria) in Las Leyendas Zoological Park, (Lima, Peru)

Notas sobre la ecología de una población relicto de la lagartija de las Lomas *Microlophus tigris* (Tropiduridae: Sauria)en el Parque Zoológico Las Leyendas (Lima, Perú)

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Abstract

I studied activity patterns, microhabitat use and thermal ecology of a small-wild population of the Loma's lizard, *Microlophus tigris* in Parque Las Leyendas Zoo, from April to October of 2006. *Microlophus tigris* individuals were active in a variety of microhabitats, from bushes and vegetation debris to prehispanic bricks (adobes) and litter, during the hottest hour of the day. Mean body temperature (29,4 ºC) was similar to body temperature observed in a natural population from Lomas de Lachay, although in Parque de Las Leyendas, substrate temperature was higher than air temperature, probably related to thermal properties of materials used as microhabitats and to seasonal differences. We encouraged the Zoo to takes conservation measures to protect this endangered wild population of lizard in Lima city.

Keywords: Loma's lizard, *Microlophus tigris*, Parque de Las Leyendas, ecology, conservation

Resumen

Evalué algunos aspectos de la ecología de una pequeña población silvestre de *Microlophus tigris* en el Zoológico Parque de Las Leyendas, desde abril a octubre del 2006. *Microlophus tigris* fue observado en una variedad de microhábitats, desde arbustos y restos vegetales hasta ladrillos prehispánicos (adobes) y desperdicios, durante las horas más calientes del día. La temperatura corporal promedio (29,4 ºC) fue similar a la reportada para una población natural de esta especie en Lomas de Lachay, aunque en el Parque de Las Leyendas, la temperatura del sustrato fue más alta que la temperatura del aire, probablemente relacionado a las propiedades termales de los materiales usados como microhábitats y diferencias estacionales. Recomendamos al zoológico tomar medidas de conservación para proteger a esta población de lagartijas amenazada dentro de la ciudad de Lima.

Palabras clave: Lagartija de las Lomas, *Microlophus tigris*, Parque de Las Leyendas, ecología, conservación.

Zoological parks have become the last refuge of several wild species that are endangered due to high levels of exploitation (hunting for subsistence or illegal traffic, etc.), fragmentation and destruction of their natural habitats (deforestation for croplands, highways development, urban expansion, among others; Rabb 1994). The Parque de Las Leyendas Zoo, located in the San Miguel district of Lima, is the main zoo in Peru with permanent exhibition of representative species from all over the country (as well as several species from other countries), promoting wildlife conservation and educating people about its importance for the next generations. This area (ca. 64 ha) is occupated by fifty-three archaeological sites belonging to Lima culture (0 – 600 A.C.) and Curacazgo de Maranga (1100 – 1532 A.C.). Since 1964, is devoted to conservation of Peruvian biological heritage (http://www.leyendas.gob.pe/nosotros.html).

A small population of the Peruvian endemic Lomas's Lizard, *Microlophus tigris* Tschudi 1845, lives in the archaeological and abandoned croplands areas located within the zoological park area (Fig. 1). This lizard species occurs from Trujillo to Arequipa, inhabiting the foothills of the Pacific slopes of the Andes and lomas formations (Carrillo & Icochea 1995, Dixon & Wright 1975, Pérez 2005). Dixon and Wright (1975) examined individuals registered in Lima and Callao city so; it is highly probably this population could be a relict one rather than an introduced population. Actually, this species shared its habitat with another endangered local wild lizard, *Phyllodactylus sentosus*, recorded in the zoo area (Pérez 2010).

Microlophus tigris has been categorized as ***Endangered*** by peruvian law (D.S. Nº 034-2004-AG/INRENA). Although this lizard species is abundant in some locations (Jordán pers. obs.), its metapopulation pattern of distribution associated to loss of habitat, particularly in lomas around Lima (due to urban expansion, Mena et al. 2007), place *M. tigris* in serious risks for its conservation in the long term. To date, there is only one study on the ecology of *Microlophus tigris* from Lomas de Lachay National Reserve (Pérez 2005). In this study, I present data for the first time on microhabitat use, activity patterns and thermal ecology from an isolated population of *Microlophus tigris* in an artificial habitat inside Parque de las Leyendas Zoo.

The study site (12º04'04.74, 77º05'14.40", 53 m) encompasses a large archaeological area, abandoned cropland (around 40 years) and open deposits of construction and organic material (vegetation debris from parks and gardens) (Fig. 2). Natural vegetation is scarce, with some bouganvilla (*Bougainvillea* spp.), huarango (*Prosopis* spp.), pines (*Pinus* spp.) disseminated throughout the area. Field work was conducted from April to October of 2006. All data on microhabitat use, activity patterns and thermal ecology was combined regardless of seasonality because of low sample size. Microhabitats were

Figure 1. *Microlophus tigris* (female) basking on a plastic cylinder on Las Leyendas Zoological Park.

classified as follows: 1) bushes/vegetation debris, 2) pre-hispanic ruins (also named "huacas": pre-hispanic constructions made from hand-made mud bricks), 3) construction debris, 4) stones and 5) other (metal material, garbage). Visual encounter surveys (Crump & Scott 1994) with no time limits where employed to collect data on activity time and microhabitat use of individual lizards, from 09:00 to 17:00 during 25 days (200 hours/man). Individuals were captured by hand or with a custom-made noose to record their body temperature with a cloacal thermometer Miller and Weber® within 30 seconds after captured. Individuals were caught by legs to avoid heat transfer from the investigator. Substrate temperature was recorded at the exact place where the lizard had been captured by pressing the bulb against the substrate. Air temperature was recorded one centimeter above the substrate at the same place.

Spatial and temporal niche breadths were calculated from the inverse formula of Simpson (Pianka 1973, Vitt & Zani 1996):

$$B = 1/\Sigma\, \rho i^{2}$$

where ρi is the proportional use of resource i and n is the number of categories (resources) employed by the species.

ANOVA analysis was used to test differences among thermal variables. Data were tested for normality and variances homogeneity with Kolmogorov-Smirnov and Barlet test (Zar 1999), respectively. All statistical analysis was performed with Statistica software with a α-level of 0, 05.

Individuals of *Microlophus tigris* (n=83) was mostly recorded on vegetal debris (39% and 43% respectively), others (metal,

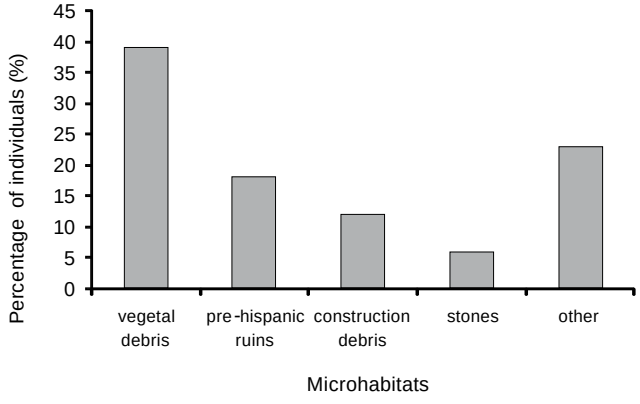

Figure 2. Microhabitat use by *Microlophus tigris* in Parque de Las Leyendas.

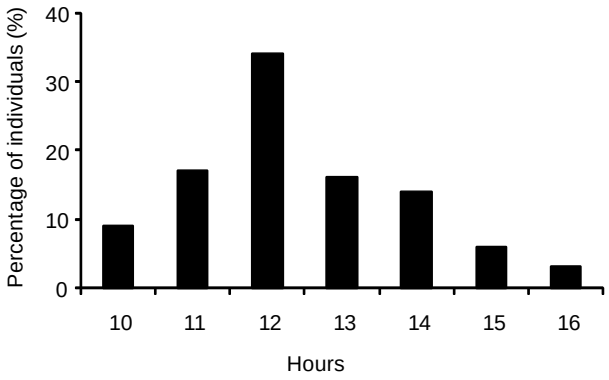

Figure 3. Activity patterns of *Microlophus tigris* in Parque de Las Leyendas.

Table 1. Multiple regression values among temperature variables from Microlophus tigris (n=17).

Variables	*Tb*	*Ta*	*Ts*	*Ta vs. Ts*
X ± SD	29,4 ± 4,6	25,4 ± 3,03	30,6 ± 6,7	-
Range	19,6-36,4	19,6-36,4	18,4-43	-
R^2		0,47	0,30	0, 47
F		13,57	6,61	6,35
P		<0,002	<0,02	<0,01

garbage among others; 23,9%) and in less proportion in other categories (Fig. 2).

Spatial niche breadth was 3,92. Active individuals (n=99) were observed between 10:00 and 16:00 h, with an activity peak around midday (Fig. 3). Activity niche breadth was of 4.94. Mean lizard body temperature (T_b) was 29,4 ± 4,6ºC, mean air temperature (T_a) was 25,4 ± 3,03 ºC and mean substrate temperature (T_s) was 30,6 ± 6,7 ºC. Ranges are presented in Table 1. T_a and T_s were related to T_b and both variables interact to affect lizard body temperature (Table 1, Fig. 2). T_b was not different from T_s and T_a, but T_s was higher than T_a ($F_{1,32}$ = 8,43; p=0,006).

Microlophus tigris used a broad range of substrates in our study site in contrast with findings by Pérez (2005) in the Lomas de Lachay population. In Lomas de Lachay, *M. tigris* uses rocks as perches (73%) even when rocks are sparse (Pérez 2005). Despite such high substrate selectivity in the lomas, individuals of *M. tigris* at our study site seemed to use a wide range of substrates, from prehispanic bricks to plastic and metal materials. These substrates could provide shelter and appropriate thermal microhabitats, although this hypothesis has not been tested directly in this study. Overall, these lizards in Parque de las Leyendas were mostly observed near vegetation debris which act as food sources since vegetation (i.e. primary production) is practically absent in the entire study site.

Similarly to what observed at Lomas de Lachay (Pérez 2005), lizards in the zoo starts their activity late in the morning (~10:00 h.) and stay active throughout the early afternoon (~16:00 h). These two populations exhibit similar activity niche breadths. This could be related to variation in environmental temperatures along the day, with lizards delaying activity to times of the day when temperatures are near their thermal optimum (Huey 1974, Castilla et al. 1999). Body temperatures of *Microlophus tigris* were similar in Lomas de Lachay (natural site) and Parque de Las Leyendas (artificial site). However, there were differences in microhabitat temperature: while in the lomas T_s and T_a were similar, in Parque de Las Leyendas, T_s was higher than T_a. This difference may be related to the thermal properties of materials used as microhabitats by *M. tigris* in the zoo, like metals, clothes, prehispanic bricks (hand-made with mud) and to seasonal differences in data recording: summer (from December 2003 to May 2004) in Pérez (2005) and a whole year (2005) in this study. However, our data support the hypothesis that *M. tigris* its a thermoconformist (Pérez 2005). Additional studies are needed to test this hypothesis.

There are not healthy microhabitats available for lizards as had been observed by the author: plastics, metals and garbage constitute the habitat of these lizards. Also, the presence of rats and feral cats could enhance conservation risks for this lizard (and also for the critical endangered gekkonid *Phyllodactylus sentosus*) inside Parque de Las Leyendas Zoo, acting as potential predators of both lizards species. Additionally, two observations might be examples of the actual state of lizards in the Zoo: a very low weight male *M. tigris* (observed in August, 28th, 2006) and other very low weigth juvenile individual observed in August, 6th, 2010. Low food availability and/or habitat quality related to unhealthy habitat could account for this observation.

Conservation measures are needed to ensure the protection of this endangered and endemic lizard living isolated in an urban environment inside Parque de las Leyendas. A recommended strategy is habitat restoration including construction of healthy artificial microhabitats along with the recovery of archaeological heritage and increasing availability of vegetation patches over the actual distribution range of lizards inside Parque de Las Leyendas Zoo as healthy food sources for them.

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Literature cited

Bergallo H.G. y C.F.D. Rocha. 1994. Spatial and trophic niche differentiation in two sympatric lizards (Tropidurus torquatus and Cnemidophorus ocellifer) with different foraging tactics. Australian Journal of Ecology. 19: 72–75.

Carrillo N. & J. Icochea. 1995. Lista taxonómica preliminar de los reptiles vivientes del Perú. Publicaciones del Museo de Historia Natural, UNMSM (A). 49: 1-27

Castilla A., R. Van Damme & D. Bauwens. 1999. Field body temperatures, mechanisms of thermoregulation and evolution of thermal characteristics in lacertid lizards. Nat. Croa 8(3):253-274

Dixon J & J. Wright. 1975. A review of the lizards of the iguanid genus Tropidurus in Peru. Contribution in Science, The Natural History Museum of Los Angeles. 1-40

Huey R. 1974. Winter thermal ecology of the iguanid lizard Tropidurus peruvianus. Copeia (1):149-155.

Huey R. & E.R. Pianka. 1981. Ecological consequences of foraging mode. Ecology 62 (4): 991-999

Mena J., M. Williams, C. Gazzolo & F. Montero. 2007. Estado de conservación de Melanomys zunigae (Sanborn 1949) y de los mamíferos pequeños en las Lomas de Lima. Rev.peru. biol. 14(2): 201-207

Parque de Las Leyendas.2011. http://www.leyendas.gob.pe/nosotros.html

Pérez Z.J. 2005. Ecologia de Duas Espécies de Lagartos Simpatricos em uma Formação Vegetal de Lomas no Deserto Costeiro Peruano Central. Dissertação de Mestrado. Universidade do Estado do Rio de Janeiro (UERJ). Rio de Janeiro. Brasil.

Pianka E. 1973. The structure of lizard communities. Annual Review of Ecology and Systematics 4: 53-74

Rabb G. 1994. The changing roles of zoological parks in conserving biological diversity. Integrative and Compative Biology 34: 159-164.

Vitt, L.J. and C.M. de Carvalho. 1995. Niche partitioning in a Tropical Wet Season: Lizards in the Lavrado Area of Northern Brazil. Copeia 2: 305-329

Vitt & Zani. 1996. Organization of a taxonomically diverse lizard assemblage in Amazonian Ecuador. Canadian Journal of Zoology 74: 1313-1335