

# MICROHABITAT USE OF *RHEOBATES PALMATUS* (WERNER 1899) (ANURA: AROMOBATIDAE) IN A RIVERSIDE ECOSYSTEM OF VILLA DE LEYVA, COLOMBIA.

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**Abstract:** Microhabitat use in *Rheobates palmatus* Werner, 1899 is described based upon six individuals living in a sector of a stream called El Guamo in the Vereda Sabana, Villa de Leyva municipality, Boyacá department, Colombia. In order to describe the individual's microhabitat, environmental temperature, relative humidity, substrate and horizontal position (proximity to water bodies) were measured. The range of environmental temperature (14.6-18.4 °C) and relative humidity (80-93%) where the individuals were recorded was characteristic of a cold and wet zone, as well as the types of substrates associated with the stream. Similarly, the species individuals were recorded nearby the stream and in remote areas near pastures. This work is the first basic record on microhabitat characteristics used by *R. palmatus* for the municipality of Villa de Leyva.

**Keywords:** Ecology, Visual Encounter Survey, environmental parameters, Andes.

**Resumen:** J. E. Cortés-Suárez. "Uso del microhábitat en *Rheobates palmatus* (Werner 1899) (Anura: Aromobatidae), en un ecosistema ribereño de Villa de Leyva, Colombia". Se describe el microhábitat de *Rheobates palmatus* Werner, 1899 con base en seis individuos encontrados en un sector de una quebrada llamada El Guamo en el municipio de Villa de Leyva, vereda Sabana, departamento de Boyacá, Colombia. Para describir el microhábitat de los individuos reportados se registró la temperatura ambiente, humedad relativa, sustrato y posición horizontal (cercanía a cuerpos acuáticos). El rango de temperatura ambiente (14.6-18.4 °C) y humedad relativa (80-93%) en donde se registraron los individuos es característico de una zona fría y húmeda, así como también los tipos de sustratos asociados a la quebrada. Del mismo modo, los individuos de la especie fueron registrados tanto en zonas cercanas como en zonas alejadas de la quebrada aledañas a pastizales. Este trabajo es el primer registro base que se realiza sobre las características del microhábitat usado por *R. palmatus* para el municipio de Villa de Leyva.

**Palabras clave:** Ecología, Muestreo por Encuentro Visual, parámetros ambientales, Andes.

## INTRODUCTION

The concept of microhabitat refers to the characteristics of the habitat at a finer scale related to physicoquimic variables of a specific place (Krausman 1999). According to this, the microhabitat can be defined by its level at which a research can be done for a species or biological group (Johnson 1980, Hall *et al.* 1997), considering the activities of the individuals in particular places of the habitat (Ricklefs and Miller 1999).

*Rheobates palmatus* Werner 1899, is an endemic frog of the Colombian Andes which has been reported in elevations from 300 to 2400 meters in different types of habitats such as cloud forests and rain forests, and also in habitats with certain level of disturbance like pastures and crops (Lüddecke 2003, Ramírez *et al.* 2010). According to Lüddecke (1976, 2003), *R. palmatus* is a cryptic species that occurs in wet habitats with small cave-like structures used as refuge or ovoposition zones, although it can be also found in areas with low hills and rocky streams with low course, and puddles surrounded by protective river bed dry forest (Gallego *et al.* 2008, Acosta-Galvis 2012). Likewise, due to its great tolerance to disturbed habitats and ex-situ conditions, the species

can be found in artificial lakes and caves accomplishing different types of activities (Lüddecke 1993, 2003).

Knowledge about microhabitat characteristics of *R. palmatus* that can define its differential use at a finer scale its unknown, for example, considering microhabitat variables such as environmental temperature and relative humidity. According to this, it is important to consider the information about microhabitat requirements of certain amphibian species, particularly the ones restricted to specific microhabitats, since this could have profound implications in their conservation (Zimmerman and Bierregaard 1986, Seebacher and Alford 2002). Here I provide the first preliminary report of microhabitat requirements in *R. palmatus* based on six individuals living in a riverside ecosystem at the Villa de Leyva municipality, Boyacá department, Colombia.

## MATERIALS AND METHODS

The individuals of *R. palmatus* were recorded from 25 to 28 November in a sector of a stream called El Guamo (05° 40'59.6" N y 073° 31'12." W at 2241 m elevation) located at the Vereda Sabana

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in the Villa de Leyva municipality, Boyacá department, Colombia. The stream characterizes for having a slow current water course, and shrub vegetation and canopy trees near the stream.

The sampling was conducted along the stream during the day (08:00–12:00 hours) and the night (20:00–00:00 hours) using VES (Visual Encounter Survey) technique (Rueda *et al.* 2006). Each individual found was photo-identified and the following microhabitat variables registered: environmental temperature, relative humidity, substrate type and horizontal position related to the stream (distance of individuals to the stream). Environmental temperature and relative humidity were measured using an electronic termohigrometer EXTECH™.

Substrate type was measured considering the following categories: leaf litter, steam, rocks (Cadavid *et al.* 2005, Heyer *et al.* 1994), and bryophytes; which were defined after the sampling. Horizontal position (distance of individuals to the stream) was evaluated following the categories proposed by Cadavid *et al.* (2005): I = 0–40 cm, II = 41–80 cm, III = 81–1.20 cm, IV = 1.21–1.60 cm, V = 1.61–2.00 cm, VI = >2.00 cm.

## RESULTS AND DISCUSSION

Six individuals of *R. palmatus* were found in three substrate types of a tropical dry forest: leaf litter, rocks and bryophytes, being found most of the individuals in the later substrate ( $n = 4$ ). The individuals of *R. palmatus* were reported in equal number in zones near the stream (I = 0–40 cm,  $n = 3$ ), and zones far from the stream (VI = > 2.00 cm,  $n = 3$ ) close to pastures (Fig. 1A and B). All frogs were recorded in an environmental temperature range between 14.6–18.4 °C and in a relative humidity range between 80–93%. Environmental temperature and relative humidity values reported

here are characteristic of a humid environmental pocket with a very dry-cold weather proper of high mountain zones (ICN 2004), which can reduce dehydration risk (Lüddecke 2003) of the individuals found. However, low individual sample could have limit the climate interval for the two variables reported in this note, considering that the species can be found abundantly in different types of microhabitats that could eventually have a wider variation on its climatic variables.

The individuals were also registered on different substrate types such as leaf litter, rocks and bryophytes in areas near and far from the stream close to pastures. This could be related to the species reproductive mode and its ecophysiological adaptation capacity to different environments and anthropogenic disturbances. For example, Lüddecke (2003) and Acosta-Galvis (2012) establish that the species reproduces in lotic streams with low water volume, but also occurs in wet habitats with small cave-like structures used for shelter and spawning, formed by plants, soil or rocks, and also by artifacts like water pipes and wall cracks, given that the species is commonly found near human settlements.

Finally, I suggest that increased samplings should be obtained by conducting surveys during a longer time for a better representation of the species microhabitat characteristics. Likewise, further studies should be done to determine the actual microhabitat factors that influence *R. palmatus* occurrence in that area.

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**FIG.1.** Microhabitat and individual of *R. palmatus* in the Villa de Leyva municipality. (A) Microhabitat and substrate types reported for the individuals of the species in the Vereda Sabana, Villa de Leyva; (B) Individual of the species, not collected, reported near El Guamo stream. Photos: Javier Ernesto Cortés Suárez.

*Microhabitat e individuo de R. palmatus en el municipio de Villa de Leyva. (A) Microhabitat y los tipos de sustratos reportados para los individuos de la especie en la Vereda Sabana, Villa de Leyva; (B) Individuo de la especie, no capturado, reportado cerca a la Quebrada El Guamo. Fotos: Javier Ernesto Cortés Suárez.*

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## REFERENCES

- Acosta-Galvis, A.R. 2012.** Anfibios de los enclaves secos en la ecorregión de La Tatacoa, Alto Magdalena, Colombia. *Biota Colombiana* 13(2):182-210.
- Cadavid, J., R. Valencia and A. Gómez. 2005.** Composición y estructura de anfibios anuros en un transecto altitudinal de los Andes Centrales de Colombia. *Revista Museo Argentino de Ciencias Naturales* 7(2):103-118.
- Gallego, O., A. Quevedo, V. Luna and W. Figueroa. 2008.** Falan, Cuna de la Vida. Libro Pedagógico de Educación Ambiental del Municipio de Falan Departamento del Tolima. Guía de Campo. Ibagué. 160 pp.
- Hall, L., P. Krausman and M. Morrison. 1997.** The habitat concept and a plea for standard terminology. *Wildlife Society Bulletin* 25:173-182.
- Heyer, R., M. Donnelly, R. McDiarmid, C. Hayec and M. Foster (Eds.). 1994.** Measuring and Monitoring Biological Diversity. Standard Methods for Amphibians. Smithsonian Institution Press. Washington. United States of America. 364 pp.
- ICN (Instituto de Ciencias Naturales, Facultad de Ciencias, Universidad Nacional de Colombia). 2004.** Colecciones en Línea. Disponible en: <http://www.biovirtual.unal.edu.co>. Consulted on 04-06-2013.
- Johnson, D.H. 1980.** The comparison of usage and availability measurements for evaluating resource preference. *Ecology* 61:65-71.
- Krausman, P. 1999.** Some basic principles of habitat use. *En:* Launchbaugh, K., K. Sanders and J. Mosley (eds.). *Grazing Behavior of Livestock and Wildlife*. Idaho Forest, Wildlife and Range Experimental Station Bulletin # 70. University of Idaho, Moscow, ID. 89 pp.
- Lüddecke, H. 1976.** Einige Ergebnisse aus Feldbeobachtungen an *Phyllobates palmatus* (Amphibia, Ranidae) in Kolumbien. *Mitteilungen des Instituto Colombo-Alemán de Investigación Científica Punta de Betín* 8: 157-163.
- Lüddecke, H. 1993.** Gruppenhaltung des Raketenfrosches *Colostethus palmatus* (Dendrobatidae). *Elaphe* 1:14-16.
- Lüddecke, H. 2003.** Space use, cave choice, and spatial learning in the dendrobatid frog *Colostethus palmatus*. *Amphibia-Reptilia* 24:37-46.
- Ramírez, P.M., M. Osorno-Muñoz, J. Rueda, A. Amézquita, and M. Ardila-Robayo. 2010.** *Rheobates palmatus*. *In:* IUCN 2012. IUCN Red List of Threatened Species. <[www.iucnredlist.org](http://www.iucnredlist.org)>. Consulted on 30 May 2013.
- Ricklefs, R. and Miller, J. 1999.** *Ecology*. Fourth edition. W.H Freeman & Co. 822 pp.
- Rueda, J., F. Castro and C. Cortez. 2006.** Técnicas para el inventario y muestreo de anfibios: una compilación. *In:* A. Angulo, J.V. Rueda, J. Mahecha y E. La Marca (eds.). *Técnicas de Inventario y Monitoreo para los Anfibios de la Región Tropical Andina*. Conservación Internacional. 299 pp.
- Seebacher, F. and R. Alford. 2002.** Shelter microhabitats determine body temperature and dehydration rates of a terrestrial amphibian (*Bufo marinus*). *Journal of Herpetology* 36(1):69-75.
- Zimmerman, B. and R. Bierregaard. 1986.** Relevance of the equilibrium theory of island biogeography and species-area relations to conservation with a case from Amazonia. *Journal of Biogeography* 13:133-143.