

FIRST RECORD OF *LEPTODACTYLUS OCELLATUS* (LINNAEUS, 1758) (AMPHIBIA, ANURA, LEPTODACTYLIDAE) IN BOLIVIA AND COMMENTS ON RELATED SPECIES

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ABSTRACT

The distributions of *Leptodactylus ocellatus*, *L. chaquensis*, and *L. macrosternum* in Bolivia are reviewed and discussed. *Leptodactylus chaquensis* and *L. ocellatus* are easily distinguished morphologically but *L. chaquensis* and *L. macrosternum* are indistinguishable. In Bolivia, *L. ocellatus* is known only from a single locality in the Paraguay River basin, which is reported here for the first time. *Leptodactylus chaquensis* occurs in the Chaco region of southeastern Bolivia, but it is unknown to what extent this species enters the Cerrado. The distribution boundaries and putative overlapping areas of *L. chaquensis* and *L. macrosternum* are unknown.

Key Words: Amphibia, Anura, Leptodactylidae, *Leptodactylus ocellatus*, *L. chaquensis*, *L. macrosternum*, taxonomy, distribution, Bolivia.

RESUMEN

Primera cita de *Leptodactylus ocellatus* (Linnaeus, 1758) (Amphibia, Anura, Leptodactylidae) en Bolivia y comentarios sobre especies próximas

Se revisa y discute la distribución de *Leptodactylus ocellatus*, *L. chaquensis* y *L. macrosternum* en Bolivia. Mientras que, morfológicamente, *L. chaquensis* y *L. ocellatus* se diferencian fácilmente, *L. chaquensis* y *L. macrosternum* son imposibles de distinguir. *Leptodactylus ocellatus* se encuentra en la parte boliviana de la cuenca del río Paraguay, aunque de momento se conoce solamente de una localidad, que se cita aquí por primera vez. *Leptodactylus chaquensis* habita en el Chaco, pero se desconoce hasta dónde penetra en el Cerrado. No se conocen los límites de las áreas de distribución y posibles zonas de solapamiento de *L. chaquensis* y *L. macrosternum*.

Palabras clave: Amphibia, Anura, Leptodactylidae, *Leptodactylus ocellatus*, *L. chaquensis*, *L. macrosternum*, taxonomía, distribución, Bolivia

Introduction

One of the most diverse and abundant frogs in the Neotropics are those of the genus *Leptodactylus* Fitzinger, 1826, which is divided into four species groups. With only six species, the *Leptodactylus ocellatus* group is the least diverse species group in *Leptodactylus*. In spite of this

limited diversity, this group still poses several important taxonomic problems.

Whereas other species groups of *Leptodactylus* have been the subject of comprehensive taxonomic research, the *L. ocellatus* group has not. The only complete review of this group was carried out by Gallardo (1964) and is now out of date. The *L. ocellatus* group currently comprises *L. bolivia* -

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nus Boulenger, 1898 (Amazon basin), *L. chaquensis* Cei, 1950 (Chacoan region), *L. insularum* Barbour, 1906 (Middle America and northern South America; it is often considered a synonym of *L. bolivianus*), *L. macrosternum* Miranda-Ribeiro, 1926 (central, northern and eastern South America), *L. ocellatus* (Linnaeus, 1758) (southern and eastern South America) and the rare *L. viridis* Jim and Spirandelli-Cruz, 1973 (Bahia, Brazil). The ranges of several species overlap in some areas but, in general, their distributions remain poorly known as a consequence of the lack of external distinguishing characters in some of these species. One of these problematic zones is the lowlands of Bolivia, which is the subject of this paper.

The *ocellatus-chaquensis* problem

The recognition of Chacoan populations formerly considered *L. ocellatus* as a different species, *L. chaquensis* (Cei, 1950), restricted the distribution of *L. ocellatus* to Southern Brazil, Uruguay, eastern Paraguay and eastern Argentina (Cei, 1980). Considerable emphasis has been put on the differences between these mostly parapatric, sibling species. Their specific status is currently not questioned, and they are easy to distinguish on the basis of morphology, color pattern, physiology, genetics, bioacoustics, reproduction, behavior, etc. (see, for example, Cei, 1950; 1956; Barrio, 1966; Gallardo, 1964). Furthermore, the two species are sympatric in some areas (Cei, 1980). As a consequence of the splitting of *L. ocellatus* into two species, many previous records of *L. ocellatus* in the literature had to be considered as pertaining to *L. chaquensis* on the basis of their geographic location. In Bolivia, all the records of *L. ocellatus* prior to 1950 were transferred to *L. chaquensis* by De la Riva (1990). However, Cei (1950) considered the occurrence of *L. ocellatus* in this country as plausible. Based on Cei's statements, De la Riva (1990) predicted the occurrence of *L. chaquensis* in the Bolivian area adjacent to the Paraguay river.

The presence of *Leptodactylus ocellatus* in the Bolivian side of the Paraguay basin was confirmed in February and August 1996, when field parties from the Museo de Historia Natural "Noel Kempff Mercado", Santa Cruz de la Sierra, conducted surveys at the Estancia Arco Iris, 4 km W of Puerto Suárez, Province German Busch, Department of

Santa Cruz (18°57'S/57°47'W). A large lake, the Laguna Cáceres, represents the most important physiographic feature of the area. A total of seven specimens of *L. ocellatus* [NKA (Museo Noel Kempff Mercado, Amphibian Collection) 2225, 2651-3, 2659, 2731-2] were collected amidst the aquatic vegetation at the shore of the lake. The species was fairly abundant in the area, and was seen in other parts of the lake. Individuals identified as *L. chaquensis* or *L. macrosternum* were collected as well.

The *chaquensis-macrosternum* problem

In contrast to the *Leptodactylus ocellatus-L. chaquensis* pair, little attention has been given to the much more problematic differences between *L. chaquensis* and *L. macrosternum*. The problem is significant because these frogs are extremely common and abundant both in the field and in scientific collections.

Cei (1962) realized that *Leptodactylus chaquensis*-like frogs occur not only in the Chacoan region, but also across the open formations of central Brazil, reaching the Caatingas in the northeast. He also suggested the existence of a related species in the Amazon basin. Gallardo (1964) elevated *L. ocellatus macrosternum* Miranda-Ribeiro to species level and stated that this taxon (and not *L. ocellatus*) occurs in northern and central South America. Gallardo's concept of *L. macrosternum* also comprises Cei's Amazonian species, as well as northern populations of *L. chaquensis*. Gallardo (1964) commented on some faint differences to distinguish *L. macrosternum* from *L. chaquensis*. Cei (1970) was the first author to acknowledge the striking problem in differentiating these two species; however, by means of biochemical methods, he supported the validity of *L. macrosternum*. Cei (1970) stated that this problem was more complicated than that of the pair *L. ocellatus-L. chaquensis*, especially due to the lack of information on ecology, life history, physiology or vocalizations of *L. macrosternum*. An appropriate diagnosis of the two species is still needed. Upon examination of tens of specimens from areas such as Guyana, Venezuela, Brazil, and Argentina, the senior author experienced the difficulty in finding reliable characters to separate the two putative species. With the information and material at hand, it would be justified to think that *L. chaquensis* might be a junior synonym of *L. macrosternum*.

Distribution of *L. chaquensis*, *L. macrosternum*, and *L. ocellatus* in Bolivia

Leptodactylus ocellatus might occur in the Department of Santa Cruz westwards much further than is currently known, but knowing the actual range of distribution of the species in the country will require additional sampling. The distributions of *L. chaquensis*-*L. macrosternum* are less easy to ascertain, as a consequence of their complicated taxonomic situation. The putative distribution of *L. macrosternum* comprises Amazonian Colombia, Venezuela, the Guianas, Brazil and Paraguay (Frost, 1985). This distribution parallels approximately that of other open-formation anurans, as *Pseudis paradoxa* (Linnaeus), *Phyllomedusa hypochondrialis* (Daudin), *Leptodactylus labyrinthicus* (Spix), etc. These species are common in eastern and central Bolivia. Thus, one would expect that *L. macrosternum* might occur in Bolivia as well. Gallardo (1964) indeed provided some localities for the species in Bolivia [which were overlooked by De la Riva (1990)], namely Buenavista, Pailón, Cabezas, Abapó, and Tarendá (= Tatarendá). Additionally, Gallardo also reported the species at the Brazilian locality of Corumbá, which is almost on the Bolivian border, very close to the locality reported above for *L. ocellatus*. Gallardo (1964) also provided some Bolivian localities for *L. chaquensis*: El Carmen, Roboré, and San José de Chiquitos. Interestingly, the localities for *L. macrosternum* are in some instances "more chacoan" than those of *L. chaquensis*, e. g., Cabezas, Abapó and Tatarendá. For example, Tatarendá is a typical Chacoan locality far south from the other localities given [*L. chaquensis* had been already reported from Tatarendá by Andersson (1906) (as *L. ocellatus*) (De la Riva, 1990)]. This inconsistency suggests that, at the time of reviewing the group, perhaps Gallardo was not able to clearly distinguish the two species involved. Thus, these records must be taken with caution. On the other hand, Heyer & Muñoz (1999) recently reported *L. chaquensis* from Chapada dos Guimarães, Mato Grosso, which is a locality far northwards of Gallardo's southernmost localities for *L. macrosternum*. From all these records, it can be concluded that the three species might be sympatric, at least, in some areas of eastern Santa Cruz. In Fig. 1. are summarized most of the available locality records for these three species in Bolivia [only records for which coordinates were provided in the original citation or could be determined have been included; vague records like "Río Pirai" or "Province Sara" are

excluded; museum acronyms follow Leviton *et al.* (1985); CBF= Colección Boliviana de Fauna, La Paz; MNK= Museo de Historia Natural "Noel Kempff Mercado", Santa Cruz].

Discussion

The absence of records from the area of the Beni-Santa Cruz border (Fig. 1) suggests that *Leptodactylus chaquensis* might occur in Santa Cruz, Chuquisaca and Tarija, and *L. macrosternum* in Beni and La Paz. This scheme would suggest that *L. chaquensis* enters the Cerrado, but *L. macrosternum* does not enter the Chaco. However, filling that gap with additional records would obscure such scheme. Indeed, the lack of records in the area of the Beni-Santa Cruz border suggests that it is a poorly surveyed zone, rather than a real gap in the distribution of these frogs. In any case, the taxonomic allocation of northern Santa Cruz populations would remain uncertain.

The area of the Beni savannas of Bolivia is a mixture of the Amazonian and Cerrado biotas. Likewise, the Cerrado and Chaco biotas have amphibian communities with many species shared. As a result, the Beni herpetofauna shows elements from the three regions. Thus, the presence of either *L. chaquensis* or *L. macrosternum* appears equally likely in Beni. It is even plausible that the two species occur in sympatry [two different types of advertisement calls have been recorded at the Estación Biológica Beni (Reichle, pers. comm)]. This situation is similar to that of the Paradox Frog, *Pseudis paradoxa*, whose Beni populations are of uncertain taxonomic status and might belong to a northern subspecies rather than to a Cerrado or Chacoan one (De la Riva, 1999).

With the current state of the systematics of these frogs, it is impossible to ascertain the taxonomic status of their populations in the Bolivian Amazon. Those populations from the Chacoan area (part in the Paraná basin, part in the Amazon basin), are inferred to be *L. chaquensis* but, admittedly, this arrangement is based only on plausible distributions rather than on certainty about their taxonomic identity. A thorough study on the systematics of these frogs is badly needed in order to accurately assess their true diversity and distributions.

ACKNOWLEDGEMENTS

J. Aparicio, E. Guzmán, M. E. Montaña and the junior author collected the specimens of *L. ocellatus*. The senior

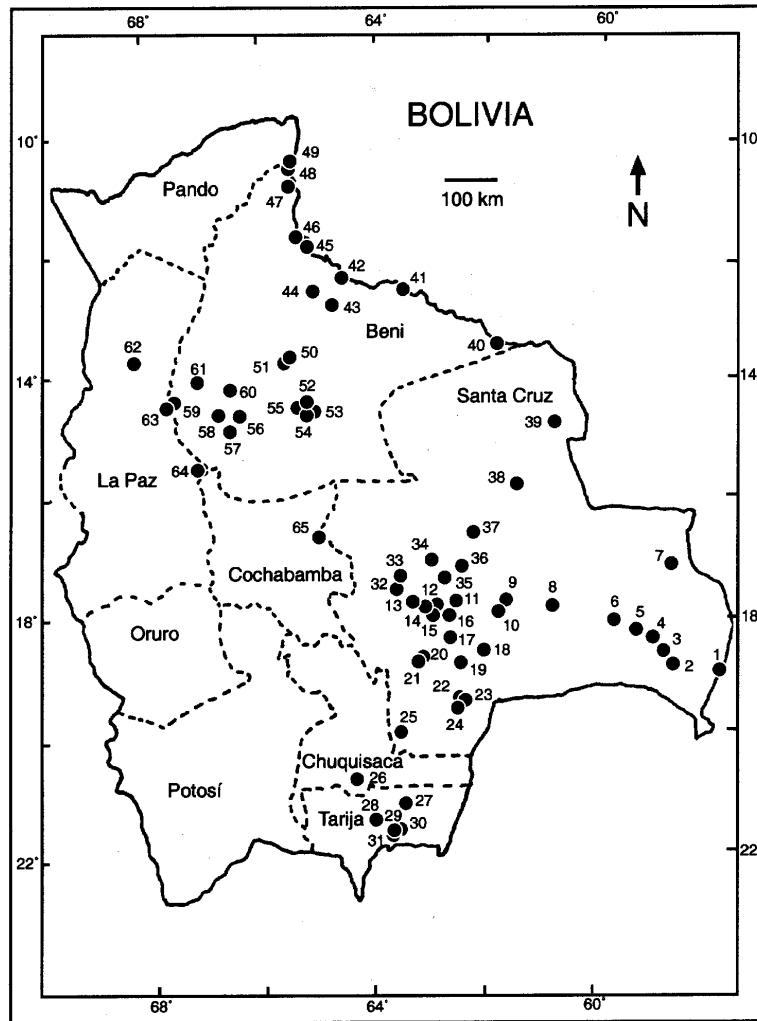


Fig 1.— Map of Bolivia showing locality records for *Leptodactylus ocellatus* and the pair *L. chaquensis-L. macrosternum*. The locality 1) is the only one known for *L. ocellatus*, albeit the species might occur at other sites in the Bolivian pantanal. *L. chaquensis-L. macrosternum* is also present at 1). 1) Laguna Cáceres (this paper); 2) El Carmen (Gans, 1960); 3) San Fermín (Müller & Hellmich, 1936); 4) Tunama (Müller & Hellmich, 1936); 5) Roboré (Gans, 1960); 6) El Portón (Gans, 1960); 7) San Fernando (MNK); 8) San José de Chiquitos (Müller & Hellmich, 1936); 9) Tunás (Gans, 1960); 10) Estancia San Miguelito (MNK); 11) El Pailón (Gans, 1960); 12) Santa Cruz de la Sierra (Müller & Hellmich, 1936); 13) Terevinto (MNK); 14) Estancia Cedrito (this paper); 15) Lomas de Arena (this paper); 16) La Bola (this paper); 17) 15 km E of Ingeniero Mora (AMNH); 18) Cupesí (González, 1998); 19) La Madre (González, 1998); 20) Cabezas (Gallardo, 1964); 21) Abapó (Gallardo, 1964); 22) Aguaraigua (González, 1998); 23) Cerro Colorado (González, 1998); 24) Yapiroa (González, 1998); 25) Camiri (ZFMK); 26) El Palmar (Harvey, 1997); 27) Villamontes (= San Francisco; Müller & Hellmich, 1936); 28) Entre Ríos (CBF); 29) Tatarendá (Andersson, 1906); 30) Caiza (Peracca, 1897); 31) Aguiarenda (Peracca, 1897); 32) Buenavista (Gallardo, 1964); 33) Río Palacios (MNK); 34) Mineros (MNK); 35) El Naranjal (USNM); 36) Los Troncos (Müller & Hellmich, 1936); 37) San Ramón (Köhler, 1995); 38) Santa Rosa de la Roca (Köhler, 1995); 39) El Refugio, Parque Nacional Noel Kempff Mercado

(Harvey *et al.*, 1998); 40) Remanso (AMNH); 41) 5 km NW of Puerto Versailles (AMNH); 42) Boca del Baures (AMNH); 43) San Joaquín (FMNH); 44) Puerto Siles (AMNH); 45) Alejandría (AMNH); 46) Santa Rosa (AMNH); 47) Guayaramerín (AMNH); 48) Cachuela Esperanza (UMMZ); 49) Villa Bella (CMNH); 50) Puerto Caballo (AMNH); 51) Santa Ana de Yacuma (= Santa Ana de Movimas; Boulenger, 1898); 52) Boca del Ibaré (AMNH); 53) Trinidad (AMNH); 54) Puerto Almacén (Köhler, 1995); 55) Río Tijamuchi (AMNH); 56) Estación Biológica Beni (Reichle, 1997); 57) El Triunfo (CBF); 58) San Borja (De la Riva *et al.*, 1992); 59) Rurrenabaque (Fugler, 1988); 60) Espíritu (CBF); 61) Lago Rogagua (UMMZ); 62) Ixiamas (UMMZ); 63) San Buenaventura (USNM); 64) Covendo (= Misiones Mosetenes?; Boulenger, 1898). 65) Puerto Villarroel (CBF).

Fig. 1.— Mapa de Bolivia con las localidades conocidas para *Leptodactylus ocellatus* y el par de especies *L. chaquensis-L. macrosternum*. La localidad 1) es la única conocida para *L. ocellatus*, aunque la especie podría existir en otros lugares del pantanal boliviano. *L. chaquensis-L. macrosternum* también se encuentra en 1).

author is grateful to the curators and collection managers of the museums consulted. R. De Sá, W. R. Heyer, and E. R. Wild provided valuable comments. This paper is funded by project DGES PB97-1147, Spanish Ministry of Education and Culture.

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Recibido, el 2-VIII-1999
 Aceptado, el 24-IX-1999
 Publicado, el 15-XII-1999