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A new peculiar *Liolaemus* species of the "*chiliensis*" phyletic group from the volcanic Cordilleran landscapes of Southern Mendoza Province, Argentina (Iguania, Lacertilia, Reptilia)

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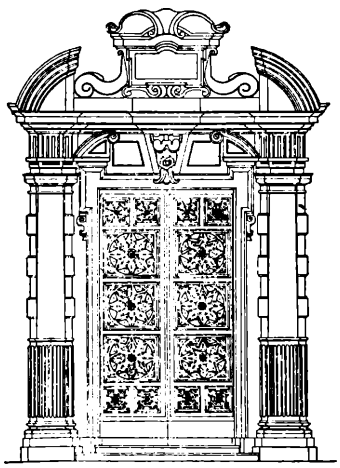

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A new peculiar *Liolaemus* species of the "*chiliensis*" phyletic group from the volcanic Cordilleran landscapes of Southern Mendoza Province, Argentina (Iguania, Lacertilia, Reptilia)

ABSTRACT

A new lizard of the genus *Liolaemus*, belonging to the evolutionary "*chiliensis*" group, is described. Specimens come from the Peteroa Volcano region (2400 m), close to the Chilean frontier, in the Andean mountains of Southern Mendoza Province, Argentina. The new species is related to *coeruleus*, *cristiani* and *neuquensis*, species from the same cordilleran environments, all of these taxa being characterized by the lack of precloacal pores in males. A specific rank may be also supported for *Liolaemus bellii neuquensis* from Copahue Volcano, 2500 m, Neuquén, which meet the criteria of the now so called "evolutionary species" (sensu Frost and Hillis, 1990) on the basis of its distinctive characters.

KEY WORDS: Andeas herpetofauna, *chiliensis* group, evolutionary species, *Liolaemus*, precloacal pores, sexual characters in males, Tropidurial lizards, volcanic Cordilleran landscapes.

INTRODUCTION

The southernmost Andean districts of the Mendoza Province, Argentina, still remain herpetologically poorly known, as well as the adjacent mountains and valleys of the Neuquén Province, southward. Since the pioneer Müller and Hellmich's studies, sixty years ago, very few localized taxa have been reported for such a wide country, which extends about 500 km along the Chilean fron-

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tier, from about 35° to 40° South latitude. During a very hard field research recently carried out by one of us (Videla: summer 1996), a peculiar sample of *Liolaemus* specimens was collected in the montane locality named Baños del Azufre (or "sulphureous springs") (2400 m), about 10 km from the still active Peteroa Volcano (4135m), Malargüe Department, Mendoza Province, Argentina. Recognizable at first sight as belonging to a new cordilleran lizard, the sample - two males and two females - was furtherly carefully studied by one of us (Cei: winter 1996), being compared with the majority of the known species and subspecies of the genus. A new specific taxon was then detected, referable to the largest evolutionary group of the *Liolaemus* line, the "*chiliensis*" group, assembling about 78 specific and subspecific taxa, in accordance with the recent Etheridge's tentative classification (1995), whose general systematic approach has been here taken into account. This new species, named having in mind its typical natural environment, shall be so described and commented below.

Liolaemus thermarum sp. nov.

Holotype: MACN 36681, collected at Baños del Azufre, 2500 m, 10 km from Peteroa Volcano, Malargüe Department, Mendoza Province, Argentina, March 1996, by F. Videla and R. González del Solar: adult male specimen.

Paratypes: MACN 36682: adult female specimen; MRSN R1220-1, adult male specimen; MRSN R1220-2: adult female specimen. All the same locality and data as the holotype.

(Museum acronyms used in the paper: MACN = Museo Argentino de Ciencias Naturales, MRSN = Museo Regionale Scienze Naturali (Turin, Italy)).

Etymology. The specific name is from the Latin word *thermae*, *thermarum*, in reference to the sulfureous thermal springs from its montane Andean habitat, near to the still active Peteroa Volcano.

Diagnosis. A medium-size, stout *Liolaemus*, belonging to the "*chiliensis*" group, being characterized by high scale number at midbody, softly keeled dorsal scales medially thickening on a vertebral line, absence of precloacal pores and a peculiar coloration stressed by a very wide and dark, bilateral lower stripe on the flanks. It is easily recognizable from the several species of the "*chiliensis*" group, except *coeruleus*, *bellii neuquensis* and *cristiani* in having a different color pattern and lacking precloacal pores in males. It is distinguishable from *Liolaemus coeruleus* and *Liolaemus bellii neuquensis*, also lacking precloacal pores, in having a larger and stouter body, higher scale number at midbody and a very different dorsal and ventral coloration (Col. Pl. 1 and 2). In accordance with the original description of *L. cristiani* (Nuñez *et al.*, 1991; Navarro and Nuñez, 1992) it differs from this Chilean form in having a very different lepidosis and dorsal coloration: no scale numbers at midbody are reported in the original description of *L. cristiani*.

Liolaemus ramonensis Müller and Hellmich 1932 has been reported as lacking precloacal pores (Navarro and Nuñez, 1992), but in the original description (Müller and Hellmich, 1932) of the two male paratypes "... 5 Präanalporen" and "... 6 Präanalporen auf der Hinterseitendes Randes der Analklappe gelegen ..." are clearly indicate. The holotype of *L. ramonensis* was a female specimen.

Description of the holotype. Body stout, 85 mm snout-vent length; tail 123 mm, thick and somewhat depressed, 0.59 percent total length in the holotype. Hindlimbs stout, 50 mm length; 0.59 percent snout-vent length; forelimbs 31 mm, 0.35 percent snout-vent length; when adpressed, hindlimbs cross the shoulder, forelimbs cross the middle of the body. Axilla-groin distance 42 mm. Head large and distinct from neck, 18.5 mm (as measured from inferior apex of ear opening to snout point apex), widest 16 mm across temporal region. Snout moderately large, 7.4 mm (from tip of snout to anterior eye commissure), very slightly projecting beyond lower jaws. Orbit moderately large, 5.5 mm as measured along its greatest horizontal length, about 0.34 times head length. Nasal region swollen, convex in profile; fronto-nasal region slightly concave in profile. Rostral wider than high, bordered by 6 scales. Nasal scales small, not contacting rostral, being separated by four interposed scales, by a scale row from anterior supralabials. Nostril oriented anterolaterally, very evident. Dorsal head scales differentiated, bulky and rough. Supraorbital semicircles regular and complete; two scale rows and a frontal azygos between orbits; 8 supraoculars subequal, decreasing anteriorly, separated from superciliaries by two smaller scale rows. Five superciliaries short, about 4-5 times longer than wide; interparietal polygonal, slightly smaller than adjacent parietal scales; two pairs of enlarged parietals posterior to interparietal; subocular and postoculars forming a somewhat interrupted slightly projecting shelf; a single row of 8-9 loreolabials, slightly smaller than supralabials, separating the suboculars from the 6-6 supralabials; few anterior loreals somewhat smaller than lorilabials. Temporals small, irregularly slightly keeled; external ear opening vertical, its vertical diameter smaller than orbit, bordered by granular scales, larger anteriorly, very small posteriorly. Mental slightly wider than rostral, bordered by 2 infralabials and 2 postmentals; 5-5 infralabials; gulars oval, imbricate, smooth, smaller than ventrals, slightly larger anteriorly.

Dorsal scales in about 30 transverse rows on neck, subimbricate or almost yuxtaposed, very small and slightly keeled, gradually becoming larger on dorsum, but decreasing in size on the sides, grading into smooth, flat, imbricate ventral scales. On the vertebral line some longitudinally thickened scale rows are present. Ventrals rhomboidal with soft corners, imbricate, more than three times larger than dorsals, but smaller, irregular and somewhat polygonal on precloacal region. Lateral nuchal folds very evident, with a notorious longitudinal fold from the ear opening to the shoulder; very minute, conical granules

on lateral skin folds and the axillary region; few conical granules on the groin. Number of scales around midbody 88.

Brachial and antebrachial scales regularly imbricate and keeled above; smaller and soft on ventral surface, finely granular on the axillary region. Suprafemoral scales large, smooth or slightly keeled, often slightly bifid on the point; post-femorals and infrafemorals granular. Supratibials large, sharply keeled, in regular scale rows; post-tibials and infratibials smooth, flat and imbricate, about equal in size to ventral body scales. Supracarpals and supratarsals smooth or very faintly keeled, somewhat irregular in size, imbricate; infracarpals and infratarsals very small, keeled, imbricate. Supradigitals smooth, imbricate, a slightly concave distal margin on manus, a slightly convex margin on pes; terminal distal margin of supradigitals notched, with short, curved, blackish claw; fourth toe claw about as long as 3 distal supradigitals. Lateral digitals small, rounded, imbricate; subdigital lamellae tricarinate, 22-23 on fourth fingers, 26-26 on fourth toes.

Dorsal and lateral caudal scales larger than body scales, imbricate and mucronate proximally, becoming regularly imbricate and keeled, verticillate but not mucronate distally. Ventral caudals like abdominal scales proximally, becoming distinctly imbricate, keeled and verticillate distally.

Color pattern in life (Col. Pl. 1, 1, 2) : Dorsal and lateral surfaces of head light creamish or pale tan, with scattered dark or whitish spots; bulky prefrontal, frontal and parietal scales very dark brown or black, scattered with pale scale organs; lateral nuchal skin folds pale tan with small, confused brown marks. Dorsum and upper surface of tail pale tan, scattered with faint brown spots, somewhat darker and thickened on the median, vertebral and paravertebral line; a wide, dorso-lateral and lateral, dark brown longitudinal band from axilla to groin, becoming progressively less obscure backward; bluish scales present, very scarce on the back, mostly along the lower borders of the lateral obscure band. Upper surface of forelimbs creamish, speckled with distinct brown spots; upper surfaces of hindlimbs similar to dorsum for color pattern. Throat and chest whitish speckled with faint grayish marks, more evident on mental, infralabial and postmental scales; ventral surface whitish, with pale pinkish shade, continued on lower distal whitish surface of tail; a yellowish band on the last four lower femoral scale rows, and in the precloacal scales (Col. Pl. 1, 2).

Color pattern in preservative : Dorsally a general brownish ground, but fundamental pattern of living animals still recognizable, such as the black cephalic scales, the median lighter dorsal surface, scattered with darker marks, and the wide obscure lateral band from axilla to groin. Limbs and tail lighter than dorsum: throat and ventral surfaces darker than in the living specimens, without its abdominal pale pink shade and the yellow band on the last four lower femoral scale rows and precloacal scales; lower surface of tail whitish gray.

Variation in paratypes. Variation for metric and meristic characters is given in Table 1. No remarkable variation for lepidosis can be reported: dorsal scale rows very irregular also in the paratypes, difficulting the calculation of their high number at midbody; ventrals imbricate or subimbricate, dorsals scarcely subimbricate, often non overlapping, almost yustaposed. Differences in coloration will be pointed out. The wide obscure brown stripe from axilla to groin may be interrupted by spaced transversal broken marks, 4-10 bluish or greenish scales each, from the paravertebral zone downward (Col. Pl. 1, 3); the wide obscure brown stripe is somewhat fainter in some female specimens; the abdominal pale pinkish shade and the yellow band on the last lower femoral scale rows are absent in female and their significance of color sex character may be suggested.

The clear cut differences between the high scale number at midbody of *Liolaemus thermarum* (84-89) and the lower scale number at midbody of *L. coeruleus* (63-69, in 22 adult specimens), and *L. bellii neuquensis* (68-75, in 4 adult specimens), must be pointed out. Moreover, the evident hemigular folds (Fig. 1) exhibited by *Liolaemus bellii neuquensis* (= *L. altissimus neuquensis* Müller and Hellmich, Zool. Samml. Bay Staat., 35/1938: Holotype) are also unrecognizable in all of the types of *L. thermarum*, as well as in *L. coeruleus*.

Distribution. Only known from its "terra typica".

	MACN 36681 male Holotype	**MRSN R1220-1** male Paratype	**MRSN R1220-2** female Paratype	**MACN 36682** female Paratype
Total length	210	195	189	170
Snout-vent	85	74	84	70.5
Tail	123	116	101	96
Head length	18.5	16	18.2	15
Head width	16	14	15	13.5
Forelimb	31	26	29.5	26
Hind limb	50	46	44.6	41.5
Axilla-groin	42	35	40	34.5
Scales around midbody	88	89	87	84
Snout length	7.4	5.6	6	5
Orbital diameter	5.5	5	5.2	5
Supralabials	6-6	5-7	6-6	6-6
Infralabials	5-5	5-5	5-5	5-5
Fourth toe subdigital lamellae	26-26	27-28	26-25	26-26

Table 1 - Metric and meristic characters of holotype and paratypes of *Liolaemus thermarum* (measures of metric characters in mm).

ECOLOGICAL NOTES

Liolaemus thermarum was found in a glacial valley named Baños Termales del Azufre (35° 15´ lat. S, 70° 30´ long. W, 2400 m), located in Malargüe Department (Mendoza Province, Argentina) (Col. Pl. 2,1). This valley extends along the volcanic relief Azufre-Planchón-Peteroa, and belongs to the westernmost section of the Andean Cordillera known as "Cordillera Principal". The effusive activity of such a complex was remarkable in Early Pleistocene, progressively concentrating around the Peteroa Volcano, whose latest thrown out ejecta (volcanic ash) were observed in 1991. Currently only fumaroles and thermal springs showing some therapeutical properties are present. The above mentioned Andean complex presents important glaciers, whose melting originate several streamlets or montane "arroyos", mostly tributaries of the Valenzuela river.

Two kinds of environments characterize this wide U-shaped valley: wet meadows or "vegas", and the xeric rocky ravines scattered with a thin vegetation cover, such as gramineous grasses (*Schyzachirium paniculatum, Poa holciformis*), camephytes (*Pernettya mucronata, Haplopappus* sp.), fanerophytes (*Berberis empetrifolia, Mulinum spinosum*) and an isolated geophyte (*Crushanckia glacialis*). The low, dense grass of the "vegas" is specially crowded by the gramineous stems of *Luzula* sp., *Poa holciformis, Agrostis* sp., by *Mulinum spinosum* and by *Oxychloe andina, Carex gayana* and *Acaena magellanica* on the streamlet borders (Martinez Carretero, pers. comm.).

Baños del Azufre shows a cold, humid climate: its annual precipitations, mostly snowy, average about 940 mm, mostly snow, temperature averages 12°

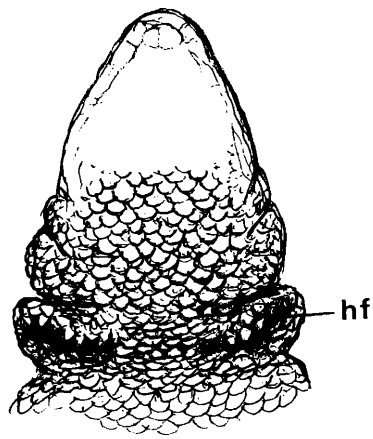

Fig. 1 - Evident hemigular folds of the holotype of *Liolaemus altissimus neuquensis* (= *L. neuquensis*) from Copahue Volcano, Neuquén, Müller and Hellmich, 1939 (Drawing from the specimen 35/1938: Zool. Samml. Bay. Staat. Mus. München). (Strongly magnified)

C in summer and 1° C in winter (Arg. Nat. Meteorol. Serv.). A permanent snow bed covers the valley from April to September. The specimens, captured in March, were observed in the rocky environment, basking during the morning and being most active at noon. They sheltered under stones or in crevices, exhibiting a peculiar aggressive behavior when sized. A prevalent insectivorous diet is probably their rule.

GENERAL REMARKS

In spite of obvious differences at the specific level, a number of morphological, ecological and biogeographical affinities may suggest ancient relationships between *Liolaemus thermarum* and *L. coeruleus* or *L. bellii neuquensis*. This latter taxon, moreover, appears to meet the criteria for evolutionary species sensu Frost and Hillis (1990), given the several character states differentiating that isolated lizard from Copahue Volcano, Neuquén, from the other Chilean subspecies of *bellii*, all allopatric, with no evidence of intergradation (Müller and Hellmich, 1939). Significant characteristics differentiating *L. bellii bellii, L. b. moradoensis* and *L. b. araucaniensis* from *neuquensis* are the presence of cloacal pores (1-2), a distinct dorsal lepidosis, a minor scale number at midbody (54-63 versus 68-75 in *neuquensis*), and different pattern of coloration can be pointed out. Valid reasons are thus available to elevate the subspecies *neuquensis* to the status of species, such as in many other similar cases: of course, additional samples from its "terra typica" could provide a still more clear cut evidence and they are thus desirable.

Ecological conditions of the Andean slopes, homeland of *Liolaemus thermarum*, as well as *coeruleus* and *neuquensis*, are similar. They range from 1600-1800 m for *coeruleus* to 2500 m for *thermarum*, and from 1800 to 2300 m for *neuquensis*, in the neighborhood of Copahue Volcano and its thermal springs. Rocky landscapes and wasted basalt ravines, in a low montane bush of graminaceae and cushion-like spiny tufts, are their environments. The map of Fig. 2 may tentatively indicate the presently known geographical distribution of these scattered liolaemine taxa, including the typical locality of the poorly known but morphologically related *L. cristiani* from Cerro El Peine, 2248 m, Maule region, Chile. In their habitat, other species of *Liolaemus* as *L.buergeri* and *L. elongatus* are generally associated. Near the collecting area of *L. thermarum* specimens of a *Phymaturus* species belonging to the *flagellifer* group have been found.

No further speculations can be added on the origin and the evolutionary trends of these cordilleran tropidurine lizards, characterized as having a fundamental color pattern and lacking precloacal pores in both sexes. Very little is known of their habits and reproduction: nevertheless a suggestive remark could be the presence of these lizards in a definite geographical Andean area, where biocenotic influences of the last glacial- postglacial climatic and environmental actions appears still evident as probable factors of selective evolution.

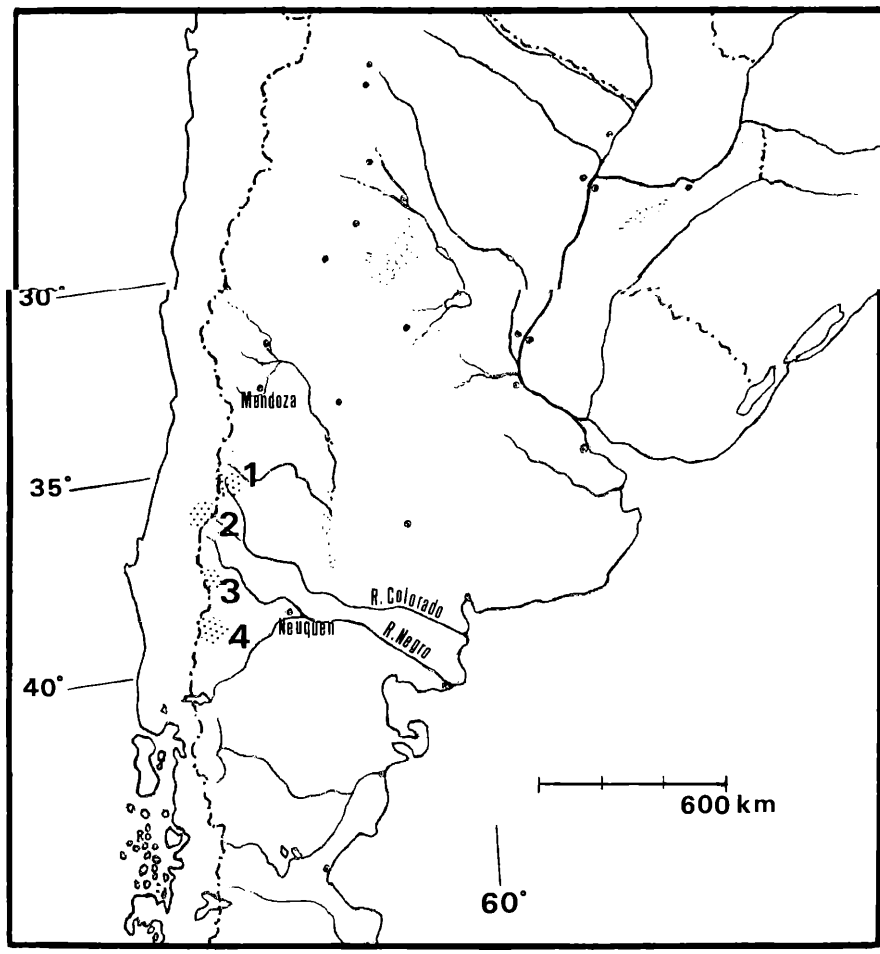

Fig. 2 - Map of collection localities of the precloacal pores lacking *Liolaemus* species of the "*chiliensis*" group (sensu Etheridge) from the cordilleran mountains of Mendoza and Neuquén Provinces, Argentina.

1 - Baños del Azufre, 2400 m, 10 km SE of Peteroa Volcano, Mendoza Province: *L. thermarum*;
2 - Cerro El Peine (35° 37′ S, 71° 02′ W), 2448 m, Maule region, Chile: *L. cristiani*;
3 - Environs of Copahue Volcano, Baños de Copahue, 1800 to 2300 m, Neuquén Province: *L. neuquensis*;
4 - Cordilleran slopes 10 km SW of Primeros Pinos, road to Alluminé Lake, 1800 m, Neuquén Province: *L. coeruleus*.

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RESUMEN

Se describe una nueva especie de *Liolaemus* de las regiones cordilleranas del sur-oeste de Mendoza (Departamento Malargüe), en particular cerca de las fuentes termales (Baños del Azufre), a 10 km del Volcán Peteroa, a una altitud de 2400 m. Esta nueva especie se caracteriza por la completa ausencia de los poros precloacales en los machos y se relaciona con otras especies del grupo "*chiliensis*" (sensu lato), también carentes de dichos poros, como *coeruleus, neuquensis* y *cristiani*, todas distribuídas en las áreas fronterizas de Argentina o Chile, a lo largo de unos 500 km en latitud y en ambientes ecológicamente similares. Se propone elevar a categoría específica *Liolaemus belli neuquensis*, por presentar caracteres diferenciales suficientes para separarlo como "evolutionary species" de las otras subespecies de *Liolaemus bellii*, todas alopátricas.

RIASSUNTO

Si descrive una nuova specie di *Liolaemus* della cordigliera del sud-ovest di Mendoza (Departamento Malargüe), piú precisamente in prossimitá delle sorgenti termali di Baños del Azufre, a circa 10 km dal Vulcano Peteroa, e a una altitudine di 2400 m. Questa specie é caratterizzata da una totale assenza di pori precloacali nei maschi, condizione morfologica poco frequente nel genere *Liolaemus*, presentando relazioni morfo-ecologiche con altre forme, pure senza pori precloacali, appartenenti al grande gruppo evolutivo "*chiliensis*", come *coeruleus, neuquensis* e *cristiani*, conosciute per localitá di altitudine e ambiente naturale similari, situate nello stesso arco andino, alla frontiera argentino-chilena, per una estensione di circa 500 km di latitudine. Durante questo studio si é considerato opportuno elevare a categoria specifica, come "evolutionary species", la sottospecie *Liolaemus bellii neuquensis*, ben differenziata morfologicamente dalle altre forme trinominali allopatriche di *Liolaemus bellii.*

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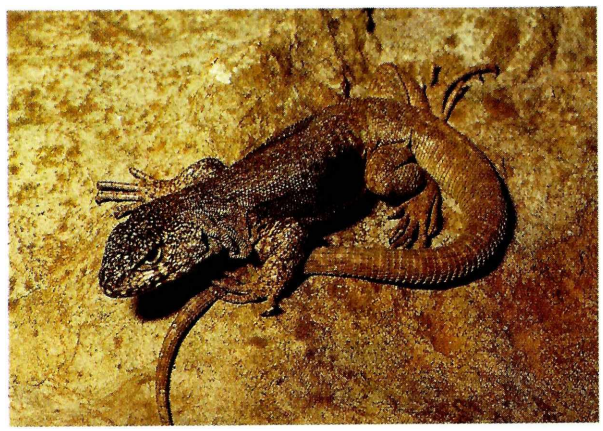
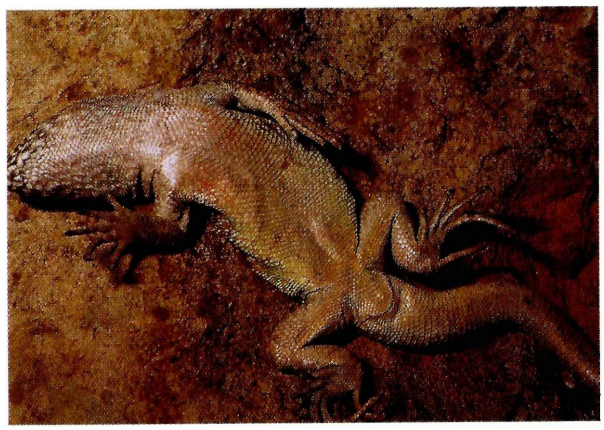


1 - Holotype of *Liolaemus thermarum*, male, MACN 36681, from Baños del Azufre, near Peteroa Volcano, 2400 m. March 1996. Dorso-lateral view.

Photo: J.M. Cei



2 - The same specimen: ventral view. (The yellow scales on femoral and precloacal regions are evident).

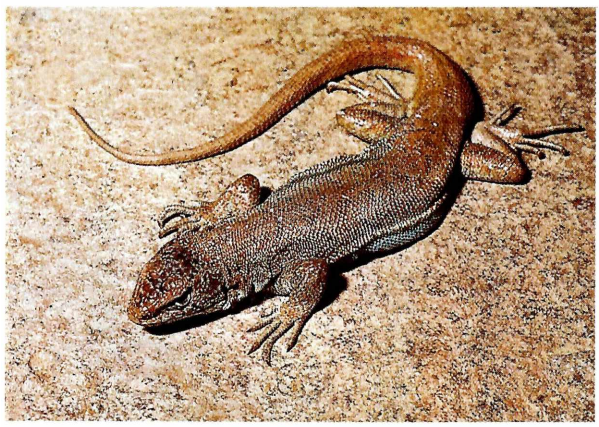
Photo: J.M. Cei

3 - Paratype of *Liolaemus thermarum*, female, MACN 36682; same data of the holotype.

Photo: J.M. Cei

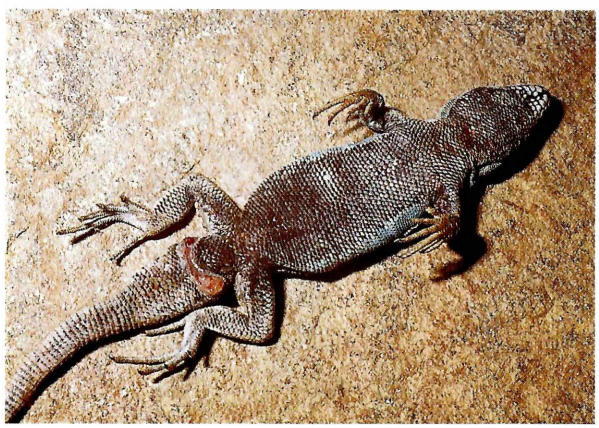
1 - Characteristic landscape and environment of the Baños del Azufre Valley, "terra typica" of *Liolaemus thermarum*, at 2400 m. The rocky environment where the specimens were found, and the green "vegas" on the bottom of the picture, can be recognized

Photo: F. Videla



2 - *Liolaemus coeruleus* male, from about 10 km SW of Primeros Pinos, 1600 m, Zapala, Neuquén. February 1986. Morphological affinities with *Liolaemus thermarum* are remarkable.

Photo: J.M. Cei



3 - The same specimen, ventral view. The absence of precloacal pores is evident.

Photo: J.M. Cei