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## THREE NEW SPECIES OF THE *LIOLAEMUS ELONGATUS* GROUP (IGUANIA: LIOLAEMIDAE) FROM ARGENTINA

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**R E S U M E N.** — Describimos tres nuevas especies de *Liolaemus* del Sur de Argentina. Estas nuevas especies pertenecen al grupo de *Liolaemus elongatus*, grupo monofilético incluido en el subgénero *Liolaemus sensu stricto*. Dos de las nuevas especies habitan en el sur de la Provincia de Mendoza y la otra en el centro-oeste de la provincia de Río Negro. Las nuevas especies presentan estados de caracteres que las diferencian de todos los miembros del grupo de *L. elongatus*. Esos estados de carácter incluyen al patrón de coloración, número de escamas en el dorso, forma de las escamas temporales y tamaño (entre otros). Aunque con estas nuevas especies se dilucida el status taxonómico de varias poblaciones pertenecientes al grupo de *L. elongatus*, muchas quedan inciertas aún.

**PALABRAS CLAVE:** *Liolaemus*, grupo *elongatus*, Patagonia, nuevas especies.

**A B S T R A C T.** — We describe three new species of *Liolaemus* from Southern Argentina. These new species belong to the monophyletic *Liolaemus elongatus* group, included within the subgenus *Liolaemus sensu stricto*. Two of the new species inhabits in southern Mendoza Province and the other one inhabits in central west Río Negro Province. The new species exhibit character states that distinguish them from all other members of the *L. elongatus* group. Those character states include color pattern, number of scales in dorsum, shape of temporal scales, and size (among others). Although with those new species we clarify the taxonomic status of several populations which belongs to the *L. elongatus* group, many remain unknown.

**KEYWORDS:** *Liolaemus*, *elongatus* group, Patagonia, new species.

### INTRODUCTION

The taxonomic composition of the genus *Liolaemus*, an specious South American lizard, has growing up during the last decade (Abdala *et al.*, 2008; Abdala *et al.*, 2009; Avila *et al.* 2008; Avila *et al.*, 2010; Lobo *et al.*, 2007; Lobo *et al.*, 2010; Quinteros *et al.*, 2008a,b), increasing its specific number to 223 (Lobo *et al.*, 2010). These lizards inhabit in diverse microhabitat, distributed from Tierra del Fuego to central Peru. The taxonomic and phylogenetic studies carried out in this particular group di-

vided the Genus in two main groups (Subgenera: *Liolaemus sensu stricto*, and *Eulaemus*), and in several subgroups included (Laurent, 1983, 1985; Etheridge, 1995, 2000; Abdala, 2007; Lobo, 2001, 2005; Avila *et al.*, 2006; Morando, 2007; Espinoza *et al.*, 2004; Schulte *et al.*, 2000, among much others). Inside the *Liolaemus sensu stricto* (the most studied group) is found a group primarily defined by Cei (1974), the *Liolaemus elongatus* group. Later, Espinoza *et al.* (2000) re-defined this group, composed by: *L. austromendocinus* (Cei, 1974), *L. capillitas* (Hulse,

1979), *L. elongatus* (Koslowsky, 1896), *L. heliodermis* (Espinoza, Lobo, and Cruz, 2000), *L. petrophilus* (Donoso Barros and Cei, 1971), and *L. thermarum* (Videla and Cei, 1996). *Liolaemus umbrifer* was added to the group after its description (Espinoza & Lobo, 2003). These species are distributed in west Argentina, from Catamarca, in the north, to Chubut, in the south. Posterior phylogenetic analyses (Lobo, 2005; Díaz Gómez and Lobo, 2006) defined a new group (*Liolaemus capillitas* group), which include the Northern distributed species of *L. elongatus* group, formed by *L. capillitas*, *L. heliodermis*, *L. dicktracyi* (Espinoza and Lobo, 2003) and *L. umbrifer*.

In phylogenetic analyses performed by Morando *et al.* (2003) and Avila *et al.* (2004), these species are included in two more inclusive groups named *L. elongatus* and *L. petrophilus* groups. The *L. capillitas* group proposed by Lobo (2001, 2005) and recovered by Díaz Gómez and Lobo (2006) is included in the *L. petrophilus* group proposed by Morando *et al.* (2003) and Avila *et al.* (2004). *Liolaemus talampaya* (Avila *et al.*, 2004) is recovered in a clade which includes species member of the *L. capillitas* group following the phylogenetic hypothesis of Lobo (2005). Recently two new species were described, *L. tulkas* and *L. parvus* (Quinteros *et al.*, 2008a) the first one belonging to the *L. capillitas* group, and the second one also included in the *petrophilus* group and related to *L. austromendocinus* and *L. gununakuna* according to (Morando *et al.*, 2003 and Avila *et al.*, 2004). Recently, Lobo *et al.*, (2010) proposed the *L. elongatus* group (including the *L. capillitas* group) which resemble the *elongatus - kriegi* complex (without the *kriegi* group) of Morando *et al.*, (2003) and Avila *et al.*, (2004).

In this work we describe three new species of *Liolaemus*, which belong to the more inclusive *Liolaemus elongatus* group (sensu Lobo *et al.*, 2010). Two of

them inhabit in southwestern Mendoza Province, whereas the other inhabit in central western Río Negro Province.

## MATERIALS AND METHODS

We studied specimens that belong to the *Liolaemus elongatus* group and additional specimens of other species of the *Liolaemus sensu stricto* subgenus.

Morphological characters commonly used for *Liolaemus* taxonomy were considered, as described in Laurent (1985); Etheridge (1993, 1995, 2000), Cei (1986), Lobo (2001), and Abdala (2007). Description of color in life was made based on photographs taken at the time of capture. Description of body color patterns follows Lobo and Espinoza (1999). Squamation characters were taken with a microscope (10-40X), measurements were obtained using caliper to the nearest 0.02 mm. Specimens were captured by noosing or hand, sacrificed with sodium pentothal 1%, fixed in 10% formalin and later preserved in 70% ethanol. Specimens used in the study are listed in the Appendix 1.

## RESULTS

Comparison between new species and other members of the *Liolaemus elongatus* group are showed in Table 1.

### *Liolaemus smaug* sp. nov.

Figs 1-4

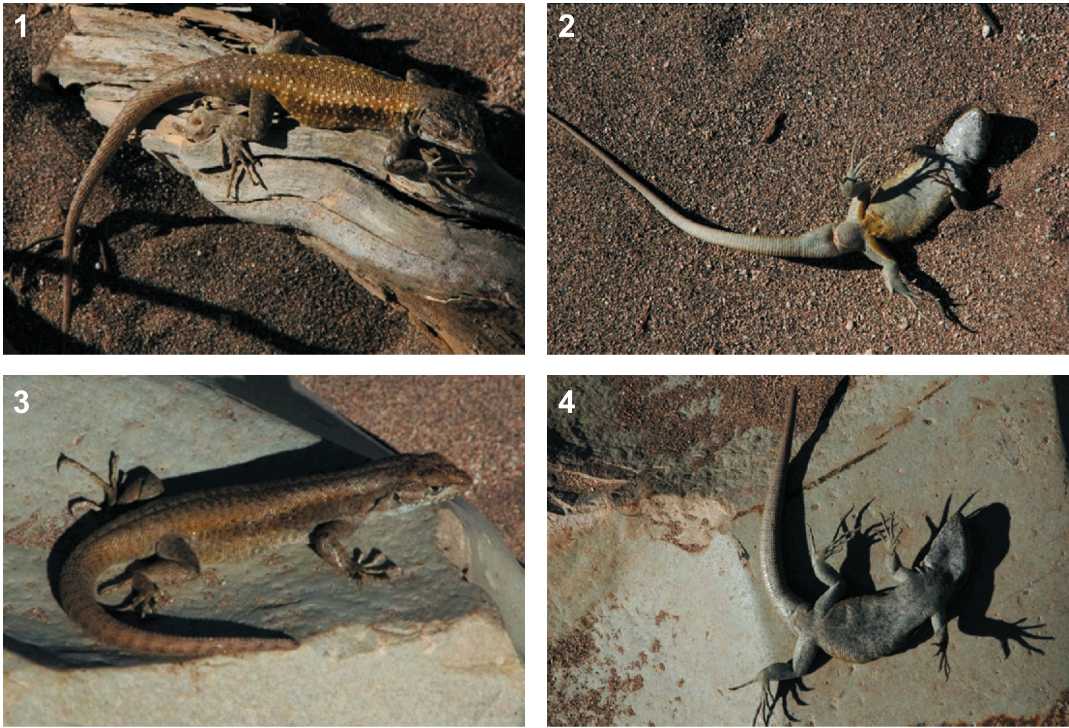
1974 *Liolaemus elongatus elongatus* Cei, J. M., J. Herp. 8:219-229.

1998 *Liolaemus elongatus* Cei, J. M. and L. J. Avila, Facena, 14:75-80.

*Holotype*.— FML 22449: Between Las Loicas and Volcán Peteroa Provincial Road 186, (35°39'51,3" S; 70°12'00,9"W, 1688 m.), Malargüe Department, Mendoza Province, Argentina. Abdala, Scrocchi, Nori, Martinez, Carrizo, cols. October 2008.

Character/Species	<i>L. austromendocinus</i>	<i>L. gununakuna</i>	<i>L. petrophilus</i>	<i>L. elongatus</i>	<i>L. therrmarum</i>	<i>L. parvus</i>	<i>L. choique</i>	<i>L. shitan</i>	<i>L. smaug</i>
<b>Mid-body scales</b>	63 - 81	84–97	75–88	70-79	84-89	60-77	74-88	72-85	73-80
<b>Ventral Scales</b>	116-134	108-112	121-133	96-105	-	96-113	118-135	120-132	119-131
<b>Dorsal Scales</b>	65-78	83-90	65-82	62-68	-	70-81	65-81	64-76	69-83
<b>Max. SVL</b>	103.2 mm	94.1 mm	99.2 mm		85.0 mm	65.1 mm	90.7 mm	98.3 mm	71,3 mm
<b>Keels in Temporal scales</b>	absent	Weak to absent	Weak	Weak	Weak	Weak to absent	Weak to absent	Weak to absent	Absent
<b>Keels in dorsal scales</b>	Weak	Distinct	Distinct	Distinct	Weak	Distinct	Distinct	Distinct	Distinct
<b>Preloacal pores</b>	2–4	1–3	2–5	4	0	1-4	3-4	3-5	3-4
<b>Head color</b>	Brownish gray	Iridescent yellow	Ochre/ yellow	Light Brown	Brown	Brown	Brown	Black or Brown	Gray to Brown
<b>Body color</b>	Brownish gray	Iridescent yellow	Ochre/yellow, dark brown and yellow	Light Brown	Brown	Light brown with yellow	Yellow with black	Black to Brown and yellow	Males: Ocre to Yellow. Females: Brown Lateral bands, vertebral spot and speckled white spots
<b>Dorsal body pattern</b>	Indistinct	Transverse bars	Indistinct to transverse bars	Vertebral and Lateral Bands	Indistinct	Indistinct/tiny spots in vertebral region	Vertebral and Lateral Bands to Dorsum melanic	Indistinct	vertebral spot and speckled white spots
<b>Tail rings</b>	Weak to distinct	Distinct	Distinct	Absent and present	Absent	Weak to absent	Absent	Weak to absent	Weak to absent
<b>Sexual Dichromatism</b>	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Weakly	Present

**Table 1.** Character states of the *Liolaemus petrophilus* group members. Modified from Espinoza and Lobo, 2003.



**Figure 1.** *Liolaemus smaug* sp. nov. Holotype in dorsal view. **Figure 2.** *Liolaemus smaug* sp. nov. Holotype ventral view. **Figure 3.** *Liolaemus smaug* sp. nov. Female in dorsal view. **Figure 4.** *Liolaemus smaug* sp. nov. Female in ventral view.

*Paratypes.*— FML 22444 – 448 and FML 22451: Same locality and date of the holotype. FML 23817-18: 11 km from Las Loicas, on the provincial road 186 to Paso Pehuenche, Malargüe Department, Mendoza Province, Argentina. Abdala, Juárez, Robles cols. February 2006.

*Etymology.*— In Tolkien's mythology Smaug, the Golden, is the last of the Middle Earth dragons. The name *Liolaemus smaug* is because this new species exhibit a golden coloration on body.

*Diagnosis.*— A slender, medium size *Liolaemus* (Max SVL 71.25 mm), which belong to the *L. chiliensis* group, particularly in the *L. elongatus* group (sensu Lobo *et al.* 2010). Inside this group the new species is distributed far away south from the members of the *L.*

*capillitas* group (Lobo, 2005) who inhabit in Northwestern Argentina and differs of them because the lack of red coloration on cloacal region and tiny spots spread in shoulder region (both character states are synapomorphies of the *L. capillitas* group, sensu Lobo, 2005). *Liolaemus smaug* differs from all members of the *L. petrophilus* group in having a distinct color pattern and in character states of lepidosis. It differs from the southern members of the *L. petrophilus* group (*L. austromendocinus*, *L. elongatus*, *L. gununakuna* (Avila, Morando, Perez, and Sites, 2004), *L. petrophilus*, and *L. thermarum*) because it has a small SVL (max SVL 71.25 mm in *L. smaug* vs. 81 – 103 mm). Dorsal scales have a distinct keel in *L. smaug*, while in *L. austromendocinus* the dorsal scales are weakly keeled. Temporal scales are keeled in *L. elongatus*, *L. petrophilus*, and *L. thermarum* while in

*L. smaug* the temporal scales are smooth. *Liolaemus smaug* have lower number of scales around midbody than *L. gununakuna* and *L. thermarum* (73–80 in *L. smaug* vs. 84–97). The number of dorsal scales in *L. smaug* is lower than in *L. gununakuna* but higher than in *L. elongatus* (62–68 in *L. elongatus*; 69–83 in *L. smaug*; 83–90 in *L. gununakuna*). *Liolaemus gununakuna* has a lower number of ventral scales than *L. smaug* (108–112 in *L. gununakuna* vs. 119–131 in *L. smaug*). Preloacal pores are present in males of *Liolaemus smaug*, character state that differs with males of *L. thermarum* where the preloacal pores are absent. Sexual dichromatism is evident in *L. smaug*, being absent in *L. austromendocinus*, *L. elongatus*, *L. gununakuna*, *L. parvus*, *L. petrophilus*, and *L. thermarum*. It differs from the member of the *L. kriegi* group (sensu Morando *et al.*, 2003) in a lower number of scales around midbody (73–80 vs 85–110 in *L. burgeri* and *L. kriegi*); lower number of dorsal scales (71–83 vs 87–110 in *L. kriegi*). *Liolaemus burgeri* exhibit a red coloration in cloacal region, absent in *L. smaug*. The max SVL in *L. smaug* is 71.3 mm, being 75–108 mm in *L. burgeri* and in 73–98 mm *L. kriegi*.

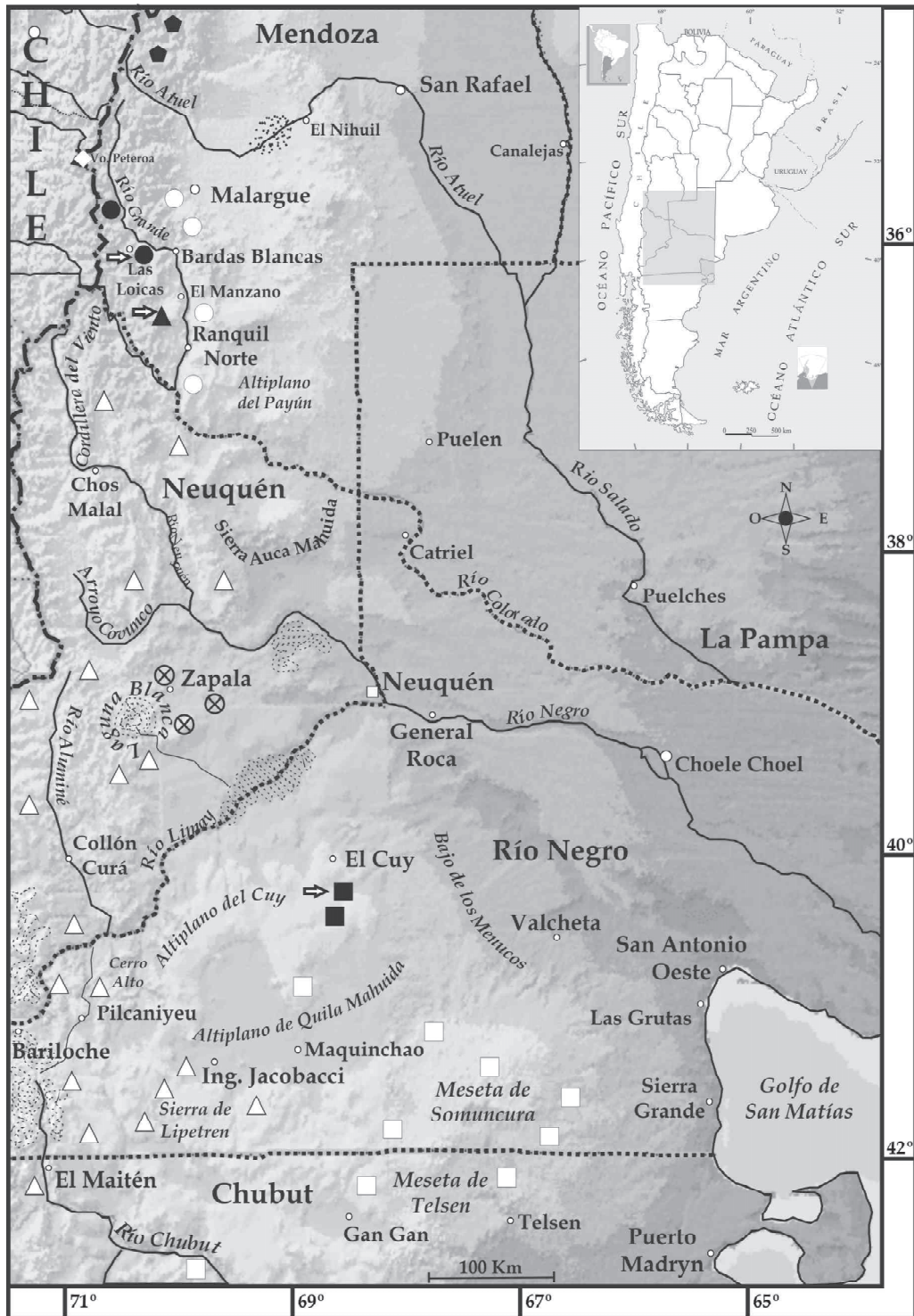
*Description of the holotype.*— Adult male. SVL 63.3 mm. Trunk length 14.8 mm. Head longer (14.2 mm) than wide (10.5 mm). Head height 10.5 mm. Eye diameter 5.3 mm. Interorbital distance 7.3 mm. Orbit–auditory meatus distance 5.3 mm. Auditory meatus height 2.7 mm; 1.6 mm wide. Orbit–commissure of mouth distance 1.8 mm. Internares 2.5 mm. Subocular scale 4.7 mm. Femur length 10.8 mm, tibia 12.0 mm, and foot 19.1 mm. Humerus length 8.9 mm. Tail length 97.8 mm.

Dorsal surface of the head smooth, with 14 scales. Rostral wider than high, bordered by eight scales. Mental larger than rostral, trapezoidal, bordered by four scales. Nasal in contact with ros-

tral. Four internasals. Nasal scale surrounded by eight scales, separated from canthal scale by two scales. Four scales between frontal and supercilliaris. Five scales between frontal and rostral. Frontal divided in two. Two postrostrals. Interparietal smaller than parietals, in contact with seven scales. Orbital semicircles complete. Five supraoculars. Preocular separated from lorilabial row by one scale. Three scales in the anterior margin of auditory meatus. Nine smooth temporals. Ten lorilabials, five of them, in contact with subocular scale. Six supralabials, none in contact with subocular. Five infralabials, the second one in contact, ventrally, with two scales. Six chinshields, the second pair separated by two scales.

Seventy-eight scales around midbody. Seventy-three round, imbricate, and keeled dorsals from occiput to hind limbs. Scales of flank same sized and shaped than dorsals. Ventrals same sized than dorsals, flat and imbricate. Thirty-six smooth weakly imbricate gulars. Four preloacal pores. Antehumeral scales flat, larger or equal in size than dorsals. Postauricular, rictal, and longitudinal folds present. Scales on the longitudinal fold granular and smooth. Fourth finger with 20 subdigital lamellae; fourth toe with 28. Infracarpals flat, imbricate, and trifid. Infratarsals flat, imbricate, and trifid.

*Color In Life.*— Figs. 1–2. Head dark grey dorsally, and light gray on sides. Dorsal background golden yellow, with speckled white spots in paravertebral region. Vertebral region light brown, being stronger in forelimbs region, and become lighter to disappear in hind limbs. Without paravertebral and scapular spots, nor dorsolateral bands. Fore and hind limbs dorsally dark gray. Tail dorsally light yellow, exhibiting a weakly ring pattern. Ventrally, throat, chest, belly, cloacal region and tail, light gray. Lateral field of belly and hind limbs bright yellow.



**Figure 5.** Localities of species of *Liolaemus petrophilus* group, from southern Mendoza to Chubut. Black circle: *Liolaemus smaug* sp. nov. Black triangle: *Liolaemus choique* sp. nov. Black square: *Liolaemus shitan* sp. nov. White diamond: *Liolaemus thermarum*. Black pentagon: *Liolaemus parvus*. White circle: *Liolaemus austromendocinus*. White triangle: *Liolaemus elongatus*. White square: *Liolaemus petrophilus*. Crossed circle: *Liolaemus gununakuna*.

*Variation* (based on sixteen specimens).— Snout-vent length 50.4–71.25 mm (X = 60; SD = 7.1). Head length 12.1–15.8 mm (X = 15.5; SD = 1.3), width 9.1–11.9 mm (X = 10.4; SD = 1.0). Interorbit distance 6.1–8.6 mm (X = 7.3; DS = 0.8). Humerous length 7.3–9.8 (X = 8.5; DS = 1.0). Radio length 6.6–8.6 (X = 7.6; DS = 0.7). Auditory meatus height 1.9–3.1 (X = 2.3; DS = 0.4), wide 1.3–1.7 (X = 1.5; DS = 0.1). Axilla-groin distance 14.9–30.2 mm (X = 23.3; SD = 4.7). Femur length 10.5–14.4 (X = 11.6; DS = 1.4). Tibia length 10.0–13.4 (X = 11.7; DS = 1.4). Tail length 83.6–90.7 mm (X = 87.2; SD = 5.1). Midbody scales 73–80 (X = 77.7; SD = 2.2). Dorsal scales, 69–83 (X = 74.6; SD = 4.1) between occiput and anterior surface of thighs. Dorsal head scales 11–15 (X = 14.0; SD = 1.4). Ventrals 119–131 (X = 123.7; SD = 4.2). Scales around interparietal 3–9 (X = 6.1; SD = 1.9). Five to seven (X = 6.1; SD = 0.6) enlarged supraoculars. Seven to ten (X = 9.0; SD = 1.1), smooth temporals. Scales on neck 41–53 (X = 47.6; SD = 4.4), between posterior margin of the auditory meatus and shoulder, along the longitudinal fold. Scales between auditory meatus and antehumeral fold 28–35 (X = 31.0; SD = 2.5). Auricular, longitudinal and antehumeral fold present. Gulars 28–38 (X = 33.2; SD = 2.9). Supralabials 6–9 (X = 7.1; SD = 1.1). Infralabials 4–6 (X = 5.1; SD = 0.6). Scales around nasals 6–8 (X = 7.1; SD = 0.8). Four to five scales between rostral and frontal (X = 5.7; SD = 0.5). One to ten scale organs on posrostrals (X = 6.0; SD = 2.9). Five to nine lorilabials (X = 7.0; SD = 1.3). Three to five lorilabials in contact with the subocular scale. Subdigital lamellae on fourth finger 18–22 (X = 20.5; SD = 1.4); on fourth toe 25–29 (X = 26.9; SD = 1.1). Precloacal pores 2–3 in males (X = 2.8; SD = 0.4), absent in females.

Sexual dichromatism present. In males and females, head gray or dark brown with some scales or small black spots. Dorsum in males is bright golden

yellow, with three longitudinal black stripes. One of them on the vertebral region, formed by black scales or black small spots gathered. The other two stripes are located on sides of the body, and become lighter to disappear on anterior margin of hind limbs. Dorsum in males exhibit many white scales in paravertebral region, some white spots are located on sides of the body. Those spots are absent in females. Dorsal background in females is light yellow with some red or brown shade (Fig. 3). The stripes on sides of body are less conspicuous than in males. Ventrally, the fore and hind limbs of males are bright yellow, absent in females (Fig. 4).

*Distribution*.— Fig. 5. *Liolaemus smaug* inhabit zones close to Las Loicas, on the road to Volcán Peteroa, in Laguna de la Niña Encantada, and in Los Molles, which are localities of Malargüe department, in Mendoza Province.

*Natural History*.— *Liolaemus smaug* was found in a sandy area, more often seen under bushes along the margins of Río Grande river. Surprisingly, individuals were not found related to a rocky microhabitat, but on sand, which is a unique biological datum for *L. petrophilus* group. Basking over large rocks around the sand, we found *Phymaturus verdugo* (Ceï and Videla, 2003) and only in the base of rocks, we found *L. smaug*, in a sandy and bushy area. Many specimens of *L. smaug* were basking on rocks, but when disturbed, they run directly to bushes on sand. No more data about its biology are known.

*Liolaemus shitan* sp. nov.

Figs. 6-9

- 1998 *Liolaemus elongatus*. Cei, J. M. and L. J. Avila, Facena, 14:75-80.  
 2003 *Liolaemus elongatus*. Morando *et al.*, Syst. Biol., 52:159-185.  
 2010 *Liolaemus cf elongatus*. Scrocchi *et al.* 252 pp.

**Holotype.**— FML 19276: Over Provincial route 6, 175 km from General Roca, Estancia Piedras Blancas, (40°17'17,8"S, 68°27'26,9"W; 820 m), 25 de Mayo Department, Río Negro Province, Argentina. November, 2007, Abdala, Quinteros, Scrocchi, and Stazonelli cols.

**Paratypes.**— FML 19277 – 283: same data than holotype; FML 23832-836: Over ruta Provincial 6, to 175 km from General Roca, Estancia Piedras Blancas, (40°17'17,8" S 68°27'26,9" W; 820 m), 25 de Mayo Department, Río Negro Province, Argentina. February, 2009. Abdala, Bonino, Cruz, and Moreno cols.

**Etymology.**— *Shitan* is an Arabian word that means demon. The name *Liolaemus shitan* is because the specimens of this new species are extremely aggressive when captured and because of its dorsal black coloration.

**Diagnosis.**— A large size *Liolaemus* (Max SVL 98.3 mm), which belong to the *L. chiliensis* group. Inside this group it belongs to the *L. elongatus* group (sensu Lobo *et al.* 2010). The new species is distributed far away south from the members of the *L. capillitas* group (Lobo, 2005) – included in the *L. petrophilus* group – which inhabit in Northwestern Argentina and differs from it because the lack of the synapomorphies of the *L. capillitas* group (Lobo, 2005). *Liolaemus shitan* differs from the southern distributed members of the *L. petrophilus* group in having a distinct color pattern, entirely melanic. From *L. elongatus*, *L. parvus*, and *L. gununakuna* differs in having

more ventral scales (120-132 in *L. shitan* vs. 96-113 in the other three species). Dorsal scales in *L. shitan* shows an evident keel, whereas this keel is weak in *L. austromendocinus* and *L. thermarum*. Temporal scales are weakly keeled in *L. shitan*, and smooth in *L. austromendocinus* and *L. smaug*. The number of scales around midbody is lower in *L. shitan* (72-85) than in *L. gununakuna* and *L. thermarum* (84-97). Number of dorsal scales in *L. gununakuna* is larger (83-90) than in *L. shitan* (64-76). *Liolaemus shitan* is larger than *L. parvus*, *L. smaug*, and *L. thermarum*. Also, *L. shitan* exhibit a weakly sexual dichromatism, absent in all members of the *L. petrophilus* group, with the exception of *L. smaug*. The lacks of preloacal pores in *L. thermarum* distinguish it from *L. shitan*. It differs from the member of the *L. kriegi* group (Morando *et al.*, 2003) in the lower number of scales around midbody (72-85 vs 85-110 in *L. burgeri* and *L. kriegi*); the lower number of dorsal scales (69-83 vs 87-110 in *L. kriegi*). The presence of red coloration in cloacal region in *L. burgeri* distinguishes this taxon with *L. shitan* (without red coloration).

**Description of the Holotype.**— Adult male. SVL 98.3 mm. Trunk length 43.3 mm. Head longer (21.9 mm) than wide (18.7 mm). Head height 10.8 mm. Eye diameter 7.3 mm. Interorbital distance 10.7 mm. Orbit–auditory meatus distance 8.2 mm. Auditory meatus height 4.8 mm; 2.5 mm wide. Orbit–commisure of mouth distance 2.3 mm. Internares 3.8 mm. Subocular scale 5.8 mm. Femur length 19.2 mm. Tibia length 22.5 mm. Foot length 28.3 mm. Humerous length 14.2 mm. Tail length 124.1 mm.

Dorsal surface of the head smooth, with 15 scales. Rostral wider than high, bordered by eight scales. Mental larger than rostral, trapezoidal, bordered by four scales. Nasal not in contact with



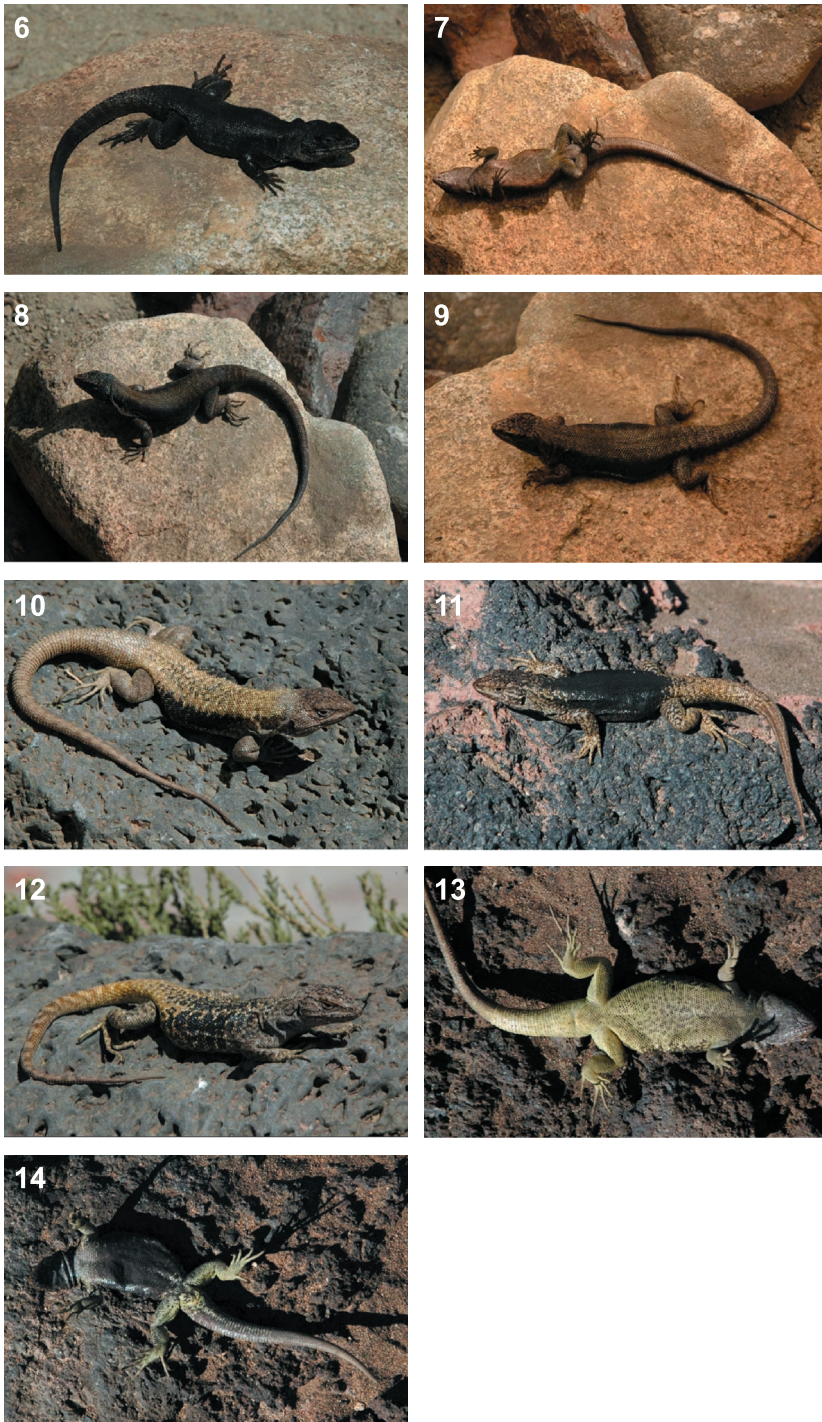
rostral scale. Four internasals. Nasal surrounded by nine scales, separated from canthal scale by three scales. Five scales between frontal and superciliaries. Seven scales between frontal and rostral. Frontal divided in two. Four postrostrals. Interparietal smaller than parietals, in contact with seven scales. Orbital semicircles complete. Preocular separated from lorilabial row by one scale. Two projected scales in anterior margin of auditory meatus. Ten smooth temporals. Ten lorilabials, five of them in contact with subocular. Seven supralabials, none of them in contact with subocular. Five supraoculars. Six infralabials, second in contact, ventrally, with two scales. Five chinshields, second pair separated by two scales.

Eighty-four scales around midbody. Seventy-five triangular, imbricate, and keeled dorsals, from occiput to hind limbs. Scales of flank same sized and shaped than dorsals. One hundred and thirty two ventral scales. Ventral scales same sized than dorsals, flat and imbricate. Fourteen pygal scales. Five precloacal pores. Forty-six smooth and weakly imbricate gulars. Fifty eight scales on neck (from posterior margin of auditory meatus to shoulder, along the longitudinal fold. Antehumeral scales flat, larger or equal sized than dorsals. Postauricular, rictal, and longitudinal folds present. Scales on the longitudinal fold granular and smooth. Fourth finger with 22 subdigital lamellae; fourth toe with 27. Infracarpals flat and imbricate. Infratarsals flat, imbricate, and trifold.

*Color in Life.*—Figs. 6-9. Head black, with some dark brown scales located on nasal and internasal region. Dorsal background black. Without paravertebral nor scapular spots. Dorsolateral bands and vertebral line absents. Lateral regions of body black. Tail, fore and hind limbs with the same color of dorsum. Ventrally, throat, chest, belly, cloacal region and tail lead gray.

*Variation* (based on twelve specimens).— Snout-vent length 75.9-98.7 mm (X = 88.1; SD = 6.7). Head length 17.0-22.3 mm (X = 19.4; SD = 1.8), width 13.2-17.9 mm (X = 15.8; SD = 1.5). Interorbit distance 8.4-11.1 mm (X= 9.8; SD= 0.9). Humerous length 9.8-14.4 (X= 12.3; SD= 1.2). Radio length 9.7-13.6 (X= 11.3; SD= 1.1). Auditory meatus height 2.7-5.4 (X= 4.1; SD= 0.7), wide 1.8-3.0 (X= 2.4; SD= 0.4). Axilla-groin distance 29.4-44.6 mm (X = 38.1; SD = 4.4). Femur length 14.6-19.3 (X= 17.4; SD= 1.5). Tibia length 16.6-21.8 (X= 18.9; SD = 1.4). Tail length 111.3-154.7 mm (X =135.9; SD = 11.6). Midbody scales 72-85 (X =78.3; SD =3.8). Dorsal scales, 64-76 (X = 68.7; SD = 4.0) between occiput and anterior surface of thighs. Dorsal head scales 14-17 (X = 16.0; SD =1.2). Ventrals 120-132 (X = 125.2; SD = 3.6). Scales around interparietal 6-8 (X = 7.1; SD = 0.8). Five to seven (X = 5.5; SD = 0.8) enlarged supraoculars. Eight to nine (X =8.75; SD = 0.5), weakly keeled to absent temporals. Scales on neck 46-54 (X= 49.9; SD= 2.7), between posterior margin of the auditory meatus and shoulder, along the longitudinal fold. Scales between auditory meatus and antehumeral fold 28-34 (X = 31.0; SD = 1.9). Auricular, longitudinal and antehumeral fold present. Gulars 35-47 (X = 40.8; SD = 4.0). Supralabials 8-10 (X = 9.0; SD = 0.8). Infralabials 5-6 (X =5.6; SD = 0.5). Scales around nasals 6-8 (X = 7.2; SD = 0.9). Five to eight scales between rostral and frontal (X = 6.7; SD = 1.0). Four to fifteen scale organs on posrostrals (X = 10.0; SD = 3.2). Seven to ten lorilabials (X = 8.0; SD = 1.1). Two to five lorilabials in contact with the subocular scale. Subdigital lamellae on fourth finger 21-24 (X = 22.7; SD =0.9); on fourth toe 27-31(X = 29.2; SD = 1.4). Precloacal pores 3-4 in males (X= 3.5; SD=0.5), absent in females.

Males and females with similar color pattern. Head black or dark brown with black spots. Dorsal background is strong



**Figure 6.** *Liolaemus shitan* sp. nov. Male in dorsal view. **Figure 7.** *Liolaemus shitan* sp. nov. Male in ventral view. **Figure 8.** *Liolaemus shitan* sp. nov. Male in dorsal view (see the yellow area in the vertebral zone). **Figure 9.** *Liolaemus shitan*. Female in dorsal view. **Figure 10.** *Liolaemus choique* sp. nov. Male in dorsal view. **Figure 11.** *Liolaemus choique*. Male in dorsal view (see black vertebral and paravertebral zones). **Figure 12.** *Liolaemus choique* sp. nov. Female in dorsal view. **Figure 13.** *Liolaemus choique* sp. nov. Female in ventral view. **Figure 14.** *Liolaemus choique* sp. nov. Male in ventral view (see black belly).

black or black with some region of light yellow. In specimens with yellow it can be observed black paravertebral spots. Most of specimens are black over their dorsum. There is not a vertebral line, nor dorsolateral stripes. Sides of body black. Juveniles exhibit three longitudinal black stripes over a yellow background, and when they become adults the dorsal background are black (L. Avila, pers. comm.). Ventrally, gular region dark gray. Belly exhibits the same coloration of throat, but in some specimens it can be pale pink. Hind limbs of males, dark yellow. Tail, dorsally ring patterned, ventrally immaculate gray.

*Distribution.*— *Liolaemus shitan* is known only from its type locality in the South of El Cuy in Río Negro Province. (Fig.5)

*Natural History.*— *Liolaemus shitan* inhabit in a rocky place in Río Negro Province. The specimens were captured while basking in rocks. When basking, the dorsal black coloration become brighter. *Liolaemus shitan* lives in syntopy with *Phymaturus ceii* (Scolaro and Ibarquengoytia, 2007), and *Liolaemus rothi* (Koslowky, 1898).

*Liolaemus choique* sp. nov.

Figs. 10-14

1974. *Liolaemus elongatus elongatus* Cei, J. M., J. Herp. 8:219-229.

1975. *Liolaemus elongatus*. Cei, J. M., Physis, 89: 203-208.

*Holotype.*— FML 22453: Paso el Choique, on provincial road 221, (36°22'01,1" S; 69°48'07,2"W, 2407m.), Malargüe Department, Mendoza Province, Argentina. Abdala, Scrocchi, Carrizo, Martinez, and J. Nori cols. October, 2008

*Paratypes.*— FML 22452, 22454-58: Same data of the holotype.

*Etymology.*— The epithet Choique was used by Araucanian to name to *Pteroc-*

*nemia pennata* (Rheiformes). We named the new species “choique” because its type locality: Paso El Choique.

*Diagnosis.*— A large sized *Liolaemus* (Max SVL 90.7 mm), which belongs to the *L. chiliensis* group. Inside this group, it belongs to the *L. elongatus* group (sensu Lobo *et al.*, 2010). The new species is distributed far away south from the members of the *L. capillitas* group (Lobo, 2005) – included in the *L. petrophilus* group – which inhabit in Northwestern Argentina and differs by the absence of the synapomorphies of the *L. capillitas* group (see Lobo, 2005). The new species differs from *L. austromendocinus*, *L. elongatus*, *L. gununakuna*, *L. parvus*, *L. petrophilus*, *L. shitan*, *L. thermarum*, and *L. smaug*, in the different dorsal color pattern. *Liolaemus choique* is smaller (Max SVL 90.7 mm) than *L. austromendocinus*, *L. petrophilus* and *L. shitan* (98 -103 mm), but larger than *L. parvus* and *L. smaug* (71-77 mm). The temporal scales are slightly keeled in *L. choique*, these keels are absent in the temporal scales of *L. austromendocinus* and *L. smaug*. In *L. choique* the dorsal scales exhibit a conspicuous keel, in *L. austromendocinus* and *L. thermarum* the dorsal scales are weakly keeled. The number of ventral scales (118-135, mean = 124) in *L. choique* is larger than in *L. elongatus*, *L. gununakuna*, and *L. parvus*, (96-105, 108-112 and 96-113 respectively). The number of dorsal scales in *L. choique* (65-81) is lower than in *L. gununakuna* (83-90). The males of *L. choique* exhibit precloacal pores, absent in *L. thermarum*. *Liolaemus smaug* exhibit sexual dichromatism, absent in *L. choique*. The presence of ringed pattern in the tail in *L. austromendocinus*, *L. gununakuna*, and *L. petrophilus* is not shared by *L. choique* (tail without ringed pattern). It differs from the member of the *L. kriegi* group (Morando *et al.*, 2003) in the lower number of dorsal scales (65-81 vs 87-110

in *L. kriegi*). Red coloration in cloacal region is evident in *L. burgeri*, absent in *L. choique*.

*Description of the holotype.*— Adult male. SVL 90.7 mm. Trunk length 37.2 mm. Head longer (21.4 mm) than wide (15.7 mm). Head height 9.6 mm. Eye diameter 5.3 mm. Interorbital distance 9.1 mm. Orbit–auditory meatus distance 7.9 mm. Auditory meatus height 3.4 mm, 2.2 mm wide. Orbit–commissure of mouth distance 2.2 mm. Internares 3.0 mm. Subocular scale 5.1 mm. Femur length 18.4 mm. Tibia length 17.6 mm. Foot length 27.9 mm. Humerous length 12.3 mm. Tail length 150.4 mm.

Dorsal surface of the head smooth, with 17 scales. Rostral wider than high, bordered by six scales. Mental larger than rostral, trapezoidal, bordered by four scales. Nasal not in contact with rostral. Four internasals. Nasal surrounded by six scales, separated from canthal by two scales. Five scales between frontal and supercilliaris. Six scales between frontal and rostral. Frontal divided in two. Two postrostrals. Interparietal smaller than parietals, in contact with seven scales. Orbital semicircles complete. Preocular separated from lorilabial row by one scale. Five scales projected in anterior margin of auditory meatus, disposed like a bunch. Eleven slightly keeled temporals. Eight supralabials, none in contact with subocular. Seven supraoculars. Seven lorilabials, three of them in contact with subocular. Five infralabials, second in contact, ventrally, with two scales. Five chinshields, second pair separated by two scales.

Eighty-five scales around midbody. Seventy-five triangular, imbricate, and keeled dorsals from occiput to hind limbs. Scales of flank same sized and shaped than dorsals. Ventrals same sized than dorsals, flat and imbricate. One hundred and twenty nine ventrals. Thirteen pygals. Four precloacal pores. Forty-three smooth, slightly imbricate gu-

lars. Fifty four scales on neck (from posterior margin of auditory meatus to shoulder along the longitudinal fold. Antehumeral scales flat, larger or equal sized than dorsals. Postauricular, rictal, and longitudinal folds present. Scales on the longitudinal fold granular and smooth. Fourth finger with 19 subdigital lamellae. Fourth toe with 26. Infracarpals and infratarsals imbricate and trifold.

*Color in life.*— Head dark brown with black spots irregularly speckled on dorsum and temporal region. Dorsal background bright yellow with numerous black irregular scales and spots on vertebral and paravertebral region. Sides of body, with a black stripe over the yellow background. Without paravertebral spots, vertebral line nor dorsolateral stripes. Dorsally, fore and hind limbs gray, with black spots. Tail, dorsally yellow with irregular dark brown bands which exhibit white spots. Ventrally, throat, chest and anterior region of belly lead gray. Posterior region of belly, forelimbs and cloaca region, dark gray with black scales. Tail yellowish gray.

*Variation* (based on eight specimens).— Snout-vent length 62.3–90.3 mm ( $X = 76.1$ ;  $SD = 9.7$ ). Head length 12.2–18.5 mm ( $X = 16.9$ ;  $SD = 1.3$ ), width 11.1–15.2 mm ( $X = 13.3$ ;  $SD = 1.4$ ). Interorbit distance 7.3–9.4 mm ( $X = 8.5$ ;  $SD = 0.8$ ). Humerous length 9.7–11.3 ( $X = 10.5$ ;  $SD = 0.7$ ). Radio length 8.9–10.8 ( $X = 9.8$ ;  $SD = 0.7$ ). Auditory meatus height 2.3–3.6 ( $X = 3.1$ ;  $SD = 0.4$ ), wide 1.8–2.4 ( $X = 2.2$ ;  $SD = 0.2$ ). Axilla-groin distance 23.7–37.8 mm ( $X = 32.7$ ;  $SD = 5.2$ ). Femur length 13.4–16.1 ( $X = 14.7$ ;  $SD = 0.8$ ). Tibia length 13.2–17.1 ( $X = 15.2$ ;  $SD = 1.2$ ). Tail length 116.2 (only one specimen exhibits the tail not autotomized). Midbody scales 74–88 ( $X = 78.9$ ;  $SD = 5.0$ ). Dorsal scales, 65–81 ( $X = 72.6$ ;  $SD = 6.2$ ) between occiput and anterior surface of thighs. Dorsal head scales 13–18 ( $X = 14.9$ ;  $SD = 1.7$ ). Ventrals 118–134 ( $X = 123.7$ ;  $SD = 5.2$ ). Scales around interpa-

rietal 5-7 (X = 5.7; SD = 0.8). Six to seven (X = 6.4; SD = 0.5) enlarged supraoculars. Eight to ten (X = 8.7; SD = 0.8), smooth temporals. Scales on neck 41-50 (X = 45.7; SD = 2.8), between posterior margin of the auditory meatus and shoulder, along the longitudinal fold. Scales between auditory meatus and antehumeral fold 26-32 (X = 29.9; SD = 1.9). Auricular, longitudinal and antehumeral fold present. Gulars 35-39 (X = 37.0; SD = 1.3). Supralabials 6-8 (X = 7.4; SD = 0.8). Infralabials 4-6 (X = 5.4; SD = 0.8). Scales around nasals 6-7 (X = 6.7; SD = 0.5). Five to eight scales between rostral and frontal (X = 6.0; SD = 1.4). Seven to twelve scale organs on posrostrals (X = 9.1; SD = 1.5). Seven to nine lorilabials (X = 8.6; SD = 0.8). Five to six lorilabials in contact with subocular scale. Subdigital lamellae on fourth finger 18-22 (X = 19.9; SD = 1.2); on fourth toe 23-28 (X = 25.6; SD = 1.7). Precloacal pores 3-4 in males (X = 3.3; SD = 0.6), absent in females.

*Variation in coloration.*— Figs. 9-14. Without sexual dichromatism. Head dark brown with black spots in dorsal and lateral sides. In some specimens those spots are wider and cover the most of the head. Dorsal background yellow with three black irregularly stripes. One of them located in the vertebral zone and the other two in lateral fields of body. Some specimens show the entire dorsum black, because the stripes are wider and join together. The black spots are present dorsal region of fore and hind limbs, and in the base of tail. Neck and occipital region are yellow. Ventrally, pale yellow with gray or black spots. In some specimens those spots are widespread, making the throat and chest completely black or dark gray. In males thighs can exhibit a bright yellow coloration. This coloration is absent in females.

*Distribution.*— *Liolaemus choique* is known only from its type locality in

Malargüe Department, Mendoza, Argentina (Fig. 5).

*Natural History.*— *Liolaemus choique* was founded in a region of slopes with volcanic rocky places, and vegetation primarily formed by bushes. Is a saxicolous species, which take refuge under the rocks or in crevices, although we found some specimens under bushes. Is a fast lizard like all other members of the *L. petrophilus* group, and can be observed basking on rocks at noon or at early afternoon. No more data about its biology are known.

## DISCUSSION

The *Liolaemus elongatus* group, like the genus, increased almost exponentially its taxonomic composition since it was proposed (Ceï, 1974) to the present day. Ceï (1986) included in this group three species (*L. austromendocinus*, *L. elongatus* and *L. petrophilus*). Later Espinoza and Lobo (2003) redefined the group including three more species (*L. capillitas*, *L. heliodermis*, and *L. thermanum*). Those assignments were performed without a phylogenetic analysis. The molecular based phylogeny performed by Schulte *et al.* (2000), include two species of the *elongatus* group (*L. austromendocinus* and *L. elongatus* = *L. parvus*, see Quinteros *et al.*, 2008a). Lobo (2001) studied the phylogenetic relationships of the *Liolaemus sensu stricto* subgenus, recovering a clade formed by ((*L. austromendocinus* + *L. cf. elongatus* = *L. parvus*, see Quinteros *et al.*, 2008a) (*L. elongatus* (*L. capillitas* + *L. cristiani*)). With the description of two new species, Espinoza and Lobo (2003) divided the group in two, naming a northern clade (formed by: *L. capillitas*, *L. dicktracyi*, *L. heliodermis*, and *L. umbrifer*) and a southern clade (formed by: *L. austromendocinus*, *L. elongatus*, *L. petrophilus* and *L. thermanum*). Morando *et al.* (2003) per-

formed a phylogeographic analysis of the *elongatus* – *kriegi* group. Inside these groups, Morando *et al.* (2003) included three groups (*elongatus*, *kriegi*, and *petrophilus* groups), splitting the population assigned to *L. elongatus* from all other members of the group. The *petrophilus* group remains formed by: ((a clade with populations of *L. petrophilus*) (*L. sp1*= *L. talampaya* + *L. capillitas*)) ((*L. sp2*= *L. gununakuna* (*L. austromendocinus* + *L. sp4* = *L. parvus*)). In a phylogenetic analysis Avila *et al.* (2004), included populations studied by Morando *et al.* (2003) and Espinoza and Lobo (2003), and they found the *petrophilus* group formed by ((*L. gununakuna* (*L. austromendocinus* + *L. parvus*)), and the other (((*L. talampaya* + *L. dicktracyi*) *L. tulkas*)) (*L. capillitas* + *L. umbriifer*)). Lobo (2005) re-analyzed a previous study (Lobo, 2001) adding more taxa and characters, finding and defining the *capillitas* group, formed by the northern clade of Espinoza and Lobo (2003) and the same clade found by Avila *et al.* (2004). The *capillitas* group is supported by two synapomorphies: spots in the shoulder region and a red coloration in the cloacal zone. The new species described here do not show those character states so, they are not members of the *capillitas* group of Lobo (2005). *Liolaemus smaug* could be one of the populations (*L. sp5*) studied by Morando *et al.* (2003), closely distributed. Also, Morando *et al.* (2003) mentioned that this population may correspond to *L. thermarum*, differing in the presence of preloacal pores, one of the differences we found here. In the same work, Morando *et al.* (2003) studied a population from Río Negro Province with black dorsal coloration, concluding that this population is a black morph of *L. elongatus*. Based in our studies this population is actually *L. shitan*, and also differ from *L. elongatus* in squamation character states. Both, *Liolaemus smaug* (as *L. sp5*) and *Liolaemus shitan* are included in the *L. elongatus* group

of Morando *et al.* (2003). In Avila *et al.* (2004) work, *Liolaemus smaug* (as *L. sp5*) is a member of the *L. elongatus* group. In both approaches, the *L. elongatus* group is more related to the *L. kriegi* group (*L. burgeri* and *L. kriegi*) than the *L. petrophilus* group. In a morphology based phylogeny performed by Lobo (2005) the *L. kriegi* group (formed by *L. ceii*, *L. kriegi*, and eventually *L. burgeri*) is more related to species of the *L. leopardinus* group more than any member of the *L. elongatus* or *L. petrophilus* group. Moreover, *L. burgeri* is recovered as a member of the *L. capillitas* group because it shows red coloration in cloaca region. Based on these facts a new phylogenetic analysis including the new species described is needed to understand the taxonomic composition and the relationships of the *L. elongatus*, *L. kriegi* and *L. petrophilus* groups.

Although we describe three new species, there are many populations members of the *L. elongatus* group, which still remains unknown.

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## APPENDIX

Specimens examined. The acronyms follows Leviton *et al.* (1985) except for MCN (Museo de Ciencias Naturales de la Universidad Nacional de Salta, Argentina).

*L. austromendocinus*: FML 3432–433, 7189–191, 7240–243; MCN 604–609. *L. buergeri*: FML 7192–195; MCN 501–502, 2023–2024, 2188. *L. capillitas*: FML 1229; 1316; 1914; 1933, 2029; 2427; 3083–084. *Liolaemus choique*: FML 22453 (Holotype); FML 22452. 22454–58 (Paratypes). *L. dicktracyi*: FML 9928 (Holotype), FML 9929–33 (Paratypes), MCN 461–62 (Paratypes). *L. elongatus*: FML 1606; FML 2112; FML 13070; FML 13071. *L. gununakuna*: FML 12717 (Holotype); FML 12718–20 (Paratypes); FML 13043–44 (Paratypes). *L. heliodermis*: FML 7196 (Holotype), 6006–07 (Paratypes). *L. parvus*: FML 16548 (Holotype), 16546–547, 16549 (Paratypes); FML 2737, 2965; FML 2593 (Paratypes); FML 16121–125 (Paratypes). *L. petrophilus*: MCZ 156902 (Paratypes), 170441–42. MCN 1346–347; FML 793, 10074. *Liolaemus shitan*: FML 19276 (Holotype); FML 19277 – 283; FML 23832–836; (Paratypes); FML 13060–61; FML 8573. *Liolaemus smaug*: FML 22449 (Holotype); FML 22444 – 448 (Paratypes); FML 23817–18 (Paratypes); FML 22451 (Paratype); FML 7216–18. FML 1041; FML 7777; FML 7839; FML 7769; FML 7779. *L. talampaya*: MCN 2031–036. *L. tulkas*: FML 18136 (Holotype). FML 18317–321 (Paratypes). *L. umbrifer*: FML 9934 (Holotype), FML 9935–45 (Paratypes), MCN 463–464 (Paratypes), 488–89, 2185–2187.