A new species of *Liolaemus* (Reptilia: Squamata) from southwestern Rio Negro province, northern Patagonia, Argentina

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Abstract

A new species of lizard of the genus *Liolaemus* from southwestern Rio Negro Province, central Patagonia is described. The new species is a member of the *Liolaemus fitzingerii* group, and molecular data show it as sister taxon of *L. martorii*, but it differs in size, squamation, coloration, and sexual dimorphism. *Liolaemus casamiquelai* sp. nov. is terrestrial, dwelling on loose sandy soil in a shrubby landscape, and seems to be oviparous and insectivorous.

Key words: Iguanidae; Liolaemini; melanops complex; *Liolaemus casamiquelai* sp. nov.; new species

Resumen

Se describe una nueva especie de lagartija del género *Liolaemus* del suroeste de la Provincia de Rio Negro, Patagonia Central. La nueva especie es un miembro del grupo *Liolaemus fitzingerii*, y datos moleculares la muestran como el taxón hermano de *L. martorii*, diferenciándose en tamaño, escamación, coloración y dimorfismo sexual. *Liolaemus casamiquelai* sp. nov. es terrestre, vive en suelo arenoso suelto en un ambiente arbustivo, y parece ser ovípara e insectívora.

Palabras claves: Iguanidae; Liolaemini; complejo melanops; *Liolaemus casamiquelai* sp. nov.; nueva especie

Introduction

The liolaemid lizard fauna of central Patagonia is very rich but still inadequately known despite extensive field work over the last four decades. In the 1970’s and 1980’s several new species were described, all endemic to this region (e.g. *Liolaemus petrophilus* Donoso Barros & Cei 1971; *L. somuncurae* Cei & Scolaro 1981). In the last ten years new field surveys in central Chubut and Rio Negro provinces revealed several new species of *Liolaemus* (e.g. *L. sagei* Etheridge & Christie, *L. tehuelche* Abdala, *L. inacayali* Abdala, *L. uptoni* Scolaro & Cei, *L. chehuachekenk* Avila et al.). Further, other species of this liolaemid lizard genera was re-validated (*Liolaemus goetschi* Cei and Scolaro 2003), and new surveys in poorly known areas, coupled with the application of molecular techniques, revealed that several probably new species of *Liolaemus* remain undescribed (Avila et al. 2006a; Morando et al. 2003, 2004, 2007). *Liolaemus* predominates in the lizard fauna of austral South America, and ranges from coastal central Perú southward through Bolivia, Paraguay, Chile, and Argentina, and up to the Atlantic coast of Uruguay and southeastern Brazil (Etheridge & Espinoza 2000). About 220 species are known, of which 60 have been described in the last ten years, and new species descriptions are published at a rate of five or six per year (Abdala et al. 2008). One detailed study of a single species complex suggested that the total number of actual species might be approximately triple the number known at that time (Morando et al. 2003).
Two main clades are recognized in *Liolaemus*, the *Eulaemus* and *Liolaemus* sensu stricto. The *Eulaemus* clade encompasses several subclades (Morando 2004; Avila *et al.* 2006a; Abdala 2007), including a group of large species distributed mainly south of Colorado River in sandy lowland habitats of Patagonia. Recent studies (Morando 2004; Avila *et al.* 2006a) referred to this clade as the *fitzingerii* group, which includes two main species complexes *L. fitzingerii* and *L. melanops*; a phylogenetic approach not followed by Abdala (2007) in a recent taxonomic study.

Here we describe a new species of *Liolaemus* from southwestern Río Negro Province that shows morphological and chromatic differences from all other described species of *Liolaemus*, and belongs to the *melanops* species complex as defined by Morando (2004) and Avila *et al.* (2006a).

**TABLE 1.** Summary of morphometric, meristic, and chromatic characteristics in species of the *Liolaemus melanops* complex. *L. goetschi* data are from Müller and Hellmich, (1938), and *L. morenoi* data from Etheridge and Christie (2003). SAM = scales around midbody, DS = dorsal scales, VS = ventral scales, and PP = precloacal pores.

<table>
<thead>
<tr>
<th>Species</th>
<th>Maximum SVL (in mm)</th>
<th>SAM</th>
<th>DS</th>
<th>VS</th>
<th>PP</th>
<th>Scapular marks</th>
<th>Ventral melanism</th>
<th>Head Hood</th>
<th>Sexual dichromatism</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>L. casamiquelai</em> (n = 30)</td>
<td>106.2</td>
<td>64–78</td>
<td>66–87</td>
<td>92–115</td>
<td>7–11</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td><em>L. melanops</em> (n = 27)</td>
<td>83.3</td>
<td>64–75</td>
<td>75–90</td>
<td>94–122</td>
<td>7–11</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Strong</td>
</tr>
<tr>
<td><em>L. martorii</em> (n = 22)</td>
<td>75.5</td>
<td>56–67</td>
<td>68–79</td>
<td>82–107</td>
<td>5–10</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Weak</td>
</tr>
<tr>
<td><em>L. goetschi</em> (n = 5)</td>
<td>73</td>
<td>57–66</td>
<td>---</td>
<td>---</td>
<td>7</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td><em>L. morenoi</em> (n = 9)</td>
<td>87</td>
<td>72–85</td>
<td>72–95</td>
<td>---</td>
<td>8–10</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td><em>L. canqueli</em> (n = 24)</td>
<td>92.2</td>
<td>67–79</td>
<td>70–90</td>
<td>90–117</td>
<td>7–10</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

**Material and methods**

Specimens were collected by hand or forks, sacrificed by a pericardic injection of sodium pentothal Abbot®, dissected slightly to extract a sample of liver for molecular study, fixed in 10-20% formalin, and later transferred to 70% ethanol. Measurements were taken with a digital caliper to the nearest 0.1 mm. Some character states were observed with the aid of a binocular stereomicroscope. Scale terminology follows Smith (1946), and recent treatments of related species by Etheridge and Christie (2003). Where numbers of paired scales are provided they are given as left-right, and terminology of lateral neck folds follows Frost (1992). Descriptions of color in life are based on notes taken in the field and color photographs of recently captured animals. We examined sample series of related species of the *melanops* complex (Morando 2004; Avila *et al.* 2006a; Table 1, Appendix I) from the herpetological collections of Fundación Miguel Lillo (FML), Argentina; Monte L. Bean Museum, Brigham Young University (BYU); Museo de La Plata, Universidad Nacional de La Plata (ML.P/S/R); Museum of Vertebrate Zoology, University of California-Berkeley (MVZ); Museo Argentino de Ciencias Naturales Bernardino Rivadavia, Buenos Aires (MACN), and the Herpetological Collection L. J. Avila / M. Morando (LJAMM-CNP) of the Centro Nacional Patagónico, Puerto Madryn, Argentina (CENPAT–CONICET, http://www.cenpat.edu.ar/nuevo/colecciones03.html). Data from *L. morenoi* were taken from Etheridge and Christie (2003) and from lizards collected in the type locality. Data from *L. goetschi* were taken from Müller and Hellmich (1939) and from lizards collected in the type locality. Molecular procedures: Protocols for DNA extraction, mtDNA cytochrome–b primer description, PCR, and sequencing procedures follow Morando et al. (2003). See Appendix I for specimens used for molecular analyses. Alignment: Sequences were edited and aligned using the program Sequencher 3.1.1 (Gene Codes Corporation Inc. 1995). Phylogenetic Analyses: We used PAUP* (version 4.0b4b; Swofford, 2001) to run a Maximum Parsimony exhaustive search and 10,000 bootstrap pseudoreplicates (Felsenstein 1985). Bayesian analyses based on GTR + I model of evolution determined using jModelTest v0.1.1 (Guindon and Gascuel 2003; Posada, 2008), were performed using MrBayes 3.1.2 (Huelsenbeck and Ronquist 2001). *A priori* the specific parameter values were uniform and were estimated as part of the analysis. From a random starting
tree, we ran $5.0 \times 10^6$ generations and sampled the Markov chains at intervals of 1,000 generations. We burn-in 25% of the samples and the equilibrium samples were used to generate a consensus tree. The percentage of samples that recover any particular clade on this tree represents that clade’s posterior probability (PP), these are the $P$-values.

Results

*Liolaemus casamiquelai* sp. nov.
(Figure 1, 2)

**Type material.** Holotype: MACN 39042, an adult male collected along the south side of Ruta Nacional 23, 14 km W Aguada de Guerra (41° 09’ S, 68° 30’ W, 866 m, Fig. 5), 25 de Mayo Department, Río Negro province, Argentina, 27 November 2000, by L. J. Avila, and C. H. F. Perez.

![FIGURE 1. *Liolaemus casamiquelai*, holotype adult male (MACN 39042), from southern edge of Ruta Nacional 23, 14 km W Aguada de Guerra, 25 de Mayo Department, Río Negro province, Argentina.](image)

33.2 km N junction Ruta Provincial 6 (40°02’S, 68°54’ W, 876 m), El Cuy Department, Río Negro province, Argentina, 6 November 2008, by L. J. Avila, and M. Nicola. LJAMM-CNP 2973-6 adult males. Ruta Provincial 6, 64 Km NE Ingeniero Jacobacci (40°53’, 69°17’, 854 m), 25 de Mayo Department, Río Negro province, Argentina, 29 November 2000, by L. J. Avila, and C. H. F. Pérez.

**FIGURE 2.** Dorsal (upper) and ventral (below) view of the *Liolaemus casamiquelai*, holotype.

**Diagnosis.** *Liolaemus casamiquelai* is a robust and medium sized member of the clade of *Liolaemus* referred to as the *boulengeri* group by Etheridge (1995), and is a member of the *Liolaemus melanops* complex that includes *L. canqueli*, *L. goetschi*, *L. martorii*, *L. melanops*, *L. morenoi*, and several other candidate species still in need of detailed morphological study (Morando 2004; Avila *et al.* 2006a). *Liolaemus casamiquelai* can be distinguished from all other species of its group of *Liolaemus* by a combination of characteristics: its larger size, stout body, intense melanic venter, lack of melanic head, and bright green dorsal coloration with a pattern of transversal irregular black stripes (Figs. 1, 2, 3). *Liolaemus casamiquelai* differs from *L. canqueli* and *L. melanops* in lacking a dark brown or black hood on the head in adults of either sex, and from *L. goetschi* and *L. martorii* in lacking large, black pre-and postcapular spots and these species are smaller. *Liolaemus casamiquelai* differs from *L. morenoi* in having a green background color with transverse black bands rather than a dorsal background color of light tan with brown spots or wavy with white posterior borders.

**Description of the holotype.** Adult male 92.7 mm (SVL), tail 131.0 mm. Axilla-groin distance 43.7 mm.

- Head length 17.7 mm; head width 14.9 mm; head depth 11.0 mm. Arm length 26.2 mm; tibial length 19.0 mm; foot length 26.4 mm.

- Upper head scales smooth, convex, bulged, pitted with scale organs. Rostral pentagonal, twice as wide as high (3.17 x 1.4 mm). Two postrostrals, wider than high, nasal scales separate from rostral. Nasal scales subpentagonal in shape (1.8 x 1.7 mm). Nostrils roughly oval in shape, occupying almost half of the nasal scale. Nasal scales in contact with eight scales on each side. Internasal scales slightly convex. Four internasals, two in contact with postrostral, left almost rectangular, right quadrangular; two separate from postrostral by first internasal, almost oval in shape. Four frontonasals, two medials, hexagonal, in tandem, smaller than laterals. Left lateral frontonasals larger than right lateral scale. Nine prefrontals, regularly arranged, first row with a small medial, two large mediolateral and two smaller lateral; medial and laterals
rhomboidal and similar in size, mediolaterals symmetric but roughly rectangular. Second row with two symmetric scales, regular and roughly pentagonal in shape, last row with two symmetric but smaller scales. Four small frontal scales almost similar in size than last prefrontals, in two rows. Eight frontoparietals irregular in shape, larger than frontal and parietal; arranged in three rows. Interparietal pentagonal with a large and conspicuous white cream “eye” in the middle, surrounded by five scales. Two large parietals, regularly arranged. Circumorbital circles incomplete: 13–14. Supraoculars 8–9, laterally expanded. Two rows of irregular, small scales between supraoculars and external circumorbital, 11-15. Superciliaries 7-7, first five strongly overlapped. Nuchal scales small, irregularly rounded, slightly bulged. Two internasals. First canthal higher than wide, separating first and second loreals, contacting lorilabials. Posterior canthal longer than wide. Posterior canthal overlaps only a small part of first superciliary. Loreals: three irregular in size but symmetrically arranged on each side, two between first canthal and preocular. Canthals, preocular and anterior subocular forming a slight concavity. One preocular, slightly longer than wide; one elongate subocular (5.1 x 0.8 mm), one small postocular; a very evident keel in preocular and subocular, postocular with a less marked keel. Lorilabials convex to flat, 7-7, all roughly quadrangular, pitted with conspicuous and numerous scale organs. Upper ciliary scales in two rows, rectangular, compressed, and moderately projecting. Lower and upper ciliaries similar in size and shape. Palpebral scales small, irregular, convex. Supralabials 8-8, slightly convex. Temporal scales rounded, smooth, convex, juxtaposed, with a scale organ in the tip. Auditory meatus higher than wide (3.4 x 1.2 mm) surrounded by granular scales. Mental pentagonal wider than high (2.9 x 2.0); in contact with anterior infraoral and postmental but not in contact with anterior sublabials. Infraoral 6-5, Chinshields 5-5, transversally expanded, separated from infraoral by series of 2-3 elongated but smaller sublabials. Only a few scale organs present in supralabials and infraoral. Gular scales smooth, flat, imbricate, rhomboidal, immediately after postmental, gradually becoming rounded posteriorly and with a distinct posterior apical notch. Lateral neck folds (longitudinal, oblique, antehumeral and postauricular) well developed. Antegular and gular folds not developed. Dorsal body scales subtriangular, slightly to not imbricated. Eighteen to 24 longitudinal rows with scales with distinct but smooth keels, a few with an apical scale organ. At midbody, dorsal scales laterally smooth, imbricate. Scales anterior to, above, posterior, and close to posterior forelimb and hind limb insertions, small, smooth, slightly overlapping, becoming granular. Ventral body scales smooth, flat, imbricate, with an apical notch in gulars; subtriangular to obovate, same size than dorsal body scales. Scales around midbody 72; scales between occiput an anterior margin of hind-limb articulations 76. Scales of cloacal apron more equal in size than ventral body scales. Preocular pores 7. Supraboralis smooth, rhomboidal, imbricate, with a small notch in the tip. Infraoral small, convex, and not overlapping. Supra-antelabials smooth, imbricate, rhomboidal to obovate, some with a small notch in the tip, others larger than suprabroralis. Infra-antelabials smooth, rhomboidal, distally becoming with one to three small but distinct spines near the hand insertion. Supracroes smooth, strongly imbricate. Infraoral keeled, imbricate. Supradigital lamellae smooth, strongly imbricate. Subdigital lamellae tricarinate, imbricate, numbering: I: 12, II: 20, III: 20, IV: 16, V: 10. Suprafemoral smooth, imbricate, rhomboidal, few with an apical scale organ. Suprafemoral smooth, imbricate, rhomboidal. Supratibials smooth, imbricate, becoming rounded distally. Twenty six to 45 spinoe scales in a postfemoral patch. Infratibials smooth, imbricate. Supratarsals, smooth, imbricate, a few with an apical notch. Infratarsals strongly imbricate, with one keel, and one to three small but distinct spines near the digits insertion. Supradigital smooth, imbricate. Infradigital bi- to tri-carinate, numbering I: 11, II: 16, III: 23, IV: 29, V: 18. Ventral caudal scales smooth, a few slightly keeled, imbricated. Dorsal caudal scales keeled, imbricated. 

**Coloration.** In life, general background color on neck, body, tail, and limbs, brightly green-yellow (in sunlight) becoming gray/light gray in the shade. Dorsal head surface irregularly brown intermixed with smaller, irregular gray areas, grading to light tan in azymous and nuchal areas. Between occupit and rump, a series of twelve more or less regular, transversal black bands, 2-5 scales wide, more regular in the midbody between limbs. First two marks on the nuchal area irregularly divided and merged, limiting clear spots with background coloration. Markings continue on the lateral sides of the head and neck as irregular well-marked lines 1-2 scales wide, becoming faded and gray on the ventral surface. On the lateral sides of the head, clear areas are larger and clear-white. On the trunk dorsum, transversal marks are broken, or slightly connected.
along vertebral midline. Some marks between limbs become forked on the lateral regions of the trunk. All marks between limbs extend, usually well defined, to the ventral scales. Between legs and first third of the tail, transverse marks merge and become more regular. Along the tail transverse marks merge longitudinally and become almost indistinguishable in the last third of the tail. Background coloration becomes light-gray on distal two-thirds of the tail. Lower lateral sides of the neck, trunk, and first third of the tail orange-yellow when lizard is in the shade without bright coloration. Otherwise, no lateral color differs from the general background. On dorsal limb areas an irregular pattern of black lines, continuous from the dorsum, delimit rounded or irregular, clear spots with a light gray background. Ventral surfaces of the gular, chest, belly, interfemoral, femoral and apron areas black. Ventral surface of the limbs and tail white with some gray areas. All bright coloration disappears after capture, and after several years in preservative, all coloration became faded.

**FIGURE 3.** *Liolaemus casamiquelai* (A) and the other species in its clade: *L. morenoi* (B), *L. martorii* (C), *L. melanops* (D), *L. goetschi* (E), and *L. canqueli* (F). All males from the type localities. *Liolaemus goetschi* (type specimen) photograph courtesy of the Zoologische Staatssammlung München through Dr. K. Delhey

**Variation.** Based on the paratypes (Table 2, Fig. 4): in 15 males: SVL 78.8–106.2 mm. Axilla groin distance 37.8–54.5 mm. Foot length 15.6–27.1 mm. Tibial length 16.2–19.6 mm. Arm length 22–28.5 mm. Head length 15.1–18.8 mm. Head width 13.1–16.2 mm. Head depth 9.5–13.8 mm. Midbody scales 64–78. Dorsal scales between occiput to rump 66–87. Ventral scales 92–109. Supralabials 6–9. Infralabials 5–7. Fourth toe lamellae 27–32. Precloacal pores 7–11. In 15 females: SVL 74.1–103.5 mm. Axilla-groin distance 38.3–56.4 mm. Foot length 21.8–27.0 mm. Tibial length 15.3–18.2 mm. Arm length 22.1–26.6 mm. Head length 13.9–18.2 mm. Head width 12–15.0 mm. Head depth 9.1–11.6 mm. Midbody scales 66–76. Dorsal scales between occiput to rump 75–84. Ventral scales 96–115. Supralabials 5–9. Infralabials 5–7. Fourth toe lamellae 25–33. Dorsal head scales variable in size, some irregular in shape, most convex but a few almost
flat. Cloacal apron larger in males that in females. Scales of the cloacal apron slightly smaller that ventral scales in males, same size or slightly smaller in females. Postfemoral patch not present in females and variable in size in males between 18–22 scales.

**TABLE 2.** Morphometric and meristic variation in the *Liolaemus casamiquelai* type series. Means and standard deviations (SD) of the main morphometric and meristic characters. Measures in mm and scale in numbers.

<table>
<thead>
<tr>
<th>Character</th>
<th>Males (N= 15)</th>
<th>Females (N= 15)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SVL</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Axilla-groin distance</td>
<td>46.07</td>
<td>3.94</td>
</tr>
<tr>
<td>Head length</td>
<td>17.58</td>
<td>1.29</td>
</tr>
<tr>
<td>Head width</td>
<td>14.95</td>
<td>1.17</td>
</tr>
<tr>
<td>Head high</td>
<td>10.89</td>
<td>1.04</td>
</tr>
<tr>
<td>Foot length</td>
<td>25.11</td>
<td>2.77</td>
</tr>
<tr>
<td>Tibial length</td>
<td>18.00</td>
<td>1.19</td>
</tr>
<tr>
<td>Arm length</td>
<td>25.73</td>
<td>1.64</td>
</tr>
<tr>
<td>Midbody scales</td>
<td>71</td>
<td>4.38</td>
</tr>
<tr>
<td>Dorsal scales</td>
<td>78.13</td>
<td>5.15</td>
</tr>
<tr>
<td>Ventral scales</td>
<td>100.8</td>
<td>5.0</td>
</tr>
<tr>
<td>Fourth toe lamellae</td>
<td>29.26</td>
<td>1.48</td>
</tr>
<tr>
<td>Supralabial scales</td>
<td>7.66</td>
<td>1.17</td>
</tr>
<tr>
<td>Infraorbital scales</td>
<td>6</td>
<td>0.75</td>
</tr>
<tr>
<td>Cloacal pores</td>
<td>8.33</td>
<td>1.18</td>
</tr>
</tbody>
</table>

In some individuals melanic coloration is more extensive than the holotype. In a few individuals dorsal transversal marks are connected longitudinally, becoming lines of clear dots on the dorsum. In some individuals melanic coloration extends on lateral sides of the neck and head, leaving only a few clear scales; others have the same areas with a very reticulated pattern of anastomosed gray lines. All individuals show a bright yellow-green coloration in full sun, which immediately fades in the shade and disappears completely when lizards are kept in captivity. Dorsal background color bright green in recently captured adult males and females, few individuals (20-30%) have a yellowish-green sheen. Individuals from locality Ruta Nacional 23 10 km E Ingeniero Jacobacci have a grey background coloration on the head and tail.

**Etymology.** To honor Rodolfo Magín Casamiquela, a recently deceased vertebrate paleontologist and anthropologist, born in Ingeniero Jacobacci (formerly Huahuel Niyeu) in 1932, a small town very close to *L. casamiquelai* type locality. R. M. Casamiquela was a researcher (retired) of Consejo Nacional de Investigaciones Científicas y Técnicas of Argentina (CONICET), and developed a large and prolific scientific and cultural literature ranging from amphibians fossils to historic tales of Patagonia.

**Geographic distribution.** *Liolaemus casamiquelai* is known from five localities (Fig. 6) in western Rio Negro province: (1) the type locality, (2) in the eastern edge of Cari Lafquen Chica Lagoon, (3) along the National Road 23 eastern of Ingeniero Jacobacci town, (4) 64 km north of Ingeniero Jacobacci along the Provincial Road 6, and (5) south of Aguada Guzman town, along the Provincial Road 74.

**Natural history.** The holotype and the paratypes were found basking on the edges or walking inside of clumps of spinose shrubs. All localities except (5) are in Meseta Central ecoregion (Bran *et al.* 2000), the most arid region in Río Negro province, with an annual rain lower than 200 mm and temperatures between 10-12°C. This ecoregion is characterized by the presence of lower plateaus, small hills, and peneplains covered by lower-shrub steppe vegetation with dominant plants as Nassauvia axillaris, N. glomerulosa, and Chuquiraga avellanedae or shrub-grass steps with clumps of Prosopis denudans and Lycium sp, surrounded by grassy...
areas with several species of grass, more common is *Stipa humilis*. The fifth locality is an ecotonal area between southern Monte and the Meseta Central ecoregion, with the same vegetation plus some individuals of *Larrea* spp. and clumps shrubs of *Schinus johnstonii*. According to Cabrera (1994) phytogeographic classification, all the localities are included in the Dominio Andino Patagónico, Provincia Patagónica. All of the sites where *L. casamiquelai* were collected are similar in physiography, normally flat, with sandy soil mixed with gravel areas or more compacted soil. Clumps of shrub appear in areas with some degree of protection from the strong winds typical of Patagonia; these clumps are composed mainly of *Prosopis denudans* (or *Schinus johnstonii* in locality 5) and smaller shrubs of *Atriplex* sp., *Lycium chilensis*, and *Chuquiraga avellanedae*, all of which grow under the protection of this spiny mesquite. These clumps reach a maximum height of 1.8 m, and cover an area between two to four m² and separated from each other by distances of two or three meters. This region is characterized by highly degraded soils (due to overgrazing), and shows a tendency towards desertification. Clumps seem to be the safest areas for lizards and rodents, as well for some birds. The majority of the lizards were observed only inside or in the immediate vicinity of the spiny shrub clumps. We never observed a lizard in small shrubs or between grasses surrounding this clumps. All lizards observed during several field trips were seen in the immediate edges or inside the clumps. Usually lizards bask under sun in early morning (09:00 to 10:00) and in late afternoon (18:00 to 19:00) in the mid-summer, when they show a bimodal type of activity, but in early spring and late-summer they usually show continuous activity without a mid-day break. In the type locality we collected other species of *Liolaemus* living in syntopy with *L. casamiquelai*, including *L. inacayali*, *L. bibronii*, and *L. aff. melanops*, as well as two leiosaurid species *Leiosaurus bellii* and *Pristidactylus nigroangulus* Avila et al. (2003). In other localities we collected *Liolaemus elongatus*, *L. petrophilus*, *Phymaturus aff. ceii*, and *Homonoia darwinii* usually in nearby

**FIGURE 4.** Variation in some individuals of the type series. Dorsal and ventral color variation in some individuals of the type series of *Liolaemus casamiquelai* showing variation in dorsal and ventral coloration; only individuals showing extreme variation are included.
FIGURE 5. General view of the type locality of *Liolaemus casamiquelai* from a northern perspective. Lizard activity was observed only under large clumps of shrubs.

FIGURE 6. Known distribution of *Liolaemus casamiquelai* (red dots; 1 = Ruta Nacional 23, 14 km W Aguada de Guerra; 2 = eastern edge of Cari Lafquen Chica Lagoon; 3 = along the National Road 23 eastern of Ingeniero Jacobacci town; 4 = 64 km north of Ingeniero Jacobacci along the Provincial Road 6; and 5 = south of Aguada Guzman town, along the Provincial Road 74. The major geographic landmarks are illustrated, and the insert identifies this area in Argentina.
FIGURE 7. Phylogenetic relationships of the Liolaemus melanops complex with other described members of the fitzingerii group. Numbers above branches are MP bootstrap values.

rocky outcrops but not sharing the same microhabitat than L. casamiquelai (Acosta et al. 1996a,b; Avila et al. 2003; Avila et al. 2004; Avila et al. 2006a, b). In nearby localities we collected Bothrops ammodytoides and Philodryas patagoniensis (Avila et al. 2001), both are known to eat lizards and are probable predators of L. casamiquelai. Some other likely predators, such as the hawks Falco sparverius and Buteo polyosoma, are common in this area. Liolaemus casamiquelai is probably oviparous as well others members of its clade, and feeds mainly in arthropods and some plant matter as a dissected stomach content show.

Remarks. Phylogenetic analysis based on the mitochondrial gene fragment cyt-b (805 bp), using Maximum Parsimony and Bayesian approaches of all described species of the fitzingerii group (melanops + fitzingerii complexes) and two outgroups (L. boulengeri and L. cuyanus) recovered the tree shown in Fig. 7. This topology presents evidence to support the monophyly of the melanops complex with L. casamiquelai as the sister taxon of L. martorii (MP Bootstrap Support [MPB]: 90; Posterior Probability [PP]: 0.51) and closely related to L. goestchi. Liolaemus morenoi is the basal species of this clade we call melanops N (MPB: 83, PP: 0.99). Liolasus canqueli is the sister taxon of L. melanops, clade we refer to as melanops S (MPB: 96, PP: 0.94). The uncorrected pairwise distances within species of the melanops N clade range from 0.62% (L. goestchi vs. L. casamiquelai) to 2.73% (L. morenoi vs. L.martorii); the distance between L. canqueli vs. L. melanops is 1.74%; and species distances between melanops N and S clades range from 3.11% to 3.85%. There is evidence of incomplete lineage sorting for this marker within and between these clades (Morando et
al., in prep.), and species from this complex (as in other Liolaemus complexes) exhibit strong variation in background and pattern coloration that difficult an easy recognition of species limits without a proper sampling effort and an adequate knowledge of contact zones. A poor morphological knowledge of large series, lack of extensive sampling, absence of revision of type specimens, fail to collect samples in the right type locality made difficult an adequate study of the species of the complex and originated a complicated nomenclatural status for some of them. But a discussion of the nomenclatural status of some species and our vision of the present situation of this complex is out of the scope of this work. Some authors do not recognize L. martorii and suggested synonymy with L. goetschi (Cei & Scolaro 2003, Pincheira et al. 2008) but our recommendation is to be conservative until intensive serious studies present convincing evidence for species limits in this group; until then, we still recognize L. martorii as a valid species well characterized with some morphological traits (see Abdala 2003) even the molecular paraphyly discovered for some individuals in Avila et al. (2006). These species as well as other undescribed taxa from this group are under study by our research group and a detailed analysis will be published elsewhere.

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References


APPENDIX I.

Specimens examined

*Liolaemus casamiquelai* (30).—ARGENTINA: RIO NEGRO: 25 de Mayo Department: Laguna Cari Lafquen Chica, 7 km N Ingeniero Jacobacci: MACN 39041, MLP-S 2599-2600, LJAMM-CNP 2948-2949; Laguna Cari Lafquen Chica and Ruta Provincial 6, 10 km N junction Ruta Nacional 23; LJAMM-CNP 11090-92; Ingeniero Jacobacci: LJAMM-CNP 2807-08; Ruta Provincial 6, 64 km NE Ingeniero Jacobacci: LJAMM-CNP 2973-6; Ruta Nacional 23, 14 km W Aguada de Guerra: MACN 39042-39045, MLP-S 2601-3, LJAMM-CNP 2977, 79, 80, 86, 4878; Ruta Nacional 23, 22.3 km E Ingeniero Jacobacci: LJAMM-CNP 11101-02; El Cuy Department: Ruta Provincial 74, 33.2 km N Chasico (road to Aguada Guzman), 33.2 km N junction Ruta Provincial 6: LJAMM-CNP 11099-11100.


*Liolaemus goetschi* (5).—ARGENTINA: RIO NEGRO: General Roca Department: 4.5 km E Ruta Provincial 6, 38 km N junction Ruta Nacional 22: LJAMM-CNP 5199-5203.

*Liolaemus melanops* (34).—ARGENTINA: CHUBUT: Telsen Department: Ruta Provincial 8, at Quele Cura (Sierra Colorado): BYU 48152-3, MLP-S 2473-4, LJAMM-CNP 2934, 2936-37, 2939-41; Ruta Provincial 8, 49 km S junction Ruta Provincial 5: LJAMM-CNP 8109-8112; Ruta Provincial 8, 112 km NW junction Ruta Provincial 4, 1 km S Aguada Malaespina Ranch: LJAMM-CNP 11153-11163. RIO NEGRO: Valcheta Department: Road between Cona Niyeu and Telsen, 8.4 km S junction Ruta Provincial 8: LJAMM-CNP 11180-11888.


*Liolaemus martorii* (45).—ARGENTINA: RIO NEGRO: San Antonio Department: road to San Antonio Este, 19.0 km W junction Ruta Provincial 1: LJAMM-CNP 11719-22; Las Grutas road to Piedras Coloradas Beach: LJAMM-CNP 2560-71, 2573-2581, 2669-70; 11724-8. Adolfo Alsina Department: Bahia Creek, 10.5 km E Caleta de los Loros, by Ruta Provincial 1: LJAMM-CNP 2584-2586, 11676-11686.

Specimens used for phylogenetic analyses

*Liolaemus melanops* complex (from type localities): *L. goetschi*: LJAMM-CNP 5203; *L. martorii*: LJAMM-CNP 2561; *L. casamiquelai*: LJAMM-CNP 2977; *L. martorii*: MIC1279; *L. canqueli*: LJAMM-CNP 2199; *L. melanops*: LJAMM-CNP 2934.

*Liolaemus fitzingerii* complex: *L. chehuacheken*: LJAMM-CNP 3223; *L. fitzingerii*: LJAMM-CNP 10146; *L. xanthoviridis*: LJAMM-CNP 2201.

Outgroups: *L. cuyanus*: BYU 47312; *L. boulengeri*: LJAMM-CNP 6841.