

New Species of the Iguanian Lizard Genus *Liolaemus* (Squamata, Iguania, Liolaemini) from Central Patagonia, Argentina

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ABSTRACT.—We describe a new species of lizard of the genus *Liolaemus* from northwestern Chubut Province, Argentina. This new species belongs to the *fitzingerii* group and is easily distinguished from other members of the group by a combination of morphological and genetic characters. The new species is diagnosable in showing the following combination of characters: dorsal pattern with a conspicuous vertebral band, presence of pre- and postscapular spots, prominent neck folds, and analysis of DNA sequence data from 810 base pairs of the cytochrome *b* gene (~4% sequence divergence from its sister taxa *Liolaemus fitzingerii*). The *fitzingerii* complex now includes three described species, all restricted to Patagonia, and the new species described here is endemic to a small lowland area in central Patagonia.

RESUMEN.—Describimos una nueva especie de lagartija del género *Liolaemus* para el noroeste de la provincia de Chubut, Argentina. La nueva especie pertenece al grupo *fitzingerii* y es fácilmente distinguible de otros miembros del grupo por una combinación de caracteres morfológicos y genéticos. La nueva especie es diagnosticable con la siguiente combinación de caracteres: diseño dorsal con banda vertebral conspicua, presencia de manchas pre y post escapulares, pliegues del cuello prominentes, y análisis de datos de secuencia de ADN de 810 pares de base del gen citocromo *b* (~4% de divergencia de secuencia de su taxa hermano *Liolaemus fitzingerii*). El complejo *fitzingerii* incluye ahora tres especies descritas, todas restringidas a Patagonia. Al presente, la nueva especie es endémica de un área pequeña rodeada por colinas en Patagonia central.

With more than 190 species, *Liolaemus* Wiegmann, 1834, constitutes one of the most speciose squamate genera of South America. Several species groups can be recognized on the basis of morphological, molecular, or both types of characters, with variations according to authors (e.g., Schulte et al., 2000; Morando et al., 2003; Morando, 2004; Avila et al., 2004, 2006; Abdala, 2007). Etheridge (1995) recognized one clade of species as the *boulengeri* group, with several subgroups included. Other authors are in general agreement about the species included in this clade but used different names for it. Abdala (2005) used the name *chacoensis* group, Schulte et al. (2000) named it the *boulengeri* series, but Morando (2004) and Avila et al. (2006) followed the original name used by Etheridge (1995). Here, we follow Etheridge (1995) and use the name *boulengeri* group; we also define two complexes, *boulengeri* and *rothi*, and four species groups, *donosobarrosi*, *darwinii*, *wiegmannii*, and *fitzingerii* (Fig. 1).

In a recent molecular phylogenetic analysis of several species of the *boulengeri* group, an

assemblage of species widely distributed throughout sandy or lowlands areas of the Patagonia and Monte regions of Argentina was found to form a well-supported clade, the *fitzingerii* group (Avila et al., 2006). This group includes two species complexes, named as the *melanops* and the *fitzingerii* complexes by Avila et al. (2006). The *fitzingerii* complex includes two described species, *Liolaemus fitzingerii* Duméril and Bibron 1837, and *Liolaemus xanthoviridis* Cei and Scolaro 1980, both characterized by robust bodies and extensive ventral melanism. These species inhabit the Chubut and Santa Cruz Provinces in Argentinean Patagonia, with *L. fitzingerii* extending into a small area of Patagonian Steppe environment in southern Chile. *Liolaemus fitzingerii* is widely distributed in Patagonia as far north as the Chubut River, whereas *L. xanthoviridis* is apparently restricted to a relatively small area in the northeast of Chubut Province between the Rio Chubut and the Atlantic coast (Cei, 1986). As presently understood (Avila et al., 2006), the composition of the *fitzingerii* group is not strictly equivalent to other groupings under this name made by previous authors (Cei, 1986; Halloy et al., 1998). As a result of herpetological field surveys carried out in central Patagonia, several lizard populations

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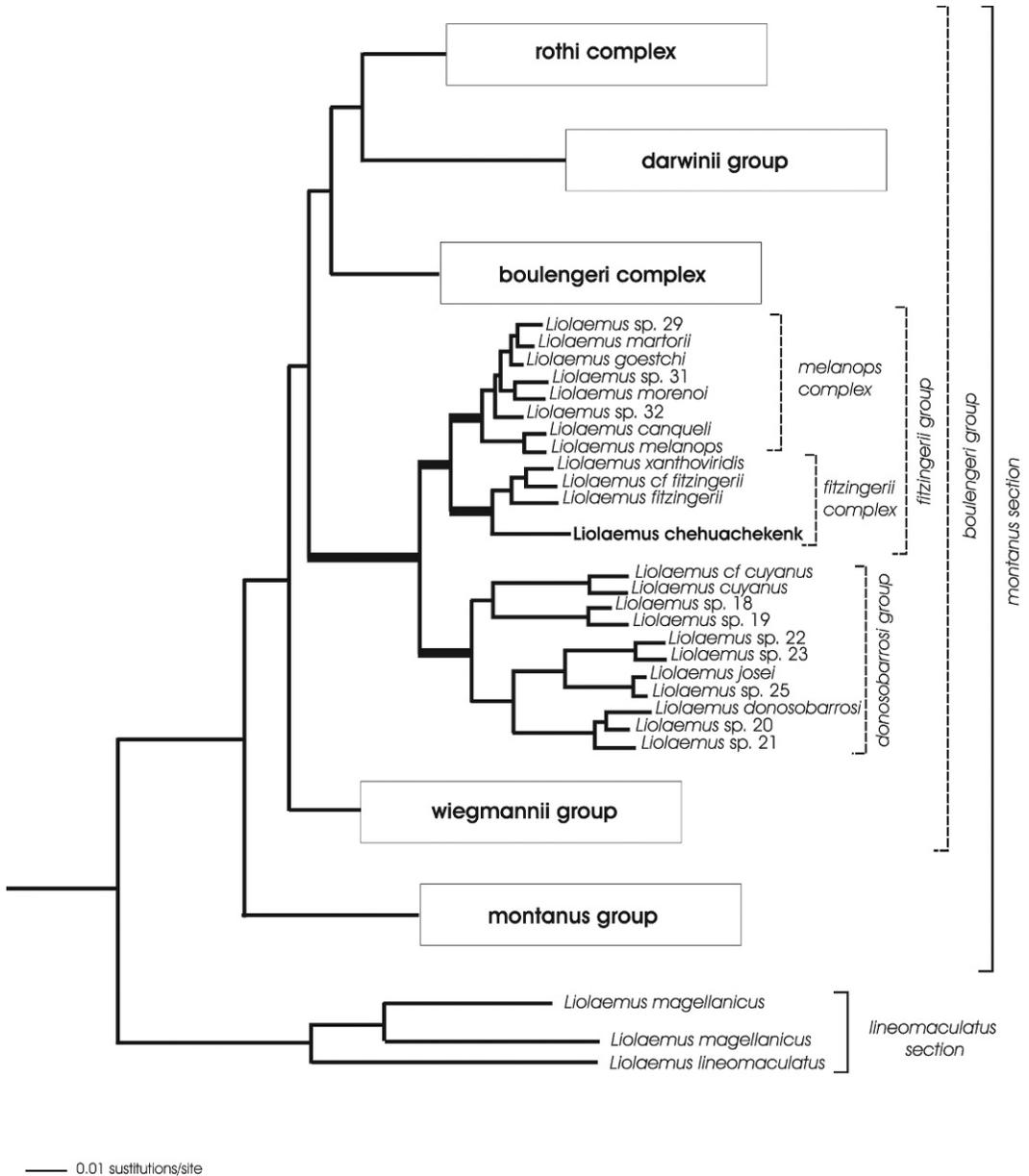


FIG. 1. Maximum likelihood tree, redrawn from Morando (2004), of relationships of all samples of the *fitzingerii* group, based on combined *cyt-b*, ND4, 12S, and GAPDH and C-mos gene regions. Black thick branches represent posterior probabilities between 0.9–1.0.

have been discovered in northwestern Chubut Province between 250 and 300 km north of any previous known locality for *L. fitzingerii*. Molecular analysis and very distinct dorsal coloration pattern show that these lizards are more related to *L. fitzingerii* and *L. xanthoviridis* than to any other member of the *fitzingerii* group (Avila et al., 2006; Morando, 2004) and support its recognition as a new species of the *fitzingerii* complex.

MATERIALS AND METHODS

Twenty-two specimens of the new species were examined. Additionally, we examined sample series of the species determined by Avila et al. (2006) and Morando (2004) to be members of the *fitzingerii* group (Appendix 1), from the herpetological collections of Fundación Miguel Lillo (FML), Argentina; Monte L. Bean Museum, Brigham Young University (BYU);

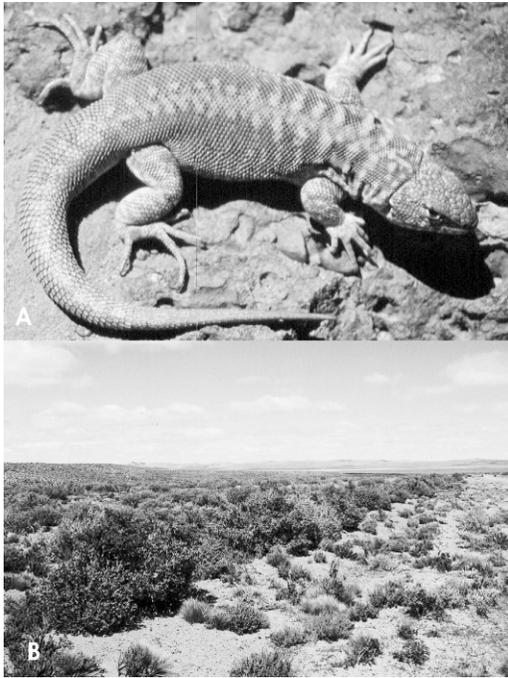


FIG. 2. (A) *Liolaemus chehuachekenk*, adult male, southwest slope of Calcatapul Mountains, Ruta Provincial 13.8 km north of El Molle, Cushamen Department, Chubut Province, Argentina; (B) landscape view of the type locality.

Museo de La Plata, Universidad Nacional de La Plata (MLP.S), Argentina; Museum of Vertebrate Zoology, University of California–Berkeley (MVZ); Museo Argentino de Ciencias Naturales Bernardino Rivadavia (MACN), Argentina; and the field collection of L. J. Avila and M. Morando (LJAMM), now housed in the Centro Nacional Patagónico, Puerto Madryn, Argentina (CENPAT–CONICET). Specimens were collected by hand or noose, sacrificed by a pericardiac injection of sodium pentothal Abbot®, fixed in 10–20% formalin, and later transferred to 70% ethanol. Measurements were taken with a dial caliper to the nearest 0.1 mm. Some character states were observed with the aid of a binocular stereomicroscope. Scale terminology and measurements follows Smith (1946) and 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. The individuals of *Liolaemus canqueli*, *Liolaemus chehuachekenk*, *Liolaemus goestchi*, *L. fitzingerii*, and *L. xanthoviridis* used for molecular analyses were also included in the morphological analyses.

RESULTS

SPECIES ACCOUNT

Liolaemus chehuachekenk sp. nov.

Figure 2A

Holotype.—MLP.S 2535, male, southwest slope of Calcatapul Mountains, Ruta Provincial 13, 8 km north of El Molle (42°10'S, 69°32'W, 900 m), Cushamen Department, Chubut Province, collected by L. J. Avila and C. H. F. Perez, 3 February 2003.

Paratypes.—MLP.S 2536, FML 1105–6, BYU 48202–3, same data as the holotype. LJAMM 5926–32, Ruta Provincial 13, 10 km north of El Molle (42°08'S, 69°32'W, 986 m), Cushamen Department, Chubut Province, collected by L. J. Avila and N. Frutos, 28 September 2004. LJAMM 5936–39, Ruta Provincial 50, 10 km north of El Escorial (43°00'S, 68°34'W, 817 m), Gastre Department, Chubut Province, collected by L. J. Avila and N. Frutos, 28 September 2004. LJAMM 5961–65, Ruta Provincial 49, 30 km south of Gastre (42°31'S, 69°12'W, 918 m), Gastre Department, Chubut Province, collected by L. J. Avila and N. Frutos, 28 September 2004.

Diagnosis.—*Liolaemus chehuachekenk* is a robust and large member of the assemblage of *Liolaemus* lizards referred to as the *boulengeri* group by Etheridge (1995). Lizards in this group are morphologically characterized by the presence of a patch of abruptly enlarged scales on the posterior medial surface of the thigh, bulged out in adult males caused by hypertrophy of the underlying puboischiotibialis muscle (Etheridge, 1995). This character distinguishes *L. chehuachekenk* from all other species of *Liolaemus* except those of the *wiegmannii* group (Etheridge, 2000; Avila, 2003; Verrastro et al., 2003; Avila et al., 2006), *darwinii* group (Etheridge, 1993, 2001; Morando et al., 2004; Avila et al. 2006), *L. fitzingerii* group, and *Liolaemus boulengeri* and *rothi* complexes (Avila et al., 2006). *Liolaemus chacoensis*, *Liolaemus hatcheri*, *Liolaemus lineomaculatus*, *Liolaemus silvanae*, and several related undescribed species have similar but a less distinct patch of enlarged scales in the femoral area but lack the underlying hypertrophied muscle (Etheridge and Christie, 2003). *Liolaemus kolengh*, a recently described species, has the same characteristic (Abdala and Lobo, 2006).

Here, we first compare the new species to four other species groups/complexes of *Liolaemus* (the *wiegmannii*, *darwinii*, *boulengeri*, and *donosobarrosi*) and then compare it to the other species in the *fitzingerii* group (*melanops* complex and *L. fitzingerii* and *L. xanthoviridis*). From the species of the *wiegmannii* group, *L. chehuachekenk* differs because all species of that group are considerably smaller (maximum SVL <78 mm, except *Liolaemus lutzae*, maximum

SVL 84 mm vs. >90 mm in *L. chehuachekenk*), with slender bodies (vs. stout body in *L. chehuachekenk*); have six scales surrounding the mental (vs. four scales in *L. chehuachekenk*); a mental scale narrower anteriorly than posteriorly; and small lorilabials, frequently in two rows separating supralabials from the subocular (vs. one row of larger lorilabials scales in *L. chehuachekenk*; Etheridge, 2000). From species of the *Liolaemus darwini* group, with the exception of *Liolaemus albiceps* and *Liolaemus irregularis*, all of the species in this group have slender bodies, smaller adult size (<70 mm vs. >90 mm in *L. chehuachekenk*), strongly defined dorsal sexual dichromatism (vs. absence of sexual dichromatism in *L. chehuachekenk*), moderately cusped, and straight sided to slight expanded crowns of their posterior marginal teeth, rather than strongly expanded and deeply cusped teeth as in the *fitzingerii* species complex (Etheridge and Christie, 2003). *Liolaemus chehuachekenk* differs from both species groups in coloration because all of the species in the last two groups lack the black pigment distributed across the throat, chest, and abdomen in adults of both sexes. Some species of the *wiegmannii* or *darwini* groups have ventral spots, reticulations, or small areas covered with black coloration, but the patterns are very different from *L. chehuachekenk* (see below).

Species of the *boulengeri* complex are smaller (<75 mm vs. >90 mm in *L. chehuachekenk*), more slender (vs. stout in *L. chehuachekenk*), with dorsal pattern of dorsolateral lines, transverse marks or series of spots, and marked sexual differences in body size (males larger than females), dorsal dichromatism, males normally with conspicuous pre- and postscapular spots, ventral melanism reduced, and usually marked yellow, orange, green, or brick red coloration on lateral body in reproductive season; none of these characteristics is ever present in *L. chehuachekenk*. Species of the *rothi* complex have immaculate ventral coloration (always melanistic in *L. chehuachekenk*), and usually have a dorsal pattern of transverse series of four irregularly rounded dark spots on a background of light gray, tan, or faded pink, and irregularly distributed yellow patches of almost the same size as the dorsal spots on the body, head, and limbs; these characteristics are never present in *L. chehuachekenk*. *Liolaemus sagei* also are smaller and have more scales around midbody (82–100 vs. 69–75 in *L. chehuachekenk*).

Species of the *donosobarrosi* group lack extended ventral melanism; *Liolaemus donosobarrosi* is a smaller species (maximum SVL 64.2 mm vs. >90 mm in *L. chehuachekenk*) and has a dorsal pattern consisting of transverse series of four half-moon spots surrounding

white or yellow spots on a background of tan, pale orange, brick red to brown color, a complete absence of black coloration in ventral areas, a lower number of preloacal pores (3–7 vs. 7–10 in *L. chehuachekenk*), and more scales around midbody (71–89 vs. 69–75 in *L. chehuachekenk*). *Liolaemus cuyanus* has six scales in contact with the mental scale (four in *L. chehuachekenk*), a light brown dorsal coloration crossed by well-defined transversal brown bands with posterior white-borders, a conspicuous brown to black antehumeral band from throat to shoulder, and white ventral areas; these color characteristics are absent in *L. chehuachekenk*. *Liolaemus mapuche* usually has six scales in contact with the mental scale (as *L. cuyanus*), but *L. chehuachekenk* has only four scales in contact with the mental; *L. mapuche* also has a very different dorsal coloration in life characterized by a light blue head and scattered blue scales on a light green background, a black antehumeral arch, four series of gray paravertebral and lateral spots, and scattered yellow and blue scales in the lateral area of the body (Abdala, 2002), all these chromatic characteristic are never present in *L. chehuachekenk*. *Liolaemus josei* has a dorsal pattern of four series of transversal spots and strong sexual dichromatism, characteristic not present in *L. chehuachekenk*).

Species of the *melanops* complex (Table 1) have a general dorsal pattern of diffused spots or wavy lines with white posterior borders. *Liolaemus morenoi* has a slender body and more scales around midbody (72–85 vs. 69–75) than *L. chehuachekenk*. *Liolaemus canqueli* has a completely black head with brilliant yellow body coloration interrupted by transverse black marks, which are sometimes fused showing a reticulated pattern in both sexes; *L. chehuachekenk* never has black head or brilliant yellow coloration. *Liolaemus melanops* is a smaller species (maximum SVL 82.4 mm vs. >90 mm in *L. chehuachekenk*), with a slender body, males with completely black head and brilliant yellow/green body coloration with a pattern of transverse black marks. Some populations of *L. melanops* described as *Liolaemus martorii* (see Abdala, 2003; Avila et al., 2006) lack the ventral melanism and have a pattern of four transversal dots.

From species of the *fitzingerii* complex (Table 1), *L. chehuachekenk* shows few morphological differences. *Liolaemus xanthoviridis* has brilliant yellow or green dorsal background coloration with an irregular dark brown-black reticulated pattern with irregularly distributed yellow spots (Ceï and Scolaro, 1980; Ceï, 1986), which is never present in *L. chehuachekenk*. *Liolaemus fitzingerii* has a dorsal pattern of small dark green dots bordered by white or white

TABLE 1. Morphological characteristics and sexual dimorphism in lizards of the *fitzingerii* group. Melanism: H = head, G = gular, C = collar, Ne = neck, V = ventral, F = femoral, CA = cloacal apron, Y = melanic, P = partially melanic, N = nonmelanic. SD = sexual dimorphism: M = marked, W = weak or nonevident. Data for *Liolaemus morenoi* were taken from Etheridge and Christie (2003).

Species	SVL (max.)	Midbody scales	Dorsal scales	Dorsal pattern	Dorsal background coloration	Melanism										
						H	G	C	Ne	V	F	CA	SD			
<i>L. canqueli</i> (N = 43)	96.7	72.3 (66-79)	79.4 (70-90)	Wavy transverse marks fused and alternate	Yellow	Y	P	Y	Y	Y	Y	Y	Y	P	P	M
<i>L. chihuachekenk</i> (N = 22)	98.3	72.0 (69-75)	77.5 (73-81)	Wide vertebral band with dotted transverse dorsolateral marks	Ochre-gray	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	W
<i>L. fitzingerii</i> (N = 108)	103.0	73.0 (64-84)	77.8 (67-87)	Plain to a pattern of irregular/regular white dots bordered of white	Green, green-yellow, ochre, blue, brick red	N	N	Y	Y	Y	Y	Y	Y	P	Y	W
<i>L. goestchii</i> (N = 5)	61.3	62.2 (57-68)	72 (64-78)	Dorsal transverse marks to four dots yellow/white bordered	Ochre, brown to dark green	N	N	N	P	N	N	N	N	N	N	W
<i>L. martorii</i> (N = 24)	76.5	63.5 (59-73)	74 (67-84)	Two series of well marked dorsolateral marks white bordered	Gray, light to dark brown	N	N	N	P	N	N	N	N	N	N	W
<i>L. melanops</i> (n = 46)	82.4	69.2 (63-79)	76.2 (70-89)	Series of four black dots	Iridescent green to brightly yellow	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	W
<i>L. morenoi</i> (N = 11)	87.0	79.0 (72-85)	81.4 (72-95)	Wavy transverse marks	Tan	N	N	N	P	P	N	P	P	N	N	W
<i>L. xanthoviridis</i> (N = 12)	97.0	75.0 (68-82)	80.8 (74-87)	Reticulated pattern	Iridescent green to brightly yellow	N	P	Y	Y	Y	Y	Y	Y	N	N	W

dots bordered by black, disposed irregularly or in two complete or incomplete dorsolateral series, on a variable dorsal background of ochre, green, dark yellow, blue, or grey; sometimes with very variable brick orange areas on head and body. *L. chehuachekenk* have conspicuous pre- and postscapular black spots, with the prescapular spot sometimes partially or totally fused with the melanic collar; neck folds are well developed and prominent in this species but are less evident in *L. xanthoviridis* and *L. fitzingerii*.

Description of the Holotype.—Adult male 99.0 mm (SVL), regenerated tail 88.0 mm (46.0 mm regenerated portion). Axilla-groin distance 46.5 mm. Head length 19.4 mm; head width 16.3 mm; head height 13.3 mm; snout length 7.0 mm; orbit–nostril distance 3.5 mm; internostril distance 4.3 mm; horizontal diameter of the orbit 6.8 mm. Arm length 25.4 mm; tibial length 18.7 mm; foot length 26.8 mm. Upper head scales smooth but pitted with numerous scale organs, more numerous on scales between rostral and frontal. Rostral about twice as wide as high (3.6×1.7 mm). Two postrostrals, wider than high, together with first supralabials separate nasal scales from rostral. Nasal scales longer than wide (2.2×1.8 mm), subtriangular. Nostril slightly less than one-half length of nasal, posterior in position, roughly subtriangular in shape. Nasal scales in contact with eight scales on each side. Internasal scales flat to slightly convex. Two preinternasals and four postinternasals, large, symmetrically arranged. Ten frontonasals in two rows. Five anterior frontonasals, a median frontonasal, longer than wide; two smaller lateral frontonasals on each side, symmetrically arranged. Internal lateral frontonasal slightly smaller than median frontonasal, subpentagonal in shape; external lateral frontonasals almost half the size of external, lateral in position, wider than long. Five posterior frontonasals, slightly convex, bulged, longer than wide, symmetrically arranged. Four prefrontals, irregular, in two irregular rows. One frontal scale, irregular, smaller or equal to prefrontals. Seven frontoparietals smaller than frontal, six equal in size to interparietal, arranged in 1–2–3 row plus a smaller scale almost half size of interparietal between last row and right side of interparietal. Interparietal longer than wide, pentagonal with a conspicuous “eye” in middle. Four parietal scales very conspicuous, symmetrically arranged, convex separated in middle by one very small supernumerary scale. Occipital scales convex, swollen, in two conspicuous groups of 13–15 scales on left-right sides separated by five smaller, medially arranged scales. Supraoculars 10–9, posterior six to eight

transversally expanded. Smaller lateral supraoculars, 18–19, in one to three rows. Circumorbitals 11–12. Anterior canthal wider than long, almost lateral in position, separated from nasal by one small postnasal scale. Posterior canthal longer than wide, overlapping almost half of anterior superciliary. Canthal ridge evident blunt at posterior canthal. Superciliaries 7–7. Loreals 5–5, together with preocular and anterior subocular forming a slight concavity. Loreals on right side more convex and swollen than on left side. One preocular, longer than wide; one elongate subocular almost five times longer than wide (5.2×1.1 mm), and one postocular, both with dorsal keel. Pre- and subocular flat. Upper ciliary scales in two rows, those of inner row flat quadrangular (12–14), those of outer row rectangular, compressed, and moderately projecting (14–16). Lower ciliary scales in two rows, those of inner row flat and quadrangular (10–10), those of upper row rectangular, compressed, and moderately projecting (12–12). Palpebral scales small, irregular, flat; some anterior scales with scale organs. Lorilabials 6–6, as wide as supralabials; with conspicuous scale organs. Supralabials 8–8. Lower temporals smooth, subimbricate; upper temporals slightly swollen, juxtaposed. Temporals with an apical scale organ. Anterior auriculars smaller than posterior temporals, compressed, moderately projecting. Auditory meatus higher than wide (3.1×1.1 mm). Mental pentagonal higher than wide (2.8×1.7 mm), in contact with anterior supralabials and postmentals but not in contact with anterior sublabials. Infralabials 5–6. Chinshields 5–5, transversally expanded, separated from infralabials by series of two to three elongated but smaller sublabials scales. Some sublabials with conspicuous scale organs. Gular scales smooth, flat, imbricate, with rounded posterior margins; some posterior median gulars with a distinct apical notch. Lateral neck folds (longitudinal neck, gular, antehumeral, dorsolateral, postauricular) well developed and prominent. Antegular distinct. Nuchal fold distinct in life. Anterior nuchal scales small, swollen, strongly imbricate, with an apical scale organ. Lateral nuchals granular, majority with an apical scale organ.

Dorsal body scales obovate, juxtaposed to slightly imbricate, with a distinct but blunt keel, few with a single scale organs at distal extremity of keel. At midbody, 27 scale rows with keels. Some interstitial granules visible between dorsal scales. Midbody, dorsal scales grade laterally into slightly smaller, smooth, imbricate scales, many with an apical notch or scale organ. Scales anterior to, above, and posterior to forelimb and hind-limb insertions small, smooth, nonoverlapping, some granular. Ventral scales 126

(counted from mental to last apron row). Ventral body scales obovate to subtriangular, smooth, flat, imbricate, same size than dorsal body scales. Scales around midbody 72; scales between occiput and anterior margin of hindlimb articulations 76. Scales of cloacal apron slightly smaller than ventral body scales. Pre-cloacal pores 11.

Suprabrachials rhomboidal to obovate, strongly imbricate, smooth to faintly keeled, about twice as large as dorsal body scales, few with a notch. Scales close to the elbow noticeably smaller, smooth. Anterior supra-antibrachials and supracarpals obovate, some with a notch, smooth. Infrabrachials small, smooth, not imbricate, grading to almost granular. Infrantebrachials larger than infrabrachials, obovate to subtriangular, imbricate, smooth. Infracarpals strongly imbricate, rhomboidal, bluntly keeled, with a small mucron. Pre- and post-digital scales of manus smooth. Subdigital lamellae with three blunt keels, numbering: I: 12, II: 20, III: 20, IV: 15, V: 11. Anterior suprafemorals as large as dorsal body scales, rhomboidal to obovate, smooth, grading into smaller posterior suprafemorals, not imbricate with small interstitial granules; some scales with apical scale organs. Supratibials obovate, with a weak blunt keel; supratarsal and supradigitals smooth. Prefemorals and infrafemorals smooth, imbricate, same size or smaller than suprafemorals. Postfemorals small, smooth, rounded, convex, with small interstitial scales; a ventromedial patch of 20–23 large, projecting scales, few with a blunt spine. Infratibials smooth, rounded, imbricate, same size that infrafemorals. Infratarsal small, imbricate, smooth becoming weakly keeled distally. Subdigital lamellae with one or two keels, a few with three blunt keels, not mucronate, numbering I: 12; II: 16; III: 23; IV: 29; V: 18.

Dorsal caudals imbricate, most equal to dorsal body scales but some slightly larger; dorsal caudals with a weak keel, becoming more strongly keeled on regenerated portion. Lateral and ventral caudals smooth.

Coloration in Life.—Background color of dorsal areas of head, body, limbs, and tail ochre-gray; grading laterally to light tan and to cream-white ventrally. Dorsal pattern with a series of irregular, transverse bands (nine scales wide), tan to pale yellow, between neck and midbody, merging medially to form a conspicuous longitudinal, irregular yellow-light orange vertebral "band" (7–10 scales wide) that extends between occiput and first portion of the tail (Table 1). This band becomes broken, and forms irregular scale spots 5–12 scales long between midbody and midtail but disappearing on regenerated portion of tail. A few scales at edges of vertebral

band with black coloration at base. Upper surface of limbs with irregular pale orange bars. Two small but conspicuous pre- and postscapular black spots. Scales of chin and anterior throat white to light gray, becoming darker posteriorly. Ventral areas cream white to light gray, posterior throat and central areas of chest and abdomen covered by a black area. Black pigment on anterior throat extending laterally anterior to antegular fold, appearing as incomplete black "collar." Some scales on cloacal apron and proximal infrafemoral areas slightly dark but not black.

Coloration in Preservative.—In preservative, the background coloration become light ochre after few weeks, light yellow to orange coloration fades to pale yellow, and irregular bands of limbs almost disappear, fading to tan or light ochre. Pattern coloration as pre- and postscapular spots and black ventral coloration remains almost unaltered.

Variation.—Variation of body measurements and scale counts is given in Table 2. No precloacal pores in females. Dorsal head scales variable in size, some irregular in shape, most convex but a few almost flat. Cloacal apron larger in males than in females. Scales of the cloacal apron slightly smaller than ventral scales in males, same size or slightly smaller in females. Postfemoral patch variable in size in males between 20 and 27 scales; smaller and less bulged in females. Dorsal coloration variable but maintaining the pattern of a vertebral band with transversal bands in the anterior part of the trunk, in some individuals becoming gradually broken, reaching the proximity of the rump and remaining as a spotted area in the proximal portion of the tail. In some individuals the transversal bands are broken into spotted lines, tan or faded yellow with a few black and white scales intermixed. Postscapular spots almost disappear in some individuals, remaining as a few dark brown scales.

Distribution.—*Liolaemus chehuachekenk* has been collected in three localities in northwestern Chubut Province (Fig. 3). Type locality is in the piedmont of the Calcatapul mountains in the Cushamen Department (Fig. 2B). The area is a gentle southwestern slope of the Calcatapul mountains with "islands" of shrubs less than 1.5 m tall and 2.0 m in diameter (dominated by *Chuquiraga avellanadae*, with a low density of *Ephedra ochreatea* and *Schinus molle*); several types of grasses (mainly *Stipa* sp. and *Poa* sp.) cover the intermediate areas, but the structure is patchy with denuded soil, produced usually by overgrazing followed by wind erosion. The habitat of the type locality is in the Dominio Andino-Patagónico, Provincia Patagónica (Cabrera, 1971) in a physiognomic-floristic sector

TABLE 2. Descriptive statistics of body size measurements and scale counts of *Liolaemus chehuachekenk* type series. Mean \pm standard deviation, range in parentheses.

Variable	Males (N = 13)	Females (N = 6)
SVL	97.8 \pm 6.3 (82.0–103.4)	89.5 \pm 6.5 (78.2–95.1)
Head length	19.1 \pm 1.0 (16.3–20.5)	17.0 \pm 1.3 (15.0–18.3)
Head width	15.8 \pm 1.4 (12.6–17.1)	14.0 \pm 0.8 (12.6–15.1)
Arm length	27.4 \pm 1.4 (23.6–29.1)	24.4 \pm 2.0 (20.7–26.9)
Tibial length	19.0 \pm 1.4 (16.2–21.5)	16.6 \pm 1.1 (14.6–17.9)
Foot length	26.6 \pm 1.6 (24.0–29.4)	24.0 \pm 1.5 (21.1–25.2)
Midbody scales	71.7 \pm 5.2 (64–85)	72.0 \pm 3.7 (68–77)
Dorsal scales	76.9 \pm 4.5 (71–86)	76.6 \pm 3.0 (72–81)
Ventral scales	105.5 \pm 4.8 (100–116)	107.1 \pm 4.3 (99–111)
Preloacal pores	8.7–0.7 (7–10)	0
Supralabial scales	6.8 \pm 0.8 (7–10)	7.0 \pm 0.9 (8–9)
Infralabial scales	8.4 \pm 1.0 (6–8)	8.8 \pm 0.4 (6–8)
Third toe lamellae (hand)	20.4 \pm 0.7 (19–21)	20.0 \pm 1.7 (18–23)
Fourth toe lamellae (foot)	28.2 \pm 1.5 (25–31)	28.1 \pm 1.9 (26–31)
Lorilabial scales	7.4 \pm 0.5 (7–8)	8

characterized by a shrubby steppe of *Chuquiraga avellanadae*, *Nardophyllum chilliotrichoides*, *Nassauvia glomerulosa*, *Nassauvia ulicina*, and *Lycium ameghinoi*. A second locality is south of the town of Gastre, on the edge of the Pampa de Gastre flats; this site is very similar in floristic and physiognomic characteristics but suffers from severe overgrazing. Both localities are in a piedmont region formed by alluvial cones of surrounding small mountains chains. The third locality is in a small valley between Campana Mahuida and Rosada Mountains with floristic and physiographic characteristic similar to the type locality.

Etymology.—The specific name *chehuachekenk*, comes from the name of one of the main subgroups of the Tehuelches aboriginal people that inhabited western Chubut, Rio Negro, and southern Neuquén Provinces and were themselves known as Chehuache-Kenk.

Natural History.—Lizards were found along dirt roads, basking at the edges of shrubs (e.g., *Chuquiraga avellanadae*); usually they remained motionless on the bare ground where they blended in with patterns of light and shadows on the soil. When pursued, they ran around the bush or, less frequently, from bush to bush. Other lizards were observed in this area, but the density of *L. chehuachekenk* appears to be low because no more than 10 individuals were observed after 3 h of active searching on sunny days when other lizard species were very active. Apparently *L. chehuachekenk* is restricted to the shrubby areas because active search in surrounding habitats failed to detect the species. *Liolaemus bibronii* and *L. cf. boulengeri* were observed in syntopy with *L. chehuachekenk*.

Only a few data on reproduction are available, but based on the parity mode of closely related species, we hypothesize that this species

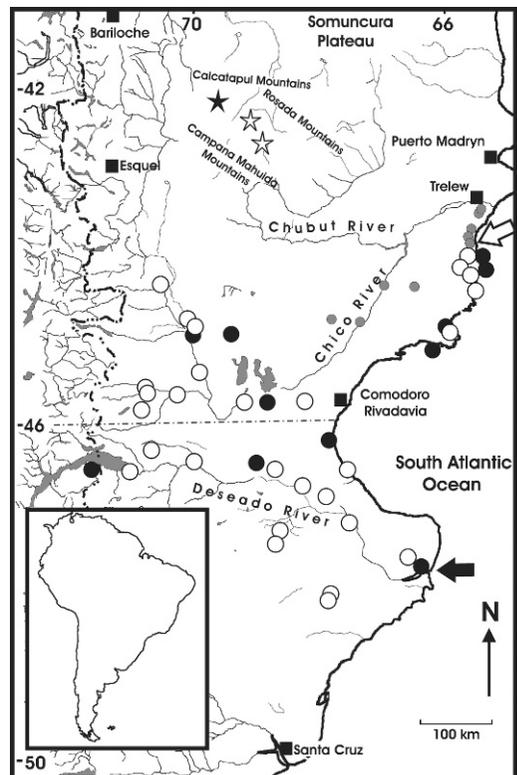


FIG. 3. Known geographic distribution of the lizards of the *Liolaemus fitzingerii* complex. Type locality of *Liolaemus chehuachekenk* (black star); white stars mark two additional localities. Circles are known localities for *L. fitzingerii*, white: vouchers analyzed, black: bibliographic references, black arrow: type locality. Small gray circles are bibliographic references for *Liolaemus xanthoviridis*, white arrow: type locality.

is oviparous, and the reproductive pattern is very similar to that suggested for *L. rothi* by Etheridge and Christie (2003). We suggest that mating occurs in late summer or autumn, egg development in spring, followed by oviposition in late spring and early summer and hatchling in late summer. No hatchlings were observed in the area when lizards were collected in early February (midsummer); adult males collected at this time had large testes (mean 11.4×8.9 mm), and all females were characterized by empty, convoluted oviducts with small ovarian follicles. In one stomach, 49 ant heads were found, with seven partially digested fruits, 101 small seeds of an unidentifiable plant, and six seeds of *Ephedra ochreatea*. This suggests that *L. chehuachekenk* is similar to other Patagonian lizards in its use of invertebrates and plants as food resources (Acosta et al. 1996; Quatrini et al., 2001).

DISCUSSION

A full assessment of species boundaries and distributions for all populations under the name *L. fitzingerii* is beyond the scope of this work, but we can address some issues here. Cei (1980), after an analysis of the type series of *L. fitzingerii*, proposed that lizards from near Puerto Deseado, Santa Cruz Province, Argentina (black arrow in Fig. 3), are most similar to individuals of the original description by Dumeril and Bibron (1837). This locality is 700 km southeast of type locality of *L. chehuachekenk*. Recently, and without any clear explanation, Pincheira Donoso and Nuñez (2005) suggest that Chile Chico, Aysen, Chile (500 km southwest) is the type locality for *L. fitzingerii*, following Donoso Barros (1966). Despite the nomenclatural problems, it is clear that all populations now considered as *L. fitzingerii* are south of the Chubut River, whereas all known populations of *L. chehuachekenk* are north of this river and are restricted to a small series of valleys and a salty flat basin.

Liolaemus chehuachekenk is the northernmost member of the *fitzingerii* complex and it is the basal taxon of the clade (Fig. 1). The other two species are found more than 250 km south (*L. fitzingerii*) and 300 km southeast (*L. xanthoviridis*). Cruz et al. (1999) recorded *L. xanthoviridis* for Valdés Peninsula, but we extensively surveyed this area, and no specimens of this species were found; it is very probable that *L. xanthoviridis* does not cross the Chubut River. Also, we have evidence that the population mentioned by Cruz et al. (1999) may be an undescribed species of the *melanops* group. Based on the data published in Avila et al. (2006), the cytochrome *b* uncorrected pairwise genetic distance between *L. fitzingerii* and *L.*

chehuachekenk is approximately ~4%, which also supports *L. chehuachekenk* as a different species. This molecular analysis that recovers these three species in a clade differs from the results presented by Halloy (1998) based on behavior characters, in which *L. xanthoviridis* is recovered as the sister species of *L. melanops*, and *L. fitzingerii* is nested within the *arenicola* clade. Abdala (2005) recovered most of the species studied here in a *fitzingerii* group based on a morphological analysis, but phylogenetic relationships were unclear; neither *L. martorii* nor *Liolaemus goestchi* were recovered in this group. This incongruent result in part may be caused by misassignment of populations treated as *L. goestchi* by Abdala (2005), because his specimens were not from the type locality of this species, and our observations suggest that these specimens probably represent a different undescribed species (Avila et al., unpubl. data).

Future work will target unsampled isolates in the northern region of the Chubut Province and integrate nuclear gene regions and quantitative morphological data analyses (geometric morphometric assessment of body shape) into tests of relationships and species boundaries in this clade.

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APPENDIX 1

Specimens Examined

Liolaemus canqueli (60).—ARGENTINA: CHUBUT: Languineo Department: Pampa de Agnia: BYU 47283–4, MLP.S 2470, LJAMM 2900, 2902–4. Ruta Nacional 25, 5 km west of Pampa de Agnia: 4665–72. Paso de Indios Department: Ruta Provincial 12, 6 km south of Cerro Condor: BYU 47280–1, MLP.S 2472. Valle de los Mártires, Ruta Nacional 25, km 249, 19 km east of junction Ruta Provincial 27: FML 13053, MLP.S 2467–8, LJAMM 2148, 2236, 2256. Ruta Provincial 53, 7–20 km southeast of Paso de Indios: FML 13047, LJAMM 2149, 2199, 2239–41, 2270–1, 2286. Ruta Nacional 25, 8 km west of Paso de Indios: LJAMM 4725–7. Ruta Nacional 25, 15 km west of Los Altares: LJAMM 4602–8. Las Plumas: LJAMM 4613–4. Ruta Provincial 53, 48.3 km northwest of El Sombrero, 37 km southwest of Paso de Indios: LJAMM 3470–5. Ruta Provincial 27, 6.9 km south of El Sombrero and junction to Ruta Provincial 53: LJAMM 3737–45. Ruta Provincial 27, 78.1 km south of El Sombrero and Ruta Provincial 53: LJAMM 3760–1.

Liolaemus chehuachekenk (22).—ARGENTINA: CHUBUT: Cushamen Department: southwest slope of Calcatapul mountains, Ruta Provincial 13, 8 km north of El Molle: MLP.S 2535–6, FML 1105–6, BYU 48202–3. Ruta Provincial 13, 10 km north of El Molle: LJAMM 5926–32. Gastre Department: Ruta Provincial 50, 10 km north of El Escorial: LJAMM 5936–39. Ruta Provincial 49, 30 km south of Gastre: LJAMM 5961–65.

Liolaemus fitzingerii (108).—ARGENTINA: CHUBUT: Escalante Department: Ruta Nacional 26, km 69, 27 km west of Pampa del Castillo: BYU 47288, LJAMM 2879, 4888. Florentino Ameghino Department: Ruta Provincial 1, 10 km south of Dos Pozos: MLP.S 2528; LJAMM 2427–8, 2505–8. Bahía Camarones; Playa Elola: FML 13052, MLP.S 2469, LJAMM 2464, 2500, 2502–4. Cabo Raso: LJAMM 2491–7. 20 km south of junction Ruta Provincial 32 and Ruta Provincial 1: MLP.S 2460. Ruta Provincial 31, 36 km south of Florentino Ameghino: LJAMM 6121–6122. Ruta Provincial 31, 4 km north of junction Ruta Nacional 3: LJAMM 6124. Río Senguer Department: Ruta Provincial 20, 19 km west of Los Manantiales: FML 13050, MLP.S 2462. Ruta Provincial 20, 5 km north of Los Tamariscos: LJAMM 4576. Ruta Nacional 40, 2 km south of Río Mayo: LJAMM 2889. Ruta Provincial 26, 4.4 km southwest of junction Ruta Provincial 38, Río Mayo valley: LJAMM 3935–7. Ruta Provincial 26, 6.8 km southwest of junction Ruta Provincial 38, Río Mayo valley: LJAMM 3925–8. Ruta Provincial 51, 25.2 km south of Ricardo Rojas, near Chalia Creek and Quilchamal Lagoon: 3919–3924. Sarmiento Department: 24 km southeast of Sarmiento, road to Bosque Petrificado: FML 13049, MLP.S 2459. Tehuelches Department: Ruta Nacional 40, 7.9 km

southwest of junction Ruta Provincial 20: BYU 47291, 47308, LJAMM 2921–2, 2925. Ruta Provincial 20, 30 km south of Nueva Lubecka, 3 km north of La Laurita: LJAMM 2888, 4890. SANTA CRUZ: Deseado Department: 1 km west of Tellier: BYU 47297–8, LJAMM 2918–20, 4891. Ruta Nacional 3, km 2107, 7 km north of Tres Cerros: BYU 47295–6, LJAMM 2871–2. Ruta Nacional 3, 6 km north of Tres Cerros: LJAMM 4637–39, 4675–78. Ruta Nacional 3, km 1923, 10 km south of Caleta Olivia: BYU 47299–300, LJAMM 2895–7, 4879. Ruta Nacional 3 and Río Deseado: BYU 47285, LJAMM 2891–2, 4875–7. Ruta Provincial 43, 16 km east of Las Heras: BYU 47293–4, LJAMM 2882–7. Ruta Provincial 43, 30 km south of Pico Truncado: LJAMM 4612. Ruta Provincial 43, 3 km east of Koluel Kaike: LJAMM 4618–20. Ruta Provincial 12, 2 km south of Gobernador Moyano: LJAMM 3929–33. Lago Buenos Aires Department: Ruta Provincial 43, 19 km west of Perito Moreno: BYU 47286–7, LJAMM 2875–7. Ruta Provincial 43, El Pluma: BYU 47292, LJAMM 2913–4. Ruta Nacional 40, 71 km south of Santa Cruz-Chubut border: LJAMM 4634–4636.

Liolaemus goetschi (5).—ARGENTINA: RIO NEGRO: 25 de Mayo Department: 38 km north of Ruta Nacional 22, Laguna Playa, north General Roca: LJAMM 5199–5203.

Liolaemus martorii (25).—ARGENTINA: RIO NEGRO: San Antonio Department: El Salado beach: MLP.S 2454–5, 2465, LJAMM 2511–6, 2584–6, 6126; Las Grutas, Piedra Colorada beach: MLP.S 2466, LJAMM 2563–71. Adolfo Alsina Department: Bahía Creek: MLP.S 2456–7.

Liolaemus melanops (46).—ARGENTINA: CHUBUT: Telsen Department: Sierra Colorada: MLP.S 2473–4. Ruta Provincial 61, 40.3 km junction Ruta Provincial 11, between Estancia Ranquihuao and Estancia San Manuel: LJAMM 5948–51, 6136–7. Ruta Provincial 11, 55 km north of junction Ruta Nacional 25, 5 km south of Ruta Provincial 40: LJAMM 5952–8. Ruta Provincial 11, 6 km northwest of Bajada del Diablo: LJAMM 5941–3. RIO NEGRO: Valcheta Department: Ruta Provincial 60, 10 km west of Chipauquil: BYU 47307, 48129–30, MLP.S 2475–6, LJAMM 2951, 2955–7. 24 km west of Cona Niyeu, road to El Cain: LJAMM 5986–95, 5147–5150. Ruta Provincial 8, 10 km Río Negro and Chubuts limits: 6001–6.

Liolaemus morenoi (2).—ARGENTINA: NEUQUEN: Collon Cura Department: Ruta Nacional 40, 2 km south of Cerro Piñon: LJAMM 6477–8.

Liolaemus xanthoviridis (12).—ARGENTINA: CHUBUT: Paso de Indios Department: Ruta Provincial 29, 45 km west of Garayalde: BYU 47289–90; LJAMM 2907–9; Petrified forest, junction Ruta Provincial 27 and 29, 106 km west of Garayalde: BYU 46769, 47282, LJAMM 2911–2. Florentino Ameghino Department: Ruta Provincial 1, 12 km south of Dos Naciones ranch: FML 13051, MLP.S 2463, 2458, LJAMM 2418.