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A new species of *Liolaemus* (Squamata: Liolaemidae) from the Reserva Paisajística Subcuenca del Cotahuasi, southwestern Peru

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***Abstract.*—The diversity of reptiles in the Andes of southwestern Peru is poorly documented. Despite the fact that studies on saurians have intensified in recent years, mainly in the genus *Liolaemus*, information gaps on the biodiversity of this area remain. Such is the case of the Reserva Paisajística Subcuenca del Cotahuasi (RPSCC), Department of Arequipa, where populations of an undescribed species of the genus *Liolaemus* have been discovered recently. These individuals have morphological and molecular characteristics that are not assignable to any of the known species. Here, we describe this new species of *Liolaemus*, which inhabits the dry Puna of the RPSCC above 4,500 m asl. The combination of morphological and molecular characters differentiates this new species from its closest congeners. Phylogenetic analyses indicate that the new species is part of the *L. montanus* group and is grouped in a clade alongside *L. qalaywa,* recently described from a site 133 km northwest of the type locality of this new species.**

Keywords. Andes, Arequipa, dry Puna, protected area, Reptilia, systematics, taxonomy

***Resumen.*—La diversidad de reptiles en los Andes del suroeste de Perú está poco documentada, a pesar que en los últimos años se han intensificado los estudios en saurios, principalmente con el género *Liolaemus*, aún existen vacíos de información sobre la biodiversidad en esta área. Es el caso de la Reserva Paisajística Sub Cuenca del Cotahuasi (RPSCC), en el departamento de Arequipa, donde poblaciones de una especie no descrita del género *Liolaemus,* con características morfológicas y moleculares que no son asignables a ninguna de las especies conocidas. A continuación, describimos esta nueva especie de *Liolaemus*, que habita la Puna seca del RPSCC, por encima de los 4.500 m snm. La combinación de caracteres morfológicos y moleculares lo diferencia de sus congéneres más cercanos. Además, los análisis filogenéticos indican que la nueva especie es parte del grupo *L. montanus* y está agrupada en un clado junto a *L. qalaywa*, una especie recientemente descrita, ubicada a 133 km al noroeste de la localidad tipo de la nueva especie.**

Palabras clave. Andes, Arequipa, Área protegida, Puna seca, reptiles, sistemática, taxonomía

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Introduction

The genus *Liolaemus* Wiegmann, 1834, includes 283 valid species (Abdala et al. 2021) and represents about 85% of the diversity of the Liolaemidae family, which also harbors two other genera: *Ctenoblepharys*, with a single species (*C. adspersa*), and *Phymaturus* represented by 47 species (Abdala and Quinteros 2014; Lobo and Nenda 2015; González-Marín et al. 2016; Scolaro et al. 2016; Hibbard et al. 2019). The genus *Liolaemus* is distributed in South America, from central Peru to Patagonia in Argentina and Chile, inhabits various regions of Bolivia, Brazil, Uruguay, and Paraguay (Abdala and Quinteros 2014), and spans an altitudinal range from sea level to the peaks of the Andes (Aparicio and Ocampo 2010; Cerdeña et al. 2021). It has a very effective adaptive radiation and occupies a great variety of ecosystems, including environments with hostile climates, such as the High Andes (Chaparro et al. 2020) and hyper-arid deserts (Huamaní-Valderrama et al. 2020). *Liolaemus* species have a physiological condition that makes them dependent on the environment to obtain heat, being heliothermic (direct radiation) or thigmothermic (by contact with the substrate) (Martori et al. 2002; Astudillo et al. 2019). They also present different types of diets, ranging from strict herbivores (Valdecantos et al. 2012) to facultative omnivores (Pincheira-Donoso et al. 2008; Semhan et al. 2013; Olivera and Aguilar 2020), in addition to different reproductive types, including triploidy in females of *L. parthenos* (Abdala et al. 2016). In Peru, the genus *Liolaemus* is represented by 28 described species (Chaparro et al. 2020; Huamaní-Valderrama et al. 2020; Arapa-Aquino et al. 2021; Quiroz et al. 2021). In the last three years, the interest in this taxonomic group has resulted in the descriptions of nine new species in different regions (Gutiérrez et al. 2018; Aguilar-Puntriano et al. 2019; Villegas-Paredes et al. 2020; Chaparro et al. 2020; Huamaní-Valderrama et al. 2020; Arapa-Aquino et al. 2021; Quiroz et al. 2021), however, there are still several undescribed populations that would form independent lineages (Aguilar-Puntriano et al. 2018; Abdala et al. 2020; Quiroz et al. 2021).

Specifically in the Deparment of Arequipa, nine species of *Liolaemus* are registered (*L. annectens*, *L. anqapuka* *L. balagueri*, *L. etheridgei*, *L. insolitus*, *L. nazca*, *L. signifer*, *L. tacnae,* and *L. yarabamba*) (Zeballos et al. 2002; Gutiérrez et al. 2010; Aguilar et al. 2013; Villegas-Paredes et al. 2020; Huamaní-Valderrama et al. 2020; Ormeño et al. 2021; Quiroz et al. 2021), but there are still several additional species yet to be described (Abdala et al. 2020; Huamaní-Valderrama et al. 2020). An important protected area in the northeastern part of the Department, the Reserva Paisajística Sub Cuenca del Cotahuasi (RPSCC), is the largest in the western Peruvian Andes (SERNANP 2019a). The RPSCC presents a remarkable altitudinal gradient from 950 m asl in the Chaucalla sector up to 6,000 m asl on the summit of the mountain Solimana, and twelve different ecosystems present in this reserve have unique combinations of physical, climatic, and biological characteristics that generate a unique and globally important biological diversity (SERNANP 2019b). However, the diversity of *Liolaemus* reported in the RPSCC is very low, as among the nine species registered in Arequipa, *L. annectens* is the only species reported in this area (AEDES 2008).

During recent reptile surveys conducted in the Andean ecosystems of RPSCC, specimens of *Liolaemus* with distinctive morphological characteristics were collected, and considered a population of unknown taxonomic status. The morphological and molecular analyses carried out in this work allowed us to determine the independence of this population within the genus *Liolaemus*. This assessment used the general or unified concept of species proposed by De Queiroz (1998, 2007), which defines species as entities that represent independent historical lineages or divergent lineages of metapopulations. The independence of these lineages was assessed based on a morphological and molecular phylogeny, multivariate statistical analyses, and the description of unique morphological characters, providing decisive evidence to describe this population as a new species of the *L. montanus* group.

Materials and Methods

Fieldwork procedures. Field surveys were conducted in the RPSCC, at five localities in the Province of La Unión, Department of Arequipa, Peru, between 4,500–4,529 m asl. All specimens were collected by hand and euthanized with a lethal dose of 1% Halatal. Tissue samples were extracted from thighs and stored in microtubes containing 96% ethanol. Specimens were fixed in 10% formalin, stored in 70% ethanol, and deposited in the Museo de Historia Natural de la Universidad Nacional de San Agustín, Arequipa, Peru (MUSA), and the Museo de Biodiversidad del Perú, Cusco, Peru (MUBI). This study was carried out under permission issued by Resolución Jefatural Nº012-2019-SERNANP-RPSCC-J of Servicio Nacional de Áreas Naturales Protegidas por el Estado (SERNANP), of the Ministerio de Agricultura, Peru.

Material examined. Specimens of the *L. montanus* group were examined from four collections: Museo de Historia Natural, Universidad Nacional de San Agustín de Arequipa, Perú (MUSA); Museo de Biodiversidad del Perú, Cusco, Perú (MUBI); Museo de Historia Natural, Universidad Nacional Mayor de San Marcos de Lima, Perú (MUSM); and Fundación Miguel Lillo (FML), Tucumán, Argentina. The specimens analyzed for the first time, as well as those previously examined by Abdala and Quinteros (2008), Abdala et al. (2008, 2009, 2013, 2020), Quinteros et al. (2008), Quinteros and Abdala (2011), Gutiérrez et al. (2018), Abdala et al. (2020), Chaparro et al. (2020), and Huamaní-Valderrama et al (2020), are detailed in Appendix I.

Morphology. Morphological characters related to lepidosis, morphometry, and color pattern, follow Laurent (1985), Etheridge (1995, 2000), Abdala (2007), Abdala et al. (2020), Abdala and Juárez-Heredia (2013), and Gutiérrez et al. (2018). The description of the coloration in life is based on our field notes and photographs of the live specimens. Observations of lepidosis and body measurements were taken using a binocular stereoscope (10–40x) and a precision caliper to 0.01 mm. All bilateral characters were measured on the right side (Losos 1990; Abdala et al. 2019). The measured morphometric traits were: snout-vent length (SVL); length of the interparietal (LEI); head width (AC); head height (HC); auditory meatus height (hTy); auditory meatus width (aTy); length of the head (LC); neck width (ACC); length of the hand (LH); arm width (AHU); length of the radius (LAR); length of the arm (LB); length of the thigh (M); length of the tibia (T); length of the fourth toe of the hind limb (4P); length of the foot without claw (L4P); length of the trunk (TL); body width (AL); and width of the base of the tail (WTB). The meristic characters counted were: number of scales around the interparietal scale (A11); number of supralabials on the right side (A12); number of infralabials on the right side (A13); number of infralabials on the left side (A19); number of lorilabials (A20); number of scales around the mental scale (A14); Hellmich index (A18); subdigital lamellae of the fourth finger of the forelimb (A20–4); subdigital lamellae of the fourth toe of the hind limb (A21–4); number of dorsal scales between the occiput and the level of the anterior edge of the thigh (A22); number of ventral scales in contact with the second infralabial scales (A24); number of scales in contact with the mental scale (A25); number of scales around the nasal scale (M3); number of supraocular enlarged scales on the right side (M5); number of scales that form the frontal (M6); number of scales between the rostral and frontal (M11); number of organs in the postrostral scales considering that the scale organs are present on head scales of *Liolaemus* species, and appear to be randomly distributed to each individual examined (M16); number of gular scales (M23); number of scales around midbody (M26); number of ventral scales (M32); number of auricular scales, projecting scales on anterior edge of auditory meatus (M34); number of superciliaries (M37); number of temporals (M38); and number of pygals (M40). Morphometric and meristic characters are detailed in Appendix II.

Statistical analysis. The homoscedasticity was evaluated with Levene's test, and Normal distributions of the morphometric data were examined using the Kolmogorov-Smirnov test ($P \leq 0.05$). To reduce the effect of non-normal distributions of the morphological data, all continuous variables were $\log_{10}$ transformed and meristic variables were square-root transformed (Irschick and Losos 1996; Sokal and Rohlf 1998; Peres-Neto and Jackson 2001; Abdala et al. 2019). All operational taxonomic units were analyzed by two distinct treatments. Five populations of *Liolaemus* (*L.* "Cotahuasi," *L.* "Inmaculada," *L. melanogaster, L. qalaywa,* and *L. williamsi*) and the new species (*Liolaemus* **sp. nov**.), were used as comparative groups for building the PCA and DFA because they are both phylogenetically and geographically close to *Liolaemus* **sp. nov.** A principal component analysis (PCA) was employed to analyze the morphological variation, and discriminant function analysis (DFA) was used to verify morphological variation between and within each *Liolaemus* species employing a jackknife classification matrix (Manly 2000; McCune and Grace 2002; Quinn and Keough 2002; Zar 2010).

The PCA analysis was performed to assess the distribution of the individual characters corresponding to the six species (*L.* "Cotahuasi," *L.* "Inmaculada," *L. melanogaster*, *L. qalaywa*, *L. williamsi,* and *Liolaemus* **sp. nov.**) in the multivariate space. The PCA was based on the correlation matrices of the morphological variables to reduce the dimensionality of the data (Lovett et al. 2000; Quinn and Keough 2002). The PCA and DFA were analyzed separately for continuous and meristic characters, according to Abdala et al. (2019), in order to not joint both matrices in the multivariate analyses, although there is no mathematical consensus on this approach (McGarigal et al. 2000). The relationships of the new species and its congeners were examined by DFA means analysis of the morphological characters. *Liolaemus* groups were previously defined in the PCA analysis. This mathematical model allows an assessment of whether the groups discriminated by the DFA correspond to those established by the PCA. The DFA produces a linear combination of variables that maximizes the probability of correctly assigning observations to predetermined groups; and, simultaneously, new observations can be classified into one of the groups, providing likelihood values of such a classification (McGarigal et al. 2000; van den Brink et al. 2003). All statistical analyses were performed using the Statistica software, version 7.0 (http://www.statsoft.com).

DNA extraction, amplification, and sequencing. Total genomic DNA was extracted from samples of muscle using the GenElute mammalian genomic DNA miniprep kit (Sigma-Aldrich) according to the manufacturer's instructions. Fragments of the approximately 1,174 and 850 base pairs of the mitochondrial cytochrome b (cyt-*b*) and 12S rRNA genes were amplified through Polymerase Chain Reaction (PCR) using primers IguaCytob_F2 (5'-CCACCGTTGTTATTCAACTAC-3') and IguaCytob_R2 (5'-GGTTTACAAGACCA-ATGCTTT-3') (Corl et al. 2010); and tPhe

(5'-AAAGCACRGCACTGAAGATGC-3') and 12e (5'-GTRCGCTTACCWTGTTACGACT-3') (Wiens et al. 1999), respectively. Each reaction contained 1x PCR buffer (KCl), 2.5 mM $MgCl_2$, 0.25 mM each dNTP, 0.1 µM each primer, 1 unit of Taq DNA polymerase, and 1 µL DNA extract. PCR cycling consisted of 5 min initial denaturation at 94 °C then 35 cycles of: 30 sec at 94 °C; 30 sec at 55 °C; and 60 sec at 72 °C; followed by a final elongation step of 2 min at 72 °C. The PCR product was visualized on 1.5% agarose gels stained with Gel-Red (Biotium Inc.) and subsequently sent to Macrogen (South Korea) for purification and direct sequencing. The nucleotide sequence was visualized and edited using the 4 Peaks software (http://nucleobytes.com/4peaks/). It was checked manually, and nucleotides with ambiguous positions were clarified. The sequences newly obtained in this study are publicly available in GenBank (see Appendix III).

Phylogenetic analysis. Two matrices were constructed to include: (1) morphological data; (2) molecular characters (cyt-*b* and 12S); morphological phylogenetic analysis were performed using the matrix of Abdala et al. (2020). The morphological matrix includes 306 characters and 105 terminals (with *Ctenoblepharys adspersa* as an "outgroup" and 103 terminals of the *L. montanus* group). Parsimony was used as the optimality criterion, only selecting the shortest trees or those with the fewest homoplasies. TNT version 1.5 (Tree Analysis Using New Technology; Goloboff et al. 2003) was employed to generate the phylogenetic hypotheses. Continuous characters were analyzed following Goloboff et al. (2006) and standardized using the function mkstandb.run. For this analysis, the value of two was considered as the highest transformation cost. Heuristic searching was used to find the shortest trees or those with the smallest number of steps. The matrix was analyzed using the "*implied weights*" method (Goloboff 1993). The values of the constants K were between three and 20, and the values K = 14 (morphological analysis) were used as in the analysis of Abdala et al. (2020). One thousand replications were performed for each search. Symmetric resampling was used to obtain support values for the results obtained, with 500 replications with a deletion probability of 0.33. For the construction of the molecular phylogenetic tree, the cyt-*b* and 12S sequences were concatenated and compared with *Liolaemus montanus* group sequences obtained from GenBank (Appendix III). A maximum likelihood phylogenetic analysis was carried out with MEGA X (Kumar et al. 2018). Heuristic tree searches were performed with the HKY + G substitution model (determined with the Akaike information criterion), and 1,000 bootstrap replications.

Results and Discussion

Studies were performed on a new lineage of lizards of the genus *Liolaemus*, which was validated using integrative taxonomy (with morphological and molecular evidence). The results of the phylogenetic and statistical analyses performed suggested that the new population can be considered as distinctive from all other described species of the *Liolaemus* genus. In accordance with best practices in zoological nomenclature, the results of the morphological revision and phylogenetic analyses are provided following the formal presentation of the new proposed species.

Taxonomy

Liolaemus warjantay **sp. nov.** (Fig. 1)

2008 *Liolaemus signifer annectens*, AEDES Guía de Anfibios y Reptiles. Reserva Paisajística Subcuenca del Cotahuasi
2020 *Liolaemus* aff. *qalaywa*, Huamaní-Valderrama et al. *Amphibian & Reptile Conservation*
2021 *Liolaemus* aff. *qalaywa*, Quiroz et al. *Zoological Studies*

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Holotype. MUSA 5700, an adult male (Figs. 1, 2C–E, and 4A, D, G, J, M, P), from 6.4 km NE of Pampamarca, District of Pampamarca, Province of La Unión, Department of Arequipa, Peru (15°5'41.24"S 72°57'7.06"W) at 4,529 m asl, collected on 20 December 2019, by M. Ubalde and L. Arapa.

Paratypes. Thirteen specimens. All specimens belong to District of Pampamarca, Province of La Unión, Department of Arequipa, Peru. **Six adult males:** MUSA 5691–92 from 4.1 km NE of Pampamarca, (15°9'37.79"S, 72°55'30.10"W) at 4,500 m asl, collected on 6 August 2019, by M. Ubalde, J. Bedregal, J. Zegarra, L. Cáceres, and E. Guillén. MUSA 5695 from 0.06 km S of holotype (15°5'54.30"S, 72°57'5.49"W) at 4,510 m asl, collected on 19 December 2019, by M. Ubalde and L. Arapa. MUSA 5701–02 and MUBI 17684, same data as holotype. **Five adult females:** MUSA 5693–94 from 0.2 km S of holotype (15°5'47.80"S, 72°57'5.19"W) at 4,510 m asl, collected on 6 August 2019, by M. Ubalde, J. Bedregal, J. Zegarra, L. Cáceres, and E. Guillén. MUBI 17683, an adult female, from 6.3 km NE of Pampamarca, (15°5'44.14"S, 72°57'6.93"W) at 4,503 m asl, collected on 6 August 2019, by M. Ubalde, J. Bedregal, J. Zegarra, L. Cáceres, and E. Guillén. MUSA 5696 and 5699 from 6.2 km NE of Pampamarca (15°5'42.68"S, 72°57'8.28"W) at 4,504 m asl, collected on 19 December 2019, by M. Ubalde and L. Arapa. **One subadult female:**

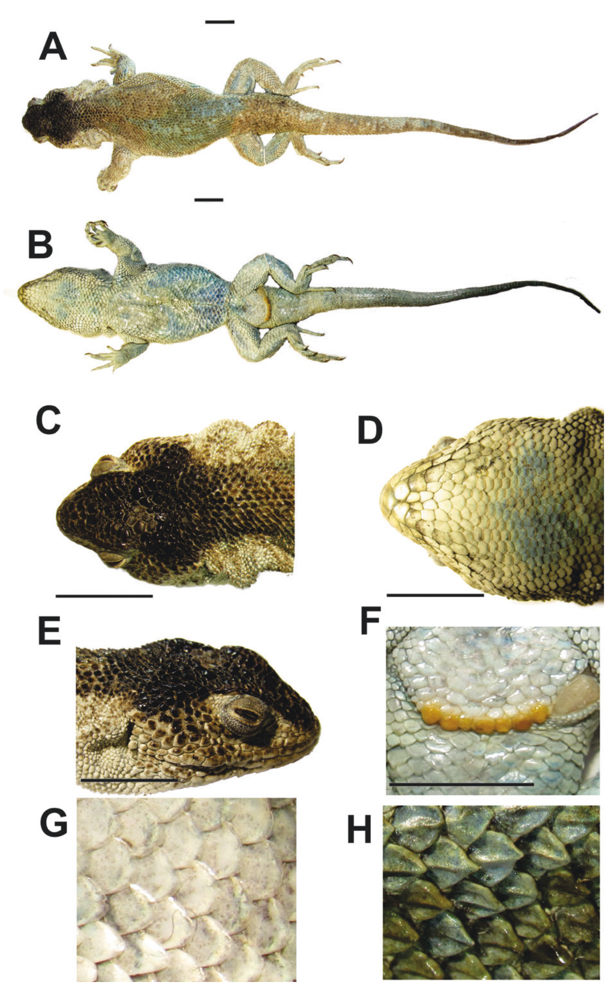

Fig. 1. Holotype of *Liolaemus warjantay* **sp. nov.** MUSA 5700 (SVL = 89.56 mm, Tail = 122.3 mm): **(A)** dorsal and **(B)** ventral views of body; **(C)** dorsal, **(D)** ventral, and **(E)** lateral views of head; **(F)** ventral view of precloacal pores; **(G)** ventral body scales; **(H)** keeled dorsal body scales. Scale = 5 mm.

MUSA 5698 from 0.4 km S of holotype (15°5'55.81"S, 72°57'6.35"W) at 4,501 m asl, collected on 19 December 2019, by M. Ubalde and L. Arapa.

Diagnosis. We assign *Liolaemus warjantay* **sp. nov**. to the *L. montanus* group because it presents a blade-like process on the tibia, associated with the hypertrophy of the tibial muscle *tibialis anterior* (Etheridge 1995; Abdala et al. 2020) and based on molecular (Fig. 6) and morphological evidence (Fig. 5). The species of the *L. montanus* group differ from those of the *L. boulengeri* group by the complete absence of patches of enlarged scales in the posterior part of the thigh (Abdala 2007). Compared to the species of the *L. montanus* group, *Liolaemus warjantay* **sp. nov.** is a robust lizard differing by its larger size (max SVL = 89.56 mm) from *Liolaemus andinus, L. anqapuka, L. audituvelatus, L. balagueri, L. cazianiae, L. chiribaya, L. duellmani, L. eleodori, L. erroneus, L. etheridgei, L. evaristoi, L. fabiani, L. famatinae, L. fittkaui, L. foxi, L. gracielae, L. griseus, L. hajeki, L. halonastes, L. huacahuasicus, L. insolitus, L. montanus, L. multicolor, L. nazca, L. omorfi, L. orko, L. ortizi, L. pantherinus, L. poconchilensis, L. poecilochromus, L. porosus, L. pulcherrimus, L. reichei, L. robertoi, L. rosenmanni, L. ruibali, L. schmidti, L. stolzmanni, L. tajzara, L. thomasi, L. torresi, L. vallecurensis, L. williamsi,* and *L. yarabamba* (all with SVL between 50–80 mm). The presence of imbricate dorsal scales with keels differentiates *L. warjantay* **sp. nov**. from species with smooth juxtaposed or sub-imbricate scales, such as *Liolaemus andinus, L. audituvelatus, L. balagueri, L. cazianiae, L. chiribaya, L. eleodori, L. fabiani, L. foxi, L. gracielae, L. halonastes, L. insolitus, L. jamesi, L. nigriceps, L. omorfi, L. patriciaiturrae, L. pleopholis, L. poconchilensis, L. poecilochromus, L. porosus, L. reichei, L. robertoi, L. robustus, L. rosenmanni, L. ruibali, L. schmidti, L. scrocchii, L. torresi, L. vallecurensis, L. victormoralesii,* and *L. vulcanus*.

The new species differs from *Liolaemus chiribaya, L. evaristoi, L. etheridgei, L. insolitus, L. multicolor, L. omorfi, L. poconchilensis, L. pulcherrimus, L. robertoi, L. ruibali*, and *L. schmidti*, by the absence of sky blue or light blue scales on the sides and dorsum of the body and tail. The number of scales around midbody in *L. warjantay* **sp. nov**. varies between 55–64 (mean = 60.3), which differentiates it from several species of the group with more than 65 scales, such as *L. andinus, L. audituvelatus, L. cazianiae, L. duellmani, L. eleodori, L. erroneus, L. forsteri, L. foxi, L. gracielae, L. halonastes, L. inti, L. multicolor, L. nigriceps, L. patriciaiturrae, L. pleopholis, L. poecilochromus, L. porosus, L. pulcherrimus, L. robertoi, L. rosenmanni, L. ruibali, L. schmidti, L. multiformis,* and *L. vallecurensis*. The number of ventral scales between the mental scale and the border of the vent in *L. warjantay* **sp. nov.** varies between 72–85 (mean = 78.2), and is lower than the number in the following species (with more than 90 ventral scales): *L. andinus, L. cazianiae, L. erroneus, L. foxi, L. gracielae, L. halonastes, L. inti, L. multicolor, L. nigriceps, L. pachecoi, L. patriciaiturrae, L. pleopholis, L. poecilochromus, L. porosus, L. robertoi, L. rosenmanni, L. torresi,* and *L. vallecurensis*; and higher than the number in the following species (with less than 70 ventral scales): *L. dorbignyi, L. fittkaui, L. melanogaster, L. polystictus,* and *L. thomasi*. The number of dorsal scales of *L. warjantay* **sp. nov**. varies between 45–63 (mean = 52.8), while the species with more than 70 scales are *L. andinus, L. audituvelatus, L. cazianiae, L. duellmani, L. eleodori, L. erroneous, L. fabiani, L. famatinae, L. forsteri, L. foxi, L. gracielae, L. halonastes, L. multicolor, L. nigriceps, L. orko, L. patriciaiturrae, L. pleophlolis, L. poecilochromus, L. porosus, L. pulcherrimus, L. robertoi, L. rosenmanni, L. ruibali, L. schmidti, L. torresi,* and *L. vallecurensis;* and the species with less than 45 dorsal scales are *L. jamesi* and *L. pachecoi.*

Only one female was found with two vestigial precloacal pores, that differentiates *Liolaemus warjantay* **sp. nov.** from species that do have pores in all females and in greater quantity as in *L. aymararum, L. cazianiae, L. chiribaya, L. chlorostictus, L. dorbignyi, L. eleodori, L. erroneus, L. etheridgei, L. fabiani, L. famatinae, L. griseus, L. hajeki, L. huayra, L. huacahuasicus, L. inti, L. jamesi, L. montanus, L. nazca, L. nigriceps, L. orko, L. pachecoi, L. pantherinus, L. patriciaiturrae, L. porosus, L. pulcherrimus, L. qalaywa, L. scrocchii, L. multiformis,* and *L. vulcanus*.

The color pattern clearly differentiates the new species from *Liolaemus yauri*, mainly the dorsal color of the head in both sexes of *L. warjantay* **sp. nov.** is dark grey and always darker than body, while in *L. yauri* the coloration is lighter and not in contrast with the body color; the color of the palpebral scales in females of *L. warjantay* **sp. nov.** is pale yellow, and in *L. yauri* is chestnut or grey; the shapes of the paravertebral spots in both sexes of *L. warjantay* **sp. nov.** are in the form of thin transversal lines and curved posteriorly (ocelli-shaped), while in *L. yauri* they are circular rhomboid or sub-quadrangular.

Liolaemus warjantay **sp. nov.** can be distinguished from *L. annectens* and *L. qalaywa* (two geographically close species) by a combination of the following characters: trifid scales from the plantar surface, absence of pores in the base of the tail, presence of gular fold, and the presence of ocelli in males (Table 2, Fig. 4). The analysis of DNA sequences of *L. warjantay* **sp. nov.** reveals differences of 2.4–5.1% with *L. qalaywa*, and 9.2–9.5% with *L. annectens*.

Description of the holotype (Fig. 1). Adult male (MUSA 5700), SVL 89.56 mm. Head greater in length (22.45 mm) than width (17.02 mm). Head height 12.51 mm. Neck width 21.43 mm. Eye diameter 3.83 mm. Interorbital distance 13.33 mm. Auditory meatus elliptical 5.97 mm high, 1.98 mm wide. Internasal width 3.52 mm. Subocular scale length 6.18 mm. Trunk length 34.53 mm, width 28.64 mm. Tail length 122.3 mm. Tail width 15.08 mm (cloaca level). Femur length 20.53 mm, tibia 18.61 mm, and foot 26.01 mm. Humerus length 12.03 mm, width 8.43 mm. Forearm length 8.43 mm, width 17.54 mm. Hand length 15.84 mm. Fourth finger length of the foot 15.52 mm. Pygal region length 8.89 mm, and cloacal region width 12.31 mm. Nasal separated from rostral by one scale. Two internasals slightly longer than wide. Nasal surrounded by seven scales, separated from canthal by one scale. Six scales between frontal and rostral. Frontals divided into four scales. Interparietal surrounded by eight scales. Preocular separated from lorilabials by one scale. Five superciliaries and 15 upper ciliary scales, lower ciliaries are neither projected nor open between them. Three differential scales at anterior margin of auditory meatus and a large diagonal auricular scale. Nine temporary granular scales. Five lorilabial scales, in contact with subocular. Eight supralabials, which are not in contact with subocular. Five supraocular. Ten lorilabials, five scales are in contact with the subocular scale and separated by a scale from the preocular. Six infralabials. Four scales around the mental scale. Four scales in contact with the second infralabial scale, and six scales separate the fourth shields. Dorsal head with 15 scales, 42 scales up to the neck, 24 up to the antehumeral fold (following the longitudinal fold), 59 scales around the body, 51 dorsal from the occiput to the hind limbs. The dorsal scales are triangular, with a pronounced keel, mucron, and imbricate. With 79 ventral scales, eight pygals, and seven precloacal pores.

Four chin shields, 4th pair separated by six scales. Seventy scales around half a body. Fifty-nine triangular dorsal body scales, imbricated, and with a keel and mucron; laminar anterior on members, imbricate and slightly keeled; laminar on hind limbs, imbricate and slightly keeled; tail with dorsal scales juxtaposed. Seventy-nine ventral scales, from the mental to the cloacal region, following the ventral midline of the body, laminar, imbricated. Thirty-seven imbricate gulars, smooth. Neck with longitudinal fold with 42 granular, not-keeled scales, ear fold and antehumeral fold present. Forelimbs ventrally laminar, subimbricate to imbricate, with keeled scales; hind legs laminar, imbricate, with keeled scales. Twenty subdigital lamellae on the 4th finger of the hand. Twenty-two subdigital lamellae of the 4th toe, with three keels, plantar trifid scales with keels and mucrons. Lamellar ventral scales on tail, imbricate, not keeled. Seven precloacal pores. Supernumerary pores absent.

Color of holotype in life (Figs. 2D–F). Head completely melanic. Temporal region with clear edges, supralabial, infralabial, and lorilabial scales are gray with black spots. Palpebral scales pale yellow. Neck dorsally black and yellow on the sides with some black or dark hues. Body uniform brownish-yellow color, vertebral field not defined, vertebral line and dorsolateral bands absent. Paravertebral spots diffuse, imperceptible, black in color, and in the form of thin transversal lines, curved posteriorly. These spots project to the sides of the body, which are lighter yellow in color with no obvious spots. Front and rear legs brown with yellow hues and dark scales. Fingers light gray. Tail of the same color as the body, a little lighter on the sides and at its distal end. Venter light gray or whitish throughout the body, with some dark shades in the center of the abdomen and yellow on the sides of the abdomen.

Morphological variation (Table 1). Thirteen specimens including MUSA 5691–96, MUSA 5698–5702, and MUBI 17683–84 (seven males and six females). Considering both sexes, individuals of *L. warjantay* **sp. nov**. reach a maximum snout-vent length of 95.12 mm, with males tending to be larger than females (SVL male mean: 85.98 mm; SVL female mean: 78.39 mm) (Table 1). Other characters: A line of lorilabial scales. Dorsal scales juxtaposed, triangulars the majority and with keeled scales between occiput and hindlimb

Table 1. Morphological variation among specimens of *Liolaemus warjantay* **sp. nov.**

Morphological character	Variation	Mean	STD
Dorsal surface of head rough	(14–18)	15.69	1.49
Nasal surrounded	(5–7)	5.85	0.8
Supralabials	(6–8)	7.08	0.49
Lorilabials	(7–9)	8.38	1.04
Supraoculars	(4–5)	4.62	0.51
Parietals (slightly smaller than interparietals)	(5–9)	6.85	1.21
Infralabials	(6–7)	6.08	0.28
Gulars	(32–37)	34.58	1.83
Temporals granular	(8–10)	9	0.71
Auditory meatus height	(3.01–5.97)	3.96	0.73
Auditory meatus width	(0.7–1.98)	1.36	0.38
Head length	(16.03–22.74)	20.11	2.19
Head width	(12.12–22.85)	16.98	3.36
Head height	(8.31–12.9)	10.73	1.42
Underarm to groin length	(24.84–71.93)	37.84	11.58
SVL males	(74.87–95.12)	85.98	6.06
SVL females	(61.1–92.31)	78.39	12.18
Femur length	(12.9–20.53)	16.71	2.09
Humerus length	(10.18–13.35)	11.59	0.99
Forearm length	(9.10–12.32)	11.19	0.99
Hand length	(10.64–16.19)	13.3	1.63
Scales around midbody	(55–64)	60.31	2.78
Scales dorsals	(45–63)	52.77	4.97
Infradigital lamellae of the 4th finger of the hand	(16–20)	17.62	1.45
Infradigital lamellae of the 4th finger of the toe	(17–25)	22.23	1.92
Ventral scales	(72–85)	78.15	3.91
Tail length (n = 8)	(99.61–123.56)	112.52	9.06
Males with precloacal pores	(5–9)	7.14	1.46
Females with precloacal pores	(0–2)	0.33	0.82
Body measurements in males		85.95	
Body measurements in females		78.39	
Tail length in males		115.74	
Tail length in females		108.36	

insertion. Parietals slightly smaller than interparietals. Occiput scales granular or conical in males and granular in females. Nasal and canthal separated by two scales. Upper ear border with enlarged anterior diagonal scale. Temporary scales granular and without keel. Subocular in contact with three to five lorilabials. Second right infralabial scale in contact with four or five scales. Dorsal body scales, subimbricated to imbricate, males with dark, light and triangular scales, females with dark scales and rounded or triangular posterior border. Ventral scales, imbricated in the gular, pectoral, abdominal, and pygal region. Precloacal pores evident in males, only one female with two small pores. Dorsal scales at the base of the tail are imbricated. Dorsal scales on forelimbs imbricate without keel or slight keel. Dorsal scales on hind limbs imbricate and with a slight to strong keel, only one female with subimbricate. Heteronotes in the region where the femoral patch would be present. Palmar scales, imbricated and with a triangular posterior border. Plantar scales, with slight or strong keel and triangular rear edge, one male rounded and without keel and one female without keel. Subdigital lamellae of the fourth toe with three keels.

Color variation in life (Figs. 2–3). *Liolaemus warjantay* **sp. nov**. shows evident sexual dichromatism. In males, head and temporal region are gray or dark brown, always darker than body. Lorilabial, supralabial, and infralabial

Fig. 2. Adult males of *Liolaemus warjantay* **sp. nov.** in dorsal, lateral, and ventral views: **(A–C)** MUSA 5695 (SVL = 88.18 mm); **(D–F)** MUSA 5700 (SVL = 89.56 mm, Tail = 123.3 mm); **(G–I)** MUSA 5702 (SVL = 86.21 mm, Tail = 123.56 mm); **(J–L)** MUBI 17684 (SVL = 86.21 mm, Tail = 123.56 mm); **(M–O)** MUSA 5702 (SVL = 84.89 mm, Tail = 117.47 mm).

scales are always lighter in color than the rest of the head. Color of body is highly variable, varying from brown to dark gray. Paravertebral spots are dark and can vary in shape and intensity. Most of the specimens have the shape of light ocelli with two edges, one light internal and the other dark external, which can vary in intensity and thickness. These edges can project to the sides of the body. Paravertebral spots are more evident in juvenile specimens, and in larger males they can be very diffuse or imperceptible. No vertebral line, dorsolateral bands, antehumeral arch, or scapular spots. The sides of the body are lighter than the back, and can vary from yellow to orange. No lateral spots, with small circular spots, with yellow orange scales. No blue scales anywhere on the body. The forelimbs and hindquarters are generally lighter in color than the body and with yellow or black dots or scales. Tail with spots and lines of the body change merging or fading until they are completely lost by approximately the first fifth of the tail, then they become lighter or darker in color than the rest of the body (Fig. 2). Ventrally, the color is variable, some males are completely yellow, orange, or white; some with dark spots or scales on different parts of the body. Females have a similar design as males, but with less dramatic colors (Fig. 3). Head color also varies from chestnut to dark gray. Supralabial, infralabial, and lorilabial scales are lighter in color than the back of the head, with gray being the most common color. Dorsal body is light to dark brown. Paravertebral spots are also ocelli-shaped, but they are black or dark brown with a white border. These ocelli are more evident in smaller females and may be absent in larger ones. Some females with edges of the paravertebral spots projecting to the sides of the body in a “zigzag” line shape, with no obvious vertebral line or

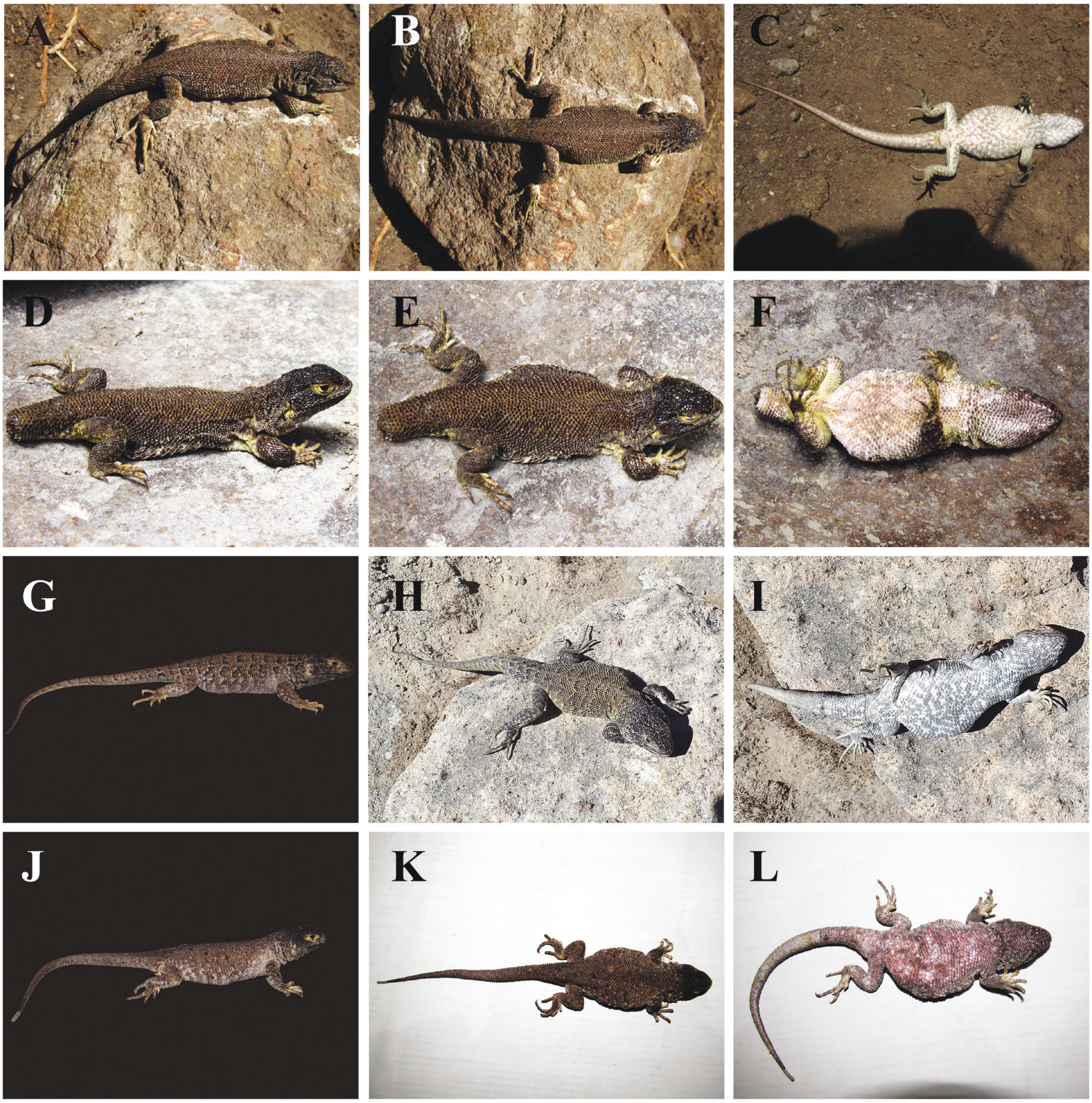

Fig. 3. Adult females of *Liolaemus warjantay* **sp. nov.** in dorsal, lateral, and ventral views: **(A–C)** MUSA 5699 (SVL = 70.63 mm, Tail = 99.61 mm); **(D–F)** MUSA 5696 (SVL = 88.14 mm); **(G–I)** MUSA 5694 (SVL = 85.84 mm, Tail = 118.33 mm); **(J–L)** MUBI 17683 (SVL = 92.31 mm, Tail = 107.14 mm).

dorsolateral bands. Lateral body is generally the same color as dorsum. No lateral spots. Tail and hind limbs have the same design and color as the body, however, they are lighter in color after the first third. Immaculate white underneath. Some have dark spots or scales on different parts of the body.

Distribution and natural history (Figs. 7–8). *Liolaemus warjantay* **sp. nov.** is restricted to the type locality, Pampamarca (Fig. 8), in the RPSCC, Department of Arequipa, Peru, at elevations between 4,500–4,529 m asl (Fig. 7). This species inhabits high Andean dry puna (Fig. 8), where the climate has hostile conditions due to the high elevations, with a wide range of temperatures (-8.9–14.6 ºC), and an annual average of 4 ºC (WorldClim database, based on collected information on environmental variables for 30 years) (Fick and Hijmans 2017). Individuals were registered and collected during the dry and wet seasons (July–December), in natural rocky areas with rocks which varied in size ranging between 30–200 cm, small bushes (*Parasthrephia* sp.), grassland (*Stipa* sp. and *Festuca* sp.), and to a lesser extent an area of yareta (*Azorella* sp.). The peak of lizard activity was during 1100–1300 h. In the month of July, 100% of the adult females observed were pregnant; while in December, no pregnant females were observed, but there were juvenile individuals. In most cases, the juveniles were associated with shelters that were channels under

Table 2. Morphological differences between *Liolaemus warjantay* **sp. nov.** and related species.

Species	*L. warjantay* **sp. nov.**		*L. qalawa*		*L. annectens*	
Morphological character	Males (n = 7)	Females (n = 6)	Male (n = 1)	Females (n = 8)	Males (n = 9)	Females (n = 10)
Lorilabial scales	7–10 $\bar{x}$ = 8	7–9 $\bar{x}$ = 8	9	6–8 $\bar{x}$ = 7	6–8 $\bar{x}$ = 7	6–8 $\bar{x}$ = 7
Infralabials forming a keel	absent	absent	barely keeled	barely keeled	absent	absent
Supra-scapular fold	present	present	present	present	absent	absent
Granular scales in lateral field of dorsum	absent	absent	absent	absent	present	present
Surface of scales on side of body	smooth	smooth	barely keeled	barely keeled	smooth	smooth
Ventrolateral line	present	present	absent	absent	present	present
Antehumeral scales enlarged	absent	absent	present	present	present	present
Shape of palmar scales	trifid	trifid	triangular	triangular	trifid	trifid
Mucron in scales of hindlimbs	absent	absent	present	present	absent	absent
Shape of plantar scales	trifid	trifid	rounded	rounded	conical	conical
Pores on base of tail	absent	absent	present	present	absent	absent
Gular fold	incomplete	incomplete	absent	absent	absent	absent
Enlarged scales on sides of gular fold	present	present	absent	absent	absent	absent
Color pattern	Dorsal coloration pattern in the form of ocelli in males		The design of the dorsal body color pattern is diffuse and variable.		Seamless pattern of yellowing around the eyes	
	Yellow coloration pattern around the eyes observed only in females		The coloration of males and females is yellow and orange around the eye.			

the rocks (approximately 40 cm long by 20 cm high) and were observed together with adult females in some cases, and the number of juveniles observed in each refuge was between 3–6 individuals. The potential predators of *L. warjantay* **sp. nov**. are: American Kestrel (*Falco sparverius*), Andean Fox (*Lycalopex culpaeus*), and snakes (*Tachymenys peruviana*), which were observed during field work in the type locality of *L warjantay* **sp. nov.**, and these species are known to include a percentage of lizards in their diets (Jaksić et al. 1981, 1982; Guzmán-Sandoval et al. 2007; Walker et al. 2007; Santillán et al. 2009; Miranda et al. 2015; Pozo-Zamora et al. 2017).

Etymology. The specific name in the Quechua language ("warjantay") refers to the local name in RPSCC and its surroundings assigned to the high Andean lizards of the genus *Liolaemus*.

Phylogeny. The morphology-based phylogeny presented here (Fig. 5), performed with all the values of the concavity constant (K), indicates that *Liolaemus warjantay* **sp. nov.** belongs to the *L. montanus* group, and within this to the *L. ortizi* clade (Abdala et al. 2020), and it is recovered as sister taxon of *L. qalaywa*. The molecular analysis (Fig. 6) shows that the terminals of *L. warjantay* **sp. nov.** (MUBI 17683, MUSA 5692, MUSA 5685, VOI 009, and VOI 006) form a monophyletic subclade. This was also recovered as a sister of *L. qalaywa* in a clade with a terminal identified as *L. signifer sensu lato* (MUSM 29110), from Desaguadero, in the Department of Puno, near the Bolivian border, which was mentioned by Chaparro et al. (2020) and might represent a potential new species of the *L. montanus* group from the Titicaca Andean plateau in southern Peru. The topology of the molecular tree is consistent with previous results using

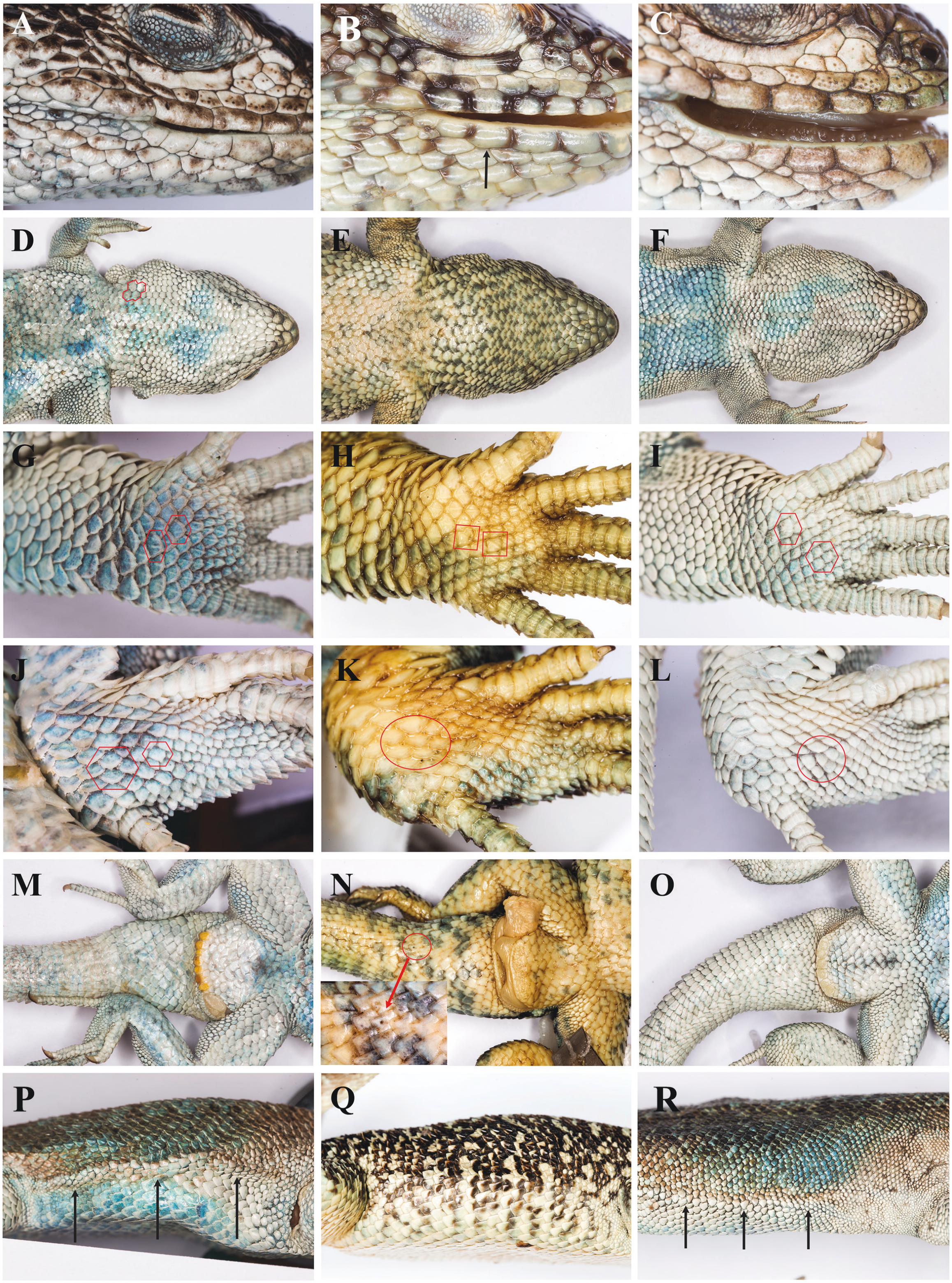

Fig. 4. Comparisons of distinctive characters between the new species described herein and the phylogenetically and morphologically closest species. Adult males of, *Liolaemus warjantay* **sp. nov.** (MUSA 5700, holotype): **(A)** Infralabials with absent keel, **(D)** Presence of enlarged scales on sides of gular fold, **(G)** Palmar scales trifid, **(J)** Plantar scales trifid, **(M)** Absence of pores at the base of the tail, **(P)** Dorsolateral fold present; *L. qalaywa* (MUBI 13286, holotype): **(B)** Infralabials barely keeled, **(E)** Absence of enlarged scales on sides of gular fold, **(H)** Palmar scales triangular, **(K)** Plantar scales rounded, **(N)** Presence of pores at the base of the tail, **(Q)** Dorsolateral fold absent; *L. annectens* (LECG 102): **(C)** Infralabials with absent keel, **(F)** Absence of enlarged scales on sides of gular fold, **(I)** Palmar scales trifid, **(L)** Plantar scales conical, **(O)** Absence of pores at the base of the tail, **(R)** Dorsolateral fold present.

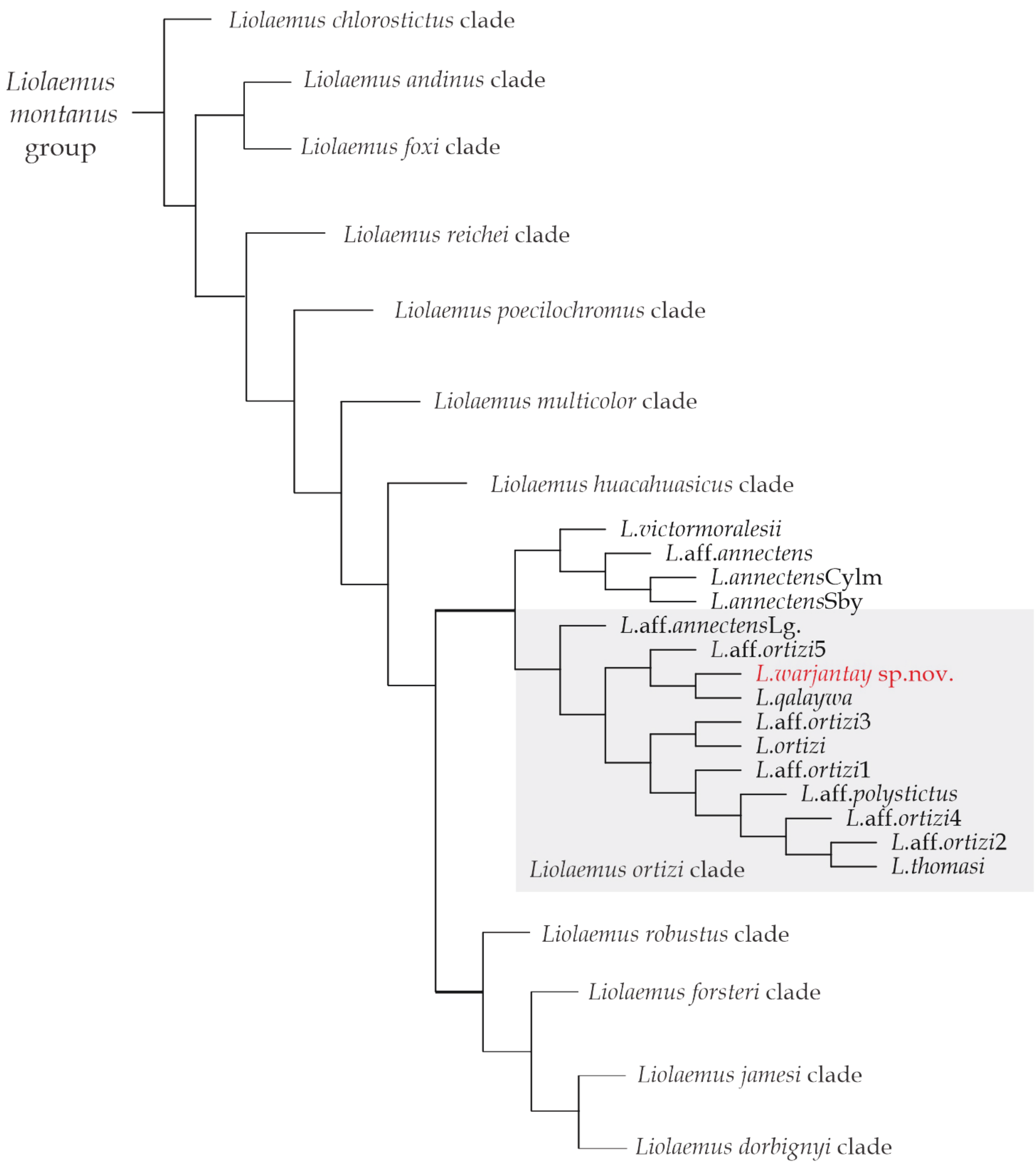

Fig. 5. Phylogenetic tree showing the relationships between *Liolaemus warjantay* **sp. nov.** and species within the *L. montanus* group by morphological phylogenetic analysis.

either the same molecular markers (Chaparro et al. 2020) or only cyt-*b* (Huamaní-Valderrama et al. 2020; Quiroz et al. 2021).

Statistical analysis. The summary statistics for all the non-transformed continuous and meristic characters taken from the six species of *Liolaemus* are shown in Appendix II. Levene's test did not find homogeneity of variance for either the continuous or meristic characters in some groups. Therefore, Principal Component Analysis is recommended to extract the linear combinations that best explain the variation in the data set. The results of the PCAs for continuous and meristic characters are presented separately in Table 3 (Fig. 9) and Table 4 (Fig. 10). The first two components of the continuous characters explained 72.15% of the variation. A screen plot test of the PCs indicated that only the two first components contained nontrivial information. The first axis represents body size, loading for most variables positively and accounting for 63.60% of the variation,

Table 3. Principal Component (PC) axis loadings of continuous characters for *L.* "Cotahuasi" (*n* = 14), *L.* "Inmaculada" (*n* = 15), *L. melanogaster* (*n* = 2), *L. qalaywa* (*n* = 8), *L. williamsi* (*n* = 5), and *L. warjantay* **sp. nov.** (*n* = 11). Eigenvectors, eigenvalues, and percentages of variance explained for the first two Principal Components from transformed data in the six putative species of *Liolaemus*.

Loadings	PC1	PC2
Percentage variation accounted for	63.6	8.55
Eigenvalue	12.08	1.62
Snout-vent length	0.95	0.08
Length of the interparietal	0.89	–0.08
Head width	0.8	0.39
Head height	0.67	0.01
Auditory meatus height	0.78	–0.21
Auditory meatus width	–0.06	–0.73
Length of the head	0.95	–0.01
Neck width	0.92	0.23
Length of the hand	0.8	0.07
Arm width	0.88	–0.08
Length of the radius	0.62	–0.54
Length of the arm	0.62	–0.36
Length of the thigh	0.87	–0.30
Length of the tibia	0.93	–0.08
Length of the fourth toe of the hind limb	0.72	0.14
Length of the foot without claw	0.89	0.06
Length of the trunk	0.62	0.32
Body width	0.78	0.39
Width of the base of the tail	0.9	–0.16

with strong loadings for: snout-vent length, length of the head, length of the tibia, neck width, width of the base of the tail, length of the interparietal, length of the foot without claw, arm width, length of the thigh, head width, length of the hand, auditory meatus height, body width, and length of the fourth toe of the hind limb. The second axis represents morphological variation and accounts for most of the remaining variation, with strong loading for auditory meatus width. The first three components of meristic characters explained 43.00% of the variation, and a screen plot test of the PCs indicated that only those components contain relevant information. The three axes represent morphological variation, loading strongly for number of temporals, number of supralabials on the right side, and number of ventral scales in contact with the second infralabial scales. The three axes account for the remaining variation, albeit with values below 0.70. The positions of the species based on their scores for the two morphological principal components axes are illustrated in Figs. 9–10. The spatial distribution of the

Table 4. Principal Component (PC) axis loadings of meristic characters for *L.* "Cotahuasi" (*n* = 14), *L.* "Inmaculada" (*n* = 15), *L. melanogaster* (*n* = 2), *L. qalaywa* (*n* = 8), *L. williamsi* (*n* = 5), and *L. warjantay* **sp. nov.** (*n* = 11). Eigenvectors, eigenvalues, and percentages of variance explained for the first three Principal Components from transformed data in the six putative species of *Liolaemus*.

Loadings	PC1	PC2	PC3
Percentage variation accounted for	19.32	13.62	10.07
Eigenvalue	4.64	3.27	2.42
Number of scales around the interparietal scale	0.09	0.1	–0.17
Number of supralabials on the right side	–0.75	–0.03	0.1
Number of infralabials on the right side	0.57	–0.17	–0.47
Number of infralabials on the left side	0.41	0.4	0.15
Number of lorilabials	–0.66	0.35	0.03
Number of scales around the mental scale	–0.40	–0.14	–0.03
Hellmich index	–0.60	0.27	0.18
Subdigital lamellae of the fourth finger of the forelimb	–0.48	0.64	–0.09
Subdigital lamellae of the fourth toe of the hind limb	–0.38	0.5	–0.10
Number of dorsal scales between the occiput and the level of the anterior edge of the thigh	–0.26	–0.39	–0.21
Number of ventral scales in contact with the second infralabial scales	–0.11	0.45	–0.74
Number of scales in contact with the mental scale	–0.16	–0.46	0.46
Number of scales around the nasal scale	0.2	–0.18	0.49
Number of supraocular enlarged scales in the right side	–0.43	–0.02	–0.15
Number of scales that form the frontal	0.2	–0.45	–0.54
Number of scales between the rostral and frontal	–0.33	–0.16	–0.29
Number of organs in the postrostral scales	–0.04	–0.36	0.1
Number of gular scales	–0.65	–0.54	0.06
Number of scales around midbody	–0.65	–0.42	–0.28
Number of ventral scales	–0.14	0.28	–0.60
Number of auricular scales	0.36	–0.39	–0.33
Number of superciliaries	–0.04	–0.63	–0.25
Number of temporals	–0.86	–0.16	0
Number of pygals	–0.15	–0.33	–0.04

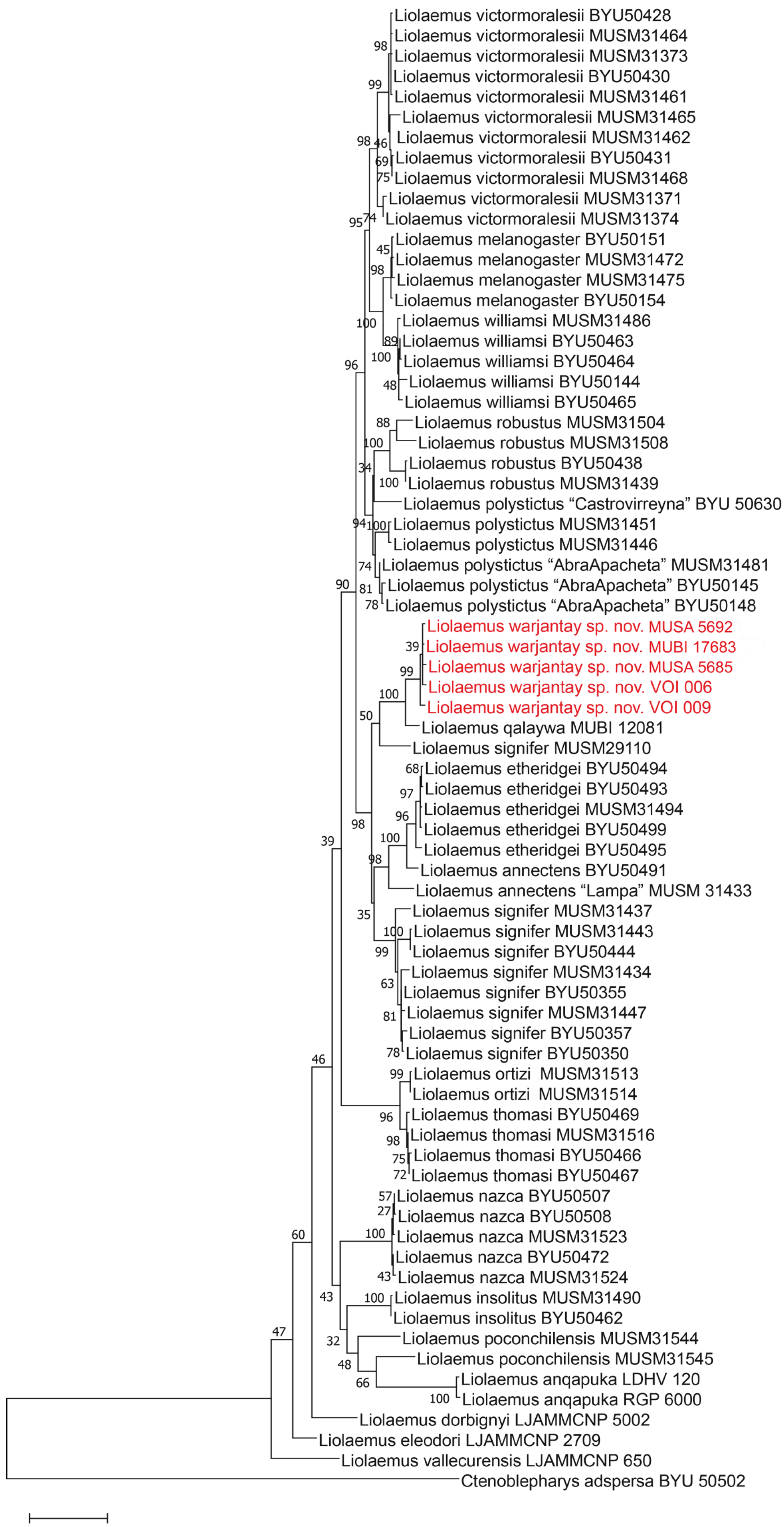

Fig. 6. Phylogenetic tree showing the relationships between *Liolaemus warjantay* **sp. nov.** and species within the *L. montanus* group by molecular phylogenetic analysis.

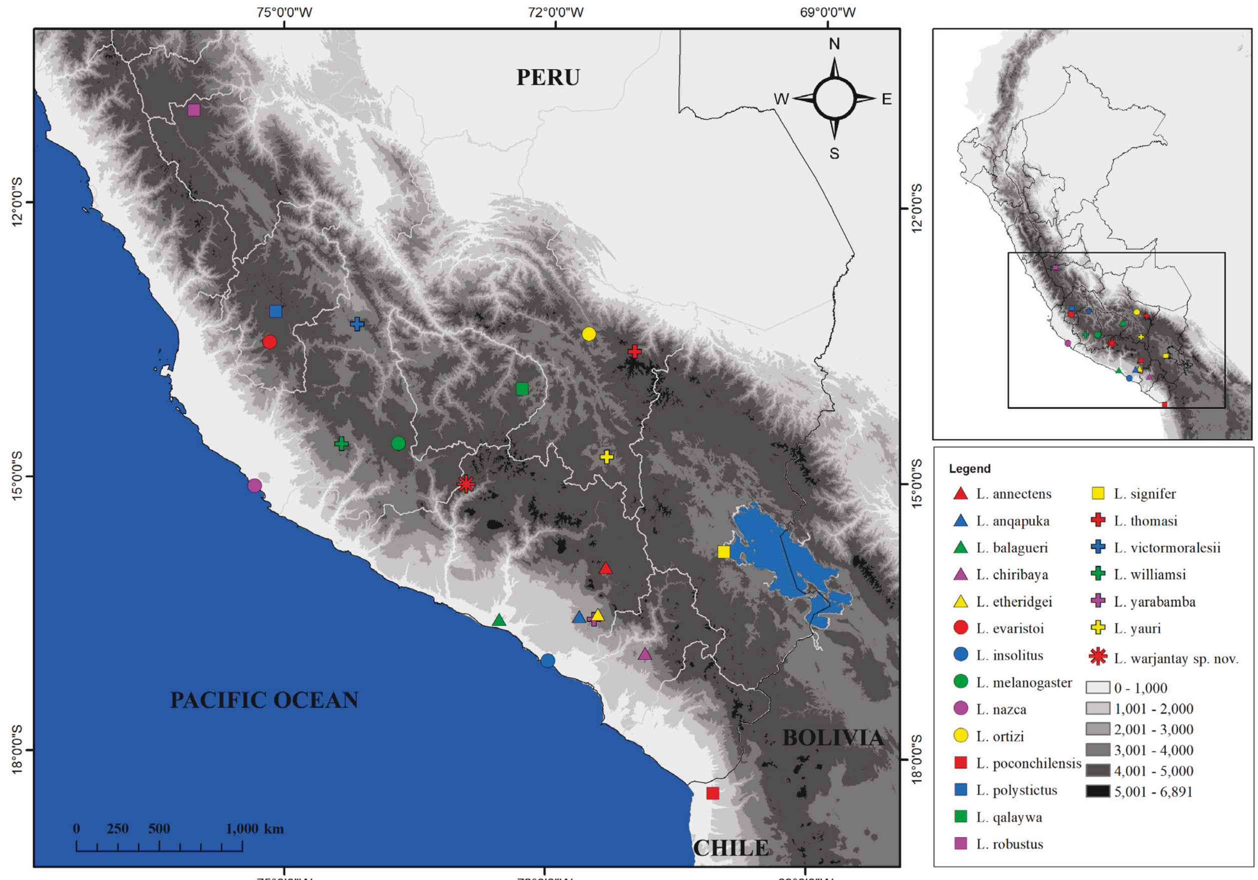

Fig. 7. Geographic distribution showing the type localities of species included in the *Liolaemus montanus* group in Peru.

Fig. 8. Habitat of the type locality of *Liolaemus warjantay* **sp. nov.** in the Department of Arequipa, Peru.

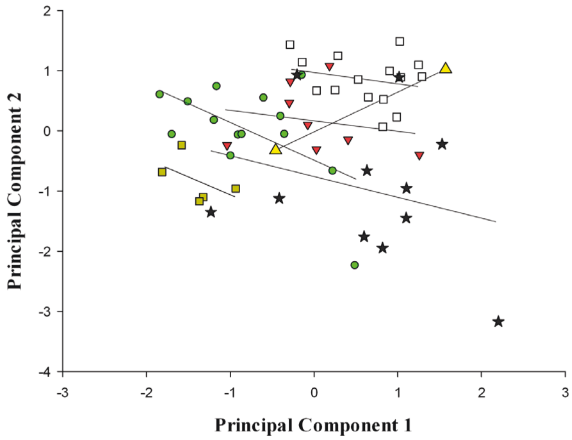

Fig. 9. Plot of Principal Component (PC) scores of continuous characters for *L.* "Cotahuasi" (green circles, *n* = 14), *L.* "Inmaculada" (white squares, *n* = 15), *L. melanogaster* (yellow triangles, *n* = 2), *L. qalaywa* (red triangles, *n* = 8), *L. williamsi* (olive squares, *n* = 5), and *L. warjantay* **sp. nov.** (black stars, *n* = 11). Eigenvectors, eigenvalues, and percentages explained for the first two Principal Components are summarized in Table 3.

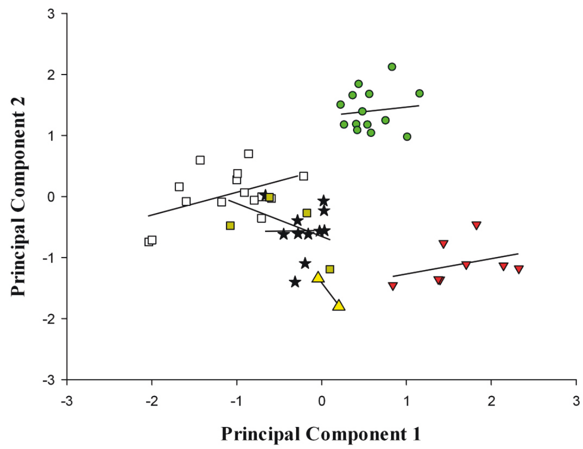

Fig. 10. Plot of Principal Component (PC) scores of meristic characters for *L.* "Cotahuasi" (green circles, *n* = 14), *L.* "Inmaculada" (white squares, *n* = 15), *L. melanogaster* (yellow triangles, *n* = 2), *L. qalaywa* (red triangles, *n* = 8), *L. williamsi* (olive squares, *n* = 5), and *L. warjantay* **sp. nov.** (black stars, *n* = 11). Eigenvectors, eigenvalues, and percentages explained for the first three Principal Components are summarized in Table 4.

continuous characters indicates that body size (PC1) and morphological variation (PC2) are sufficient to separate the six *Liolaemus* species. These species can also be distinguished by their position analyzing meristic characters only. In both analyses, *L. warjantay* **sp. nov**. can be differentiated from other phylogenetically related species by its body size and morphological variation. To further clarify the position of the *Liolaemus* species in the morphospace of both continuous and meristic characters, a DFA was carried out where the group membership was determined *a priori*. The result obtained through the DFA for the six species of *Liolaemus* was not significant for continuous morphological characters (Wilk's Lambda = 0.93, F = 0.43, $P = 0.82$), and the jackknife classification was 100% satisfactory. The DFA of operational taxonomic units for meristic characters was not significant (Wilk's Lamba = 0.75, F = 1.69, $P = 0.17$), however, the jackknife satisfactory classification was developed at a 100% rate. These results show that our *L. warjantay* **sp. nov**. can be reliably distinguished from the other species by the combination of morphological characters.

On the reptile diversity in the Department of Arequipa. Scientific research on the reptiles in the Department of Arequipa indicates that 25 species of reptiles have been registered from 1978 to 2021 (Péfaur et al. 1978; Cei and Péfaur 1982; Zeballos et al. 2002; Gutiérrez et al. 2010; Huamaní-Valderrama et al. 2020; Villegas-Paredes et al. 2020; Ormeño et al. 2021; Quiroz et al. 2021), of which ten belong to the genus *Liolaemus*: *L. annectens*, *L. anqapuka L. balagueri*, *L. etheridgei*, *L. insolitus*, *L. nazca*, *L. signifer*, *L. tacnae, L. warjantay* **sp. nov.**, and *L. yarabamba*. Even so, there is a noticeable paucity of inventory, diversity, and distribution studies on the taxa present in this region, as is the case in many parts of the country. This shortage of information includes the RPSCC where *L. warjantay* **sp. nov.** was found, which protects an area of 490,450 ha, distributed across a space that rises from 950 m asl through the Cotahuasi canyon to snow peaks above 6,100 m asl. Additionally, three distinct populations of *Liolaemus* lizards were recorded during the field surveys in the RPSCC, which can be considered as "candidate species" with unique morphological characteristics, although more analyses (molecular and morphological) are required to investigate their taxonomic identities. Two of the populations belong to *L. montanus* group, one recorded near to the type locality of *L. warjantay* **sp. nov.** and other distributed further to the southeast and separated by the geographical barrier of the Cotahuasi canyon. The third population belongs to the *L. alticolor-bribonii* group. There is no evidence that *L. annectens* occurs in the RPSCC, although this species was reported by AEDES (2008) as "*Liolaemus signifer annectens*" (= *Liolaemus annectens*), based on specimens observed in Huaynacotas, Pampamarca, and Puyca localities, and the description text and photographs of this species provided by AEDES (2008) fit very well with the populations of *Liolaemus warjantay* **sp. nov.** described here. These recent discoveries are important for filling the information gaps regarding the reptile diversity of the Department of Arequipa, and also from Peru as a whole, because it helps to develop our understanding of the real potential diversity of lizards in the genus *Liolaemus*, which for years has been underrated.

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Juan C. Chaparro is a Peruvian Biologist with extensive experience in studying the fauna of all the traditional geographic regions of Peru. Juan graduated in Biological Sciences from Universidad Nacional Pedro Ruiz Gallo, Lambayeque, Peru, and received a Master's degree in Biodiversity in Tropical Areas and Conservation in 2013 from an institutional consortium of the International University of Menendez Pelayo (UIMP-Spain), Universidad Tecnológica Indoamérica (UTI-Ecuador), and Consejo Superior de Investigaciones Científicas (CSIC-Spain). He is currently the president of the Herpetological Association of Peru (AHP), director and curator of the Herpetological Collection of the Museo de Biodiversidad del Perú (MUBI), and works as a consultant in environmental studies. Juan has authored or co-authored 56 peer reviewed scientific papers, notes, book chapters, and books on fauna, especially in herpetology and arachnology, on topics such as taxonomy, biodiversity, systematics, phylogeny, conservation, and biogeography in South America. He is interested in those topics, as well as life history, distributional patterns, and evolution using amphibian and reptiles as biological models.

Alvaro J. Aguilar-Kirigin is a Bolivian Biologist, a graduate of the Universidad Mayor de San Andrés, La Paz, a researcher at the Colección Boliviana de Fauna specializing in herpetology since 2002, and a member of the Bolivian Network of Researchers in Herpetology. He carried out two research internships in Argentina and Uruguay, focusing on the systematics and phylogeny of *Liolaemus* and the latitudinal patterns in phenotypic plasticity regarding seasonal flexibility in the fat body size in 59 species of lizards. He has authored over 37 publications, 18 of which are peer-reviewed, 10 are book chapters, and seven are technical cards as part of book chapters, including the descriptions of three species of *Liolaemus*. He is interested in integrative taxonomy as a line of research, especially in the genus *Liolaemus* because of its phenotypic plasticity in the Andean region, making incursions with linear models in the studies of comparative classical morphometry. He is also linked to the conservation of the wildlife fauna that inhabit the Amazonian Forest in the Department of Beni, Bolivia.

José Cerdeña is a Biologist who graduated from the Universidad Nacional de San Agustin de Arequipa (Peru), and a researcher at Museo de Historia Natural de la Universidad Nacional de San Agustín de Arequipa (MUSA) in Peru. José's research includes systematics, taxonomy, and biogeography of Lepidoptera, but with a recent interest in the taxonomy and ecology of the genus *Liolaemus* in southern Peru.

Wilson Huanca-Mamani is a Biologist from the Universidad de Concepción (Concepción, Chile), with a Doctorate in Plant Biotechnology from Centro de Investigación y de Estudios Avanzados del IPN (CINVESTAV), Unidad Irapuato (Mexico). Wilson is currently a researcher at the Universidad de Tarapacá (Arica, Chile). One of his research interests focuses on the population genetics of desert plants.

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Ana Lazo-Rivera is a Biologist and principal professor of the Zoology Section, Professional School of Biology, Faculty of Biological Sciences of the Universidad Nacional de San Agustín de Arequipa, Peru.

Cristian S. Abdala is an Argentinian Biologist, a researcher at CONICET, and a professor at the National University of Tucumán in Argentina. Cristian received his Ph.D. degree from the Universidad Nacional de Tucumán (UNT), and is a herpetologist with extensive experience in the taxonomy, phylogeny, and conservation of *Liolaemus* lizards. He has authored or co-authored over 70 peer-reviewed papers and books on herpetology, including the descriptions of 56 recognized lizard species, mainly in the genus *Liolaemus*. One species, *Liolemus abdalai*, has been named in his honor. He has conducted several expeditions throughout Patagonia, the high Andes, Puna, and salt flats of Argentina, Chile, Bolivia, and Peru. Since 2016, Christian has been the president of the Argentine Herpetological Association.

Appendix I. Specimens examined.

Liolaemus annectens (*n* = 11): **PERU. Arequipa:** Caylloma, Callalli: LDVH 073, LECG 001, LECG 006, LECG 036, LECG 042, LECG 054, LECG 058, LECG 102, LECG 109, LECG 133–34.

Liolaemus anqapuka (*n* = 22): **PERU. Arequipa**: Arequipa, Uchumayo: MUBI 13521–22, MUSA 4131, 4133–34; Arequipa, Uchumayo, Quebrada Tinajones, MUSA 1766–67, MUSA 4546, 5207–12, 5214, MUBI 14417, MUBI 14680, LSF 001, LSF 002; Arequipa, Uchumayo, between Quebrada Tinajones and Quebrada San Jose, MUSA 5573–75.

Liolaemus balagueri (*n* = 18): **PERU. Arequipa:** Camaná, Quilca, Lomas de Quilca, MUSA 1772–74, MUSA 5575–78, MUBI 13206–09, MUBI 16483–84, MUSM 39193-95; Camaná, Camaná, Lomas de La Chira, MUSM 39192, MUSA 5579.

Liolaemus chiribaya (*n* = 11): **PERU. Moquegua:** Mariscal Nieto, Torata, Jaguay Chico, MUSM 31548–50, MUSM 31553; Mariscal Nieto, Torata, Cerro los Calatos, MUSM 31547, MUSM 31386, MUSM 31388–91; Mariscal Nieto, between Moquegua and Torata, MUSM 31387.

Liolaemus etheridgei (*n* = 17): **PERU. Arequipa:** Cabrerías, Cayma, MUSA 501; Cerro Uyupampa, Sabandia, MUSA 549–54; Monte Ribereño de la Quebrada de Tilumpaya Chiguata. Pocsi, MUSA 1113–14, 1116, 1264–68, 1353; Anexo de Yura Viejo, Yura, MUSA 1229.

Liolaemus evaristoi (*n* = 16): **PERU. Huancavelica:** Los Libertadores, Pilpichaca, Huaytara, MUSA 2841 (holotype), 2781–85, 2840, 2842–45, MUBI 10474–78 (paratypes).

Liolaemus insolitus (*n* = 10): **PERU. Arequipa:** Lomas de Mejía, Deán Valdivia, MUSA 346, MUSA 1741, MUSA 2187–90; Alto Inclan, Mollendo MUSA 4787–88, MUSA 4812, MUSA 4815.

Liolaemus nazca (*n* = 7): **PERU. Ica:** Nazca, MUSM 31520–21, MUSM 31523, MUSM 31525–26, MUSM 31541, MUSM 16100.

Liolaemus poconchilensis (*n* = 2): **PERU. Tacna:** Morro Sama, Las Yaras, MUSA 1638–39.

Liolaemus polystictus (*n* = 13): **PERU. Huancavelica:** Mountain near Rumichaca, Pilpichaca, MUSA 1337–1338; Santa Inés, Castrovirreyna, MUSA 2448–2457; Santa Inés, FML 1683 (paratype).

Liolaemus qalaywa (*n* = 28): **PERU. Apurimac**: Choaquere, MUBI 13286 (holotype), MUBI 12100, MUBI 12096–99, MUBI 12101–04; Ñahuinlla MUBI 13260, MUBI 13264–65; Progreso, MUBI 12981–83; Punchayoc Ccasa, MUBI 17621; Ccosana, MUBI 17622–23; Pumamarca, MUSA 5600, MUBI 13287; Chila, MUSA 5601, MUBI 12081, MUBI 12084; Ccomerococha, MUBI 15900, MUBI 15903, MUBI 15901–02 (all paratypes).

Liolaemus robustus (*n* = 11): **PERU. Lima**: Surroundings of Huancaya, Reserva Paisajistica Nor Yauyos Cochas, MUSA 1693–1702; Junín: Junín, FML 1682 (paratype).

Liolaemus signifer (*n* = 12): **PERU. Puno:** Titicaca Lake, 3,840 m, FML 1434; Titicaca Lake, road to Puno, FML 1557; near Tirapata, MUSA 1415; Huancané, Comunidad Taurahuta, MUSA 1441–43; Huerta Huayara community, 3 km before Puno, MUSA 1483–87.

Liolaemus yarabamba (*n* = 5): **PERU. Arequipa**: Yarabamba, MUSA 5570 (holotype), MUSA 501, MUSA 178–79, MUBI 17663.

Liolaemus yauri (*n* = 10): **PERU. Cusco:** Vizcachane, 3,878 m, MUSA 5672 (holotype), MUSA 5670–71, MUSA 5673–74; Huano Huano MUSA 5675–78, MUBI 2500, 15899.

Appendix II. Morphological characteristics of six species of *Liolaemus* studied in this work. Range in the first line; mean ± standard deviation (mm) for quantitative characters in the second line. m = males, f = females; see **Materials and Methods** for descriptions of morphological characters.

	L. "Cotahuasi" *n* = 14	*L.* "Inmaculada" *n* = 15	*L. melanogaster* *n* = 2	*L. qalaywa* *n* = 8	*L. williamsi* *n* = 5	*L. warjantay* **sp. nov**. *n* = 13
Morphological character	(m = 6, f = 8)	(m = 11, f = 4)	(m = 1, f = 1)	(m = 1, f = 7)	(m = 3, f = 2)	(m = 7, f = 6)
SVL females	59.16–74.02	73.67–88.34	14.5	68.51–86.06	60.74–66.21	61.01–88.14
	66.87 ± 5.49	79.5 ± 6.36	—	77.87 ± 5.37	63.48 ± 3.87	75.61 ± 11.29
SVL males	66.94–77.5	72.35–92.71	21.53	85.54	65.94–71.76	84.46–95.12
	71.96 ± 4.02	84.13 ± 5.84	—	—	68.53 ± 2.96	87.84 ± 3.9
LEI	6.64–9.45	8.94–10.84	8.98–10.70	8.50–9.99	7.74–8.47	8.06–13.33
	7.79 ± 0.86	10.00 ± 0.59	9.84 ± 1.22	9.11 ± 0.42	8.02 ± 0.29	10.35 ± 1.52
AC	13.20–18.12	15.99–19.82	14.80–20.51	14.10–18.71	10.77–11.83	12.12–22.85
	15.63 ± 1.64	17.85 ± 1.33	17.66 ± 4.04	16.15 ± 1.40	11.26 ± 0.50	16.27 ± 3.13
HC	9.35–12.94	9.42–12.96	8.69–11.36	9.68–15.90	7.95–9.19	8.31–12.90
	10.45 ± 0.88	11.36 ± 1.12	10.03 ± 1.89	12.22 ± 1.77	8.61 ± 0.56	10.72 ± 1.49
hTy	3.05–4.05	2.97–4.78	3.02–3.97	3.18–4.51	2.53–3.03	3.01–5.97
	3.50 ± 0.33	3.80 ± 0.53	3.50 ± 0.67	3.79 ± 0.42	2.81 ± 0.19	3.99 ± 0.78
aTy	1.28–1.98	1.02–1.46	0.80–1.19	1.07–1.66	1.13–1.61	0.95–1.98
	1.52 ± 0.21	1.20 ± 0.14	1.00 ± 0.28	1.38 ± 0.22	1.40 ± 0.21	1.45 ± 0.32
LC	13.84–19.05	16.99–21.95	15.99–21.86	16.04–20.24	13.49–16.30	16.03–22.74
	15.99 ± 1.83	19.88 ± 1.71	18.93 ± 4.15	17.86 ± 1.40	14.81 ± 1.14	20.03 ± 2.32
ACC	12.46–18.12	17.68–22.21	14.50–21.53	14.46–20.50	12.89–13.73	14.00–24.19
	14.73 ± 1.86	19.47 ± 1.27	18.02 ± 4.97	17.00 ± 1.92	13.25 ± 0.31	18.97 ± 2.95
LH	9.94–13.26	12.00–14.96	13.19–13.61	10.88–14.11	9.18–11.90	10.64–15.84
	11.85 ± 1.06	13.69 ± 0.98	13.40 ± 0.30	12.29 ± 1.32	10.44 ± 1.08	13.17 ± 1.53
AHU	4.12–5.52	5.47–7.72	6.30–7.86	4.65–7.03	4.34–5.09	5.53–8.53
	4.79 ± 0.51	6.36 ± 0.61	7.08 ± 1.10	5.56 ± 0.73	4.83 ± 0.30	7.06 ± 0.96
LAR	7.68–19.38	9.06–10.99	9.58–11.20	8.63–10.91	8.40–8.93	9.28–17.54
	9.76 ± 2.92	9.81 ± 0.61	10.39 ± 1.15	9.35 ± 0.74	8.67 ± 0.22	11.86 ± 2.24
LB	7.38–10.32	7.59–11.71	12.08–14.88	7.45–12.04	9.29–10.04	10.18–13.35
	8.46 ± 1.01	9.50 ± 1.09	13.48 ± 1.98	9.52 ± 1.31	9.63 ± 0.28	11.62 ± 0.92
M	10.04–14.88	13.43–16.61	14.72–17.67	12.37–16.03	12.25–14.46	12.90–20.53
	12.39 ± 1.27	15.15 ± 0.92	16.20 ± 2.09	14.20 ± 1.15	13.23 ± 0.88	17.06 ± 2.06
T	11.66–15.12	14.18–17.35	12.72–17.66	13.04–16.47	11.04–13.34	14.05–18.61
	12.99 ± 1.15	15.62 ± 0.88	15.19 ± 3.49	14.10 ± 1.08	12.31 ± 1.02	16.37 ± 1.51
4P	11.26–14.74	12.06–16.66	11.71–14.39	11.11–14.39	9.76–11.34	11.05–15.52
	12.86 ± 1.02	14.13 ± 1.28	13.05 ± 1.90	12.43 ± 0.99	10.79 ± 0.61	12.77 ± 1.40
L4P	16.24–22.74	20.07–26.02	19.05–23.74	18.00–22.80	16.78–17.89	17.57–26.01
	19.61 ± 1.57	23.05 ± 1.54	21.40 ± 3.32	19.65 ± 1.44	17.29 ± 0.40	21.71 ± 2.38
TL	27.08–38.82	32.38–47.77	32.45–43.98	28.87–42.76	27.58–31.54	24.84–71.93
	34.39 ± 3.98	39.13 ± 4.23	38.22 ± 8.15	36.78 ± 4.32	29.62 ± 1.75	38.01 ± 12.20
AL	16.84–27.30	25.16–33.59	24.13–34.40	22.06–34.34	18.40–21.94	17.67–34.61
	22.87 ± 3.06	28.83 ± 2.59	29.27 ± 7.26	27.77 ± 3.78	20.50 ± 1.34	25.52 ± 4.71
WTB	7.64–11.60	9.10–13.55	9.61–13.89	9.69–13.14	8.50–11.29	8.95–15.08
	9.72 ± 1.28	11.32 ± 1.30	11.75 ± 3.03	11.36 ± 1.15	9.62 ± 1.09	12.12 ± 1.76
A11	5–8	6–9	6–7	6–8	6–9	5–9
	7.14 ± 0.95	6.47 ± 0.92	6.50 ± 0.71	6.75 ± 0.71	6.80 ± 1.30	6.91 ± 1.30

Appendix II (continued). Morphological characteristics of six species of *Liolaemus* studied in this work. Range in the first line; mean ± standard deviation (mm) for quantitative characters in the second line. m = males, f = females; see **Materials and Methods** for descriptions of morphological characters.

A12	6–7	7–10	8	6–7	6–8	6–8
	6.71 ± 0.47	8.33 ± 0.82	8.00 ± 0.00	6.38 ± 0.52	7.00 ± 1.00	7.09 ± 0.54
A13	5–6	5–7	5	6–9	4–6	6
	5.93 ± 0.27	5.80 ± 0.56	5.00 ± 0.00	7.50 ± 0.93	4.80 ± 0.84	6.00 ± 0.00
A20	7–9	7–9	7	5–7	7–9	7–10
	8.00 ± 0.39	8.27 ± 0.80	7.00 ± 0.00	5.63 ± 0.74	8.20 ± 0.84	8.55 ± 1.04
A14	4	4–6	4	4	4	4
	4.00 ± 0.00	4.27 ± 0.70	4.00 ± 0.00	4.00 ± 0.00	4.00 ± 0.00	4.00 ± 0.00
A18	15–17	15–20	16–17	13–15	16	14–18
	16.29 ± 0.73	17.67 ± 1.35	16.50 ± 0.71	14.25 ± 1.04	16.00 ± 0.00	15.55 ± 1.44
A19	4–5	1–5	4	2–5	3–4	3–5
	4.50 ± 0.52	3.47 ± 1.19	4.00 ± 0.00	3.88 ± 0.99	3.80 ± 0.45	3.64 ± 0.67
A20–4	18–20	16–21	15–17	14–18	15–19	16–20
	19.29 ± 0.91	18.93 ± 1.58	16.00 ± 1.41	15.50 ± 1.41	17.60 ± 1.52	17.91 ± 1.38
A21–4	22–24	21–27	19–23	18–24	21–24	17–25
	23.07 ± 0.73	23.60 ± 1.45	21.00 ± 2.83	21.13 ± 2.03	22.60 ± 1.34	22.18 ± 2.09
A22	47–52	52–63	45–53	52–62	59–81	45–63
	49.57 ± 1.55	56.40 ± 3.44	49.00 ± 5.66	55.13 ± 3.23	68.40 ± 10.48	53.00 ± 5.29
A24	4–5	4–5	2	4–5	4	4–5
	4.71 ± 0.47	4.53 ± 0.52	2.00 ± 0.00	4.13 ± 0.35	4.00 ± 0.00	4.55 ± 0.52
A25	3–5	4–7	7	4–7	5–6	4–6
	4.79 ± 0.58	5.67 ± 0.82	7.00 ± 0.00	5.63 ± 0.92	5.40 ± 0.55	5.18 ± 0.87
M3	5–8	5–8	8–9	6–7	6–7	5–7
	6.29 ± 0.91	5.87 ± 0.74	8.50 ± 0.71	6.50 ± 0.53	6.40 ± 0.55	5.82 ± 0.75
M5	4–5	4–6	4	4–5	4–5	4–5
	4.50 ± 0.52	5.13 ± 0.83	4.00 ± 0.00	4.38 ± 0.52	4.80 ± 0.45	4.64 ± 0.50
M6	1–4	1–4	2	3–5	2–3	2–6
	2.71 ± 0.73	2.93 ± 0.80	2.00 ± 0.00	4.13 ± 0.64	2.60 ± 0.55	4.00 ± 1.34
M11	6–7	6–9	7	6–7	6–8	6–9
	6.57 ± 0.51	7.33 ± 1.11	7.00 ± 0.00	6.88 ± 0.35	6.80 ± 0.84	6.91 ± 0.94
M16	1–4	1–4	3–11	2–4	3–7	2–8
	3.00 ± 0.96	2.87 ± 0.92	7.00 ± 5.66	3.25 ± 0.71	4.40 ± 1.52	5.55 ± 1.75
M23	23–26	33–44	37–46	26–34	26–34	32–37
	24.29 ± 0.83	36.53 ± 2.92	41.50 ± 6.36	28.00 ± 3.02	29.00 ± 3.46	34.82 ± 1.72
M26	51–55	54–67	50–57	52–58	57–65	55–64
	52.50 ± 1.40	61.07 ± 3.83	53.50 ± 4.95	55.00 ± 2.83	60.40 ± 3.58	60.64 ± 2.84
M32	75–82	72–84	71	71–83	72–81	73–85
	79.07 ± 2.27	77.27 ± 3.31	71.00 ± 0.00	75.88 ± 4.58	76.60 ± 4.51	79.18 ± 3.28
M34	2	0–4	2–4	3–6	1–2	2–4
	2.00 ± 0.00	2.60 ± 0.91	3.00 ± 1.41	4.38 ± 1.06	1.60 ± 0.55	2.73 ± 0.65
M37	3–4	3–5	4	4–6	5	5
	3.64 ± 0.50	4.07 ± 0.59	4.00 ± 0.00	4.88 ± 0.64	5.00 ± 0.00	5.00 ± 0.00
M38	7–8	9–11	9	6–8	8–11	8–10
	7.71 ± 0.47	10.00 ± 0.85	9.00 ± 0.00	7.25 ± 1.04	9.40 ± 1.14	9.00 ± 0.63
M40	7–8	7–10	9–10	7–8	7–9	8–10
	7.64 ± 0.50	8.07 ± 1.03	9.50 ± 0.71	7.88 ± 0.35	8.40 ± 0.89	8.73 ± 0.79

Appendix III. GenBank codes and voucher information of *Liolaemus* used in this study.

Species name	Voucher code	cyt-*b*	12S	Source
Ctenoblepharys adspersa (outgroup)	BYU 50502	MH981364	MH888040	Aguilar-Puntriano et al. 2018
L. annectens	BYU 50491	KX826617	KX826718	Aguilar et al. 2016
L. annectens "Lampa"	MUSM 31433	KX826618	KX826719	Aguilar et al. 2016
L. anqapuka	MUSA 1766	MT773407	MZ098637	Huamaní-Valderrama et al. 2020; this study
L. anqapuka	MUBI 13522	MT773408	MZ098638	Huamaní-Valderrama et al. 2020; this study
L. dorbignyi	LJAMMCNP 5002	KF968848	KF969032	Olave et al. 2014
L. etheridgei	BYU 50493	KX826619	KX826720	Aguilar et al. 2016
L. etheridgei	BYU 50494	KX826620	KX826721	Aguilar et al. 2016
L. etheridgei	BYU 50495	KX826621	KX826722	Aguilar et al. 2016
L. etheridgei	BYU 50499	KX826623	KX826723	Aguilar et al. 2016
L. etheridgei	MUSM 31494	KX826625	KX826724	Aguilar et al. 2016
L. eleodori	LJAMMCNP 2709	KF968850	KF969034	Olave et al. 2014
L. insolitus	MUSM 31490	KX826627	KX826727	Aguilar et al. 2016
L. insolitus	BYU 50462	KX826626	KX826726	Aguilar et al. 2016
L. melanogaster	BYU 50151	KX826628	KX826728	Aguilar et al. 2016
L. melanogaster	MUSM 31472	KX826630	KX826730	Aguilar et al. 2016
L. melanogaster	MUSM 31475	KX826631	KX826731	Aguilar et al. 2016
L. melanogaster	BYU 50154	KX826629	KX826729	Aguilar et al. 2016
L. nazca	BYU 50472	KX826673	KX826768	Aguilar et al. 2016
L. nazca	BYU 50507	KX826674	KX826769	Aguilar et al. 2016
L. nazca	BYU 50508	KX826675	KX826770	Aguilar et al. 2016
L. nazca	MUSM 31523	KX826676	KX826771	Aguilar et al. 2016
L. nazca	MUSM 31524	KX826677	KX826772	Aguilar et al. 2016
L. ortizi	MUSM 31513	KX826633	KX826733	Aguilar et al. 2016
L. ortizi	MUSM 31514	KX826634	KX826734	Aguilar et al. 2016
L. poconchilensis	MUSM 31544	KX826636	KX826735	Aguilar et al. 2016
L. poconchilensis	MUSM 31545	KX826637	KX826736	Aguilar et al. 2016
L. polystictus	MUSM 31451	KX826642	KX826740	Aguilar et al. 2016
L. polystictus	MUSM 31446	KX826641	KX826739	Aguilar et al. 2016
L. polystictus “AbraApacheta”	MUSM 31481	KX826660	KX826756	Aguilar et al. 2016
L. polystictus “AbraApacheta”	BYU 50145	KX826658	KX826754	Aguilar et al. 2016
L. polystictus “AbraApacheta”	BYU 50148	KX826659	KX826755	Aguilar et al. 2016
L. polystictus "Castrovirreyna"	BYU 50630	KX826638	KX826737	Aguilar et al. 2016
L. qalaywa	MUBI 12081	MT366061	MT371370	Chaparro et al. 2020
L. robustus	MUSM 31504	KX826646	KX826743	Aguilar et al. 2016
L. robustus	MUSM 31508	KX826648	KX826744	Aguilar et al. 2016
L. robustus	MUSM 31439	KX826645	KX826742	Aguilar et al. 2016
L. robustus	BYU 50438	KX826644	KX826741	Aguilar et al. 2016
L. signifer	MUSM 31443	KX826656	KX826752	Aguilar et al. 2016
L. signifer	MUSM 31434	KX826654	KX826750	Aguilar et al. 2016
L. signifer	BYU 50444	KX826652	KX826748	Aguilar et al. 2016
L. signifer	BYU 50357	KX826651	KX826747	Aguilar et al. 2016
L. signifer	BYU 50350	KX826649	KX826745	Aguilar et al. 2016
L. signifer	MUSM 31437	KX826655	KX826751	Aguilar et al. 2016

Appendix III (continued). GenBank codes and voucher information of *Liolaemus* used in this study.

Species name	Voucher code	cyt-*b*	12S	Source
L. signifer	BYU 50355	KX826650	KX826746	Aguilar et al. 2016
L. signifer	MUSM 31447	KX826657	KX826753	Aguilar et al. 2016
L. signifer	MUSM 29110	KX826653	KX826749	Aguilar et al. 2016
L. thomasi	BYU 50469	KX826680	KX826775	Aguilar et al. 2016
L. thomasi	BYU 50466	KX826678	KX826773	Aguilar et al. 2016
L. thomasi	MUSM 31516	KX826681	KX826776	Aguilar et al. 2016
L. thomasi	BYU 50467	KX826679	KX826774	Aguilar et al. 2016
L. vallecurensis	LJAMMCNP 650	KF968960	KF969166	Olave et al. 2014
L. victormoralesii	MUSM 31371	KX826665	KX826757	Aguilar et al. 2016
L. victormoralesii	MUSM 31374	KX826667	KX826762	Aguilar et al. 2016
L. victormoralesii	MUSM 31373	KX826666	KX826758	Aguilar et al. 2016
L. victormoralesii	MUSM 31461	KX826668	KX826763	Aguilar et al. 2016
L. victormoralesii	BYU 50430	KX826663	KX826760	Aguilar et al. 2016
L. victormoralesii	MUSM 31462	KX826669	KX826764	Aguilar et al. 2016
L. victormoralesii	BYU 50431	KX826664	KX826761	Aguilar et al. 2016
L. victormoralesii	BYU 50428	KX826662	KX826759	Aguilar et al. 2016
L. victormoralesii	MUSM 31464	KX826670	KX826765	Aguilar et al. 2016
L. victormoralesii	MUSM 31465	KX826671	KX826766	Aguilar et al. 2016
L. victormoralesii	MUSM 31468	KX826672	KX826767	Aguilar et al. 2016
L. warjantay **sp. nov**.	MUBI 17683	MT773399	MZ098641	Huamaní-Valderrama et al. 2020; this study
L. warjantay **sp. nov**.	MUSA 5692	MT773400	MZ098643	Huamaní-Valderrama et al. 2020; this study
L. warjantay **sp. nov**.	MUSA 5685	MT773401	MZ098642	Huamaní-Valderrama et al. 2020; this study
L. warjantay **sp. nov**	VOI 009	MT773402	MZ098639	Huamaní-Valderrama et al. 2020; this study
L. warjantay **sp. nov**	VOI 006	MT773403	MZ098640	Huamaní-Valderrama et al. 2020; this study
L. williamsi	BYU 50463	KX826684	KX826778	Aguilar et al. 2016
L. williamsi	BYU 50464	KX826685	KX826779	Aguilar et al. 2016
L. williamsi	BYU 50144	KX826683	KX826777	Aguilar et al. 2016
L. williamsi	MUSM 31486	KX826688	KX826781	Aguilar et al. 2016
L. williamsi	BYU 50465	KX826686	KX826780	Aguilar et al. 2016