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Aspronema cochabambae (Squamata: Lacertilia: Scincidae): its discovery in Argentina, morphological variation and extent of suitable habitat

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As currently defined, the genus *Aspronema* Hedges & Conn, 2012 contains two species, *A. cochabambae* (Dunn, 1935) and *A. dorsivittatum* (Cope, 1862) (Hedges & Conn 2012). The latter species is widely distributed in Bolivia, Brazil, Paraguay Uruguay, and Argentina. In Argentina, *A. dorsivittatum* occurs in Chacoan grasslands and forests below 1,200 m a.s.l., yet has been poorly sampled (Cei 1993, Avila et al. 2013).

Prior to its rediscovery by Mausfeld & Lötters (2001) and Harvey et al. (2008), *A. cochabambae* was considered a subspecies of *Mabuya frenata* (currently *Notomabuya*). Harvey et al. (2008) redescribed *A. cochabambae* based on the holotype, available museum specimens, and new material from the department of Cochabamba (Harvey et al. 2008). Based on comparisons with *A. dorsivittatum*, these authors identified a suite of diagnostic characters distinguishing *A. cochabambae* from all congeners. Until now, *A. cochabambae* seemed to be endemic to the Andes in the departments of Cochabamba and Santa Cruz, Bolivia, and has been classified as "Vulnerable" due to its known occurrence at only ten localities (Aguayo & Harvey 2009).

During fieldwork on 2 and 3 December 2015, we obtained two specimens of *A. cochabambae* at Las Cuevas, Cerro Bravo, 2,700 m a.s.l., near Los Toldos, Santa Victoria Department, Salta Province, Argentina. Additionally, we observed five specimens of this skink in the same area. At this site, humid pastures consisting primarily of the grasses *Festuca* spp. and *Stipa* spp. border streams and are populated by a mosaic of patches of the tree *Polylepis australis* and mixed brush, including the shrubs *Berberis commutata*, *Schinus* sp., *Baccharis* spp., *Hieracium argentinense*, *Onoseris hastata*, *Mutisia* spp., *Bomarea edulis*, and *Chuquiraga longiflora* (Fig. 1).

The two collected specimens were deposited in the herpetological collection of the Laboratorio de Genética Evolutiva (LGE), Instituto de Biología Subtropical, UNaM-CONICET, Posadas, Misiones, Argentina. In Table 1, we compare the new specimens of *A. cochabambae* to those of *Aspronema* examined previously by Harvey et al. (2008). Both new specimens are females: LGE 18999, snout–vent length (SVL) 82.2 mm, tail length 74.3 mm, from -22.238854° -64.772250°, 2,700 m a.s.l.; and LGE 18998, SVL 81.2 mm, tail length 79.3 mm, from -22.234377°,

Figure 1. Habitat of *Aspronema cochabambae* in Argentina: Las Cuevas, Santa Victoria, Salta, Argentina, 2,700 m as.l.

Table 1. Comparison of selected characters between two populations of *Aspronema cochabambae* and *A. dorsivittatum*.

	A. cochabambae Bolivia (Harvey et al. 2008)	*A. cochabambae* Argentina This work	*A. dorsivittatum* This work
Internasals	Contact n = 15 (94%) Separate n = 1 (6%)	Contact n = 0 Separate n = 2 (100%)	Contact n = 12 (92.3%) Separate n = 1 (7.7%)
Prefrontals	Contact n = 0 Separate n = 16 (100%)	Contact n =0 Separate n = 2 (100%)	Contact n = 3 (21.5%) Separate n = 11 (78.5%)
Frontoparietals	Fused	Fused	Paired
Supraoculars	3 n = 32 (100%)	3 n = 2/2 (100%)	3 n = 25 (92.5%) 4 n = 2 (7.5%)
Supraciliaries	3 n = 26 (93%) 4 n = 2 (7%)	3 n = 2/2 (100%)	3 n = 3 (12%) 4 n = 4 (88%)
Supralabial below eye	4 n = 0 5 n = 19 (68%) 6 n = 9 (32%)	4 n = 0 5 n = 1/1 (50%) 6 n = 1/1 (50%)	4 n = 9 (24.4%) 5 n = 28 (75.6%)
Lamellae under fourth finger	11.9 ± 1.0, n = 15 10 n = 2 (15%) 11 n = 2 (15%) 12 n = 5 (39%) 13 n = 4 (31%)	11 (n =2)	12.4 ± 0.7, n = 13 10 n = 0 11 n = 1 (7.6%) 12 n = 5 (38.4%) 13 n = 7 (53.8%)
Lamellae under fourth toe	14.9 ± 1.0, n = 14 12 n = 0 13 n = 1 (7%) 14 n = 3 (21%) 15 n = 7 (50%) 16 n = 2 (14%) 17 n = 1 (7%)	14 or 15 14 n =1 15 n =1	17.0 ± 1.0, n = 14 12 n = 0 13 n = 0 14 n = 1 15 n = 1 (7.14%) 16 n = 3 (21.4%) 17 n = 4 (28.5%) 18 n = 5 (35.7%)
Dorsals	57–62 (59.7 ± 1.9, 14)	58–62 (n = 2)	53–60 (57.3 ± 2.3, 13)
Scales around midbody	28–32 (30.9 ± 1.1, 16)	29–32	26–32 (28.6 ± 1.8, 13)
Ventrals	34–43 (38.5 ± 2.6, 13)	37–39	29–38 (35.2 ± 2.9, 13)
Dorsolateral white stripe	Present	Present	Present
Ventrolateral white stripe	Present	Present	Present
Palms and soles	Usually darker than venter	Darker than venter	Pale

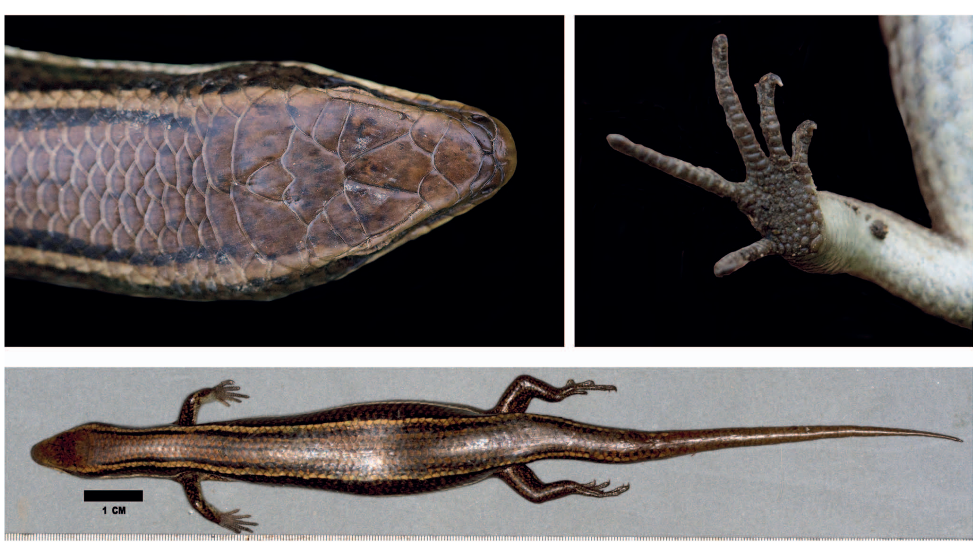

Figure 2. Adult specimen of *Aspronema cochabambae* (LGE 18998) from Las Cuevas, Argentina, illustrating fused frontoparietals and black palms that are diagnostic of this species.

-64,772725°, 2,632 m a.s.l. The two specimens possess each of the characters used to diagnose this species by Harvey et al. (2008) (Table 1, Fig. 2): (1) prefrontals paired, usually separated medially; (2) frontoparietals fused; (3) parietals usually in contact with each other behind interparietal; (4) secondary nuchals absent; (5) supraciliaries usually three, first longer than combined second and third; (6) palm and sole usually darkly pigmented (rarely pale); (7) narrow vertebral and paravertebral brown stripes present dorsally; lateral black band edged dorsally and ventrally by prominent pale stripes; (9) lamellae under fourth finger 10–13; (11) lamellae under fourth toe 13–16; (12) limbs relatively short; fourth toe just reaching wrist when legs are adpressed against flanks; (13) supraoculars three, the first

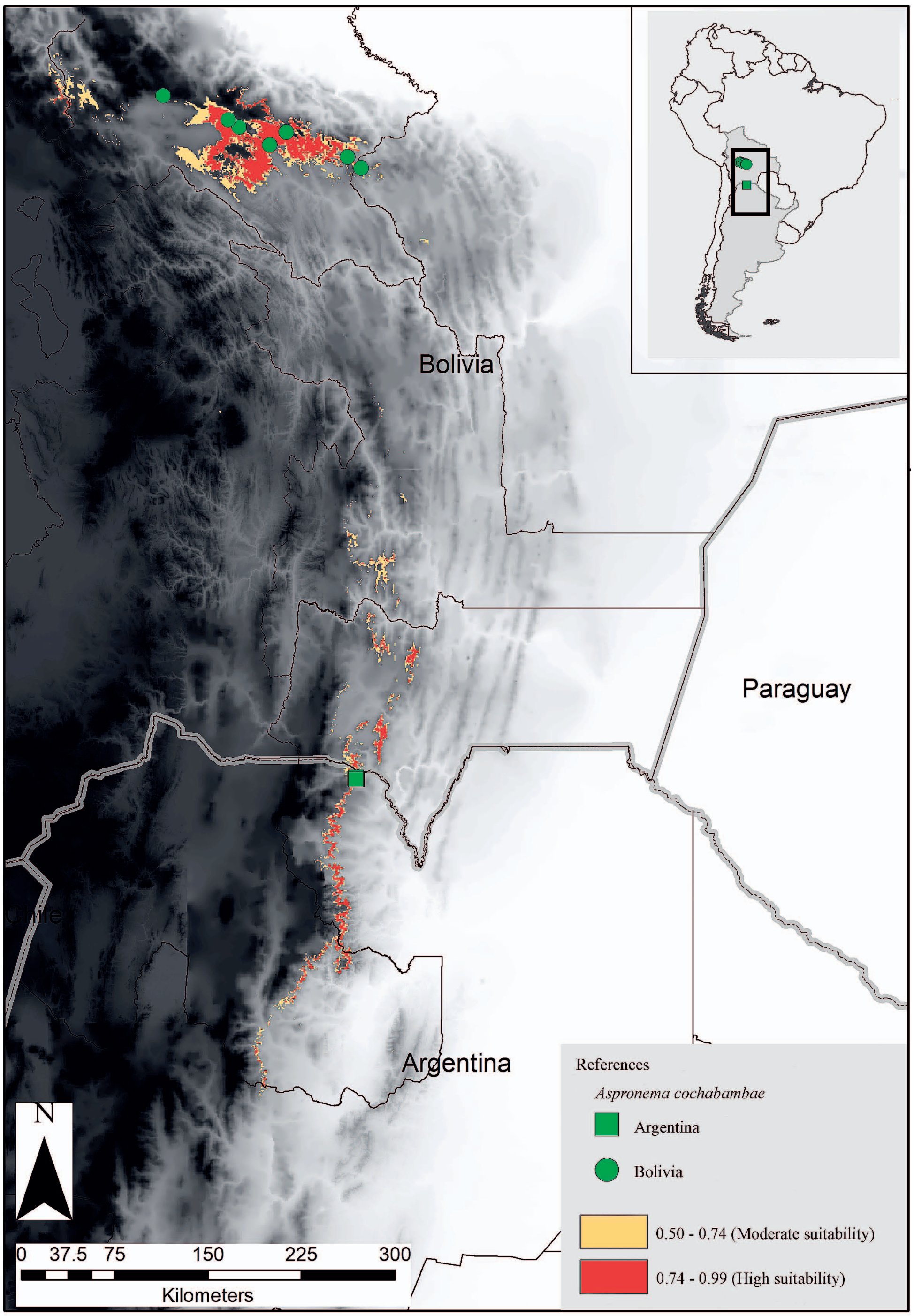

Figure 3. Known distribution of *Aspronema cochabambae* in Bolivia (green circles) and Argentina (green square) and extent of suitable habitat identified by bioclimatic modelling.

larger than remaining two combined; (14) supralabials 6–7, the fifth or sixth largest and positioned under eye; (15) internasals (= supranasals) usually in contact; (16) postmental entire. This combination of characters immediately distinguishes the new specimens from their only known congener, *A. dorsivittatum*.

Harvey et al. (2008) noted that a surprisingly low genetic distance separates *A. cochabambae* from *A. dorsivittatum*. It is therefore noteworthy that this distant population has retained the same distinctive combination of diagnostic characters. Though genetically close and distributed parapatrically, these two species appear to be retaining their specific cohesiveness.

To further investigate the potential distribution of *A. cochabambae*, we used Maxent 3.4.1 (Phillips et al. 2017) to identify suitable habitat of this species based on its known localities (Appendix 1). We extracted 19 bioclimatic variables from the WorldClim Global Climate database (http://www.worldclim.org/) with a resolution of 30 arc sec. (Fick & Hijmans 2017). Definition of the area of study is crucial for precise models of ecological niche and should be informed by dispersal capacity of the study species (Barve et al. 2011). Therefore, we defined the accessible area (73,845,904 hectares) by considering the known range of *A. cochabambae*, the potential for habitat in the eastern Yungas ecoregion (Olson et al. 2001), and the low vagility of reptiles compared to other vertebrates (Vitt & Caldwell 2014). We modelled 500 interactions with the following parameters: maximum training sensitivity plus specificity, do jackknife to measure variable importance, random seed, and cross-validity as the replicated run type. The background was defined as the area of interest and 10,000 random points were set. We used the default CloLog to represent the potential suitability of the habitat of the species as a probability, with the highest values representing conditions favourable for the species' presence (Phillips et al. 2017). We evaluated performance of the model by using area under the AUC curve (Fielding & Bell 1997), where AUC = 1 indicates perfect fit of the model and AUC ≤ 0.5 indicates that the model performed no better than random (Elith et al. 2011). We then divided habitat suitability values from our model into two classes: high and moderate.

The Maxent model predicted the presence of *A. cochabambae* with high performance (AUC = 0.99) for the training and testing data set. In Fig. 2, we show areas of moderate (AUC = 0.50–0.74) and high (AUC = 0.74–0.99) habitat suitability. Although the largest expanse of highly suitable habitat surrounds previously known localities in the departments of Cochabamba and Santa Cruz, the model identified smaller patches of suitable habitat in the departments of Chuquisaca and Tarija, Bolivia. Interestingly, the model also detected suitable habitat to the south of the new localities, suggesting that this secretive species may have a more expansive distribution in Salta and, possibly, in Jujuy provinces. Though resembling the habitat of *A. cochabambae* in Bolivia, as described by Harvey et al. (2008), the suitable habitat in Argentina is more localised, consisting of small patches in the "Bosque montano" phytogeographic district sensu Cabrera (1994). Plausibly, the new localities of *A. cochabambae* represent relict populations of a previously continuous distribution. However, additional research in intervening areas of Bolivia and biogeographic studies are required to test this hypothesis.

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Appendix 1

Locality records of *Aspronema cochabambae* used to identify suitable habitat using Maxent (DatumWGS84).

BOLIVIA: Cuenca Taquiña, -17.297377, -66.170528 (CBG 124); Infiernillo, -17.524068, -65.622539 (CBG 321); Montepunko, -17.559963, -65.280213 (CBG 125,126, 145,146); Pocona, -17.651049, -65.400427 (MCZ 46532, UMMZ 172577); Serrania de Siberia, -17.740345, -64.839255 (CBF 2900, 2901, UTA 55805); Siberia, -17.820459, -64.740292 (CBG323); Toralapa, -17.470045, -65.700178 (CBG 396); Santa Cruz, no data, (UMMZ 68098).

ARGENTINA: Las Cuevas, -22.234377, -64.772725 (LGE 18998); Las Cuevas, -22.238854, -64.77225 (LGE 18999); Las Cuevas unvouchered (5): -22.2344007, -64.782455; -22.235597, -64.769923; -22.235213, -64.771689; -22.24793, -64.777294; -22.238082, -64.776197.