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## **Refuting the revalidation of** *Telmatobius laevis* **Philippi 1902**

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The taxonomy and systematics of Andean frogs of the genus Telmatobius have been considered complex, due mainly to the high levels of inter and intraspecific variation in morphological characters. Recently, Cuevas (2013) revalidated the species T. laevis Philippi 1902, which was originally described from two syntypes (one currently lost) collected in the late nineteenth century, based on photographs of the only preserved specimen. He also used bibliographic material showing that the original type material constituted two different taxa and that its type locality, previously not located, is Potrero Grande in the Andes Range of central Chile (33°28'S). Biogeographically, this implies a geographic distribution extension for the genus of more than 450 km on the other side of Andes, and that T. laevis inhabits within the distribution range of the phenotypically similar Alsodes montanus. Here I critically review the arguments of Cuevas (2013) and show that his main evidence for revalidating T. laevis, the location of its type locality, is based on an erroneous interpretation of the literature. Moreover, I point out several deficiencies and inconsistencies of the description and redescriptions of this taxon that were not addressed by Cuevas (2013). Reanalysing the literature and photographs of the only known specimen, and incorporating new geographic data, I suggest instead that the only known specimen of T. laevis belongs to T. marmoratus, its original designation, and came from an undetermined place within the traditional known range of the genus in Chile. However, this proposal is problematic due to the high degree of morphological variation exhibited by T. marmoratus, the uncertain taxonomic status of its Chilean populations and the unclear origin of the specimen. Therefore, I consider T. laevis as a species inquirenda until these issues are clarified or new biological material is obtained. Furthermore, I provide photographic and geographic data of frogs from Potrero Grande belonging to the genus Alsodes.

Key words: Alsodes, Andes Range, species inquirenda, taxonomy, Telmatobius

## **INTRODUCTION**

he genus Telmatobius is one of the most distinctive and diversified amphibian lineages of the central high Andes. Sixty-three species are currently recognised, distributed between Ecuador and north-central Chile and Argentina, ten of which have been described in the past 15 years (Frost, 2016). The taxonomy and systematics of Telmatobius have been considered complex (e.g., Trueb, 1979; Cei, 1986; Wiens, 1993; De la Riva, 2005; Aguilar & Valencia, 2009; De la Riva et al., 2010) and there have been some claims that its species richness may be underestimated (De la Riva et al., 2012; Catenazzi et al., 2015). On the other hand, many species of the genus are considered threatened or even extinct, mainly due to their restricted geographic distributions, destruction of their habitats and/or the presence of the pathogenic fungus Batrachochytrium dendrobatidis (e.g., Merino-Viteri et al., 2005; Barrionuevo & Mangione, 2006; Seimon et al., 2007; Catenazzi et al., 2013).

Recently, Cuevas (2013) clarified the identity of the frog *T. laevis* described by Philippi (1902), which later was

transferred to the genus Alsodes by Lynch (1978). This species was described from two specimens collected in 1887 and since that date has not been observed again. Cuevas (2013) demonstrated that the type material (two syntypes, one currently lost) comprised two different taxa, using new bibliographic material and analysing photographs of the only existing specimen attributed to the species. He also located the type locality, Potrero Grande, in the western slopes of Andes close to the city of Santiago, capital of Chile (33°28'S). The demonstration that this taxon belongs to the genus Telmatobius and the location of the type locality have two important biogeographic implications: i) T. laevis would be the southernmost species of the genus, and would be isolated from the closest congeneric taxa by approximately 1190 km in a straight line on the western slopes and by more than 450 km on the opposite side of the Andes Range, and ii) its distribution range would overlap with that of A. montanus, a phenotypically very similar species which inhabits the western foothills of Andes between 33°20'S and 35°S (Araya & Riveros, 2008; Correa et al., 2008).

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**Fig. 1.** Geographic location of some places called Potrero Grande and Potrero, the southernmost known localities of *Telmatobius*, and localities of *Alsodes montanus* between 33 and 34°S. (A) North-central Chile and Argentina showing places called Potrero Grande and Potrero in the northeast of Chile (triangles): 1) Potrero Grande, 2–4) Potrero; and the southernmost known localities of *Telmatobius* in Chile (Río Vilama, type locality of *T. vilamensis*) and in Argentina (Cerro Madrid, Río Gualcamayo, type locality of *T. contrerasi*) (squares). (B) Location of Potrero Grande in the western slopes of the Andes of central Chile (according to Rentzsch, 1937; see details in the text); circles indicate all localities of *A. montanus* between 33 and 34°S that appear in Correa et al. (2008): 1) La Parva, 2) Farellones, 3) Estero Covarrubias, 4) Puente Blanco, 5) Río Clarillo (question mark means exact location unknown); the white rectangle indicates the magnification (map C) of the map of Klatt & Fickenscher (1929) shown by Cuevas (2013) in his Fig. 4. (C) Localities of A. montanus within Potrero Grande (white squares): 6) Arroyo Lagunitas (there *A. tumultuosus* was also found), 7) Arroyo Sin Nombre 2; the white star (8, Arroyo Lajitas) indicates the locality of *A. tumultuosus* that appears in Lobos et al. (2013); Potrero Grande in uppercase indicates its location according to the map of Klatt and Fickenscher (1929).

The merit of the study of Cuevas (2013) is double. He incorporated previously unknown iconographic (unpublished drawings) and cartographic material to the scarce information on the species, and carefully analysed and drew new photographic material of the only known specimen. However, he did not get new material from the type locality, so still only one specimen attributed to this species exists, collected 130 years ago. Here, I critically review the bibliographic information analysed by Cuevas (2013) and I demonstrate that the location of the type locality is based on an erroneous interpretation of the literature, so still its location is unknown. Also, I provide additional geographic antecedents showing that the original type locality might be located in northern

Chile, within the traditional distribution range of the genus *Telmatobius*. Considering this new information and morphological arguments, I propose an alternative identification for the only known specimen, pointing out the weaknesses of such proposal, and suggest a taxonomic decision. Moreover, I describe live frogs from Potrero Grande, the type locality of *T. laevis* according to Cuevas (2013), which belong to *A. montanus*.

## MATERIALS AND METHODS

The most relevant bibliographic sources used by Cuevas (2013) were carefully reviewed, in particular Philippi (1902), Riso Patrón (1924), Schmidt (1928), Müller (1938) and Cei (1962). Also, I reviewed sources of geographic names looking for places in the Andes Range called Potrero and Potrero Grande (United States Board of Geographic Names, 1967; Instituto Geográfico Militar, 1983). I did not examine the map of Klatt & Fickenscher (1929), so my comments about it are based on the text and figures of Cuevas (2013).

A set of stock photographs of the only specimen attributed to *Telmatobius laevis*, deposited at the Field Museum of Natural History of Chicago (FMNH 9978), were analysed. This material was kindly provided by Alan Resetar, Manager of the Amphibian and Reptile Collection. He examined the oral cavity of that specimen to verify if it had vomerine teeth. I also used an adult female from Quebe, northern Chile (belonging to the *T. marmoratus* complex according to Sáez et al., 2014; DBGUCH 0805027) to compare its lateral snout profile with the specimen FMNH 9978.

Between 15 and 17 January 2013, an expedition to Potrero Grande, located in the mountains east of Cerro Ramón, east of Santiago, central Chile (33°28'S, Fig. 1; see also Fig. 4 of Cuevas, 2013), was carried out as part of the project for elaborating the National Plan of Amphibian Conservation of Chile (RECOGE), funded by the Ministerio del Medio Ambiente (Lobos et al., 2013). The general indications to locate Potrero Grande were obtained from Rentzsch (1937), because I had no access to the map of Klatt & Fickenscher (1929) and when the expedition was planned, Cuevas (2013) had not been published. The journey started in the town of El Alfalfal, located on the north bank of the Colorado River, and finished on the slopes of the drainage system of the Molina River (Fig. 1). The journey to the farthest point from El Alfalfal lasted five hours total on horseback. Two nocturnal surveys were performed in one stream each of the Colorado and Molina River drainage systems. The searches for amphibians were done by visual encounter surveys by two people, walking along the edges of the streams, without predetermined limits of time or covered distance. Another stream was surveyed in daytime during the travel on horseback, using a refugia search (cavities between rocks under water). The localities with amphibian populations discovered in that field trip were partially described in Lobos et al. (2013), but no data of coordinates were provided there. Here I complete the information about these localities, specifying the coordinates, altitude and species encountered, and provide photographic material. No individual was collected in the localities surveyed.

## RESULTS

#### Descriptions of Telmatobius laevis

The main conclusion of Cuevas (2013) was that the two syntypes used by Philippi (1902) to describe *T. laevis* belonged to two different taxa, and one of them, the only existing specimen (FMNH 9978, a male; syntype B of Cuevas, 2013), actually would represent a valid species of *Telmatobius*. Here I review some details of the descriptions of that specimen, showing several deficiencies and inconsistencies, and describe new observations based on photographs of the specimen.

The description of *T. laevis* by Philippi (1902) is based on two specimens originally labelled as Telmatobius marmoratus by Fernand Lataste, whose sex was not specified, and unlike other descriptions of the author's work, it is relatively long and detailed. However, Schmidt (1928), who was the first to redescribe the species, used only one specimen sent to the Field Museum of Natural History of Chicago (FMNH 9978), apparently one of the original syntypes. Cei (1962) and Cuevas (2013) also based their descriptions on this specimen (photographs in the case of Cuevas, 2013). There is one important morphological difference between the description of Philippi (1902) and the redescription of Schmidt (1928): unlike Philippi (1902), he indicated that the specimen FMNH 9978 has vomerine teeth. In fact, the lack of vomerine teeth was one of the two arguments used by Philippi (1902) to distinguish *T. laevis* from *Cycloramphus* marmoratus Duméril and Bibron, 1841 (this name was changed to T. marmoratus by Boulenger, 1882 without comments, but Philippi, 1902 continued using C. marmoratus). The other trait used by Philippi (1902) for erecting the new taxon appears in the description of C. marmoratus (Duméril & Bibron, 1841): he noted that males of C. marmoratus, unlike T. laevis, "have on the underside of the first finger a gland that extends almost to the tip" (p. 46). The omission of this character (the gland) in later descriptions of T. laevis is consistent with the original description, but since the redescription of Schmidt (1928), a nuptial structure on the first finger is described in the specimen FMNH 9978: "base of the first finger swollen, covered with nuptial asperities, without a horny black layer".

The description of *T. laevis* of Cuevas (2013) is "based on photographs of syntype B as well as Cei's (1962) description of the same specimen" (p. 150), the latter based on that of Schmidt (1928), so it differs essentially from that of Philippi (1902) by the presence of vomerine teeth and the nuptial structure on the first finger. Therefore, the description of Cuevas (2013) is the more recent and complete to date, judging, for example, by the additional information about the webbing formula. However, the description of the vomerine teeth is confusing: "Vomerine teeth absent or reduced (Fig. 3B), but a barely protuberant region like two horizontal fleshy crests between the choanae is present" (p. 148; note his Fig. 3B does not show this character). This contrasts with



**Fig. 2.** Live specimens of the *Telmatobius marmoratus* complex and *Alsodes montanus*, and panoramic view of a sampling site in Potrero Grande. (A) Female specimen from Quebe (*T. marmoratus* complex). (B) Male specimen (not collected) of *A. montanus* from Arroyo Lagunitas, a place within Potrero Grande (see Fig. 1C). (C) Lateral profile of the same specimen of *A. montanus* of B, showing the patch of spines in the chest characteristic of the genus (red arrow). (D) Juvenile specimen of *A. montanus* from Arroyo Sin Nombre 2 in Potrero Grande (see Fig. 1C). (E) Panoramic view of Arroyo Lagunitas in Potrero Grande.

the clear descriptions of that character of Schmidt (1928) ("vomerine teeth present, in small patches between the choanae") and Cei (1962) ("vomerine teeth in two small groups between the choanae"; I do not know to what extent Cei (1962) was based on the description of Schmidt, 1928).

Regarding the structure on the first finger, the descriptions of Cuevas (2013) are also ambiguous: "right hand with sexual spines", "keratinous granulations in the first finger in pad like form" and "nuptial asperities only on the first finger and they are homogeneously distributed" (all on p. 148). Also, it is worth noting that Cuevas (2013) redescribed this character only from the right hand (he mentions in the legend of Fig. 3D that the thumb of the left hand is deformed) and apparently only based on photographs of that hand in palmar view (he did not show detailed photographs or drawings of this structure alone).

I examined photographs of the hands and the inside of the mouth of the specimen FMNH 9978, and I could verify, with the aid of Alan Resetar, that it has vomerine teeth (two on each side) and a pad-like nuptial structure covered by minute granulations on the first finger of the left hand. These observations confirm the differences in those traits between the original description of Philippi (1902) and subsequent redescriptions (Schmidt, 1928; Cei, 1962; Cuevas, 2013), which have important implications for the generic assignment and taxonomic status of this species (see next sections).

#### Type locality of Telmatobius laevis

One of the arguments used by Cuevas (2013) to revalidate T. laevis is the location of its type locality, Potrero Grande. However, a careful analysis of the bibliographic sources he used shows that the original type locality of this species is just "Potrero". In the original description, Philippi (1902, p. 44) complains that perhaps Fernand Lataste believed that word was enough to define the place of origin of the two animals identified and labelled originally as "Telmatobuis marmoratus Dum. i Bibr. Potrero 2.87" (in the text of Philippi, 1902, the genus is misspelled). The designation of Potrero Grande as the type locality of T. laevis was first made by Müller (1938), who redescribed T. montanus (now Alsodes montanus) using material from that locality collected at 2200 m, but he synonymised T. laevis with T. montanus, suggesting that Potrero and Potrero Grande were the same place (discussed in Gallardo, 1970).

The key point of the argumentation of Cuevas (2013) is that Cei (1962) "assumed Potrero Grande as the type locality of *T. laevis*" (Cuevas, 2013, p. 149), but actually Cei (1962) did not assume this, since he clearly established "Potrero, Chile (locality unclear)" as its *terra tipica* (Cei, 1962, p. 63), and, unlike Müller (1938), considered *T. laevis* and *T. montanus* as distinct species. In fact, Cuevas (2013) himself quotes correctly Cei (1962) on the same page: "Cei, 1962; Batr. Chile: 63, noted that the type locality had not been located with certainty". Furthermore, Cei (1962) mentioned that Potrero Grande was a locality attributed to *T. montanus*, not to *T. laevis*.

The other antecedent used by Cuevas (2013) to

identify Potrero Grande as the type locality of T. laevis is the geographic origin of the lost syntype (syntype A of his paper). Cuevas (2013) compared a drawing of R.A. Philippi with live specimens of A. nodosus, identifying syntype A as this species, but the problem lies in the geographic data. Cuevas (2013) indicated: "Remarkably, the locality Potrero Grande by Klatt & Fickensher (1929) coincides with records for A. nodosus by Bogart (1970), Díaz & Valencia (1985) and Penna et al. (1983), providing evidence that it is the locality mentioned by Lataste (see also Busse, 1980; Penna et al., 1983)" (p. 149). This statement is misleading for two reasons. First, of the three publications cited only Penna et al. (1983) used specimens from near the study area, "23 km east of Santiago (latitude 33°21' S, longitude 70°24' W, altitude 800m)" (p. 2370), although neither the latitude nor the altitude match the location of Potrero Grande. The other two references included specimens from just "Santiago" (Bogart, 1970) and from Sierras de Bellavista, around 150 km south of Potrero Grande (Díaz & Valencia, 1985). Second, neither Busse (1980) nor Penna et al. (1983) add, mention or discuss additional geographic antecedents to indicate that Potrero Grande "is the locality mentioned by Lataste".

Immediately after the text quoted above, Cuevas (2013) adds "Alsodes nodosus has also been reported for Lagunillas (33°22'S, 70°21'W) and Yerba Loca (33°20'S 70°18'W), neighbouring Potrero Grande (Bogart, 1970; Cuevas, unpublished data)", both localities not reported previously. Indeed, these localities are located south and north of Potrero Grande, respectively (although Lagunillas is 27 km south of the specified coordinates), but the presence of the species there does not guarantee its occurrence at higher altitudes. In fact, the purported presence of A. nodosus in Potrero Grande (2200-3000m) implies an extension of its altitudinal limits (50-1500 m; e.g. Formas, 1995; Veloso & Navarro, 1988; Veloso, 2006; Veloso & Nuñez, 2010), but none of the geographic and bibliographic antecedents of Cuevas (2013) supports this altitudinal range extension. The presence of this species in Lagunillas might expand those altitudinal limits (personal observation), but regrettably he does not specify its altitude.

In summary, there are no antecedents in the literature to assign Potrero Grande as the type locality of *T. laevis* and the geographic data of *A. nodosus* provided by Cuevas (2013) do not lend support to his hypothesis that "both syntypes were collected from the same locality (Potrero Grande, Andes Mountain, Santiago de Chile, Fig. 2)" (p. 150).

#### Location of Potrero Grande and Potrero

One of the contributions of the study of Cuevas (2013) is the location of Potrero Grande, a place in the Andes Range east of Santiago that he identified as the type locality of *T. laevis*. Cuevas (2013), like Müller (1938, p. 314) previously, used the map of Klatt & Fickenscher (1929) to locate Potrero Grande and its limits (although it is not clear if he quotes Klatt & Fickenscher, 1929): "they refer to a plateau 'Potrero Grande' (33°28'33'S, 70°23'54'W), limited in the north-east by the stream Recauguenes

and in the north-west by the stream Covarrubias; to the south, this plateau is limited by La Encañada de las Condes" (p. 149). These limits are more restricted than those indicated by Rentzsch (1937), the source that I consulted to plan the expedition to the site: "Potrero Grande is a vast plateau in a high position of 2200–3000 m, extending between Ramón and Quempo mountains on one side and the valleys of Molina and Colorado rivers on the other" (originally in German, translation mine). This last information was corroborated in situ by conversations with the muleteers who guided us and gave us accommodation at the place. They also noted that the "fundo" (a ranch or farm in Spanish) Potrero Grande no longer receives that name and was divided into several farms. Also I had the opportunity to talk with the owner of the Fundo Santa Matilde (Mr. Mayra), one of the properties into which Potrero Grande was divided, who corroborated this information. Therefore, it can be established that the true limits of the old "fundo" Potrero Grande were those indicated by Rentzsch (1937) (specified in Fig. 1B).

The search of geographic names showed that two other places in Chile are called Potrero Grande, also in the foothills of the Andes, one in the extreme north (18°32'S, 69°45'W; Fig. 1A) and the other south of Santiago (35°12'S, 70°53'W) (populated places according to the United States Board of Geographic Names, 1967). Regarding places called just Potrero, I found three located in the high Andes in northern Chile (19°27'S, 68°34'W, 4100 m; 20°02'S, 68°46'W, 4250 m; 22°16'S, 68°07'W, 3600 m; ravines according to the Instituto Geográfico Militar, 1983; Fig. 1A), within the traditionally accepted distribution range of the genus *Telmatobius* (Formas et al., 2005).

#### **Frogs from Potrero Grande**

Müller (1938) described material of T. montanus (=A. montanus) from Potrero Grande (2200 m), a locality within the distribution range of this species in central Chile (Correa et al., 2008; Fig. 1B). During the field trip to Potrero Grande, three localities with Alsodes populations were discovered (Fig. 1C). Arroyo Lagunitas (33°25'34.6"S, 70°16′50.1″W; Fig. 2E) is a tributary stream of the Molina River which rises in a system of flooded grasslands and small lakes situated at an altitude of 2640 m. A stretch of 450 m from the source of the stream was surveyed at night by two people for two and a half hours (five manhours). Seven adult males of A. montanus (not collected) were found submerged in a small pool of this stream at 2586 m (Figs. 2B and 2C). Ten other individuals of the same species were observed semi-submerged upstream. Also, an adult female of A. tumultuosus and an adult female of Rhinella spinulosa were observed in the same stream near of the pool. The second point within Potrero Grande, Arroyo Sin Nombre 2 (33°26'18.5"S, 70°17'06.3"W, 2597 m; Fig. 1C), is also a small stream that joins the anterior and flows into the River Molina. This stream was explored by day (two people, one manhour) and there two juveniles of A. montanus were found hidden in underwater rock cavities (not collected; Fig. 2D). Also, several tadpoles of different sizes attributed to that species were found. The third place is a small stream which flows into the Quempo stream which in turn flows into the Colorado River (Fig. 1C). During the night, 550 m of this stream (starting at 33°28'09.1"S, 70°14'54.9"W; 2540–2625m altitude) were explored by two people (six man-hours) but no individual of *A. montanus* was found. Instead, many adults (about 50), juveniles and tadpoles of *A. tumultuosus* (not collected), and many tadpoles and a few adults of *R. spinulosa* were observed in the stream. No specimen of *Telmatobius* or *A. nodosus* was observed in any of the three surveyed localities.

#### Generic assignment and taxonomic identity of Telmatobius laevis

Here I integrate the observations of the specimen FMNH 9978 and the new geographical data and field evidence to the bibliographic and morphological antecedents of Cuevas (2013) to reassess the generic assignment, validity and possible identity of *T. laevis*.

According to Cei (1962), the secondary sexual characters allow differentiating T. laevis from T. montanus (=A. montanus), and hence from Alsodes (Gallardo, 1970): T. laevis has "chitinous granulations on the first finger" (p. 63; probably he meant keratinous), lacking prominent spines on fingers one and two, and patches of spines on the chest like Alsodes (present in syntype A of Cuevas, 2013). As mentioned previously, the descriptions of the structure of the first finger of the specimen FMNH have been inconsistent among studies and currently only the right arm would exhibit it according to Cuevas (2013). However, I could confirm that the specimen also has a pad-like structure with minute granulations on the first finger of the left hand, similar to other species of Telmatobius (see for example Cuevas & Formas, 2002; Formas et al., 2003; Lavilla & Barrionuevo, 2005; Formas et al., 2006), and lacks patches of spines on the chest.

It should be noted that *A. montanus*, which inhabits the foothills of the Andes of central Chile (33°20'S–35°S), also resembles a *Telmatobius* mainly due to the smooth skin, great development of membranes among toes, eye position, presence of lateral skin folds and general coloration (Müller, 1938; Busse, 1980; Veloso et al., 1982; see Fig. 2B). However, other anatomical details of the specimen FMNH 9978, like the shape of the head (wider with a slightly longer snout than *A. montanus*), the extent of the webbing (notched up to a third of its height) and the lesser development of the *canthus rostralis* and metatarsal tubercles allow distinguishing between these taxa and support its inclusion in *Telmatobius*.

As detailed previously, the absence of vomerine teeth and a gland on the underside of the first finger were the unique features used by Philippi (1902) for rejecting the identification of F. Lataste (*T. marmoratus*) and erecting a new taxon. However, the redescriptions by Schmidt (1928), Cei (1962) and Cuevas (2013) differ essentially from the original description by the presence of vomerine teeth and the presence of a padlike structure on the first finger. A potential explanation for these contradictory descriptions is that simply the specimen FMNH 9978 used by Schmidt (1928) was not one of the original syntypes used by Philippi (1902), i.e. a labelling error, or alternatively, that Philippi (1902) mistakenly omitted these two characteristics. I think that currently it is impossible to verify both possibilities, but there is one antecedent in favour of the latter. Schmidt (1928) mentioned about the discrepancy between his description and that of Philippi (1902) concerning vomerine teeth: "this curious mistake is explicable enough when the state of Philippi's eyesight, in 1902, is taken into consideration" (p. 103). Whatever the reason, these partially contradictory descriptions cast doubt that they have used the same material, which Cuevas (2013) did not take into account.

Another persistent problem that further weakens the validity of T. laevis is the lack of an adequate diagnosis. Philippi (1902) provided a diagnosis for T. laevis comparing it with T. marmoratus and T. montanus (=A. montanus), at that time the only congeneric species from Chile. Later, Schmidt (1928) also compared T. laevis with T. montanus, and also with T. peruvianus, which was reported for the country and redescribed by him with new material from Putre. Cei (1962) did not even compare T. laevis with all species of Chile (five in total at that time, including T. montanus), but rather he only differentiated this species from its geographically closest relative T. montanus. Between 1962 and 2006 the number of species of Telmatobius in Chile increased to 10 (Formas et al., 2005, 2006), excluding T. laevis and T. montanus which were transferred to the genus Alsodes. The transfer of T. laevis to Alsodes was made by Lynch (1978) without providing a diagnosis (to my knowledge no author subsequently distinguished this species from others of the genus Alsodes) and Cuevas (2013) also did not provide a diagnosis when he proposed returning A. laevis to Telmatobius. These antecedents show that T. laevis always has been compared to a very reduced number of species, including a species of another genus (A. montanus), and until now lacks a diagnosis with respect to most species of Chile (except T. peruvianus, Schmidt, 1928). Regarding the revalidation of Cuevas (2013), it is not clear why he does not proportionate a diagnosis. I think that distance and the apparent isolation of the type locality are insufficient arguments to guarantee automatically specific status for the unique known specimen of the species.

The finding of localities called Potrero in the geographic area where Telmatobius is distributed in Chile (see above and Fig. 1A) justifies a comparison of T. laevis with species from that zone. Of the two original "diagnostic" characters of Philippi (1902), absence of vomerine teeth and the gland on the underside of the first finger, only the first is useful because the second has been forgotten and deleted from more recent (re)descriptions of T. marmoratus and Telmatobius in general (e.g., Veloso et al., 1982; De la Riva, 2005; Lehr, 2005). Presence, absence or development of vomerine teeth might be useful for distinguishing some species from Chile. For example, vomerine teeth are present in T. chusmisensis and T. pefauri (this species actually has prevomerine teeth, Veloso & Trueb, 1976), are reduced (vestigial) in T. fronteriensis, but are absent in T. peruvianus, T. halli, T. zapahuirensis, T. dankoi and T. vilamensis (Veloso et al., 1982; Formas et al., 1999; Benavides et al., 2002; Formas et al., 2003, 2006). However, this character is variable in T. philippii (rudimentary or absent, Cuevas & Formas, 2002) and T. marmoratus, for which there are several descriptions (localities in parentheses): vomerine teeth are absent (Parinacota; Veloso et al., 1982), absent or rudimentary (probably Lauca; Díaz, 1984), reduced (locality not specified; Formas et al., 2003) or present (Cancosa; Capurro, 1954). This could be an example of geographic variation of this trait, but an alternative explanation is the uncertain taxonomic status of populations from Perú, Bolivia, Chile and Argentina assigned to T. marmoratus, which have been considered by recent studies as a species complex (e.g., De la Riva, 2005; De la Riva et al., 2010; Sáez et al., 2014; Victoriano et al., 2015). Moreover, there are other examples of intraspecific and intrapopulation variation in this trait in populations of T. jelskii and T. marmoratus from Perú (Vellard, 1951). Since the specimen FMNH 9978 has vomerine teeth, we can reduce to only four the candidate species from Chile: T. chusmisensis, T. fronteriensis, T. philippii and T. marmoratus.

An overlooked feature in the descriptions of T. laevis that may be useful to choose among these species is the lateral profile of the snout. In Fig. 3A of Cuevas (2013) it can be observed that the snout is very short and slightly truncated. The snout of T. chusmisensis is "short, depressed in lateral view" (Formas et al., 2006, see their Fig. 2A; I can also add it is pointed), that of T. fronteriensis is "bluntly rounded" (Benavides et al., 2002, see their Fig. 3A) and that of T. philippii is "slightly rounded" (Cuevas & Formas, 2002, see their Fig. 1A). The comparison of all these figures shows the snouts of these three species are longer and have a different profile than that of T. laevis. Regrettably, I could not find a comparable description or picture of the lateral view of the snout of T. marmoratus, so I show a photograph of a female specimen from Quebe (Fig. 2A), which according to recent phylogenetic studies can be included in the T. marmoratus complex (Sáez et al., 2014; Victoriano et al., 2015). The snout of this specimen is short and truncate as that of T. laevis (compare with Fig. 3A of Cuevas, 2013), but it is a little longer. However, among all examples mentioned above, it is the most similar to that of *T. laevis*.

In synthesis, the geographical evidence (several localities called Potrero in the high Andes from northern Chile), the presence of vomerine teeth and the shape and size of the snout in lateral view all suggest that the specimen FMNH 9978, if it is one of the syntypes used by Philippi (1902), was correctly identified by F. Lataste as *T. marmoratus*. Note that if one accepts that the type material of *T. laevis* has no vomerine teeth as originally described by Philippi (1902), this identification does not need to be changed due to the variation of this feature described in *T. marmoratus* (see above).

### DISCUSSION

Andean frogs of the genus *Telmatobius* exemplify the current challenges of amphibian diversity and conservation research: on one hand, its species diversity

seems to be underestimated, and on the other hand some populations are extinct or in decline, threatened primarily by land use change, global climate change and emerging diseases. In this context, the study of Cuevas (2013) becomes more relevant because it involves the revalidation of one of the rarest species of Telmatobius, considering that it has not been seen for 130 years, and a significant extension (more than 450 km on the opposite side of the Andes) of the distribution range of the genus. Moreover, this range extension is interesting from an ecological point of view because it implies that an isolated population or populations of Telmatobius coexist with the morphological and ecologically equivalent species A. montanus in the western slopes of the Andes from central Chile. I think that a finding of such magnitude and its underlying taxonomic hypothesis should be supported by strong evidence, especially considering that currently the species cannot be assigned to any naturally occurring population (Frost, 2016). Although Cuevas (2013) analysed photographic material of the only existing specimen attributed to the species (FMNH 9978) and incorporated new bibliographic information to try to solve one of the many taxonomic problems stemming from the work of Philippi (1902) (see Cei, 1958), I demonstrate in this study he did not reach this goal because T. laevis still lacks a consistent description, a proper diagnosis and a geographically defined type locality. Furthermore, the finding of localities called Potrero (the original type locality according to Philippi, 1902) in northern Chile and the new data of frogs from Potrero Grande belonging to the genus Alsodes reported here further weaken the controversial evidence provided by Cuevas (2013) to support the presence of *Telmatobius* in the Andes of central Chile. Since I presented my arguments in detail in Results, below I only outline the main pending issues about the validity of T. laevis and conclude with a taxonomic recommendation.

Four main issues around the description and the redescriptions of T. laevis remain unresolved (and will probably stay that way). First, the reason of Philippi (1902) for describing a new species and rejecting the previous identification made by F. Lataste (T. marmoratus) of the only two known specimens seems clear (the absence of vomerine teeth and a gland on the first finger in *T. laevis*), but here lies a fundamental problem for accepting now the validity of this species: this diagnosis is very insufficient considering the current number of described species and the knowledge of the levels of phenotypic variation within the genus. Second, all authors who later redescribed the species indicated that specimen FMNH 9978 has vomerine teeth and nuptial asperities on the first finger, both characteristics absent in the two syntypes according to Philippi (1902) (remember Philippi, 1902 also included in the diagnosis the absence of a gland). Only Schmidt (1928) mentioned something about the absence of vomerine teeth in the original description (alluding to the state of Philippi's eyesight), but all subsequent studies do not contain any comment about these inconsistencies. Since these morphological differences are easily distinguishable, this raises serious doubts that the specimen FMNH 9978 really was one of the two original specimens. Third, the problem of the location of the original type locality, Potrero, still persists due to the intrinsic vagueness of its name, as Philippi (1902) first pointed out. Quoting Cuevas (2013), "potrero" is a very commonly used name referring to pasture land. Although the new geographic antecedents obtained in this study reduce the geographic area where it could be located (northernmost Chile), these data are not very useful in resolving the taxonomic problem because without a diagnosis it is difficult to differentiate T. laevis from the several species of Telmatobius that inhabit the area. Four, it is hard to accept that the specimen drawn by Philippi (syntype A of Cuevas, 2013, undoubtedly a mature male of A. nodosus) is the lost syntype because this implies that two experts (F. Lataste and R.A. Philippi) overlooked the great differences between the two original specimens, particularly in their secondary sexual characters. In fact, Philippi did not describe any differences between the two syntypes, so it is illogical that he had drawn with such details a specimen so different (see Figs. 1A and 1B of Cuevas, 2013). Here one could refer to the eyesight problem of R.A. Philippi, but this would mean that neither his drawings nor his descriptions are reliable. There is another detail that confuses this issue even more. Although at the base of the drawing the name Telmatobius laevis can be clearly read, its label, plate XII, figures I and Ia (according to Cuevas, 2013, p. 149), is different to the original indicated by Philippi (1902): "FIG. 4 i 5" (p. 43).

I agree with the final statement of Cuevas (2013), on "the necessity of morphology-based taxonomic investigations when DNA and chromosomal studies are not possible" (p. 150), but in the case of T. laevis I think he did not follow his own advice because two fundamental issues, the inconsistencies between the original description and all subsequent redescriptions, and the lack of a diagnosis that takes into account the overall variation of the genus in Chile, were not solved by him. I recognise this last task is very complex due to the extremely high levels of phenotypic variation exhibited by the genus Telmatobius, which is the reason that its taxonomy and systematics are continually in flux, but without a diagnosis and a precise locality it is impossible to rediscover this taxon in nature. The main contribution of the present study is to show that neither the literature nor field data support the presence of the genus Telmatobius in central Chile, since my taxonomic identification of the specimen FMNH 9978, as T. marmoratus, also has its own weaknesses. First, the identification is based on two characters, vomerine teeth and lateral profile of the snout, which show intraspecific variation in Telmatobius (Vellard, 1951; Wiens, 1993). Second, the identification might not be definitive because the taxonomy of T. marmoratus is unstable: in Chile it is considered a species complex (Sáez et al., 2014; Victoriano et al., 2015) and in Bolivia it is "in a state of chaos" (De la Riva, 2005). And third and most important, this taxonomic hypothesis also is based on photographs and redescriptions of only one specimen, collected 130 years ago from a place not located. Taking into account these unsolved issues and the incongruences revealed by my analysis of the literature, I consider *T. laevis* a *species inquirenda* (see also comment in Frost, 2016) and suggest eliminating it from amphibian lists until new biological material and geographic data are obtained.

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