

On the dendrobatid frogs from Bolivia: rediscovery of *Epipedobates bolivianus* (BOULENGER, 1902), first record of *Colostethus brunneus* (COPE, 1887) and comments on other species (Anura: Dendrobatidae)

Zu den Dendrobatiden Boliviens: Wiederentdeckung von *Epipedobates bolivianus* (BOULENGER, 1902), Erstnachweis von *Colostethus brunneus* (COPE, 1887) und Bemerkungen zu anderen Arten
(Anura: Dendrobatidae)

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KURZFASSUNG

Epipedobates bolivianus (BOULENGER, 1902) ist ein bisher nur von der Typuserie bekannter Pfeilgiftfrosch (Dendrobatidae) vom Ostabhang der Anden in Bolivien. Kürzlich wurde die Art unweit der Typuslokalität wiederentdeckt. Die Lebensfärbung wird erstmals beschrieben. *Colostethus brunneus* (COPE, 1887) wird erstmals und *C. mcdiarmidi* REYNOLDS & FOSTER, 1992 und *C. trilineatus* BOULENGER, 1883 werden an neuen Stellen nachgewiesen. Die Verbreitung und Taxonomie der Pfeilgiftfrösche Boliviens wird zusammengefaßt und diskutiert.

ABSTRACT

Epipedobates bolivianus (BOULENGER, 1902) is an uncommon poison frog (Dendrobatidae) from the eastern versant of the Bolivian Andes. It is only known from the type series. Recently, it was rediscovered close to the type locality. Life coloration is described for the first time. *Colostethus brunneus* (COPE, 1887) is recorded for the first time, and *C. mcdiarmidi* REYNOLDS & FOSTER, 1992 and *C. trilineatus* BOULENGER, 1883 are reported from additional localities. The distribution and taxonomy of the Bolivian poison frogs is summarized and discussed.

KEY WORDS

Anura, Dendrobatidae; *Epipedobates bolivianus*, *Colostethus brunneus*, first record; Bolivia.

South American poison frogs of the genus *Epipedobates* MYERS, 1987 (Dendrobatidae) are known from low to moderate elevations both east and west of the Andes. Including *Phobobates* ZIMMERMANN & ZIMMERMANN, 1988 as a junior synonym of *Epipedobates*, presently about 30 species are known (GLAW & al. 1998; MYERS & al. 1998). Most species of *Epipedobates* occur in the upper Amazon basin including the Andean foothills (FROST 1985). Although, in recent years, the knowledge on certain members of the genus has increased (e.g., HADDAD & MARTINS 1994), several species remain poorly known. For sure, *E. bolivianus* (BOULENGER, 1902) has to be included with the least known species of *Epipedobates* (DE LA RIVA & al. 1996). The original description was based on one specimen from San Ernesto (800 m a.s.l.) and two from

San Carlos (1200 m a.s.l.), both in the Departamento La Paz, Bolivia (FROST 1985). Since, the species was redescribed twice (SILVERSTONE 1976; RODRÍGUEZ & MYERS 1993). Both contributions were based on the type specimens only as fresh material of *E. bolivianus* has not been available.

On 17 September 1998, LG collected a specimen of *E. bolivianus*, SVL 23.6 mm (fig. 1A), at Territorio Comunitario y Reserva de la Biosfera "Pilon Lajas" (15°06' 36" S, 67°32' 33" W; ca. 1350 m a.s.l.), Serranía Beu, Provincia Sudyungas, Departamento La Paz. This locality lies in the proximity of the above mentioned localities (fig. 2). The specimen is deposited in the amphibian collection of the Museo de Historia Natural "Noel Kempff Mercado", Santa Cruz de la Sierra, Bolivia (NKA 3707). In addition, an adult female, SVL

26.6 mm (figs. 1B, 1C), was found by SR on 2 October 1999 at km 30 on the Yucumo-Quiquibey road (15°41'55" S, 67°28'52" W; ca. 1650 m a.s.l.), Provincia Nor-yungas, Departamento La Paz. This locality is situated about 100 km south-east to the former. The specimen is deposited at the Colección Boliviana de Fauna, La Paz, Bolivia (CBF 3901). We compared both specimens with the descriptions of *E. bolivianus* by SILVERSTONE (1976) and RODRÍGUEZ & MYERS (1993) as well as b/w photographs of the lectotype [BM (British Museum, London) 1947.2.13.89]. Our comparison revealed high coincidence in external features except that NKA 3707 possesses a small light thigh spot while in the lectotype and CBF 3901 the dorsolateral line continues on the upper femur. Life coloration, previously unknown, was as follows (figs. 1A - 1C): ground colour black, dorsally turning into brownish orange (most intense at mid-dorsum); bright dorsolateral line yellow (orange before eye in NKA 3707), turning into yellowish cream before groin; labial line whitish cream; limbs dorsally brownish bronze, hind limb with black marbling in NKA 3707; ventral sides of body and limbs greenish to bluish cream with black marbling; prominent light yellow axillary and in NKA 3707 small light yellow thigh spot (light calf spot absent). Thus far known, this species is restricted to humid montane forest (800-1650 m a.s.l.) in the Yungas de La Paz.

Epipedobates bolivianus superficially resembles *E. pictus* (BIBRON in TSCHUDI, 1838) from semi-humid and very humid lowland rain forests of the south-western Amazon basin of Bolivia and adjacent Peru (HADDAD & MARTINS 1994). It can be distinguished from *E. bolivianus* by having light reddish orange axillary, thigh and calf spots as well as bluish marbled ventral surfaces (HADDAD & MARTINS 1994). The third species of *Epipedobates* known to occur in Bolivia is the Amazonian *E. hahneli* (BOULENGER, 1883). It can be distinguished from *E. bolivianus* by having a whitish dorsolateral line and bluish marbled ventral surfaces (HADDAD & MARTINS 1994). In contrast to *E. bolivianus*, both *E. pictus* and *E. hahneli* are primarily lowland species, although, according to DE LA RIVA & al. (1996), *E. pictus* reaches up to 1300 m

a.s.l. We summarise the Bolivian distributions of both species mentioned in fig. 2 based on records in REYNOLDS & FOSTER (1992), HADDAD & MARTINS (1994), DE LA RIVA & al. (1996), KÖHLER & LÖTTERS (1999), and material at CBF, NKA and ZFMK (Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn). Although *E. pictus* and *E. hahneli* occur in broad sympatry in south-eastern Peru (compare DUELLMAN & THOMAS 1996), there is presently no evidence of sympatry in Bolivia. However, *E. pictus* (NKA 3753-58, 3771, 3794) was also found at different sites within Territorio Comunitario y Reserva de la Biosfera "Pilon Lajas" and thus occurs in sympatry with *E. bolivianus* (see fig. 2); nevertheless, syntopic occurrence cannot be confirmed. A record of *E. pictus* (NKA 2733-2734) from the northern Paraguay basin in extreme south-eastern Bolivia (see fig. 2) is remarkable since the general area is semiarid and most probably does not meet the species' usual biotope requirements.

Other dendrobatid frogs known from Bolivia belong to the genus *Colostethus* COPE, 1866, a speciose group of apparently non-toxic and more cryptically coloured species (FROST 1985; GLAW & al. 1998). *Colostethus mediarmidi* REYNOLDS & FOSTER, 1992 was described from humid montane forest (ca. 1650-1700 m a.s.l.) in the Chapare region, Departamento Cochabamba. On 17 and 21 September 1998, LG found this species, two males (NKA 3708, 3712) of 22.0 and 24.0 mm SVL (fig. 3), in humid montane forest at Territorio Comunitario y Reserva de la Biosfera "Pilon Lajas" (15°06'36" S, 67°32'33" W; ca. 1350 m a.s.l.), Serranía Beu, Provincia Sudyungas, Departamento La Paz. These specimens coincide exactly with the original description. The records of *C. mediarmidi* are all situated in the Yungas of Cochabamba and La Paz (fig. 2) separated by a distance of more than 250 km. Due to insufficient collecting, it remains to be resolved if the species is more or less continuously distributed (as we assume) or if it shows a disjunct distribution.

Colostethus trilineatus (BOULENGER, 1883) was suggested to represent a valid species from the south-western Amazon basin by MORALES (1994). According to



1B

Fig. 1A: *Epipedobates bolivianus* (BOULENGER, 1902) in dorsal view (NKA 3707).
Fig. 1B: *Epipedobates bolivianus* (BOULENGER, 1902) in dorsal view (CBF 3901).
Fig. 1C: *Epipedobates bolivianus* (BOULENGER, 1902) in ventral view (CBF 3901).
Abb. 1A: *Epipedobates bolivianus* (BOULENGER, 1902) in Dorsalansicht (NKA 3707).
Abb. 1B: *Epipedobates bolivianus* (BOULENGER, 1902) in Dorsalansicht (CBF 3901).
Abb. 1C: *Epipedobates bolivianus* (BOULENGER, 1902) in Ventralansicht (CBF 3901).



1A

1C



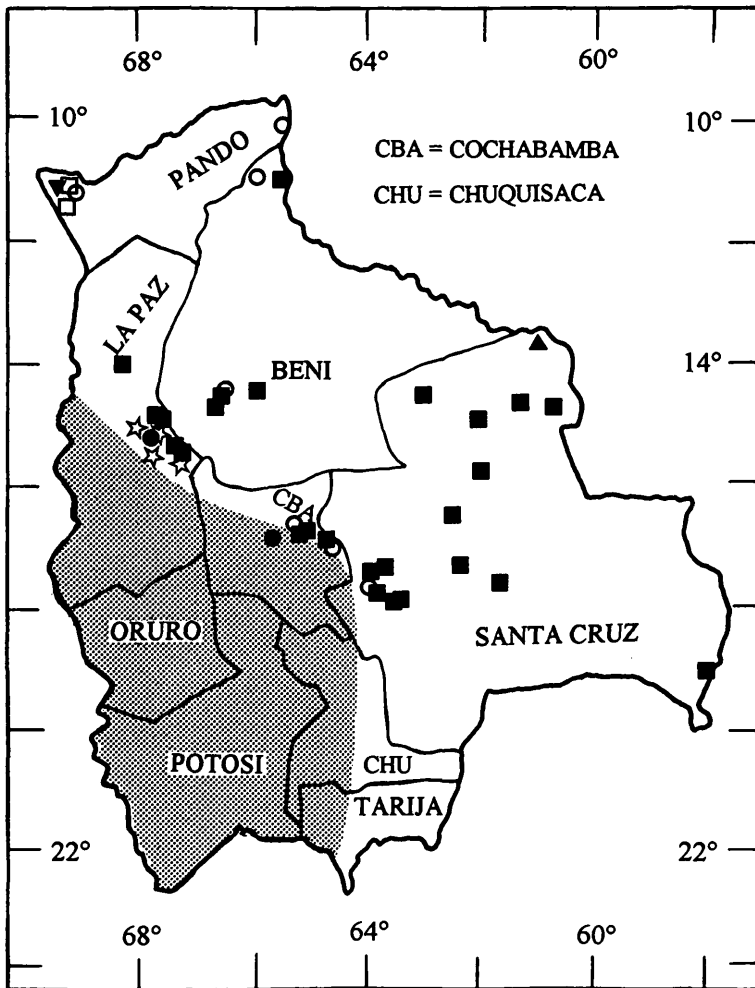


Fig. 2: Map of Bolivia with Departamentos and localities where dendrobatid frogs have been found.

▲ - *Colostethus brunneus*; ● - *C. mcdiarmidi*; ○ - *C. trilineatus*; ▼ - *Colostethus* sp. from Cobija; ☆ - *Epipedobates bolivianus*; □ - *E. hahneli*; ■ - *E. pictus*. Andean areas above 2500 m a.s.l. are grey.

Abb. 2: Bolivien mit seinen Departamentos und den Fundorten von Dendrobatiden.

▲ - *Colostethus brunneus*; ● - *C. mcdiarmidi*; ○ - *C. trilineatus*; ▼ - *Colostethus* sp. from Cobija; ☆ - *Epipedobates bolivianus*; □ - *E. hahneli*; ■ - *E. pictus*. Andine Bereiche über 2500 m ü. N. N. sind grau.

DE LA RIVA & al. (1996), REICHLE & KÖHLER [1996 under the name *Colostethus marchesianus* (MELIN, 1941)] and KÖHLER & LÖTTERS (1999), in Bolivia this species occurs in lowland rain forest (ca. 200-300 m a.s.l.) of the Departamentos Cochabamba, Beni and Pando (fig. 2). DE LA RIVA & al. (1996) examined specimens reported by FUGLER (1983 as *Colostethus* sp.) from Tumi Chucua, Departamento Beni, and by EDWARDS (1974 as *C. "phaeocene-*

on") from near Chipirí, Departamento Cochabamba, and concluded that they are also *C. trilineatus*. Recently, SR collected two females, SVL 18.1 and 18.9 mm (NKA 3842-43), referable to this dendrobatid frog species, at Mataracú (17°33'92" S, 63°52'71" W; ca. 500 m a.s.l.), Parque Nacional Amboró, Provincia Ichilo, Departamento Santa Cruz (compare fig. 2). Due to the lack of physical barriers, we principally agree with DE LA RIVA & al. (1996) that *C.*

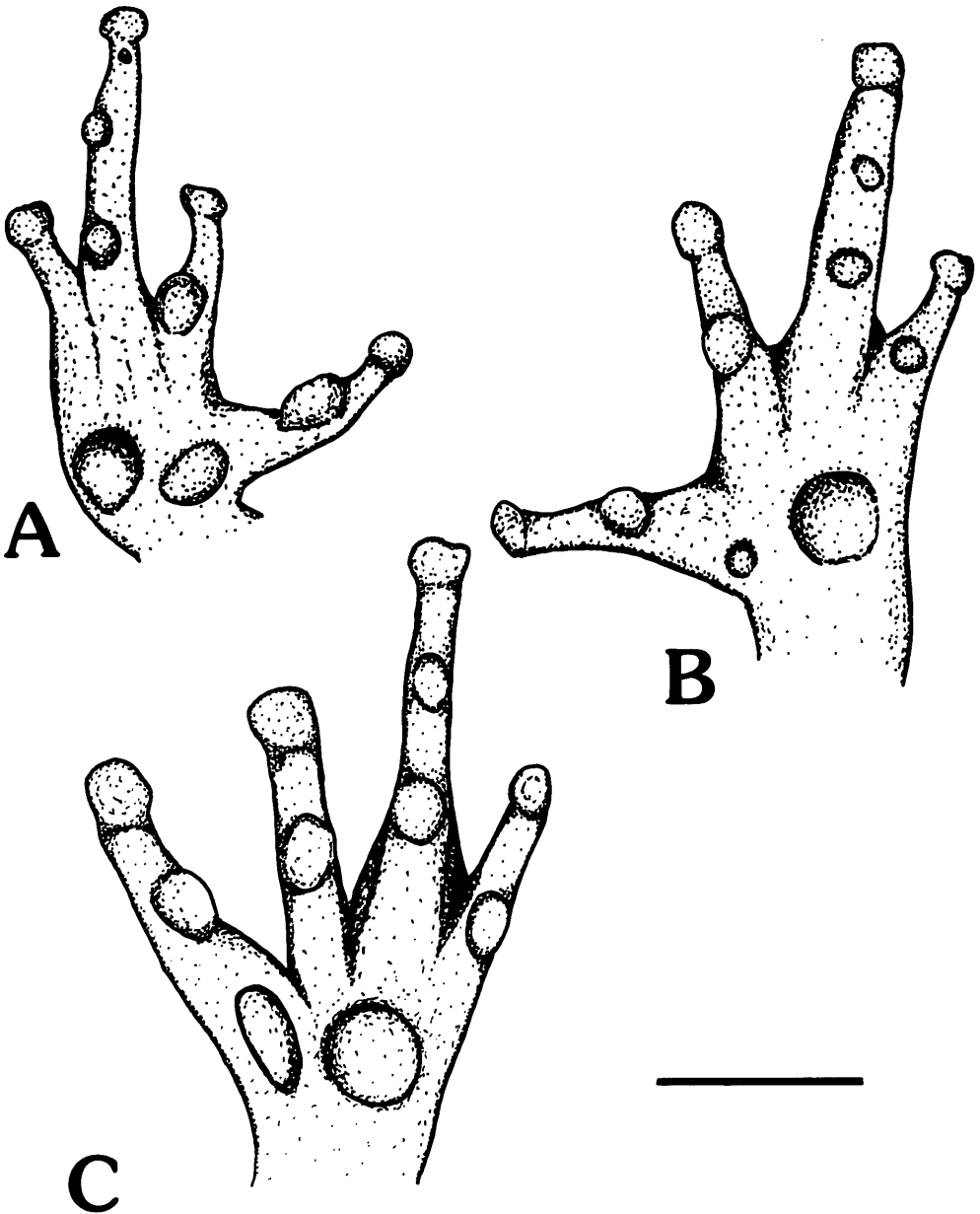


Fig. 4: Palmar surfaces of individuals from three populations of *Colostethus* from lowland Bolivia. Bar equals 4 mm.

A - *Colostethus trilineatus* BOULENGER, 1883 [Pando, Cobija, ZFMK 66791] - right hand.

B - *Colostethus trilineatus* BOULENGER, 1883 [Beni, Totaizal (EBB), ZFMK 62444] - left hand.

C - *Colostethus* sp. [Pando, Cobija, ZFMK 66793] - left hand.

Abb. 4: Handflächen von Individuen dreier *Colostethus*-Populationen aus dem bolivianischen Tiefland.
Der Balken entspricht 4 mm.

A - *Colostethus trilineatus* BOULENGER, 1883 [Pando, Cobija, ZFMK 66791] - rechte Hand.

B - *Colostethus trilineatus* BOULENGER, 1883 [Beni, Totaizal (EBB), ZFMK 62444] - linke Hand.

C - *Colostethus* sp. [Pando, Cobija, ZFMK 66793] - linke Hand.

trilineatus is also widespread in the intervening area of the known Bolivian localities. Nevertheless, we noted differences in the size of the thenar tubercle in three Bolivian populations examined by us. In females from Mataracú (NKA 3842-43) and a male and female from Cobija, Departamento Pando (ZFMK 66791-92), the thenar tubercle is about two thirds of the size of the palmar tubercle (fig. 4A). In contrast, in ZFMK 62444, a male from Totaizal (EBB), Departamento Beni, the thenar tubercle is less than one third of the size of the palmar tubercle (fig. 4B). We will not exclude that our observation reflects interspecific variation in sibling species. With respect to this, it is noteworthy that, according to HANAGARTH & BECK (1996), the Beni savannahs apparently have little zoogeographic relation to the Amazon basin.

KÖHLER & LÖTTERS (1999) recognised another morphotype of *Colostethus* from Cobija, Departamento Pando (compare fig. 2). According to the authors, it differs from syntopic *C. trilineatus* (sensu MORALES 1994) in slightly larger size, shape of dorsolateral stripes, the presence of white ventrolateral marks (fig. 5A) and having a yellowish ventral colour (fig. 5B). Dissections revealed that the two specimens available (ZFMK 66793-94) are adult females. *Colostethus trilineatus* females are otherwise known to have white ventral sides (e.g., NKA 3842-43, ZFMK 66792). In addition, the thenar tubercles of this morph and syntopic *C. trilineatus* (ZFMK 66791-92, male and female) are different in shape and size (figs. 4A, 4C). This supports the hypothesis of KÖHLER & LÖTTERS (1999) that the two forms found at Cobija are not conspecific.

Recently, the authors found members of the genus *Colostethus* (fig. 6) at Parque Nacional "Noel Kempff Mercado" (Campamento Pauserna, 13°31'56" S, 61°06'20" W; ca. 140 m a.s.l.) in the north-eastern lowlands of the Departamento Santa Cruz, Provincia Velasco (fig. 2). They are deposited at NKA (3012, 3150, 3153, 3162, 3835-36) and ZFMK (69917-18). These specimens, mean SVL 15.2 mm (range 14.6 - 16.0 mm, n=8) in which a dorsal rhombus-like pattern may be present or absent, coincide well with *C. brunneus* (COPE, 1887) as redescribed by EDWARDS (1974) and LA MARCA (1996). According to FROST (1985), this species is broadly distributed over almost the entire Amazon basin with extends into the Guyanas (the type locality is in Brazil, Estado Mato Grosso). We here report *C. brunneus* for the first time from Bolivia.

In summary, three species of *Epipedobates* and at least three, maybe five species of *Colostethus* are known from Bolivia. Due to distributions outside but close to the Bolivian border (e.g., FROST 1985; MARTINS & HADDAD 1990; MORALES, 1992; RODRÍGUEZ & MYERS 1993; HADDAD & MARTINS 1994; MYERS & al. 1998), the following dendrobatid frog species may be expected to occur in this country as well: *Allobates femoralis* (BOULENGER, 1883), *Colostethus* sp. from south-eastern Peru (V. R. MORALES, pers. comm.), *Dendrobates biolat* MORALES, 1992, *D. vanzolinii* MYERS, 1982, *D. quinquevittatus* STEINDACHNER, 1864, *Epipedobates braccatus* (STEINDACHNER, 1864), *E. macero* RODRÍGUEZ & MYERS, 1993, *E. simulans* MYERS, RODRÍGUEZ & ICOCHEA, 1998 and *E. trivittatus* (SPIX, 1824). The presence of the latter was previously confirmed through call recordings by APARICIO (1992).

Fig. 3, 5A, 5B, 6 (opposite page) / Abb. 3, 5A, 5B, 6 (gegenüberliegende Seite)

Fig. 3: *Colostethus mdiarmidi* (NKA 3708) illustrated for the first time in life.
Abb. 3: *Colostethus mdiarmidi* (NKA 3708). Erste Abbildung eines lebenden Exemplars.

Fig. 5: *Colostethus* sp. from Cobija (ZFMK 66794), Departamento Pando;
5A - dorsolateral view; 5B - ventral view. It is not clear if it is conspecific or not with *C. trilineatus*.

Abb. 5: *Colostethus* sp. aus Cobija (ZFMK 66794), Departamento Pando;
5A - Dorsolateralansicht; 5B - Ventralansicht. Es ist unklar, ob die Form artgleich oder nicht mit *C. trilineatus* ist.

Fig. 6: *Colostethus brunneus* (ZFMK 69917) from Parque Nacional "Noel Kempff Mercado".
Abb. 6: *Colostethus brunneus* (ZFMK 69917) vom Parque Nacional "Noel Kempff Mercado".



5A
5B



3
6



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