

A new species of *Phrynopus* (Anura: Leptodactylidae) from the eastern Andean slopes of central Peru

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Abstract

A new species of leptodactylid frog, genus *Phrynopus*, is described from a *Polylepis*-forest of the eastern Andean slopes of central Peru (Departamento de Huánuco) between 3420 and 3430 m above sea level. The new species is assigned to the *Phrynopus peruanus* group and differs from all known species of the genus by having ventral surfaces of arms (except hands), legs (except feet), venter, chest and groin mainly red, and remaining dorsal, lateral and ventral surfaces of body with reticulated pattern and structure of slightly elevated brown to greenish blotches surrounded by cream to yellow lines. The new species occurs sympatrically with *Phrynopus horstpauli* and *Gastrotheca griswoldi*. Males of the new species are unknown.

Key words: Anura: Leptodactylidae: *Phrynopus heimorum* sp. nov.; central Peru.

Zusammenfassung

Eine neue Phrynopus-Art (Anura: Leptodactylidae) von den östlichen Andenabhängigen Zentralperus.

Ein neuer Leptodactylide aus der Gattung *Phrynopus* wird aus einem *Polylepis*-Wald der östlichen Andenabhänge Zentralperus (Departamento de Huánuco) zwischen 3420 und 3430 m ü. M. beschrieben. Die neue Art gehört der *Phrynopus peruanus* Gruppe an und unterscheidet sich von allen bekannten Arten der Gattung durch die überwiegend roten Ventralflächen der Arme (außer Hände), Beine (außer Füße), Brust, Leiste und des Bauches, während die verbleibenden dorsalen, lateralen und ventralen Flächen von einem netzartigem Muster und Struktur aus etwas erhöhten braunen bis grünen Flecken, die von cremefarbenen bis gelben Linien umrandet werden, überzogen sind. Die neue Art kommt sympatrisch mit *Phrynopus horstpauli* und *Gastrotheca griswoldi* vor. Männchen der neuen Art sind unbekannt.

Schlagwörter: Anura: Leptodactylidae: *Phrynopus heimorum* sp. nov.; Zentralperu.

1 Introduction

Frogs of the genus *Phrynopus* are known to occur in the Andes from Colombia south to Bolivia, inhabiting cloud forests, paramos and subparamos between 1000 and 4000 m above sea level (LYNCH 1975, HEDGES 1990, DE LA RIVA 1992). As currently defined, the genus includes 25 species, 17 of which are known from Peru (RODRÍGUEZ et al. 1993, MORALES 1995, DUELLMAN 2000, LEHR et al. 2000). In his revision of the genus *Phrynopus*, LYNCH (1975) pointed out the distribution gap of about 600 km airline between the records of northern and central Peru. This gap was essentially eliminated by HEDGES (1990) description of *P. bracki* from the Cordillera Yanachaga (Departamento Pasco) and by the description LEHR et al. (2000) of *P. horstpauli* (Departamento Huánuco), both central Peru, and DUELLMAN's (2000) description of *P. fallaciosus* from the Cordillera Central (Departamento Amazonas) in northern Peru.

In April 1999, herpetological collections of the Forschungsinstitut und Naturmuseum Senckenberg (Frankfurt am Main, SMF), in cooperation with the Museo de Historia Natural de la Universidad Mayor de San Marcos (Lima, MHNSM), led to an exploration of forested regions between 3010 and 3430 m above sea level in the eastern Andean slopes of central Peru (Departamento de Huánuco). These forests are naturally fragmented ("bosques fragmentados") and are known for their high species diversity and endemism (TERBORGH 1992, YOUNG & VALENCIA 1992, INRENA 1996).

They have been poorly sampled for their herpetofauna (DUELLMAN & SCHULTE 1992). Among other new amphibians and reptiles, four new species of *Phrynopus* have been collected. One of them was recently described by LEHR et al. (2000) and two new species remain to be named (LEHR et al. in press). The purpose of this paper is to describe the fourth species as new.

2 Material and Methods

For coloration in life, the Naturalist's Color Guide (SMITHE 1975, 1981) was used. Field notes on the new species were recorded by EDGAR LEHR on 15 and 17 April 1999. Specimens were fixed by injecting a mixture (5 : 1000) of 40 % formalin and 98 % ethanol, and preserved in 70 % ethanol. Measurements of preserved specimens follow DUELLMAN (1970), and were taken with vernier callipers, rounded to the nearest 0.1 mm: SVL (snout-vent length), TL (tibia length), FL (foot length: from proximal end of inner metatarsal tubercle to tip of fourth toe), HL (head length: from tip of snout to angle of jaw, measured obliquely), HW (head width: greatest width, measured between centers of tympani), ED (eye diameter: greatest length of orbit), IOD (interorbital distance), EW (eyelid width: greatest width of upper eyelid), IND (internarial distance: measured between the medial margins of the external nares), and END (eye-nostril distance: measured between the anterior corner of the orbital opening and the posterior margin of the external nares). Two specimens (MHNSM 20440, MHNSM 20445) were cleared and stained using the method of DINGERKUS & UHLER (1977). Drawings were made using a stereo microscope (Leica MZ 12) with drawing tube attachment. Definitions of snout profiles follow HEYER et al. (1990). Institutional abbreviations are as listed in LEVITON et al. (1985) except MHNSM (Museo de Historia Natural, Universidad Nacional Mayor de San Marcos, Lima, Peru).

3 Results

Phrynopus heimorum sp. nov. (figs. 1-3)

Holotype: MHNSM 20441 (fig. 1), adult female, collected on 17 April 1999 approximately 10 km east of Conchamarca (09°59'44''S, 76°09'40''W, 3420 m above sea level), Distrito Conchamarca, Provincia Ambo, Departamento de Huánuco, Peru, by EDGAR LEHR.

Paratypes: MHNSM 20440, SMF 80470, 80474 (females), collected with the holotype; SMF 80469 (female), collected by local people in the same area and obtained by EDGAR LEHR on 15 April 1999; MHNSM 20442-20443 (females), 20445 (female), 20444, 20446 (juveniles), SMF 80471-80472 (females), 80473 (juvenile), collected about 500 m east of the type locality on 17 April 1999 by EDGAR LEHR and ELIAS PONCE, all localities are at Distrito Conchamarca, Provincia Ambo, Departamento de Huánuco, Peru.

D i a g n o s i s : A small species of *Phrynopus* attaining maximum SVL of 26.0 mm in adult females; skin of dorsum slightly tuberculate, that of venter areolate; first finger shorter than second; digit tips with apical swelling; bones of terminal phalanges irregularly T-shaped; toes lacking lateral fringes and free of webbing; two equally round metatarsal tubercles (inner sometimes slightly larger); tarsus lacking tubercles or folds; tympanum absent; snout rounded in dorsal and lateral view; prevomerine teeth and dentigerous processes absent, dentigerous ramus of prevomer present;

frontoparietals complete, not bearing crests; nasals moderate in size, narrowly separated; pectoral girdle functionally arciferous; body dorsally and laterally colored brownish to greenish, prominent net-like pattern on dorsal, lateral and ventral surfaces of body (except extremities) with honeycomb-like structure of slightly elevated brown to greenish blotches surrounded by cream to yellow lines; ventral surfaces of arms (except hands), legs (except feet), venter, chest and groin red (fig. 1).

Phrynopus heimorum differs from all described species of the genus by having the ventral surfaces of arms (except hands), legs (except feet), venter, chest and groin mainly red in life, and remaining dorsal, lateral and ventral surfaces of body with a reticulated pattern and structure of slightly elevated brown to greenish blotches surrounded by cream to yellow lines in life.

Phrynopus heimorum most closely resembles the Bolivian species *P. pinguis* HARVEY & ERGUETA, 1998 in respect of size, shape of body and short limbs, and differs from it as follows (*P. pinguis* in parentheses): maximum female SVL 26.0 mm (20.1 mm); skin of dorsum slightly tuberculate, that of venter areolate (skin of dorsum and venter smooth); first finger shorter than second (first finger much shorter than second); no basal webbing of toes (basal webbing of toes); tympanum absent (tympanum present); venter mainly red (venter immaculate yellow or charcoal-gray); lateral and ventral surfaces of body with a net-like pattern and structure (not present). *Phrynopus heimorum* differs from the sympatric *P. horstpauli* LEHR, KÖHLER & PONCE, 2000 as follows (*P. horstpauli* in parentheses): maximum female SVL 26.0 mm (39.7 mm); skin of dorsum slightly tuberculate (dorsum tuberculate, tubercles on dorsum coalesce forming X- or V- like figures on neck, and dorsolateral folds or ridges); first finger shorter than second (first finger much shorter than second); venter mainly red (venter mottled gray).

Description of holotype: Head (fig. 2) narrower than body; head wider than long; head width 32.3 % of SVL; snout rounded in dorsal and lateral view; canthus rostralis moderately sharp, concave; loreal region slightly concave; lips not flared; nostrils lateral, weakly protuberant; snout short, interorbital region flat, no cranial crests; upper eyelid width 88.2 % of IOD, tympanum absent; no supratympanic fold; tongue short, oval, not notched posteriorly, posterior two - thirds free; choane small, concealed by palatal shelf of maxillae; prevomerine teeth and dentigerous processes absent.

Skin of dorsum slightly tuberculate; skin of venter areolate; no discoidal folds; no dorsolateral folds; no ulnar tubercles or ridge; three palmar tubercles, outer minute; thenar surface bearing a few ill-defined supernumerary tubercles; subarticular tubercles large, round, and conical in lateral view; fingers lacking lateral fringes; tips of fingers with apical swelling; first finger shorter than second (fig. 3).

Tarsus and heel lacking tubercles or folds; two metatarsal tubercles, inner slightly larger than outer, inner longer than wide, outer nearly round; plantar surface without supernumerary tubercles; subarticular tubercles round, small, more prominent than those of fingers, conical in lateral view; toes lacking lateral fringes and without any web (fig. 3); hind limbs very short, heel of adpressed limb not reaching forearm insertion.

Color of holotype in life: Dorsum and flanks of body showing a net-like pattern of olive-brown (color 28 in SMITHE 1975, 1981) blotches surrounded by straw yellow (56) lines; straw yellow (56) very narrow middorsal stripe beginning between



Fig. 1. Holotype of *Phrynopus heimorum* (MHNSM 20441) in dorsolateral (a) and ventral (b) views.

Abb. 1. Holotype von *Phrynopus heimorum* (MHNSM 20441) in dorsolateraler (a) und ventraler (b) Ansicht.

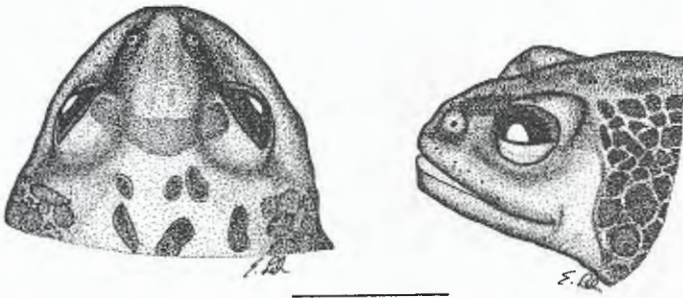


Fig. 2. Lateral and dorsal views of head of female *Phrynopus heimorum*, MHNSM 20441 (holotype). Scale = 5 mm.

Abb. 2. Laterale und dorsale Ansichten des Kopfes eines Weibchens von *Phrynopus heimorum*, MHNSM 20441 (Holotypus). Balken = 5 mm.

eyes and extending to mid body; extremities with glaucous (79) blotches; hands and feet with red (108) blotches, tips of fingers and toes black; distinct red (108) blotches lateral above insertion of arms and from groin extending to venter; upper lip with glaucous blotches (79); glaucous (79) stripe beginning at nose extending to anterior margin of eye, and glaucous (79) postorbital stripe extending diagonally to corner of the mouth; venter, parts of chest and throat colored with a net-like pattern as described above, but, in addition, covered with many red (108) and black spots; hands and feet ventrally black, remaining ventral surfaces of arms and legs red (108); upper half of chest and lower half of venter red (108); very narrow midventral stripe beginning on throat and extending to end of venter; iris green and orange (no similar color available in SMITH 1975, 1981) with black reticulation, pupil bordered above by a green semi-ringlet.

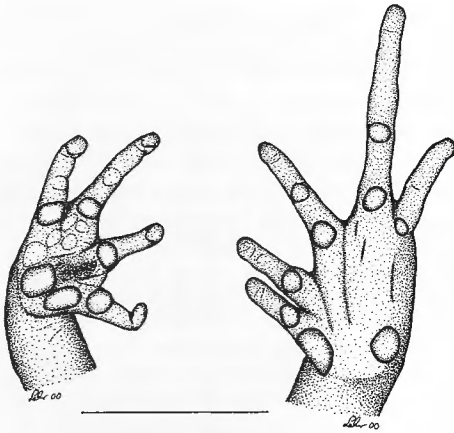


Fig. 3. Ventral views of hand and foot of female *Phrynopus heimorum*, MHNSM 20441 (holotype). Scale = 5 mm.

Abb. 3. Ventrale Ansichten von Hand und Fuß eines Weibchens von *Phrynopus heimorum*, MHNSM 20441 (Holotypus). Balken = 5 mm.

Color of holotype in preservative (ethanol): Dorsum and flanks of body showing a net-like pattern with gray blotches surrounded by cream lines; narrow middorsal stripe cream; extremities with gray blotches, hands and feet with cream blotches, tips of fingers and toes dark gray; cream blotches above insertion of arms and from groin extending to venter; upper lip with gray blotches; gray stripe beginning at tip of snout extending to anterior margin of eye, and gray postorbital stripe extending diagonally to corner of the mouth; venter, parts of chest and throat in a net-like pattern as described above, but covered with many cream and black spots; hands and feet ventrally dark gray, remaining surfaces of arms and legs cream to light orange; upper half of chest and lower half of venter cream to light orange; very narrow midventral stripe beginning on throat and extending to end of venter.

	SMF 80471	MHNSM 20445	MHNSM 20442	SMF 80469	SMF 80474	MHNSM 20440	SMF 80470	MHNSM 20441	MHNSM 20443	SMF 80472
SVL	26.0	25.5	25.3	24.9	24.6	24.4	24.0	23.5	22.0	20.0
TL	7.5	7.5	7.3	7.3	7.9	7.1	7.4	7.8	7.5	6.5
FL	8.1	8.0	8.1	8.5	8.5	8.4	8.6	8.6	8.2	7.6
HL	6.1	6.3	6.5	6.1	6.6	6.1	6.2	5.7	5.7	5.6
HW	7.6	7.3	7.5	7.8	7.2	7.5	7.2	7.6	7.7	6.2
ED	1.8	2.0	1.9	2.1	1.9	1.7	1.9	2.0	1.8	1.9
IOD	2.6	2.2	2.4	2.5	2.2	2.3	2.4	2.6	2.8	1.7
EW	1.6	1.5	1.7	1.6	1.7	1.8	1.5	1.5	1.7	1.7
IND	2.0	1.8	2.0	2.0	1.7	1.9	1.7	1.7	1.9	1.5
END	1.7	1.7	1.5	1.5	2.0	1.9	1.8	1.8	1.7	1.3

Table 1. Measurements (in mm) of 10 characters (following DUELLMANN 1970) of 10 adult females of *Phrynopus heimorum*. For abbreviations see text.

Tabelle 1. Messungen (in mm) von 10 Merkmalen (nach DUELLMANN 1970) von 10 adulten Weibchen von *Phrynopus heimorum*. Für Abkürzungserklärungen siehe Text.

Variation: Variation in the type series is mainly in color in life. Dorsal and lateral ground colors vary from olive brown (color 28 in SMITHE 1975, 1981, MHNSM 20440), brownish olive (29, MHNSM 20445), olive (30, SMF 80474), olive-green (47, SMF 80471; 48, SMF 80460), olive-gray (42, MHNSM 20444), green (46, SMF 80471), dark drab (119 B, MHNSM 20443) to vandyke brown (221, SMF 80472). The net-like pattern is present in all specimens. Middorsal stripes are present or absent (SMF 80469, MHNSM 20440, 20444, 20446). All specimens have midventral stripes beginning on throat and extending to end of venter, some additionally have two ventral stripes, one beginning on forearm and extending to mid of chest, and another one beginning on the shank and extending to mid of venter (MHNSM 20443, SMF 80470). Some specimens have an extensive ventral red coloration like the holotype (SMF 80469,

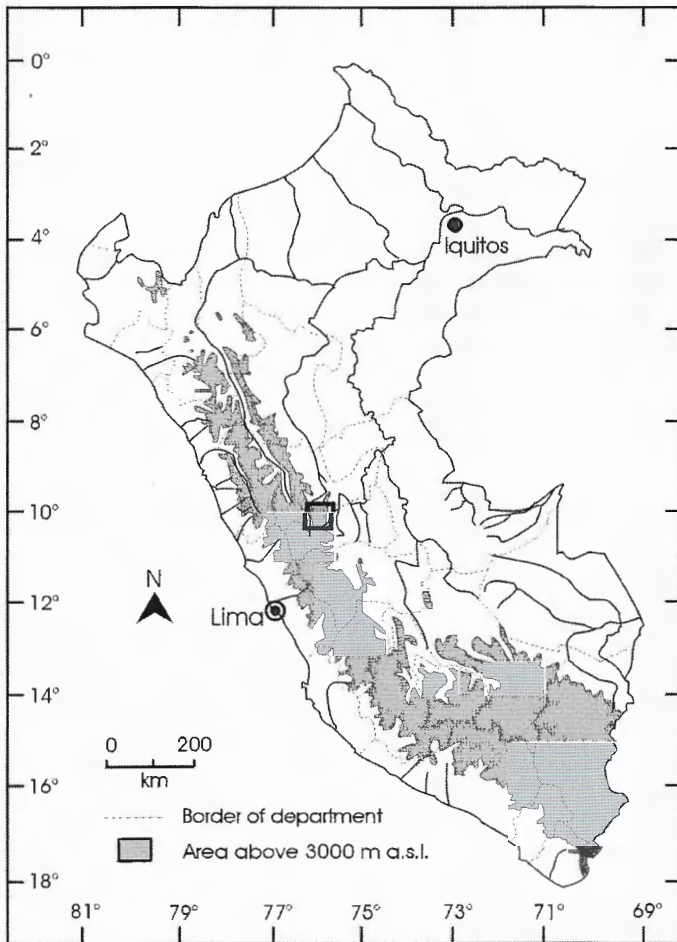


Fig. 4. Location of study area (indicated by a frame) in Peru.

Abb. 4. Lage des Untersuchungsgebietes (versehen mit einem Rahmen) in Peru.

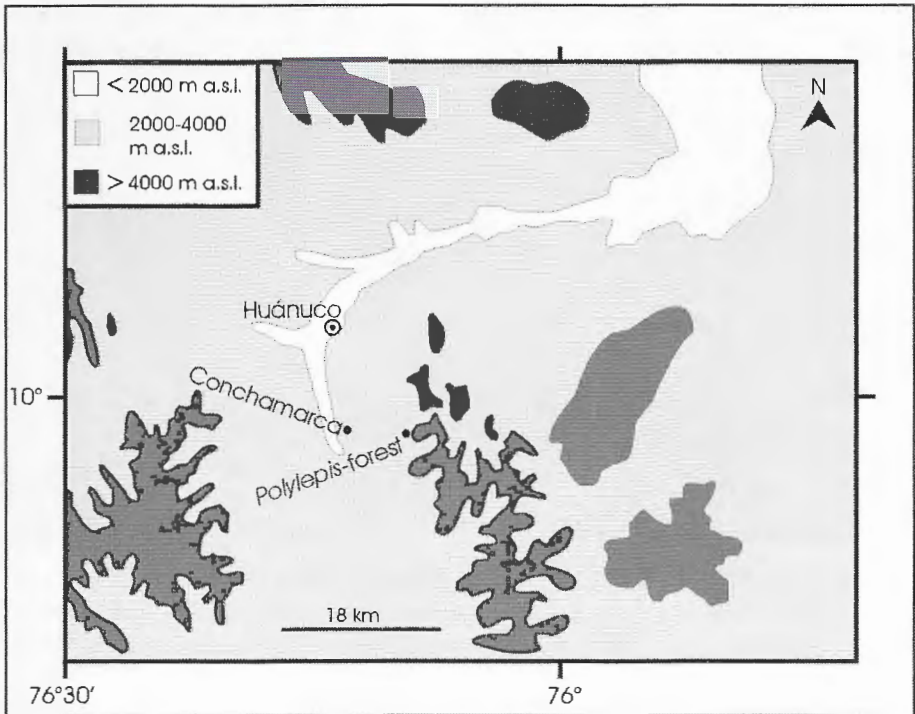


Fig. 5. Type locality of *Phrynopus heimorum*. Map corresponds to the frame in fig. 4.

Abb. 5. Typuslokalität von *Phrynopus heimorum*. Der Kartenausschnitt entspricht dem Rahmen in Abb. 4.

80474); others bear few red blotches on arms, legs and region of groin only (MHNSM 20440, 20442-20444); others pass small red blotches in the region of the groin only (SMF 80470, 80473). SMF 80469 and SMF 80474 in coloration are most similar to the holotype.

For variation in selected morphometric characters of adult females of the type series see Table 1. Males of *P. heimorum* are unknown.

Distribution: *Phrynopus heimorum* is only known from the type locality and close vicinities (figs. 4, 5).

Natural history: All specimens of *P. heimorum* were collected at midday under rocks in a pasture with a few bushes near a canal and under rocks covered by a large layer of moss in a *Polylepis*-forest (fig. 6). The area belongs to the Yungas (or Selva Alta) ecoregion as defined by BRACK (1986) and PEÑAHERRERA DEL AGUILA (1989); formation of vegetation is "Matorral húmedo" and "Queñoales" (INRENA 1995, 1996).

At the type locality and close vicinities, *P. heimorum* occurs syntopically with *P. horstpauli* (see specimens examined) and *Gastrotheca griswoldi* SHREVE, 1941



Fig. 6. Type locality of *Phrynopus heimorum* in a *Polylepis*-forest.

Abb. 6. Typuslokalität von *Phrynopus heimorum* in einem *Polylepis*-Wald.

(MHNSM 20311-20312, SMF 80321-80323). Two opened preserved females of *P. heimorum* (MHNSM 20440, 20445) had large yolky eggs.

Etymology: The new species is dedicated to DORIS and KLAUS PETER HEIM (Gräffelfing, Germany) in recognition of supporting taxonomic research and nature conservation in Peru.

4 Remarks

Three cases of sympatric distribution within the genus *Phrynopus* are known, i. e., *P. cophites* and *P. peruvianus* (LYNCH 1975), *P. parkeri* and *P. nebulanastes* (CANNATELLA 1984), and *P. heimorum* and *P. horstpauli* (LEHR et al. 2000, this paper).

The absence of males among the 13 specimens of *P. heimorum* collected is remarkable but probably not unusual, since a sex ratio of 2 males to 81 females is known for other eleutherodactyline frogs (LYNCH 1975). The absence of males can also be the result of sampling technique and may "simply reflect secretiveness of the males" (LYNCH 1975). Although field work was carried out also in other localities at high and moderate elevations in the eastern Andes of central Peru, *P. heimorum* was only found at the type locality and close vicinities. This fact implies a very restricted distribution of *P. heimorum* and suggests that it may potentially be threatened.

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Specimens examined in addition to the new species

Phrynopus horstpauli: Departamento Huánuco: Provincia Ambo: approximately 10 km east of Conchamarca (09°59'44''S, 76°09'40''W, 3420 m above sea level) (MHNSM 20431-20435, SMF 80463-80465).

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