The Herpetofauna of the Peruvian dry forest along the Andean valley of the Marañón River and its tributaries, with a focus on endemic iguanians, geckos and tegus

Claudia Koch

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“Even so, the loss of a few species may seem almost irrelevant compared to major environmental problems […] There is one last reason for caring […] And it is simply this: the world would be a poorer, darker, lonelier place without them.”

- MARK CARWARDINE -

(Source: Adams, D. & M. Carwardine (1990): Last Chance to See. Ballentine Books, 265 pp.)

CONTENT

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1. GENERAL INTRODUCTION

1.1 Objectives and Background

The total area of Peru is about 1,285,220 square kilometers with the Andean region covering almost one-third of the country's territory (Peñaherrera del Aguila 1989, Lehr 2002). According to Conservation International (2013), Peru is among the 17 megadiversity countries in the world. This biodiversity is mostly due to the complex topography of the Andes, which range north to south through the entire country, with an average height of 4,000 m above sea level (a.s.l.) (Figure 1.1). This mountain range greatly influences the climate of most of Peru resulting in a wide variety of vegetation formations, including deserts, scrubs, dry forests, puna grasslands, humid montane forests, cloud forests, and humid lowland forests (Brack 1986, Duellman & Pramuk 1999) (Figure 1.2).

Each of these habitats poses diverse challenges to its inhabiting fauna, resulting in the development of different living strategies and subsequently resulting in the genesis of the megadiversity that is currently present in Peru (Brack 2004).

In the early 19th century, the first explorers such as J.B. Spix (1781-1826) and J.J. Tschudi (1818-1889) became aware of the potential of the South American species richness and Tschudi (1845) already published the first overview on the Peruvian herpetofauna in 1845. Since then, numerous investigations of amphibians and reptiles of Peru have been conducted. However, the numerous descriptions of new species over the past few decades give evidence that the Peruvian herpetofauna is still not entirely recorded (Dixon & Huey 1970, Fritts 1972, Cadle 1991, Duellman & Pamuk 1999, Duellman 2004). Currently, 566 amphibian species (Figure 1.3) and 439 reptilian species (Figure 1.4) are known from Peru. According to Rodríguez (1996) approximately 20% of the amphibian species actually occurring in Peru are still unkown and Lehr (2002) assumes that the number of unknown reptilian species is similar.

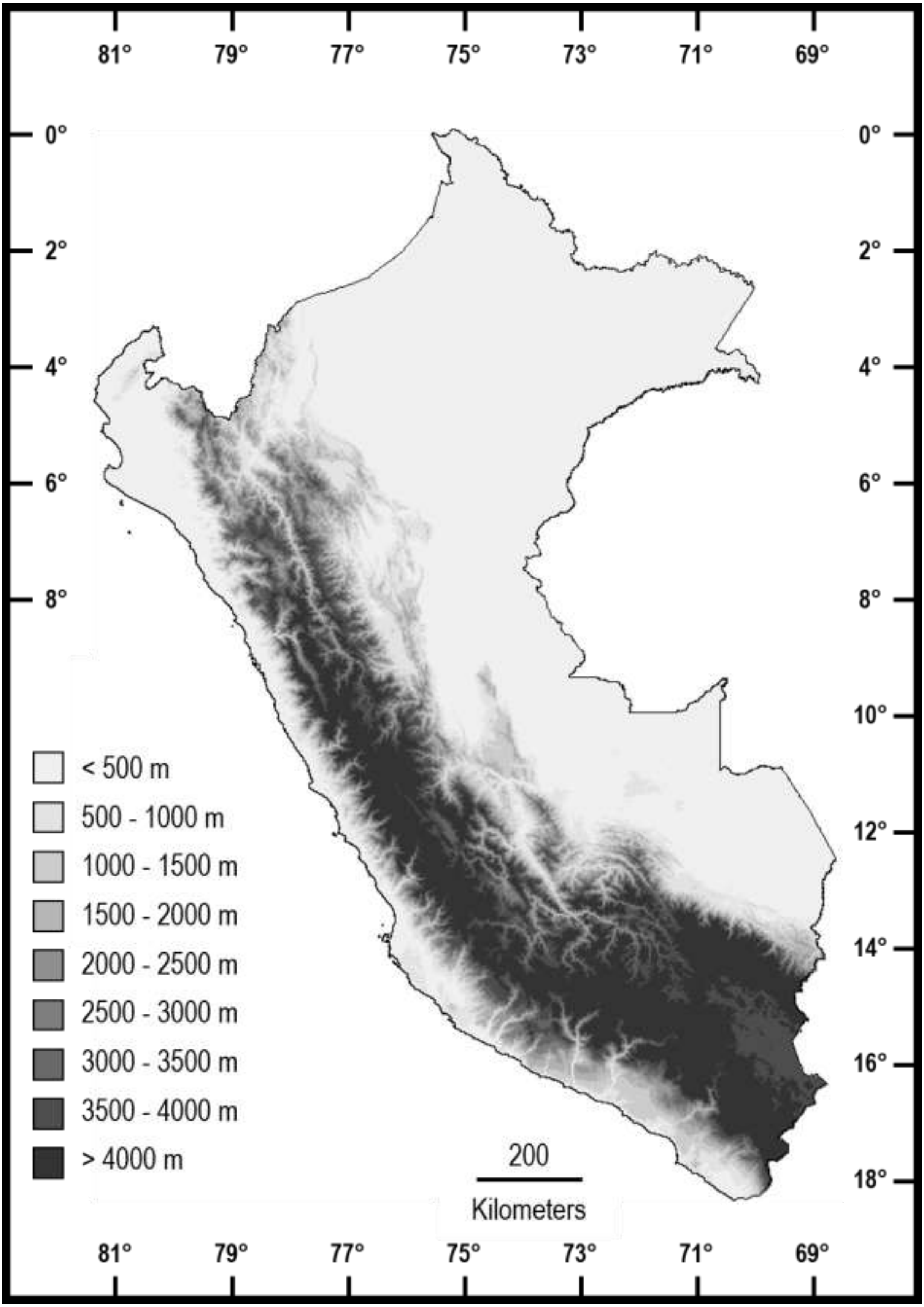

Figure 1.1: Map of the Peruvian Andes

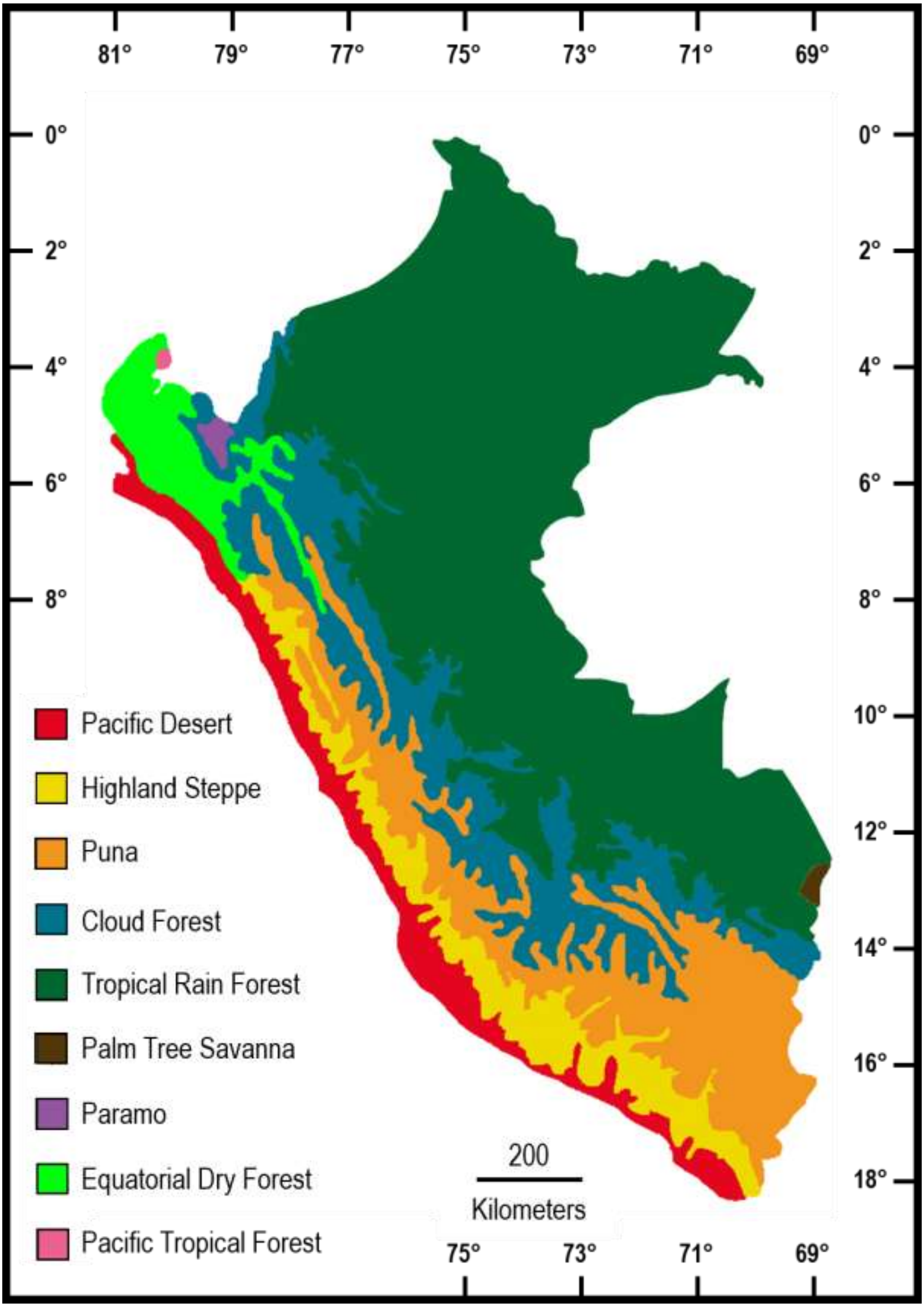

Figure 1.2: The Peruvian Eco-regions (modified according to Peñaherrera del Aguila 1989)

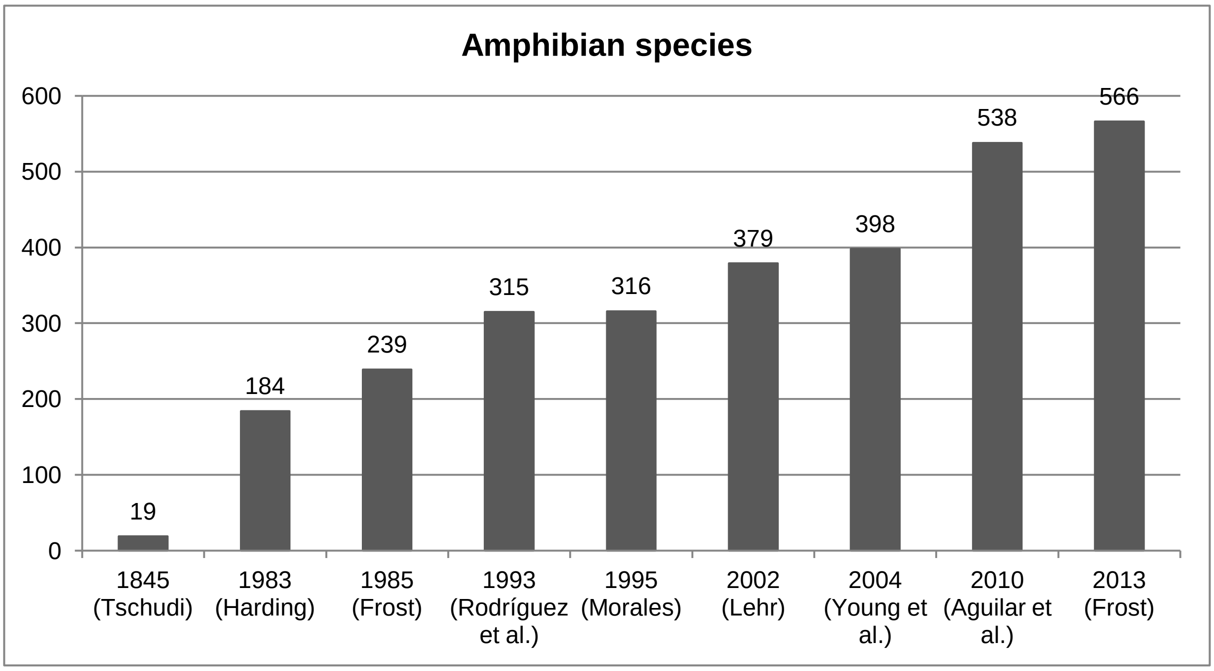

Figure 1.3: Increase in the amphibian diversity in Peru (1845-2013)

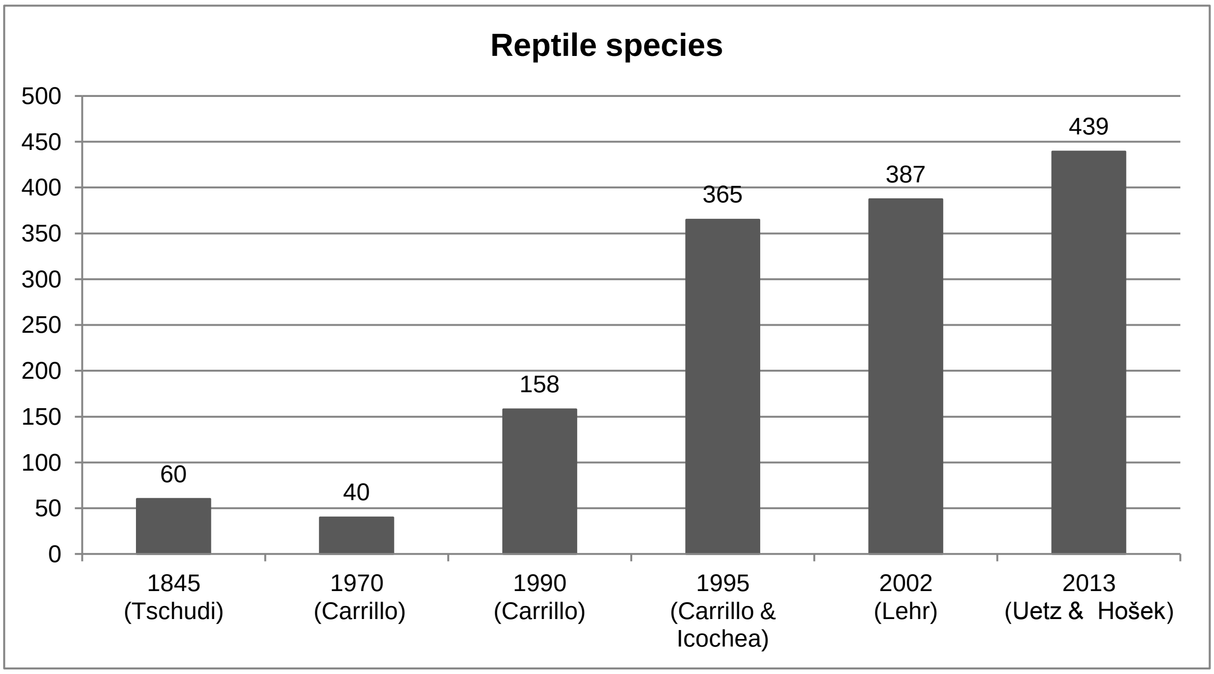

Figure 1.4: Increase in the reptile diversity in Peru (1845-2013)

While many surveys have been undertaken in the *Selva*, the Amazonian rainforest, the complex physiography of the Andes has probably limited herpetological research in many potentially diverse regions of the so called *Sierra* (Gentry 1992, Duellman & Pramuk, 1999, Lehr 2002). Some of these regions have not been explored at all (Lehr, 2002; Campbell & Lamar, 2004).

Compared to other South American ecosystems, the inter-Andean valleys are geographically more isolated and differ greatly from the adjacent mountain slopes with respect to climate, vegetation and soil composition. These valleys bear a narrow fringe of dry forest that forms part of the Equatorial Dry Forest Eco-region (Brack 1986, 2004).

For amphibians and reptiles, which already have a lower dispersal potential compared to mammals or birds, these valleys represent a barrier for their distribution, which is an interesting fact for two reasons: First, it is most likely that these valleys shelter a high number of endemic species with many new and undescribed taxa. Second, in case of environment change or loss, the mountain slopes prevent the inhabiting species of these valleys from migrating to regions with more suitable living conditions.

The equatorial dry forest eco-region is part of a global biodiversity hotspot (Myers et al. 2000) and thus shelters a high number of floral and faunal species with a high proportion of endemics (Bridgewater et al. 2003, Venegas 2005, Särkinen et al. 2011). Large parts of this ecosystem have never been surveyed in herpetological terms.

The present study was organized to contribute to the knowledge of the herpetofauna of this peculiar dry forest habitat. Field surveys to Peru were conducted in July 2005, between April and August 2008, between March and May 2009, between November 2009 and February 2010, and between September and November 2010. During a total period of 13 months 22 different localities along a stretch of more than 350 km of the Marañón River and some of its tributaries were surveyed.

Specific objectives of this research are to: (1) provide a checklist of the amphibian and reptilian species inhabiting the inter-Andean dry forest region, (2) discover new taxa and new country and regional records, (3) calculate the amount of endemic species inhabiting this peculiar habitat, as compared to plants and vertebrate groups (e.g. birds) (4) provide data on autecology and natural history of lesser known species, (5) identify the threats that this ecosystem and its inhabiting herpetofauna is facing, and (6) provide a basis for future research and for the development of conservation strategies.

1.2 Investigation Area

1.2.1 Physiography

The Peruvian Andes are a heterogeneous formation and consist of several parallel cordilleras that are separated from each other by long valleys. The major drainage system of the Northern Peruvian Andes is the Marañón River, which flows through the deep valley between the Cordillera Occidental and the Cordillera Central. At its confluence the Marañón River merges with the Huallaga River and other smaller rivers to form the Amazona River (Duellman & Pramuk 1999, Brack 2004).

The Huancabamba Depression in the Piura, Cajamarca, Amazonas and San Martin Regions is the major structural and physiographic break of the Andes consisting of a complex system of relatively low ridges, basins and deep valleys (Duellman & Pramuk 1999). The low altitude of the Andes in this region causes fragmentation of montane habitats and introduces a complex mixture of environments (Cadle 1991).
The lowest point of the Huancabamba Depression is the Abra de Porculla, in the Piura Region, with an elevation of 2,145 m a.s.l. This point forms both a biogeographic corridor between the lowland of the Pacific coast in the West and the Amazon basin East of the Andes, and a biogeographic barrier for the North-to-South distribution of Andean species (Duellman 1979, Duellman & Pramuk 1999, Brack 2004).

The equatorial dry forest expands from southern Ecuador to the northern part of Peru, where it reaches up to 2,800 m a.s.l. It continues southward in two small strips, which are connected at Abra de Porculla into the La Libertad Region, which either runs along the coast west of the Andes or penetrates the inter-Andean region of the Marañón River and its tributaries (Brack 1986, Venegas 2005, Särkinen et al. 2011).

The 22 localities in focus of this study are situated along the dry forest of the Marañón valley and its tributaries in the Amazonas, Cajamarca and La Libertad Regions.

1.2.2 Climate

The climate of the equatorial dry forest is tropical, warm and dry with annual mean temperatures between 23°C and 24°C. Temperatures are primarily dependent on the altitude and may exceed 40°C in lower valleys of the Marañón River and are colder at higher elevations (Duellman & Pramuk 1999, Brack 2004).
Most of the annual rain falls in summer, between December and March and is exceptionally high in years with the El Niño phenomenon. General annual rainfalls are about 500 mm in the northern part and about 100 mm in the southern part (Brack 2004).

1.2.3 Vegetation

The xeric vegetation (Figure 1.5) that predominate on the low hills of the Marañon River has no closed canopy and is characterized by moderate-sized trees of various genera (e.g., *Prosopis*, *Acacia*, *Capparis*, *Pseudobombax*), by drought-resistant trees, especially near streams (e.g., *Bursera, Jacaranda*, *Phithecolobium*), by numerous cacti (e.g. *Cereus*, *Opuntia*, *Lemairocereus*), and by terrestrial and aboreal bromeliads (e.g., *Pitcairnia, Tillandsia*) (Duellman & Pramuk 1999, Hughes et al. 2004).

Principle sources of income of the majority of people inhabiting the investigation areas are livestock breeding and agriculture (e.g., mangos, papayas, oranges, lime, bananas, sugar cane, and rice; Figure 1.6) which is why parts of the natural vegetation – especially along water bodies – have been removed. In several areas, farmers use the water of small creeks to irrigate their plantations and cause anthropogenic redirections of the flowing water up to several times a day.

Figure 1.5: The *Bosque de Cactus* near Balsas, Amazonas Region, is mainly composed of cacti and represents a subtype of the equatorial dry forest

Figure 1.6: Agriculture in the valley of Balsas, Amazonas Region

1.2.4 Fauna

Most of the dry forest fauna originated from the Amazonian region, but due to the long isolation of the Marañon valley since the rise of the Andes many distinct faunal elements evolved. This richness in endemic species is especially apparent in birds (e.g. *Patagioenas oenops, Forpus xanthops, Phacellodomus dorsalis, Melanopareira maranonica, Turdus maranonicus, Incaspiza ortizi, I. laeta, I. watkinsi*), reptiles (e.g. *Amphisbaena pericensis, Anomalepis aspinosus, Microlophus stolzmanni, Stenocercus huancabambae, Ameiva concolor, Gonatodes atricucullaris, Pseudogonatodes barbouri, Phyllodactylus interandinus, P. johnwrgihti, Sibynomorphus vagrans*) and amphibians (e.g. *Hyloxalus insulatus, Excidobates mysteriosus, Pristimantis percnopterus*) (Brack 2004).

Examples for typical mammals found in the dry forest region are the northern tamandua (*Tamandua mexicana*), the Sechuran fox (*Pseudalopex sechurae*), the puma (*Puma concolor*), the jaguar (*Panthera onca*), the ocelot (*Leopardus pardalis*) the tayra (*Eira barbara*), the collared peccary (*Pecari tajacu*), and the northern viscacha (*Lagidium peruanum*). The Gerbil leaf-eared mouse (*Phyllotis gerbillus*) and the Guayaquil squirrel (*Sciurus stramineus*) even represent endemic mammal species of the equatorial dry forest (Brack 2004).

2. BIODIVERSITY OF THE PERUVIAN DRY FOREST HERPETOFAUNA

2.1 Annotated checklist and key to the species of amphibians and reptiles inhabiting the northern Peruvian dry forest along the andean valley of the Marañón River and its tributaries

This section is intended to be submitted to Zookeys as:

KOCH, C., VENEGAS, P.J., & W. BÖHME (in preparation): Annotated checklist and key to the species of amphibians and reptiles inhabiting the northern Peruvian dry forest along the andean valley of the Marañón River and its tributaries.

Contribution of Claudia Koch to this manuscript:
Field work (together with P.J. Venegas) and museums work; data collection; morphological analysis; interpretation of morphological data; conception of article; compilation of map; writing and proof reading.

Abstract. A checklist of the amphibians and reptiles of 22 localities situated in the northern Peruvian dry forest valley of the Marañon and its tributaries, containing 14 species of amphibians and 45 species of reptiles, is provided from data collected between July 2005 and November 2010 during several herpetological surveys to Peru and from the literature. Detailed accounts are given for each collected species containing morphometric and pholidotic data, information on natural history, comments regarding their distribution, the conservation status and key literature. At least six of the species discovered during the survey period were new to science. Eight taxa might also represent new species but more collected material is necessary to determine their status. For one snake species we provide the first country record and for eight further species new regional records are provided.

Introduction

The equatorial dry forest expands from south Ecuador to the northern part of Peru where it continues southward in two small stripes into the Region La Libertad, running either along the coast west of the Andes to the City of Trujillo, or penetrating the inter-Andean region of the Marañon and its tributaries to the City of Pataz (Brack 1986, Särkinen et al. 2011, Venegas 2005). This ecoregion is home to a large number of vertebrates (e. g. *Puma concolor, Tremarctos ornatus, Tamandua mexicana, Amazilia amazilia* and *Iguana iguana*) with a high proportion of endemic species (e. g. *Onifelis colocolo, Penelope albipennis* and *Bothrops barnetti*). Especially the inter-Andean part of this dry forest has rarely been studied with respect to its flora and fauna.

In a recent study Särkinen et al. (2011) used a plant genus (*Mimosa*) to estimate the species diversity and endemism in the inter-Andean dry forest valley of the Marañón River and concluded that the species diversity in the studied genus in this valley has been underestimated and the number of endemic species inhabiting the Marañón valley is high. The occurrence of multiple congeneric Marañón endemics is also seen in many other plant genera as well as in several animal groups, such as birds (Garcia-Bravo 2011), reptiles (Koch et al. 2006, 2011, 2013; Reeder 1996; Venegas et al. 2008), and amphibians (Lötters et al. 2004). The first zoological survey of some parts of the inter-Andean dry forest was the Harvard Peruvian Expedition of 1916, conducted by the Museum of Comparative Zoology (MCZ) of the Havard University, Cambridge, USA. During this expedition large series of reptiles and amphibians from

Perico and Bellavista, Province Jaén, Region Cajamarca were collected and resulted in the description of several new species (Barbour & Noble 1920; Noble 1921a,b, 1924; Schmidt 1936; Schmidt & Walker 1943; Dunn 1923). In 1967 and 1968 R.B. Huey collected specimens for the Museum of Vertebrate Zoology (MVZ) from Jaén and Bagua Grande and in 1968 R. Thomas collected specimens from Bellavista for the Louisiana Museum of Natural History (LSUMZ). Specimens from Balsas were collected by F.G. Thompson in 1972 for the Florida Museum of Natural History (UF) and by J. P. O'Neill in 1975 for the LSUMZ. P. Hocking collected in 1982 for the MCZ in Bagua Grande and J.W. Wright and J.R. Dixon collected specimens from Bellavista and Bagua Chica for the Los Angeles County Museum (LACM) and for the Texas Cooperative Wildlife Collection (TCWC). Nevertheless great parts of the inter-Andean dry forest of Peru have never been surveyed in herpetological terms.

To contribute to the knowledge of the herpetofauna of this peculiar dry forest habitat we conducted several field trips between July 2005 and November 2010 to 22 different localities in inter-Andean valleys.

Investigation areas

The dry forest ecoregion of the Marañón River and its tributaries is located in the Central Andes confined by the Cordillera Occidental to the west, and by the Cordillera Central to the East. It extends from the Huancabamba Depression in northern Peru with the lowest elevation of 2145 m at the Abra de Porculla (Duellman 1979; Duellman & Pramuk 1999) along the flanks of the Chinchipe, Chamaya, Huancabamba and Utcubamba rivers and tributaries (Regions Piura, Cajamarca, Amazonas) southwards along the deep and narrow valleys of the Marañón River and its tributaries to the Region La Libertad (Särkinen *et al.* 2011). This dry forest ecoregion is composed of numerous xeric plants like *Prosopis, Acacia, Capparis, Bursera, Phithecolobium, Cereus* and *Opuntia*.

The surveyed localities are situated in the Regions Amazonas, Cajamarca and La Libertad along a stretch of more than 350 km of the Marañón River and its tributaries at altitudes between 384 – 2,092 m above sea level (a.s.l.) (Tables 2.1.1-2.1.3, Figure 2.1.1-2.1.4). Whenever we had the possibility we surveyed both stream sides of the Marañón and its tributaries. In some parts the Marañón River serves as a border between Peruvian Regions (major political and administrative division of

Peru), resulting in a splitting of some villages, with one part belonging to the Region sinistral to the river and another part belonging to the Region to the right side of the river. We surveyed 19 localities along the Marañón and its tributaries, three of which are divided by the Marañón and subsequently belong to two different Peruvian Regions. In tables 2.1.1 and 2.1.2 we treat these localities separately (CUE/CUW; PME/PMW; BAL/CHA) resulting in a total of 22 surveyed localities.

The surroundings of these localities are partially anthropogenically modified as most locals earn their livings through agriculture (e.g. mango, lemon, sugar cane, rice) and livestock farming.

Table 2.1.1. List of surveyed localities in the Region Amazonas

ID	Province	Locality/Coordinates	Altitude	Remarks
BAC	Bagua	Bagua Chica S 05°38’06.9’’ W 78°32’27.7’’	500 m	Located near the Rio Utcubamba
BAG		Bagua Grande S 05°47’33.3’’ – S 05°47’39.8’’ W 78°23’04.9’’ – W 78°23’25.4’’	527- 568 m	Located near the Rio Utcubamba
BAL	Chachapoyas	Balsas S 06°48’15.7’’ – S 06°51’15.9’’ W 77°59’47.9’’ – W 78°01’38.0’’	859-1,289 m	Located near the Rio Marañon, to the East of the river
CUE	Cumba	Cumba S 05°54’27.8’’ – S 05°59’41.4’’ W 78°38’54.9’’ – W 78°40’46.1’’	457- 549 m	Located near the Rio Marañon, to the East of the river
PME	Utcubamba	Puerto Malleta S 06°03’42.0’’ – S 06°04’09.2’’ W 78°35’42.7’’ – W 78°36’08.8’’	486- 580 m	Located near the Rio Marañon, to the East of the river
ZAP		Zapatalgo S 06°03’35.6’’ – S 06°06’05.2’’ W 78°28’53.5’’ – W 78°30’08.4’’	521-1,029 m	Located near the Rio Marañon, to the East of the river close to the junction with the Rio Llaucano

Table 2.1.2. List of surveyed localities in the Region Cajamarca

ID	Province	Locality/Coordinates	Altitude	Remarks
LAB	San Ignacio	La Balza S 04°59’44.3’’ W 79°07’19.4’’	926- 959 m	Located near the Rio Canchis, close to the junction with the Rio Chinchipe
BEL	Jaén	Bellavista S 05°30’29.0’’ – S 05°41’29.3’’ W 78°30’23.6’’ – W 78°41’58.2’’	384-769 m	Located near the Rio Marañon
JGA		Jaén/Gotas de Agua S 05°41’02.9’’ – S 05°42’39.2’’ W 78°44’44.1’’ – W 78°48’53.6’’	613 – 855 m	Located near the city of Jaén at about 11 km West of the Rio Marañon
PER		Perico S 05°20’26.7’’ – S 05°23’08.7’’ W 78°46’59.0’’ – W 78°48’32.8’’	439- 720 m	Located on both sides of the Rio Chinchipe close to the junction with the Rio Tabaconas
PUC		Pucará S 06°01’54.6’’ – S 06°03’41.1’’ W 79°03’02.0’’ – W 79°08’16.0’’	900- 1,054 m	Located on both sides of the Rio Chamaya at about 6 km of the junction with the Rio Huancabamba
SAR		Santa Rosa de la Yunga S 05°25’29.8’’ – S 05°26’38.4’’ W 78°33’03.3’’ – W 78°35’31.8’’	1,036-1,332 m	Located about 7 km left of the Rio Marañon and about 8 km of the junction with the Rio Chinchipe
CUW	Cutervo	Cumba S 05°54’17.4’’ – S 05°54’29.6’’ W 78°41’21.3’’ – W 78°41’43.9’’	462 – 481 m	Located near the Rio Marañon, to the West of the river
PMW		Puerto Malleta S 06°03’57.1’’ – S 06°04’32.1’’ W 78°36’21.1’’ – W 78°37’00.7’’	509 – 541 m	Located near the Rio Marañon, to the West of the river
CHA	Celendin	Chacanto S 06°50’23.3’’ – S 06°51’17.0’’ W 78°01’23.8’’ – W 78°02’14.6’’	866- 1141 m	Located near the Rio Marañon, to the West of the river
LIM		Limon S 06°52’21.5’’ – S 06°52’43.0’’ W 78°05’03.5’’ – W 78°05’10.5’’	2,008-2,092 m	Located about 7 km to the West of the Rio Marañon

Table 2.1.3. List of surveyed localities in the Region La Libertad

ID	**Province**	**Locality/Coordinates**	**Altitude**	**Remarks**
SVP	Bolivar	San Vicente/Pusac S 06°59’24.8’’ – S 06°59’56.9’’ W 77°54’32.8’’ – W 77°56’30.9’’	1,425-1,672 m	Located about 8 km to the East of the Rio Marañon
SRT	Cajabamba	Santa Rosa/El Tingo (Marcamachay) S 07°21’10.6’’ – S 07°22’25.6’’ W 77°50’04.2’’ – W 77°53’55.2’’	1,062-1,300 m	Located to the West of the Rio Marañon at the Rio Crisnejas close to the junction of both rivers
CAL	Bambamarca	Calemar S 07°29’53.2’’ – S 07°33'08.8’’ W 77°42’06.8’’ – W 77°43’25.8’’	1,106–1,688 m	Located near the Rio Marañon, to the East of the river
CGL	Pataz	Chagual S 07°49’30.4’’ – S 07°53’38.4’’ W 77°33’50.8’’ – W 77°38’35.5’’	1,239-1,370 m	Located near the Rio Marañon on both sides of the river
VIJ		Vijus S 07°42’56.8’’ – S 07°43’34.7’’ W 77°39’11,8’’ – W 77°39’51.1’’	1,260–1,408 m	Located near the Rio Marañon, to the East of the river
PIA		Pias (Laguna) S 07°53’26.1’’ – S 07°53’55.3’’ W 77°33’40.5’’ – W 77°34’45.0’’	1,720–1,952 m	Located to the East of the Rio Marañon close to the junction with Rio Parcoy

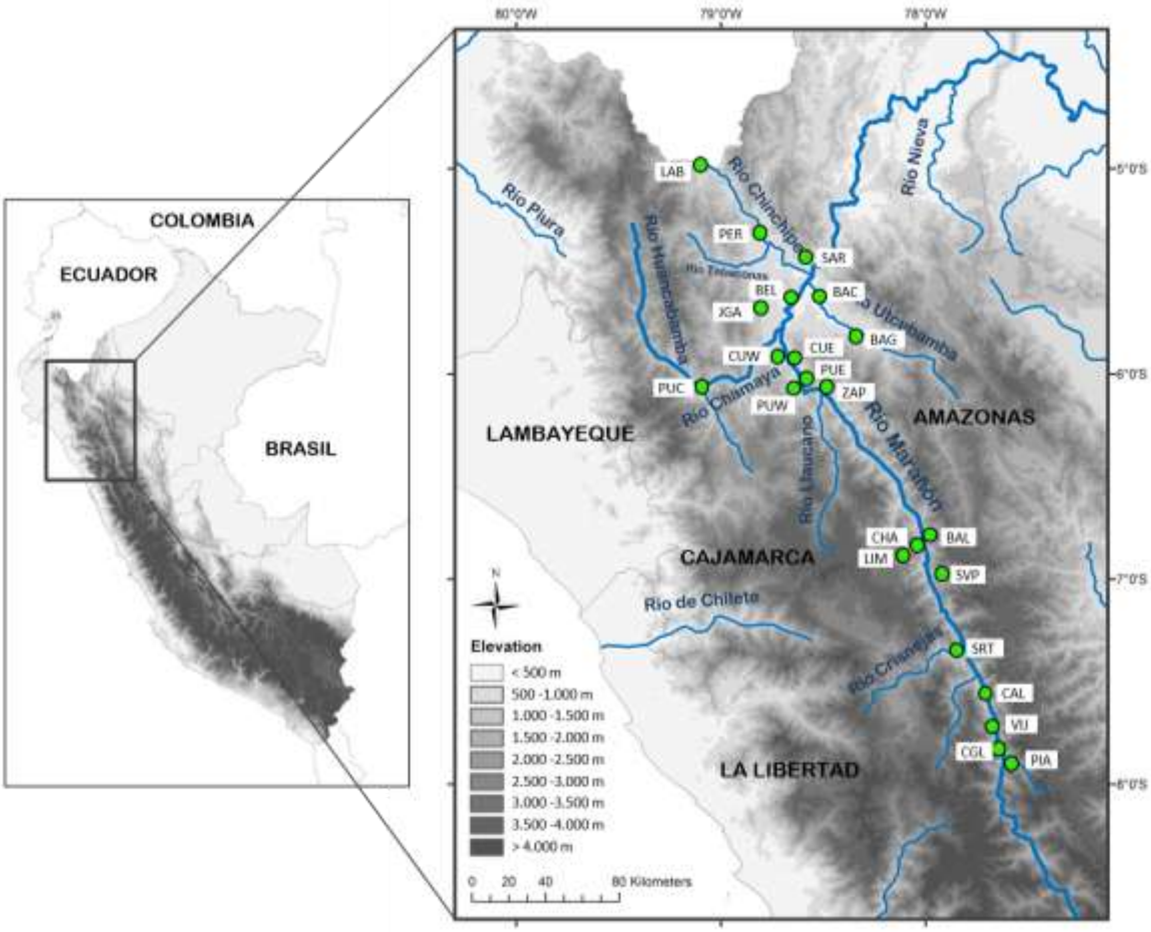

Figure 2.1.1. Map of the Marañón River and its tributaries showing the 22 surveyed localities (see Tables 2.1.1-2.1.3 for abbreviations of locality names)

Figure 2.1.2. Surveyed localities in the Region Amazonas. **A**: Bagua Chica; **B**: Bagua Grande; **C**: Balsas; **D**: Cumba; **E**: Puerto Malleta; **F**: Zapatalgo.

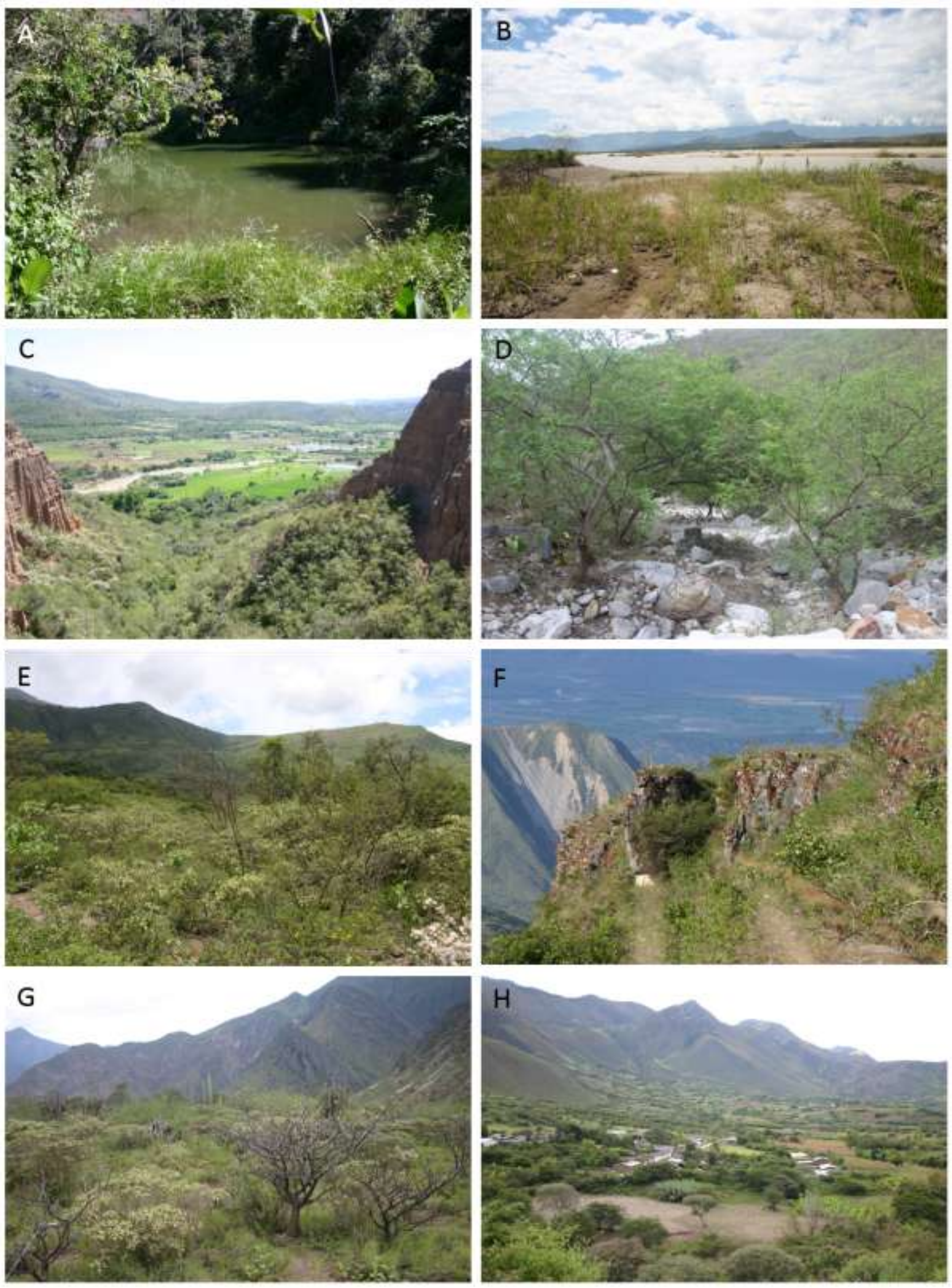

Figure 2.1.3. Surveyed localities in the Region Cajamarca. **A**: La Balza; **B**: Bellavista; **C**: Jaen/Gota de Agua; **D**: Perico; **E**: Pucara; **F**: Santa Rosa de la Yunga; **G**: Chacanto; **H**: Limon.

Figure 2.1.4. Surveyed localities in the Region La Libertad. **A**: San Vicente/Pusac; **B**: Santa Rosa/El Tingo (Marcamachay); **C**: Calemar; **D**: Chagual; **E**: Vijus; **F**: Pias.

Materials, methods and fieldwork

Fieldwork was conducted between July 2005 and November 2010. The different localities were surveyed by day and night for 10 to 211.5 person-hours (ph) with an average survey time of 85.6 ph per locality: Pucara ≈ 126.75 ph; Bellavista ≈ 209.75 ph; Perico ≈ 69.5 ph; Balsas ≈ 182.5 ph; San Vicente/Pusac ≈ 50.5 ph; Limon ≈ 10 ph; Santa Rosa de la Yunga ≈ 211.5 ph; Chagual ≈ 71.75 ph; Vijus ≈ 94 ph; Pias ≈ 90 ph; Santa Rosa/El Tingo; (Marcamachay) ≈ 74 ph; Calemar ≈ 87.75 ph; Zapatalgo ≈ 68.5 ph; Puerto Malleta ≈ 52 ph; Cumba ≈ 48.25 ph; Jaén/Gotas de Agua ≈ 85.5 ph; La Balza ≈ 49.5 ph; Bagua Grande ≈ 25 ph; Bagua Chica ≈ 20 ph.

Specimens were detected during visual encounter surveys and were either captured by hand, by use of a fishing rod with a loop of cord, by use of a sling shot or by use of a pitfall trap (checked semidaily). All captured individuals were registered with respect to habitat, time, temperature, height above ground and additional observations. Altitudes above sea level and geographic coordinates were recorded with a GPS (Garmin GPSMap 60CSx) using the geodetic datum WGS84. Humidity and air temperatures were taken with a digital thermo-hygrometer (Extech) with an external sensor.

After photographing voucher specimens were anesthetized with the narcotic T61and tissue samples were taken. Subsequently specimens were fixed over 12–24 h in 10% formalin and finally stored in 70% ethanol. Specimens were later deposited in the Centro de Ornitología y Biodiversidad (CORBIDI), Lima, Peru and in the Zoologisches Forschungsmuseum Alexander Koenig (ZFMK), Bonn, Germany. Comparative material was examined from the collections of CORBIDI, the ZFMK, the Natural History Museum of the University of Kansas, Lawrence, USA (KU), the Natural History Museum of London, UK (BM), the Royal Ontario Museum, Toronto, Canada (ROM), the Museum of Comparative Zoology, Cambrigde, USA (MCZ), the Fieldmuseum of Natural History, Chicago, USA (FMNH), the Los Angeles County Museum, Los Angeles, USA (LACM), the Muséum d’Histoire Naturelle de Genève, Geneva, Switzerland (MHNG), the Senckenberg Museum, Frankfurt, Germany (SMF), the Zoologische Staatssammlung München, Germany (ZSM), the Zoologisches Museum Hamburg, Germany (ZMH) and the Museum für Naturkunde, Berlin, Germany (ZMB).

Measurements were taken depending on the size of the animal with a tape measure or by use of a vernier caliper to the nearest 0.1 mm.

If reasonable, dissection of the lower body was undertaken to check the internal reproductive organs (testicles or ovaries) of sexually undetermined specimens.

The following abbreviations were used:

AGL	axilla–groin length (distance from insertion of forelimb to insertion of hindlimb)
D	number of dorsal scales in snakes excluding ventrals (counted at three different points a long the body: (1) at a head's length behind the head; (2) at midbody; (3) at a head's length before the cloaca
DL	dorsal granules/scales (counted in longitudinal row from occipitals to base of tail)
DOM	midbody granules/scales (counted in transverse row around midbody; in snakes countings exclude ventrals)
ED	horizontal eye diameter
EN	eye-nostril distance
FP	number of femoral pores on left thigh
FL	length of foot
FLL	length of forelimb
HH	height of head (at highest part of head)
HL	length of head (from tip of snout to posterior edge of ear)
HLL	length of hindlimb
HW	width of head (across supraoculars)
IL	number of infralabials
IN	internarial distance
IOD	inter-orbital distance
LFF	number of lamellae under fourth finger
LFT	number of lamellae under fourth toe
MDS	middorsal scale rows (counted from between the rostral scale and terminal spine)
PV	paravertebral scales (counted in longitudinal row from occipitals to base of tail)
SC	number of subcaudal scales in snakes (counted in longitudinal row from from cloaca to tip of tail)
SL	number of supralabials
SVL	snout–vent length (from tip of snout to cloaca)
TD	horizontal tympanum diameter
TIL	length of tibia
TL	length of tail
V	number of ventral scales (counted in longitudinal row from throat to cloaca)

Results

We collected a total of 51 species from the 22 surveyed localities in the inter-Andean dryforest valley of the Marañón River and its tributaries, differentiated in 14 species of amphibians and 37 species of reptiles. Six localities (Bellavista, Perico, Jaén, Balsas, Bagua Grande and Bagua Chica) have already been surveyed during former expeditions (Barbour & Noble 1920; Burt & Burt 1931; Cadle 1991, 2007; Dixon & Huey 1970; Dunn 1923; Gans 1963; Noble 1921a,b; Schmidt & Walker 1943; Taylor 1939; Wilson & Mena 1980) resulting in the registration of several species for regions were we as well found them. Nevertheless, these expeditions recorded 12 of our collected species but from localities were we could not find them during our fieldwork. They further recorded eight species of reptiles (*Epictia* ("*albifrons*") *tenella* (Klauber 1939); *Drymoluber dichrous* (Peters 1863); *Oxyrhopus melanogenys* (Tschudi 1845)*; Sibynomorphus oneilli* Rossman & Thomas 1979; *Tantilla capistrata* Cope 1876; *Anomalepis aspinosus Taylor* 1939; *Bachia barbouri* Burt & Burt 1931; *Bachia intermedia* Noble 1921) which we did not find in any of the surveyed areas during our research period. We add the information regarding additional localities and species records from the literature in table 2.1.4 as known occurrences of the respective species but we only present detailed accounts on those species which we collected during our fieldwork. Dunn (1923) examined snake species which were collected by G.K. Noble during the Havard Peruvian Expedition 1916. He identifies one specimen from Perico as *Bothrops atrox* and another specimen from Bellavista as *Mastigodryas boddaerti*. Due to the geographical distribution of the members of the *M. boddaerti* Group demonstrated in a recent publication (Montingelli et al. 2011) we doubt that the specimen from Bellavista belongs to the species *M. boddaerti* and due to our own discovery of a new *Bothrops* species from locations close to Perico, we doubt that the specimen examined by Dunn from Perico belongs to the species *B. atrox*. As Dunn (1923) does not give any details about the respective specimens and as we did not revise the collected voucher specimens to verify their species affiliation we omit these two records in table 2.1.4.

Key to species

1. Skin soft, without scales (class: Amphibia)……………...……………...……….2
   Skin robust, covered with scales (class: Reptilia)……..………..……….………...15
2. Skin warty; striking parotoid gland present behind the eye; (genus: *Rhinella)*…………………………………………………………………..….3
   Skin smooth or grainy; without parotoid glands…………………….…...….……6
3. Cranial crests poorly developed; parotoid glands with a depressed medial edge...*R. limensis*
   All cranial crests conspicuously developed……………….……………………..4
4. A distinct dorsolateral crest generally present; snout pointed in dorsal view…...*R. margaritifera*
   Distinct dorsolateral crest generally absent; snout rounded in dorsal view……..5
5. Venter cream with an immaculate or dotted pattern; dorsal skin rugose in both sexes……………………….……………………..……….…………*R. marina*
   Venter immaculate cream or white; dorsal skin not noticeably rugose in females…………………..……..………………………………….....*R. poeppigii*
6. Fingers lacking expanded terminal discs; finger I longer than finger II ………….7
   Fingers with expanded terminal discs……….…………………………………...8
7. Dorsolateral folds and longitudinal ridges present and distinct……………………………..…………………..*Leptodactylus labrosus*
   Dorsolateral folds or longitudinal ridges absent or very indistinct ventral surface of head, body and limbs white, yellowish or cream, respectively, heavily spotted with dark brown or black…………………………………...…*Leptodactylus sp.*
8. Divided scutes present on the dorsal surface of digits……….…………….……9
   Dorsal surface of digits without scutes……...…………………………………. 11
9. Venter black or dark brown with well-defined white spots…………………………….………………….. *Excidobates mysteriosus*
   Venter white, cream or greyish without coloured spots; fingers and toes with lateral fringes; toes basally webbed; (genus: *Hyloxalus*)…………….………..10
10. Finger I longer than finger II...……..……………..…………...…………… *H. insulatus*
    Finger I as long as finger II ……….……………...…………………*H. elachyhistus*
11. Toes distinctly webbed; dorsum green...……..………..…………………………12
    Toes without distinct webbing…………………………….…..…………………13

12. Parietal peritoneum completely white; visceral peritonea clear except for pericardium; adult males with humeral spines …………..…….*Rulyrana mcdiarmidi*

Anterior half of the parietal peritoneum white; All visceral paritonea clear………..……………………………..…………………..…..*Nymphargus posadae*

13. Finger I longer than finger II; posterior surface of thighs with a reticulated pattern of dark brown and cream to yellowish; skin on venter smooth; dorsolateral folds present………………………….……………………..*Pristimantis lymani*

Finger I shorter than finger II; skin on venter coarsely areolate; dorsolateral folds absent…………………………..……..……………………………………..14

14. Fingers and toes with narrow lateral fringes; discs on outer fingers rounded……………………………………………….………*Pristimantis incomptus*

Fingers and toes lacking distinct lateral fringes; discs on outer fingers nearly truncate………………………………..…...………..…*Pristimantis percnopterus*

15. Limbs generally well developed, ear opening present…...……………………..….16

Limbs not present or only rudimentary, ear opening absent……..……………....32

16. Eye lids absent, dorsal scales granular……………………..……………...………17

Eye lids present ……………………………..……..…..………………………...18

17. Sheath of five scales covering the nail…....…..…..……*Pseudogonatodes barbouri*

Nails uncovered……………………………..……………………...*Gonatodes atricucullaris*

18. Toes with adhesive pads ventrally………..………..…………………………………19

Toes without adhesive pads……………………………..…………………………24

19. Most distal part of digit dilated with two large terminal plates (genus: *Phyllodactylus*)……………………………………………………………………..20

Most distal part of digit not distinctly dilated, digital lamellae single…..…………………….....………..……….. *Phyllopezus maranjonensis*

20. With ≤ 10 dorsal tubercular rows……………………………..…………………....21

With ≥ 12 dorsal tubercular rows…………………………………….…………..….22

21. Enlarged postanal scale present; SVL ≤ 42 mm…..…….…..………….*P. thompsoni*

No enlarged postanal scale; SVL ≤ 81 mm…………….....…………..….*P. delsolari*

22. Internasals usually separated by two granules; femur with enlarged tubercles; SVL ≤ 44 mm………..……………………………………….……………*P. johnwrighti*

Internasals in contact; tubercles absent on femur……..…………………………23

23. Tibia without enlarged tubercles; SVL ≤ 49 mm………….......….*P. interandinus*

Enlarged tubercles present on tibia; SVL ≤ 77 mm………………………….*P. reissii*

24. Femoral pores present……………………………………………..…………………..…25

Femoral pores absent……………………………………..………….……….….….29

25. Venter with imbricate scales, not distinctly enlarged (genus: *Polychrus*)….......26

Venter with 10–12 longitudinal rows of large plate-like scales (genus: *Ameiva*)……………………………………………………………………………..…27

26. Vertebral crest present…………..…...…………...……………….…..*P. peruvianus*

Vertebral crest absent…………...…………………...……………..*P. jacquelinae*

27. Colour pattern with 5 longitudinal yellow stripes on dorsum; postbrachials dilated...*A. nodam*

Colour pattern different; postbrachials not or hardly dilated.........……..……..…28

28. Rostral contacting postnasal; most specimens with a trace of a pale vertebral streak……………………..………………………………..…...........*A. concolor*

Rostral not contacting or in short contact with postnasal; distinct cream-coloured vertebral stripe present in most females and juvenile specimens………………………………………………………*A. aggerecusans*

29. Dorsal scales smooth……………………..…...………………………………30

Dorsal scales keeled…………………………...……...…………………………31

30. Venter covered with squarish, juxtaposed scales, larger than dorsals………………………………………..………....*Callopistes flavipunctatus*

Venter covered with imbricate, rounded scales…………..……*Varzea altamazonica*

31. Ventral scales keeled………………………….…..…*Stenocercus huancabambae*

Ventral scales smooth……………………..……….……*Microlophus stolzmanni*

32. Body ventrally with large squarish scales; eyes well developed…….…………33

Dorsal and ventral body scales of almost same size; eyes small or rudimentary……………………………………………………………….………..49

33. Dorsal scale rows at midbody > 22…………....……………………………..34

Dorsal scale rows at midbody ≤ 21……………….……………….…………35

34. Dorsals smooth; dorsal scale rows at midbody > 50……..*Boa constrictor ortonii*

Dorsals keeled; dorsal scale rows at midbody < 30; deep pit between nostril and eye……………………………………………………...……..…*Bothrops* sp.

35. Dorsal scale rows at midbody ≤ 12; paravertebrals keeled…..*Chironius exoletus*

Dorsal scale rows at midbody ≥ 14……………………………………..…….36

36. Anal plate single ………………………..……………………………37

Anal plate divided……………………….………..……………………………..39

37. Dorsal scale rows at midbody 15...……..……….……….…*Drymoluber dichrous*
Dorsal scale rows at midbody ≥ 17…………………………………..…………38

38. Dorsal scale rows at midbody 17 or 19; body red with yellow and black bands on nape and anterior part of body usually present; head black……………………………………………………..*Oxyrhopus melanogenys*
Dorsal scale rows at midbody 19; dorsum black in adults and red in juveniles; juveniles with a black head and a yellow or cream band on nape……*Clelia clelia*

39. Dorsal scale rows at midbody ≥ 17 …………..………………………………40
Dorsal scale rows at midbody < 16…………..………………………………..44

40. Dorsal scale rows at midbody ≥ 19…....…..…*Leptodeira septentrionalis larcorum*
Dorsal scale rows at midbody 17………….……………..………………………41

41. Loreal scale absent……………………..…………..……………*Oxybelis aeneus*
Loreal scale present (genus: *Mastigodryas*)………..……..…...………………42

42. With a dorsolateral longitudinal stripe on the body…………........………..…43
Without such a stripe; dorsal scales with dark apical edges ……… *M. reticulatus*

43. Light dorsolateral stripe relatively thick, situated on scale rows 4-6..… *M. heathii*
Light dorsolateral stripe relatively thinn, situated on scale rows 4 and 5……………………………………………………………..……………..*M. boddaerti*

44. Body pattern of complete rings; ventrals > 185...……...……*Micrurus peruvianus*
Body pattern different; ventrals ≤ 185..…………………..……………………45

45. Loreal present (genus: *Sibynomorphus*)………………..…………………………46
Loreal absent…………………………………..……………..……..……....47

46. A relatively broad irregular dark band across the posterior edge of the prefrontals present.....................………………....………………………..……..*S. vagrans*
Without a discrete band across the posterior edge of the prefrontals……………………………………………...…..…..………..*S. oneilli*

47. Colour pattern of distinct dark dorsal saddle blotches present …..Colubridae sp.
Colour pattern without saddle blotches (genus: *Tantilla*)……..……….……....48

48. Without a dark middorsal stripe; a pale nuchal band complete or medially divided; dark nape band followed by a pale band; tip of snout light-coloured……………………………………………………………*T. capistrata*
Dark middorsal stripe present or not, if not present, a pale nuchal band usually divided medially and laterally; dark nape band not followed by a pale band; tip of snout usually dark……………………………..…………..*T. melanocephala*

49. Forelimbs present (genus: *Bachia*)……….……...……………….……….50
Forelimbs absent…………………………..…..…………….………………51

50. Forelimb with three digits.……………….……..……………………...*B. intermedia*
Forelimb with two digits………………..…....……………………..........*B. barbouri*

51. Scales arranged in body annuli; 4 preanal pores present; body pinkish……………………….…………….……………..*Amphisbaena pericensis*
Scales not arranged in distinct body annuli; preanal pores absent……..………52

52. Dorsal scale rows at midbody > 15……………...……….*Anomalepis aspinosus*
Dorsal scale rows at midbody 14 (genus: *Epictia*)…….……….……………..52

53. Tip of tail dorsally black or brown……….…………..……………..…………..54
Tip of tail dorsally bright yellow……….………….…….…….………….…….56

54. Rostral dorsally yellowish-white; dorsum with seven black longitudinal stripes…………………………………………...……..………...*Epictia sp.1*
Rostral dorsally grey or greyish-brown; dorsal pattern without longitudinal stripes…………………...……………………………………………......55

55. Body dorsally brown to reddish-brown, fading into yellow dorsolaterally and laterally ………………………………………………………*Epictia cf. rufidorsa*
Dorsum almost uniformly brown………...…………………….……….*Epictia sp. 2*

56. Body dorsally and ventrally shining anthracite-gray, each scale with white outlines………………………………………………….……………*Epictia sp.5*
Dorsal body scales blackish with yellow outlines; body ventrally greyish or greyish-brown……………………………..………………..……………......57

57. Yellow outlines of each scale very bright and prominent……………..*Epictia sp.3*
Yellow outlines of each scale very thin and inconspicuous..…..……..*Epictia sp.4*

Table 2.1.4. List of species and the localities where they were found (see Tables 2.1.1-2.1.3 for abbreviations of locality names)

Taxon	BAC	BAG	BAL	CUE	PME	ZAP	LAB	BEL	JGA	PER	PUC	SAR	CUW	PMW	CHA	LIM	SVP	SRT	CAL	CGL	VIJ	PIA
Rhinella limensis			X												X		X	X	X	X	X	X
Rhinella margaritifera							X	X^{11}	X	X^{11}		X										
Rhinella marina							X	X^{11}		X^{11}		X										
Rhinella poeppigii	X	X		X	X	X		X	X	X	X			X								
Rulyrana mcdiarmidi						X						X										
Nymphargus posadae												X										
Excidobates mysteriosus												X										
Hyloxalus elachyhistus									X			X										
Hyloxalus insulatus																X						
Pristimantis lymani		X		X		X		X	X	X	X	X		X								
Pristimantis incomptus												X										
Pristimantis percnopterus												X										
Leptodactylus labrosus		X						X		X												
Leptodactlylus sp.							X															
Phyllodactylus delsolari			X												X				X		X	X
Phyllodactylus interandinus	X^{8}	X^{8}			X			X	X	X^{8}			X	X								
Phyllodactylus johnwrighti				X							X											
Phyllodactylus reissii	X	X	X	X	X	X		X	X	X	X			X			X					
Phyllodactylus thompsoni			X														X	X	X	X	X	X
Phyllopezus maranjonensis			X												X			X	X			

Notes: 1. Dunn 1923; 2. Schmidt & Walker 1943; 3. Wilson & Mena 1980; 4. Taylor 1939; 5. Noble 1921a; 6. Noble 1921b; 7. Burt & Burt 1931; 8. Dixon & Huey 1970; 9. Cadle 2007; 10. Cadle 1991; 11. Barbour & Noble 1920. Fields marked with a * represent species that were sighted in the respective localities but could neither be captured as voucher specimens nor be photographed.

Table 2.1.4. (continued)

Taxon	BAC	BAG	BAL	CUE	PME	ZAP	LAB	BEL	JGA	PER	PUC	SAR	CUW	PMW	CHA	LIM	SVP	SRT	CAL	CGL	VIJ	PIA
Gonatodes atricucullaris								X[5]	X			X										
Pseudogonatodes barbouri						X		X[5]		X												
Polychrus jacquelinae																	X					
Polychrus peruvianus		X		X	X	X		X	X	X	X	X		X								
Microlophus stolzmanni	X	X	X	X	X	X	*	X	X	X	X	X	X	X	X		X	X	X	X	X	X
Stenocercus huancabambae		X[10]		X			X	X	X	X		X										
Varzea altamazonica				X					X			X										
Ameiva aggerecusans			X			X									X							
Ameiva concolor																			X	X	*	X
Ameiva nodam	X	X		X			*	X	X	X	X			X								
Callopistes flavipunctatus								X		*												
Bachia barbouri										X[7]												
Bachia intermadia										X[6]												
Amphisbaena pericensis								X	X	X[6]												
Boa constrictor ortonii				X						X[1]												
Colubridae sp.																		X				X
Chironius exoletus				X																		
Clelia clelia			X	X						X[1]												
Drymoluber dichrous										X[1]												

Notes: 1. Dunn 1923; 2. Schmidt & Walker 1943; 3. Wilson & Mena 1980; 4. Taylor 1939; 5. Noble 1921a; 6. Noble 1921b; 7. Burt & Burt 1931; 8. Dixon & Huey 1970; 9. Cadle 2007; 10. Cadle 1991; 11. Barbour & Noble 1920. Fields marked with a * represent species that were sighted in the respective localities but could neither be captured as voucher specimens nor be photographed.

Table 2.1.4. (continued)

Taxon	BAC	BAG	BAL	CUE	PME	ZAP	LAB	BEL	JGA	PER	PUC	SAR	CUW	PMW	CHA	LIM	SVP	SRT	CAL	CGL	VIJ	PIA
Leptodeira septentrionalis larcorum						X		X		X									X	X	X	X
Mastigodryas reticulata										X		X							X			
Mastigodryas heathii																	X	X				
Mastigodryas boddaerti																						X
Oxybelis aeneus				X	X	X		X			X							X	X			
Oxyrhopus melanogenys								X[1]		X[1]												
Sibynomorphus oneilli			X[9]																			
Sibynomorphus vagrans				X				X[1]				X										
Tantilla capistrata									X[3]	X[2]												
Tantilla melanocephala									X													
Micrurus peruvianus								X[2]	X	X[2]												
Bothrops sp.								X										X	X			
Anomalepis aspinosus										X[4]												
Epictia tenella								X[1]														
Epictia cf. *rufidorsa*																		X		X	X	
Epictia sp. 1																X						
Epictia sp. 2																					X	
Epictia sp. 3												X										
Epictia sp. 4						X																
Epictia sp. 5								X														

Notes: 1. Dunn 1923; 2. Schmidt & Walker 1943; 3. Wilson & Mena 1980; 4. Taylor 1939; 5. Noble 1921a; 6. Noble 1921b; 7. Burt & Burt 1931; 8. Dixon & Huey 1970; 9. Cadle 2007; 10. Cadle 1991; 11. Barbour & Noble 1920. Fields marked with a * represent species that were sighted in the respective localities but could neither be captured as voucher specimens nor be photographed.

AMPHIBIA

Bufonidae

Rhinella limensis **(Werner, 1901)** (Figure 2.1.5 A, B)

Bufo limensis Werner 1901, Abh. Ber. Zool. Anthropol. Ethnograph. Mus. Dresden, 9: 14.
Bufo spinulosus limensis — Vellard 1959, Mem. Mus. Hist. Nat. Javier Prado, 8: 18.
Bufo spinulosus limensis — Cei, Erspamer & Roseghini 1968, Syst. Zool., 17: 239.
Bufo limensis limensis — Cei 1972, In: Blair (ed.), Evol. Genus *Bufo*: 82-91.
Chaunus limensis — Frost et al. 2006, Bull. Am. Mus Nat. Hist 297: 364.
Chaunus limensis — Savage and Bolaños 2009, Zootaxa, 2005: 4.
Rhinella limensis — Chaparro, Pramuk, & Gluesenkamp 2007, Herpetologica, 63: 211.
Rhinella limensis — Pramuk et al. 2008, Global Ecol. Biogeograph., 17: 76.

Holotype: MTD D1795

Type locality: "Umgebung von Lima", Peru.

Voucher (46): CORBIDI 5634-5636, 7622-7638, 7640-7643, 7679, ZFMK 90979-90981, 91802-91819

Distribution: This species is endemic to Peru, and according to Lehr (2002) inhabits the arid Peruvian coast from Pisco north to Sechura desert at elevations between 70-2830 m a.s.l.. We found this species in Balsas, in the Southern part of the Region Amazonas, in Chacanto, Region Cajamarca and in various localities in the Region La Libertad (San Vicente/Pusac, Santa Rosa/El Tingo, Vijus, Chagual, Calemar, and Pias) at elevations between 893 – 1871 m a.s.l.

Remarks: The collected specimens are very variable in their colouration and colour pattern. The tympanum is comparably large and our largest collected adult specimen has a SVL of 109 mm. All specimens exhibit only poorly developed cranial crests. For identification we used the key of Pramuk & Kadivar (2003) but in most specimens we had problems to determine wether the medial edge of the parotoid glands was depressed or flush and wether the snout was more rounded or acuminate in dorsal view. Hence we could not unambiguously identify our specimens as *R. limensis* or *R. vellardi* and assigned them to the oldest available species name.

Most individuals were detected after dusk from 6.30 pm to midnight either in puddles, little waterfilled pools or slow-moving parts of rivulets or on paths, sandy soil or stones near little creeks or irrigation canals. Few individuals were detected during the day from 10 am to 3.45 pm hiding under stones near waterbodies. Air temperature when animals were active ranged from 23.2°C to 30.5°C, ground temperature ranged from 25.0°C to 31.1°C, water temperature ranged from 20.2°C to 26.4°C and air humidity ranged from 45% to 74%.

Freshly metamorphosed juveniles, tadpoles of all larval stages (see Gosner 1960) and egg strings were found in January, April and July in shallow and slow-moving parts of rivulets or in little waterfilled pools with water temperatures of 20.3°C to 24.3°C. The juveniles had a greyish dorsal ground-color intermixed with small conspicuous red dots. One specimen of the colubrid snake *Leptodeira septentrionalis* was observed couching on some *limensis*-tadpoles that were cavorting in the water beneath a pile of branches.

Table 2.1.5. Morphometrics of *Rhinella limensis* (in mm)

Sex	SVL	HW	HL	IOD	EN	IN	ED	TD	TL	FL
♂	≤ 103	≤ 32.2	≤ 29.5	≤ 9.6	≤ 8.6	≤ 7.0	≤ 10.2	≤ 4.5	≤ 42	≤ 67
♀	≤ 109	≤ 31.6	≤ 29.8	≤ 10	≤ 7.9	≤ 6.7	≤ 10.0	≤ 5.1	≤ 40	≤ 61
Juveniles	≤ 47	≤ 15.9	≤ 14.9	≤ 5.3	≤ 4.2	≤ 3.7	≤ 6.2	≤ 2.1	≤ 20	≤ 30

Key literature: Angulo & Aguilar (2003); Cei (1972); Cordova (1999); Duellman & Schulte (1992); Lehr (2002); Leviton & Duellman (1978); Martin (1972); Pramuk (2006); Pramuk & Kadivar (2003); Pramuk et al. (2008); Vellard (1959) ; Werner (1901).

Conservation status: IUCN: Least Concern (Angulo et al. 2004a).

***Rhinella margaritifera* (Laurenti, 1768)** (Figure 2.1.5 C)

Rana margaritifera Laurenti 1768, Spec. Med. Exhib. Synops. Rept.: 30.
Rana gemmata Lacépède 1788, Hist. Nat. Quadrup. Ovip. Serpens, 16mo ed., 2: 303, 458.
Rana gemmata Bonnaterre 1789, Tab. Encyclop. Method. Trois Reg. Nat., Erp.: 4.
Bufo nasutus Schneider 1799, Hist. Amph. Nat.: 217.
Bufo margaritifer — Latreille 1801, *In:* Sonnini de Manoncourt & Latreille, (An. X), Hist. Nat. Rept., 2: 118.
Bufo margaritifer — Daudin 1802 "An. XI", Hist. Nat. Rain. Gren. Crap., Quarto: 89.
Bufo mitrata Daudin 1802 (An. XI), Hist. Nat. Rain. Gren. Crap., Quarto: 79.
Bufo perlatus Cuvier 1817, Regne Animal., 2: 97.
Bufo (Oxyrhynchus) naricus Spix 1824, Animal. Nova Spec. Nov. Test. Ran. Brasil.: 49.
Bufo (Oxyrhynchus) nasutus — Spix 1824, Animal. Nova Spec. Nov. Test. Ran. Brasil.: 50.
Bufo (Otilophis) margaritifer — Cuvier 1829, Regne Animal., Ed. 2, 2: 112.
Bufo (Rhinella) naricus — Cuvier 1829, Regne Animal., Ed. 2, 2: 111.
Bufo (Rhinella) nasutus — Cuvier 1829, Regne Animal., Ed. 2, 2: 111.
Bufo margaritifer — Wagler 1830, Nat. Syst. Amph.: 207.
Otolophus margaritifer — Fitzinger 1843, Syst. Rept.: 32.
Trachycara fusca Tschudi 1845, Arch. Naturgesch., 11: 169.
Bufo pleuropterus Schmidt 1857, Sitzungsber. Akad. Wiss. Wien, Phys. Math. Naturwiss. Kl., 24: 13.
Otilophus margaritifer — Schmidt 1858, Denkschr. Akad. Wiss. Wien, Math. Naturwiss. Kl., 14: 251.

Otilophus margaritifer — Günther 1859 "1858", Cat. Batr. Sal. Coll. Brit. Mus.: 69.
Otilophus ? pleuropterus — Cope 1862, Proc. Acad. Nat. Sci. Philadelphia, 14: 358.
Bufo margaritiferus — Cope 1870 "1869", Proc. Am. Philos. Soc., 11: 156.
Bufo margaritifer — Peters 1873, Monatsber. Preuss. Akad. Wiss. Berlin, 1873: 624.
Bufo margaritifera — Hoogmoed 1989, in Fontenet (ed.), Treballs Ictiol. Herpetol., 2: 167-180.
Rhinella margaritifer — Frost et al. 2006, Bull. Am. Mus. Nat. Hist., 297: 366.

Lectotype: Avila-Pires et al. (2010) designated the specimen depicted in Seba (1734 pl. 71, figures 6 and 7) as lectotype.

Type locality: “Brasilia”

Voucher (13): CORBIDI 1840, 1901, 1921, 5619-5622, ZFMK 88766, 88767, 90950-90953

Distribution: This species is known from Bolivia, Brazil, Colombia, Ecuador, French Guiana, Guyana, Panama, Peru, Suriname, Venezuela at elevations from sea level to 2400 m a.s.l (Barrio-Amorós 1998, Ernst et al. 2005, Hoogmoed 1990, Lutz 1934, Solís et al. 2010). We found this species in the Regions Amazonas and Cajamarca at elevations of 723-1184 m a.s.l.

Remarks: A complex of species (Barrio-Amoros 2004). The single specimen from near Jaén (ZFMK 88766) was detected at the end of May at 1 pm when it started calling while it was sitting in the shady part of a little creek. CORBIDI 1921 was sitting in July at 3.30 pm on a trunk in about 1.5 m above the ground. ZFMK 88767, CORBIDI 1840 and CORBIDI 1901 were collected in June 2008; the former was found in a pond at 2.30 pm whereas the latter two were sitting at 8.15 pm in an irrigation canal of an orchard near the pond of the former specimen. The other specimens were collected in December 2009 between 8.15 pm – 9 pm sitting on the sandy ground near the roadside. Air temperature when animals were sighted ranged from 26°C - 38.8°C, ground temperature ranged from 24.6°C – 26.2°C and air humidity ranged from 50% – 74%.

Table 2.1.6. Morphometrics of *Rhinella margaritifera* (in mm)

No.	SVL	HW	HL	IOD	EN	IN	ED	TD	TL	FL
CORBIDI 1840	39	12.3	14.0	/	/	/	3.8	1.9	17	26
CORBIDI 1901	/	15.0	14.8	/	/	/	3.7	1.9	19	23
CORBIDI 1921	43	12.9	14.7				4.1	2.5	20	27
ZFMK 88766	39	12.7	12.8	3.3	3.6	2.1	4.4	1.8	17	26
ZFMK 88767	39	11.0	12.8	5.6	3.9	2.6	4.2	2.5	18	26
CORBIDI 5619	36.8	11.7	12.2	/	/	/	3.9	2.2	16	24
CORBIDI 5620	31.3	10.6	10.9	/	/	/	3.5	1.1	14	20
CORBIDI 5621	23.2	7.8	8.1	/	/	/	2.8	1.0	10	13
CORBIDI 5622	21.2	6.2	7.0	/	/	/	2.3	0.7	8	11
ZFMK 90950	26	8.7	8.2	3.1	2.8	1.9	3.6	0.8	11	16
ZFMK 90951	33	10.6	11.6	4.7	3.0	2.4	3.9	1.2	15	22
ZFMK 90952	28.9	9.4	8.7	4.1	2.9	2.2	3.4	1.1	12	15
ZFMK 90953	49	16.1	15.8	6.9	4.3	3.5	5.9	3.0	20	28

Key literature: Avila-Pires et al. (2010); Barrio-Amorós (1998, 2004); Fouquet et al. (2007); Hass et al. (1995); Hoogmoed (1990); Lescure & Marty (2000); Lutz (1934).

Conservation status: IUCN: Least Concern (Solís et al. 2010).

***Rhinella marina* (Linnaeus, 1758)** (Figure 2.1.5 D)

Rana marina Linnaeus 1758, Systema Naturae 10th Edition: 211.
Bufo brasiliensis Laurenti 1768, Spec. Med. Exhib. Synops. Rept.: 26.
Rana gigas Wahlbaum 1784, Schr. Ges. Naturforsch. Freunde Berlin 5: 239.
Rana humeris-armata Lacepede 1788, Hist. Nat. Quadrup. Ovip. Serpens 16mo ed. 2: 297, 458.
Bufo marinus — Schneider 1799, Hist. Amph. Nat: 219.
Bufo agua Latreille 1801, *In:* Sonnini de Manoncourt & Latreille, Hist. Nat. Rept. 2: 130.
Rana brasiliana — Shaw 1802, Gen. Zool. 3 (1): 160.
Bufo horridus Daudin 1802, Hist. Nat. Rain. Gren. Crap. Quarto: 97.
Bufo humeralis Daudin 1803, Hist. Nat. Gen. Part. Rept. 8: 205.
Bombinator maculatus Merrem 1820, Tent. Syst. Amph.: 178.
Rana maxima Merrem 1820, Tent. Syst. Amph.: 182.
Bombinator horridus — Merrem 1820, Tent. Syst. Amph.: 179.
Bufo maculiventris Spix 1824, Animal. Nova Spec. Nov. Test. Ran. Brasil.: 45.
Bufo lazarus Spix 1824, Animal. Nova Spec. Nov. Test. Ran. Brasil.: 45.
Bufo albicans Spix 1824, Animal. Nova Spec. Nov. Test. Ran. Brasil.: 47.
Bufo marinus — Gravenhorst 1829, Delic. Mus. Zool. Vratislav. 1: 54.
Bufo horribilis— Wiegmann 1833, Isis van Oken 26: 654.
Docidophryne agua — Fitzinger 1843, Syst. Rept.: 32.
Docidophryne lazarus — Fitzinger 1861, Sitzungsber. Akad. Wiss. Wien Phys. Math. Naturwiss. Kl. 42: 415.
Phrynoidis agua — Cope 1862, Proc. Acad. Nat. Sci. Philadelphia 14: 358.
Bufo marinus var. Horribilis — Peters 1873, Monatsber. Preuss. Akad. Wiss. Berlin: 618.
Bufo marinus var. fluminensis Jimenez de la Espada 1875, Vert. Viaje Pacif. Verif. 1862-1865: 199.
Bufo marinus var. napensis Jimenez de la Espada 1875, Vert. Viaje Pacif. Verif. 1862-1865: 201.
Bufo pithecodactylus Werner 1899, Verh. Zool. Bot. Ges. Wien 49: 481.
Bufo marinis — Barbour & Noble, 1920, Bull. Mus. Comp. Zool., 63: 425.
Bufo marinus marinus Schmidt 1932, Field. Mus. Nat. Hist. Publ. Zool. Ser. 18: 159.
Bufo angustipes Taylor & Smith 1945, Proc. U.S. Nat. Mus. 95: 553.
Bufo pythecodactylus — Rivero 1961, Bull. Mus. Comp. Zool. 126: 27.

Bufo marinus horribilis — Lynch & Fugler 1965, J. Ohio Herpetol. Soc. 5: 8.
Bufo marinus — Zug & Zug 1979, Smith. Contrib. to Zool. 284: 1-40.
Bufo marinus — Harding 1983, Pergamon Press: 64.
Bufo marinus — Frost 1985, Allen Press, Inc. & The Association of Systematics Collections, Lawrence, Kansas: 53.
Bufo marinus marinus — Henley 1985, Stud. Neotrop. Fauna Environ. 20: 167-173.
Bufo marinus — Duellman & Schulte 1992, Copeia (1): 168.
Chaunus marinus — Frost et al. 2006, Bull. Am. Mus Nat. Hist 297: 364.
Rhinella marina — Chaparro, Pramuk, & Gluesenkamp, 2007, Herpetologica, 63: 211.
Rhinella marinus — Pramuk et al., 2008, Global Ecol. Biogeograph., 17: 76.

Type: By indication including specimen illustrated in Seba (1734 pl. 76, figures 1)
Type locality: "America", restricted by Müller & Hellmich (1936) to Suriname.
Voucher (10): CORBIDI 1894, 1904, 1907, 1915, 1926, 7619, ZFMK 88755-88758
Distribution: This species has a very broad distribution range and occurs in Belize, Bolivia, Brazil, Colombia, Costa Rica, Ecuador, El Savador, French Guiana, Guatemala, Guyana, Honduras, Mexico, Nicaragua, Panama, Peru, Suriname, USA (Texas), Venezuela. It has been introduced worldwide e.g. on the Antilles, Australia, Fiji, Hawaii, Mauritius, New-Guinea, Philippines, Ryukyu Islands, Taiwan and many Pacific Islands. The elevational distribution is from sea level up to 3,000 m a.s.l. (Frost 1985; Harding 1983; Solís et al. 2009). We collected this species in the Peruvian Region Cajamarca in Santa Rosa de la Yunga and in La Balza, directly at the boarder to Ecuador at elevations between 926 m and 1332 m a.s.l.
Remarks: The collected specimens exhibit well developed cranial crests and a rugose dorsal skin in both sexes. The venter is cream with an indistinct reticulate or dotted pattern. We found this species at night from 7.30 pm to 10.30 pm in or near a pond or an irrigation canal of a coffee plantation, on sandy soil, at the roadside or near human dwellings. Air temperature reached from 21.0°C to 26.9°C, humidity reached from 59% to 76% and water temperature was at 21.4°C.

Table 2.1.7. Morphometrics of *Rhinella marina* (in mm)

No.	Sex	SVL	HW	HL	IOD	EN	IN	ED	TD	TL	FL
CORBIDI 1894	♂	63	19.8	22.3	6.8	5.1	4.9	7.9	4.0	29	41
CORBIDI 1904	♂	93	28.0	25.9	9.2	6.7	7.1	10.5	4.0	43	66
CORBIDI 1907	Juv.	44	14.3	15.4	6.2	4.0	4.3	5.7	2.0	21	33
CORBIDI 1915	♂	85	27.0	25.8	10.5	7.1	6.7	7.8	2.8	42	58
CORBIDI 1926	♂	91	29.4	30.7	12.3	7.7	6.9	9.5	3.3	4 3	59
CORBIDI 7619	/	/	/	/	/	/	/	/	/	/	/
ZFMK 88755	♀	84	22.8	27.5	11.0	6.1	6.7	9.3	4.1	37	54
ZFMK 88756	/	81	24.0	28.6	10.5	5.7	6.5	9.6	4.6	39	55
ZFMK 88757	/	92	28.8	29.9	11.5	6.4	8.4	11.2	4.7	43	64
ZFMK 88758	Juv.	34	10.3	12.7	3.7	2.4	3.0	4.4	1.3	13	20

Key literature: De la Riva (2002); Duellman & Schulte (1992); Easteal (1986); Frost (1985); Harding (1983); Henle (1985); Kwet et al. (2006); Lehr (2002); Lescure & Marty (2000); Lutz (1934); Martin (1972); Pramuk (2006); Pramuk & Kadivar (2003); Pramuk et al. (2008); Zug (1983); Zug & Zug (1979).

Conservation status: IUCN: Least Concern (Solís et al. 2009).

***Rhinella poeppigii* (Tschudi, 1845)** (Figure 2.1.5 E, F)

Bufo Poeppigii Tschudi 1845, Arch. Naturgesch., 11: 169.
Bufo molitor Tschudi 1845, Arch. Naturgesch., 11: 169.
Docidophryne Lazarus — Fitzinger 1861 "1860", Sitzungsber. Akad. Wiss. Wien, Phys. Math. Naturwiss. Kl., 42: 415.
Phrynoidis agua — Cope 1862, Proc. Acad. Nat. Sci. Philadelphia, 14: 358.
Phrynoidis molitor — Cope 1862, Proc. Acad. Nat. Sci. Philadelphia, 14: 358.
Bufo andianus Cope 1868, Proc. Acad. Nat. Sci. Philadelphia, 20: 115.
Bufo marinus andinensis Melin 1941, Göteborgs K. Vetensk. Vitterh. Samh. Handl., Ser. B, 1: 14.
Bufo marinus poeppigi — Mertens 1952, in Titschacke (ed.), Beiträge von Fauna Perus, 3: 259.
Bufo marinus poeppigi — Vellard 1959, Mem. Mus. Hist. Nat. Javier Prado, 8: 35
Bufo marinus poeppigi — Cei, Erspamer, & Roseghini 1968, Syst. Zool., 17: 239
Bufo marinus poeppigi — Henle 1985, Stud. Neotrop. Fauna Environ., 20: 167-173.
Bufo poeppigii — Duellman & Schulte 1992, Copeia, 1992: 168.
Chaunus poeppigii — Frost et al. 2006, Bull. Am. Mus. Nat. Hist., 297: 364.
Chaunus poeppigii — Savage & Bolaños 2009, Zootaxa, 2005: 4.
Rhinella poeppigii — Chaparro, Pramuk, & Gluesenkamp 2007, Herpetologica, 63: 211.
Rhinella poeppigii — Pramuk et al. 2008, Global Ecol. Biogeograph., 17: 76.

Holotype: Not designated; MHNN 90.77 is a type according to museum records.

Type locality: "Montañas de Monobamba", Peru.

Voucher (31): CORBIDI 1842, 1845, 1883, 5623-5633, ZFMK 88759-88765, 90982-90991

Distribution: This species is known from Peru and Bolivia from elevations between 260 m and 1,829 m a.s.l. (De la Riva 2002).We found this species in several localities in the Regions Amazonas and Cajamarca at elevations between 384 m and 1,029 m a.s.l.

Remarks: This species exhibits well developed cranial crests and an immaculate cream to white venter. Most individuals were detected from dusk (5 pm) to shortly after midnight at air temperatures of 23.8°C – 30.8°C, ground temperatures of 21.3°C – 28.9°C and air humidity of 54% - 73%. They were found in or near waterbodies (ponds, rivulets, irrigation canal), in paddy fields, orchards, low gras vegetation, at the roadside, on sandy soil or under stones or trunks. During the day we detected several individuals hidden in or around houses in the villages.

Table 2.1.8. Morphometrics of *Rhinella poeppigii* (in mm)

Sex	SVL	HW	HL	IOD	EN	IN	ED	TD	TL	FL
♂	≤ 85.5	≤ 25.8	≤ 27.2	≤ 10.4	≤ 5.8	≤ 6.4	≤ 9.5	≤ 4.9	≤ 38	≤ 53
♀	≤ 125.3	≤ 35.4	≤ 35.4	≤ 14.9	≤ 8.0	≤ 8.6	≤ 11.4	≤ 5.0	≤ 40	≤ 72
Juveniles	≤ 43.5	≤ 13.4	≤ 13.4	≤ 4.3	≤ 3.5	≤ 2.8	≤ 5.2	≤ 2.3	≤ 17	≤ 24

Key literature: Blair (1972); De la Riva (2000, 2002); De la Riva et al. (1996); Duellman & Schulte (1992); Henle (1985, 1992); Köhler (2000); Kwet et al. (2006); Pramuk (2006); Pramuk & Kadivar (2003); Pramuk et al. (2008).

Conservation status: IUCN: Least Concern (Angulo et al. 2004b).

Figure 2.1.5. Toads of the genus *Rhinella* from the inter-Andean dryforest valleys. A: *R. limensis* ♂; B: *R. limensis* ♀; C: *R. margaritifera*; D: *R. marina*; E: *R. poeppigii* ♀ with several ticks; F: *R. poeppigii* ♂ and ♀ in amplexus.

Centrolenidae

Rulyrana mcdiarmidi (Cisneros-Heredia, Venegas, Rada, & Schulte, 2008)

(Figure 2.1.6 A)

Cochranella mcdiarmidi Cisneros-Heredia, Venegas, Rada, & Schulte 2008, Herpetologica, 64: 342.
Rulyrana mcdiarmidi — Guayasamin, Castroviejo-Fisher, Trueb, Ayarzagüena, Rada, & Vilà 2009, Zootaxa, 2100: 34.

Holotype: DFCH-USFQ D132

Type locality: "along a small rivulet tributary of the Jambue River, ca. 6 km S from Zamora (ca. 04° 03′S, 78° 56′W, 1150 m), on the western slope of Contrafuerte de Tzunantza, Cordillera Oriental, eastern slopes of the Andes, Provincia de Zamora-Chinchipe, República del Ecuador".

Voucher (15): CORBIDI 1769, 1771, 5637-5642, ZFMK 88783, 90944-90949

Distribution: This species is known from southeastern Ecuador and from the Peruvian Region Cajamarca from elevations between 1100-1500 m a.s.l (Cisneros-Heredia et al. 2008). We collected our specimens near Santa Rosa de la Yunga, Region Cajamarca, and in Zapatalgo, Region Amazonas at elevations between 824-1205 m a.s.l. With the latter we provide the first record of the species for the Region Amazonas.

Remarks: Three specimens (CORBIDI 1769, 1771, ZFMK 88783) were found between 7.30-8.30 pm on a stone, a rock and a plant, respectively, at the waterfall La Shumbanita near Santa Rosa de la Yunga. The other specimens were collected between 8-11 pm from the rocky creek beds of Quebrada Longdoco and Quebrada Pangueico near Zapatalgo. Water temperature was between 16.8-24.6 °C, air temperature was between 20.3-26.5°C and humidity ranged from 58-69%. The specimens coincide well with the diagnosis given by Cisneros-Heredias et al. (2008) with the exception that some individuals from Zapatalgo exhibit a basal webbing between fingers I and II. The skin of the specimens from Zapatalgo was distinctly smoother than the skin of the Santa Rosa specimens with the latter having a distinctly warty and tubercular dorsal skin.

Table 2.1.9. Morphometrics of *Rulyrana mcdiarmidi* (in mm)

No.	Sex	SVL	HW	HL	IOD	EN	IN	ED	TD	TL	FL
CORBIDI 1769	/	16.3	6.3	6.0	/	/	/	2.1	0.8	10	13
CORBIDI 1771	/	12.0	4.7	5.0	/	/	/	1.6	0.5	6	9
CORBIDI 5637	♀	26.6	8.2	8.7	3.3	2.5	2.5	3.1	1.0	15	22
CORBIDI 5638	♀	29.0	8.9	9.3	2.8	3.0	1.9	3.4	0.7	15	22
CORBIDI 5639	♀	26.6	8.4	7.6	3.3	2.2	2.3	3.0	0.9	15	22
CORBIDI 5640	♀	23.0	7.2	6.9	2.6	2.2	2.3	2.9	1.0	14	18
CORBIDI 5641	♂	20.4	7.1	7.1	2.9	2.7	2.0	2.8	1.2	13	16
CORBIDI 5642	♂	26.9	9.2	7.8	3.5	2.4	2.7	3.2	0.8	15	21
ZFMK 88783	♂	22.8	8.5	9.1	2.5	1.9	2.6	3.5	0.9	15	20
ZFMK 90944	♂	27.7	9.9	9.3	3.1	2.4	2.2	3.5	1.0	16	22
ZFMK 90945	♂	25.9	9.0	9.4	2.9	2.7	1.9	3.4	0.9	16	21
ZFMK 90946	♀	26.8	10.3	9.7	2.8	2.5	1.9	3.6	0.9	16	22
ZFMK 90947	♀	23.9	9.0	8.8	2.9	2.5	2.4	3.4	1.0	15	20
ZFMK 90948	♂	24.1	9.0	8.3	2.9	2.3	1.9	3.2	0.8	14	20
ZFMK 90949	♀	26.2	10.0	8.8	3.3	2.4	1.8	3.4	1.0	16	22

Key literature: Cisneros-Heredia et al. (2008); Guayasamin et al. (2009).

Conservation status: IUCN: Data Deficient (Cisneros-Heredia & Angulo 2009).

***Nymphargus posadae* (Ruiz-Carranza & Lynch, 1995)** (Figure 2.1.6 B)

Cochranella posadae Ruiz-Carranza & Lynch 1995 Lozania, 62: 18.
Nymphargus posadae — Cisneros-Heredia & McDiarmid 2007, Zootaxa, 1572: 35.

Holotype: ICN 11307

Type locality: "Departamento de Cauca, municipio de Inzá, Km. 613 carretera Popayán a Inzá, vertiente oriental Codillera Central, 2° 34′ latitud N, 76° 4′ W de Greenwich, 2800 m", Colombia.

Voucher (1): ZFMK 91820

Distribution: This species is known from Colombia, Ecuador and Peru, from elevations between 1100- 2800 m a.s.l (Cisneros-Heredia & McDiarmid 2007, Cisneros-Heredia et al. 2008, Ruiz-Carranza & Lynch 1995, 1997).

Remarks: The single specimen was detected at 7.45 pm on a leave at the waterfall La Shumbanita at a water temperature of 18.9 °C, an air temperature of 22.1°C and an air humidity of 71%.

Table 2.1.10. Morphometrics of *Nymphargus posadae* (in mm)

Sex	SVL	HW	HL	IOD	EN	IN	ED	TD	TL	FL
Juvenile	18.6	7.4	7.1	2.2	1.7	1.4	3.3	0.6	10.6	13.7

Key literature: Cisneros-Heredia & McDiarmid (2007); Cisneros-Heredia et al. (2008); Guayasamin & Funk (2009); Guayasamin et al. (2006); Ruiz-Carranza & Lynch (1995, 1997); Stuart et al. (2008).

Conservation status: IUCN: Vulnerable B1ab(iii) (Guayasamin 2008).

Dendrobatidae

***Excidobates mysteriosus* (Myers, 1982)** (Figure 2.1.6 C)

Dendrobates mysteriosus Myers 1982, Am. Mus. Novit., 2721: 18.
Ranitomeya mysteriosa — Bauer 1988, Het Paludarium, Netherlands, November: 6.
"Dendrobates" mysteriosus — Grant et al. 2006, Bull. Am. Mus. Nat. Hist., 299: 174.
Excidobates mysteriosus — Twomey & Brown 2008, Herpetologica, 64: 125.

Holotype: AMNH 155349.

Type locality: "Vicinity of Santa Rosa, 3000 feet (*ca.* 900 m.) elevation, upper Río Marañón drainage, Department of Cajamarca, Peru. The type locality lies in the hills northwest of the confluence of the Río Chinchipe with the Río Marañón, at about 5° 22′ S, 78° 41′ W".

Voucher (5): CORBIDI 1765, 1768, 1770, 1771, 5797

Distribution: Known only from near Santa Rosa de la Yunga, Cajamarca Department, Peru at elevations of around 600-1200 m a.s.l (Schulte 1990). Our specimens were collected in the surroundings of Santa Rosa de la Yunga at elevations between 1270-1305 m a.s.l.

Remarks: On the morning (7.30-8.30 am) of the 22nd of July 2008 we discovered four individuals of the species near Santa Rosa de la Yunga at an air temperature of 24.9°C, a ground temperature of 20.2°C and an air humidity of 62%. Two specimens were hoping at the trackside, the other two were found in bromeliads that were attached to rock walls. On 4th of May 2009 we collected a female (CORBIDI 5797) from a rock bromeliad at 4.30 pm at an air temperature of 29.2 °C and an air humidity of 69%. In two adjacent bromeliads we found three females and one male, each with two individuals, but these animals were not collected. On 5th of May 2009 we surveyed a dense forest near La Yunga (S 05°26’05.3’’, W 78°32’00.8’’; about three hours walk from Santa Rosa) and detected during the early afternoon (1.40-3.10 pm) seven specimens (3 males + 4 females) near a small creek each in a bromeliad that was attached to trees or logs at heights between 0.5-4 m above the ground (we did not collect any of these specimens), except for one case in which a male and a female were sharing the same bromeliad. In the highest of these bromeliads (4 m above the ground) we found a male specimen carrying two larvae on its dorsum (photo voucher). Several individuals of the species were calling while we surveyed the forest. Air temperature was 29.2°C, ground temperature was 26.5°C and air humidity was 69%.

Table 2.1.11. Morphometrics of *Excidobates mysteriosus* (in mm)

No.	Sex	SVL	HW	HL	IOD	EN	IN	ED	TD	TL	FL
CORBIDI 1765	♂	21.5	6.9	7.8	2.7	2.0	2.4	2.5	0.9	10	16
CORBIDI 1768	♀	25.4	7.6	8.3	2.8	1.8	3.1	2.1	0.8	12	17
CORBIDI 1770	♀	25.9	7.7	8.0	2.9	2.3	3.0	2.3	1.1	12	18
CORBIDI 5797	♀	27.8	7.7	8.9	/	/	/	2.7	1.6	12	18
CORBIDI 1771	/	19.5	6.3	6.4	/	/	/	2.1	0.8	9	14

Key literature: Lötters et al. (2007); Myers (1982); Schulte (1990, 1999); Twomey & Brown (2008).
Conservation status: IUCN: Endangered B1ab (iii) (Icochea et al. 2004).

***Hyloxalus elachyhistus* (Edwards, 1971)** (Figure 2.1.6 E,F)

Colostethus elachyhistus Edwards 1971, Proc. Biol. Soc. Washington: 149.
Colostethus elachyhistus- Duellman & Wild 1993, Occ. Paprs. Mus. Nat. Hist. Univ. Kansas, Lawrence: 26.
Colostethus elachyhistus- Coloma 1995, Nat. Hist. Mus. Univ. Kansas, Lawrence: 28.
Hyloxalus elachyhistus — Grant et al. 2006, Bull. Am. Mus. Nat. Hist. 299: 168.

Holotype: KU 120540

Type locality: "Loja, Loja Province, Ecuador, 2150 m".

Voucher (28): CORBIDI 1781-1784, 1787, 1788, 1797, 1798, 1800-1803, 1806, 1815, 1816, 1820, 1821, 1831, 1834, 5653-5655, ZFMK 88779-88782, 90977, 90978

Distribution: This species occurs in Southern Ecuador and Northern Peru, where it is known from the Regions of Cajamarca and Piura. The elevational range reaches from 600-2,760m a.s.l. (Coloma 1995, Duellman 2004, Icochea et al. 2004). We found specimens of the species in Santa Rosa and Gotas de Agua, both Province Jaén, Region Cajamarca, at elevations between 807-1281 m a.s.l.

Remarks: The animals were found between 9 am and 9.20 pm in shallow water of small creeks, irrigation canals and little pools. Larvae of different stages were detected at end of May and from mid of June to the first days of July. Calling individuals were detected and calls were recorded on 5th of May 2009 at 6.30 pm and on 30th of May 2008 at 9.30 am. CORBIDI 1815 was found on 17th of June 2008 at 4 pm on a little stone wall at the bank of a canal. The male was carrying 27 larvae on its dorsum. On 5th of July 2008 at 8.15 pm we detected another male (CORBIDI 1788) on the roadside with 10 larvae on the dorsum. When animals were sighted water temperature reached from 19.6°C – 21.2°C, air temperature reached from 21.1°C – 24.6°C and humidity reached from 60% – 75%.

In the following table we provide the maximum value of each measurement, as the number of collected specimens is too high to present the data individually for each voucher specimen.

Table 2.1.12. Morphometrics of *Hyloxalus elachyhistus* (in mm)

SVL	HW	HL	IOD	EN	IN	ED	TD	TL	FL
≤ 24.9	≤ 7.8	≤ 9.0	≤ 2.9	≤ 2.7	≤ 3.4	≤ 3.3	≤ 1.8	≤ 12	≤ 17

Key literature: Coloma (1995); Duellman (2004); Duellman & Wild (1993).

Conservation status: IUCN: Endangered A2ac; B2ab (iii,iv,v) (Icochea et al. 2004).

***Hyloxalus insulatus* (Duellman, 2004)** (Figure 2.1.6 D)

Colostethus insulatus Duellman 2004, Sci. Pap. Nat. Hist. Mus. Univ. Kansas 35: 24.
Hyloxalus insulatus — Grant et al. 2006, Bull. Am. Mus. Nat. Hist. 299: 168.

Holotype: KU 211857

Type locality: "17 km ENE (by road) of Balsas (ca. 06° 50′ S, 77° 56′ W), 1810 m, Provincia de Chachapoyas, Departamento de Amazonas, Peru".

Voucher (9): CORBIDI 5656-5658, 5798-5800, ZFMK 90935-90937

Distribution: This species is endemic to Peru and known from the Marañón valley, Regions Amazonas and Cajamarca, at elevations between 1260-2600 m a.s.l. (Aguilar et al. 2010, Duellman 2004). We found specimens of the species in Limon, Province Celendin, Region Cajamarca, at elevations between 2008-2092 m a.s.l.

Remarks: Adult individuals and larvae of different stages were detected on 28th of April from 4 pm to 6.10 pm near or in shallow water of a small creek, and little pools. Calling individuals were detected and calls were recorded at around 4.00 pm. When animals were sighted water temperature was about 19.6°C, air temperature was about 26.4°C and humidity was about 58%.

Table 2.1.13. Morphometrics of *Hyloxalus insulatus* (in mm)

No.	Sex	SVL	HW	HL	IOD	EN	IN	ED	TD	TL	FL
CORBIDI 5656	♀	23.5	6.9	7.7	/	/	/	3.0	0.9	10	16
CORBIDI 5657	♀	20.2	6.6	7.6	/	/	/	2.7	1.6	9	15
CORBIDI 5658	♀	24.9	7.5	7.8	/	/	/	2.7	1.7	12	17
CORBIDI 5798	♂	17.2	5.6	6.7	/	/	/	2.3	1.0	9	14
CORBIDI 5799	♂	21.4	6.7	7.5	/	/	/	3.1	1.4	10	15
CORBIDI 5800	♂	16.5	5.8	6.4	/	/	/	2.2	0.8	8	13
ZFMK 90935	♀	24.0	7.2	8.5	2.7	2.1	3.3	2.9	1.8	11	17
ZFMK 90936	♀	24.8	7.9	8.4	2.7	2.3	3.0	3.3	1.5	11	15
ZFMK 90937	♂	21.2	6.7	7.8	2.6	2.0	3.3	3.0	1.4	11	16

Key literature: Aguilar et al. (2010); Duellman (2004).

Conservation status: IUCN: Data Deficient (IUCN SSC Amphibian Specialist Group 2011).

Figure 2.1.6. Centrolenid and dendrobatid frogs from the inter-Andean dryforest valleys. A: *Rylurana mcdiarmidi*; B: *Nymphargus posadae*; C: Male of *Excidobates mysteriosus* with two tadpoles on the dorsum; D: *Hyloxalus insulatus*; E: *Hyloxalus elachyhistus*; F: *Hyloxalus elachyhistus* with 27 tadpoles on the dorsum.

Craugastoridae

Pristimantis lymani (Barbour & Noble, 1920) (Figure 2.1.7 A)

Eleutherodactylus lymani Barbour & Noble 1920, Bull. Mus. Comp. Zool. 63 (8): 403-404.
Eleutherodactyls carrioni Parker 1932, Ann. Mag. Nat. Hist., Ser. 10, 9: 23.
Eleutherodactylus (Eleutherodactylus) lymani — Lynch 1996, *in* Powell and Henderson (eds.), Contr. W. Indian Herpetol.: 154.
Eleutherodactylus lymani — Lynch & Duellman 1997, Univ. Kansas Mus. Nat. Hist. Spec. Publ., 23: 227.
Pristimantis lymani — Heinicke, Duellman & Hedges 2007, Proc. Natl. Acad. Sci. USA, Suppl. Inform., 104: Table 2.
Pristimantis (Pristimantis) lymani — Hedges, Duellman & Heinicke 2008, Zootaxa, 1737: 120.

Holotype: MCZ 5422

Type locality: "Perico, valley of the Chinchipe, [Provincia Cajamarca,] northwestern Peru".

Voucher (66): CORBIDI 1793, 1796, 1838, 1844, 1851, 1854, 1866, 1879, 1891, 1893, 1896, 1899, 1908, 1909, 1914, 1916, 1919, 1922, 1924, 1927, 1929, 1932, 2061, 5745-5760, 5803, ZFMK 88770-88778, 90960-90975, 90992

Distribution: This species is known from southern Ecuador and northern Peru at elevations between 130-3000 m a.s.l. (Duellman & Lehr 2007). We found this species in the Regions Amazonas and Cajamarca at elevations between 453 m and 1207 m.

Remarks: The animals were found from 9 am to 10 am and between 3 pm and 0.10 am, but most frequently after dusk in or close to small creeks, irrigation canals and little pools. Some individuals were also found in or close to human dwellings, on or under stones, on rocks or logs or hoping over grassland or forest ground. Calling individuals were detected on 9th of July 2008 at 9.15 pm and on 23rd of March 2009 at 10.30 pm.

When animals were sighted water temperature ranged from 24.3°C to 28.1°C, ground temperature reached from 17.4°C to 24.6°C, air temperature reached from 19.2°C to 30.8°C and humidity ranged from 45% to 75%.

In the following table we provide the maximum value of each measurement, as the number of collected specimens is too high to present the data individually for each voucher specimen.

Table 2.1.14. Morphometrics of *Pristimantis lymani* (in mm)

SVL	HW	HL	IOD	EN	IN	ED	TD	TL	FL
≤ 62.1	≤ 21.7	≤ 24	≤ 7.2	≤ 7.6	≤ 5.7	≤ 6.7	≤ 4.1	≤ 38	≤ 50

Key literature: Barbour & Noble (1920); Duellman & Lehr (2007, 2009); Duellman & Pramuk (1999); Hedges et al. (2008); Lynch (1969, 1979); Lynch & Duellman (1997); Parker (1932).

Conservation status: IUCN: Least Concern (Rodriguez et al. 2010).

Pristimantis incomptus (Lynch & Duellman, 1980) (Figure 2.1.7 B)

Eleutherodactylus incomptus Lynch & Duellman 1980, Misc. Publ. Mus. Nat. Hist. Univ. Kansas, 69: 35.
Eleutherodactylus (Eleutherodactylus) incomptus — Lynch 1996, *in* Powell and Henderson (eds.), Contr. W. Indian Herpetol.: 154.
Eleutherodactylus (Eleutherodactylus) incomptus — Lynch & Duellman 1997, Univ. Kansas Mus. Nat. Hist. Spec. Publ., 23: 226.
Pristimantis incomptus — Heinicke, Duellman, & Hedges 2007, Proc. Natl. Acad. Sci. USA, Suppl. Inform., 104: Table 2.
Pristimantis (Pristimantis) incomptus — Hedges, Duellman, & Heinicke 2008, Zootaxa, 1737: 121.

Holotype: KU 143484

Type locality: "16.5 km NNE Santa Rosa, Provincia Napo, Ecuador, 1700 m.”

Voucher (4): CORBIDI 1835, 5744, ZFMK 90976, 91821

Distribution: This species occurs in Ecuador and Peru at elevations of 1270-1910 m a.s.l (Lynch & Duellman 1980, Duellman & Pramuk 1999). We collected our specimens in the surroundings of Santa Rosa de la Yunga at elevations between1240-1330 m a.s.l.

Remarks: In accordance with the diagnosis given by Lynch & Duellman (1980) the snout of our collected individuals is rounded in dorsal view and the digits have very narrow lateral fringes. Two specimens (CORBIDI 5744, ZFMK 90976) were detected on 5th of May 2009 at around 6.45 pm in a coffee plantation while they were calling from the leaves of coffee plants in heights between 1.5-1.8 m above the ground. Air temperature was 24.6 °C and humidity was 60% when the animals were calling. ZFMK 91821 was found one day later at 4.50 pm in a bromeliad that was attached to a rock wall. CORBIDI 1835 was collected by Napoleon Monsalve in August 2008.

Table 2.1.15. Morphometrics of *Pristimantis incomptus* (in mm)

No.	Sex	SVL	HW	HL	IOD	EN	IN	ED	TD	TL	FL
CORBIDI 1835	♀	24.1	8.6	8.9	/	/	/	2.8	1.5	14	19
CORBIDI 5744	♀	20.2	7.2	8.0	/	/	/	2.4	0.7	11	15
ZFMK 90976	♂	21.7	8.3	8.5	2.7	2.3	2.0	3.4	1.0	12	15
ZFMK 91821	♂	22.1	8.4	8.6	2.6	2.4	2.0	3.0	1.2	13	16

Key literature: Duellman & Lehr (2009); Duellman & Pramuk (1999); Hedges et al. (2008); Lynch & Duellman (1980, 1997); Stuart et al. (2008).

Conservation status: IUCN: Vulnerable B1ab (iii) (Rodriguez et al. 2004).

Pristimantis percnopterus (Duellman & Pramuk, 1999) (Figure 2.1.7 C)

Eleutherodactylus percnopterus Duellman & Pramuk 1999, Sci. Pap. Nat. Hist. Mus. Univ. Kansas, 13: 58.
Pristimantis percnopterus — Heinicke, Duellman, & Hedges 2007, Proc. Natl. Acad. Sci. USA, Suppl. Inform., 104: Table 2.
Pristimantis (Pristimantis) percnopterus — Hedges, Duellman, & Heinicke 2008, Zootaxa, 1737: 128.

Holotype: KU 217318

Type locality: "Santa Rosa de la Yunga (06° 05′ S, 78° 43′ W, 1300 m), Provincia Jaén, Departamento Cajamarca, Peru".

Voucher (2): CORBIDI 1832, ZFMK 95237

Distribution: This species is endemic to northern Peru at elevations of 1100-2400 m a.s.l. (Duellman & Lehr 2009, Duellman & Pramuk 1999). We collected individuals near Santa Rosa de la Yunga at elevations of 1184-1273 m a.s.l.

Remarks: In accordance with the diagnosis given by Duellman & Pramuk (1999) our specimens have a subacuminate snout in dorsal view and the digits lack distinct lateral fringes. Both specimens were captured in July 2008. CK 131 was detected at 3.30 pm in a bromeliad that was fallen of a tree. Air temperature was 26.6°C and humidity was 59%. CORBIDI 1832 was hopping on the forest floor when detected at 9 am.

Table 2.1.16. Morphometrics of *Pristimantis percnopterus* (in mm)

No.	Sex	SVL	HW	HL	IOD	EN	IN	ED	TD	TL	FL
CORBIDI 1832	Juv.	9.5	3.5	3.7	/	/	/	1.3	0.4	5	6
ZFMK 95237	Juv.	14.8	5.3	6.0	2.1	1.9	1.5	1.9	0.6	8	10

Key literature: Duellman & Lehr (2009); Duellman & Pramuk (1999); Hedges et al. (2008).

Conservation status: IUCN: Near Threatened (Rodriguez et al. 2004).

Leptodactylidae

Leptodactylus labrosus **Jiménez de la Espada, 1875** (Figure 2.1.7 D)

Leptodactylus labrosus Jiménez de la Espada 1875, Vert. Viaje Pacif. Verif. 1862-1865: 36.
Leptodactylus curtus Barbour & Noble 1920, Bull. Mus. Comp. Zool., 63: 405.
Leptodactylus labrosus — Heyer & Peters 1971, Proc. Biol. Soc. Washington, 84: 164.
Leptodactylus labrosus — Heyer 1978, Science Bull. Los Angelels County Mus. Nat Hist., 29: 56.
Leptodactylus labrosus — Gonzáles-Fernández, García-Díaz & San Segundo 2009, Spixiana, 32: 273.

Lectotype: MNCN 3524 (designated by Heyer & Peters 1971 and numbered according to González-Fernández et al. 2009).

Type locality: "Pimocha, [Guayas Province,] orillas del Rio Daule (Ecuador)".

Voucher (14): CORBIDI 1882, 5663-5668, ZFMK 88769, 90954-90959.

Distribution: This species is known from Ecuador to Peru at elevations from 0-1300 m a.s.l. (Cisneros-Heredia 2006). According to Lehr (2002) this species occurs in Peru in the Regions Ancash, Cajamarca, Piura and La Libertad. We found this species in Cajamarca and in the surroundings of Santa Rosa de la Yunga and Bagua Grande, Region Amazonas at elevations between 393-652 m a.s.l..

Remarks: All individuals were found after dusk (6.50 pm – 10.45 pm) sitting in or very close to a water point, such as: paddy fields, little creeks or waterfilled cart tracks. Air temperature was between 24.6°C – 28°C, water and ground temperature were between 22.7°C – 27.5°C and air humidity ranged from 59% – 73%.

Table 2.1.17. Morphometrics of *Leptodactylus labrosus* (in mm)

No.	SVL	HW	HL	IOD	EN	IN	ED	TD	TL	FL
CORBIDI 1882	53.0	16.0	17.2	3.9	4.7	3.5	5.2	3.3	25	36
ZFMK 88769	58.7	14.8	19.5	3.5	4.6	3.6	5.3	3.2	27	40
CORBIDI 5663	57.3	14.8	18.0	/	/	/	5.1	3.4	24	35
CORBIDI 5664	53.0	13.3	16.8	/	/	/	5.3	3.1	23	34
CORBIDI 5665	51.1	14.2	17.1	/	/	/	4.7	2.7	23	32
CORBIDI 5666	53.4	15.3	19.0	/	/	/	5.7	3.2	25	37
CORBIDI 5667	38.6	11.6	14.1	/	/	/	3.7	2.1	19	31
CORBIDI 5668	40.4	11.3	18.9	/	/	/	3.7	2.4	18	29
ZFMK 90954	55.5	16.4	19.7	3.0	4.6	3.6	6.2	3.3	23	37
ZFMK 90955	52.9	16.4	17.7	3.0	4.1	3.3	5.4	3.3	23	35
ZFMK 90956	51.1	15.3	17.4	3.1	4.6	3.5	5.4	3.1	22	33
ZFMK 90957	55.3	16.8	20.2	3.1	4.6	3.7	5.8	3.4	24	36
ZFMK 90958	55.4	17.5	22.0	3.5	4.6	3.7	6.0	3.4	25	37
ZFMK 90959	39.1	12.2	14.6	3.0	3.4	2.8	5.0	2.7	18	29

Key literature: Babour & Noble (1920); Cisneros-Heredia (2006); Heyer (1978); Heyer & Peters (1971); Lehr (2002).

Conservation status: IUCN: Least Concern (Angulo et al. 2004).

Leptodactylus sp. (Figure 2.1.7 E,F)

Locality: We found this species in La Balza, a small village near the Rio Canchis directly at the boarder of Peru with Ecuador, Province San Ignacio, Region Cajamarca, 926 m.

Voucher (2): CORBIDI 1860, ZFMK 88768

Distribution: This species is only known from the locality mentioned above.

Remarks: Both specimens were found in June 2008. The adult individual was detected after dusk at 7.30 pm sitting in a pond, whereas the juvenile was found during a rainy and cloudy day at 2.45 pm about 10 m besides the pond. The specimens could not be assigned to one of the known species of the genus *Leptodactylus*. It is diagnosed by the following characters: (1) no light longitudinal stripe on dorsal surface of thigh and tibia present; (2) sole of foot dark with light tubercles; (3) toes without lateral fringes; (4) toes without distinct discs; (5) upper lip with several distinct dark bars; (6) dorsolateral folds indistinct; (7) ventral surface distinctly dark-mottled. To clarify the status of this specimens and to describe them as a new species more material would be needed.

Table 2.1.18. Morphometrics of *Leptodactylus sp.* (in mm)

No.	Sex	SVL	HW	HL	IOD	EN	IN	ED	TD	TL	FL
CORBIDI 1860	/	61.1	15.4	21.2	6.7	7.3	5.1	5.2	3.6	33	46
ZFMK 88768	Juv.	13.2	4.3	5.1	1.3	1.6	1.3	1.5	0.8	6	9

Key literature: Heyer (1978); Heyer & Peters (1971).

Conservation status: IUCN: not yet assessed (IUCN 2013).

Figure 2.1.7. Frogs of the families Craugastoridae, Hylidae and Leptodactylidae from the inter-Andean dryforest valleys. A: *Pristimantis lymani*; B: *P. incomptus*; C: *P. percnopterus*; D: *L. labrosus*; E: Dorsal view of *Leptodactylus* sp.; F: Ventral view of *Leptodactylus* sp.

REPTILIA

GEKKOTA

Phyllodactylidae

Phyllodactylus delsolari **Venegas, Townsend, Koch & Böhme, 2008**

(Figure 2.1.8 A)

Phyllodactylus delsolari Venegas, Townsend, Koch & Böhme 2008, Journal of Herpetology 42 (2): 386-396.
Phyllodactylus delsolari — Koch & Beraún 2011, Check List 7 (3): 272-275.
Phyllodactylus delsolari — Aurich, Koch & Böhme 2011, North-Western Journal of Zoology 7 (2): 310-317.

Holotype: UF 50059

Type locality: "7 km east of Balsas, 1,400 m elevation, Departamento de Amazonas, Peru (6.847°S, 77.986°W)"

Voucher (34): see Venegas et al. (2008), and Koch & Beraún (2011).

Distribution: This species is known from northern Peru along the dryforest valley of the Marañon River from Pias, Province Pataz, Region La Libertad to Balsas, Province Chachapoyas, Region Amazonas and Chacanto, Province Celendin, Region Cajamarca at elevations between 865-1,870 m a.s.l (Koch & Beraún 2011).

Remarks: See Venegas et al. (2008) for taxonomy, description and remarks on natural history, Aurich et al. (2011) for remarks on ecology, and Koch & Beraún (2011) for remarks on distribution and sympatry.

Key literature: Aurich et al. (2011); Koch & Beraún (2011); Venegas et al. (2008).

Conservation status: IUCN: not yet assessed (IUCN 2013). Several hydroelectric projects are driven by the Peruvian government and involve the construction of big dams which inundate big extensions of dry forest. This will result in a fragmentation of the habitat of *P. delsolari* and many other species and consequently create barriers for their genetic pools (Koch et al. 2013). As most of the habitat of this species is affected by these projects we presume that it is seriously threatened. Further research should be undertaken to determine the conservation status of this and other species occurring in the affected regions.

Phyllodactylus interandinus **Dixon & Huey, 1970** (Figure 2.1.8 B)

Phyllodactylus interandinus Dixon & Huey 1970, Los Angeles County Museum Contributions in Science (192): 34.
Phyllodactylus interandinus — Kluge 1993, San Diego, Internat. Gecko Soc., 245 pp..
Phyllodactylus interandinus — Rösler 2000, Gekkota 2: 104.
Phyllodactylus interandinus — Venegas, Townsend, Koch & Böhme 2008, Journal of Herpetology 42 (2): 386.

Holotype: TCWC 27914

Type locality: **“**4,8 km S (by road) Bellavista, 520 m, Department of Cajamarca, Peru.”

Voucher (26): CORBIDI 1799, 1808, 1813, 1814, 1826, 1827, 1830, 5675-82, ZFMK 88749-51, 90903-10

Distribution: This species is known from the valleys of the Cajamarca, Chinchipe, Maranon, and Utcubamba rivers in the northern Peruvian Regions Amazonas and Cajamarca (Dixon & Huey 1970). We found *P. interandinus* in Bellavista, Gotas de Agua near Jaén, Puerto Malleta and Cumba at elevations between 426-613 m a.s.l.

Remarks: The number of longitudinal rows of dorsal tubercles in our specimens varied from 13 to 20 and the number of tubercles in paravertebral row from head to base of tail ranged from 54 to 74. After sunset we detected specimens of this species on or under stones or actively on the ground. At day time individuals were found hidden in or under decomposing logs, cacti or other plant material. We collected 6 female individuals, three in May and three in December, which were pregnant and contained a single egg each.

Table 2.1.19. Morphometrics (mm) and pholidosis characters of *Phyllodactylus interandinus*

No.	Sex	SL	IL	LFF	LFT	DOM	AGL	SVL	TL	HL	HW
CORBIDI 1808	♂	8/8	7/8	11	13	74	19	42	broken	10.9	6.6
CORBIDI 1830	♂	7/6	5/5	/	/	70	12	34	39	10.4	5.4
CORBIDI 5680	♂	7/7	6/6	11	/	77	18	45	42	14.9	7.0
ZFMK 90909	♂	8/8	6/6	10	14	91	18	45	38	13.7	7.9
ZFMK 90910	♀	8/8	6/7	10	13	79	19	45	37	13.0	7.2
ZFMK 90905	♀	7/7	7/6	11	14	76	19	45	38	12.5	7.5
ZFMK 90906	♂	8/7	6/7	11	14	75	17	43	45	14.0	7.2
ZFMK 90907	Juv.	8/8	7/7	11	13	75	13	29	25	9.8	4.9
CORBIDI 1799	♀	8/7	6/6	10	11	70	15	37	40	10.2	5.8
CORBIDI 1813	♀	7/8	6/6	11	13	74	16	38	39	10.8	5.7
CORBIDI 1814	♀	9/8	6/7	11	16	75	22	49	38	12.5	6.2
CORBIDI 1826	♀	8/8	7/7	11	13	66	20	43	37	12.2	5.6
CORBIDI 1827	♀	8/7	6/7	10	12	74	21	44	43	13.9	6.7
CORBIDI 5675	♀	7/8	6/6	10	13	76	19	40	broken	12.1	6.3
CORBIDI 5676	♀	8/8	6/6	10	13	86	19	43	44	12.2	7.0
CORBIDI 5677	♀	8/8	6/6	10	14	83	22	46	28	12.7	7.0
CORBIDI 5678	♀	7/7	7/7	11	14	87	18	45	broken	13.4	7.4
CORBIDI 5679	♀	8/8	6/6	10	12	85	18	40	broken	17.3	6.4
CORBIDI 5681	♀	9/8	6/7	11	13	76	18	41	40	13.3	6.5
ZFMK 88749	♀	9/8	7/6	10	12	83	20	45	48	13.7	7.0
ZFMK 88750	♂	8/8	6/6	11	13	81	16	39	44	11.6	5.9
ZFMK 88751	♀	8/11	6/7	10	11	83	15	40	broken	11.4	6.4
ZFMK 90908	♂	8/9	7/7	10	14	81	18	42	35	12.1	6.3
ZFMK 90903	♂	8/9	7/7	10	15	75	17	39	48	11.1	6.4
ZFMK 90904	♂	8/8	6/6	11	13	71	13	33	41	10.1	5.6
CORBIDI 5682	Juv.	9/9	7/7	11	12	/	9.5	25	25	7.4	4.2

Key literature: Dixon & Huey (1970); Venegas et al. (2008).

Conservation status: IUCN: Least concern (Aguilar 2010).

***Phyllodactylus johnwrighti* Dixon & Huey, 1970** (Figure 2.1.8 C)

Phyllodactylus johnwrighti Dixon & Huey 1970, Los Angeles County Museum Contributions in Science (192): 34.
Phyllodactylus johnwrighti — Kluge 1993, San Diego, Internat. Gecko Soc., 245 pp.
Phyllodactylus johnwrighti — Rösler 2000, Gekkota 2: 104.
Phyllodactylus johnwrighti — Venegas, Townsend, Koch & Böhme 2008, Journal of Herpetology 42 (2): 386.

Holotype: TCWC 27916

Type locality: “13 km SSE (by road) Hacienda Molino Viejo, 1190 m, Department of Cajamarca, Peru.”

Voucher (11): CORBIDI 1763, 1764, 1766, 1772-75, 1780, 5683, ZFMK 88746-47

Distribution: This species is found on the arid slopes of Rio Huancabamba in the Regions Cajamarca and Piura at elevations up to 2100 m a.s.l (Dixon & Huey 1970). We collected specimens in Pucará, Region Cajamarca and Cumba, Region

Amazonas and provide with the latter the first record for the Region Amazonas. Our specimens were collected at elevations between 517-900 m a.s.l.

Remarks: Our collected specimens had 12 or 14 longitudinal rows of dorsal and the number of tubercles in paravertebral row from head to base of tail ranged from 45 to 50. All individuals were detected at day time hidden under stones or in decomposing logs.

Table 2.1.20. Morphometrics (mm) and pholidosis characters of *Phyllodactylus johnwrighti*

No.	Sex	SL	IL	LFF	LFT	DOM	AGL	SVL	TL	HL	HW
CORBIDI 1772	♂	9/10	8/8	13	11	77	12.5	34	broken	11.9	6.2
CORBIDI 1773	♂	8/9	?/8	/	11	75	13.5	34	broken	11.3	5.4
CORBIDI 1774	♂	8/9	8/8	/	15	/	6.6	19	17	7.6	3.7
CORBIDI 5683	♂	8/7	7/6	10	12	78	14.7	34	broken	10.3	5.3
CORBIDI 1763	♂	7/6	7/7	10	10	/	14.4	33	broken	11.1	5.7
ZFMK 88746	♂	6/6	6/6	/	12	/	9.8	27	27	9.8	5.2
ZFMK 88747	♂	8/8	7/7	12	14	/	10.0	29	broken	9.2	5.2
CORBIDI 1766	♀	10/10	7/8	11	/	/	9.9	26	26	9.5	5.2
CORBIDI 1780	♀	11/12	7/7	10	14	75	11.1	27	broken	9.7	4.8
CORBIDI 1764	/	8/7	7/6	/	/	/	7.1	20	18	7.4	3.4
CORBIDI 1775	/	9/7	7/6	9	12	67	10.4	31	30	10.7	4.8

Key literature: Dixon & Huey (1970); Venegas et al. (2008).

Conservation status: IUCN: not yet assessed (IUCN 2013).

Phyllodactylus reissii **Peters, 1862** (Figure 2.1.8 D)

Phyllodactylus reissii Peters 1862, Monatsber. Königl. Akad. Wiss. Berlin: 626.
Phyllodactylus reissii— Boulenger 1885, Catalogue of the lizards in the British Museum (Nat. Hist.): 80.
Phyllodactylus baessleri Werner 1901, Abhandl. Ber. Zool. Anthrop. Mus. Dresden, 9 (2): 2.
Phyllodactylus guayaquilensis Werner 1910, Mitt. Naturh. Mus. Hamburg 27 (2): 4.
Phyllodactylus abrupteseriatus Werner 1913, Mitt. Naturh. Mus. Hamburg 30, 2. Beiheft: 4.
Phyllodactylus magister Noble 1924, Occ. Pap. Boston Soc. Nat. Hist. 5: 110.
Phyllodactylus reissii — Dixon & Huey 1970, Los Angeles County Museum Contributions in Science (192): 50.
Phyllodactylus reissii — Kluge 1993, San Diego, Internat. Gecko Soc., 245 S..
Phyllodactylus reissii — Rösler 2000, Gekkota 2: 104.

Lectotype: ZMB 4567 (designated by Dixon & Huey 1970)

Type locality: “in der Nähe der Guayaquil” (Ecuador)

Voucher (85): CORBIDI 1809, 1810, 1812, 1817, 1819, 1823, 1829, 1833, 1836, 1847, 1855, 1856, 1881, 1886, 1895, 1913, 1928, 2062, 5684-5711, 5802, ZFMK 88737-88745, 88748, 90875-90902

Distribution: This species is very abundant from southern Ecuador to northern Peru at elevations from seal level up to 2000 m a.s.l. (Dixon & Huey 1970). We found the species from Perico, Province Jaén, Region Cajamarca to San Vicente, Province Bolivar, Region La Libertad, Peru at elevations of 419-1432 m a.s.l.

Remarks: Our collected individuals of this species had 12-16 rows of enlarged tubercles, consisting of 31-60 tubercles between rear of head and vent.

We found this species sympatric with their congeners *P. johnwrighti, P.interandinus, P. delsolari, P. thompsoni* and with *Phyllopezus maranjonensis*. They were active between 6.45 pm and 1 am and mostly found on rock walls or house walls. Some individuals were further found on the sandy walls of dry creekbeds or running over sandy ground. From 11 am to 6.25 pm we detected individuals of this species hiding under stones, logs or tree barks. During their active hours air temperatures ranged from 24.4 to 29.9°C, substrate temperatures ranged from 21.7 to 31.9°C and air humidity ranged from 46 to 75%.

One female (not collected) was detected in May 2008 directly after it had layed an egg on the sandy soil at the edge of a dry creekbed.

In the following table we provide ranges of the scale counts and measurements, as the number of collected specimens is too high to present the data individually for each voucher specimen.

Table 2.1.21. Morphometrics (mm) and pholidosis characters of *Phyllodactylus reissii*

Sex	SL	IL	LFF	LFT	DOM	AGL	SVL	TL	HL	HW
♀	8-13	6-11	10-14	12-18	77-114	≤ 35	≤ 77	≤ 88	≤ 22.9	≤ 11.1
♂	7-13	6-11	10-14	12-17	70-110	≤ 31	≤ 73	≤ 84	≤ 23	≤ 12
Juv.	8-12	7-10	10-13	13-17	78-90	≤ 17	≤ 41	≤ 45	≤ 13	≤ 6.7

Key literature: Aurich et al. (2011); Carillo de Espinoza et al. (1990); Dixon & Huey (1970); Goldberg (2007); Huey (1979); Schlueter (1997, 2002).

Conservation status: IUCN: Least concern (Cisneros-Heredia & Goldberg 2010).

Phyllodactylus thompsoni Venegas, Townsend, Koch & Böhme, 2008

(Figure 2.1.8 E)

Phyllodactylus thompsoni Venegas, Townsend, Koch & Böhme 2008, Journal of Herpetology 42 (2): 386-396.
Phyllodactylus thompsoni — Koch & Beraún 2011, Check List 7 (3): 272-275.
Phyllodactylus thompsoni — Aurich, Koch & Böhme 2011, North-Western Journal of Zoology 7 (2): 310-317.

Holotype: UF 126943

Type locality: "7 km east of Balsas, 1,400 m elevation, Departamento de Amazonas, Peru (6.847°S, 77.986°W)"

Voucher (60): see Venegas et al. (2008), and Koch & Beraún (2011).

Distribution: This species is found in northern Peru along the dryforest valley of the Marañon River from Pias, Province Pataz, Región La Libertad to Balsas, Province Chachapoyas, Región Amazonas and Chacanto, Province Celendin, Región Cajamarca at elevations of 862-1,880 m a.s.l (Koch & Beraún 2011). We can thus

Remarks: See Venegas et al. (2008) for taxonomy, description and remarks on natural history, Aurich et al. (2011) for remarks on ecology, and Koch & Beraún (2011) for remarks on distribution and sympatry.

Key literature: Aurich et al. (2011); Koch & Beraún (2011); Venegas et al. (2008).

Conservation status: IUCN: not yet assessed (IUCN 2013). See comment under *P. delsolari*.

Phyllopezus maranjonensis Koch, Venegas & Böhme, 2006 (Figure 2.1.8 G,H)

Phyllopezus maranjonensis Koch, Venegas & Böhme 2006, Salamandra 42 (2/3): 146.
Phyllopezus maranjonensis — Koch & Beraún 2011, Check List 7 (3): 272.
Phyllopezus maranjonensis — Aurich, Koch & Böhme 2011, North-Western Journal of Zoology 7 (2): 311.
Phyllopezus maranjonensis — Gamble et al. 2012, Mol. Phylog. Evol. 62 (3): 946.

Holotype: MHNSM 19555

Type locality: "from Quebrada Honda in the vicinity of Balsas (06°49'S, 78°00'W, approximately 900-1000 m above sea level), Provincia de Chachapoyas, Departamento de Amazonas, Peru"

Voucher (27): see Koch et al. (2006) for details on the six type specimens; CORBIDI 5659-5662, 7647-7653, ZFMK 90867-90870, 91765-91770.

Distribution: We found this species in northern Peru along the dryforest valley of the Marañon River from Calemar, Province Bambamarca, Region La Libertad to Balsas, Province Chachapoyas, Region Amazonas and Chacanto, Province Celendin, Region Cajamarca; 865-1,312 m a.s.l. Due to our investigations we can thus add the Regions Cajamarca and La Libertad to the known distributional ranges of this species.

Remarks: See Koch et al. (2006) for taxonomy, description and remarks on natural history, Gamble et al. (2012) for phylogenetic relationship, Aurich et al. (2011) for remarks on ecology, and Koch & Beraún (2011) for remarks on distribution and sympatry.

Key literature: Aurich et al. (2011); Gamble et al. (2012); Koch & Beraún (2011); Koch et al. (2006).

Conservation status: IUCN: not yet assessed (IUCN 2013). See comment under *Phyllodactylus delsolari*.

Sphaerodactylidae

***Gonatodes atricucullaris* Noble, 1921** (Figure 2.1.8 I,J)

Gonatodes atricucullaris Noble 1921, Ann New York Acad. Sci 29: 135.

Gonatodes atricucullaris — Peters & Donoso-Barros 1970, Smithsonian Institution Press, Washington D.C. & London: 132.

Gonatodes atricucullaris — Peters & Donoso-Barros 1986, Smithsonian Institution Press, Washington D.C. & London: 132.

Gonatodes atricucullaris — Rösler 2000, Gekkota 2: 84.

Holotype: MCZ 14042

Type locality: “Bellavista, Peru”

Voucher (3): CORBIDI 1789, 1828, ZFMK 88752

Distribution: This species is only known from the Region Cajamarca from Perico to Bellavista (Noble 1921a). We found one individual in Gotas de Agua, near Jaén and the other two were collected in Santa Rosa, Región Cajamarca at elevations between 450-1250 m a.s.l.

Remarks: The specimen from near Jaén was found at 5.30 pm in an old wasps’ nest that was hanging on the sandy walls of adried-up streambed. One specimen from Santa Rosa was found at 5 pm hidden under a log in a small dense forest. The second specimen from Santa Rosa was detected at 11 am running on the walls of a house.

Table 2.1.22. Morphometrics (mm) and pholidosis characters of *Gonatodes atricucullaris*

No.	Sex	SL	IL	LFF	LFT	AGL	SVL	TL	HL	HW
CORBIDI 1789	♀	7/6	6/6	18	18	13.7	35.4	broken	9.6	4.6
CORBIDI 1828	♀	5/7	7/8	14	16	8.3	20.1	23	6.6	4.0
ZFMK 88752	♂	5/6	4/4	16	18	12.5	30.5	28	8.6	4.2

Key literature: Noble (1921a).

Conservation status: IUCN: not yet assessed (IUCN 2013).

***Pseudogonatodes barbouri* (Noble, 1921)** (Figure 2.1.8 F)

Lepidoblepharis barbouri Noble 1921, Ann New York Acad. Sci 29: 133.
Pseudogonatodes barbouri — Parker 1926, Ann. Mag. Nat. Hist. (9) 17: 198.
Pseudogonatodes barbouri — Peters & Donoso-Barros 1970, Smithsonian Institution Press, Washington D.C. & London: 132.
Pseudogonatodes barbouri — Kluge 1993, San Diego, Internat. Gecko Soc., 245 S..
Pseudogonatodes barbouri — Rösler 2000, Gekkota 2: 106.

Holotype: MCZ 14044

Type locality: “Perico, Peru”

Voucher (3): CORBIDI 1822, ZFMK 90924, 90925

Distribution: This species is known from the dryforest valley of the Chinchipe and the Marañon River from Perico to Bellavista and Jaén, Region Cajamarca (Avila-Pires & Hoogmoed 2000, Noble 1921a). Besides one specimen from Perico, Cajamarca, we collected 2 individuals of *P. barbouri* from Zapatalgo, Amazonas and can thus expand the known distributional range of the species. Our specimens were collected at elevations between 515-1030 m a.s.l.

Remarks: Two specimens were each found under a single stone alongside a little trail or under a pile of stones, respectively. The single specimen from Perico was found in a rotten log.

Table 2.1.23. Morphometrics (mm) and pholidosis characters of *Pseudogonatodes barbouri*

No.	Sex	SL	IL	LFF	LFT	DOM	AGL	SVL	TL	HL	HW
CORBIDI 1822	♀	4/4	2/3	7	6	49	8.0	21.2	15.3	6.1	3.6
ZFMK 90924	♂	5/4	3/3	5	5	55	6.6	17.2	15.5	5	3.1
ZFMK 90925	♂	4/3	2/3	5	6	51	7.6	17.3	15.3	5.6	3.2

Key literature: Avila-Pires & Hoogmoed (2000); Huey & Dixon (1970); Noble (1921a).

Conservation status: IUCN: not yet assessed (IUCN 2013).

Figure 2.1.8. Gecko species from the inter-Andean dryforest valleys. A: *Phyllodactylus delsolari*; B: *P. interandinus*; C: *P. johnwrighti*; D: *P. reissii*; E: *P.* thompsoni; F: *Pseudogonatodes barbouri*; G: *Phyllopezus maranjonensis* with common color pattern; H: *Phyllopezus maranjonensis* with abnormal color pattern; I: *Gonatodes atricucullaris* ♂; J: *G. atricucullaris* ♀.

IGUANIA

Polychrotidae

Polychrus jacquelinae Koch, Venegas, Garcia-Bravo, Böhme, 2011

(Figure 2.1.9 A)

Polychrus jacquelinae Koch et al. 2011, ZooKeys, 141: 82.

Holotype: CORBIDI 7725

Type locality: "from a new road, that was still under construction and is intended to connect San Vicente/Pusaq and Uchumarca (06°59'S, 77°54'W, approximately 1460–1570 m above sea level), Province Bolivar, Región de La Libertad, Peru".

Voucher (6): see Koch et al. (2011).

Distribution: Only known from the type locality (Koch et al. 2011).

Remarks: see Koch et al. (2011).

Key literature: Koch et al. (2011).

Conservation status: IUCN: not yet assessed (IUCN 2013).

Polychrus peruvianus (Noble, 1924) (Figure 2.1.9 B)

Polychroides peruvianus Noble 1924, Occasional Papers of the Boston Society of Natural History, 5: 109.
Polychroides peruvianus — Burt & Burt 1933, Transactions of the Academy of Science of St. Louis, 28: 40.
Polychrus peruvianus — Etheridge 1965, Herpetologica, 21: 167.
Polychrus peruvianus — Gorman et al. 1969, Breviora, 316: 5.
Polychroides peruvianus — Peters & Donoso-Barros 1970, Smithsonian Institution Press, Washington D.C. & London: 232.
Polychroides peruvianus — Peters & Donoso-Barros 1986, Smithsonian Institution Press, Washington D.C. & London: 232.
Polychrus peruvianus — Lehr 2002, Natur und Tier-Verlag: 203.
Polychrus peruvianus — Yánez-Muñoz et al. 2006, Check List, 2 (2): 63.
Polychrus peruvianus — Koch et al. 2011, ZooKeys, 141: 89.

Holotype: MCZ 17973

Type locality: "valleys near Querocotilla, province of Cajamarca, Peru."

Voucher (49): see Koch et al. (2011)

Distribution: South Ecuador to Región Cajamarca, Peru, at elevations of 400 to 1750 m a.s.l. (Koch et al. 2011).

Remarks: see Koch et al. (2011).

Key literature: Duellman (1979); Gorman et al. (1969); Koch et al. (2011); Noble (1924); Schlüter (2010); Vanzolini (1983); Yánez-Munoz et al. (2006).

Conservation status: IUCN: Data Deficient (Cisneros-Heredia 2010).

Tropiduridae

Microlophus stolzmanni (Steindachner, 1891) (Figure 2.1.9 C, D)

Tropidurus stolzmanni Steindachner 1891, Ann. k. k. Hofmus. Wien 6: 371-378.
Tropidurus occipitalis bocourtii Burt & Burt 1931, Bull. Amer. Mus. Nat. Hist. 61: 291
Tropidurus occipitalis stolzmanni — Mertens 1956, Senck. Biol. 37: 101-136.
Tropidurus stolzmanni — Dixon & Wright 1975, Contrib. Sci. Nat. Hist. Mus. Los Angeles 271: 1-39.
Microlophus stolzmanni — Frost 1992, American Museum Novitates (3033): 1-68.
Microlophus stolzmanni — Lehr 2002, Natur und Tier-Verlag (Münster): 203.
Microlophus stolzmanni — Torres-Carvajal 2004, Herpetologica 60 (1): 75-83.

Syntypes: NMW 18908: 1,2

Type locality: “bei Chota”, Cajamarca, Peru

Voucher (108): CORBIDI 1794, 1839, 1841, 1850, 1859, 1862, 1868, 1871, 1878, 1880, 1885, 1887, 1888, 1892, 1897, 1906, 1917, 1918, 1923, 1925, 5770-5789, 5801, 7602-7618, 7620, 7621, 7676, 7677, ZFMK 88715-88725, 90839-90857, 91771-91786

Distribution: This species is endemic to northern Peru and so far known from the Regions Amazonas, Cajamarca and Piura at elevations of 475-1400 m (Dixon & Wright 1975). We found this species in the regions Cajamarca, Amazonas and La Libertad, from Santa Rosa, Jaén, Cajamarca in the north to Pias, Pataz, La Libertad in the south at elevations of 394-1952 m a.s.l.

Remarks: This species was detected sun basking on stones, stone walls, rocks or logs from 10 am to 5.30 pm. They were found active on tracks or in low gras vegetation from 11 am to 23 pm. Sleeping or resting animals were detected hidden under stones, logs or in holes of stone walls or unhidden or trunks, shrubs, cacti plants or on roofs between 7.15 pm and 0.30 am.

When animals were active substrate temperature ranged from 28.9°C to 33.1°C, air temperature reached from 22.7°C to 42.4°C and humidity ranged from 25% to 72%.

In the following table we provide ranges of the measurements and countings, as the number of collected specimens is too high to present the data individually for each voucher specimen.

Table 2.1.24. Morphometrics (mm) and pholidosis characters of *Microlophus stolzmanni*

Sex	SL	IL	LFF	LFT	DOM	DL	PV	SVL	TL
♀	5-9	5-10	20-24	26-33	73-107	46-63	78-120	≤ 119	≤ 129
♂	5-9	6-10	20-27	26-35	75-104	46-62	82-120	≤ 139	≤ 252
Juv.	5-10	6-9	20-27	27-34	80-109	48-58	89-113	≤ 65	≤ 119

Key literature: Dixon & Wright (1975); Mertens (1956); Schlüter (2000); Steindachner (1891).

Conservation status: IUCN: not yet assessed (IUCN 2013).

***Stenocercus huancabambae* Cadle, 1991** (Figure 2.1.9 E)

Stenocercus huancabambae Cadle 1991, Proc. Acad. Nat. Sci. Philad. 143: 30.
Stenocercus huancabambae — Torres-Carvajal 2004, Herpetologica 60 (1): 78.
Stenocercus huancabambae — Torres-Carvajal 2007, Herpetological Monographs 21: 124.

Holotype: MCZ 165319

Type locality: “San José (Bagua Grande), Dep. Amazonas, Perú”

Voucher (18): CORBIDI 1861, 1864, 1889, 1903, 1920, 1930, 1931, 5790-5792, ZFMK 88726-31, 90837-38

Distribution: This species is known from the northern Peruvian dryforest valley of the Marañon River in the regions Amazonas and Cajamarca (Cadle 1991, Torres-Carvajal 2007). As we found specimens in La Balza, San Ignacio, Cajamarca directly at the border to Ecuador it is most likely that the species also occurs in southern Ecuador. According to Cadle (1991) *S. huancabambae* is found at elevations between 200-920 m, due to our observations we can extend the elevational range up to 1318 m a.s.l.

Remarks: Individuals of this species were found throughout the year between 10 am and 8 pm at air temperatures of 25.5°C – 34°C, ground temperatures of 23°C – 31°C and an air humidity of 44% - 72 %. Most individuals were detected while they were running over the forest floor or between dense ground vegetation. One individual was sitting on an agave at the roadside. While taking a tissue sample from the femur muscle of CORBIDI 5791 directly after euthanization, we detected a long nematode inside the leg of this adult male.

Table 2.1.25. Morphometrics (mm) and pholidosis characters of *Stenocercus huancabambae*

No.	Sex	SL	IL	LFF	LFT	DOM	PV	SVL	TL	HL	HW
CORBIDI 1930	♀	7/8	7/7	17	27	39	53	61	140	15.3	9.5
CORBIDI 1931	♀	8/7	7/9	18	26	50	57	38	80	11.7	7.6
CORBIDI 1864	♂	7/6	7/6	18	27	46	56	40	114 m	13.7	8.3
CORBIDI 1861	♀	6/6	6/7	16	28	45	54	43	67	11.0	7.2
CORBIDI 1903	♀	6/5	7/7	17	26	45	59	75	156	17.5	10.9
CORBIDI 1889	Juv	7/5	7/7	19	29	43	48	38	broken	11.4	7.6
CORBIDI 1920	Juv.	7/6	7/6	15	26	38	50	33	58	10.4	5.7
ZFMK 88726	♂	7/7	6/6	17	26	47	57	68	156	10.0	16.0
ZFMK 88727	♀	6/6	7/7	16	24	44	61	70	157	10.0	17.0
ZFMK 88728	Juv.	6/5	6/6	16	29	51	55	39	78	6.0	12.0
ZFMK 88730	Juv.	5/7	6/7	18	28	48	53	39	82	7.0	11.0
ZFMK 88729	♂	5/4	6/5	17	25	46	55	69	152	11.0	17.0
ZFMK 88731	♀	5/6	6/6	17	24	37	60	66	139	11.0	17.0
CORBIDI 5790	♀	5/5	6/6	16	26	47	55	63	broken	15.6	8.3
CORBIDI 5791	♂	7/7	7/7	16	26	47	60	87	164	23.2	12.9
CORBIDI 5792	♀	6/6	6/6	18	28	48	55	48	87	13.3	7.1
ZFMK 90837	♂	5/5	6/6	16	23	42	55	66	144	16.9	12.3
ZFMK 90838	♀	5/5	6/6	17	25	45	58	59	broken	14.6	9.3

Key literature: Cadle (1991); Torres-Carvajal (2007).

Conservation status: IUCN: not yet assessed (IUCN 2013).

SCINCOMORPHA

Scincidae

Varzea altamazonica (Miralles, Barrio-Amoros, Rivas & Chaparro-Auza, 2006)

(Figure 2.1.9 F)

Mabuya altamazonica Miralles, Barrio-Amoros, Rivas & Chaparro-Auza 2006, Zootaxa 1188:1-22.
Varzea altamazonica — Hedges & Conn 2012, Zootaxa 3288: 215.

Holotype: MNHN 2006.0291

Type locality: “Kilometer 34 on road Tarapoto-Yurimaguas (600 m elevation), Concesión de Manejo de Fauna Silvestre ASPRAVEP (Asociación de Productores de Ranas Venenosas Progreso), Rio Cainarachi, Departamento San Martin, Peru.”

Voucher (5): CORBIDI 1032, 1033, 1911, 7644, ZFMK 88753

Distribution: This species is known from Southern Ecuador, Bolivia, Amazonian Peru and Western Brazil at elevations between 100-990 m a.s.l. (Harvey et al. 2008, Miralles et al. 2006, 2009a, Miralles & Carranza 2010). We collected *V. altamazonica* in Gotas de Agua near Jaén and in Santa Rosa de la Yunga, both Region of Cajamarca and in Cumba, Region of Amazonas, at elevations between 487-1239 m a.s.l..

Remarks: All specimens were found in dense ground vegetation. Our specimens broaden the previously known range of dorsal scale rows (48-55; Miralles et al. 2006) and have a slightly higher number of ventral scale rows than previously reported for the species (28-36; Miralles et al. 2006).

Table 2.1.26. Morphometrics (mm) and pholidosis characters of *Varzea altamazonica*

No.	Sex	DL	V	DOM	LFF	LFT	SVL	TL	HL	HW
CORBIDI 1032	/	47	35	20	11	14	81	broken	18.1	11.8
CORBIDI 1033	/	51	36	19	10	14	89	129	15.9	11.7
CORBIDI 1911	♂	57	34	30	12	16	81	58*	14.9	8.3
ZFMK 88753	♂	55	49	30	13	17	88	106	16.7	7.8
CORBIDI 7644	♀	41	37	28	11	14	82	131.5	18.5	11.0

*partly broken

Key literature: Miralles et al. (2006, 2009a,b); Miralles & Carranza (2010); Harvey et al. (2008).

Conservation status: IUCN: not yet assessed (IUCN 2013).

Teiidae

Ameiva aggerecusans Koch, Venegas, Rödder, Flecks & Böhme, in press

(Figure 2.1.9 G)

Ameiva aggerecusans Koch et al. (in press), Zootaxa

Holotype: ZMK 85024

Type locality: Balsas, Province Chachapoyas, Region Amazonas, Peru (06°49’11.6’’S, 78°00’12.2’’W, 1000 m above sea level).

Voucher (13): see Koch et al. (in press).

Distribution: Endemic to the canyon of the Marañon River from Zapatalgo to Balsas, Region Amazonas; 852-1037 m a.s.l. (Koch et al. in press).

Remarks: see Koch et al. (in press).

Key literature: Koch et al. (in press).

Conservation status: IUCN: not yet assessed (IUCN 2013). See comment under *Phyllodactylus delsolari*.

Ameiva concolor Ruthven, 1924 (Figure 2.1.9 H)

Ameiva bifrontata concolor Ruthven 1924, Occ. Pap. Mus. Zool. 155: 3-6.
Ameiva bifrontata concolor — Burt & Burt 1931, Bulletin American Museum of Natural History, 61: 227–395.
Ameiva bifrontata concolor — Peters & Donoso-Barros 1970, Smithsonian Institution Press, Washington D.C. & London: 20.
Ameiva bifrontata concolor — Peters & Donoso-Barros 1986, Smithsonian Institution Press, Washington D.C. & London: 20.
Ameiva concolor — Harvey *et al.* 2012, Zootaxa, 3459: 1–156.
Ameiva concolor — Koch *et al.* (in press), Zootaxa

Holotype: UMMZ 59192

Type locality: Paipoy, Rio Crisnejas, 24 km from Marañòn (elevation 1067 m), province of Cajamarca, Peru.

Voucher (10): see Koch et al. (in press).

Distribution: Canyons of the Crisnejas and Marañon River in the Northern Peruvian Andes from Paipoy to Pias (Laguna), Region La Libertad; 1067-1720 m a.s.l. (Koch et al. in press).

Remarks: see Koch et al. (in press).

Key literature: Burt & Burt (1931); Koch et al. (in press); Ruthven (1924).

Conservation status: IUCN: not yet assessed (IUCN 2013). See comment under *Phyllodactylus delsolari*.

Ameiva nodam Koch, Venegas, Rödder, Flecks & Böhme, in press (Figure 2.1.9 I)

Cnemidophorus divisus Fischer 1879, Verhandlungen des Naturwissenschaftlichen Verein in Hamburg 3: 78–103. (the original description refers to a Venezuelan taxon described by Fischer as C. divisus)
Ameiva bifrontata divisa — Ruthven 1924, Occasional Papers of the Museum of Zoology, University of Michigan (155): 1–6.
Ameiva bifrontata divisa — Burt & Burt 1931, Bulletin American Museum of Natural History, 61: 227–395.
Ameiva bifrontata divisa — Burt & Burt 1933, Transactions of the Academy of Science of Saint Louis 28 (i): v–108.
Ameiva nodam Koch *et al.* (in press), Zootaxa

Holotype: CORBIDI 1870

Type locality: Bellavista, Province Jaén, Region 250 Cajamarca, Peru (05°38'15.6''S, 78°37'59.2''W, 390–440 m above sea level).

Voucher (29): see Koch et al. (in press).

Distribution: Canyons of the Chinchipe, Chamaya, Huancabamba, Utcubamba and Marañón River from Fonda Atapaca (near Chinchipe River, East of San Ignacio, 450 m), Región Cajamarca to Puerto Malleta, Región Cajamarca (near Rio Marañón, 509 m above sea level), Peru; 390-1054 m a.s.l. (Koch et al. in press).

Remarks: see Koch et al. (in press).

Key literature: Koch et al. (in press).

Conservation status: IUCN: not yet assessed (IUCN 2013). See comment under *Phyllodactylus delsolari*.

***Callopistes flavipunctatus* (Duméril & Bibron, 1839)** (Figure 2.1.9 J)

Aporomera flavipunctata Duméril & Bibron 1839, Erpétologie Général on Histoire Naturelle Complète des Reptiles Vol.5: 72.
Callopistes flavipunctatus — Gray 1845, Trustees of the British Museum/Edward Newman, London: 17.
Tejovaranus branickii Steindachner 1878, Denkschr. Kais. Akad. Wiss. 38: 93.
Callopistes flavipunctatus — Werner 1901, Abh. Ber. Königl. Zool. Anthrop.-Ethnogr. Mus. Dresden 9: 5.
Callopistes flavipunctatus — Burt & Burt 1933, Trans. Acad. Sci. St. Louis: 58.
Callopistes flavipunctatus — Peters & Donoso-Barros 1970, Smithsonian Institution Press, Washington D.C. & London: 88.
Callopistes flavipunctatus — Peters & Donoso-Barros 1986, Smithsonian Institution Press, Washington D.C. & London: 88.
Callopistes flavipunctatus — Bonetti 2002, Mondadori (Milano): 170.
Tejovaranus flavipunctatus — Schlueter 2004, Sauria, Berlin 26 (1): 17-21.

Syntypes: MHNP 8298 (2)

Type locality: "Tropical South America"

Voucher (3): CORBIDI 1875, 7645, ZFMK 88714

Distribution: This species occurs in southern Ecuador and northern Peru (Schlüter 2004). We collected three specimens in Bellavista, Province Jaén, Region Cajamarca at elevations of around 450 m a.s.l.

Remarks: We found *C. flavipunctatus* in April and the first days of May active during the daytime (9 – 2 pm) at air temperatures of up to 43.6 °C. After 2 pm and in the winter months we could not find individuals of this thermophile species. It probably holes up in its own digged burrows during climatic unfavourable periods.

Table 2.1.27. Morphometrics (mm) and pholidosis characters of *Callopistes flavipunctatus*

No.	Sex	V	Ventrals in transverse line	LFF	LFT	SVL	TL	HL	HW
CORBIDI 1875	♂	76	64	23	39	310	534	62.9	29.1
CORBIDI 7645	juv.	85	62	20	30	144	318	31.0	14.0
ZFMK 88714	juv.	76	47	19	29	151	338	36.5	12.0

Key literature: Schlueter (2004); Werner (1901); Ziegler & Böhme (1997).

Conservation status: IUCN: not yet assessed (IUCN 2013).

Figure 2.1.**9**. Lizard species from the inter-Andean dryforest valleys. A: *Polychrus jacquelinae*; B*: P. peruvianus*; C: *Microlophus stolzmanni* ♂; D: *Microlophus stolzmanni* ♀; E: *Stenocercus huancabambae*; F: *Varzea altamazonica*; G: *Ameiva aggerecusans*; H: *A. concolor*; I: *A. nodam*; J: *Callopistes flavipunctatus*.

AMPHISBAENIA

Amphisbaenidae

***Amphisbaena pericensis* Noble, 1921** (Figure 2.1.10 A)

Amphisbaena pericensis Noble 1921, Ann New York Acad. Sci 29: 141.
Amphisbaena pericensis — Hoogmoed & Avila-Pires 1991, Boletim Do Museu Paraense Emilio Goeldi Serie Zoologia 7 (1): 89.
Amphisbaena pericensis — Gans 2005, Bull. Am. Mus. Nat. Hist. 289: 18.

Holotype: MCZ 14631

Type locality: "Peru: Cajamarca: Perico (05°21'S, 78°47'W)"

Voucher (2): CORBIDI 1867, ZFMK 88754

Distribution: This species is known from Perico to Bellavista, Region Cajamarca, Peru (Noble 1921b). We found *A. pericensis* in Bellavista and in Gotas de Agua near Jaén, Region Cajamarca at elevations between 447- 717 m a.s.l.

Remarks: The number of body annuli of our two specimens is a bit higher than previously reported for the species (198-218; Gans 1963, Vanzolini 2002). ZFMK 88754 was caught with a pit fall trap and had the tail fully automotised. CORBIDI 1867 was found at 1 pm crawling on soft soil at a humidity of 82% and an air temperature of 25°C.

Table 2.1.28. Morphometrics (mm) and pholidosis characters of *Amphisbaena pericensis*

No.	Body annuli	Tail annuli	SL	IL	number of dorsal segments to a midbody annulus	number of dorsal segments to a midbody annulus	Preanal pores	SVL	TL
CORBIDI 1867	220	22	4/4	4/4	16	18	4	150	17
ZFMK 88754	232	/	4/4	4/4	14	16	4	136	/

Key literature: Gans (1963, 2005); Noble (1921b); Vanzolini (2002).

Conservation status: IUCN: not yet assessed (IUCN 2013).

OPHIDIA

Boidae

Boa constrictor LINNAEUS, 1758

Boa constrictor ortonii Cope, 1878 (Figure 2.1.10 B)

Boa ortonii Cope 1878, Proc. Amer. Phil. Soc. 17: 35.
Constrictor constrictor Dunn 1923, Proc. Biol. Soc. Wash. 36: 186.
Constrictor constrictor ortonii — Schmidt & Walker 1943, Publ. Field. Mus. Nat. Hist., Chicago, (Zool. Ser.) 24: 305.
Constrictor constrictor ortonii — Prado & Hoge 1947, Mem. Inst. Butantan 20: 284.
Boa constrictor ortonii — Stimson 1969, Das Tierreich 89: 4.
Boa constrictor ortonii — Peters & Orejas-Miranda 1970, United States Nat. Mus. Bull. 297: 38.
Boa constrictor ortonii — Bonny 2007, Die Gattung Boa. KUS-Verlag: 83.

Holotype: ANSP 11402

Type locality: “Chilete (Cajamarca), west of Pacasmayo, Peru.”

Voucher (1): CORBIDI 5795

Distribution: This subspecies of *B. constrictor* is endemic to Peru and occurs in the Regions Piura, Lambayeque, Cajamarca, Amazonas and La Libertad west of the Andes and along the valley of the Marañón River at elevations of 0-2000 m a.s.l. (Bonny 2007, Pesantes-Segura 2000).

Remarks: We found a juvenile female individual at 7.20 pm in about 8 m height on a steep, stony and sandy slope beside the road in Cumba, Region Amazon at 467 m a.s.l.. The scale counts and the high number of 37 saddle blotches of our specimen are typical for the subspecies ortonii.

Table 2.1.29. Morphometrics (mm) and pholidosis characters of *Boa constrictor ortonii*

Sex	D	V	SC	SL	IL	SVL	TL	HL	HW
♀	50-64-38	249	54	22/22	23/25	596	62	28.8	10.7

Key literature: Binder (2002); Binder & Lamp (2007); Bonny (2007); Bosch (1994); Medina (1974); Pesantes-Segura (2000); Price & Russo (1991); Schmidt & Walker (1943).

Conservation status: IUCN: not yet assessed (IUCN 2013).

Elapidae

***Micrurus peruvianus* Schmidt, 1936** (Figure 2.1.10 C)

Micrurus corallinus Dunn 1923 (nec Wied), Proc. Biol. Soc. Wash. 36: 186.
Micrurus peruvianus Schmidt 1936, Zoological Series of Field Museum of Natural History 20 (19): 193.
Micrurus peruvianus — Kuch, Ayala-V. & Freire L. 2002, Herpetozoa 15(3/4): 182.

Holotype: MCZ 17385

Type locality: "Perico, Department of Cajamarca, Peru."

Voucher (1): CORBIDI 1912

Distribution: This species is distributed in Ecuador and northern Peru (Campbell & Lamar 1989, Kuch et al. 2002). We collected the only specimen with a pitfall trap in Gotas de Agua, Province Jaén, Region Cajamarca.

Remarks: The specimen was already dead when we discovered it in the pit fall trap.

Table 2.1.30. Morphometrics (mm) and pholidosis characters of *Micrurus peruvianus*

Sex	D	V	SC	SL	IL	SVL	TL	HL	HW
/	15-15-15	173	32	7/6	7/6	326	33	7.5	3.9

Key literature: Campbell & Lamar (1989); Kuch et al. (2002); Schmidt (1936).

Conservation status: IUCN: not yet assessed (IUCN 2013).

Viperidae

Bothrops sp. (Figure 2.1.10 D)

Voucher (3): CORBIDI 1876, 7646, ZFMK 91792

Distribution: We found this species in the interandean valley of the Marañon River from Bellavista, Province Jaén, Region Cajamarca, to Calemar, Province Pataz, Region La Libertad, at elevations between 430-1312 m a.s.l.

Remarks: CORBIDI 1876 was detected on 8th of May 2008 at 8 pm resting on a fallen tree trunk. The two juveniles CORBIDI 7646 and ZFMK 91792 were both detected at around mid of October 2010. The former specimen was found at 9 pm lying on dry sandy ground protected by an overhanging rock from the rain. The latter was lying at 5.30 pm on sandy ground at the bank of Rio Crisnejas. Air temperature when animals were sighted ranged from 23.2°C-31.3°C and ground temperature was at 32.5°C.

This species differs from other known species of the genus in several characters and will be described elsewhere.

Dunn (1923) mentions a specimen of *B. atrox* which was collected by G.K. Noble during the Havard Peruvian Expedition in 1916 from Perico, Cajamarca. We have not examined this specimen, but due to the distribution we assume that it rather belongs to this undescribed species of *Bothrops* instead of *B. atrox.*

Table 2.1.31. Morphometrics (mm) and pholidosis characters of *Bothrops sp.*

No.	Sex	D	V	SC	SL	IL	SVL	TL	HL	HW
CORBIDI 1876	♀	29-24-21	190	57	7/7	10/10	810	120	37	18
CORBIDI 7646	Juv.	23-24-19	204	54	7/7	8/8	225	33	15	8
ZFMK 91792	♀	24-23-19	200	53	7/7	8/9	396	54	19	10

Key literature: Fenwick et al. (2009); Schätti & Kramer (1993).

Conservation status: IUCN: not yet assessed (IUCN 2013).

Figure 2.1.10. Amphisbaenidae and snakes from the inter-Andean dryforest valleys. A: *Amphisbaena pericensis*; B: *Boa constrictor ortonii*; C: *Micrurus peruvianus*; D: *Bothrops* sp..

Colubridae

Colubridae sp. (Figure 2.1.11)

Voucher (2): ZFMK 95238, CORBIDI 7726

Distribution: We found this species in Santa Rosa (Marcamachay), Province Cajabamba, and in Pías, Province Pataz, both Region La Libertad, at elevations of 1154 m and 1726 m a.s.l, respectively.

Remarks: The female CORBIDI 7726 was detected on 7th of January 2010 at 12.30 pm resting on a stone. The male CK 430 was detected on 12th of October 2010 at 8.15 pm on pebbly-clayey ground. Air temperature when animals were sighted was 33.3°C and 28.1°C, respectively.

The two adult specimens exhibit a conspicuous sexual dimorphism in body size and ventral colouration.

This species could not be assigned to any of the known colubrid genera and represents a new so far monotypic genus which will be described elsewhere.

This terrestrial colubrid snake is characterized by: (1) eyes small, not visible from below, with round pupils; (2) dorsals smooth, without keels or apical pits, rhomboid, in 15 rows throughout the body; (3) loreals absent; (4) suboculars absent; (5) longitudinal mental groove present; (6) anal plate divided; (7) subcaudals paired; (8) Hypapophyses developed in all trunk vertebrae; (9) mental groove absent; (10) hemipenes single; (11) body with dark bands that are not closed on ventral side.

Table 2.1.32. Morphometrics (mm) and pholidosis characters of Colubridae sp.

No.	Sex	D	V	SC	SL	IL	SVL	TL	HL	HW
CORBIDI 7726	♀	15-15-15	182	57	7/7	6/6	513	125	16	12
ZFMK 95238	♂	15-15-15	179	65	6/6	5/6	198	56	8	5

Conservation status: IUCN: not yet assessed (IUCN 2013).

Figure 2.1.11. Colubridae sp. A: Dorsal view of female; B: Ventral view of female; C: Dorsal view of male; D: Ventral view of male.

Chironius exoletus (Linnaeus, 1758) (Figure 2.1.12 A)

Coluber exoletus Linnaeus 1758, Systema Naturae 10th Edition: 223.
Natrix exoleta — Laurenti 1768, Synopsin Reptilium, Vienna, Joan. Thomae: 78.
Coluber carinatus — Merrem 1820, Versuch Syst. Amphib., J. C. Kriegeri, Marburg: 120.
Coluber pyrrhopogon Wied 1824, Isis von Oken 14: 666.
Tyria exoleta — Fitzinger 1826, Isis von Oken 19: 884.
Erpetodryas exoletus — Boie 1826, in Schlegel, Bull. Sci. Nat. Geol. Paris: 327.
Herpetodryas exoletus — Wagler 1830, in Spix, Nat. Syst. Amphib.: 180.
Herpetodryas carinatus — Cope 1868 , Proc. Acad. Nat. Sci. Philadelphia, 20: 105.
Zaocys tornieri Werner 1896, Verh. Zool. Bot. Ges. Wien 46: 6-24: 15.
Chironius carinatus — Amaral 1931, Bull. Antivenin Inst. Am. 4: 91.
Chironius pyrrhopogon — Bailey 1955, Occasional Papers of the Museum of Zoology, University of Michigan (571): 12.
Chironius cochrane — Hoge & Romano 1969, Mem. Inst. Butantan 34: 93.
Chironius exoletus — Hoge, Romano, & Cordeiro 1978, Mem. Inst. Butantan 40/41: 41.
Chironius exoletus — Vanzolini in Peters & Orejas Miranda 1986, Smithsonian Institution Press, Washington D.C. & London: 5.
Chironius exoletus — Starace 1998, Ibis Rouge Editions, Guadeloupe, Guyane: 146.
Chironius exoletus — Dixon, Wiest & Cei1993, Museo Regionale di Scienze Naturali Monografie (Turin) 13: 92.
Chironius exoletus — La Marca, Mus. Cien. Tecno. Mérida, Vol.1: 138.
Chironius exoletus — Kornacker 1999, PaKo-Verlag, Rheinbach, Germany: 71.
Chironius exoletus — Savages 2002, University of Chicago Press: 649.

Holotype: Number 150 of Linnaeus´ Collection at ZMUU, ZMUU 135 according to Hoge et al. (1978) in their redescription of the holotype.

Type locality: “Indiis”

Voucher (1): CORBIDI 7668

Distribution: This species is wildely distributed in Argentina, Bolivia, Brazil, Colombia, Costa Rica, Ecuador, French Guiana, Guyana, Panama, Peru, Suriname, and Venezuela, at heights between 333-2400 m a.s.l (Dixon et al. 1993, Pérez-Santos & Moreno 1988). We collected the only specimen in Peru in Cumba, region Amazonas at 496 m a.s.l.

Remarks: We found the specimen at 10.45 pm sleeping in a tree (Acacia macracantha) at about 5 m aove the ground.

Table 2.1.33. Morphometrics (mm) and pholidosis characters of *Chironius exoletus*

Sex	D	V	SC	SL	IL	SVL	TL
♂	12-12-8	139	136	9	9	564	358

Key literature: Dixon et al. (1993); Giraudo & Scrocchi (2002); Hollis (2006); Kok (2010); Kornacker (1999); Lehr (2002); Pérez-Santos & Moreno (1988); Rojas-Runjaic (2006).

Conservation status: IUCN: not yet assessed (IUCN 2013).

Clelia clelia **(Daudin, 1803)** (Figure 2.1.12 B)

Coluber clelia Daudin 1803, Histoire naturelle, générale et particulière des Reptiles, tom. 6: 330.
Clelia daudini Fitzinger 1826, Neue Classification der Reptilien: 55.
Brachyruton cloelia — Duméril, Bibron & Duméril 1854, Deuxième partie, comprenant l'histoire des serpents venimeux. Paris, Librairie Encyclopédique de Roret: 1007.
Oxyrhopus clelia — Cope 1878, Proc. Amer. Philos. Soc. 17 [1877]: 33
Oxyrhopus cloelia [sic] — Boulenger 1886, Ann. Mag. nat. Hist. (5) 18: 437
Clelia cloelia — Stejneger 1913, Proc. US. Natl. Mus. 45 (1992): 541-547.
Pseudoboa cloelia — Serié 1936, Inst. Mus. Univ. La Plata, Obra Cincuentenario: 47.
Clelia clelia immaculata Smith, 1942, Proc. U.S. Natl. Mus., 92: 394.
Clelia clelia clelia — Dunn 1944, Caldasia 3 (12): 201.
Clelia clelia groomei Greer 1965, Breviora (223): 1.
Clelia clelia clelia — Duellman 1978, Misc. Publ. Univ. Kans. Mus. Nat. Hist. 65: 235
Clelia clelia clelia — Gasc & Rodrigues 1980, Bull. Mus. Nat. Hist. Nat. Paris 2 (4): 559-598.
Clelia clelia — Schwartz & Henderson 1991, University of Florida Press, Gainesville: 595.
Clelia clelia clelia — Cei 1993, Museo Regionale Sci. Naturale Torino, Monografie 14: 1-949.
Clelia clelia — Liner 1994, Herpetol. Circ. No. 23: 1-113.
Boiruna maculata — Leynaud & Bucher 1999, Academia Nacional de Ciencias Miscelanea (98): 15
Clelia clelia clelia — Gorzula & Señaris 1999, Scientia Guaianae, Caracas, No. 8 [1998], 269+ pp.
Boiruna maculata — dos Santos-Costa et al. 2000, Rev. Inst. Med. trop. S. Paulo 42 (5): 283.
Boiruna maculata — Campos Nogueira 2001, Herpetological Review 32 (4): 285-287.

Clelia clelia clelia — Boos 2001, Texas A&M University Press, 270 pp.
Clelia clelia — Scott et al. 2006, Pap. Avuls. Zool. 46 (9): 88.

Holotype: "Presumably lost" (Zaher 1996).

Type locality: "Suriname"

Voucher (2): CORBIDI 1444, 7671

Distribution: This species is wildly distributed and occurs in Argentina, Belize, Bolivia, Brazil, Colombia, Costa Rica, Ecuador, El Salvador, French Guiana, Guatemala, Honduras, Lesser Antilles, Mexico, Nicaragua, Panama, Paraguay, Peru, Suriname, Uruguay, and Venezuela at altitudes up to 2500 m a.s.l. (Lehr 2002, Pérez-Santos & Moreno 1988, 1991, Scott et al. 2006). We collected our specimens in Cumba and in Balsas, both Region of Amazonas at elevations of about 465 m and 1000 m a.s.l, respectively.

Remarks: The juvenile specimen was found at 7.45 pm at the roadside next to a restaurant. The male was collected on 23rd of June 2006 near Quebrada Honda in Balsas.

Table 2.1.34. Morphometrics (mm) and pholidosis characters of *Clelia clelia*

No.	Sex	D	V	SC	SL	IL	SVL	TL
CORBIDI 1444	♂	17-19-17	216	74	7/7	7/7	1405	325
CORBIDI 7671	juvenile	17-19-17	228	77	7/7	7/7	416	86.5

Key literature: Delia (2009); Giraudo (2002); Greer (1965); Lehr (2002); Pizzatto (2005); Pérez-Santos & Moreno (1988, 1991); Santos-Costa et al. (2000); Scott et al. (2006); Vaughan & Ruiz-Gutierrez (2006); Zaher (1996).

Conservation status: IUCN: not yet assessed (IUCN 2013).

Leptodeira septentrionalis KENNICOTT, 1859

Leptodeira septentrionalis larcorum Schmidt & Walker, 1943 (Figure 2.1.12 C)

Leptodeira larcorum Schmidt & Walker 1943, Zool. Ser. Field. Mus. Nat. Hist. 24: 311.
Leptodeira rhombifera larcorum — Shreve 1947, Bull. Mus. Comp. Zoöl. 99 (5): 531.
Leptodeira septentrionalis larcorum — Duellman 1958, Bull. Amer. Mus. Nat. Hist. 114: 77.
Leptodeira septentrionalis larcorum — Peters & Orejas-Miranda 1970, Smith. Inst. Press, Washington D.C. & London: 155.
Leptodeira septentrionalis larcorum — Perez-Santos & Moreno 1991, Mus. Reg. Sci. Nat. Torino Monogr. 11: 207.

Holotype: FMNH 34302

Type locality: “Chiclin, Libertad, Peru.“

Voucher (11): CORBIDI 1865, 5643, 5644, 7664-66, ZFMK 85030, 90929, 90930, 91793, 91794

Distribution: This subspecies of *Leptodeira septentrionalis* is known from Ecuador (Pérez-Santos & Moreno 1991) and Peru (Schmidt & Walker 1943). In Peru it is known from the Regions Ancash, Cajamarca, La Libertad and Lambayeque (Carrillo de Espinoza & Icochea 1995, Duellman 1958, Williams & Plenge 2005). We found specimens in the regions Amazonas, Cajamarca and La Libertad between Bellavista (Jaén, Cajamarca) and Pías (Pataz, La Libertad) at elevations of 410-1857 m a.s.l.

Remarks: ZFMK 85030 was discovered on 10th of July 2005 at 9.40 pm on a pile of branches that rose above the water of Quebrada Honda (Balsas, Amazonas). The snake seemed to couch on tadpoles of *Rhinella limensis* that were cavorting in the water beneath. CORBIDI 1865 was creeping at the roadside while it was raining on 9th of May 2008 at 10.15 pm. ZFMK 90929 and 90930 were both detected at the end of March 2009 at 7.15 pm and at 10 pm, respectively, curled up on a branch of a tree (*Acacia macracantha*) in about 2 m height. CORBIDI 7664 was also collected at the end of March 2009 at 10.25 pm while it was slowly creeping along a sandy wall at the roadside in about 3 m above the ground. CORBIDI 5643 was captured on 9th of December 2009 at 5.15 pm from a decaying log. One day later we detected CORBIDI 5644 at 9.20 pm in a fern at 20 cm above the ground between the road and the Quebrada Pangueico (Zapatalgo, Amazonas). CORBIDI 7665 was creeping along a stone wall at the roadside on 7th of January 2010 at 8.50 pm. 5 days later we detected CORBIDI 7666 at 11 pm in a plant. Another 4 days later ZFMK 91793 was detected at 7.30 pm curled-up on a stone at the edge of Laguna de Pías (Pias, La Libertad). ZFMK 91794 was detected on 21st of October 2010 at 7.15 pm in an interstice of a stone wall.

When individuals of the species were sighted air temperature ranged from 23.4°C-31.9°C, substrate temperature ranged from 23.2°C-27.9°C and air humidity ranged from 46-76%.

The number of dorsal scale rows at midbody (DOM) of our collected specimens is slightly lower (17-21) as compared to the 24 specimens examined by Duellman (1958) which have between 21 and 23 DOM. On the contrary the number of ventrals of our specimens is slightly higher (176-196) as compared to Duellman's specimens (170-185).

Table 2.1.35. Morphometrics (mm) and pholidosis characters of *Leptodeira septentrionalis larcorum*

No.	Sex	D	V	SC	SL	IL	SVL	TL
CORBIDI 1865	♂	19-21-15	186	40*	8/8	8/8	335	68
CORBIDI 5643	♂	17-20-15	194	36*	7/7	9/8	419	63
CORBIDI 5644	♀	19-20-15	196	94	8/8	11/12	218	77
CORBIDI 7664	♀	20-20-16	176	77	8/8	9/9	130	47.4
CORBIDI 7665	♂	20-19-15	187	89	8/8	9/9	290	86
CORBIDI 7666	♂	15-17-15	187	87	8/8	9/9	228	79.5
ZFMK 85030	♂	19-19-14	188	91	8/8	9/10	395	149
ZFMK 90929	♂	19-20-15	191	88	9/8	10/10	355	127
ZFMK 90930	♀	20-21-18	189	91	8/8	10/11	535	188
ZFMK 91793	♀	19-21-15	190	26*	8/8	10/11	605	60*
ZFMK 91794	♂	20-21-15	189	21*	8/8	10/10	443	43*

*tail ends very blunt, ultimate part of tail may be missing due to a former injury

Key literature: Duellman (1958); Pérez-Santos & Moreno (1991); Schmidt & Walker (1943).

Conservation status: IUCN: not yet assessed (IUCN 2013).

***Mastigodryas reticulatus* (Peters, 1863)** (Figure 2.1.12 D)

Herpetodryas reticulata Peters 1863, Monatsber. Akad. Wiss: 285.
Mastigodryas reticulatus — Montingelli et al. 2011, South Am. J. Herpetol. 6 (3): 190.

Holotype: ZMB 4504

Type locality: "Guayaquil"

Voucher (1): CORBIDI 1003, 1934, 7658

Distribution: According to Montingelli et al. (2011) this species occurs from central and southwestern Ecuador to southern Ecuador in lowland regions up to 600 m.a.s.l. We collected our specimens in the Regions Cajamarca and La Libertad at elevation between 669 and 1239 m a.s.l. And can thus extend the known distribution of the species to northern Peru.

Remarks: CORBIDI 1003 was collected on 21st of November 2005 in the surroundings of Santa Rosa de la Yunga. CORBIDI 7658 was found on 17th of October 2010 in Calemar. CORBIDI 1934 was detected on 18th of June 2008 at 2.40

pm creeping at the roadside in Perico. Air temperature was 30.4°C, ground temperature was 25.7°C and air humidity was 58%.

M. reticulatus was recently revalidated and redescribed by Montignelli et al. (2011). All specimens coincide well with the figures (2,3) they provide of a freshly preserved specimen from Ecuador. The dorsum is olive-brown in the anterior part fading to a more reddish-brown posteriard. Most dorsal scales show dark apical edges. The supralabials, ventral surface of head and the first ventrals are bright yellow, the latter fading posteriard towards an immaculate cream colour.

Table 2.1.36. Morphometrics (mm) and pholidosis characters of *Mastigodryas reticulatus*

No.	Sex	D	V	SC	SL	IL	SVL	TL
CORBIDI 1934	♀	19-17-15	190	111	9/9	9/9	836	334
CORBIDI 7658	/	16-16-15	192	115	9/9	9/9	347	132
CORBIDI 1003	♀	17-17-15	197	113	9/9	10/10	790	350

Key literature: Montingelli et al. (2011).

Conservation status: IUCN: not yet assessed (IUCN 2013).

***Mastigodryas heathii* (Cope, 1876)** (Figure 2.1.12 E)

Drymobius heathii Cope 1876, Journal of the Academy of Natural Sciences of Philadelphia (2) 8: 179.
Herpetodryas boddaerti var. *heathii* — Boettger 1889, Ber. Senck. Ges.: 313.
Dryadophis heathii — Stuart 1939, Copeia (1): 55.
Dryadophis heathii — Stuart 1941, Misc Publ., Museum of Zoology, University of Michigan (49): 1-106.
Dryadophis boddaerti heathii — Schmidt & Walker 1943, Zool. Ser. Field Mus. Nat. Hist.: 306.
Mastigodryas heathii — Peters & Orejas-Miranda 1970, United States Nat. Mus. Bull. 297: 194.
Mastigodryas heathii — Lehr et al. 2002, Faunistische Abhandlungen, Staatliches Museum für Tierkunde Dresden:382.
Mastigodryas heathii — Montingelli et al. 2011, South Am. J. Herpetol. 6 (3): 191.

Holotype: ANSP 11544

Type locality: “Valley of Jequetepeque, Peru”

Voucher (3): CORBIDI 7669, ZFMK 91801

Distribution: According to Montingelli et al. (2011) this species is distributed from southwestern Ecuador to the Region Lima in Peru, from sea level up to 2000 m a.s.l. Lehr (2002) found this species in the Region Ancash at elevations up to 2620 m a.s.l. Our individuals were collected in the Regions Cajamarca and La Libertad at elevations of 1128 -1507 m a.s.l.

Remarks: CORBIDI 7669 was detected on 24th of April 2009 at 12.15 pm while it was creeping in about 1.5 m height on sandy walls at the roadside. ZFMK 91801 was detected on 13th of October 2010 at 4.40 pm moving in a crevice near the Rio Crisnejas. Air temperature when the specimens were sighted ranged from 31.5°C-34°C, ground temperature ranged from 28°C-44°C and air humidity was at 45%.

CORBIDI 7669 has a greyish-brown dorsum and a pale grey lateral longitudinal stripe on the anterior half of the body; the stripe fades posteriard to a pale ocher.

M. boddaerti and *M. heathii* both share a lateral longitudinal stripe on the body. They differ in the position of the stripe, which is thin and situated on the scale rows 4-5 in *M. boddaerti* and relatively thick and situated on the scale rows 4-6 anteriorly and 3-5 posteriorly in *M. heathii* (Schmidt & Walker 1943, Stuart 1941).

In life, ZFMK 91801 has a brownish head and a bluish-grey dorsum with a very light lateral stripe on the scale rows 4 and 5 on the anterior part of the body, which gradually disappears posteriorly. Most scales dorsally exhibit dark apical edges. This colour pattern resembles the pattern described by Montignelli et al. (2011) for preserved specimens of *M. reticulatus*.

Although some doubts are remaining, we place this specimen to *M. heathii* as we found it within the known altitudinal and distributional range of *M. heathii* as quoted by Montingelli et al. (2011).

Table 2.1.37. Morphometrics (mm) and pholidosis characters of *Mastigodryas heathii*

No.	Sex	D	V	SC	SL	IL	SVL	TL
CORBIDI 7669	♀	17-17-15	195	119	9/9	10/10	756	321
ZFMK 91801	♀	17-17-15	195	109	9/9	10/10	878	349

Key literature: Cope (1876); Lehr (2002); Montingelli et al. (2011); Schmidt & Walker (1943); Stuart (1941).

Conservation status: IUCN: Least Concern (Lehr 2010).

Mastigodryas boddaerti (Sentzen, 1796) (Figure 2.1.12 F)

Coluber boddaerti — Sentzen 1796, Ophiologische Fragmente, Meyers. Zool. Arch. 2: 59.
Drymobius boddaertii — Amaral 1925, Proc. U.S. Nat. Mus. 67: 24.
Dryadophis boddaerti — Stuart 1939, Copeia (1): 55.
Dryadophis boddaertii — Alemán 1953, Mem. Soc. Cien. Nat. La Salle 13: 213.
Dryadophis boddaertii — Roze 1958, Acta Biol. Venezuélica 2: 264.
Dryadophis boddaertii — Roze 1966, Taxonom. Zoogeo. Ofidios de Venezuela: 120.
Mastigodryas boddaerti — Peters & Orejas-Miranda 1970, United States Nat. Mus. Bull. 297: 192.
Mastigodryas boddaerti —La Marca 1997, Mus. Cien. Tecno. Mérida, Vol. 1: 138.

Mastigodryas boddaerti —Kornacker 1999, Checklist and key to the snakes of Venezuela: 114.
Mastigodryas boddaerti — Montingelli et al. 2011, South Am. J. Herpetol. 6 (3): 191.

Holotype: ANSP 5651

Type locality: "200 miles of Caracas, Colombia ?, Venezuela"

Voucher (1): CORBIDI 7657

Distribution: This species is wildly distributed and occurs in Bolivia, Brazil, Colombia, Ecuador, French Guiana, Guayana, Surinam, Venezuela, Tobago and Trinidad (Kornacker 1999). Our specimen was found near the Laguna de Pías (S 07°53'50.5'', W 077°34'26.3''), Province Pataz, Region La Libertad, Peru at an elevations of 1817 m a.s.l..

Remarks: The single specimen was detected on 18th of January 2010 at 3.25 pm shortly after it was overrun by a car.

The dorsum of our collected specimen is greyish-brown with a thin light lateral stripe on scale row 4 in posterior 2/3 of body. The anterior 1/3 of body exhibits bright yellow lateral and ventral scales, fading ventrally towards an immaculate greyish-white. The supralabials and the ventral surface of the head is bright yellow and a black line runs along the upper edge of the supralabials and sharply separates them from the adjacent head scales.

Table 2.1.38. Morphometrics (mm) and pholidosis characters of *Mastigodryas boddaerti*

Sex	D	V	SC	SL	IL	SVL	TL
/	16-16-15	185	110	9/9	11/11	434	200

Key literature: Kornacker (1999); Lehr (2002); Montingelli et al. (2011); Schmidt & Walker (1943).

Conservation status: IUCN: not yet assessed (IUCN 2013).

Oxybelis aeneus (Wagler, 1824) (Figure 2.1.12 G)

Dryinus aeneus Wagler 1824, Monaco, Typis Franc. Seraph. Hübschmanni: 12.
Coluber acuminatus Wied 1824, Isis von Oken 6: 667.
Dryinus auratus Bell 1825, Zool. Jour., London 2: 325.
Coluber acuminatus — Wied 1825, Isis von Oken 12: 1336.
Dryophis acuminatus — Fitzinger 1826, Isis von Oken 19: 884.
Dryophis aeneus — Fitzinger 1826, Isis von Oken 19: 884.
Oxybelis aeneus — Wagler 1830, Nat. System der Amphibien, mit vorangehender Classification der Säugetiere und Vögel: 183.
Dryinus veneus — Grifith & Pidgeon 1831, Whittaker, Treacher, and Co., London: 260.
Oxybelis aeneus — Gray 1831Whittaker, Treacher, and Co., London: 93.

Dryophis aurata — Schlegel 1837, La Hague, Kips and Van Stuckum. Partie générale:255.
Oxybelis aeneus — Duméril, Bibron & Duméril 1854, Erp. Gén. ou histoire naturelle complète des reptiles. Tome septième: 819.
Dryophis vittatus Girard 1854, Proc. Acad. Nat. Sci. Phila.:226.
Dryophis acuminate — Günther 1858, Catalogue of colubrine snakes in the collection of the british museum: 156.
Cryiophis acuminatus — Reinhardt 1860, Rhdt. Vidensk. Medd. Naturhist. Foren. Kjobenhavn. 2: 225.
Oxybelis acuminatus — Cope 1862, Proc. Acad. Natur. Sci. Philadelphia 14 (9): 356.
Dryophis acuminatus — Cope 1871, Proc. Acad. Natur. Sci. Philadelphia 23 (2): 204.
Oxibelis acuminatus — Garcia Cubas 1884, Oficina Tip. de la Secr. de Fomento, Mexiko : 177.
Dryophis acuminata — Ferrari-Perez 1886, Proc. United States Nat. Mus. 9: 185.
Dryophis aeneus — Garman 1887, Mass. Proc. Amer. Phil. Soc. 24 (126): 284.
Oxibilis acuminatus — Velasco 1892, Secr. Fomento, Méxiko, D. F.: 78.
Oxybelis acuminatus — Bocourt 1897, Livr. 15 Imprimerie Nat., Paris : 829-860.
Oxybelis argenteus Bocourt 1897, Livr. 15 Imprimerie Nat., Paris : 829-860.
Oxybelis accuminatus — Meek 1910, Field. Mus. Natur. Hist. Zool. Ser. 148, 7 (12): 416.
Oxybelis microphthalmus Barbour & Amaral 1926, Proc. New England Zool. Club 9: 80.
Oxybelis potosiensis Taylor 1941, Univ. Kansas Sci. Bull. 27: 128.
Oxybelis aeneus aeneus — Bogert & Oliver 1945, Bull. Amer. Mus. Nat. Hist. 83: 382.
Oxybelis aeneus auratus — Bogert & Oliver 1945, Bull. Amer. Mus. Nat. Hist. 83: 381.
Oxybelis auratus — Hall 1951, Univ. Kansas Sci. Bull. 34: 202.
Oxybelis aeneus — Gasc & Rodrigues 1980, Bull. Mus. Nat. Hist. Nat. Paris 2 (4): 559-598.
Oxybelis aeneus — Stebbins 1985, Houghton Mifflin, Boston: 220.
Oxybelis aeneus — Gorzula & Señaris 1999, Scientia Guaianae, Caracas No.8: 269.
Oxybelis argenteus — Gorzula & Señaris 1999, Scientia Guaianae, Caracas No.8: 269.
Oxybelis aeneus — Lehr 2002, Natur und Tier-Verlag (Münster): 95.
Oxybelis aeneus — Boundy et al. 2012, tandard Common and Current Scientific Names for North American Amphibians, Turtles, Reptiles, and Crocodilians, Seventh Edition. SSAR, 101 pp.

Lectotype: ZSM 2645/0

Type locality: “Solimöens, Tefé, Amazonas, Brazil.”

Voucher (9): CORBIDI 1849, 5645-47, 7670, ZFMK 90926-28, 91796

Distribution: This species is known from Belize, Bolivia, Brazil, Colombia, Costa Rica, Ecuador, El Salvador, French Guiana, Guatemala, Guyana, Honduras, Mexico, Nicaragua, Panama, Peru, Suriname, Tobago, Trinidad, USA, Venezuela at altitudes up to2500 m a.s.l (Cisneros-Heredia & Touzet 2007, Keiser 1974, 1982, Lehr 2002, Peters & Orejas-Miranda 1970). We collected specimens of this species in Peru in the regions Amazonas, Cajamarca and la Libertad, between Bellavista (Jaén, Cajamarca) and Calemar (Pataz, La Libertad) at elevations between 392-1500 m a.s.l.

Remarks: All specimens were detected during dusk or night time (5.20 pm – midnight) sleeping or resting on trees or branches in heights between approximately 40 cm and 6 m above the ground. Air temperature was between 24.9-28.1°C and humidity ranged from 58-75%.

Table 2.1.39. Morphometrics (mm) and pholidosis characters of *Oxybelis aeneus*

No.	Sex	D	V	SC	SL	IL	SVL	TL	HL	HW
CORBIDI 5645	♂	17-17-13	185	159	9/9	10/8	695	440	25.3	6.9
ZFMK 90926	♂	17-17-13	186	164	9/9	9/9	790	512	29.0	7.3
ZFMK 91796	♂	17-17-13	186	161	9/9	8/10	702	450	26.5	6.8
CORBIDI 5646	♀	17-17-13	190	165	9/9	11/10	553	320	21.5	5.9
CORBIDI 5647	♀	17-17-13	196	150	9/9	12/10	370	196	17.3	5.2
CORBIDI 7670	♀	17-17-13	192	159	9/9	9/9	549	314.5	20.2	5.5
CORBIDI 1849	♀	17-17-13	186	156	9/9	10/10	768	455	30.0	7.7
ZFMK 90927	♀	17-17-13	189	159	10/9	10/9	569	334	20.8	6.5
ZFMK 90928	♀	17-17-13	193	167	9/9	9/9	549	322	22.4	5.9

Key literature: Cisneros-Heredia & Touzet (2007); Franzen (1996); Henderson (1974); Hetherington (2006); Keiser (1974, 1982); Lehr (2002); Schmidt & Inger (1951); Scott (1983).

Conservation status: IUCN: not yet assessed (IUCN 2013).

***Sibynomorphus vagrans* (Dunn, 1923)** (Figure 2.1.12 H)

Pseudopareas vagrans Dunn 1923, Proc. Biol. Soc. Washington 36: 187.
Pseudopareas vagrans — Marx 1958, Fieldiana Zool. 36: 490.
Sibynomorphus vagrans — Peters 1960, Misc. Publ. Mus. Zool., Univ. Michigan (114): 161.
Sibynomorphus vagrans — Cadle 2007, Bulletin of the Museum of Comparative Zoology, 158(5): 233.

Holotype: MCZ 17284

Type locality: “Bellavista, Peru”

Voucher (5): CORBIDI 5648, 5649, 7667 ZFMK 90931, 90932

Distribution: The species was so far only known from the type locality in Bellavista, Cajamarca at elevations of 421 m (Cadle 2007). We found this species in Peru in Santa Rosa de la Yunga, Region Cajamarca and Cumba, Region Amazonas at elevations between 458-1326 m a.s.l. and can thus expand the distributional and also the altitudinal range of the species.

Remarks: The individual from Santa Rosa (CORBIDI 5648) was found dead on a trail near the waterfall La Shumbanita. All other individuals were found at night between 9-9.30 pm resting or crawling in a tree in heights of 2.5-4.5 m above the ground. Air temperature was between 27-28°C and himudity layed between 60-75%.

Table 2.1.40. Morphometrics (mm) and pholidosis characters of *Sibynomorphus vagrans*

No.	Sex	D	V	SC	SL	IL	SVL	TL	HL	HW
CORBIDI 5648	/	15-15-15	158	68	8/8	10/10	360	115	14.3	6.5
ZFMK 90932	♂	15-15-15	162	85	8/8	11/12	405	150	16.7	8.5
CORBIDI 5649	♀	15-15-15	168	76	8/8	13/11	388	121	17.2	7.2
CORBIDI 7667	♀	15-15-15	167	72	8/8	9/9	442	130	/	/
ZFMK 90931	♀	15-15-15	168	83	9/10	11/12	441	132	18.5	9.7

Key literature: Cadle (2007); Dunn (1923); Peters (1960).

Conservation status: IUCN: not yet assessed (IUCN 2013).

Tantilla melanocephala (Linneaus, 1758)

Coluber melanocephalus Linnaeus 1758, Systema Naturae 10th Edition: 218.
Natrix melanocephalus — Merrem 1820, J. C. Kriegeri, Marburg: 110.
Elaps melanocephalus — Wagler 1824, Serp. Bras. Spec. Nov. Hist. Nat. espec. Nouv. Serp.: 8.
Duberria melanocephala — Fitzinger 1826, Neue Class. der Rept. nch ihren nat. Verwandt. nebst einem Verz. der Rept.-Samm. Des k.k. zool. Mus. Zu Wein:55.
Lycodon melanocephalum — Boie 1827, Isis von Oken 20(3):526.
Cloelia melanocephala — Wagler 1830, Nat. System der Amphibien, mit vorangehender Classification der Säugetiere und Vögel: 187.
Calamaria melanocephala — Schlegel 1837, Ess. Sur la physion. Des serp. Kips and Van Stuckum. La Hague, Partie general, 28: 38.
Homalocranion melanocephalum — Duméril, Bibron & Duméril 1854, Paris, Librairie Encyclopédique de Roret: 855.
Tantilla melanocephala — Cope 1861, Proc. Acad. Nat. Sci. Philadelphia 1861: 74.
Elapomorphus mexicanus Günther 1862, Ann. Mag. Nat. Hist. (3) 9: 57.
Homalocranion melanocephalum — Jan & Sordelli 1866,. J.B. Bailière et Fils, Paris: Livraison 15.
Tantilla armillata Cope 1876, Journal of the Academy of Natural Sciences of Philadelphia N.S. (2) 8: 93-183.
Homalocranium melanocephalum var. fuscum Boucourt 1883, Miss. Scientifi. au Mexique et dans l'Amér Impri. Imper., Paris: 588.
Elapomorphus mexicanus — Strauch 1884, 2nd. Ed. Bull. Acad. Imp. Sci. St. Petersbourg 29: 562.
Tantilla pallida Cope 1887, Proc. Amer. Philos. Soc. 24: 56.
Homalocranium armillatum — Günther 1895, Taylor, & Francis, London: 149.
Homalocranium melanocephalum var. fraseri Günther 1895, Taylor, & Francis, London: 148.
Homalocranium melanocephalum var. melanocephalum Günther 1895, Taylor, & Francis, London: 147.
Homalocranium melanocephalum var. pernambucense Günther 1895, Taylor, & Francis, London: 148.
Homalocranium mexicanum — Günther 1895, Taylor, & Francis, London: 153.
Homalocranium fuscum — Boulenger 1896, Catal. of the snakes in the Brit. Mus. (Nat. Hist.), 3: 220.
Homalocranium longifrontale Boulenger 1896, Ann. Mag. nat. Hist. (6) 17 (97): 17.
Homalocranium hoffmanni Werner 1909, Jahrb. Hamb. wiss. Anst. suppl. 2 (Mitt. Naturhist. Mus. Hamb. 1908) 26: 239.
Elapomorphus nuchalis Barbour 1914, Proc. Biol. Soc. Washington 27: 199.
Tantilla longifrontale — Ruthven 1922, Misc. Publ. Mus. Zool., Univ. Michigan 8: 68.
Tantilla longifrontalis — Amaral 1929, Mem. Inst. Butantan 4: 220.
Tantilla fusca — Amaral 1929, Mem. Inst. Butantan 4: 220.
Tantilla mexicana — Smith 1942, Zoologica 27: 37.
Tantilla melanocephala melanocephala — Schmidt & Walker 1943, Zool. Ser. Field Mus. nat. Hist., Chicago, 24: 319.
Tantilla melanocephalus — Shreve 1947, Caldasia 4 (19): 315.
Tantilla melanocephalus — Shreve 1947, Bull. Mus. Comp. Zool. 99 (5): 533.
Tantilla melanocephalum — Wehekind 1955, Brit. Journ. Herp. 2 (1):12.
Tantilla fraseri — Peters 1960, Bull. Mus. Comp. Zool. Harvard 122: 539.

Tantilla melanocephala melanocephala — Peters 1960, Bull. Mus. Comp. Zool. Harvard 122: 539.
Tantilla melanocephala melanocephala — Peters & Orejas-Miranda 1970, United States Nat. Mus. Bull. 297: 295.
Tantilla melanocephala melanocephala — Duellman 1978, Misc. Publ. Univ. Kans. Mus. Nat. Hist. 65: 256.
Tantilla equatoriana Wilson & Mena 1980, San Diego Society of Natural History Memoirs 11: 26.
Tantilla equatoriana — Sawaya & Sazima 2003, Herpetologica 59 (1): 122.
Tantilla melanocephala — Kornacker 1999, PaKo-Verlag, Rheinbach, Germany: 138.
Tantilla melanocephala — Rivas et al. 2012, Zootaxa 3211: 48.

Holotype: none designated (fide Wilson 1999)

Type locality: “America”

Voucher (1): CORBIDI 1843

Distribution: This species is known from Argentina, Belize, Bolivia, Brazil, Costa Rica, Colombia, Guatemala, Guyana, Ecuador, El Salvador, French Guiana, Honduras, Nicaragua, Panama, Paraguay, Peru, Suriname, Trinidad and Tobago, Uruguay, and Venezuela (Wilson 1992) at elevations from sea level up to 3080 m a.s.l. (Wilson & Mena 1980). Lehr (2002) found this species in Peru at elevations between 342-770 m a.s.l.

Remarks: The single specimen was killed by a local near Gotas de Agua, Province Jaén, Region Cajamarca, but was already dead since several days when we received it. It was partly degraded by maggots.

Table 2.1.41. Morphometrics (mm) and pholidosis characters of *Tantilla melanocephala*

Sex	D	V	SC	SL	IL	SVL	TL	HL	HW
♀	15-14-15	ca. 158	56	7/6	6/6	319	83	11.8	6.4

Key literature: Greenbaum et al. (2004); Lehr (2002); Wilson (1982, 1987, 1992, 1999); Wilson & Mena (1980).

Conservation status: IUCN: not yet assessed (IUCN 2013).

Figure 2.1.12. Colubridae from the inter-Andean dryforest valleys. A: *Chironius exoletus*; B: *Clelia clelia*; C: *Leptodeira septentrionalis larcorum*; D: *Mastigodryas reticulatus*; E: *M. heathii*; F: *Mastigodryas boddaerti*; G: *Oxybelis aeneus*; H: *Sibynomorphus vagrans*.

Leptotyphlopidae

***Epictia* cf. *rufidorsa* (Taylor, 1940)** (Figure 2.1.13 A)

Leptotyphlops rufidorsum Taylor 1940, Univ. Kansas Sci. Bull. 26 [1939] (15): 533.
Leptotyphlops rufidorsum — Schmidt & Walker 1943, Zool. Ser. Field Mus. Nat. Hist. 24 (27): 302.
Leptotyphlops rufidorsum — McDiarmid, Campbell & Touré 1999, Snake species of the world. Vol. 1. Herpetologists' League: 41.
Epictia rufidorsa — Adalsteinsson et al. 2009, Zootaxa 2244: 1-50.

Holotype: U.S.N.M.49993

Type locality: "Lima, Peru"

Voucher (7): CORBIDI 7672-7675, ZFMK 91797, 91799, 91800

Distribution: This species is endemic to Peru (Schmidt & Walker 1943) and so far only known from the Regions La Libertad and Lima (Carillo de Espinoza & Icochea 1995). All seven specimens were collected in the Region La Libertad from near the villages of Chagual and Vijus, both Province Pataz and from the village of El Tingo, Province Cajabamba, at elevations between 1062-1327 m a.s.l.

Remarks: All individuals were collected in January 2010 except for ZFMK 91800, which was found in October 2010. ZFMK 91799 was detected at 7.45 pm in a formicary at the trackside.The female specimen contained four oval eggs with lengths between 10.8— 12.5 mm and widths of 3.5— 4 mm. ZFMK 91800 is another female with eggs and was found at 9.30 pm at the edge of an irrigation canal. CORBIDI 7673 and CORBIDI 7674 were found dead on the road shortly after they were overrun, at 11.30 pm and 9.50 pm, respectively. ZFMK 91797 was detected while it was creeping on a little track at 9.30 pm. CORBIDI 7675 was found at 7.15 pm under a stone. CORBIDI 7672 was creeping in about 1.5 m above the ground along the sandy walls of a creekbed at 7.55 pm. When the animals were sighted, air temperature ranged from 25.6°C – 27.6°C, substrate temperature was at 26.5°C and air humidity ranged from 53% - 61%.

Our collected specimens are diagnosed by the following characters: (1) 14 midbody scale rows; (2) 10 midtail scale rows; (3) 2 SL, first large and in broad contact with supraocular; (4) 19-21 SC; (5) 272-280 MDS; (6) Dorsum centrally brown to reddish-brown, fading into yellow dorsolaterally and laterally, most yellow scales with brown edges; (7) head dorsally grey; (8) rostral dorsally and ventrally grey; (9) terminal part of tail dorsally brown (10) ventral surface of head, body and tail white.

They have a higher number of subcaudals and a slightly longer tail compared to what was previously recorded for this species resulting in a lower ratio of tail to body length. As the other diagnostic characters of our specimens lay within the ranges for *E. rufidora* we place them in this species.

Table 2.1.42. Morphometrics (mm) and pholidosis characters of *Epictia cf. rufidorsa*

No.	Sex	D	V	MDS	SC	SL	IL	SVL	TL	HL	HW
CORBIDI 7672	/	/	/	/	/	/	/	/	/	/	/
CORBIDI 7673	/	/	/	/	/	/	/	/	/	/	/
CORBIDI 7674	/	/	/	/	/	/	/	/	/	/	/
CORBIDI 7675	/	/	/	/	/	/	/	/	/	/	/
ZFMK 91797	/	14-14-14	268	279	21	2/2	5/6	200	14.3	4.2	3.3
ZFMK 91799	♀	14-14-14	265	280	19	2/2	5/5	258	15.4	6.3	4.0
ZFMK 91800	♀	14-14-14	270	272	19	2/2	5/5	203	14.2	4.2	2.9

Key literature: Adalsteinsson et al. (2009); Schmidt & Walker (1943); Taylor (1940).
Conservation status: IUCN: Least concern (Lundberg & Aguilar 2010).

Epictia sp. 1 (Figure 2.1.13 B)

Locality: We found this species in Limon (S 06°52’34.2’’, W 078°05’10.5’’), Province Celendin, Region Cajamarca, Peru at an altidude of 2053 m a.s.l.
Voucher (1): ZFMK 90933
Remarks: The single specimen was detected on the end of April 2009 at 5.30 pm under a stone on the soft soil of a recently tilled grainfield. Temperature under the stone was 25.9°C, air temperature was 23°C and air humidity was 57%. By its scale counts and the large anterior supralabials this species belongs to the genus *Epictia*, Adalsteinsson et al. 2009. By having a broad contact between the first supralabial and the supraocular this species is assigned to the *E. tesselata* group according to Orejas-Miranda (1964). By having a tricolor dorsal color pattern of reddish-brown, black and yellow longitudinal stripes it differs from all members of the group except for *E. alfredschmidti, E. teaguei* and *E. tricolor*. It differes from the latter by having a lower number of subcaudals and it differs from all three species by having a different ventral colouration.
Subsequently our collected specimen could not be assigned to one of the known species of the genus *Epictia*.

It is diagnosed by the following characters: (1) 14 midbody scale rows; (2) 10 midtail scale rows; (3) 2 SL, first large and in broad contact with supraocular; (4) 16 SC; (5) 257 MDS; (6) Dorsum with seven black longitudinal stripes, outermost interspaces bright yellow, other interspaces yellow near the head, fading into reddish-brown at midbody, second outermost interspace fading again into yellow towards the tail; (7) rostral dorsally yellowish-white, ventrally cream; (8) terminal spine black; (9) ventral surface of head, body and tail cream except for two dark indistinct blotches on the anal plate and three longitudinal rows of dark indistinct blotches on the subcaudals and a triangle-shaped and to the terminal spine oriented larger blotch on the ventral surface of the tail.

To clarify the status of this specimen and to describe it as a new species more material would be needed.

Table 2.1.43. Morphometrics (mm) and pholidosis characters of *Epictia sp. 1*

D	V	MDS	SC	SL	IL	SVL	TL	HL	HW
14-14-14	241	257	16	2/2	5/5	172	9.0	4.1	3.1

Key literature: Adalsteinsson et al. (2009); Cisneros-Heredia (2008); Lehr (2002); Lehr et al. (2002a, b); Orejas-Miranda (1964, 1969).

Conservation status: IUCN: not yet assessed (IUCN 2013).

Epictia sp. 2 (Figure 2.1.13 C)

Locality: The single specimen was found near Vijus (S 07°43’11.6’’, W 077°39’51.1’’), Province Pataz, Region La Libertad at 1290 m a.s.l.

Voucher (1): ZFMK 91798

Remarks: The specimen was detected under a stone on 10th of January 2010 at 9.55 pm at an air temperature of 25.8°C and an air humidity of 60%.

It isdistinguished from all congeners by the following combination of characters: (1) 14 midbody scale rows; (2) 10 midtail scale rows; (3) 2 SL, first large and in broad contact with supraocular; (4) 16 SC; (5) 188 MDS; (6) Dorsal scales brown with thin white or yellowish outlines; (7) rostral dorsally and ventrally greyish-brown; (8)

terminal part of tail dorsally brown, spine and last subcaudal ventrally yellow; (9) ventral surface of head, body and tail greyish-brown.

Table 2.1.44. Morphometrics (mm) and pholidosis characters of *Epictia sp. 2*

Sex	D	V	MDS	SC	SL	IL	SVL	TL	HL	HW
/	14-14-14	171	188	16	2/2	4/4	99	8.1	2.6	1.5

Key literature: Adalsteinsson et al. (2009); Cisneros-Heredia (2008).

Conservation status: IUCN: not yet assessed (IUCN 2013).

Epictia sp. 3 (Figure 2.1.13 D)

Locality: This species was found in the vicinities of Santa Rosa de la Yunga (S 05°25’53.3’’, W 078°33’47.0’’), Province Jaén, Region Cajamarca, Peru at 1268 m a.s.l..

Voucher (1): CORBIDI 7678

Remarks: The single specimen was found on 4th of May 2009 at 3.30 pm on a track. Air temperature was 23.6°C, ground temperature was 25.6°C and air humidity was 73%.

It isdistinguished from all congeners by the following combination of characters: (1) 14 midbody scale rows; (2) 10 midtail scale rows; (3) 2 SL, first large and in broad contact with supraocular; (4) 17 SC; (5) 203 MDS; (6) Dorsal body scales black, each scale with bright yellow rear edge; (7) rostral dorsally bright yellow, ventrally greyish-brown; (8) terminal part of tail dorsally and ventrally bright yellow; (9) ventral surface of head, body and tail (except ultimate part) light grey, scattered with dark greyish-brown scales.

Table 2.1.45. Morphometrics (mm) and pholidosis characters of *Epictia sp. 3*

Sex	D	V	MDS	SC	SL	IL	SVL	TL	HL	HW
/	14-14-14	/	203	17	/	/	/	/	/	/

Key literature: Adalsteinsson et al. (2009); Cisneros-Heredia (2008).

Conservation status: IUCN: not yet assessed (IUCN 2013).

Epictia sp. 4 (Figure 2.1.13 E)

Locality: All three specimens were found in the vicinities of Zapatalgo (S 06°04’44.0’’, W 078°29’16.7’’), Province Utcubamba, Región Amazonas, Peru at elevations of 934-968 m a.s.l.

Voucher (3): CORBIDI 5669, 5670, ZFMK 90934

Remarks: CORBIDI 5669 was found on 7th of December 2009 at 10.40 am lying dead on the dry and hot soil (45.5°C). Despite the high ground temperature the specimen was in a good condition indicating that it was only dead for a short time. Two days later at 2.10 pm we found two further specimens (CORBIDI 5670, ZFMK 90934) of the species under stones at the roadside. While lifting the stone CORBIDI 5670 was accidentially killed and the head was destroyed. Air temperature was between 30.5°C – 33.8°C, temperature under the stones was 33.6°C and air humidity was between 57% - 64%.

This species isdistinguished from all congeners by the following combination of characters: (1) 14 midbody scale rows; (2) 10 midtail scale rows; (3) 2 SL, first large and in broad contact with supraocular; (4) 15-16 SC; (5) about 208 MDS; (6) Dorsal scales blackish dark, most scales with thin yellow outlines; (7) rostral dorsally yellowish-white, ventrally black; (8) terminal part of tail including spine yellow; (9) ventral surface of head, body and tail greyish-brown.

Table 2.1.46. Morphometrics (mm) and pholidosis characters of *Epictia sp. 4*

No.	Sex	D	V	MDS	SC	SL	IL	SVL	TL	HL	HW
CORBIDI 5669	/	14-14-14	> 156	/	16	/	/	110.7	9.3	/	1.8
CORBIDI 5670	/	14-14-14	/	/	15	2/2	5/6	100	6.0	2.1	1.9
ZFMK 90934	/	14-14-14	196	208	15	2/2	6/6	113	8.3	2.6	1.9

Key literature: Adalsteinsson et al. (2009); Cisneros-Heredia (2008).

Conservation status: IUCN: not yet assessed (IUCN 2013).

Epictia sp. 5 (Figure 2.1.13 F)

Locality: We found this species in Bellavista (S 05°39'50.5'', W 078°40'47.6''), Province Jaén, Region Cajamarca at an altitude of 447 m a.s.l.

Voucher (1): CORBIDI 1818

Remarks: The single specimen was detected on 10th of May 2008 at 12.45 pm creeping on the soft soil of a mound. It was raining, the air humidity was at 82% and the air temperature was 25°C.

This species is distinguished from all congeners by the following combination of characters: (1) 14 midbody scale rows; (2) 10 midtail scale rows; (3) 2 SL, first large and in broad contact with supraocular; (4) 17 SC; (5) 284 MDS; (6) Body dorsally and ventrally anthracite-grey, each scale with white edges; (7) rostral dorsally bright yellow; (8) terminal part of tail dorsally and ventrally bright yellow.

Table 2.1.47. Morphometrics (mm) and pholidosis characters of *Epictia sp. 5*

Sex	D	V	MDS	SC	SL	IL	SVL	TL	HL	HW
/	14-14-14	256	284	17	2/2	5/6	91	5.2	1.4	1.6

Key literature: Adalsteinsson et al. (2009); Cisneros-Heredia (2008).

Conservation status: IUCN: not yet assessed (IUCN 2013).

Figure 2.1.13. Leptotyphlopidae from the inter-Andean dryforest valleys. A: *Epictia* cf. *rufidorsa*; B: *Epictia* sp. 1; C: *Epictia* sp. 2; D: *Epictia* sp. 3; E: *Epictia* sp. 4; F: *Epictia* sp. 5.

Discussion

To the 51 species of amphibians and reptiles which we found during our field work we can add eight species from the literature, which were collected in former surveys from some of our study sites. Thus a total of 59 species, differentiated in 14 species of amphibians and 45 species of reptiles are now known to occur in the surveyed localities of the interandean dry forest habitat in Northern Peru. Almost one fourth (23.7%) of the taxa discovered during our research could not be assigned to any of the known species. Among those, six reptile taxa had already led to the description of new species: *Phyllopezus maranjonensis* (Koch *et al.* 2006) *Phyllodactylus delsolari* and *P. thompsoni* (Venegas *et al.* 2008), *Polychrus jacquelinae* (Koch *et al.* 2011), *Ameiva aggerecusans* and *A. nodam* (Koch *et al.* in press). Seven taxa (*Leptodactylus* sp, *Bothrops* sp., *Epictia* sp. 1, *E*. sp. 2, *E*. sp. 3, *E*. sp. 4, *E*. sp. 5) might also represent new species and will be described as soon as more information is available to determine their species-specific characters. One colubrid species could not be assigned to any of the known genera and represents a new and so far monotypic genus which will be described as soon as more data is available.

The IUCN conservation status of more than two-thirds (67.8%) of the dry forest species mentioned herein has not been assessed so far. 18.6% of the species are considered to be Least Concern and of 3 species (*Hyloxalus insulatus, Rulyrana mcdiarmidi, Polychrus peruvianus*) sufficient information is lacking for a proper assessment of their conservation status. 8.4 % of the occurring species are categorized as being at risk: one species is considered to be Near Threatened (*Pristimantis percnopterus*), and each two species are considered to be Vulnerable (*Nymphargus posadae, Pristimantis incomptus*) or even Endangered (*Excidobates mysteriosus, Hyloxalus elachyhistus*).

32 (54.2%) of the species are considered to be endemic to Peru and 29 (49.2%) of these are even endemic to the interandean part of the equatorial dry forest. With our investigations we provide the first country record of *Mastigodryas reticulatus* for Peru (Regions Cajamarca and La Libertad). We further can extend the known distributional range of eight species within Peru: We add the Region Amazonas to the known distributions of *Leptodactylus labrosus, Rulyrana mcdiarmidi, Phyllodactylus johnwrighti, Pseudogonatodes barbouri, Leptodeira septentrionalis larcorum* and *Sibynomorphus vagrans*; to the distribution of *Microlophus stolzmanni* we add the

Region La Libertad; and to the known distribution of *Phyllopezus maranjonensis* we add the Regions Cajamarca and La Libertad.

Considering the high number of both newly discovered species and new species records for the investigated areas it becomes obvious how little the knowledge about the dry forest herpetofauna in Northern Peru is so far. The high number of species that are endemic to the interandean dry forest valleys shows how important this region is with respect to the biodiversity of the Peruvian and even the Worlds' herpetofauna. Looking beyond the herpetofauna the region further shelters a high number of endemic birds (Garcia Bravo 2011, Stattersfield et al. 1998) and plants (Bridgewater et al. 2003, Hughes et al. 2004, Särkinen et al. 2011). Due to deforestation for firewood, agriculture and narcotics plantation, and due to mining activities and above all the recent dam construction activities for four huge hydroelectric projects that will lead to floodings of great parts of the interandean dry forest valleys (Koch et al. 2013), it is mostly likely that the populations of many of the endemic species will decline. With respect to the acute threats long-term strategies for the conservation of the biodiversity of this important habitat with its unique flora and fauna should be developed and implemented at the earliest. Further field work should be undertaken to increase the knowledge about the flora and fauna of the area and to reveal the biological needs of each taxon.

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3. CONTRIBUTIONS TO THE KNOWLEDGE OF NEOTROPICAL PHYLLODACTYLID GECKOS

3.1 Two New Sympatric Species of Leaf-Toed Geckos (Gekkonidae: *Phyllodactylus*) from the Balsas Region of the Upper Marañón Valley, Peru

This part was published in Journal of Herpetology as:

VENEGAS, P.J., TOWNSEND, J.H., KOCH, C. & W. BÖHME (2008): Two new sympatric species of leaf-toed geckos (Gekkonidae: *Phyllodactylus*) from the Balsas region of the upper Marañón Valley, Peru. – Journal of Herpetology 42 (2): 386-396.

Contribution of Claudia Koch to this publication:
Field work (together with P.J. Venegas); data collection (together with P.J. Venegas and J.H. Townsend); morphological analysis and interpretation of morphological data, (equally with P.J. Venegas and J.H. Townsend); drawings; conception of article and writing (equally with P.J. Venegas and J.H. Townsend).

Abstract. Two new species of the genus *Phyllodactylus* are described based on material collected in the southern portion of Departamento de Amazonas, Peru. Both species are well differentiated from all other South American *Phyllodactylus* based on characteristics of their morphology. In the case of one species, its large adult size and lack of well-defined rows of strongly keeled scales differentiate it from other *Phyllodactylus*, whereas in the second species, the presence of an enlarged postanal scale is diagnostic. Both species were collected in the xeric Balsas region of the upper Marañón Valley, and exhibit some similarities to other assemblages of sympatric *Phyllodactylus* in South America. The Balsas region is an area of endemism that warrants further attention from systematists and conservation biologists.

The New World Leaf-Toed Geckos, genus *Phyllodactylus* Gray 1828, occur along the Pacific coast from southern California, USA, through Mexico and Central America to western Panama and from southern Ecuador to northern Chile, including the Galapagos Islands (Dixon and Huey, 1970; Bauer et al., 1997). The genus also has representatives along the Caribbean coast of the Yucatán Peninsula, the Islas de la Bahía of Honduras, the Caribbean coasts of Colombia and Venezuela, the Orinoco Basin, the Caribbean islands of Aruba, Barbados, Bonaire, Curacao, Puerto Rico, and Hispaniola, and Isla Malpelo off the Pacific coast of Colombia (Dixon, 1964; Dixon and Huey, 1970; Huey, 1975; Bauer et al., 1997). Because of the form of the terminal lamellae of their toes, characterized by having the distal phalanges symmetrically dilated with two ventral terminal plates (Peters and Donoso-Barros, 1970; Rösler, 1995), these reptiles are commonly referred to as the Leaf-Toed Geckos.

In Peru, there are 11 recognized species of *Phyllodactylus: P. angustidigitus, P. clinatus, P. gerrhopygus, P. inaequalis, P. interandinus, P. johnwrighti, P. kofordi, P. lepidopygus, P. microphyllus, P. reissi,* and *P. sentosus* (Dixon and Huey, 1970). The majority of these species are distributed along the arid Pacific coastal plain, although *P. interandinus, P. johnwrighti,* and *P. reissi* inhabit dry inter-Andean valleys in northwestern Peru (Dixon and Huey, 1970). In the interval since Dixon and Huey (1970) provided the only major treatment of the South American *Phyllodactylus*, no new species have been described in this genus from mainland South America. Moreover, the complex physiography of the Andes in northern Peru has limited herpetological collecting in many potentially diverse regions (Duellman and Pramuk, 1999), and some regions have not been explored at all (Lehr, 2002; Campbell and Lamar, 2004).

To contribute to the knowledge of the Andean herpetofauna, two of the authors (PJV and CK) surveyed the inter-Andean valleys of the upper Marañón basin in July 2005, and one author (PJV) returned for a second survey in June 2006 to collect additional information on the amphibians and reptiles of this region. The investigations resulted in the discovery of a comparatively huge new species of *Phyllopezus* (Koch et al., 2006) and two apparently new species of *Phyllodactylus*. Simultaneously, JHT was working in the Herpetology Collection at the Florida Museum of Natural History (UF), Gainesville, Florida, and became aware of material possibly representing two species of undescribed *Phyllodactylus* from the upper Marañón basin. These geckos were collected in 1972 by F. G. Thompson, Curator of Malacology at the Florida Museum of Natural History and, together with the material recently collected by PJV and CK, represent two distinctive new species of *Phyllodactylus*, which are described below.

Materials and Methods

All measurements were taken to the nearest 0.1 mm using dial calipers and a stereomicroscope with an optical micrometer; some tail measurements were taken with a tape measure. Terminology in the diagnoses and descriptions follows that used by Dixon and Huey (1970) and Bauer et al. (1997), with the term ‘‘cloacal spurs’’ used in favor of ‘‘postanal tubercles.’’ Comparative data for other South American species of *Phyllodactylus* were taken from Dixon and Huey (1970); in addition, we examined specimens of South American *Phyllodactylus* housed in the Museo de Historia Natural San Marcos, Peru (MUSM), Florida Museum of Natural History, USA (UF), and Zoologisches Forschungsmuseum Alexander Koenig, Germany (ZFMK).

Diagnostic characteristics for Peruvian *Phyllodactylus* are compared in Table 3.1.1. Measurements and morphological classifications generally follow that used by Dixon (1964). Measurements of type specimens are always in millimeters unless otherwise specified, and measurements are abbreviated as follows: snout–vent length (SVL), axilla–groin length (AGL), length of leg (LLE), length of arm (LAR), length of tail (LTA), length of head (LHE), depth of head (DHE), width of head (WHE), length of snout (LSN), diameter of eye (DEY), diameter of ear (DEA), distance from eye to ear (DEE). Sex was determined by the presence of enlarged cloacal spurs and by probing the base of the tail. For additional specimens examined, see Appendix 8.1.

Table 3.1.1. Comparison of diagnostic characteristics in species of *Phyllodactylus* from Peru.

	Max SVL (mm)	Dorsal tubercles	Rows of dorsal tubercles	Number of 4th toe lamellae	Terminal digital pads	Abdominal plaque
P. delsolari	81	small, round, smooth	≤ 10, irregular	13-16	large	no
P. thompsoni	42	large, trihedral	> 10	11-13	small	no
P. angustidigitus	57	Dorsal scales subequal	None	15-20	small	yes
P. clinatus	46	large, trihedral	> 10	13-15	large	no
P. gerrhopygus	56	Dorsal scales subequal	None	12-15	small	yes
P. inaequalis	42	small, round, smooth	< 10, irregular	10-12	large	no
P. interandinus	47	large, trihedral	> 10	10-12	large	no
P. johnwrighti	44	large, trihedral	> 10	10-12	large	no

Descriptions of new species

Phyllodactylus thompsoni sp. nov.

Figures 3.1.1, 3.1.2, 3.1.3

Holotype.—Florida Museum of Natural History (UF) 126943, a female from 7 km east of Balsas, 1,400 m elevation, Departamento de Amazonas, Peru (6.847°S, 77.986°W), collected 29 April 1972 by F. G. Thompson, original field number FGT 1511.

Paratypes.—Six; two adult males (ZFMK 84998, 85000) and four adult females (MUSM 19561, 19563 [Figure 3.1.1], 19564, ZFMK 84999) from Quebrada Honda in the vicinity of Balsas, approximately 900–1,000 m above sea level, Provincia de Chachapoyas, Departamento de Amazonas, Peru (6.817°S, 78.00°W); collected by P. J. Venegas and C. Koch on 10 July 2005.

Diagnosis.—Of the species of *Phyllodactylus* found in mainland South America, *P. thompsoni* is the only species with an enlarged postanal scale; this species can be further differentiated from *P. angustidigitus, P. gerrhopygus,* and *P. heterurus* by lacking an abdominal plaque anterior to the cloaca (abdominal plaque present in aforementioned species), from *P. inaequalis* and *P. microphyllus* by having well-defined rows of enlarged, trihedral tubercles (dorsal tubercles small, rounded, not arranged in regular rows), *from P. dixoni, P. reissi, P. delsolari*, and *P. ventralis* by not exceeding 42 mm SVL (those four species regularly exceed 70 mm SVL), from *P. johnwrighti* by having internasals in contact along the medial suture (internasals usually separated in *P. johnwrighti*), from *P. sentosus* by having enlarged medial subcaudals (medial subcaudals not enlarged in P. sentosus), from *P. clinatus, P. interandinus,* and *P. lepidopygus* by having enlarged trihedral tubercles on the dorsal surface of tibia (dorsal surface of tibia with very small granular scales in *P. clinatus* or with rounded, elevated scales in *P. interandinus* and *P. lepidopygus*), from *P. pumilis* by having homogenous scales on the proximal one-fourth of the tail (scales heterogeneous on the proximal one-fourth of the tail in *P. pumilis*), and from *P. kofordi* by lacking rows of enlarged tubercles on the tail (enlarged tubercles on the tail present in *P. kofordi*).

Description of Holotype.—A small female gecko (33.8 mm SVL) with a broad, depressed head, 1.75 times as long as it is wide; head distinct from neck; snout with concave granular scales slightly larger than granular dorsal scales; temporal and posterior dorsal surface of head with granular scales interspersed with enlarged, round, smooth scales; snout length 3.5 mm; 19 scales across the snout at the level of the third supralabial; rostral twice as wide as it is high, with a medial groove extending from the dorsal edge approximately halfway down the rostral; two internasals; 9/9 supralabials, with supralabials 5–9 entirely below the orbit; six supralabials to a point below the center of eye; eye large, pupil vertical, orbit width 2.8 mm, 3–4 denticulate scales bordering posterior-dorsal one-third of orbit; 11 scales from anterior edge of orbit to nostril; seven granules between orbits, interorbital distance 0.9 mm; eye to ear distance 3.0 mm; ear opening oval shaped, diagonally compressed, inside of ear opening strongly denticulate on the anterior and posterior edges; ear diameter about one-third the diameter of the eye; mental larger than infralabials, bell-shaped, 2.0 mm long, 1.1 and 1.7 mm wide at its narrowest and widest points; infralabials 7/7, with the first pair largest and each subsequent pair smaller than the last; five infralabials to a point below the center of eye; three irregular, enlarged medial chinshields contact the mental; scales on chin largest anteriorly, becoming smaller, almost granular toward the gular region. Body essentially cylindrical; dorsum covered with small granules, with eight complete rows of greatly enlarged, trihedral, posteriorly projecting keeled dorsal tubercles and at least four more partial rows of same scales on lateral surfaces between forelimbs and hind limbs; maximum of 39 enlarged tubercles per row between the head and level of the vent; about 108 dorsal granules between level of the axilla and level of the vent;

about 86 scales around the midbody; lateral scales enlarged, imbricate, keeled or ‘‘pointed,’’ projecting outward, becoming smaller and grading into ventral scales; ventral scales larger than laterals, smooth, imbricate, becoming larger posteriorly, 44 ventral scales along midventral line between axilla and cloaca; abdominal plaque anterior to cloaca absent; enlarged plate present posterior to cloaca and anterior to base of tail, 1 mm long by 2.2 mm wide, with the anterior edge continuous with the posterior interior surface of the cloaca; enlarged, narrow scale present bordering anterior edge of cloaca; leading edges of fore and hind limbs covered with enlarged, imbricate scales, largest on the forearms and thighs; dorsal surfaces of tibia with enlarged trihedral tubercles; fourth toe with 11 subdigital lamellae, terminal lamellae enlarged, longer than wide, with the tip of the claw primarily concealed. Tail complete, 0.82 times the length of the body, stout, tapering distally; dorsal and lateral surfaces covered with keeled, imbricate scales that are largest at the base and becoming gradually smaller distally; medial subcaudals enlarged, somewhat irregular, platelike, imbricate, more than twice as wide as long.

Measurements of Holotype.—Snout–vent length, 33.8 mm; tail length, 28.1 mm; head length, 10.9 mm; and head width, 6.2 mm.

Color (in Preservative).—Coloration of the holotype, after 35 yr preserved in formalin and stored in ethanol, is as follows: dorsal ground color of head and body pale brown; head and snout with faint pale brown mottling; brown line visible from posterior edge of orbit running along lateral surface of body, breaking up and becoming diffuse posteriorly; dorsal surfaces with irregular, brown mottling; exceeding small dark brown spots are scattered across most scales of the body, most profuse laterally; ventral scales on head and body immaculate or marked with one or two microscopic dark brown spots; tail pale brown with three pairs of brown spots, becoming paler and closer together distally.

Color in Life.—Coloration in life of an adult female paratype (Figure 3.1.1; MUSM 19563) is as follows: ground color pinkish-tan with brown indistinct thin bars reaching to the middle of dorsum, tail with seven brownish bands and yellowish-brown interspaces, bands a bit smaller than interspaces, head dirty yellowish-brown, dark brown line from nostril through eye to above arm insertion, venter white, ventral surface of tail dirty whitish.

Figure 3.1.1. Female paratype of *Phyllodactylus thompsoni* sp. nov. (MUSM 19563).

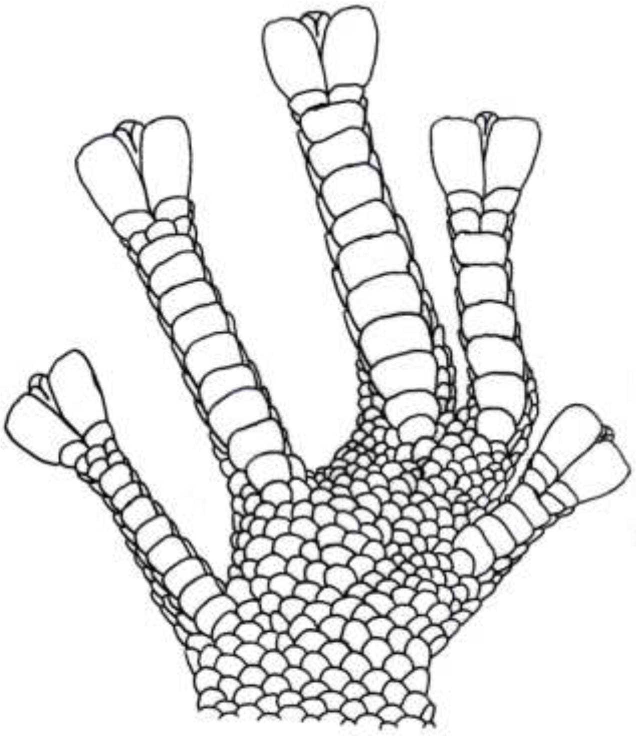

Figure 3.1.2. Ventral view of left hind foot of a paratype of *Phyllodactylus thompsoni* sp. nov. (ZFMK 85000).

Variation.—Male paratypes range from 40–42 mm SVL, and female paratypes range from 36–41 mm SVL. Tail length ranges from 42–54% of total length. Postmentals vary from two to three, always contacting first infralabial, often contacting second infralabial; number of scales immediately following postmentals varies from 5–7. Interorbital scales range from 20–26, scales across snout at level of third labials from 17–21. Usually two internasals bordered by five scales, only one specimen with four internasals bordered by four scales; internasals always in contact. Scales from nostril to eye number from 10–13. Twenty-five to 29 scales across venter, from gular region to vent from 57–68; dorsal tubercular rows always 10; paravertebral tubercles from head to base of tail vary from 36–40, with 20–24 between axilla and groin; enlarged rows of tubercles reaching base of tail number 6 in five specimens and 4 in one specimen. Tubercles absent from tail. Lamellae beneath fourth toe 12 or 13 in all paratypes. Dorsal color pattern with double row of indistinct 8–10 spots or transverse bars or lines, dorsal surface of tail usually banded with 4–9 brownish bands, with ground color interspaces of almost equal width; bands not present on regenerated tails and only very weak developed in some individuals. Ventral coloration dirty white in all specimens.

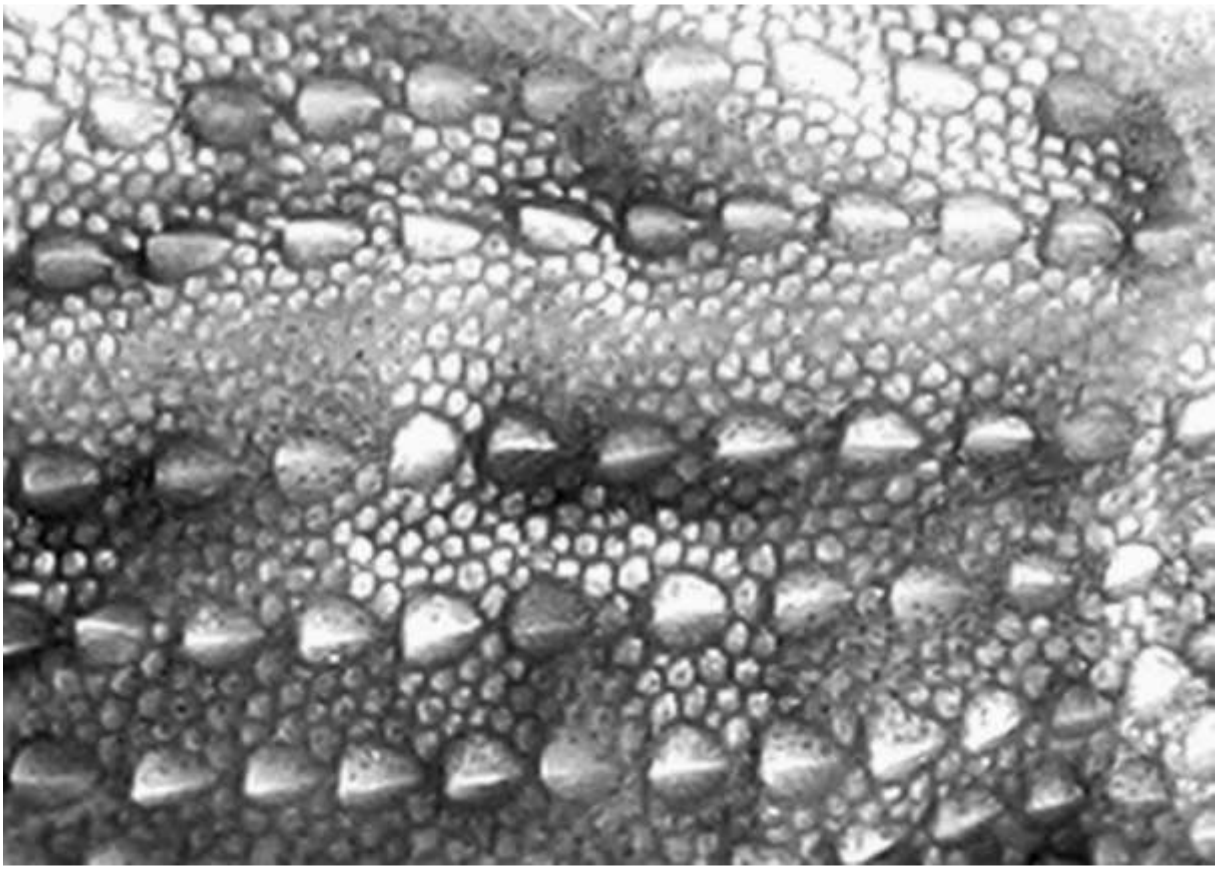

Figure 3.1.3. Close-up of dorsal scalation in a paratype of *Phyllodactylus thompsoni* sp. nov. (UF 126943).

Etymology.— The specific name *thompsoni* is a patronym honoring F. G. Thompson, collector of the holotype of this new species. Thompson has served as a curator of Malacology at the Florida Museum of Natural History since 1966, during which time he has conducted biological surveys in 18 countries worldwide that have led him to describe two subfamilies, 35 genera, and over 200 species of mollusks, as well as new species of *Thamnophis, Xenosaurus*, and *Leptotyphlops*.

Thompson's collections have also led to the description of many other amphibian and reptile taxa, including *Eleutherodactylus araiodactylus* Duellman and Pramuk 1999 and *Phrynopus thompsoni* Duellman 2000, which are only known from material collected by F. G. Thompson in Peru in May 1972.

Distribution and Natural History.— *Phyllodactylus thompsoni* is known only from the mountains east of Balsas and the Río Marañón in vicinity of the type locality, from 900–1,400 m elevation on the western slope of the northern portion of the Cordillera Central (see Duellman and Pramuk, 1999). The vicinity of the type locality receives less than 500 mm of rain annually (Duellman and Pramuk, 1999), and the vegetation is characterized as dry deciduous tropical forest and thorn scrub forest with a short, sparse overstory that includes the plants *Acacia macracantha, Aeschynomene scoparia, Caesalpinia* sp. nov., *Capparis* sp., *Coursetia cajamarcana*, *Croton* sp., *Dalea exilis, Dalea carthagenensis var. brevis*, *Eriotheca* sp., *Leucaena trichodes, Maraniona lavinii, Mimosa incarum, Mimosa ctenodes, Parkinsonia praecox*, *Pithecellobium excelsum*, and *Tecoma rosifolia* (Hughes et al., 2004). This habitat is within the Ecuatorial Dry Forest ecoregion (Brack, 1986).

Paratypes collected in 2005 and 2006 were also found at night, either perched on low rocks or actively moving on the ground. Air temperature during these nights averaged 27.3°C; substrate temperature of the rocks averaged 28.8°C.

***Phyllodactylus delsolari* sp. nov.**

Figures 3.1.4, 3.1.5, 3.1.6

Holotype.— Florida Museum of Natural History (UF) 50059, an adult female from 7 km east of Balsas, 1,400 m elevation, Departamento de Amazonas, Peru (6.847°S, 77.986°W), collected 29 April 1972 by F. G. Thompson, original field number FGT 1508.

Paratypes.— UF 50060, 50062 adult males, UF 50061 juvenile male, collected with the holotype on 29 April 1972, by F. G. Thompson; MUSM 26327, adult male and MUSM 26328–26330, adult females, from Quebrada Honda in the vicinity of Balsas (06°49'S, 78°00'W, approximately 900–1,000 m above sea level), Provincia de Chachapoyas, Departamento de Amazonas, Peru, collected by P. J. Venegas on 18 June 2006; MUSM 19566, 26410 and ZFMK 85002 adult males, MUSM 26411, ZFMK 85001, 85003 adult females from Quebrada Honda; collected by P. J. Venegas and C. Koch on 10 July 2005.

Diagnosis.— Of the *Phyllodactylus* found in western South America, *P. delsolari* is one of two ‘‘giant’’ species, the other being *P. reissi*. Both *P. delsolari* and *P. reissi* exceed 70 mm SVL, with no other species from the region exceeding 60 mm SVL. *Phyllodactylus delsolari* can be readily distinguished from *P. reissi* by having fewer than 10 poorly defined rows of small, smooth, round tubercles (12–18 well-defined rows of enlarged, trihedral, strongly keeled tubercles in *P. reissi*), and by having broad, well-defined dark dorsal cross-bands (no cross-bands or sometimes incomplete, dark, irregular, narrow cross-bands in *P. reissi*). There are two other species of ‘‘giant’’ *Phyllodactylus* recorded from mainland South America: *P. dixoni* and *P. ventralis*. Both of these species may exceed 70 mm SVL and are found in central Venezuela and along the Caribbean coast of Colombia and Venezuela, respectively. *Phyllodactylus delsolari* can be distinguished from *P. dixoni* and *P. ventralis* by having poorly defined, irregular rows of small, smooth, round tubercles (well-defined, regular rows of enlarged, trihedral, strongly keeled tubercles in *P. dixoni* and *P. ventralis*). This species can be further differentiated from all other *Phyllodactylus* found in South America as follows (Table 3.1.1): from *P. angustidigitus, P. gerrhopygus*, and *P. heterurus* by lacking an abdominal plaque (abdominal plaque present in aforementioned species); from *P. clinatus, P. interandinus, P. johnwrighti, P. kofordi, P. lepidopygus, P. pumilis*, and *P. sentosus* by having fewer than 10 poorly defined rows of enlarged, smooth, round tubercles (14–22 rows of enlarged trihedral tubercles in *P. interandinus*, 10–16 rows of enlarged keeled or trihedral tubercles in the other aforementioned species); from *P. microphyllus* by having large terminal lamellae (small terminal lamellae in *P. microphyllus*); and from *P. inaequalis* by having ear denticulation on the anterior and posterior edges (ear denticulation absent in *P. inaequalis*). There is one other species of South American *Phyllodactylus* that has broad, dark dorsal cross-bands, *P. transversalis*, which is endemic to Isla de Malpelo, but it lacks ear denticulation (inside of ear strongly denticulate on the anterior and posterior edges in *P. delsolari*) and is not reported to exceed 57 mm SVL.

Description of Holotype.—A large female gecko (73.2 mm SVL) with a broad, depressed head, 1.3 times longer than it is wide; head distinct from neck, covered in small granules that are largest on snout and smallest on back of head snout granules concave, larger than dorsal granules, snout length 7.6 mm; 22 scales across the snout at the level of the third supralabial; rostral broad, rectangular, lacking a medial groove; two internasals; supralabials 10/10, with supralabials 6–10 entirely below the orbit; seven supralabials to a point below the center of eye; eyes large, pupil vertical, orbital width 5.3 mm, three rows of small, somewhat trihedral supraciliary scales bordering the anterior edge; one row of enlarged platelike scales bordering the eye, and 2–3 rows of small granules between platelike scales and upper edge of orbit; 13 scales from anterior edge of orbit to nostril; 18 granules between orbits, interorbital distance 2.6 mm; eye to ear distance 6.7 mm; ear opening oval shaped, vertically compressed, 1.5 mm high by 1 mm wide, inside of ear opening strongly denticulate on anterior and posterior edges; mental larger than infralabials, bell-shaped, 3.7 mm long, 1.7 and 3.4 mm wide and its narrowest and widest points; infralabials 9/9, first pair largest and each subsequent pair smaller; six infralabials to a point below the center of eye; one pair of enlarged medial chinshields contacts the mental; scales on chin largest where they contact infralabials and chinshields, becoming smaller, almost granular toward the midventral line. Body depressed; dorsal surface of neck with small granules that are somewhat smaller than those on the head; dorsum covered with small granules, with about nine poorly defined longitudinal rows of enlarged, smooth scales that are 2–3 dorsal granules in width (Figure 3.1.6); a maximum of 28 enlarged scales per row between level of the axilla and level of the vent; enlarged rows most evident on posterior one-third of the dorsum, where enlarged scales are also interspersed with granules; about 134 dorsal granules between level of the axilla and level of the vent; about 115 scales around the midbody; ventral surface with smooth, platelike, subimbricate scales that gradually become larger posteriorly; 51 ventral scales along midventral line between axilla and vent; preanal plate absent; leading edges of fore and hind limbs covered with enlarged, platelike scales that are largest on the forearms and shins; fourth toe with 13 subdigital lamellae, terminal lamellae greatly enlarged, truncate, with the tip of the claw exposed. Tail complete, 1.26 times the length of the body; dorsal surface of tail covered with squarish, platelike scales, without whorls of enlarged scales; medial subcaudal scales broadly expanded, two or more times as wide as they are long, larger than any other scales found on the body.

Measurements of Holotype.—Snout-vent length, 73.2 mm; tail length, 92.4 mm; head length, 21.4 mm; and head width, 6.5 mm.

Color (in Preservative).—Coloration of holotype after 35 yr preserved in formalin and stored in ethanol, is as follows: dorsal ground color of head and body pale brown, with the snout and supralabials heavily mottled brown and irregular brown flecks and blotches on the dorsal surface of the head; dorsum with broad brown bands, which are 1–2 times as wide as the pale intervening areas; dorsal bands interrupted by a narrow pale brown middorsal stripe; lateral surfaces of the body yellowish-cream with pale brown mottling, lateral scales marked with minute dark brown spots; dorsal surfaces of limbs tan with brown flecks and mottling; ventral surface of head and body immaculate cream; dorsal surface of tail with about five poorly defined brown bands, subcaudal surface immaculate cream.

Color in Life.— Coloration of an adult male paratype (MUSM 26327) is as follows: ground color grayish-white, dorsal surface from rear of head to vent with 5–6 broad brown transversal bands, which are cut vertically by a slender grayish vertebral stripe with the margin of each band undulated (Figure 3.1.4). Head is grayish-brown, limbs with brown flecks and blotches (Figure 3.1.4), and the venter white.

Figure 3.1.4. Male paratype of *Phyllodactylus delsolari* sp. nov. (MUSM 26410).

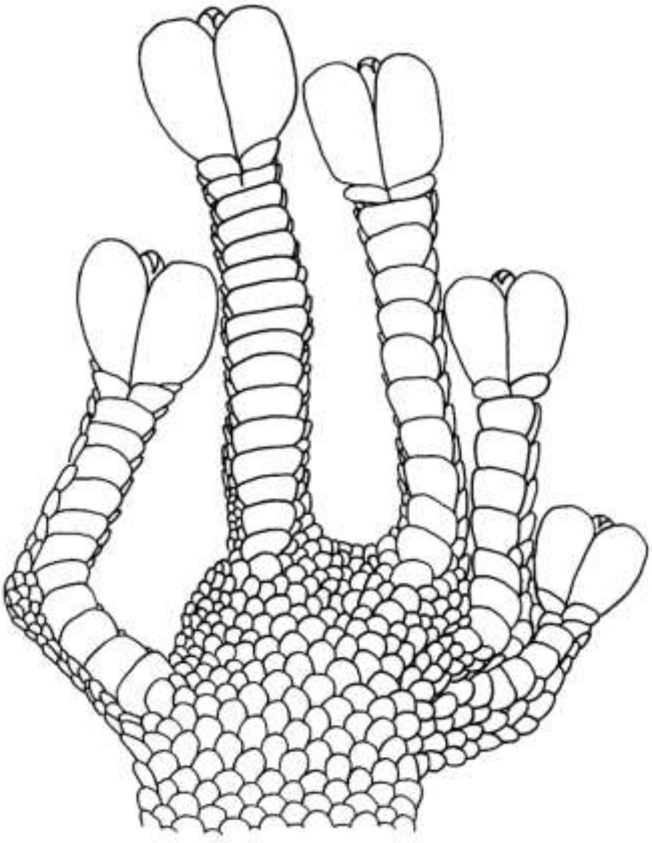

Figure 3.1.5. Ventral view of left hind foot of a paratype of *Phyllodactylus delsolari* sp. nov. (ZFMK 85001).

Variation.— Male paratypes range from 54.5–80 mm SVL, and female paratypes range from 47.5–81 mm SVL. In two adult male paratypes, UF 50062 possesses 3/3 cloacal spurs, and UF 50060 has 4/4 cloacal spurs. All paratypes have a single pair of postmental chinshields, and usually a single pair of internasals in broad contact. Supralabials 11/10 in UF 50660 (7/8 to a point below the center of eye), 10/11 in UF 50062 (8/8 to a point below the center of eye), and 11/10 in UF 50061 (8/8 to a point below the center of eye). Infralabials 7/9 in UF 50060 (6/7 to a point below the center of eye), 8/8 in UF 50061 (6/6 to a point below the center of eye), and 9/9 in UF 50062 (6/6 to a point below the center of eye). Among all paratypes, there are 11–14 scales between anterior edge of orbit and nostril; dorsal tubercles intermixed between granules, only sometimes forming short indistinct rows ranging from 6–12. All male and female paratypes lack precloacal or femoral pores. The color pattern exhibited in the paratypes is very similar to that of the holotype, with broad transversal bands from rear of head to vent numbering five or six, with 6–8 dark bands on tail. One juvenile male (UF 50061) differs from all other specimens in lacking a thin, pale middorsal stripe interrupting the transverse dorsal bands.

Figure 3.1.6. Close-up of dorsal scalation of the holotype of *Phyllodactylus delsolari* sp. nov. (UF 50059).

Etymology.— The specific name is a patronym honoring Gustavo del Solar, in recognition of his continued and unattenuated work in the conservation of the White Winged Guan, *Penelope albipennis*, a critically endangered species of Cracid bird that is endemic to northwestern Peru.

Distribution and Natural History.— The known geographic and ecological distribution of *P. delsolari* mirrors that of *P. thompsoni* (see species account above). The holotype and paratypes of *P. delsolari* collected in 1972 were found between 2100 and 2230 h on a damp, west-facing exposed limestone wall from 3–5 m above the ground. Paratypes collected in 2005 and 2006 were also found at night, usually perched between 30 cm and 3 m above the ground on tall, nearly vertical boulders in Quebrada Honda, a tributary of Río Marañón. Air temperature during these nights averaged 27.3°C; substrate temperature of the rocks averaged 28.8°C. Two individuals of *P. delsolari* were observed running on the ground a few meters away from verticals rock walls. This new species appeared abundant, along with the sympatric giant gecko *Phyllopezus maranjonensis* (Koch et al., 2006), in the zones where the ravine is very narrow and forms a small canyon surrounded by completely vertical rocky walls. Along with *P. maranjonensis*, the congener *Phyllodactylus reissi* is also sympatric with *P. delsolari* and *P. thompsoni* in the Balsas region, giving that area a unique assemblage of sympatric geckos (especially giant geckos) notable among Neotropical herpetofaunas. Three female paratypes of *P. delsolari* were gravid. Two of these females (MUSM 26328, 26330) contained two oviductal eggs with the following sizes: 3.8 x 3 mm and 3.6 x 2.7 mm; 8.5 x 6.9 mm and 8.6 x 7.3 mm, respectively; the other female (MUSM 26328) contained a single oviductal egg measuring 5.5 x 5 mm.

Discussion

The New World *Phyllodactylus* remains a relatively little studied yet significant group of gekkonids, and virtually no systematic work has appeared since Dixon and Huey (1970) presented their exhaustive review of the South American taxa. In that work, all revisionary systematics were based on comparative morphological data, and no attempt was made to resolve higher-level relationships within the South American taxa. Bauer et al. (1997) restricted the genus *Phyllodactylus* to New World taxa, naming five new genera and retrieving a sixth from synonymy to represent monophyletic clades of geckos from Africa, Asia, and Europe that were previously referred to as *Phyllodactylus*. As indicated by Bauer et al. (1997), the monophyly of the New World *Phyllodactylus* has not been tested, and phylogenetic relationships among species of *Phyllodactylus* remain unknown.

The *P. gerrhopygus* group is defined by the presence of abdominal plaques in the group's three constituent species: *P. angustidigitus, P. gerrhopygus,* and *P. heterurus*. An abdominal plaque (referred to as "preanal plate" by Dixon and Huey, 1970) is a novel sensory organ resembling an enlarged, roundly triangular plate or scale located anterior to the cloacal opening on the ventral surface and is most likely a heat sensing organ used to actively sample substrate temperature (Kroll and Dixon, 1972). Members of the *P. gerrhopygus* group inhabit some of the driest and coldest habitats of any South American species of *Phyllodactylus*, making the evolution of the heat-sensing abdominal plaque potentially advantageous (Kroll and Dixon, 1972). *Phyllodactylus thompsoni* possesses an enlarged scalelike plate or pad extending from the posterior inside edge of the cloacal lip posteriorly onto the body. The extremely dry habitat in the upper Marañón Valley, not unlike that of the arid Andean foothills inhabited by *P. gerrhopygus*, may have fueled evolution in *P. thompsoni* of an organ homologous to the abdominal plate in the *P. gerrhopygus* group. External examination of the postcloacal plate does not allow for determination of whether this plate is a sensory plaque like those found in the *P. gerrhopygus* group, some other sort of sensory organ, or perhaps simply cloacal ornamentation.

After being overlooked by biologists until relatively recently, the upper Marañón Valley in the area of Balsas is beginning to be recognized as an important center for endemism within the Marañón Valley, particularly among plants (Bregman, 1996; Bridgewater et al., 2003; Hughes et al., 2004; Pendry, 2004; Hughes, 2005). The vicinity of the type locality for *P. delsolari* and *P. thompsoni* also encompasses the distribution of the endemic legume (Leguminosae) species *Coursetia cajamarcana, Mimosa ctenodes, Parkinsonia peruviana*, two undescribed species of *Caesalpinia*, and the endemic genus and species *Maraniona lavinii* (Hughes et al., 2003, 2004; Hughes, 2005). Many of these taxa, as well as endemic species from other plant families, exhibit highly localized distributions in the Balsas area, some of which (like *Maraniona*) are restricted to a narrow elevational belt that also encompasses the known distribution of the two new *Phyllodactylus*.

The Marañón Valley is also an area of bird endemism, with 22 species restricted to the valley, and Balsas and its immediate surroundings up to 2,900 m elevation is considered an area of importance for endemic bird conservation (Franke et al., 2005). This region and the surrounding highlands is potentially a center for land snail endemism, with some endemics already described (Thompson, 1982) and over 70 new species awaiting description (F. G. Thompson, pers. comm.), all of which were collected on the same trip that produced the type material of *Phyllodactylus delsolari* and *Phyllodactylus thompsoni*, as well as that of *E. araiodactylus* (Duellman and Pramuk, 1999), *Phrynopus spectabilis* (Duellman, 2000; later synonymized with *Pleurodema marmorata* by Lehr, 2006), and *Phyllodactylus thompsoni* (Duellman, 2000).

Eleven of the 15 species of *Phyllodactylus* reviewed or described by Dixon and Huey (1970) are sympatric with at least one other member of the genus. There are four species of sympatric geckos in the Balsas region: *Phyllodactylus delsolari, Phyllodactylus thompsoni, Phyllodactylus reissi,* and *Phyllopezus maranjonensis* (Koch et al., 2006). In their discussion of sympatry in *Phyllodactylus*, Dixon and Huey (1970) noted two general commonalities among sympatric sets of *Phyllodactylus*: first, sympatric species typically exhibit a wide divergence in body size, often typified by the presence of one relatively large and one relatively small species; second, sympatric species usually demonstrate clear differences in their respective degrees of arboreality. Although *P. delsolari* and *P. thompsoni* obviously conform to the first of Dixon and Huey's (1970) characterizations, the ecological relationships among the two giant species of *Phyllodactylus* (*P. delsolari* and *P. reissi*) and the even larger sympatric gecko *Phyllopezus maranjonensis* remains unclear. Clearly, focused examination of the unique gekkonid assemblage in the Balsas region is warranted, particularly given the apparent ecological overlap among the three species of giant geckos.

In lower parts of the Marañón basin around 120–150 km north of Balsas, in the Huancabamba Depression near Bagua and the confluence of the Marañón and ríos Chinchipe and Utcubamba, the giant species *P. reissi* is sympatric with the small species P. interandinus, an endemic to the Bagua region. The Huancabamba Depression is both an important hotspot for endemism across a variety of taxonomic groups (Cadle, 1991; Duellman and Wild, 1993; Reeder, 1996; Duellman and Pramuk, 1999; Sancho, 2004) and one of the most significant biogeographic barriers in the entire Andes, separating the northern and southern cordilleras of the Andes and forming the southern edge of the distribution for taxa found to the north and the northern edge for species found in the southern cordilleras (Duellman, 1979; Weigend, 2002). Suites of plant genera found in both the Bagua and Balsas regions of the Marañón Valley, such as the legumes *Mimosa* and *Coursetia*, each contain species endemic to that respective region (Weigend, 2002; Hughes, 2005), a pattern not unlike that seen in *Phyllodactylus*. Evidence from the fossil record indicates that some dry forest-inhabiting plant species in northwestern Peru have remained remarkably conserved in terms of morphology for at least 10 million years, indicating that dry forests in this region have been present continuously for the intervening period and became gradually more fragmented, shaping the current phytogeography of the region (Burnham, 1995; Burnham and Barranco, 2004; Hughes, 2005).

Despite the identification of a number of locally endemic species in the Balsas area, this region remains poorly known and undersampled biologically. Even taxonomic groups that are relatively well studied in this region, such as plants, have thus far only received limited attention from systematists, and *P. delsolari* and *P. thompsoni* are the second and third endemic reptile species to be described from the immediate vicinity of Balsas (Koch et al., 2006). The potential for discovery of additional endemic, undescribed species in the Balsas region is high, and a concerted effort to characterize the composition and conservation status of the herpetofauna of the upper Marañón Valley should be undertaken at the earliest possible opportunity.

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3.2 Squamata, Phyllodactylidae, *Phyllodactylus thompsoni* Venegas, Townsend, Koch and Böhme, 2008 and *Phyllodactylus delsolari* Venegas, Townsend, Koch and Böhme, 2008: Latitudinal and altitudinal distribution extension and geographic distribution map

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Contribution of Claudia Koch to this publication:
Field work (together with coauthor); data collection; data analysis; interpretation of data; conception of article; main writing and proof reading.

Abstract. This work reports on the collection of the gekkonid species *Phyllodactylus thompsoni* and *Phyllodactylus delsolari* from seven and four new localities, respectively, extending the distribution of both species southward along the Río Marañón valley in Peru by about 130 km and the altitudinal range to nearly 1,900 m above sea level.

In 2008, two new species of the genus *Phyllodactylus* were described based on material collected in the southern area of the Región de Amazonas, Peru (Venegas *et al.* 2008). *Phyllodactylus thompsoni* (Figure 3.2.1) is a small species reaching only up to 42 mm snout-vent-length (SVL) and is the only representative of the genus with an enlarged postanal scale. In contrast, the other species identified, *Phyllodactylus delsolari* (Figure 3.2.2), is one of the largest representatives of the genus among those found in mainland South America, reaching up to 81 mm SVL (Dixon and Huey 1970; Venegas *et al.* 2008). Previously, both species were known only from the type locality in the vicinity of the Balsas Village, at the base of the western slope of the Cordillera Central, between 900 and 1,400 m elevation (Venegas *et al.* 2008). Both species were found at night, either perched on vertical rock walls up to 5 m above the ground or actively moving on the ground nearby rocks. The mean air temperature during these nights was reported to be 27.3 °C; the mean substrate temperature of the rocks was reported to be 28.8 °C (Venegas *et al.* 2008). The two species were found sympatric with the giant gecko *Phyllopezus maranjonensis* and the congener *Phyllodactylus reissii* (Koch *et al.* 2006; Venegas *et al.* 2008).

Here we provide seven new localities for *P. thompsoni* and four new localities for *P. delsolari* (Figure 3.2.3), based on our collected specimens, which were deposited in the collections of the Centro de Ornitología y Biodiversidad, in Lima, Peru (CORBIDI) and the Forschungsmuseum Alexander Koenig, in Bonn, Germany (ZFMK). Of the new localities, Laguna de Pias (Figure 3.2.4) represents the southernmost and also highest locality of both species and extends their distributional ranges southward along the Río Marañón valley by about 130 km and their altitudinal ranges to nearly 1,900 m above sea level.

Figure 3.2.1. *Phyllodactylus thompsoni* from Laguna de Pias, La Libertad, Peru. Photo taken on 18 January 2010.

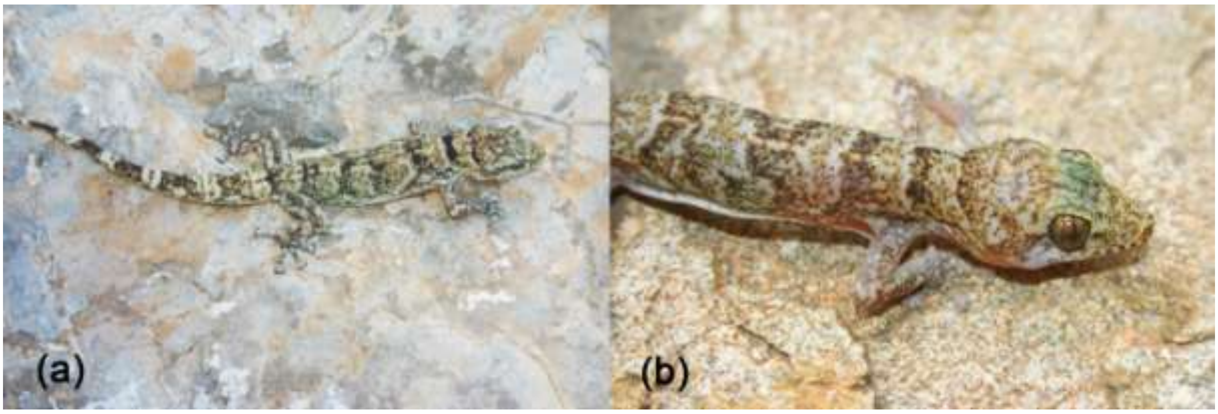

Figure 3.2.2. *Phyllodactylus delsolari* from Laguna de Pias, La Libertad, Peru. Photos taken on 18 January 2010; (a) total view and (b) close-up of the head and dorsum.

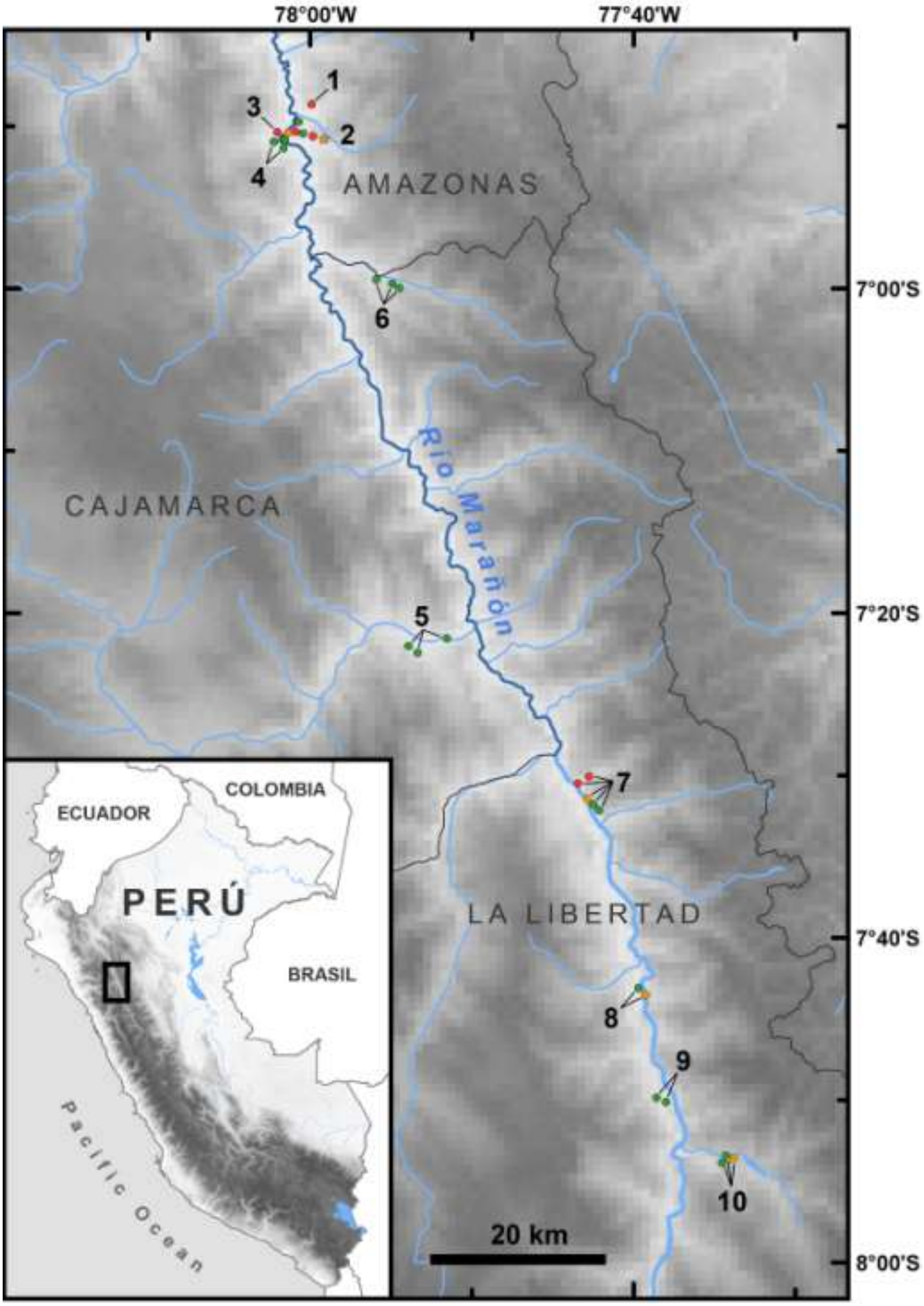

Figure 3.2.3. Map of Peru showing the new distributional ranges of *P. delsolari* (red dots) and *P. thompsoni* (green dots) based on the data presented here. The gold star marks the type locality of both species and the gold dots mark sympatric occurrences of both species. Localities: Amazonas Region: (1) Quebrada Honda/Llusca (Balsas), (2) Balsas; Cajamarca Region: (3) Chacanto, (4) Road between Chacanto and Limón, (5) Santa Rosa (Marcamachay); La Libertad Region: (6) San Vicente/ Pusac, (7) Calemar, (8) Vijus, (9) Chagual, (10) Laguna de Pias.

Six specimens of *P. thompsoni* (CORBIDI 5717–5720, ZFMK 90912, 90913) were collected near the road between Chacanto and Limón, Provincia de Celendín, Región de Cajamarca (06°50’ S, 78°02’ W; 1,135 m elevation), on 17 April 2009, by C. Koch and A. García, six specimens (CORBIDI 5722, 5723, ZFMK 90917, 90918, 90921, 90922) in San Vicente/Pusac, Provincia de Bolívar, Región de La Libertad (06°59’ S, 77°55’ W; 1,430–1,670 m elevation), between 22–24 April 2009, by C. Koch and A. García, six specimens (CORBIDI 6903–6905, ZFMK 91740–91742) in Chagual, Provincia de Pataz, Región de La Libertad (07°50’ S, 77°38’ W; 1,290–1,370 m elevation), between 6–8 January 2010, by C. Koch, E. Hoyos and A. M. Beraún, further six specimens (CORBIDI 6906–6908, ZFMK 91743–91745) in Vijus, Provincia de Pataz, Región de La Libertad (07°43’ S, 77°40’ W; 1,290 m elevation), on 10 January 2010, by C. Koch, E. Hoyos and A. M. Beraún, six specimens (CORBIDI 6909–6911, ZFMK 91746–91748) in the surroundings of Laguna de Pias, Provincia de Pataz, Región de La Libertad (07°54’ S, 77°34’ W; 1,850–1,880 m elevation), between 15–17 January 2010, by C. Koch, E. Hoyos and A. M. Beraún, seven specimens (CORBIDI 7681– 7684, ZFMK 91749–91751) in Santa Rosa (Marcamachay), Provincia de Cajabamba, Región de Cajamarca (07°22’ S, 77°53’ W; 1,090–1,300 m elevation), between 12–14 October 2010, by C. Koch and M. Palacios and six specimens (CORBIDI 7685–7687, ZFMK 91752–91754) in Calemar, Provincia de Bambamarca, Región de La Libertad (07°32’ S, 77°42’ W; 1,440–1,690 m elevation), between 19 October 2010, by C. Koch and M. Palacios (Table 3.2.1).

Table 3.2.1. Seven new localities of *P. thompsoni.*

Región	Provincia	Locality/Coordinates	Altitude	Collection numbers
Cajamarca	Celendín	Road between Chacanto and Limón (06°50' S, 78°02' W)	1,135 m	CORBIDI 5717–5720, ZFMK 90912, 90913
	Cajabamba	Santa Rosa (Marcamachay) (07°22' S, 77°53' W)	1,090–1,300 m	CORBIDI 7681–7684, ZFMK 91749–91751
La Libertad	Bolívar	San Vicente/Pusac (06°59' S, 77°55' W)	1,430–1,670 m	CORBIDI 5722, 5723, ZFMK 90917, 90918, 90921, 90922
	Pataz	Chagual (07°50' S, 77°38' W)	1,290–1,370 m	CORBIDI 6903–6905, ZFMK 91740–91742
		Vijus (07°43' S, 77°40' W)	1,290 m	CORBIDI 6906–6908, ZFMK 91743–91745
		Laguna de Pias (07°54' S, 77°34' W)	1,850–1,880 m	CORBIDI 6909–6911, ZFMK 91746–91748
	Bambamarca	Calemar (07°32' S, 77°42' W)	1,440–1,690 m	CORBIDI 7685–7687, ZFMK 91752–91754

Three specimens of *P. delsolari* (CORBIDI 5672, 5673, ZFMK 90871) were collected in Chacanto, Provincia de Celendín, Región de Cajamarca (06°50' S, 78°01' W; 890 m elevation), on 16 April 2009, by C. Koch and A. García, four specimens (CORBIDI 6912, 6913, 7656, ZFMK 91761) in Vijus, Provincia de Pataz, Región de La Libertad (07°43' S, 77°39' W; 1,260–1,315 m elevation), between 13–14 January 2010, by C. Koch, E. Hoyos and A. M. Beraún, five specimens (CORBIDI 6914–6916, ZFMK 91759, 91760) in the surroundings of Laguna de Pias, Provincia de Pataz, Región de La Libertad (07°53' S, 77°33' W; 1,820–1,870 m elevation), between 16–18 January 2010, by C. Koch, E. Hoyos and A. M. Beraún and six specimens (CORBIDI 7654, 7655, ZFMK 91755–91758) in Calemar Provincia de Bambamarca, Región de La Libertad (07°30' S, 77°42' W; 1,230–1,400 m elevation), between 19–20 October 2010, by C. Koch and M. Palacios (Table 3.2.2).

Table 3.2.2. Four new localities of *P. delsolari.*

Región	Provincia	Locality/Coordinates	Altitude	Collection Numbers
Cajamarca	Celendín	Chacanto (06°50' S, 78°01' W)	890 m	CORBIDI 5672, 5673, ZFMK 90871
La Libertad	Pataz	Vijus (07°43' S, 77°39' W)	1,260–1,315 m	CORBIDI 6912, 6913, 7656 ZFMK 91761
		Laguna de Pias (07°53' S, 77°33' W)	1,820–1,870 m	CORBIDI 6914–6916, ZFMK 91759, 91760
	Bambamarca	Calemar (07°30' S, 77°42' W)	1,230–1,400 m	CORBIDI 7654, 7655 ZFMK 91755–91758

The specimens of *P. thompsoni* reported here have a maximum SVL of 43 mm, between 10 and 12 rows of large and trihedral dorsal tubercles, enlarged trihedral tubercles on the dorsal surface of tibia, and an enlarged postanal scale, all characteristic of this species (Venegas *et al.* 2008). The specimens of *P. delsolari* reported here have a maximum SVL of 77 mm, fewer than 10 poorly defined rows of small, smooth, round tubercles, and broad, well-defined dark dorsal cross-bands as described by Venegas *et al.* (2008).

The new records reported here are the first reports of the two species outside their type localities and the first registries of these species from the Regiones de Cajamarca and La Libertad. The initial conjecture by Venegas *et al.* (2008) that the species were endemic to the Balsas region is not supported by these findings. During our investigations we found the two species (*P. thompsoni*, *P. delsolari*) sympatric in Vijus and La Laguna de Pias. In Calemar they both occurred sympatric with a third gekkonid species *Phyllopezus maranjonensis*. In addition, *Phyllodactylus delsolari* was found sympatric with *Phyllopezus maranjonensis* in Chacanto. *Phyllodactylus thompsoni* occurred sympatric with *Phyllopezus maranjonensis* in Santa Rosa (Marcamachay) and with *Phyllodactylus reissii* in San Vicente/Pusac. The latter was found to be a very abundant species in Marañón regions situated more than 100 km (linear distance) north of Balsas. In Balsas, as well as in San Vicente/Pusac, which are 20 linear kilometers apart, *P. reissii* could only be found in very low individual numbers. It seems as if the distribution of *P. reissii* and the two other species of *Phyllodactylus* overlap only in the Balsas and San Vicente/Pusac regions. From there, *P. reissii* is distributed northwards whereas *P. thompsoni* and *P. delsolari* are distributed southwards.

Figure 3.2.4. The southernmost locality where *P. thompsoni* and *P. delsolari* were found: Laguna de Pias, La Libertad, Peru, 1800 – 1900 m a.s.l.

All specimens of *P. thompsoni* and all but two specimens of *P. delsolari* were captured at night. The latter (ZFMK 91759, CORBIDI 6915) were detected during the day (11:20 am and 11:40 am) hidden in bore holes of a large boulder (Figure 3.2.5). While *P. delsolari* was exclusively found on rocks up to several meters above the ground, *P. thompsoni* was observed mainly on stones in areas of low vegetation or under/between fallen and decomposing cactus plants (Figure 3.2.6).

Figure 3.2.5. The southernmost locality where *P. thompsoni* and *P. delsolari* were found: Laguna de Pias, La Libertad, Peru, 1800 – 1900 m a.s.l.

It becomes apparent that the species mentioned herein are still poorly documented. Further research is necessary to become more acquainted with their ecology and true distributional limits. Moreover, efforts should be made to characterize the conservation status of the species and to determine if they are threatened by the human influence on their habitats.

Figure 3.2.6. Microhabitat of *P. thompsoni* near Chacanto, Cajamarca, Peru; almost half of the collected and sighted specimens where found under/ between such fallen and decomposing cactus plants.

Acknowledgements. We are principally indebted to Pablo J. Venegas for providing access to the collection of the Centro de Ornitología y Biodiversidad (CORBIDI), Lima, Peru, and for his assistance in the planning of the field trips. Wilfredo Nañez Aizcorbe helped with the legal formalities of the collection (N° 0020-2009-AG-DGFFS-DGEFFS, 0424-2010-AG-DGFFS-DGEFFS) and export permits (001829-AG-DGFFS, 003983-AG-DGFFS), which were issued to C. Koch by the Dirección General Forestal y de Fauna Silvestre of the Ministerio de Agricultura, Lima, Peru. Antonio García Bravo, Erick Hoyos Granda and Manuel Palacios Panta assisted during the field work and contributed greatly to the success of the field trips. We are indebted to Morris Flecks for the compilation of the distribution map. C. Koch would like to thank the Deutscher Akademischer Austauschdienst (DAAD) and the Alexander Koenig Stiftung for their financial support.

3.3 Ecology of a gecko assemblage (Phyllodactylidae: Squamata) from northern Peru

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Contribution of Claudia Koch to this publication:
Study idea; co-supervision of research project; field work (together with J. Aurich); writing and proof reading (together with J. Aurich).

Abstract. The ecology of four phyllodactylid geckos, three of them only recently discovered, viz. *Phyllopezus maranjonensis, Phyllodactylus delsolari, Phyllodactylus thompsoni* and *Phyllodactylus reissii,* was studied in a northern interandean basin of Peru. *P. maranjonensis* and *P. delsolari* were almost always encountered together and were exclusively found on rock faces; *P. thompsoni* was found in various microhabitats and coexisted with all three other species; *P. reissii* was rarely found and only in one locality on the walls of an abandoned house, coexisting solely with *P. thompsoni.* All species fed on arthropods with isopods, coleopterans and insect larvae dominating their diet, numerically. Stones and eggshells could be found in the stomachs of gravid *P. maranjonensis* females. Dietary niche breadth values for all species are well above 1 and similar. Dietary niche overlap among all species is low, except for *P. delsolari* and *P. reissii,* which might be associated with the low abundance of *P. reissii* in this area. Niche overlap among *P. maranjonensis* and *P. delsolari* was low and probably makes their coexistence possible, despite their remarkable size.

Introduction

Peru has a high degree of biotic diversity due to its extreme topographic variation and its numerous ecosystems. According to Rodriguez (1996) only 60% of Peru’s habitat has been herpetologically investigated. As study into previously neglected areas expands, the number of newly described species is increasing constantly. Three of the species which are the subject of this ecological study, *Phyllopezus maranjonensis* Koch, Venegas & Böhme 2006, *Phyllodactylus delsolari* and *Phyllodactylus thompsoni* Venegas, Townsend, Koch & Böhme 2008, have been recently described. They all occur in the Balsas region in a northern interandean basin along with their congener, *P. reissii,* which has been described by Peters in 1862. The latest analysis of phylogenetic relationships among gekkotan lizards revealed that the four geckos studied herein belong to the family Phyllodactylidae*,* a monophyletic trans-Atlantic gecko clade (Gamble et al. 2008).

Ecological and natural history studies are of great importance, as they can provide useful data on the evolution of important biological phenomena. Nonetheless, basic ecological and natural history data are lacking for most amphibians and reptiles and might never be accessible due to constant habitat and species loss all over the world (Vitt et al. 2003, Greene 1986 & Greene 1994). This justifies and makes ecological, behavioral and natural history studies more than necessary, to get a basic knowledge about species and to enable their conservation.

In this study the ecological relationship among the four gecko species *Phyllopezus maranjonensis, Phyllodactylus delsolari, Phyllodactylus thompsoni* and *Phyllodactylus reissii* is investigated and described. The three former species are so far known from the upper Marañon valley, from their type locality in the Balsas region (Koch 2006 & 2008, Koch et al. 2006 & Venegas et al. 2008) to 130 km upstream (Koch & Beraún 2011). *P. reissii* is known from southern Ecuador and north-western Peru (Dixon & Huey 1970) and inhabits various ecosystems like the coastal desert of Peru, the equatorial dry forest and the Pacific tropical forest (Dixon & Huey 1970, Jordán 2006).

The species *P. delsolari* and *P. reissii* can reach a similar, quite remarkable size (SVL: 81 mm and 75 mm; respectively) and *P. maranjonensis* even exceeds this size (SVL: 115 mm). It is currently the third largest gecko species of South America. According to Dixon & Huey (1970) sympatry among two *Phyllodactylus* species is sustainable if the size distribution differs markedly. Here, three large geckos are coexistent and a high competition among them is likely. A focused investigation of this unique ecological assemblage was expressed by Venegas et al. (2008).

The present study should provide some insight into the complex ecological relationship among these four gecko species. Habitat and microhabitat are described and a quantitative dietary analysis is conducted. Niche breadth and niche overlap are calculated, to gain evidence on the extent of food competition among these four species.

Materials and Methods

The four gecko species were studied in the region of Balsas (6°49’S, 78°00’W), Peru during two time periods (03/26/2010 – 04/18/2010 and 05/20/2010 – 05/29/2010). Six localities around Balsas were selected, each of which was visited four times during the first field trip and two times during the second field trip. Temperature and humidity were measured each day at approximately 3 pm and at night at approximately 7 pm, before each night’s field survey.

Due to the geckos’ natural period of nocturnal activity, monitoring and collecting of specimens was conducted from after sunset (approx. 7 pm) until midnight or shortly after midnight (not later than 2 am). Headlights (Silva and Petzl) were used to locate animals on rock faces, walls, in crevices of rocks or walls and between shrubs. Geckos were caught manually by grabbing them between their head and forelegs. Each specimen was sexed and measured with respect to its snout-vent length (SVL), head length, head width, forelimb length, hind limb length and tail length (tape measure, to 1mm). Total mass was taken with a precision spring balance (Pesola) to 0.5 g. For most captured lizards, data on surrounding habitat, microhabitat and vegetation, height on the rock surface and behavior before and during capture were recorded. Geckos not used for further analyses were marked by means of a waterproof marker and set free.

Animals used for dietary analysis were taken to the field station for euthanization and fixation. To guarantee that the stomach contents were little digested and in good condition for identification, specimens were killed the following morning, not later than 10 hours after their capture, by an injection of the veterinary anesthetic T61. To achieve the best possible fixation, 10% formalin was injected into the specimens' abdomen, tail and hind legs.

They were then stored in 10% formalin for 24 to 48 hours, until they could be moved to 70% ethanol for preservation. In the laboratory, the geckos' stomachs were removed and dissected. The percentage of empty stomachs within each species was determined. The contents of full stomachs were spread on a Petri dish and prey items of each stomach were separated and counted. Each prey item was identified to the level of order when possible. All items were grouped into 17 categories. Prey items that were well preserved, were measured by length and width by means of a digital caliper. These data were used to calculate the volume of individual prey items with the formula for a prolate spheroid according to Lima et al. (2010):

$$V = 4/3\pi\ (\text{length}/2)(\text{width}/2)^2$$

To determine a size difference between the prey items eaten by the four different gecko species, a Kruskal-Wallis test was used with all variables ($P < 0.05$). A highly significant result allows a further stepwise discriminate analysis by means of a Mann-Whitney U test ($P < 0.05$). All statistical analyses were performed by PASW Statistics 18.

To quantify the resources used by each species, niche breadth was calculated using the inverse of Simpson's (1949) measure:

$$\beta = \frac{1}{\sum_{i=1}^{n} P_i^2}$$

where *P* is the proportional utilization of each prey type *i* for a total of *n* categories (Nentwig et al. 2009). Niche breadth values (β) vary from 1 (exclusive use of a single prey type, specialist) to *n* (even use of all prey, generalist).

Niche overlap was calculated using the similarity index (Pianka 1973) according to Montechiaro et al. 2011:

$$\frac{\sum_{i=1}^{n} P_{ij} P_{ik}}{\sqrt{\sum_{i=1}^{n} P_{ij}^2 \sum_{i=1}^{n} P_{ik}^2}}$$

where *j* and *k* represent the two species of which the overlap should be computed and *P* is the proportional utilization of each prey type *i*. Values for niche overlap vary from zero (no overlap) to one (complete overlap).

Voucher specimens of all lizards used in this study are stored in 70% ethanol and housed in the herpetology collections of the Zoologisches Forschungsmuseum Alexander Koenig (ZFMK) in Bonn, Germany and in the Centro de Ornitologia y Biodiversidad (CORBIDI) in Lima, Peru.

Results

General Ecology

All species were found active between 19.00 and midnight, at temperatures from 19.1 to 32.1 °C and humidity between 32 and 80%. One individual of *Phyllodactylus thompsoni* was observed active at 06.00, shortly after sunrise.

The two large geckos *Phyllopezus maranjonensis* (max SVL 115 mm) and *Phyllodactylus delsolari* (max SVL 81 mm) were encountered together in all localities. They were almost exclusively found on exposed rock faces. *P. maranjonensis* was usually observed in open spaces, without any surrounding vegetation, whereas *P. delsolari* was more often found near, or hidden beneath, vegetation. No *P. maranjonensis* were observed on the ground and only three *P. delsolari* were running over the ground when sighted. Both species have a similar color pattern with a grayish ground color and darker dorsal transverse bands, which makes them difficult to detect in their surroundings.

Geckos of both species were distributed over all heights of the rock faces (Figure 1). A couple of individuals of *P. maranjonensis* were observed at heights above 4 m, where it was impossible to catch them. Animals of this species were generally observed individually, with no other specimens nearby. During the entire study period a total of 120 *P. maranjonensis* and 107 *P. delsolari* were observed in the investigated areas, indicating that both species were quite common and occurred in comparable abundance. In contrast, only 21 individuals of *Phyllodactylus reissii,* another large gecko (max SVL 75 mm) were found. They were observed almost exclusively in just one of the studied localities: an abandoned house, where they occupied its walls and hid in its crevices. They occurred together only with *P. thompsoni.* Three of the 19 *P. reissii* were found on a nearby coarse stone wall. Due to the height of the house walls, geckos of this species were not found more than 3 m above the ground.

Phyllodactylus thompsoni is the smallest (max SVL 42 mm) and most abundant species in this area (292 specimens observed). It was found in all localities, occurring alongside all other species. It is ubiquitous and was observed in different microhabitats: on rock faces, ground dwelling in sandy and rocky surroundings, between shrubs and grass, on tree and cactus trunks, on house and stone walls and in their crevices. More than half of the observed individuals (54.9 %) were running over the ground or sat at the base of rock faces, walls or tree trunks, less than 1 m off the ground (Figure 3.3.1). With its grey-yellowish ground color and the dark blotches on its dorsum, *P. thompsoni* is difficult to see in its surroundings.

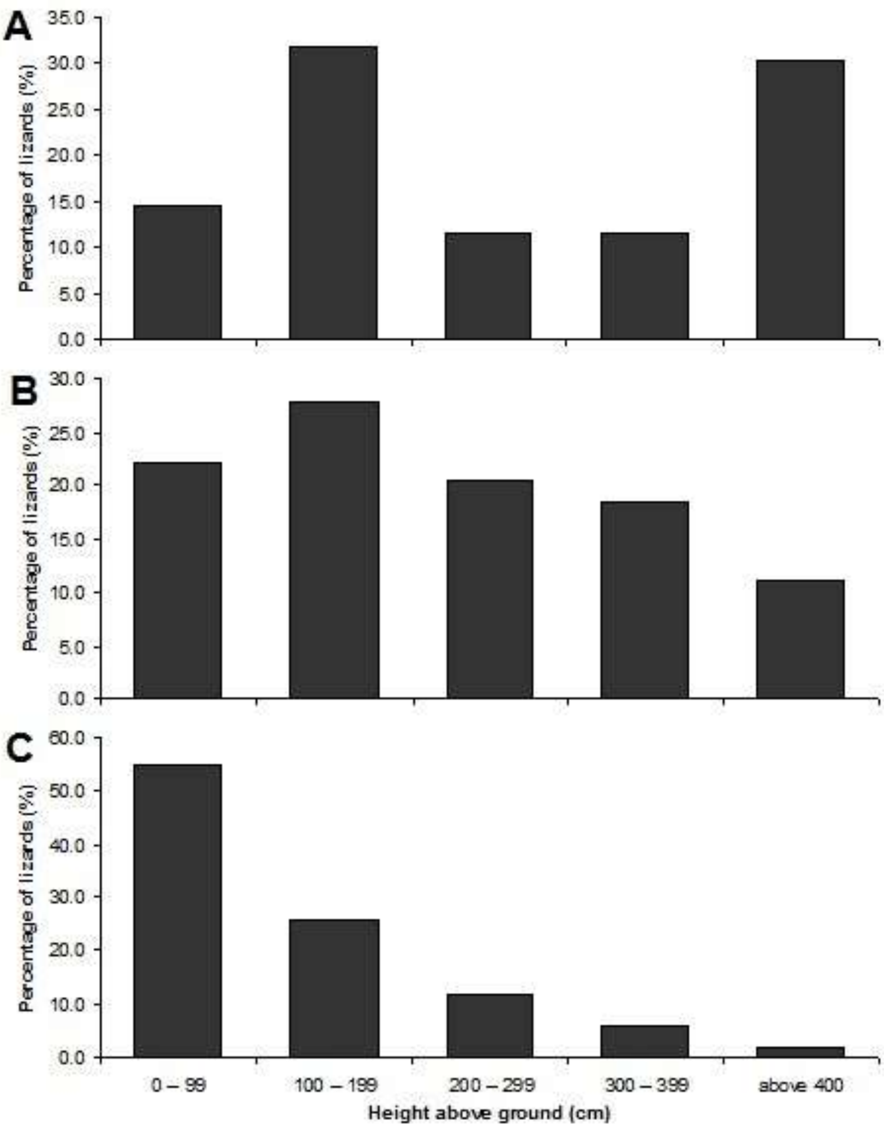

Figure 3.3.1. Height above ground when first sighted of **a)** *Phyllopezus maranjonensis,* **b)** *Phyllodactylus delsolari* and **c)** *Phyllodactylus thompsoni.*

Diet

For the stomach analyses, 21 specimens were used for each of the species *Phyllopezus maranjonensis, Phyllodactylus delsolari* and *Phyllodactylus thompsoni* and only 8 of the species *Phyllodactylus reissii.* The stomach content observation showed that 23.8% of the examined *P. maranjonensis*, 14.3% of *P. delsolari*, and 9.5% of *P. thompsoni* had empty stomachs, whereas all *P. reissii* contained prey items. The diet of these four species is exclusively composed of arthropods, although some other material was found in the stomachs. Stones and eggshells were present in 3 stomachs of *Phyllopezus maranjonensis* and 2 stomachs contained plant material, matter which was also found in one stomach of *Phyllodactylus thompsoni*.

Shed skin, which was consumed by the geckos after molting, was found in one stomach of each *P. maranjonensis* and *P. thompsoni* and in two stomachs of *P. delsolari.* None of the stomachs of *P. reissii* contained material other than arthropods.

A total of 68 objects were found in the stomachs of *Phyllopezus maranjonensis,* whereas only 46 of those were prey items (the others were stones, egg shells etc.). The number of prey items per stomach varied between one and 14, with an average of 3.2 (1SD: 3.4). Numerically, isopods accounted for the largest part of the diet of *P. maranjonensis* with 19.1%, followed by the coleopterans with 11.76%. Since one gecko swallowed 16 small stones, they actually accounted for the majority (26.5%) of the diet, but were not further considered in the evaluation (Table 3.3.1).

Due to advanced digestion, only 43.5% of the prey items of *P. maranjonensis* could be measured for width and length. These averaged 4.5 mm (1SD: 2.1) (2.0 to 8.5 mm) in width, 11.4 mm (1SD: 10.2) (4.4 to 52.2 mm) in length and 185.4 mm^3 (1SD: 274.5) (10.7 to 1119.5 mm^3) in volume. As it was not possible to measure more prey items and calculate their volume, no volumetric analyses were performed.

The stomachs of *Phyllodactylus delsolari* contained 45 prey items in total. The number of prey items in each stomach varied from 1 to 6 and averaged 2.5 (1SD: 1.5). Coleopterans dominated the diet of *P. delsolari* numerically by 35.6%, followed by lepidopterans and orthopterans each with 11.11% (Table 3.3.1). Twenty prey items (44.4%) were measured by width and length and their volume was estimated. They averaged 8.9 mm (1SD: 7.3) (2.5 to 31.5 mm) in length, 2.1 mm (1SD: 0.8) (1.1 to 3.6 mm) in width and 28.6 mm^3 (1SD: 30.5) (2.0 to 105.2 mm^3) in volume. One captured *Phyllodactylus delsolari* disgorged a complete, recently consumed prey item, identified as a centipede (Chilopoda), of the genus *Scolopendra* (Figure 3.3.2) which measured approximately 6 cm in length.

The stomachs of *Phyllodactylus reissii* held 20 prey items in total. Prey item number per stomach varied between 1 and 6, with an average of 2.5 (1SD: 1.8). Numerically, coleopterans dominated the diet of *P. reissii.* This prey category contributed 40% to this species' diet (Table 3.3.1). Eight prey items (40 %) could be measured by width and length and averaged 14.3 mm (1SD: 8.8) (2.5 to 28.5 mm) in length, 3.9 mm (1SD: 2.3) (1.0 to 8.3 mm) in width and 201.5 mm^3 (1SD: 242.5) (1.3 to 707.0mm^3) in volume.

Table 3.3.1. Diet of 16 *P. maranjonensis*, 18 *P. delsolari*, 19 *P. thompsoni* and 8 *P. reissii* from Balsas, Peru. No: Number of prey items in each category; %No: Number of prey items in each category, divided by the total number of prey items, multiplied by 100; Freq: Number of lizards that ate a particular prey type. Skin, vegetative material, stones, egg shells, etc. were combined in category "Other".

Diet category	Gecko species											
	P. maranjonensis			*P. delsolari*			*P. thompsoni*			*P. reissii*		
	No	%No	Freq	No	%No	Freq	No	%No	Freq	No	%No	Freq
Crustacea												
Isopoda	13	19.12	2	1	2.22	1	2	5.13	2	1	5	1
Myriapoda												
Chilopoda	4	5.88	4	1	2.22	1	1	2.56	1	-	-	-
Arachnida												
Araneae	7	10.29	6	2	4.44	2	2	5.13	2	3	15	3
Scorpiones	1	1.47	1	2	4.44	2	-	-	-	1	5	1
Acari	-	-	-	1	2.22	1	-	-	-	-	-	-
Insecta												
Formicidae	1	1.47	1	-	-	-	4	10.26	1	-	-	-
Other Hymenoptera	-	-	-	1	2.22	1	-	-	-	1	5	1
Coleoptera	8	11.76	7	16	35.56	10	1	2.56	1	8	40	4
Isoptera	1	1.47	1	-	-	-	-	-	-	-	-	-
Heteroptera	1	1.47	1	2	4.44	2	-	-	-	-	-	-
Auchenorrhyncha	1	1.47	1	-	-	-	8	20.51	5	-	-	-
Diptera	-	-	-	1	2.22	1	1	2.56	1	-	-	-
Lepidoptera	3	4.41	3	5	11.11	3	2	5.13	2	1	5	1
Orthoptera	4	5.88	4	5	11.11	5	4	10.26	4	3	15	3
All insect larvae	1	1.47	1	4	8.89	3	9	23.08	6	2	10	2
Unidentified arthropods	1	1.47	1	2	4.44	2	3	7.69	3	-	-	-
Other	22	32.35	6	2	4.44	2	2	5.13	2	-	-	-
Total	68	100.0		45	100.0		39	100.0		20	100.0	
Niche breadth		6.98			5.86			7.41			4.44	

Thirty-nine prey items were counted in the stomachs of *Phyllodactylus thompsoni.* The number of items per stomach varied between 1 and 5 and averaged 2.2 (1SD: 1.2). Insect larvae (not divided by order) accounted for the largest part of this species with 23.08 %, followed by Auchenorrhyncha with 20.51% (Table 3.3.1). It was possible to measure 16 prey items (41%) which averaged 6.1 mm (1SD: 5.3) (1.2 to

19.9 mm) in length, 1.4 mm (1SD: 0.6) (0.4 to 2.4 mm) in width and 9.2 mm³ (1SD: 10.4) (0.1 to 35.2 mm³) in volume.

Figure 3.3.2. *Scolopendra* sp. disgorged by *P. delsolari* after its capture.

Numerical niche breadth for all four gecko species is similar (Table 3.3.1) and suggests that none of them is a specialist. *Phyllodactylus reissii* had the lowest niche breadth with a value of 4.44 and used 8 of 15 prey categories (excluding “Other” from Table 3.3.1). The other three species used the categories more evenly. *Phyllopezus maranjonensis* and *Phyllodactylus delsolari* exploit all categories except for 3 each (Acari, other Hymenoptera, Diptera and Formicidae, Isoptera, Auchenorrhnycha, respectively) and their niche breadth values are 6.98 and 5.86, respectively. *Phyllodactylus thompsoni* had the highest niche breadth with a value of 7.41 and used 10 of 15 categories.

Niche overlap between the four species is relatively low, except between *P. delsolari* and *P. reissii* with a high overlap value of 0.95. The lowest niche overlap value of 0.28 is between *P. maranjonensis* and *P. thompsoni.* Overlap values for all other species combinations vary from 0.30 to 0.48 (Table 3.3.2). Prey size distribution differs significantly among those four species (Kruskal-Wallis Test, P = 0.000), with larger species eating larger prey, except for *P. maranjonensis* and *P. reissii* (Mann-Whitney U Test, Z = -0.203, P = 0.839), where prey size is not significantly different. However, prey items eaten by *P. maranjonensis* are significantly larger than those consumed by *P. delsolari* (Mann-Whitney U Test, Z = 3.400, P = 0.001) and *P. thompsoni* (Mann-Whitney U Test, Z = -4.521, P = 0.000).

Table 3.3.2. Dietary niche overlap among the four species.

Species	*P. delsolari*	*P. thompsoni*	*P. reissii*
P. maranjonensis	0.435	0.276	0.483
P. delsolari	-	0.368	0.947
P. thompsoni	-	-	0.301

P. thompsoni consumed significantly smaller prey than *P. delsolari* (Mann-Whitney U Test, Z = -2.395, P = 0.017) and *P. reissii* (Mann-Whitney U Test, Z = -2.817, P = 0.005). Although *P. delsolari* and *P. reissii* are similar in size, the latter consumed significantly larger prey (Mann-Whitney U Test, Z = - 2.111, P = 0.035).

Discussion

As already known for *Phyllodactylus reissii,* its primary habitat is formed by arid, tropical scrub regions in the west of the Andes and cactidominated regions in northern interandean basins of Peru (Goldberg 2007, Dixon & Huey 1970). Balsas is situated in a northern interandean valley of Peru and represents the described habitat. The other three investigated species *Phyllopezus maranjonensis, Phyllodactylus delsolari* and *P. thompsoni* were found in parts of the upper Marañon valley, from Balsas to 130 km upstream. This arid cactidominated land is part of the equatorial dry forest and can be considered as the primary habitat of these three geckos.

Apart from *Phyllopezus maranjonensis* and *Phyllodactylus delsolari,* the four studied species apparently choose different kinds of microhabitat.Whereas *P. thompsoni* was found in various microhabitats, the other species seem to specialize on one microhabitat. Although Carrillo de Espinoza (1990) and Schlueter (2002) noted that *P. reissii* occupies various vertical microhabitats like tree and cactus trunks, house walls and rock faces, the species could almost always be found on house walls in this area. *P. maranjonensis* was exclusively found on rock faces as well as *P. delsolari* in general. Although both are large species, they were almost always coexisting in all localities.

According to two characterizations by Dixon & Huey (1970), sympatry among two *Phyllodactylus* species is rather unlikely if those two species do not differ markedly in size or arboreality. Although *Phyllopezus maranjonensis* comes from another genus, coexistence with *Phyllodactylus delsolari* seems exceptional, since they do not conform to either of the characterizations, and intense competition must be present.

Despite the ecological similarity of these two species, coexistence probably becomes possible due to differences in their diet. First, *P. maranjonensis* consumes significantly larger prey than *P. delsolari,* and second, they seem to prefer different prey categories, since their dietary overlap is relatively low (0.435). Both species are hardly specialized concerning their prey and exploit a lot of different prey categories within the arthropods. According to Pianka & Pianka (1976) species with more generalized requirements tend to have higher niche overlaps, accompanied by higher reproduction success than more specialized species.

This statement seems to be confirmed by the gecko assemblage of the Balsas region. Both, *Phyllopezus maranjonensis* and *Phyllodactylus delsolari,* have a relatively high niche breadth concerning their diet (6.98 and 5.86, respectively), but a specialization on one microhabitat is apparent. Both species are quite abundant in the area, but not as abundant as *Phyllodactylus thompsoni.* This species is the one with the most generalized requirements, which is obvious by its high dietary niche breadth (7.41) and the equal use of various microhabitats.

In contrast, *Phyllodactylus reissii* was the least abundant species with the most specialized requirements, apparent by its low dietary niche breadth (4.44) and its microhabitat specialization.

Since the number of observed *P. reissii* is so low, all calculated values and analyses are rather vague. Nonetheless, some conclusions can be made. The low abundance of *P. reissii* in the Balsas region might result from dietary similarities with *Phyllodactylus delsolari* and *Phyllopezus maranjonensis.* Niche overlap with the former species is high, almost complete (0.947), and prey size distribution does not differ significantly with respect to latter species and *P. reissii.* Thus, this species is probably not able to compete with the other large species in the Balsas region.

The ecological relationship among *Phyllodactylus thompsoni* and the three large geckos conforms to both characterizations by Dixon & Huey (1970) (see above). Additionally, dietary niche overlap between *P. thompsoni* and the other species is relatively low and prey size distribution differs significantly, with *P. thompsoni* eating smaller prey than all others. All these factors make coexistence of *P. thompsoni* with each of the large species feasible.

Pianka & Pianka (1976) stated that apparently species with specialized feeding habits tend to have empty stomachs more often than generalized feeders. Despite the general feeding habits of *Phyllopezus maranjonensis,* the percentage of individuals that ran on empty seems rather high (23.8% of 21). Even so, this value is just slightly higher than the average of 21.2% which was estimated by Huey et al. (2001) for nocturnal geckos. In general, geckos seem to have empty stomachs more often than other lizard groups including Agamidae and Iguanidae (Huey et al. 2001). Within the Gekkota nocturnal species tend to have empty stomachs more often than diurnal species. The studied *Phyllodactylus* species are withal low with respect to the average calculated by Huey et al. (2001) for nocturnal geckos, with 14.3 (*P. delsolari*), 9.5 (*P. thompsoni*) and 0% (*P. reissii*) empty stomachs.

The centipedes of the genus *Scolopendra* (Figure 3.3.3) and scorpions (Figure 3.3.4) found in the stomachs of all four studied gecko species were quite striking (Table 3.3.1). *Scolopendra* uses its venom claws to catch, anaesthetize and euthanize its prey. Scorpions possess a venomous spine at the end of their metasoma which they utilize to kill large prey. Consuming these animals seems rather unlikely, but they have been found in the stomachs of other squamates like *Crotalus lepidus klauberi* (Holycross et al. 2002)*, Sistrurus catenatus* (Holycross & MacKessy 2002)*, Ptenopus garrulous* (Hibbitts et al. 2005)*, Tropidurus plica* (Vitt 1991) and *Amphibolurus inermis* (Pianka 1971), as well.

Also striking were stones and eggshells found in the stomachs of three gravid *Phyllopezus maranjonensis.* Consuming eggshells might be reasonable, since geckos are the only squamates that produce calciferous eggs (Kluge 1987). Thus, eating eggshells might help the gravid females synthesizing the shells of its own eggs but as sample size was low, no valid conclusions can be made and the intake of those objects was merely accidental along with arthropod prey.

Figure 3.3.3. *Scolopendra* sp. found in the stomach of a female *P. maranjonensis* (7x magnification).

Figure 3.3.4. Claw of a scorpion contained in the stomach of a female *P. delsolari* (20x magnification).

A recent paper on the diet of *Phyllodactylus reissii* from Tumbes (Jordán 2006) shows that feeding habits of both populations, the one from Tumbes and the one from Balsas, are comparable. In Tumbes, 6 prey categories were identified in the diet of *P. reissii,* in the present study 8. Nonetheless, the Tumbes population had a higher niche breadth (5.73) than the one from Balsas (4.44). In both study areas, coleopterans dominated the diet, although blattopterans accounted for an even larger part of the diet of *P. reissii* from Tumbes. No blattopterans could be identified in the diet of any of the studied species from Balsas. Mean prey number eaten by *P. reissii* from Tumbes was higher, whereas *P. reissii* from Balsas consumed larger prey on average.

Another study on a gecko community, including the species *Phyllodactylus microphyllus, P. kofordi* and *P. reissii* at Bayovar, Peru (Huey 1979) shows that those species feed exlusively on arthropod prey, with *P. reissii* consuming the largest and *P. kofordi* the smallest prey. The three species differ significantly in microhabitat associations, with *P. kofordi* being the least arboreal one, occurring generally on leaf litter beneath shrubs and trees.

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4. CONTRIBUTIONS TO THE GENUS *POLYCHRUS*

4.1 A new bush anole (Iguanidae, Polychrotinae, *Polychrus*) from the upper Marañon basin, Peru, with a redescription of *Polychrus peruvianus* (Noble, 1924) and additional information on *P. gutturosus* Berthold, 1845

This section was published as:

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Contribution of Claudia Koch to this publication:
Field work (together with A. Garcia-Bravo) and museums work; data collection; data analysis; interpretation of data; conception of article; drawings; main writing and proof reading.

Abstract. We herein describe *Polychrus jacquelinae*, sp. n., a new colourful species with a conspicuous sexual dimorphism from the dry forest region of the northern portion of Región de La Libertad, Peru. The new species differs from all other *Polychrus* species, in that this species has very small dorsal scales and thus a higher number of scales around midbody and in the middorsal line from behind the occipital scales to the level of the posterior edge of the thigh. Furthermore, we redescribe *P. peruvianus* whose original description is short and lacks information on intraspecific variation and sexual dimorphism. Also, we add some information on intraspecific variation and ecology of *P. gutturosus*. Finally, we synonymize *P. spurrelli* Boulenger with *P. gutturosus.*

Introduction

The polychrotine iguanid lizards of the genus *Polychrus* (Cuvier 1817) occur in Central America northward to Nicaragua and in large parts of South America, on both sides of the Andes (Avila-Pires 1995). The genus is composed of six species: *Polychrus acutirostris* Spix, 1825; *P. femoralis* Werner, 1910; *P. gutturosus* Berthold, 1845; *P. liogaster* Boulenger, 1908; *P. marmoratus* (Linnaeus, 1758); *P. peruvianus* (Noble, 1924), of which four are believed to occur in Peru (*P. femoralis, P. liogaster, P. marmoratus*, and *P. peruvianus*). Boulenger (1914) described *Polychrus spurrelli* as a seventh species in the genus which is, however, currently considered to be a subspecies of *P. gutturosus* by many herpetologists (e.g. Parker 1935, Peters 1967, Peters and Donoso-Barros 1970, 1986). However, the status of this taxon is still unclear.

Although the existence of all the currently recognized species in the genus has been known for quite a long time, with the latest discovered species being described more than 86 years ago (Noble 1924), little is still known about most of the species. Original descriptions of all species in this genus are brief and lack information on intraspecific variation and sexual dimorphism. Therefore, they seem to be inadequate by today’s standards.

Avila-Pires (1995) gave detailed redescriptions of *Polychrus acutirostris, P. liogaster* and *P. marmoratus.* Savage (2002) gave a more detailed redescription of an unknown number of male and female specimens of *P. gutturosus* but, as did the original description (Berthold 1845), he failed to provide scale counts. Taylor (1956) provided a detailed description with some measurements and scale counts on two individuals but the small number of specimens still tells little regarding variation. We examined 27 specimens from museum collections and will herein provide more information on intraspecific variation based on measurements and scale counts.

We further redescribe *Polychrus peruvianus*, a comparatively common species which occurs in northern Peru and southern Ecuador. Originally, Noble (1924) described this species as belonging to a new genus *Polychroides*, and thus did not compare it with other species of the genus *Polychrus*, where it was later placed by Etheridge (1965). The original description is based on only a single male individual and thus information on intraspecific variation and on female specimens is still lacking. Yánez-Muñoz et al. (2006) and Schlüter (2010) recently provided a brief diagnoses for this species but failed to provide a comprehensive description.

To contribute to the knowledge of the herpetofauna of Andean dry forests, three of the authors (P. J. Venegas, A. W. Garcia Bravo, and C. Koch) surveyed the inter-Andean valleys of the upper Marañon basin between March 2008 and November 2010. The investigations resulted in the discovery of an obviously undescribed species of *Polychrus* which is described herein. During their fieldwork, they also collected 47 *P. peruvianus* and were able to note several important data on the natural history of this species.

Materials and Methods

All collected specimens were preserved in 10% formol and stored in 70% ethanol and have been deposited in the zoological collections of the Centro de Ornitología y Biodiversidad, Lima, Peru (CORBIDI) and of the Zoologisches Forschungsmuseum Alexander Koenig, Bonn, Germany (ZFMK).

The new species is described on the basis of 6 collected specimens (2 males and 4 females). The redescription of *Polychrus peruvianus* is based on 47 specimens (24 males, 23 females), and the information given on *P. gutturosus* is based on 27 specimens (10 males, 15 females, 2 undefined juvenile) including the holotype. We further examined the two female syntypes of *P. spurrelli* and two male specimens that were deposited under this species epithet in the British Museum of Natural History, London, England.

Comparative data for other *Polychrus* species were taken from Avila-Pires (1995), in addition to the examination of preserved specimens housed in the Museo de Historia Natural San Marcos, Lima, Peru (MUSM), the Centro de Ornitología y Biodiversidad, Lima, Peru (CORBIDI), the Senckenberg Forschungsinstitut und Naturmuseum, Frankfurt, Germany (SMF), the Museo de Zoología de la Pontificia Universidad Católica del Ecuador, Quito, Ecuador (QCAZ), the División de Herpetología, Museo Ecuatoriano de Ciencias Naturales, Quito, Ecuador (DHMECN), the British Museum of Natural History, London, England (BM), the Muséum d'Histoire Naturelle, Geneva, Switzerland (MHNG), and the Zoologisches Forschungsmuseum Alexander Koenig, Bonn, Germany (ZFMK). All measurements of the head, body, and limbs were taken with a Vernier caliper (to the nearest 0.1 mm), tail measurements were taken with a tape measure. To facilitate comparison within the genus we tried to structure our species descriptions analog to that of Avila-Pires (1995) and used the same terminology in the diagnoses and descriptions. In the tables, ranges of morphometric and pholidosis characters are presented, followed by mean values and standard deviations in parenthesis.

Altitudes above sea level and geographic coordinates were determined with a GPS (Garmin GPSMap 60CSx) using the geodetic datum WGS84. Humidity and air temperatures were taken with a digital thermo-hygrometer (Extech) with an external sensor.

Results

Polychrus jacquelinae sp. n.

Holotype. CORBIDI 7725 (Figures 4.1.1 A-E, 4.1.2 A,B), an adult male from a new road, that was still under construction and is intended to connect San Vicente/Pusaq and Uchumarca (06°59'S, 77°54'W, approximately 1460–1570 m above sea level), Province Bolivar, Región de La Libertad, Peru, collected by W.A. Garcia Bravo on 01 July 2010.

Paratypes. CORBIDI 5742 (Figure 4.1.2 D) and CORBIDI 7724, two adult females collected with the holotype; ZFMK 91763 (Figure 4.1.2 C) subadult male and ZFMK 90834, ZFMK 91764 (Figure 4.1.2 E) two adult females from the type locality, collected by W.A. Garcia Bravo and C. Koch on 24 April 2009.

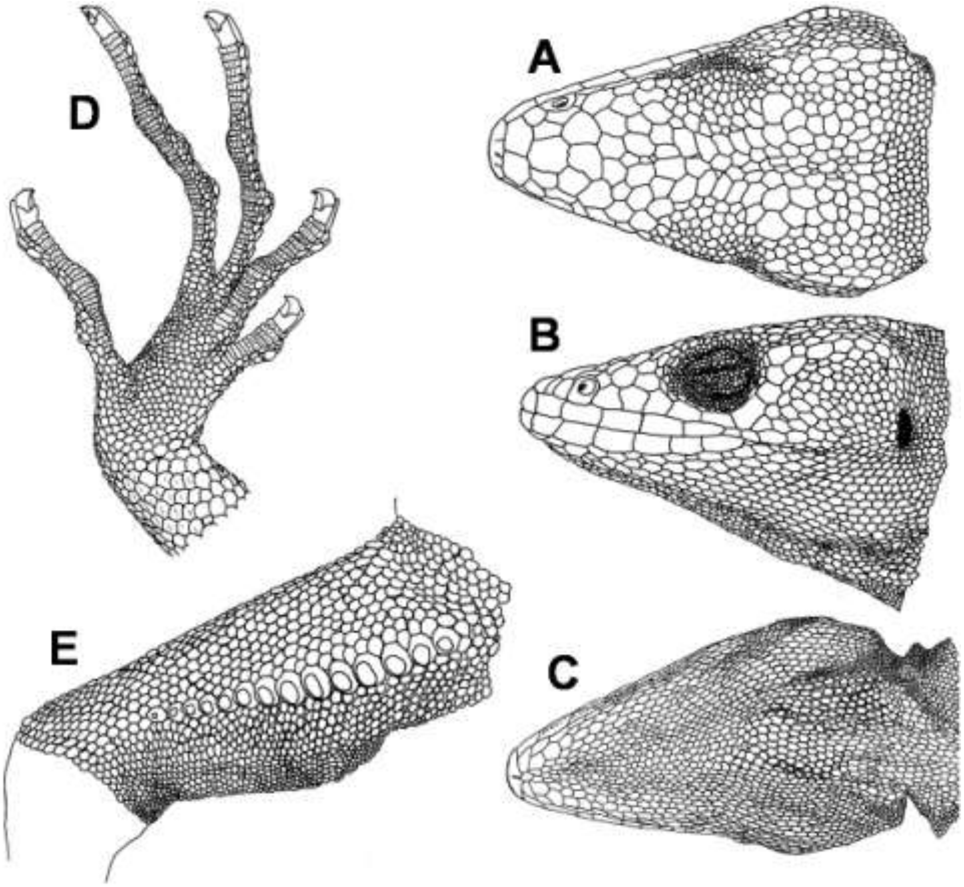

Figure 4.1.1. Male holotype of *Polychrus jacquelinae* sp. n. (CORBIDI 7725): dorsal (A), lateral (B) and ventral (C) views of head; ventral aspect of right foot (D); ventral view of right thigh with femoral pores (E).

Diagnosis (Table 4.1.1). (1) A *Polychrus* with a maximum known snout-vent-length (SVL) of 144 mm; (2) dorsal and gular crests absent; (3) 131 to 186 scales around midbody; (4) 198 to 215 scales in middorsal row from behind the occipital scales to the level of the posterior edge of the thigh; (5) femoral pores 13 to 15 on one side; (6) lamellae on finger IV 33–36; (7) lamellae on toe IV 42–48; (8) tail 2.13–2.33 times SVL; (9) dorsal and ventral scales small and smooth (10) a prominent sexual dichromatism present.

Polychrus jacquelinae sp. n. differs from other species of *Polychrus* by having more than 130 scales around midbody and more than 198 scales in middorsal row from behind the occipital scales to the level of the posterior edge of the thigh (*P. acutirostris* has fewer than 73 and 126 scales; *P. femoralis* fewer than 100 and 156; *P. gutturosus* fewer than 81 and 105; *P. liogaster* fewer than 95 and 125; *P. marmoratus* fewer than 90 and 118; and *P. peruvianus* fewer than 74 and 70 (paravertebrals), respectively). Furthermore, the new species is easily distinguished from *P. acutirostris* and *P. femoralis* by the absence of keeled ventral scales; from *P. gutturosus* by the absence of multicarinate ventral scales and by the presence of very small gular scales; from *P. liogaster* and *P. marmoratus* by the presence of a sexual dimorphism in colouration (absent in the two latter species); and from *P. peruvianus* by the absence of vertebral and gular crests.

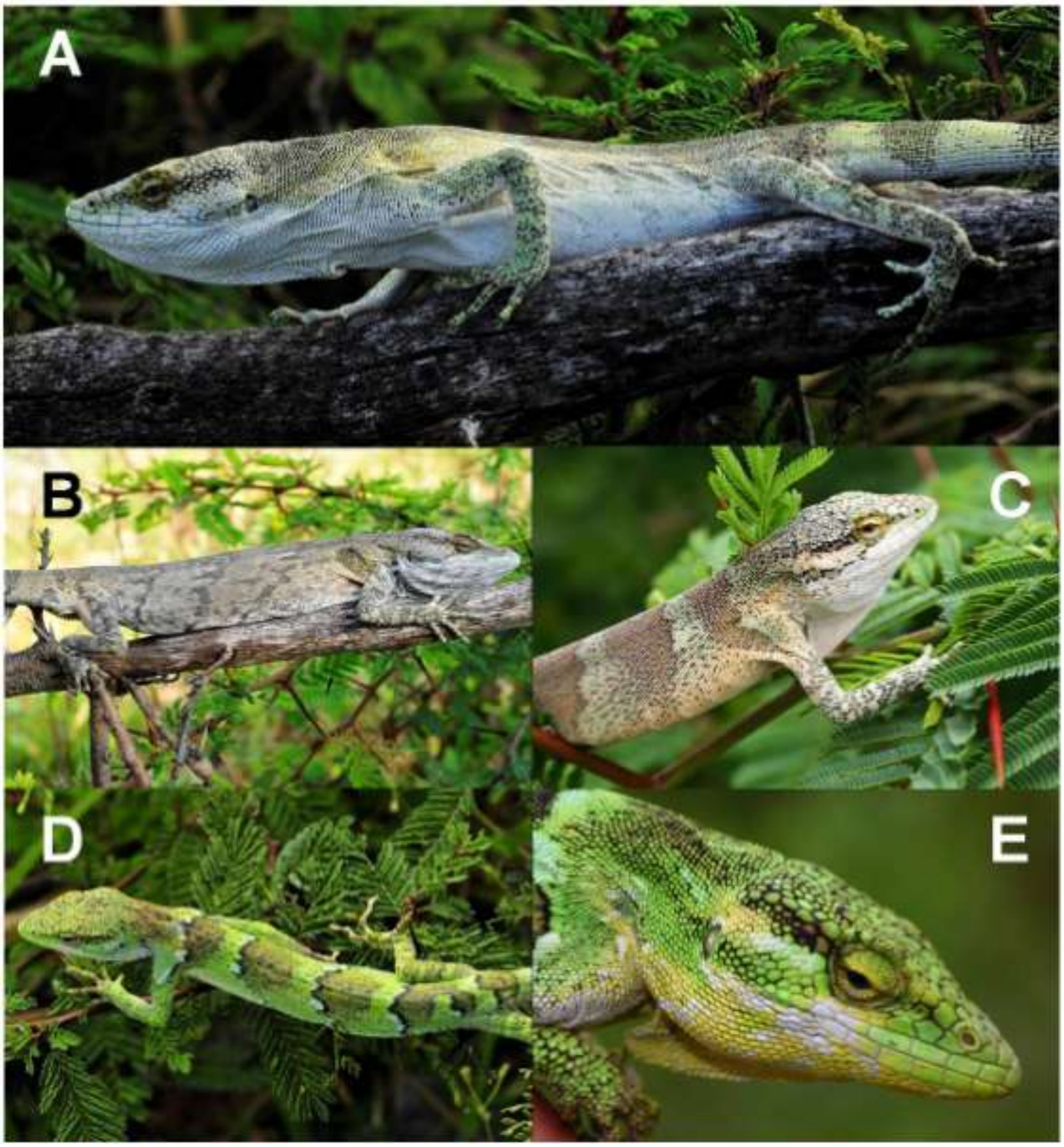

Figure 4.1.2. *Polychrus jaqcuelinae* sp. n. from La Libertad, Peru: male holotype (CORBIDI 7725) with normal colouration (**A**, photograph by M. León), in stress colouration (**B**, photograph by M. León); subadult male (**C**, ZFMK 91763); female (**D**, CORBIDI 5742, photograph by M. León), close-up of the head of one female (**E**, ZFMK 91764).

Table 4.1.1. Summary of morphometric and pholidosis characters of *Polychrus jacquelinae* sp.n.

Sex	All (n=6)	Males (n=2)	Females (n=4)
Axilla-groin length/SVL	0.46–0.55 (0.48 ± 0.03)	0.46–0.5 (0.48 ± 0.03)	0.48–0.55 (0.51 ± 0.03)
Head length/SVL	0.23–0.25 (0.24 ± 0.01)	0.25 (0.25 ± 0.00)	0.23–0.24 (0.24 ± 0.01)
Head length/Head width	1.46–1.63 (1.55 ± 0.06)	1.51–1.56 (1.54 ± 0.04)	1.46–1.63 (1.56 ± 0.08)
Head width/Head height	0.98–1.1 (1.03 ± 0.05)	1.01–1.06 (1.04 ± 0.03)	0.98–1.1 (1.03 ± 0.06)
Tail length/SVL	2.13–2.33 (2.23 ± 0.08)	2.16–2.22 (2.19 ± 0.04)	2.13–2.33 (2.25 ± 0.09)
Scales around midbody	131–186 (164.17 ± 20.45)	139–186 (162.5 ± 33.23)	131–149 (138 ± 7.87)
Vertebral scales	198–215 (206.17 ± 6.94)	198–202 (200 ± 2.83)	202–215 (209.25 ± 6.29)
Gular scales	72–83 (75.67 ± 4.18)	73–83 (78 ± 7.07)	72–78 (74.5 ± 2.65)
Diameter eye/head length	0.17–0.23 (0.19 ± 0.02)	0.18–0.19 (0.18 ± 0.01)	0.17–0.23 (0.19 ± 0.03)
Subdigitals finger IV	33–36 (34.67 ± 1.21)	34–35 (34.5 ± 0.71)	33–36 (34.75 ± 1.5)
Subdigitals toe IV	42–48 (45.33 ± 2.16)	46–47 (46.5 ± 0.71)	42–48 (44.75 ± 2.5)
Forelimbs/SVL	0.38–0.46 (0.42 ± 0.07)	0.41–0.42 (0.42 ± 0.01)	0.38–0.46 (0.42 ± 0.03)
Hindlimbs/SVL	0.51– 0.59 (0.53 ± 0.07)	0.51–0.53 (0.52 ± 0.01)	0.52–0.59 (0.54 ± 0.04)
Femoral pores (left)	13–15 (14 ± 0.63)	14 (14 ± 0)	13–15 (14 ± 0.82)

Description of holotype. Adult male with a snout-vent-length (SVL) of 140.5 mm. Head 0.25 times SVL, 1.51 times longer than wide, as wide as high. Snout pointed; canthus rostralis distinct posteriorly. Neck narrower than the head, and almost as wide as the anterior part of the body. Body compressed. Limbs well developed, forelimbs 0.41 times SVL, hindlimbs 0.53 times SVL, tibia 0.17 times SVL. The tail almost round in cross section, tapering toward the tip; 2.22 times SVL. Rostral trapezoid, almost two times as wide as high, visible from above. Posterior margin with 3 sutures that do not partition the rostral, bordered posteriorly by 2 large scales. Scales on snout heterogeneous in size, irregularly polygonal, juxtaposed, flat, rugose, some are swollen; 3 scales across snout between second canthals. 3 canthals between nasal and supraciliaries, anterior one wide. Supraorbital semicircles more or less distinct, with 9–10 scales, separated medially by 1 row of scales, slightly smaller in size than those of supraorbital semicircles (Figure 4.1.1 A). Scales on supraocular region distinctly smaller than those on snout, polygonal to rounded, juxtaposed, flat, and smooth, irregularly arranged, except for a row of smaller scales adjacent to supraciliaries. Supraciliaries 12–13, juxtaposed, smooth, anterior ones slightly longer; in a continuous series with canthals. 15 supraoculary scales on the dorsal surface of the orbit counted in a transverse line across its greatest width. Scales on parietal region, irregular polygonal, some almost rounded, juxtaposed, flat, smooth, intermediate in size between those on snout and on supraocular region. Scales on interparietal region polygonal, juxtaposed, rugose, some are somewhat swollen. Parietal eye absent. Loreal region with two scales. Nostril directed laterally, in the centre of a single nasal. Nasal in contact with second supralabial. 5 internasals. Eye diameter 0.18 times as long as head length. Eyelids partially fused, covered by granules of almost same size throughout the eyelids. A continuous series of 2 preoculars, 3–4 suboculars, which are in direct contact with supralabials, and 4 postoculars. Supralabials 7; followed to commissure of mouth by 1–2 relatively small scales. Temporal region with polygonal or rounded, juxtaposed, flat, and smooth scales, smaller toward the ear opening; delimited dorsally by a single row of enlarged supratemporal scales. Ear opening vertically oval, with smooth margin; tympanum superficial (Figure 4.1.1 B).

Mental bell-shaped, almost 2.5 times as wide as high, posterior half divided by a median sulcus. Postmentals 3, lateral ones distinctly larger than median scale. Infralabials 6; followed to commissure by 2–3 distinctly smaller scales. Lateral scales on chin almost the same size as those on median part of chin, irregular polygonal, juxtaposed, flat, smooth, and slightly convex. No elevated scales on the median part of chin and gular region present. Gular fan has scales the same size and structure as chin scales, which are separated from each other by an extensible skin covered with granules (Figure 4.1.1 C). Gular fan reaches level of forelimbs. 73 gular scales in transverse line between the two tympani.

Scales on nape anteriorly relatively small, granular and almost rounded, juxtaposed, convex; posteriorly grading into dorsals. Scales on the sides of the neck are slightly larger than those on the nape, merging ventrally with the gulars. Dorsals polygonal to rounded, juxtaposed, flat, to some extent convex; 198 scales in a middorsal line between the occiput and the posterior margin of the hindlimbs. Scales on flanks are of a similar size and same shape as those of dorsum, convex, smooth, in poorly defined, oblique rows. Ventrals larger than dorsals, flat, smooth, lanceolate, and imbricate, in poorly defined, oblique and transverse rows. A gradual transition between dorsal, lateral and ventral scales. Scales around midbody 186. Preanal plate has scales which are smaller than ventrals, approximately the same size as dorsals. Preanal pores absent. Femoral pores 14 per side, almost in the centre of a slightly larger scale (Figure 4.1.1 E).

Tail has rhomboid, flat, sharply keeled scales, distinctly larger than the dorsals, arranged in longitudinal and oblique rows; keels aligned longitudinally; on ventral surface of the tail, scales are slightly larger and more rectangular. Tail not regenerated ending somewhat bluntly.

Scales on forelimbs slightly larger than dorsals, polygonal to rounded, flat, smooth, mostly imbricate but more juxtaposed on upper arm; slightly smaller on ventral aspect of forearms; towards posterior aspect ventrals become smaller. Scales on hindlimbs are as large as dorsals, polygonal to rounded, flat, smooth, imbricate on thigh and ventrally, juxtaposed on dorsal surface of tibia, slightly larger and slightly keeled on ventral part of tibia, and slightly lanceolate; toward posterior aspect of thighs, both dorsally and ventrally, scales become distinctly smaller. Subdigital lamellae of fingers and toes single, short, multicarinate, 35 under fourth finger, 47 under fourth toe (Figure 4.1.1 D).

Measurements of holotype (in mm). Snout-vent length 140.5; axilla-groin length 64; length of leg 74; length of arm 58; length of tail 311.5; body height at midbody 25.3; body width at midbody 22.4; length of head 35.7; height of head 23.4; width of head 23.7; length of snout 25; diameter of eye 6.3; distance from tip of snout to anterior margin of nostril 7.1; distance from nostril to eye 7.9; distance from eye to ear 14.

Colouration of holotype. In life, when unstressed (Figure 4.1.2 A), the dorsal surface of the head of the male holotype is grey to greenish-grey on the snout and the parietal region, muddy yellow on the frontal region and more or less shiny yellow on the supraocular region. Most of the dorsal head scales as well as the dorsal body scales have dark edges. The sides of the head are white to slightly yellow. The granules on the eyelids and the scales surrounding the eye are shiny yellow. The dorsum is pale grey, and in some parts fades to a pale yellow or pale green with hardly any special markings, except for some slightly darker saddle blotches. The body parts above and behind the insertion of the front legs are almost as shiny yellow as the granules of the eyelids. The dorsal surface of the limbs is pale grey-green and of the tail white-grey. The tail is ringed with 12 darker grey bands, with each band being 10–13 scales in width, and thus of the same width as the ground coloured interspaces. The bands are indistinct at the beginning but become more distinct towards the tip. The chin scales, gular fan, venter and ventral surface of the limbs are white.

Under stress (Figure 4.1.2 B), colouration of whole body changes into a moderate grey, being the darkest in the middorsal region. Colouration grades laterally into beige, especially behind the limbs, with darker, frazzled, transverse stripes on the dorsum and limbs.

The species may also change its colours to camouflage itself, but this behaviour was not observed during our short investigation.

In preservative, the general dorsal colour is mainly brown-grey and the head and middorsal stripe are darker than the lateral body parts. Bands on the tail alternate in pale brown-grey and dark grey-brown. The ventral region is white to pale grey.

Variation. (Table 4.1.1) Female paratypes (n=4) reach a maximum SVL of 144 mm and a maximum tail length of 306 mm. Tails of paratypes (n=5) are 2.13–2.33 times SVL and axilla-groin lengths are 0.48–0.55 times SVL. Heads reach 0.23–0.25 times SVL, are 1.46–1.63 as long as they are wide and 0.98–1.1 times as wide as they are high. Eye diameter is 0.17–0.23 times the head length. Scales around the midbody vary between 131–149 and the vertebral scale number from behind the occiput to the level of the posterior edge of the thigh varies between 202–215. The rostral scale is posteriorly bordered by 2–4 scales and exhibits 1–4 posterior sutures that do not completely divide the rostral. There are three scales across the snout between the second canthals. There are three to four canthals between the nasal and the superciliaries. The supraorbital semicircles consist of 9–10 scales, and are separated medially by one to two rows of scales. Superciliaries 9–13 and supraoculares 13–17. In 4 paratypes, the nasal was in contact with the second supralabial, and in one specimen it was separated from the labials by small scales.

There is a continuous series of 2–4 preoculars, 3 suboculars, which are in direct contact with the supralabials, and 3–4 postoculars. Supralabials 5–7; followed to commissure of mouth by 1–4 scales. Internasals in all paratypes 5. Supratemporals 6–7.

Mental half divided by a median sulcus in three paratypes, almost divided in one paratype and completely divided in another specimen. Postmentals 4 in all paratypes. Gular scales 72–83. Infralabials 6–8; followed to commissure by 2–6 scales. Femoral pores 13–15 per side. Subdigital lamellae 33–36 under fourth finger, 42–48 under fourth toe.

Colour variation. In life, the dorsal surface of the head of the subadult male paratype (ZFMK 91763, Figure 4.1.2 C) is pale grey-green on the snout and frontal region, grey-blue in the parietal region and pale green-yellow on the supraocular region. Most dorsal head scales as well as dorsal body scales have dark edges. The sides of the head are pale green-grey to white in the region anterior to the eye, and pale peach-coloured in the temporal region. There is a dark stripe from the posterior margin of the eye, reaching below the supratemporals to the level of the ear opening. The labials and suboculars are mostly white and the dorsum is pale mint green with 6 brown to peach-coloured saddle blotches, 16–29 scales in width, being widest on the middorsal part and tapering towards the flanks. The dorsum is spotted black. There is a mint colour grading into pale peach-colour on the sides of the neck and flanks. The dorsal surface of the forelimbs is mint green and of the hindlimbs, it is peach-coloured intermixed with some mint scales. Both front and hindlimbs are spotted black. The ground colour of the tail is pale beige with 12 darker brownish bands, 10–18 scales in width. The venter, chin scales, gular fan, and limbs are white to whitish-grey.

In life, the dorsal ground colouration of females (CORBIDI 5742, CORBIDI 7724, ZFMK 90834, ZFMK 91764) on the head, back, limbs and tail is lime green with most parts spotted black (Figure 4.1.2 D); granules of eyelids are shiny yellow to lime green (Figure 4.1.2 E); sides of head posteriorly of eye between supratemporals and the beginning of the gular fan in some of the specimens are intermixed with numerous blue toned scales; dorsum has 5–6 undulated transversal black bands, 2–6 scales in width, first band on level of forelimbs, is continued on the limbs, last one on level of hindlimbs; bulges of the undulated black lines are anteriorly filled with bluish blotches, 3–5 scales in width; posteriorly, the black bands are followed by darkly shaded green stripes, 12–20 scales in width; followed by ground colour, 8–10 scales in width; adjacent starts the repetition of the whole pattern, beginning with the bluish blotches, followed by the undulated transversal black band; tail with 12 darkly shaded greenish bands, 9–12 scales in width and of almost same width as ground colour interspaces. On ventral surface, chin scales and gular fan are shiny yellow, and in some parts, spotted with white (Figure 4.1.2 E); one gravid female (ZFMK 91764) has pale green chin scales and pale orange gular fan. Venter and limbs are white; tail white to whitish-grey annulated with darker grey bands, indistinct at the beginning but becoming more distinct towards the tip. No colour changes were observed in the female specimens of this species.

In preservative, dorsal pattern remains similar to the pattern in life but colouration mainly consist of different shades of blue, only the darkly shaded green stripes on the dorsum are brownish-blue to brown in some of the specimens; head grey-blue to greenish-blue; on tail brownish to greyish-brown bands, alternating with pale greyish-brown, pale green or blue toned bands. On ventral surface, gular fan, venter, limbs and tail white to greyish-white; chin also white to greyish white, but in one gravid specimen (ZFMK 91764) it is intermixed with pale bluish scales.

Etymology. The species is dedicated to Jacqueline Maria Charles (Leicester, England) in recognition of her support of nature conservation and taxonomic research through the BIOPAT initiative.

Distribution and Natural history. This new species is only known from the type locality (Figure 4.1.3) in the inter-Andean valley on the western slope of the northern portion of the Cordillera Central (see Duellman and Pramuk 1999), at an elevation of 1460 to 1570 m above sea level. All individuals were collected near a road between San Vicente/Pusaq and Uchumarca (06°59’S, 77°54’W), Province Bolivar, Región de La Libertad, Peru. *Polychrus jacquelinae* inhabits the equatorial dry forest eco-region in the upper Marañón basin, fide Brack (1986). One subadult male (ZFMK 91763) and two females (ZFMK 90834, ZFMK 91764) were found on 24 April 2009 between 9.45 p.m. and midnight, sleeping in trees of *Acacia macracantha* in heights between 1.8 m and 5 m above the ground, at an air temperature of 22°C and a humidity of 63%. One adult male (CORBIDI 7725) and two adult females (CORBIDI 5742, CORBIDI 7724) were found on 01 July 2010 between 7.30 p.m. and 8.30 p.m., sleeping, at an air temperature of 25°C and a humidity between 34–38%, in a bush of Fabaceae sp. approximately 2 m above the ground, in a bush of *Croton* sp. approximately 4 m above the ground, and in a tree of *Bombax sp.* approximately 3.5 m above the ground, respectively. One female (ZFMK 91764) was gravid and contained 6 oval eggs (3 in each of the oviducts). On average, these eggs had a length of 27.7 mm and a width of 15.8 mm.

Figure 4.1.3. The type locality of *Polychrus jacquelinae* sp. n. (CORBIDI 7725) near San Vicente, La Libertad, Peru.

Polychrus peruvianus (Noble, 1924)

1924 *Polychroides peruvianus* Noble, Occasional Papers of the Boston Society of Natural History, 5: 109. — Terra typica: near Querocotilla, province of Cajamarca, Peru.

1933 *Polychroides peruvianus* — Burt and Burt, Transactions of the Academy of Science of St. Louis, 28: 40.

1965 *Polychrus peruvianus* — Etheridge, Herpetologica, 21: 167.

1969 *Polychrus peruvianus* — Gorman et al., Breviora, 316: 5.

1970 *Polychroides peruvianus* — Peters and Donoso-Barros, Smithsonian Institution Press, Washington D.C. & London: 232.

1986 *Polychroides peruvianus* — Peters and Donoso-Barros, Smithsonian Institution Press, Washington D.C. & London: 232.

2002 *Polychrus peruvianus* — Lehr, Natur und Tier-Verlag: 203.

2006 *Polychrus peruvianus* — Yánez-Muñoz et al., Check List, 2 (2): 63.

Diagnosis (Table 4.2.2). (1) A *Polychrus* with a maximum known SVL of 152 mm; (2) males larger than females; (3) a prominent dorsal and gular crest present; (4) 52 to 74 scales around midbody; (5) 56 to 70 paravertebral scales from the occipital region to the level of the posterior edge of the thigh; (6) femoral pores 6 to 13 on one side; (7) lamellae on finger IV 25–33; (8) lamellae on toe IV 32–43; (9) tail 1.29–3.15 times longer than SVL; (10) paravertebral scales unicarinate; (11) ventral scales uni- to tricarinate, rarely multicarinate; (12) gular scales oval, striated, much larger than ventrals; (13) a prominent sexual dichromatism present.

Description. A *Polychrus* with a maximum SVL in males of 152 mm, in females of 147 mm. Head 0.21–0.28 times SVL, 1.37–1.84 times as long as wide and 0.69–1.08 times as wide as high. Snout bluntly pointed; canthus rostralis well pronounced. Neck narrower than the head, and slightly narrower than the anterior part of the body. Limbs well developed, forelimbs 0.46–0.57 times SVL, hindlimbs 0.58–0.69 times SVL. Tail almost round in cross section, tapering toward the tip; 1.29–3.15 times SVL.

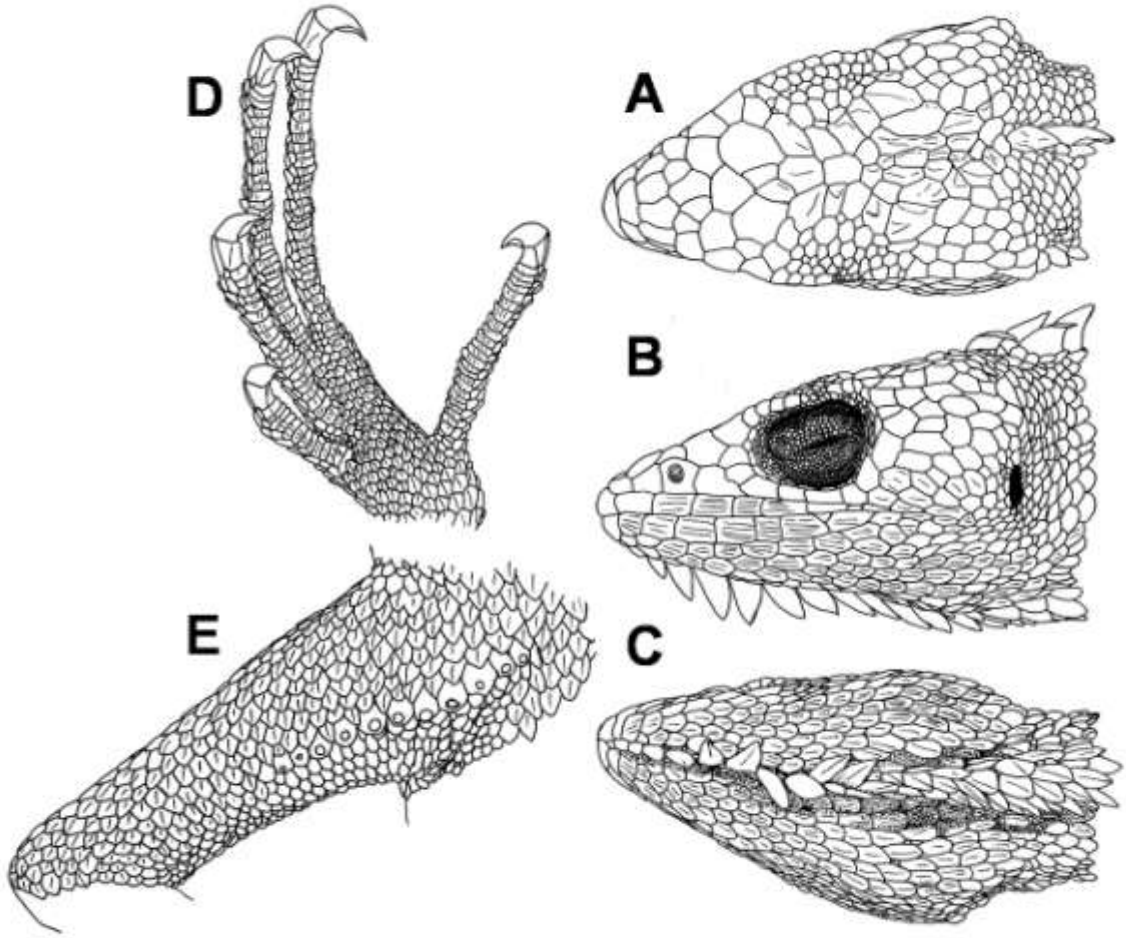

Figure 4.1.4. Male specimen of *Polychrus peruvianus* (ZFMK 90821): dorsal (**A**), lateral (**B**) and ventral (**C**) views of head; ventral aspect of left foot (**D**); ventral view of right thigh with femoral pores (**E**).

Rostral trapezoid, striated, about two times as wide as high. Most of the individuals (18/23) lack sutures on the posterior margin of the rostral, three specimens possess one very short median suture, one specimen exhibits a median suture that half divides the rostral and another specimen exhibits two short sutures on the posterior margin. Rostral bordered posteriorly by 2–4 scales, mostly 3 (17/23). Postrostral scales striated. Scales on snout heterogeneous in size, irregularly polygonal, juxtaposed, rugose or swollen; 1–4 scales, mostly 2 (14/23) across snout between second canthals. Two striated canthals between nasal and supraciliaries (3 in one specimen: ZFMK 90829). Supraorbital semicircles distinct, with 8–12 scales, separated medially by 1 scale (Figure 4.1.4 A).

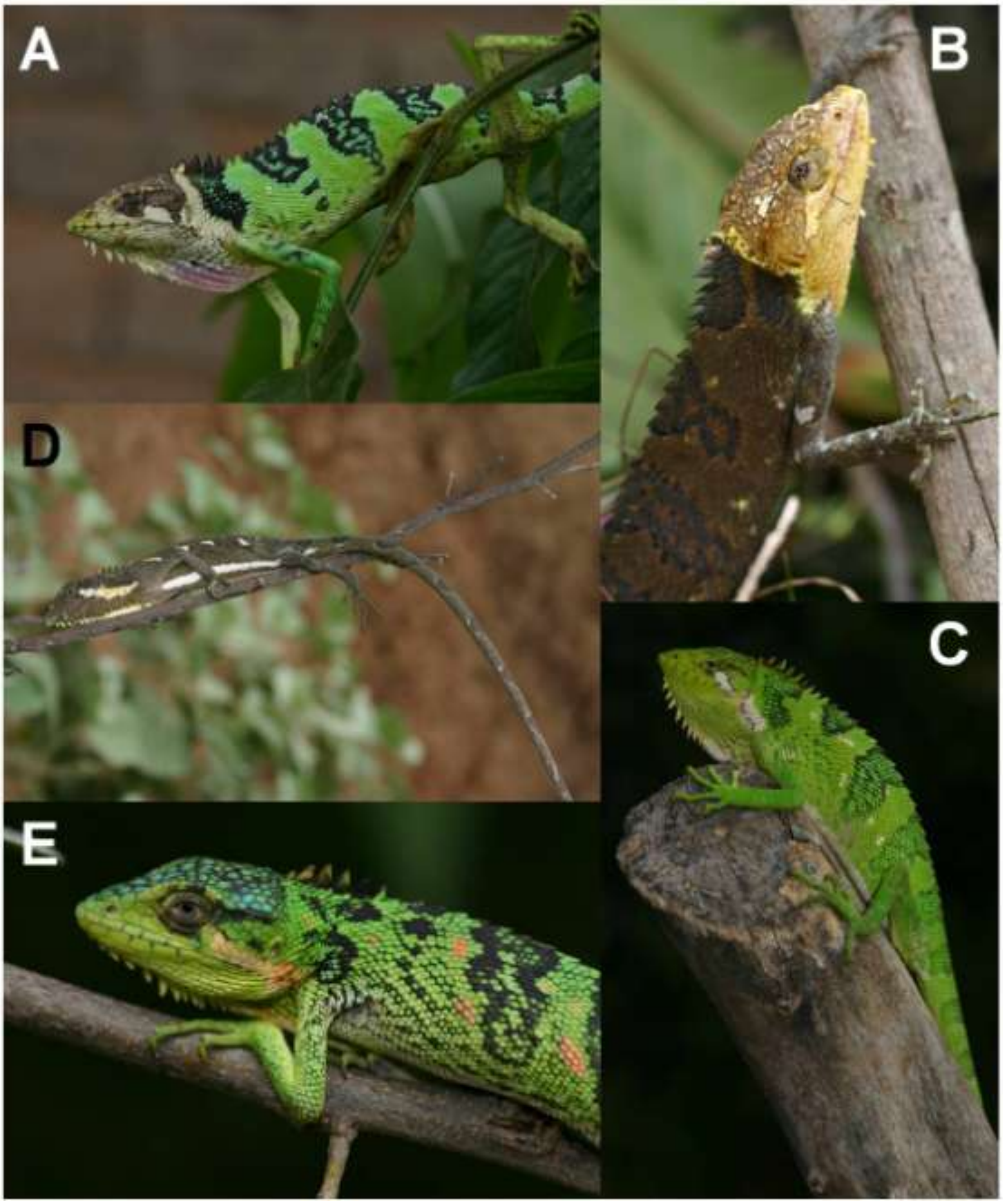

Figure 4.1.5. *Polychrus peruvianus* from Cajamarca, Peru: male with normal colouration (**A**), in stress colouration (**B**); female with normal colouration (**C**), in stress colouration (**D**); a very colourful juvenile female (**E**).

Scales on supraocular region distinctly smaller than those on snout, polygonal, juxtaposed, flat, smooth or slightly striated; irregularly arranged, except for a row of smaller scales adjacent to the supraciliaries. Supraciliaries 8–12 (n=23), juxtaposed, smooth; in a continuous series with canthals. Scales on parietal region, irregular polygonal, juxtaposed, flat, smooth or slightly striated, slightly smaller than those on snout. Scales on interparietal region polygonal, juxtaposed, rugose or swollen, almost the same size as those on the parietal region. Parietal eye absent. Loreal region has one striated scale. Nostril directed laterally, in the centre of a single nasal or slightly anterior to the center. Nasal scale has polygonal margins and is in broad contact with second supralabial. 3–6 internasals. Eye diameter 0.25–0.31 (n=23) times as long as head length. Eyelids partially fused together, covered by granules of almost same size throughout the eyelids. A continuous series of 1–3 preoculars, 2–4 suboculars, which are in direct contact with supralabials, and 3–5 postoculars. Supralabials 5–10, strongly striated with 2–5 keels; followed to commissure of mouth by 2–4 slightly smaller scales. Temporal region has polygonal or rounded, juxtaposed, flat, and smooth or slightly striated scales, nearly the same size as those of parietal region; delimited dorsally by a single row of 3–5 (n=23) enlarged supratemporal scales. Ear opening, vertically oval, with smooth margin; tympanum superficial (Figure 4.1.4 B).

Mental striated, two to 2.5 times as wide as high, posteriorly notched, followed by a median sulcus that almost or at least divides the mental half. Postmentals 3–4 (n=23), striated, lateral ones larger than median scale. Infralabials 5–10, strongly striated with 3–8 keels; followed to commissure by 2–4 distinctly smaller scales. Lateral scales on chin and gular flap oval, in posterior part more or less drawn-out, imbricate, flat and strongly striated with 1–8 keels. A row of 8–14 (n=23) raised, lobe-shaped, striated scales forming a mid-chin crest and merging into a gular flap that reaches the posterior level of the forelimbs (Figure 4.1.4 C). 28–38 (n=23) gular scales in transverse line between the two tympani. In posterior part of gular fan, most of the scales are separated from each other by a narrow stripe of extensible skin covered with granules.

Scales on nape anteriorly relatively small, almost rounded, juxtaposed and convex; posteriorly grade into dorsals and merge ventrally with gulars. Middorsal crest present; in adult males it is composed of 20–28 lobe-shaped scales, reaching from behind the occiput to the level of the hindlimbs, in females or juvenile males it is composed of 7–19 lobe-shaped scales, present only on anterior part of the dorsum. Lateral dorsals are oval or slightly lanceolate and are almost the same size throughout body, imbricate, flat; unicarinate in paravertebral region; number of keels augments in direction of ventral body part.

56–70 scales in a paravertebral line between occiput and posterior margin of hindlimbs. Ventrals imbricate, distinctly more overlapping and slightly smaller than dorsals, strongly lanceolate, uni- to multicarinate; in thorax region slightly smaller, in abdominal region arranged in oblique and transverse rows. A gradual transition between dorsal, lateral and ventral scales. Scales around midbody 52–74 (n=47). Preanal pores absent. Femoral pores 6–13 (n=47) (Figure 4.1.4 E).

Tail with imbricate, rhomboid, flat, sharply keeled scales, slightly larger than dorsals; in longitudinal and oblique rows, keeles aligned longitudinally. Original tail ending more or less pointed.

Table 4.1.2. Summary of morphometric and pholidosis characters of *Polychrus peruvianus*

Sex	All (n=47)	Males (n=24)	Females (n=23)
Axilla-groin length/SVL	0.43–0.53 (0.49 ± 0.03)***	0.43–0.53 (0.47 ± 0.03)**	0.47–0.52 (0.5 ± 0.02)*
Head length/SVL	0.21–0.28 (0.25 ± 0.02)	0.24–0.28 (0.26 ± 0.01)	0.21–0.26 (0.24 ± 0.01)
Head length/Head width	1.37–1.84 (1.58 ± 0.10)***	1.37–1.66 (1.54 ± 0.09)**	1.49–1.84 (1.61 ± 0.09)*
Head width/Head height	0.69–1.08 (0.95 ± 0.09)***	0.84–1.06 (0.96 ± 0.06)**	0.69–1.08 (0.93 ± 0.11)*
Tail length/SVL	1.29–3.15 (2.71 ± 0.47)	1.53–3.15 (2.67 ± 0.55)	1.29–3.11 (2.76 ± 0.21)
Scales around midbody	52–74 (61.49 ± 5.15)	52–67 (58.75 ± 3.42)	56–74 (64.35 ± 4.92)
Elevated vertebrals (crest)	9–28 (22.19 ± 6.16)	20–28 (25.92 ± 1.77)	9–28 (18.3 ± 6.82)
Gular scales	28–38 (33.7 ± 2.58)***	28–36 (32 ± 2.36)**	31–38 (35 ± 1.96)*
Diameter eye/head length	0.25–0.31 (0.27 ± 0.02)***	0.25–0.28 (0.26 ± 0.01)**	0.25–0.31 (0.28 ± 0.02)*
Subdigitals finger IV	25–33 (29.74 ± 1.81)	28–33 (30.13 ± 1.54)	25–33 (29.35 ± 2.06)
Subdigitals toe IV	32–43 (37.15 ± 3.01)	33–43 (36.75 ± 3.0)	32–41 (37.57 ± 3.1)
Forelimbs/SVL	0.46–0.57 (0.52 ± 0.03)***	0.46–0.57 (0.53 ± 0.03)**	0.48–0.57 (0.51 ± 0.03)*
Hindlimbs/SVL	0.58–0.69 (0.61 ± 0.04)***	0.58–0.69 (0.63 ± 0.04)**	0.52–0.65 (0.59 ± 0.04)*
Femoral pores (left)	6–13 (9.74 ± 1.45)	6–13 (9.77 ± 1.55)	7–12 (9.15 ± 1.34)

***(n=23), **(n=10), *(n=13)

Scales on forelimbs slightly smaller than dorsals, imbricate and more or less lanceolate, uni- to tricarinate. Scales on hindlimbs slightly smaller than dorsals, imbricate and more or less lanceolate, unicarinate on dorsal surface and uni- to tricarinate on ventral surface. Subdigital lamellae of fingers and toes single, short, multicarinate, 25–33 (n=47) under fourth finger, 32–43 (n=47) under fourth toe (Figure 4.1.4 D).

In life, when unstressed, the dorsal ground colouration of males (Figure 4.1.5 A) and females (Figure 4.1.5 C), is lime green on body, limbs and tail. Back and tail with dark blotches that are at least as broad as the green interspaces, with the first blotch beginning directly behind the head in females, or adjacent to a small white nuchal crossline in most males. Most specimens possess 5 of such saddle blotches on the dorsum, which are broadest in the vertebral region and decrease in width on the flanks. Blotches are more distinct in males, and are rarely found, or even absent, in females, and normally intermixed with scales of green ground colour. Additionally, some specimens possess white or pinkish and/or turquoise scales or small blotches on the lateral body parts (Figure 4.1.5 E). Head in females dorsally, laterally and ventrally lime green; in males dorsally and laterally brownish or orange brown and in some individuals spotted with white, ventrally lighter brown or yellowish, sometimes almost whitish. Scales of gular crest are white in most specimens of both sexes and extensible skin of exposed gular sac is orange, yellowish or pinkish (Figure 4.1.5 A). Females mostly with an oblique white line on both sides from behind the eye to the insertion of the forelimbs and with a straight line, about 3 to 4 scales in width, laterally between the axilla and the insertion of the hindlimbs. Venter of both sexes, lime green without special markings.

Under stress, colouration of body, limbs and tail changes into a dark brown in both sexes (Figures 4.1.5 B, D), in which case the dark saddle blotches become less evident. If the animal possesses white markings, these become even more prominent. Head colouration of females (Figure 4.1.5 D) changes into dark brown, but remains as in the unstressed mood in males (Figure 4.1.5 B).

In preservative, dorsal pattern remains similar to the pattern in life but colouration changes into bluish or brownish. Heads of males are dorsally and laterally brownish, and ventrally cream colour or whitish. Venter of both sexes pale blue, green or brown.

Distribution and natural history. In Peru, this species is distributed in the regions of Amazonas, Cajamarca, and Piura in the drainage basins of Río Huancabamba, Río Utcubamba and Río Marañón (Schlüter 2010, Noble 1924, Gorman et al. 1969, Peters and Donoso-Barros 1970, Carrillo and Icochea 1995). Yánez-Muñoz et al. (2006) collected a male specimen from Pucabamba (04°57´01” S 79°10´30” W, 1400 m a.s.l.), Province of Zamora-Chinchipe, and hence provided the first country record from Ecuador. *Polychrus peruvianus* inhabits the equatorial dry forest eco-region fide Brack (1986), but is also occasionally found in humid forests, at elevations of 600 to 1750 m a.s.l. (Duellman 1979; Gorman et al. 1969; Noble 1924). We found the species at an elevation of 400 to 1330 m above sea level. Besides the few specimens we collected for preservation, we found many more animals of the same species in each sampled area and noted additional observations we could make. All lizards were exclusively found on trees or shrubs (preferred plant species: *Acacia macracantha, A. riparia, Hura crepitans, Mutingia calabura, Sapindus riparium, Schinus molle, Solanum riparium*) alongside roads, paths, or small streams in heights between 1.5 m and 7 m above the ground. Hence the species can be considered as being highly arboreal. Only some specimens were found during the day (investigation hours: 9.30 a.m. to 4 p.m.) as they are perfectly camouflaged in the vegetation and difficult to detect between the green leaves. Daytime temperatures, when animals were found, were between 28.7°C and 35.9°C and humidity was between 41% and 63%. Most specimens were discovered after nightfall (investigation hours: 7 p.m. to 2 a.m.), when they were sleeping on branches and their bellies were shining brightly in the light of the headlamps. Nighttime temperatures were between 20.8°C and 28.3°C and humidity was between 53% and 75%. In Pucará, one individual could be observed at around 10 a.m., while it was eating little fruits of the tree *Trema micrantha*. Several times we found two, sometimes even three, specimens sleeping on the same tree. In Pucará, the species seemed to be very abundant and in one night we counted 24 adult and 3 juvenile specimens on 22 trees along a two kilometer long path section. One male and one female were found about only 0.5 m away from each other. This represents the encounter with the lowermost distance between two individuals. Other individuals were found with a distance of at least 1–2 m to the next conspecific, irrespective of sex. Although it seems that members of this species have small activity ranges, they live solitarily. Adult males exhibit a pronounced territorial behaviour and do not tolerate other males close to their branches. Under artificial conditions, a male being confronted with another male or even with its own mirror image, opened its mouth widely and extended its gular flap. Efforts to keep two males together in a cage of 3 x 2 m floor space and 2 m in height started with a non-ritualized damaging fight which lasted for around 10 minutes. After the fight the bigger male persecuted the other male in the cage and two days later the smaller male was found dead.

When discovered in a tree, the animals first react similarly as a chameleon: they compress their body laterally and try with very slow movements to take cover behind a stick or branch. Once grabbed, they expand their gular fan, open their mouth widely and try to bite the captor while they try, simultaneously, to free their bodies with strong twisting and turning movements. Similar observations were also made by Gorman et al. (1969) for *Polychrus peruvianus* and by Vanzolini (1983) for the genus *Polychrus* in general. In addition, we could observe a change in colouration in most captured animals to the above described stress colouration.

One gravid female (ZFMK 90822) was found in April 2009 at 10.35 p.m. sleeping in a tree at about 2.5 m above the ground, with an air temperature of 24.9°C and a humidity of 73%. It contained 5 oval eggs, 3 in the left and 2 in the right oviduct. In average these eggs had a length of 27.5 mm and a width of 16.2 mm. In December 2009, we collected 4 gravid females (ZFMK 90824, 90827, 90829, 90830) in different stages of gestation between 8–10.30 p.m. sleeping on trees in 2–5.5 m above the ground. Air temperature was between 25.5°C–28°C and humidity was between 55–75%. ZFMK 90824 contained 10 almost spherical eggs with a diameter of 12 mm, of which 7 were positioned in the left and 3 in the right ovary. ZFMK 90827 contained 7 almost spherical eggs with a diameter of 6 mm of which 3 were positioned in the left and 4 in the right ovary. ZFMK 90829 contained 7 almost spherical eggs with a diameter of 8.9 mm of which 4 were positioned in the left and 3 in the right ovary. ZFMK 90830 contained 4 almost spherical eggs with a diameter of 9.4 mm, 2 were positioned in each of the ovaries.

Polychrus gutturosus **Berthold, 1845**

1845 *Polychrus gutturosus* Berthold, Nachrichten von der Georg-Augusts Universität und der Königlichen Gesellschaft der Wissenschaften zu Göttingen, 3: 38. — Terra typica: Popayán, western Colombia.

1846 *Polychrus gutturosus* — Berthold, Nachrichten von der Georg-Augusts Universität und der Königlichen Gesellschaft der Wissenschaften zu Göttingen, 8-10: 11.

1869 *Polychrus* (*Chaunolaemus*) *multicarinatus* Peters, Monatsberichte der königlich Akademie der Wissenschaften zu Berlin 1869 (11): 768. — Terra typica: Costa Rica.

1885 *Polychrus gutturosus* — Boulenger, Catalogue of the lizards in the British Museum, 2: 100.

1914 *Polychrus spurrelli* Boulenger, Proceedings of the Zoological Society of London, 1914: 814. — Terra typica: near Peña Lisa, Condoto, Colombia.

1933 *Polychrus gutturosus* — Burt and Burt, Transactions of the Academy of Science of St. Louis, 28: 40.

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2003 *Polychrus gutturosus* — Köhler, Herpeton Verlag, Offenbach: 137.

2006 *Polychrus spurrelli* — Yánez-Muñoz et al., Check List, 2 (2): 63.

Diagnosis (Table 4.1.3). (1) A *Polychrus* with a maximum known SVL of 170 mm; (2) dorsal and gular crest absent; (3) 63 to 82 scales around midbody; (4) 75 to 105 scales in middorsal row from behind the occipital scales to the level of the posterior edge of the thigh; (5) femoral pores 9 to 21 on one side (Figure 4.1.6 E); (6) lamellae on finger IV 25–36; (7) lamellae on toe IV 35–45 (Figure 4.1.6 D); (8) tail 2.36–3.55 times longer than SVL; (9) dorsal scales smooth or with 1–3 keels; (10) ventral scales with 1–5 keels; (11) gular scales oval, mostly striated, much larger than ventrals, those on gular fan widely separated by granular skin (Figure 4.1.6 C); (12) a sexual dichromatism present.

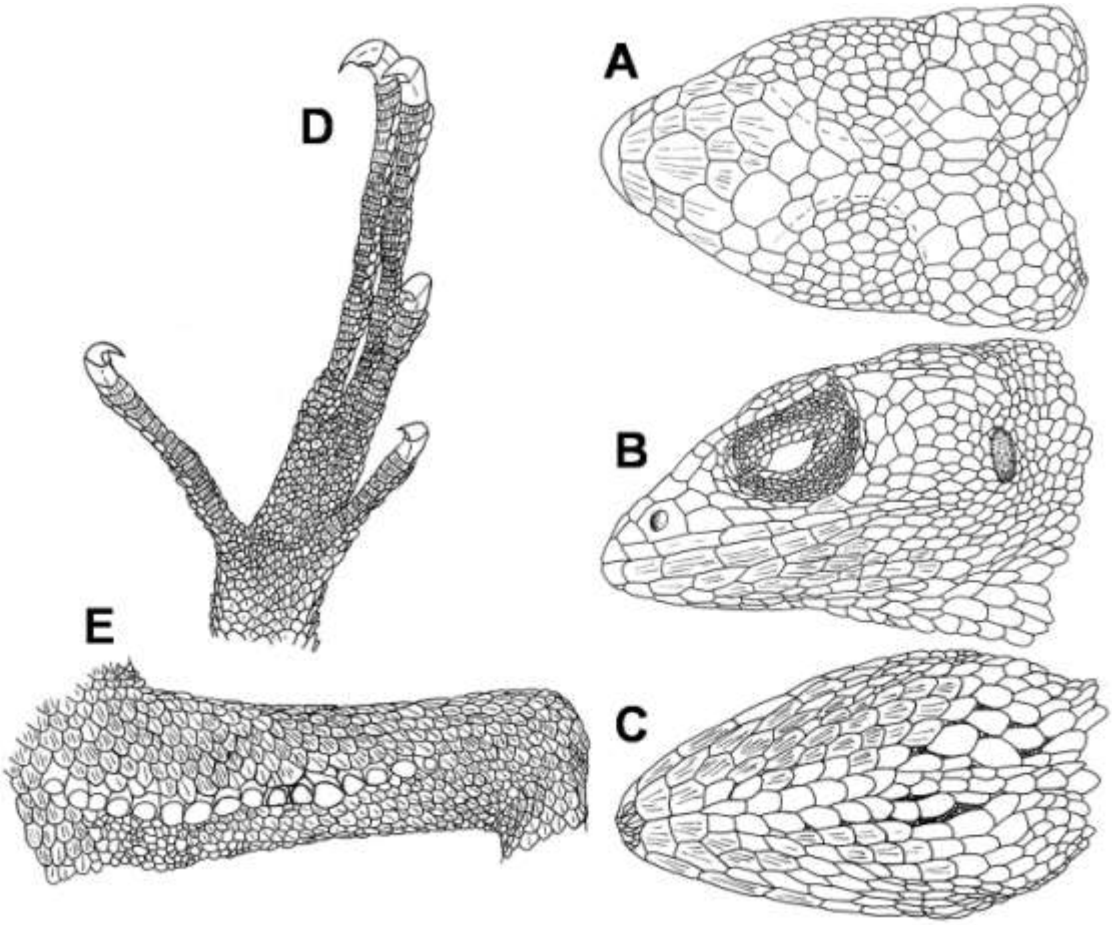

Figure 4.1.6. Male specimen of *Polychrus gutturosus* (SMF 83024): dorsal (**A**), lateral (**B**) and ventral (**C**) views of head; ventral aspect of right foot (**D**); ventral view of left thigh with femoral pores (**E**).

Description. For detailed descriptions of shape, structure and arrangement of the scales see Taylor (1956) and Savage (2002).Our examined female specimens (n=15) had a maximum SVL of 152 mm, a maximum tail length of 539 mm, a maximum total length of 691 mm, a maximum head length of 33.3 mm and a maximum head width of 26.4 mm. The male specimens (n=10) had a maximum SVL of 122 mm, a maximum tail length of 429 mm, a maximum total length of 549.8 mm, a maximum head length of 28.1 mm and a maximum head width of 22.2 mm. Rostral bordered posteriorly by normally 4 striated scales (3 in one specimen: ZFMK 40832; 5 in another specimen: MHNG 2531.062).

Scales on snout heterogeneous in size, irregularly polygonal, juxtaposed, rugose and striated; 1–6 scales across snout between second canthals. 2–3 striated canthals between nasal and supraciliaries. Supraorbital semicircle distinct (Figure 4.1.6 A), with 7–13 scales, separated medially by normally one scale (0 in two specimens: BM 1901.3.29.19, MHNG 2531.062; 2 in another specimen: ZFMK 19047). Supraciliaries 7–11, juxtaposed, striated; in a continuous series with canthals. Supraocularies 12–18. Internasals 3–5.Supralabials 4–8, strongly striated with 2–6 keels; followed to commissure of mouth by 2–4 slightly smaller scales. Infralabials 4–6, strongly striated with 3–8 keels; followed to commissure by 1–4 distinctly smaller scales (Figure 4.1.6 B). Mental approximately half divided by a median groove in 17 specimens, almost divided in 5 specimens, medially divided in one specimen and divided into numerous small scales in one specimen. Postmentals striated (Figure 4.1.6 C), normally 2 (5 in one specimen: ZFMK 25729). Supratemporals 4–5; scales in temporal region striated.

Paravertebral scales mostly keeled, only some are smooth; lateral body scales smooth or with 1–3 keels, fore- and hindlimbs dorsally with one or more keels, ventrally multicarinate. Ventral body scales with 1–5 keels.

Other morphological characters of the 27 examined individuals are summarized in table 4.1.3.

Descriptions of the colouration in life (Figures 4.1.7 A, B) are given by Breder (1946), Köhler (2003B), Ortleb and Heatwole (1965) and Savage (2002) and a description of the colour in preservative is provided by Taylor (1956).

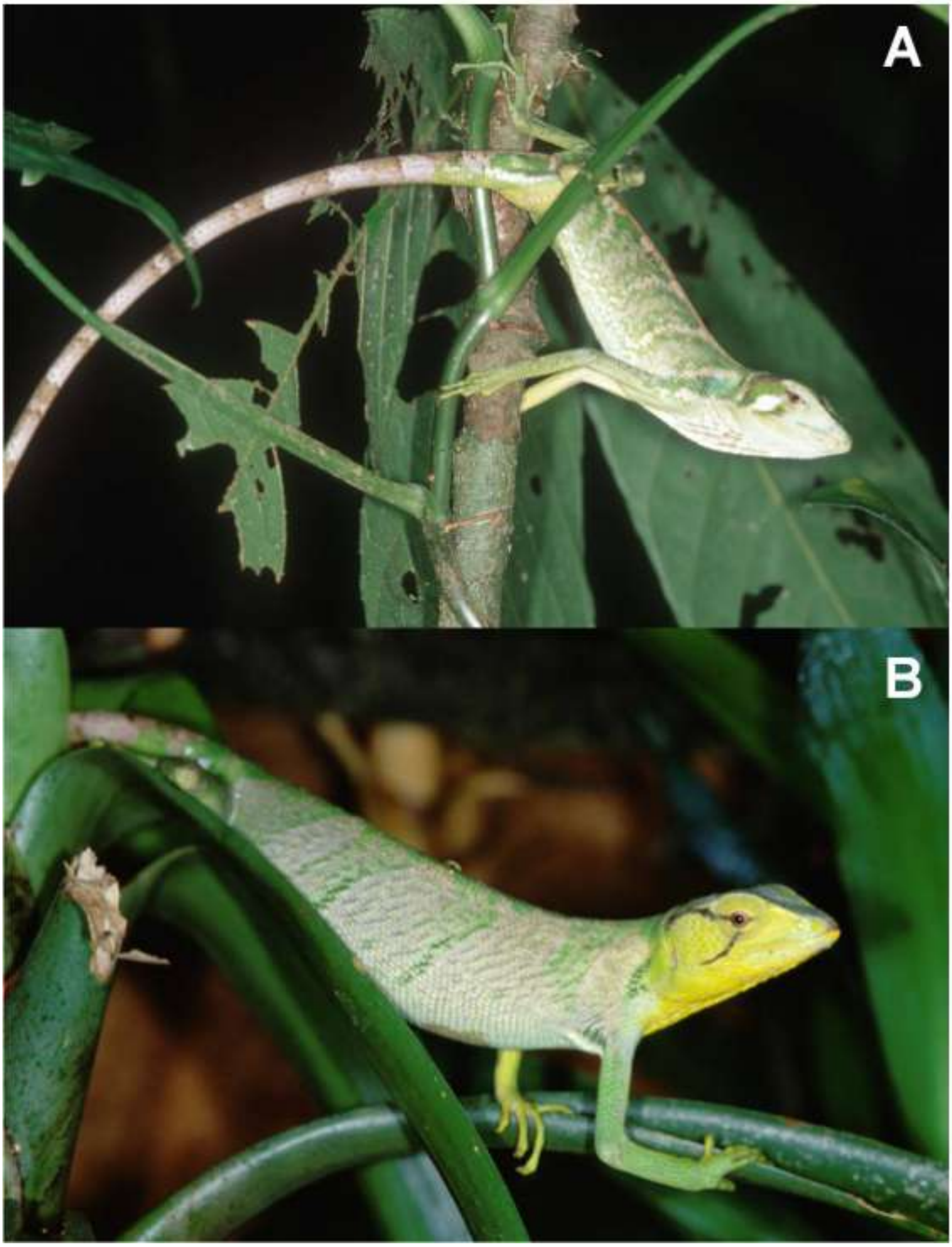

Figure 4.1.7. *Polychrus gutturosus* from near Río San Juan, Nicaragua (photographs by G. Köhler): male (**A,** SMF 83024) and female (**B**, SMF 83422).

Table 4.1.3. Summary of morphometric and pholidosis characters of *Polychrus gutturosus*

Sex	All[#] (n=27)	Males (n=10)	Females (n=15)
Axilla-groin length/SVL	0.45–0.61 (0.53 ± 0.03)	0.45–0.55 (0.53 ± 0.03)	0.45–0.61 (0.53 ± 0.04)
Head length/SVL	0.16–0.25 (0.22 ± 0.02)	0.18–0.25 (0.22 ± 0.02)	0.16–0.24 (0.22 ± 0.02)
Head length/Head width	1.10–1.6 (1.42 ± 0.15)	0.93–1.56 (1.38 ± 0.20)	1.10–1.6 (1.44 ± 0.13)
Head width/Head height	0.9–1.34 (1.11 ± 0.13)	0.97–1.34 (1.07 ± 0.13)	0.9–1.29 (1.14 ± 0.14)
Tail length/SVL	2.36–3.55 (3.10 ± 0.28)	3.08–3.55 (3.30 ± 0.16)	2.36–3.55 (2.99 ± 0.28)
Scales around midbody	63–82 (73.0 ± 5.4)	63–75 (68.4 ± 3.27)	66–82 (76.33 ± 4.42)
Vertebral scales	75–105 (89.15 ± 7.15)	75–93 (84.6 ± 5.56)	84–105 (93.13 ± 5.97)
Gular scales	22–33 (28.59 ± 2.36)	22–30 (26.9 ± 2.28)	27–33 (29.8 ± 1.78)
Diameter eye/head length	0.27–0.49 (0.33 ± 0.05)	0.30–0.49 (0.35 ± 0.05)	0.27–0.41 (0.31 ± 0.03)
Subdigitals finger IV	25–36 (31.52 ± 2.79)	30–36 (33.0 ± 1.94)	25–36 (30.87 ± 2.8)
Subdigitals toe IV	35–45 (40.81 ± 2.43)	38–44 (41.2 ± 2.15)	37–45 (41.07 ± 2.28)
Forelimbs/SVL	0.37–0.54 (0.47 ± 0.04)	0.37–0.54 (0.49 ± 0.04)	0.38–0.53 (0.46 ± 0.04)
Hindlimbs/SVL	0.46– 0.73 (0.59 ± 0.06)	0.56– 0.73 (0.63 ± 0.06)	0.46– 0.63 (0.57 ± 0.05)
Femoral pores (left)	9–21 (14.76 ± 3.15)	14–19 (15.7 ± 1.49)	9–21 (13.93 ± 3.87)

[#] 10 males, 15 females, 2 juveniles

Distribution and natural history. From northwestern Honduras and western Costa Rica to northwestern Ecuador (Köhler 2003A, Savage 2002) from sea level to 1300 m elevation (Castro-Herrera and Vargas-Salinas 2008). According to Duellman (1979), the species occurs on the Pacific slopes of the Cordillera Occidental in Colombia and Ecuador, the northern parts of the Colombian cordilleras and in the high lands in lower Central America. According to Peters (1967) and Peters and Donoso-Barros (1970, 1986), *Polychrus gutturosus gutturosus* is distributed from the higher western Andean slopes of Ecuador and Colombia and northward to Costa Rica and Nicaragua; whereas *P. gutturosus spurrelli* occurs in lowland rain forests of northwestern Ecuador and Colombia. According to Savage (2002), the species occurs in undisturbed lowland moist and wet forests and marginally along stream courses which lead into the adjacent Premontane Moist Forest.

Despite its restriction to humid forests, it is strictly diurnal and arboreal and is rarely seen (Savage 2002). A female specimen from Turrialba, Cartago Province, Costa Rica examined by Taylor (1956) contained 4 ovarian eggs in the right and 5 in the left ovary, respectively. Eggs were nearly spherical and measured 12 mm in diameter. Roberts (1997) observed a pair of *Polychrus gutturosus* copulating in a tree 2 m above the ground at La Selva Biological Station, Heredia Province, Costa Rica on 9 May and further reports of a gravid female, that was found in a *Heliocarpus* sp. tree next to Puerto Viejo river at La Selva on 24 July. According to Savage (2002), juveniles have a SVL of 53.5–57 mm when hatching. We examined 2 juveniles with a SVL of 87 mm (ZFMK 31444) and only 44 mm (QCAZ 06749), respectively. Two specimens which were not examined any further had a SVL of 39 mm (BM 94.5.29.5) and 57 mm (BM 1901.3.29.84), respectively. Based on the so far reported cases of copulating animals and gravid females, Savage (2002) suggested a rainy season productive period (May to December). He stated that eggs are apparently laid in the leaf litter on the ground. Köhler (2003B) kept a couple of *P. gutturosus* from near Rio San Juan, Nicaragua, in a terrarium. On 26 October the female laid 5 eggs, which decayed and could not be incubated successfully. We examined a gravid female (ZFMK 40830) from Comatré, Limón, Costa Rica, which was collected in October 1983. It contained a total of 6 oval eggs of which 3 were positioned in each of the oviducts. On the average, these eggs had a length of 21 mm and a width of 15 mm.

Discussion

Polychrus peruvianus is the only representative in the genus with a prominent middorsal and gular crest. Due to this character it was originally described as belonging to a new genus *Polychroides* (Noble 1924). Burt and Burt (1933) followed this nomenclature, whereas Parker (1935) and Roberts (1997) accepted only 5 species of *Polychrus* and thus consider *peruvianus* as not belonging to this genus. In contrast, Williams (1988) and Savage (2002) recognized 7 species of *Polychrus*, signifying that they considered *peruvianus* as belonging to this genus. Osteological (Etheridge 1965, Etheridge and De Queiroz 1988) and cytological data (Gorman et al. 1969) show a very close relationship to the genus *Polychrus,* and lead the authors to the assumption that *peruvianus* belongs to this genus. Due to phylogenetic examination of morphological data, Frost et al. (2001) placed *peruvianus* in the genus *Polychrus*. Yánez-Muñoz et al. (2006), who provided the first country record of the species for Ecuador, also considered the species as belonging to the genus *Polychrus*. Analysis of molecular data is still lacking to definitely determine the position of this species.

Polychrus gutturosus is the only species in the genus assumed to be composed of two subspecies (*P. g. gutturosus* and *P. g. spurrelli*). However, disagreement still exists on the status of the latter, which was described by Boulenger (1914) as a distinct species *Polychrus spurrelli* and later placed as a subspecies of *P. gutturosus* (Parker 1935). According to Parker's identification key, the pectoral scales of *P. g. gutturosus* are multicarinate whereas those of *P. g. spurrelli* are smooth. Peters (1967) and Peters and Donoso-Barros (1970, 1986) also consider *spurrelli* as a subspecies of *P. gutturosus*. According to the key provided by them, the canthus rostralis is somewhat rounded and the scales on the pectoral region are smooth, or only very weakly keeled in *P. g. spurrelli,* whereas in *P. g. gutturosus* the canthus rostralis is distinctly angular and the scales on the pectoral region are strongly keeled, usually unicarinate but may be bi- or tricarinate. According to Frost et al. (2001), Pough et al. (2004), and Avila-Pires (1995) the genus *Polychrus* contains 6 species and according to Roberts (1997), it contains only 5 species. Hence these authors do not accept *spurrelli* as being a distinct species. In a species list of Colombian lizards provided by Ayala (1986), the only *Polychrus* species mentioned to occur in the country are *P. gutturosus* and *P. marmoratus,* equally revealing that the author did not accept *spurrelli* as a valid species. In contrast, Williams (1988) and Savage (2002) accept 7 species in the genus *Polychrus*, which signifies that they considered it as a distinct species. Torres-Carvajal (2001) and Yánez-Muñoz et al. (2006) also considered *P. spurrelli* as a valid species.

As explained in very detail by Myers and Böhme (1996), it is not sure whether the type locality provided by Boulenger (1914) for *P. gutturosus* is really the highland city Popayán (1760 m a.s.l.), as referenced to by several authors (e.g. Barbour 1934, Peters and Orejas-Miranda 1970, Myers 1974), but rather a colonial province named Popayán which seems to have existed until 1820 and which once included nearly all of what is now western Colombia. Thus, the chance is quite high that the type specimens of *P. gutturosus* were originally collected at some other place in western Colombia and probably at lower elevations. Hence the original location of *P. gutturosus* within the old province of Popayán cannot be determined, and the existence of a geographic isolation of *P. gutturosus* and *P. spurrelli* is not proven. The assumption that both taxa represent different subspecies of *P. gutturosus* (i.e. by definition allopatric forms) is not supported. To shed light on the taxonomic status of *spurrelli*, we revised the two syntypes (BM 1946.8.8.33–34) on which Boulenger (1914) based his species description and two further specimens (BM 1916.4.25.2–3) in the British Museum of Natural History which were also collected by Dr. H.G.F. Spurrell in Colombia (Andagoya, Chocó) and were also designated as *P. spurrelli*. The two syntypes represent subadult females and the two other specimens represent adult males. We could not find any difference in either morphometric or pholidosis characters (Tab. 4.1.4) or in colouration between these four *Polychrus* and the 27 specimens of *P. gutturosus* formerly examined for this study. The shape of the canthus rostralis is more rounded in some specimens, whereas it is more angular in others. We found the scales in the pectoral region of the four *spurrelli* to be smooth, or slightly uni- or tricarinate in one specimen (BM 1946.8.8.34), uni- or tricarinate in two specimens (BM 1946.8.8.33, BM 1916.4.25.2) and multicarinate with 2–5 keels in one specimen (BM 1916.4.25.3). Again, there was no difference to the specimens of *P. gutturosus* studied by us, which exhibited pectoral scales with 1–5 keels.

Based on our observations, there is no evidence to support the recognition of *P. spurrelli* as a distinct species; thus, we synonymize it here with *P. gutturosus*. Genetic examination could further help to better determine the status of *spurrelli*.

Our field work resulted in the discovery of yet another undescribed species of *Polychrus* from northern Peru. We will provide a comprehensive description of this new species in a further publication.

Table 4.1.4. Summary of morphometric and pholidosis characters of *Polychrus spurrelli*

Sex	All (n=4)	Males (n=2)	Females (n=2)
Axilla-groin length/SVL	0.5–0.55 (0.52 ± 0.02)	0.52–0.54 (0.53 ± 0.01)	0.5–0.55 (0.52 ± 0.01)
Head length/SVL	0.19–0.24 (0.21 ± 0.03)	0.19 (0.91 ± 0.0)	0.24 (0.24 ± 0.03)
Head length/Head width	1.16–1.84 (1.49 ± 0.28)	1.16–1.84 (1.50 ± 0.48)	1.41–1.55 (1.48 ± 0.17)
Head width/Head height	0.9–1.12 (1.00 ± 0.08)	0.93–0.95 (0.94 ± 0.01)	1.01–1.12 (1.07 ± 0.13)
Tail length/SVL	2.97–3.20 (3.07 ± 0.12)	2.97–3.20 (3.09 ± 0.16)	2.97–3.14 (3.06 ± 0.0)
Scales around midbody	64–82 (67.5 ± 4.73)	64–74 (66.0 ± 2.83)	64–68 (69.0 ± 2.83)
Vertebral scales	85–94 (87.75 ± 4.72)	85–87 (86.0 ± 1.41)	85–94 (89.5 ± 1.41)
Gular scales	24–29 (27.25 ± 2.36)	27–29 (28.0 ± 1.41)	24–29 (26.5 ± 3.54)
Diameter eye/head length	0.35–0.42 (0.38 ± 0.03)	0.40–0.42 (0.41 ± 0.01)	0.35 (0.35 ± 0.04)
Subdigitals finger IV	27–31 (29.0 ± 1.63)	29–31 (30.0 ± 1.41)	27–29 (28.0 ± 1.41)
Subdigitals toe IV	36–38 (37.25 ± 0.96)	36–38 (37.0 ± 1.41)	37–38 (37.5 ± 0.71)
Forelimbs/SVL	0.43–0.51 (0.47 ± 0.04)	0.45–0.51 (0.48 ± 0.04)	0.43–0.50 (0.46 ± 0.06)
Hindlimbs/SVL	0.54– 0.64 (0.60 ± 0.04)	0.54– 0.60 (0.57 ± 0.04)	0.63– 0.64 (0.64 ± 0.02)
Femoral pores (left)	12–15 (13.75 ± 1.26)	14–15 (14.5 ± 0.71)	12–14 (13.0 ± 2.12)

Acknowledgments. For allowing access to herpetological collections, we are grateful to J. Cordova and C. Aguilar (MUSM), O. Torres-Carvajal (QCAZ), G. Köhler (SMF) and P. Campbell (BM). We are indebted to A. Schmitz (MHNG) for the loan of material. We thank Jacqueline Maria Charles for her financial support. CK thanks the Deutscher Akademischer Austauschdienst (DAAD), the Alexander Koenig Stiftung (AKS) and the Alexander Koenig Gesellschaft (AKG) for financial support. The Ministero de Agricultura, Peru kindly provided collecting (071-2007-INRENA-IFFS-DCB, 0020-2009-AG-DGFFS-DGEFFS, 0424-2010-AG-DGFFS-DGEFFS) and export permits (0017799-AG-INRENA, 001829-AG-DGFFS, 003983-AG-DGFFS). We are indebted to M. León and G. Köhler for providing photo material of live specimens, and to the latter also for his constructive comments during the review of the manuscript. Melissa Koch (English native speaker) kindly proofread the manuscript. Erick Hoyos Granda and Jorge Novoa Cova assisted during the field work and contributed greatly to the success of the field trips. Andreas Kirschner and Uwe Schlüter provided useful information.

5. CONTRIBUTIONS TO THE GENUS *AMEIVA*

5.1 Two new endemic species of *Ameiva* (Squamata: Teiidae) from the dry forest of northwestern Peru and additional information on *Ameiva concolor* Ruthven, 1924

This section is accepted for publication in Zootaxa as:

KOCH, C., VENEGAS, P.J., RÖDDER, D., FLECKS, M. & W. BÖHME (in press): Two new endemic species of Ameiva (Squamata: Teiidae) from the dry forest of northwestern Peru and additional information on Ameiva concolor Ruthven, 1924. – Zootaxa.

Contribution of Claudia Koch to this publication:
Field work (together with P.J. Venegas) and museums work; data collection; morphological and phylogenetical analysis (together with M. Flecks); interpretation of morphological and phylogenetical data (together with M. Flecks); niche analyses (together with D. Roedder); conception of article; drawings; compilation of distribution map; main writing and proof reading.

Abstract. We describe two new species of *Ameiva* Meyer, 1795 from the dry forest of the Northern Peruvian Andes. The new species *Ameiva nodam* sp. nov. and *Ameiva aggerecusans* sp. nov. share a divided frontal plate and are differentiated from each other and from their congeners based on genetic (12S and 16S rRNA genes) and morphological characteristics. *A. nodam* sp. nov. has dilated postbrachials, a maximum known snout-vent length of 101 mm, 10 longitudinal rows of ventral plates, 86-113 midbody granules, 25-35 lamellae under the fourth toe, and a color pattern with 5 longitudinal yellow stripes on the dorsum. *Ameiva aggerecusans* sp. nov. has not or only hardly dilated postbrachials, a maximum known snout-vent length of 99.3 mm, 10-12 longitudinal rows of ventral plates, 73-92 midbody granules, 31-39 lamellae under the fourth toe, and the females and juveniles of the species normally exhibit a cream-colored vertebral stripe on a dark dorsum ground color. We provide information on the intraspecific variation and distribution of *A. concolor*. Furthermore, we provide information on the environmental niches of the taxa and test for niche conservatism.

Introduction

According to the most recent revision of teiid lizards (Harvey *et al.* 2012), 28 species of whiptail lizards are currently recognized as belonging to the genus *Ameiva* Meyer, 1795, including two Caribbean species that are considered as being already extinct: *A. cineracea* Barbour & Noble, 1915; and *A. major* Duméril & Bibron, 1839 (Groombridge 1993; Hower & Hedges 2003; Lorvelec *et al.* 2007). The distribution of 18 of the extant species (*Ameiva alboguttata* Boulenger, 1896; *A. atrata* Garman, 1887; *A. auberi* Cocteau, 1838; *A. chrysolaema* Cope, 1868; *A. corax* Censky & Paulson, 1992; *A. corvina* Cope, 1861; *A. dorsalis* Gray, 1838; *A. erythrocephala* Daudin, 1802; *A. exsul* Cope, 1862; *A. fuscata* Garman, 1887; *A. griswoldi* Barbour, 1916; *A. lineolata* Duméril & Bibron, 1839; *A. maynardi* Garman, 1888; *A. plei* Duméril & Bibron, 1839; *A. pluvianotata* Garman, 1887; *A. polops* Cope, 1862; *A. taeniura* Cope, 1862; *A. wetmorei* Stejneger, 1913) is restricted to various Caribbean islands. Four species (*A. ameiva* (Linnaeus, 1758); *A. pantherina* Ugueto & Harvey, 2011; *A. parecis* (Colli, Costa, Garda, Kopp, Mesquita, Péres, Valdujo, Vieira & Wiederhecker, 2003); *A. provitaae* Garcia-Perez, 1995) are restricted to South America and another four species (*A. atrigularis* Garman, 1887; *A. bifrontata* Cope, 1862; *A. concolor* Ruthven, 1924a; *A. praesignis* (Baird & Girard 1852)) occur as well in South as in Middle America (Barbour & Noble 1915; Burt & Burt 1930; Schwartz & Klinikowski 1966; Echternacht 1970, 1971, 1976, 1977; Peters & Donoso-Barros 1970, 1986; Censky & Paulson 1992; Garcia-Pérez 1995; Hower & Hedges 2003; Ugueto & Harvey 2011; Harvey *et al.* 2012).

To contribute to the knowledge of the peculiar herpetofauna of Andean dry forests an area with high endemism in plants, birds and reptiles (Statterfield *et al.* 1998; Bridgewater *et al.* 2003; Koch *et al.* 2006, 2011; Venegas *et al.* 2008; Särkinen *et al.* 2011), we conducted fieldwork in interandean valleys of the Northern Peruvian Regions of Amazonas, Cajamarca, and La Libertad and surveyed 18 localities along a stretch of more than 350 km of the Marañón River and its tributaries. The Marañón valley is located in the Central Andes between the Cordillera Occidental to the west, and the Cordillera Central to the East. The Huancabamba Depression in northern Peru interrupts the Central and Eastern Cordilleras and has the lowest elevation at the Abra de Porculla (2145m) in the Western Cordillera, Region of Piura (Duellman 1979, Duellman & Pramuk 1999). The Andean dry forest extends from the Region of La Libertad along the deep and narrow valley of the Marañón River northward to the Huancabamba Depression along the flanks of the Chinchipe, Chamaya, Huancabamba and Utcubamba rivers and tributaries (Regions of Piura, Cajamarca, Amazonas) and is known to shelter a large number of endemic flora and fauna species (Särkinen *et al.* 2011). The fieldwork resulted in the discovery of several new species, of which three geckos (Koch *et al.* 2006; Venegas *et al.* 2008) and a polychrotid lizard (Koch *et al.* 2011) have recently been described and further species descriptions are still pending.

In the Canyons of the Chinchipe, Chamaya, Huancabamba, Utcubamba and Marañón River, Region of Cajamarca, we collected 29 specimens of an *Ameiva* species, which in several museum collections and in publications (Ruthven 1924a; Burt & Burt 1931, 1933) was referred to as *Ameiva bifrontata divisa* Fischer, 1879 although the former author remarks that “There is some possibility that in northern Peru and southwestern Colombia another race is distinguishable. Four Perico specimens differ from all other examples of *divisus* [see chresonymy] examined (northern Colombia) in having the supraocular granules discontinued about the middle of the postfrontals. Since in the other characters the specimens are like *divisus*, they should, at least for the present, be referred to that subspecies”.

Phylogenetic analysis together with morphological comparisons of our self-collected specimens with the type material of *Ameiva bifrontata divisa* (Syntypes: ZMH 09545–9) revealed sufficient differences to distinguish it from the taxon *divisa* and to describe it herein as a new species.

Slightly more south from the southest locality of the first new *Ameiva* species and up to approximately 100 km south along the Marañón River in the Regions of Amazonas and Cajamarca, we collected 13 specimens of a second so far undescribed *Ameiva* species, which we also detected in two museum collections, once referred to as *Ameiva* sp. and once referred to as *Ameiva bifrontata.* As the former, this species could also well be distinguished from *A. bifrontata* by its genetic and morphological characters.

Another 60km more to the South along the Marañón River, Region of La Libertad, we collected 10 specimens of *A. concolor*, which was long time considered to be a subspecies of *Ameiva bifrontata* but was recently elevated to species level by Harvey *et al.* (2012). As the original description of *A. concolor* given by Ruthven (1924a) is short and based only on four type specimens and thus information on intraspecific variation given therein is very limited, we provide some morphological information containing data of our own collected material in addition to scale counts of the Ruthven's holotype. Furthermore, we provide information on the environmental niches of the taxa and test for niche conservatism i.e., we test whether the niches of the more closely related taxa are more similar than those of the more distantly related ones.

Materials and Methods

Fieldwork, loaned material

Fieldwork was conducted between July 2005 and November 2010. After tissue samples were taken, the specimens collected during our fieldwork were fixed over 12–24 h in 10% formalin and then stored in 70% ethanol.

The first new *Ameiva* species is described on the basis of 60 collected specimens (22 males and 22 females, 15 juveniles and one undefined adult specimen). A total of 29 of these specimens were collected by two of us (CK & PJV) and housed in the collections of the Centro de Ornitología y Biodiversidad (CORBIDI) and the Zoologisches Forschungsmuseum Alexander Koenig (ZFMK). The remaining 31 specimens were detected in the following collections: Natural History Museum, University of Kansas, Lawrence, USA (KU), Natural History Museum, London, UK (BM), Royal Ontario Museum, Toronto, Canada (ROM), Museum of Comparative Zoology, Cambrigde, USA (MCZ), Muséum d'Histoire Naturelle de Genève, Geneva, Switzerland (MHNG) and Museum für Naturkunde, Berlin, Germany (ZMB).

The description of the second new species of *Ameiva* is based on 21 specimens (12 males, five females, four juveniles). A total of 13 of these specimens were collected by CK and PJV and are housed in the collections of CORBIDI and ZFMK. Eight specimens were revised from the collections of the ROM and the KU.

Additional information on *Ameiva concolor* provided herein is based on 11 specimens (six males, three females, two juveniles). Ten of these specimens were again collected by CK and PJV and housed in the collections of CORBIDI and the ZFMK. In addition, the authors had photos of the holotype at their disposal, which is housed in the University of Michigan, Museum of Zoology, Michigan, USA (UMMZ). Comparative data of *Ameiva bifrontata divisa* were taken from the type material housed in the collection of the Zoologisches Museum Hamburg, Germany (ZMH) and from specimens kept in MCZ and the Zoologische Staatssammlung München, Germany (ZSM). Comparative data of other *Ameiva* species were taken from specimens housed in the collections of the BM, MCZ, ZSM and the Senckenberg Forschungsinstitut und Naturkundemuseum Frankfurt, Germany (SMF).

The descriptions of the species mainly follow Harvey *et al.* (2012) and Ugueto & Harvey (2011). In addition, comparative data for other *Ameiva* species were extracted from Fischer (1879), Babour & Noble (1915), Ruthven (1913, 1924a, 1924b), Burt & Burt (1931), Peters (1964), Schwartz & Klinikowski (1966), Donoso-Barros (1968), and García-Pérez (1995).

Measurements of head, body and limbs were taken with a common ruler to the nearest 1 mm or a dial caliper to the nearest 0.1 mm and tail measurements were taken with a tape measure to the nearest 1 mm.

The following abbreviations were used: snout–vent length (SVL, from tip of snout to cloaca), length of tail (TL), axilla–groin length (AGL, distance from insertion of forelimb to insertion of hindlimb), width of head (HW, across supraoculars), height of head (HH, at highest part of head), length of head (HL, from tip of snout to posterior edge of ear), length of snout (SL), diameter of eye (ED), distance from tip of snout to anterior margin of nostril (DSN), distance from nostril to eye (DNE), distance from eye to ear (DEE), body height at midbody (BHM), body width at midbody (BWM), length of forelimb (FLL), length of hindlimb (HLL), length of tibia (TIL), number of lamellae under fourth finger (LFF), number of lamellae under fourth toe (LFT), number of femoral pores on left thigh (FP), number of scales in the 15th caudal verticile (SCF), midbody granules (DOM, counted in transverse row around midbody, excluding ventrals), dorsal granules (DL, counted in longitudinal row from occipitals to base of tail).

Sex of specimens without everted hemipenes was determined by dissection of the lower body to check the internal reproductive organs (testicles or ovaries).

Altitudes above sea level and geographic coordinates were recorded with a GPS (Garmin GPSMap 60CSx) using the geodetic datum WGS84. Humidity and air temperatures were taken with a digital thermo-hygrometer (Extech) with an external sensor.

Phylogenetic analyses

Tissue samples were taken from the muscle tissue of the thigh from the three *Ameiva* species mentioned herein in addition to samples taken from other *Ameiva* species for comparisons (i.e. *A. ameiva, A. bifrontata divisa* and *Medopheos edracanthus*). The latter species was just recently split of the genus *Ameiva* and considered as being monotypic (Harvey *et al.* 2012). The tissue samples were processed at the Center for Molecular Biodiversity Research of the ZFMK. Genomic DNA was extracted from the tissue samples using the DNeasy Blood & Tissue Kit (Qiagen) and the standardized extraction protocol provided by the manufacturer. Mitochondrial genes encoding the 12S rDNA and 16S rDNA were amplified using the polymerase chain reaction (PCR). We used the roughly universal primers 12SA-L (light chain; 5’ – AAA CTG GGA TTA GAT ACC CCA CTA T – 3’) and 12SB-H (heavy chain; 5’ – GAG GGT GAC GGG CGG TGT GT – 3’) of Kocher *et al.* (1989) to amplify a segment of the mitochondrial 12S ribosomal RNA gene and the likewise universal primers 16sar-L (light chain; 5’ – CGC CTG TTT ATC AAA AAC AT – 3’) and 16sbr-H (heavy chain; 5’ – CCG GTC TGA ACT CAG ATC ACG T – 3’) of Palumbi *et al.* (1991) to amplify a segment of the mitochondrial 16S ribosomal RNA gene. The PCR was carried out on a Biometra thermocycler. Amplification with the 12S primer pair started with an initial denaturation step at 94°C for 90 s, followed by 38 cycles of denaturation at 94°C for 45 s, primer annealing at 50°C for 60 s, elongation at 74°C for 120 s, the final elongation at 74°C for 300 s, and cooling at 10°C. Amplification with the 16S primer pair started with an initial denaturation step at 95°C for 900 s, followed by 15 cycles of denaturation at 94°C for 35 s, primer annealing at 60°C for 90 s, elongation at 72°C for 90 s, plus 25 cycles of denaturation at 94°C for 35 s, primer annealing at 45°C for 90 s, elongation at 72°C for 90 s, the final elongation at 72°C for 600 s, and cooling at 10°C. After the PCR, each sample was checked for successful DNA amplification in an agarose gel electrophoresis and subsequently, if successful, purified for sequencing using the QIAquick PCR Purification Kit (Qiagen) and the standardized purification protocol provided by the manufacturer. The samples were sequenced by Macrogen Europe Laboratory (Amsterdam, Netherlands). Sequences were checked with the original chromatograph data and subsequently aligned manually using the program PhyDE (www.phyde.de). Ambiguous sites were removed from the alignment.

Sequences for six specimens of the first new *Ameiva* species from the Cajamarca Region, two specimens of the second new *Ameiva* species from the Amazon and Cajamarca Regions, three specimens of *A. concolor* from the La Libertad Region, three specimens of *A. ameiva* from the Pasco and Ucayali Regions in Peru, two specimens of *A. bifrontata divisa* from Colombia, and two specimens of *Medopheos edracanthus* from Ecuador and the Lambayeque Region in Peru were supplemented with sequences obtained from GenBank (see Appendix III for respective localities and accession numbers). In order to check for monophyly of the study group, a data set including representatives of the subfamily Teiinae was created, consisting of 279 bp (81 variable sites) and 374 bp (70 variable sites) for 12S rRNA and 16S rRNA, respectively. GTR+G and GTR+G+I were chosen as models of nucleotide substitution by the Akaike Information Criterion using MrModeltest 2.3 (Nylander 2004) for 12S and 16S, respectively. A second data set contained only the members of the *A. ameiva-bifrontata*-group with 349 bp (86 variable sites) and 517 bp (85 variable sites) for 12S rRNA and 16S rRNA, respectively, and GTR+G+I was used as substitution model for each marker. Model parameters were estimated separately for each gene by partitioning the concatenated data set during subsequent analyses. Phylogenetic trees were constructed by Bayesian inference as implemented in BEAST v.1.7.5 (Drummond *et al.* 2012). The Yule Process (Yule 1925) was used as a tree prior. Results of the BEAST analyses of each data set were summarized from four independent runs with 100,000,000 generations each, sampling every 10,000 trees and omitting the initial 10% as burn-in.

Niche analyses

A comprehensive set of 19 bioclimatic variables (Appendix II) representing an average of the climatic conditions over the period 1950–2000 with a spatial resolution of 30 arc sec were obtained for our study area from the WorldClim database version 1.4 (Hijmans *et al.* 2005, 2012; http://www.worldclim.org/). The climatic conditions within a radial buffer of 50 km enclosing the species records were extracted to capture the available environmental space. Subsequently, principal component analyses (PCA) based on the combined environmental spaces available for two taxa were conducted following the PCA-env approach suggested by Broennimann *et al*. (2012), i.e. the 19 correlated bioclimatic variables were transformed into a small number of principal components (PCs) representing uncorrelated linear combinations of the original variables. In the PCA-env approach by Broennimann *et al.* (2012) a kernel density function is used to calculate the smoothed density of occurrences and background conditions for each cell of the environmental space (100 x 100 cells herein). Both the density grids computed with species records and background conditions are standardized and subtracted from each other in order to remove bias due to more frequent combinations of environmental factors in geographic space. Subsequently, the grids computed for both taxa are intersected and the overlap in environmental space is computed in terms of Schoener´s D, which was recently supposed as suitable measure for overlaps in Grinnellian niches (Rödder & Engler 2011). The PCA-env analysis was run in R and tests for niche similarity and niche equivalency sensu Warren *et al.* (2008) were implemented as modified by Broennimann *et al.* (2012). The niche equivalency test addresses the hypothesis that the niches of two taxa are effectively indistinguishable by creating a null distribution of Schoener’s D by pooling and randomly splitting the species records. Niche similarity tests are unidirectional tests addressing the hypothesis that the observed niche overlap can be attributed to the environmental space available to one of the taxa. Therefore, a null distribution of niche overlaps is created based on the actual species records of one taxon and randomly drawn records from the available environmental space of the second taxon. It is significant ($p < 0.5$) if the observed overlap exceeds the two tailed 95% CI of the null distribution indicating that the observed overlap can be attributed to active habitat choice. For more details see Warren *et al.* (2008) and Broennimann *et al.* (2012).

Results

Phylogenetic analyses

Phylogenetic analyses detected two so far undescribed species of *Ameiva* native to the interandean valleys of the Northern portion of the Marañón River and its tributaries (Figure 5.1.3). Each of them constitutes a distinct lineage within the monophyletic *A. ameiva-bifrontata*-group, while the genus *Ameiva* is not monophyletic (Appendix IV). The two new species are paraphyletic in respect to *A. concolor*, and, together with the latter, form the sister taxon to *A. ameiva*. *Ameiva bifrontata divisa* is not closely related to the clade containing the new species and *A. concolor*, but represents the most distinct taxon within the group.

Systematics

***Ameiva nodam* sp. nov.**

Figures 5.1.1–5.1.2

Cnemidophorus divisus Fischer, Verhandlungen des Naturwissenschaftlichen Verein in Hamburg 3: 78–103. – 1879 (the original description refers to a Venezuelan taxon described by Fischer as *C. divisus*)
Ameiva bifrontata divisa – Ruthven, Occasional Papers of the Museum of Zoology, University of Michigan (155): 1–6. – 1924
Ameiva bifrontata divisa – Burt & Burt, Bulletin American Museum of Natural History, 61: 227–395. – 1931
Ameiva bifrontata divisa – Burt & Burt, Transactions of the Academy of Science of Saint Louis 28 (i): v–108. – 1933

DIAGNOSIS AND COMPARISON

This comparatively small *Ameiva* is diagnosed by the following combination of characters: (1) maximum known SVL of 101mm; (2) lacking longitudinal ridge on frontal scale; (3) frontal plate divided in two subequal scales; (4) postnasals separated from prefrontals by frontonasals; (5) parietal scales usually five; (6) median gular scales not enlarged; (7) enlarged median mesoptychial scales slightly larger than largest gulars; (8) gulars posterior to the interauricular crease smaller than anterior gulars; (9) nasal suture passes centrally through nostril; (10) rostral contacting postnasals; (11) supranasals not contacting supralabials; (12) scales of circumorbital semicircle not extending to anterior margin of third supraocular; (13)

28–33 enlarged ventral scales between gular and vent; (14) 10 longitudinal rows of ventral plates, outermost often distinctly smaller; (15) 86–113 DOM; (16) 165–216 DL; (17) postbrachials dilated; (18) 25–35 LFT; (19) 27–32 SCF; (20) 10–19 FP; (21) five longitudinal yellows stripes on dorsum distinct in juveniles and females, less distinct in most males.

Ameiva nodam sp. nov. can be distinguished from all other described mainland congeners except for *A. bifrontata* and *A. concolor* by having a transversely divided frontal plate. From the latter two it differs in the color pattern and from *A. concolor* also by having the postbrachials dilated.

Especially due to the color pattern of female specimens with five longitudinal yellow dorsal stripes on a brown ground color the new species resembles *Medopheos edracanthus*, a teiid species that was just recently split of the genus *Ameiva* and is now considered as being monotypic. It differs from this species by having the frontal plate divided, by lacking preanal spurs and by having 10 instead of 8 longitudinal rows of enlarged ventral scales.

HOLOTYPE

An adult male (CORBIDI 1870, Figures 5.1.1A–F, 5.1.2A,B) from Bellavista, Province of Jaén, Region of Cajamarca, Peru (05°38’15.6’’S, 78°37’59.2’’W, 390–440 m above sea level), collected 09 May 2008 by P. Venegas and C. Koch.

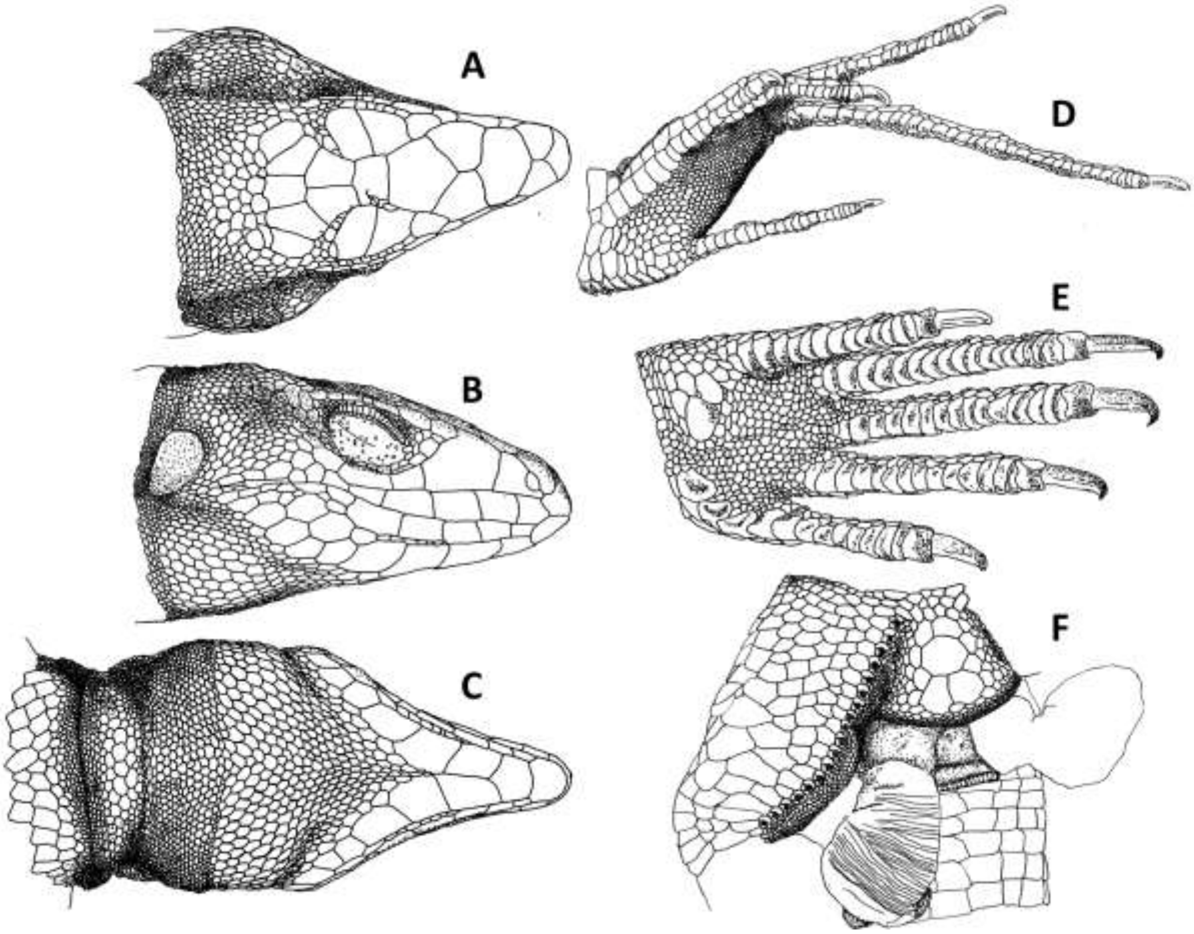

Figure 5.1.1. Male holotype of *Ameiva nodam* sp. nov. (CORBIDI 1870): dorsal (**A**), lateral (**B**) and ventral (**C**) views of head, ventral aspect of left foot (**D**), ventral aspect of left hand (**E**), ventral view of cloacal region and right thigh with femoral pores (**F**).

Description of holotype: A large adult male with a SVL of 101 mm. Head 0.25 times SVL, 2.95 times longer than wide, 0.64 times as wide as high. Snout elongate, bluntly pointed; canthus rostralis distinct. Neck only slightly narrower than head, and body. Body cylindrical. Limbs well developed, forelimbs 0.3 times SVL, hindlimbs 0.58 times SVL, tibia 0.12 times SVL. Tail round in cross section, tapering toward the tip; 2.08 times SVL. Rostral in posterior part right-angled and bordered by supranasals, in anterior part laterally stretched and bordering supranasals; wider than high; smooth, without sutures; visible from above. Supranasals almost triangular, in short medial contact, not contacting supralabials, bordered posteriorly by hexagonal frontonasal. Postnasal almost triangular, in short contact with rostral and frontonasal and in broad contact with loreal and first and second supralabial. Oblique nasal suture passing centrally through oval nostril. Prefrontals paired and roughly pentagonal, with a short medial suture slightly longer than that between supranasals;

laterally in contact with loreal, first supraocular and first supraciliary. Frontal plate divided in two subequal scales, the suture between both scales forming a straight line; anterior frontal pentagonal, laterally in contact with first and second supraoculars, distinctly larger than posterior frontal; posterior frontal pentagonal, laterally in contact with second and third supraoculars. Pair of pentagonal frontoparietals, longer than wide and with long medial suture; laterally in contact with third supraocular, and small circumorbital scales bordering posterior part of third supraocular. Interparietal pentagonal, higher than wide, slightly narrower than adjacent parietals, sutures with parietals straight; interparietal bordered at each side by two irregular parietals divided by oblique suture; outermost parietals slightly smaller than inner parietals; parietal series composed of five scales including interparietal. Supraoculars three at each side. Circumorbital semicircle formed by 12 scales at left side, 22 scales combining both sides, bordering posterior edge of third supraocular and separating it from frontoparietals by two thirds; third supraocular separated from parietals by two rows of circumorbital scales. Laterally, second and third supraocular separated from supraciliaries by a single row of small scales; 19 combining both sides. Supraciliaries seven (on one side), first highest, second longest, remaining ones shorter and subequal. Loreal very large, single, in contact with postnasal, frontonasal, prefrontal, first supraciliary, all three preoculars, first subocular, and second, third and fourth (narrowly) supralabials. Preoculars three, first and third very small and granular; second preocular larger, but distinctly smaller than suboculars. Suboculars three, all longer than wide and in contact with supralabials, first and third subocular almost equal in size, second subocular longest. A keel reaching from first through second subocular. Postoculars small, in two rows, first consisting of six and second of five scales. Enlarged supralabials seven, fifth below center of eye, second and third largest; followed to commissure of mouth by five small scales. No enlarged supratemporals distinguishable. Temporal region with polygonal or rounded scales, slightly smaller centrally. External auditory meatus large, vertically oval, bordered by granular scales, anterior margin semicircular, posterior one straight. Tympanum recessed. All dorsal and lateral head scales juxtaposed and smooth. Mental anteriorly ellipsoid, posteriorly straight, bordered by first infralabials and postmental. Postmental single and pentagonal, in contact with first and second infralabials, followed by six pairs of enlarged chinshields. First pair in broad medial contact and in contact with infralabials. Remaining chinshields separated from infralabials by one row of small, almost granular scales. Medial chin scales moderately small, convex, smooth, juxtaposed, oval or polygonal, in slightly oblique rows, all subequal in size. Enlarged infralabials six, fifth below center of eye; followed to commissure by six smaller scales. Gular region divided into two areas: anterior region with round or polygonal and flat scales in slightly oblique rows that usually remain subequal or rarely grade to slightly larger scales medially, delimited posteriorly by line uniting lower margin of ear openings. Posterior gular region covered by smaller polygonal or round scales in transverse rows. Mesoptychial scales moderately enlarged, slightly larger than anterior gular scales, in about three rows, hexagonal, flat, smooth, and juxtaposed. Scales on nape and sides of neck similar in size to dorsals. Dorsals and scales on flanks granular (slightly larger on dorsum than laterally), round, smooth, juxtaposed; 194 DL; 93 DOM. Ventrals large, smooth, rectangular, wider than long, in 10 longitudinal and 31 transverse rows; transition between ventrals and scales on flanks sharp. Preanal shield with three rows of enlarged scales. Preanal plate surrounded anteriorly and laterally by smaller scales; posteriorly by much smaller scales. 18 FP in continuous row along each thigh, with short gap medially. Each pore surrounded by four scales. Scales on tail dorsally rectangular, smaller than subcaudals, longer than wide, distinctly keeled, slightly imbricate; in transverse and approximately longitudinal rows, continuous with subcaudals around tail (except first few rows incomplete ventrally); 27 SCF. Distally caudals longer and narrower. Subcaudals rectangular, smaller than ventrals, wider than long, smooth, mostly juxtaposed. Forelimbs with row of very large, smooth, slightly imbricate, almost rectangular (distinctly wider than long) antebrachial scales on anterodorsal aspect of forearms and similar but smaller brachial scales on upper arms that extend almost to insertion of forelimbs. Antebrachials and brachials separated by smaller scales at elbow. Dorsoposterior, posterior, and ventral aspect of arms granular, slightly larger than dorsals, except for scales directly adjacent to brachials and antebrachials, which are slightly to moderately enlarged and irregular. Legs with large, smooth, imbricate scales on anterior and ventral aspects of thighs, and ventral aspect of shanks. Row of large, almost rectangular scales anteriorly on thigh, gradually becoming smaller and irregular toward pores. On ventral aspect of shanks, three rows of very large scales, anterior two more or less trapezoidal, posterior one rhomboidal, decreasing in size from anterior toward posterior row. Tibiotarsal spurs form a cluster of two rows, one of about four, and the other of about five sharply mucronate scales which are positioned along the postaxial edge of the distal end of the shank. Elsewhere on hindlimbs scales similar to dorsals. Subdigital lamellae transversely enlarged and single, moderately to distinctly tuberculate towards base. Lamellae of outer toe continuing to heel. On palms, lamellae of outer and inner fingers continuing to wrist only separated by few granules, tubercular and increasing in size towards it. 17 LFF; 32 LFT.

Measurements of holotype (in mm). SVL 101; HL 25.4; HH 13.4; HW 8.6; SL 10.5; ED 5.3; DSN 2.5; DNE 8.1; DEE 7.7; TL 210; AGL 45; BHM 13.6; BWM 17.3; FLL 30; HLL 59; TIL 12.2.

Coloration of holotype: In life (Figure 5.1.2A), the dorsal surface of the head of the male holotype is grayish-brown. The sides of the head are gray. The granules on the eyelids are white to grayish-white. Suboculars and adjacent supralabials are lighter gray than the scales in temporal region, anterior supralabials, postnasal and loreal. Supraciliaries grayish-green. Head ventrally white to grayish-white. Dorsal surface of body reddish-brown; five yellow stripes 2–3 scales in width in anterior part and 4–5 scales in width in posterior part, extending from the head to the base of the tail, one vertebral stripe beginning behind the interparietal, a dorsolateral stripe on each side beginning in the supraciliary region, and a lateral stripe beginning in the anterior upper edge of the ear opening (and being interrupted by the opening); in the posterior part the vertebral stripe is bordered on both sides by an irregular dark blackish-brown line, starting from behind the insertion of the forelimbs, very soft in the beginning and becoming up to four scales in width in direction of the base of the tail; ground color interspaces irregularly intermixed with some blackish-brown granules. Lateral body parts between armpit and groin gray with eleven small turquoise dots (4–6 granules big) arranged in a dotted line. Outermost ventrals gray, first three outer rows of ventrals with an irregular pattern of turquoise dots distinctly larger than the turquoise dots of the lateral row. Central rows of ventrals white. Forelimbs grayish-brown dorsoposterior region and brownish-gray in anteroventral region. Hindlimbs grayish-brown in dorsoposterior region, intermixed with some small dark and larger pale white spots; brownish-gray in anteroventral region. Tail brown with dark spots in anterior third, a lateral dark stripe extends from behind the hind limbs over the first sixth of the tail, adjacent and below to it is a white stripe of almost the same length. Subcaudals white.

In preservative (Figure 5.1.2B), the general dorsal color is mainly brown or grayish-brown; five dorsal stripes are gray to grayish-brown; interspaces between dorsolateral and lateral stripes are dark brown; dots between armpit and groin are pale blue. Remaining body parts are of the same pattern and coloration as in life.

VARIATION

Paratypes (59): An adult male (CORBIDI 1869) and an adult female (CORBIDI 1873) with the same data as the holotype; An adult female (CORBIDI 5762) from Bellavista, Province of Jaén, Region of Cajamarca (05°31'S, 078°31'W, 390–444 m above sea level), collected 30 March 2009 by E. Hoyos Granda and C. Koch; an adult male (MCZ 18134) and three adult females (MCZ 18135–7) from the same region, collected 1916 by G.K. Noble. A Male and a juvenile (ZFMK 88732–33) from Gotas de Agua, Province of Jaén, Region of Cajamarca (05°42'28.2''S, 78°47'18.4''W, 719 m above sea level), collected 05 June 2008 by A. Garcia Bravo and C. Koch; an adult male (CORBIDI 1910) from almost the same region (05°41'17.7''S, 78°46'02.0''W, 717 m above sea level) collected 05 July 2008 by W.A. Garcia Bravo, J. Novoa Cova and C. Koch. An adult male (ZFMK 88734) from Pucará Province of Jaén, Region of Cajamarca (06°01'51.2'' S, 79°07'32.5'' W, 1054 m above sea level), collected 10 July 2008 by W.A. Garcia Bravo, J. Novoa Cova and C. Koch; an adult female and a juvenile (ZFMK 90862, CORBIDI 5761) from almost the same region (06°03' S, 79°05' W, 970 m above sea level), collected 26 March 2009 by E. Hoyos Granda and C. Koch. An adult female (CORBIDI 5763) and a juvenile (ZFMK 90863) from Perico, Province of Jaén, Region of Cajamarca (05°20'30.7''S, 78°47'52.1''W, 490 m above sea level), collected 05 April 2009 by E. Hoyos Granda and C. Koch; an adult male (BM 1924.11.19.10), an adult female (BM 1924.11.19.11) and a juvenile (BM 1924.11.19.12) from the same region, collected 1924 collector not further determined; an adult male (MCZ 18132), two adult females (MCZ 18130–31), a juvenile (MCZ 18133) and an undefined adult specimen (ZMB 29752) from the same region, collected 1916 by G.K. Noble. A juvenile (KU 209520) from Fonda Atapaca (near Rio Chinchipe, East of San Ignacio, 450 m), Province of San Ignacio, Region of Cajamarca, collected on 4 October 1986 by CRS. Five adult males (KU 134835–8, 134841), six adult females (KU 134839–40, 134842–5) and a juvenile (KU 134834) from 7 km North of Jaén, Province of Jaén, Region of Cajamarca (730 m above sea level), collected 5 May 1970 by T.H. Fritts. An adult male (ROM 16273) from 52 km

North of Jaén, Province of Jaén, Region of Cajamarca, collected 7 July 1986 by L.D. Wilson. An adult male (MHNG 2260.19), an adult female (MHNG 2260.18) and an subadult female (MHNG 2260.17) and two juveniles (MHNG 2260.16, 2260.20) from Jaén, Province of Jaén, Region of Cajamarca, collection date and collector not further determined. An adult female (ZFMK 90864) from Puerto Malleta, Province of Cutervo, Region of Cajamarca (06°03’57.1’’S, 78°36’21.1’’W, 509 m above sea level), collected 12 December 2009 by A. Garcia Bravo and C. Koch. Four males (CORBIDI 1874, 1900, 1902, ZFMK 88735), one subadult female (CORBIDI 1898) and six juveniles (CORBIDI 1786, 1833, 1853, 1872, 1905, ZFMK 88736) from Bagua Chica, Province of Bagua, Region of Amazonas (05°38’06.9’’S, 78°32’27.7’’W, 500 m above sea level), collected 20 July 2008 by J. Novoa Cova and C. Koch. Three adult males (CORBIDI 5769, ZFMK 90865–66) and two adult females (CORBIDI 5767–68) from Cumba, Province of Cumba, Region of Amazonas (05°56’14.6’’S, 78°39’50.4’’W, 465 m above sea level), collected 16–18 December 2009 by A. Garcia Bravo and C. Koch.

Description of paratypes: Maximum SVL in male paratypes 88.3 mm (KU 134837), maximum total length in male paratypes 280.7 mm (KU 134838); maximum SVL in female paratypes 78 mm, maximum total length in female paratypes 244 mm (both CORBIDI 05762). Shape of head, body, limbs and tail as in holotype. HL 0.25–0.29 (0.27 ± 0.01, n = 15) times SVL in males; 0.24–0.28 (0.26 ± 0.01, n = 13) times SVL in females; HH 0.11–0.14 (0.13 ± 0.01, n = 16) times SVL in both sexes; HW 0.09–0.13 (0.11 ± 0.01, n = 21) times SVL in males, 0.09–0.13 (0.11 ± 0.01, n = 18) times SVL in females; SL 0.62–0.68 (0.66 ± 0.02, n = 10) times the HL; ED 0.20–0.28 (0.26 ± 0.02, n = 10) times the HL; DSN 0.08–0.13 (0.12 ± 0.02, n = 10) times the HL; DNE 0.26–0.31 (0.29 ± 0.02, n = 10) times the HL; DEE 0.22–0.26 (0.24 ± 0.02, n = 10) times the HL; TL 1.34–2.48 (1.87 ± 0.39, n = 13) times SVL in males; 1.42–2.9 (1.95 ± 0.39, n = 13) times SVL in females; AGL 0.38–0.52 (0.42 ± 0.04, n = 16) times SVL; FLL 0.33–0.38 (0.35 ± 0.01, n = 10) times SVL; HLL 0.66–0.72 (0.69 ± 0.02 n = 10) times SVL; TIL 0.17–0.2 (0.19 ± 0.01, n = 10) times SVL; foot 0.35–0.41 (0.38 ± 0.02, n = 10) times SVL.

Figure 5.1.2. Male holotype of *Ameiva nodam* sp. nov (CORBIDI 1870) from Bellavista, Cajamarca, Peru in dorsal (**A**) and ventral (**B**) view; adult female paratype from Bellavista, Cajamarca, Peru (**C**); and juvenile paratype (ZFMK 88736) from Bagua Chica, Amazonas, Peru (**D**). Please note: the depression on the back of the holotype is a bone fracture, which was accidentally caused when the animal was captured.

Arrangement, shape and surface of scales as in holotype except for the following variations:

Rostral in posterior part right-angled or nearly so. Frontonasal pentagonal or hexagonal. Prefrontals laterally contacting first supraciliary in most specimens, separated from it by the first supraocular and/or the loreal in some specimens. Median suture of prefrontals as short or slightly longer than that between supranalsals. Frontoparietals, posteriorly contacting interparietal and adjacent parietals in most specimens, some individuals with a small medial scale between the posterior suture of the frontoparietals and the interparietal. Interparietal subequal, with or without a short medial suture in anterior part; slightly narrower or slightly wider than adjacent parietals, sutures with parietals slightly oblique or straight; outermost parietals subequal or slightly smaller (rarely larger) to inner parietals. Parietal series normally composed of 5 (4 in one specimen: ZFMK 90862) scales including interparietal. Supraoculars three or four at each side, fourth much smaller than others, third supraocular largest. Circumorbital semicircle formed by 4–14 scales at left side, 8–27 scales combining both sides, bordering posterior edge of fourth (if present) and third supraocular and separating it from frontoparietals by more than half, not extending to anterior margin of third supraocular. Last supraocular separated from parietals by 2–4 rows of circumorbital scales. Laterally, all supraoculars except first separated from supraciliaries by a single or double row of small scales; 21–34 combining both sides. Supraciliaries 5–7 (on one side). Loreal very large, single, in contact with postnasal, frontonasal, prefrontal, first supraciliary, prefrontals, first subocular, second and third and occasionally fourth supralabials and in few specimens with first supraocular. Preoculars normally one, two or three in some specimens. Postoculars small, in two rows, first consisting of 3–5 and second of 3–4 scales. Enlarged supralabials five or six (mostly six), second, third and fourth largest; followed to commissure of mouth by 4–7 small scales. Five to eight slightly enlarged supratemporals distinguishable or not from other scales. Postmental followed by three to 6–8 pairs of enlarged chinshields. Enlarged infralabials 5–7; followed to commissure by 5–8 smaller scales. 165–216 (195 ± 14.67, n = 15) DL; 86–113 (95 ± 7.64, n = 12) DOM. Ventrals in ten longitudinal and 28–33 (30 ± 1.41, n = 60) transverse rows; ventrals of outermost longitudinal row smaller than other ventrals, very small in some specimens. Preanal shield with 2–3 rows of enlarged scales. Postbrachials dilated. 10–19 (16 ± 1.88, n = 36) FP; hardly or even not visible in some female and juvenile specimens. 27–32 (29 ± 1.86, n = 12) SCF. In males, a cluster of 2–3 rows, each of about 3–6 sharply mucronate scales are positioned along the postaxial edge of the distal end of the shank; females and juveniles without such tibiotarsal spurs. 13–19 (16 ± 1.32, n = 59) LFF, 25–35 (31 ± 2.08, n = 60) LFT.

Color variation: This species exhibits conspicuous ontogenetic color changes. In life, juveniles (Figure 5.1.2D) show a dark brown dorsal ground color on head, body and limbs; five longitudinal yellow stripes on dorsum very distinct; in some juveniles a more or less distinct yellow dot is present in the temporal region adjacent to the preoculars and anterior to the lateral stripe, from which it is separated by several small scales; an additional longitudinal, yellowish-white, entire or dotted line is present between the insertion of the forelimbs and the groin, little above the ventrals; in some juveniles the dark brown ground color interspaces between the vertebral and dorsolateral stripes has yellow spots in the posterior part of the body that are arranged in a longitudinal line along the center of each interspace (e.g. ZFMK 88733); forelimbs and hindlimbs dorsally with striking yellow spots; vertebral and dorsolateral stripes continuing on former third or less of the tail, where the color of the stripes grade from yellow to white; a distinct white stripe extends from the posterior insertion of the hindlimbs on the sides of the tail to the former third or less of the tail; at least last two thirds of unregenerated tail dorsally and ventrally turquoise-blue, gaining in saturation towards the tip of the tail; pale turquoise dots laterally between axilla and groin. The smaller the specimen, the larger is the contrast between the dark ground color and the yellow dorsal stripes and dots, and the more intensive is the turquoise color of the tail. In some adult males the brown interspaces between the dorsolateral and lateral yellow stripes are darker brown than the ground color; in some males the brown ground color interspaces between the yellow vertebral and dorsolateral stripes possess yellow more or less distinct spots in the posterior part of the body that are arranged in a longitudinal line along the center of each interspace; dotted turquoise line on lateral body parts between armpit and groin varies between males in size and number of dots (8–16) and may be very distinct or hardly visible; five longitudinal yellow stripes on dorsum may be distinct or very pale and almost not visible; in some males the lateral stripe is only yellow and entire in the anterior part but suspended in the posterior part consisting of turquoise dots that are parallel to the lateral turquoise dotted line; 3–4 outer rows of ventrals of each side gray, in some individuals central row of ventrals also intermixed with gray, irregular pattern of turquoise dots on 1–3 outermost rows of ventrals. Females (Figure 5.1.2C) have a similar color pattern than males but mostly without turquoise dots on the outer ventrals and instead of lateral turquoise dotted lines they normally exhibit a yellow entire or dotted line between armpit and groin; 5 longitudinal yellow stripes on dorsum normally distinct.

In preservative, the general dorsal color is mainly brown or grayish-brown; five dorsal stripes are gray to grayish-brown and less contrasted to ground color interspaces than in living individuals; interspaces between dorsolateral and lateral stripes of most males and females dark brown or blackish; ground color of juveniles dark brown or blackish; tail of juveniles grayish-blue in posterior part; dots of males between armpit and groin pale blue; dilated scales on forelimbs brownish-gray on hindlimbs bluish-gray; outermost rows of ventrals grayish-blue to blackish-blue. Remaining body parts are of the same color as in life.

ETYMOLOGY

The specific epithet is an agglutination of the exclamation “no dam”. We chose this peculiar name to protest against the possible dam construction activities for four hydroelectricity projects along the Marañón river, between the Regions of Cajamarca and Amazonas. With this we are trying to call attention to the fact that the unique dry forest habitat of this and other endemic species, several of them have only recently been discovered (Koch *et al.* 2006, 2011; Venegas *et al.* 2008), is gravely threatened by human interventions.

DISTRIBUTION AND NATURAL HISTORY

This species was collected in the northern Peruvian Andes (Figure 5.1.3), from the Canyons of the Chinchipe, Chamaya, Huancabamba, Utcubamba and Marañón rivers from Fonda Atapaca (near Chinchipe River, East of San Ignacio, 450 m), Province of San Ignacio, Region of Cajamarca to Puerto Malleta, Province of Cutervo, Region of Cajamarca (near Rio Marañón, 509 m above sea level). The lowest distributional level of the species was in Bellavista, Province of Jaén, Region of Cajamarca (near Rio Marañón, 390–440 m above sea level) and highest distributional level was in Pucará, Province of Jaén, Region of Cajamarca (near Rio Huancabamba, 1054 m above sea level, Figure 5.1.4). The species was visually detected by the first author (could not be collected) in La Balza, Province of San Ignacio, Region of Cajamarca (04°59’ S, 79°07’ W, 930 m), which is a small village at the border to Ecuador and just separated from it by the small Canchis river. It is thus most likely that this species can also be found in the dryforest regions of the Southern Ecuadorian Andes.

This new species is endemic to the Equatorial Dry Forest ecoregion (Brack 1986), a habitat which receives less than 500 mm of annual rain fall (Duellman & Pramuk 1999).

Individuals of this species were found moving quickly on the ground in low vegetation during daytime or sleeping under stones during nighttime. Air temperature during the active hours of the species was between 31.3°C and 40.8°C, substrate temperature of the ground was between 32°C and 46.2°C. *Ameiva nodam* sp. nov. was found in the same habitat together with the tropidurid lizard *Microlophus stolzmanni*.

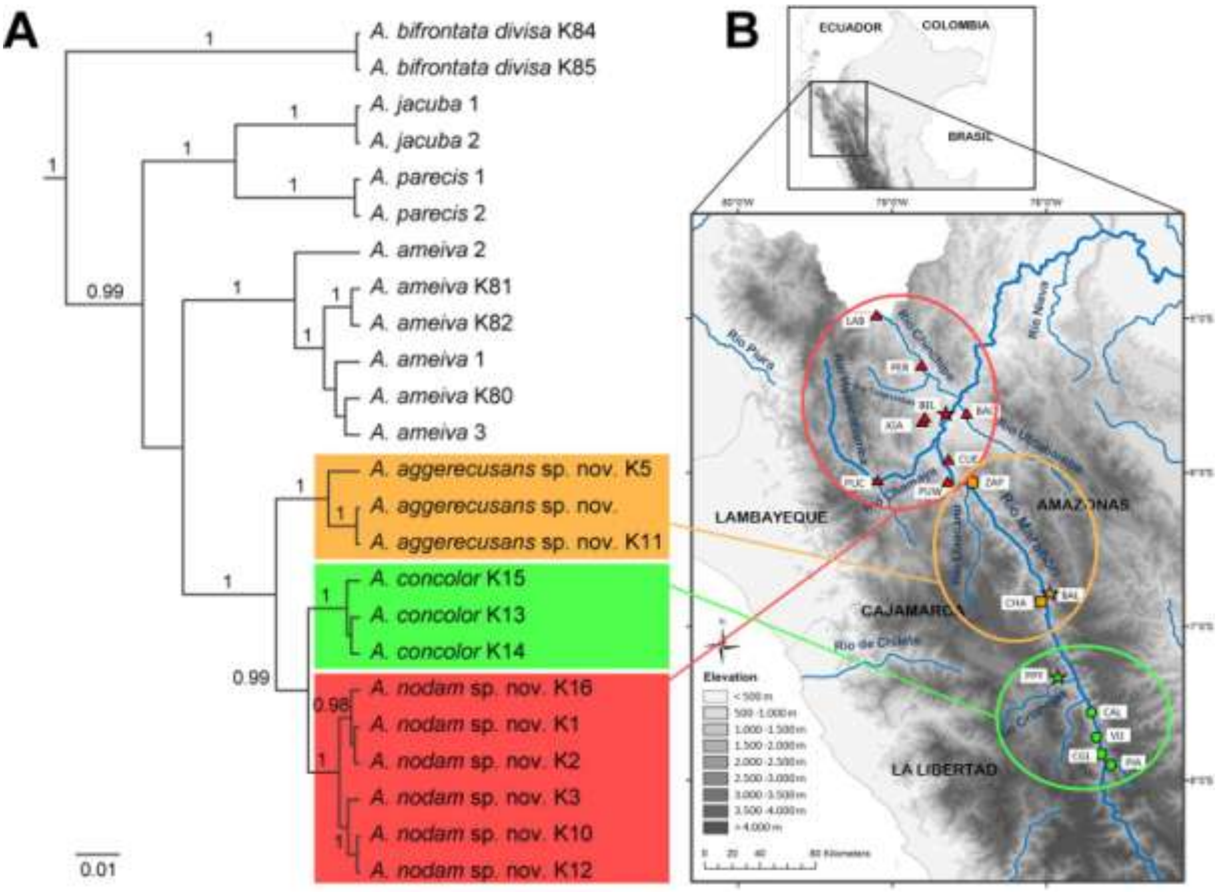

Figure 5.1.3. Maximum clade credibility tree (**A**) of the *Ameiva ameiva-bifrontata*-group inferred with BEAST using 866 bp of mitochondrial DNA (concatenated 12S and 16S rRNA). Values above branches are posterior probabilities, outgroup (*Holcosus festivus*) not shown. Map (**B**) showing the distribution of *A. nodam* sp. nov. (**red triangles**), *A. aggerecusans* sp. nov (**orange squares**) and *A. concolor* (**green dots**). The stars mark the type localities of *A. nodam* sp. nov (**red**), *A. aggerecusans* sp. nov (**orange**) and *A. concolor* (**green**). The following abbreviations for the locality names are used: LAB = La Balza; PER = Perico; BEL = Bellavista; JGA = Jaén/Gotas de Agua; BAC = Bagua Chica; PUC = Pucará; CUE = Cumba; PUW = Puerto Malleta; ZAP = Zapatalgo; CHA = Chacanto; BAL = Balsas; PPY = Paipoy; CAL = Calemar; VIJ = Vijus; CGL = Chagual; PIA = Pías.

Figure 5.1.4. Habitat of *Ameiva nodam* near Pucará, Cajamarca, Peru.

***Ameiva aggerecusans* sp. nov.**

Figures 5.1.5–5.1.6

DIAGNOSIS AND COMPARISON

This comparatively small *Ameiva* is diagnosed by the following combination of characters: (1) maximum known SVL of 99.3 mm; (2) lacking longitudinal ridge on frontal scale; (3) frontal plate divided in two subequal scales; (4) postnasals separated from prefrontals by frontonasals; (5) parietal scales 5–7; (6) median gular scales not enlarged; (7) enlarged median mesoptychial scales slightly larger than largest gulars; (8) gulars posterior to the interauricular crease smaller than anterior gulars; (9) nasal suture passes through the superior half or centrally through nostril; (10) rostral not contacting or in short contact with postnasal; (11) supranasals not contacting or in short contact with supralabials; (12) scales of circumorbital semicircle not extending to anterior margin of third supraocular; (13) 30–33 enlarged ventral scales between gular and vent; (14) 10–12 longitudinal rows of ventral plates, outermost often distinctly smaller; (15) 73–92 DOM; (16) 144–198 DL; (17)

postbrachials not or hardly dilated; (18) 31–39 LFT; (19) 26–32 SCF; (20) 12–22 FP; (21) cream-colored vertebral stripe present in most females and juvenile specimens.

Ameiva aggerecusans sp. nov. can be differentiated from all other mainland congeners except for *A. bifrontata, A. concolor* and *A. nodam* sp. nov. by having a transversely divided frontal plate. From *A. bifrontata* and *A. nodam* sp. nov. this species can be distinguished by lacking distinctly dilated postbrachials. It resembles *A. concolor* but has a lower maximum SVL and a distinctly more defined cream-colored vertebral stripe on the dorsum.

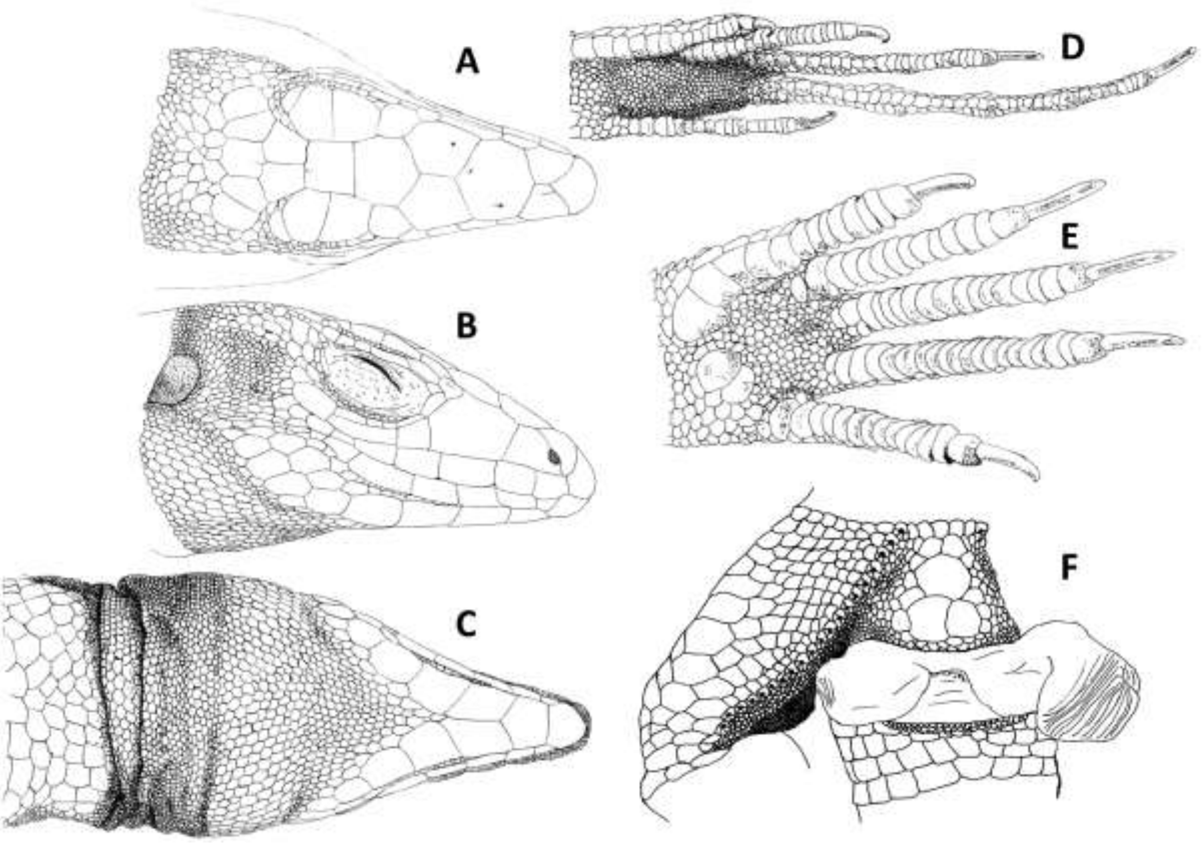

Figure 5.1.5. Male holotype of *Ameiva aggerecusans sp. nov.* (ZFMK 85024): dorsal (**A**), lateral (**B**) and ventral (**C**) views of head, ventral aspect of left foot (**D**), ventral aspect of left hand (**E**), ventral view of cloacal region and right thigh with femoral pores (**F**).

HOLOTYPE

An adult male (ZFMK 85024, Figures. 5.1.5, 5.1.6A) from Balsas, Province of Chachapoyas, Region of Amazonas, Peru (06°49’11.6’’S, 78°00’12.2’’W, 1000 m above sea level), collected on 08 July 2005 by P. Venegas and C. Koch.

Description of holotype: An adult male with a SVL of 99.3 mm. Head 0.28 times SVL, 2.32 times longer than wide, 0.9 times as wide as high. Snout elongate, bluntly pointed; canthus rostralis distinct. Neck only slightly narrower than head, and body. Body cylindrical. Limbs well developed, forelimbs 0.36 times SVL, hindlimbs 0.71 times SVL, tibia 0.21 times SVL. Tail slightly pentagonal in cross section, tapering toward the tip; 2.11 times SVL. Rostral in posterior part acute-angled and bordered by supranasals, as wide as high; smooth, with a little suture on each side posterolaterally; visible from above. Supranasals almost triangular, in short medial contact, and in short contact with first supralabials, bordered posteriorly by hexagonal frontonasal. Postnasal almost trapezoid, not contacting rostral, in median contact with frontonasal and in broad contact with loreal and first and second supralabial. Oblique nasal suture passing through the superior half of the oval nostril. Prefrontals paired and roughly pentagonal, medial suture about twice as long as that between supranasals; laterally in contact with loreal, first supraocular and first supraciliary. Frontal plate divided in two subequal scales, the suture between both scales forming a straight line; anterior frontal pentagonal, laterally in contact with first and second supraoculars, larger than posterior frontal; posterior frontal almost squarish, laterally in contact with second and third supraoculars. Paired frontoparietals, slightly longer than wide and with long medial suture; laterally in contact with third supraocular, and small circumorbital scales bordering posterior part of third and fourth supraocular. Interparietal almost squarish, wider than adjacent parietals, sutures with parietals straight; interparietal bordered at each side by two irregular parietals divided by an oblique suture; outermost parietals slightly larger than inner parietals; parietal series composed of 5 scales including interparietal. Supraoculars four at each side. Circumorbital semicircle formed by 14 scales on each side, bordering inner edge of third supraocular and posterior edge of fourth supraocular, separating the latter from frontoparietals; fourth supraocular separated from parietals by two rows of circumorbital scales. Laterally, second and third supraocular separated from supraciliaries by a single row of small scales; 21 combining both sides. Supraciliaries seven (on left side), first highest, fourth longest, remaining ones shorter and subequal. Loreal very large, single, in contact with postnasal, frontonasal, prefrontal, first supraciliary, second preocular, first subocular, and third and fourth supralabials. Preoculars two; first granular, second distinctly larger, but explicitly smaller than suboculars. Suboculars three, first one almost squarish, second and third longer than wide, all in contact with supralabials, second subocular longest. A curved keel reaching from first through second subocular. Postoculars small, in two rows, first consisting of five and second of four scales. Enlarged supralabials eight, fifth below center of eye, third largest; followed to commissure of mouth by seven small scales. An indistinct row of seven slightly enlarged supratemporals. Temporal region with polygonal scales, slightly smaller centrally. External auditory meatus large, vertically oval, bordered by granular scales, anterior margin semicircular, posterior one straight. Tympanum recessed. All dorsal and lateral head scales juxtaposed and smooth. Mental anteriorly rounded, posteriorly straight, bordered by first infralabials and postmental. Postmental single and pentagonal, in contact with first and second infralabials, and followed by eight pairs of enlarged chinshields. First pair in broad medial contact and in contact with infralabials. Second pair of chinshields separated from infralabials by one row of small, almost granular scales, and third pair of chinshields separated by two of those granular scale rows. Remaining chinshields separated from infralabials by one or two larger scales, almost equal in size than posterior chinshields and separated medially by scales of anterior gular region. Medial chin scales moderately small, convex, smooth, juxtaposed, oval or polygonal, in slightly oblique rows, all subequal in size. Enlarged infralabials eight, fifth and sixth below center of eye; followed to commissure by 6 smaller scales. Gular region divided into two areas: anterior region with round or polygonal, juxtaposed, smooth and flat scales in slightly oblique rows, subequal in size, delimited posteriorly by line uniting lower margin of ear openings. Posterior gular region covered by smaller polygonal or round scales in transverse rows. Mesoptychial scales moderately enlarged, slightly larger than anterior gular scales, in about three rows, polygonal or hexagonal, flat, smooth, and juxtaposed. Scales on nape and sides of neck similar in size to dorsals. Dorsals and scales on flanks granular, small, round, smooth, slightly larger in vertebral region; 188 DL. 88 DOM. Ventrals large, smooth, rectangular, wider than long, in 10 longitudinal and 32 transverse rows; transition between ventrals and scales on flanks sharp. Preanal shield with three distinctly enlarged scales. Preanal plate surrounded anteriorly and laterally by smaller scales; posteriorly by much smaller scales. 19 FP in a continuous row along each thigh, first pair of pores medially separated by five scales. Each pore surrounded by four scales, anterior one distinctly larger than posterior ones. Scales on tail dorsally rectangular, smaller than subcaudals, longer than wide, slightly keeled in anterior part, stronger keeled in posterior part, slightly imbricate; arranged in transverse and nearly longitudinal rows, continuous with subcaudals around tail (except first few rows incomplete ventrally); 28 SCF. In medial verticile caudals longer and narrower than in anterior and posterior part of tail. Subcaudals rectangular, smaller than ventrals, wider than long close to base, longer than wide in posterior part of the tail, smooth, mostly juxtaposed. Forelimbs with row of very large, smooth, juxtaposed or slightly imbricate, almost rectangular (distinctly wider than long) antebrachial scales on anterodorsal aspect of forearms and similar but smaller brachial scales on upper arms that extend almost to insertion of forelimbs. Antebrachials and brachials separated by smaller scales at elbow. Dorsoposterior, posterior, and ventral aspect of arms with small almost granular scales, almost equal in size than dorsals, except for scales directly adjacent to brachials and antebrachials, which are slightly to moderately enlarged and irregular. Legs with large, smooth, imbricate scales on anterior and ventral aspects of thighs, and ventral aspect of shanks. Row of large, almost rectangular scales anteriorly on thigh, gradually becoming smaller and irregular toward pores. On ventral aspect of shanks, two rows of very large scales, anterior larger and more or less trapezoidal. Tibiotarsal spurs form a cluster of three rows, each existing of about 4–5 sharply mucronate scales which are positioned along the postaxial edge of the distal end of the shank. Elsewhere on hindlimbs scales granular and slightly smaller than dorsals. Subdigital lamellae of toes transversely enlarged and single, moderately to distinctly tuberculate towards base. Lamellae of outer toe continuing to heel. On palms lamellae of outer and inner fingers continuing to wrist and only separated by few granules, tubercular and increasing in size towards it. Supradigital scales dilated, single and smooth. 18 LFF; 35 LFT.

Measurements of holotype (in mm). SVL 99.3; HL 28.43 HH 13.5; HW 12.2; SL 16.3; ED 6.6; DSN 3.0; DNE 8.9; DEE 7.1; TL 209.5; AGL 45; BHM 15.8; BWM 19.6; FLL 36.7; HLL 70.5; TIL 21.1.

Coloration of holotype: In life (Figure 5.1.6A), the dorsal surface of the head and body of the male holotype is reddish-brown and mottled with small frayed dark-brown spots of various sizes, less mottled and slightly lighter colored towards the cloacal region. The sides of the head are cream-colored with some dark dots in the temporal region. The granules on the eyelids are white to grayish-white. Head ventrally white to grayish-white. Body laterally and outermost row of ventral grayish mottled with frayed blackish spots of various sizes. Other ventrals yellowish-white to pale yellow in thoracal region. Forelimbs dorsally striking greenish-yellow (Figure 5.1.6E), ventrally pale yellow. Hindlimbs and tail dorsally pale brown, ventrally off-white.

In preservative, the ground color is dorsally light to moderately brown and grayish on flanks, mottled with blackish spots. Sides of the head are gray-brownish. Ventrals pale gray to yellowish-white. Forelimbs dorsally greenish-gray. Hindlimbs and tail dorsally grayish intermixed with some brownish parts. Pattern and coloration of remaining body parts as in life.

VARIATION

Paratypes (20): Two adult males (ZFMK 85010, 85013), two subadult males (ZFMK 85009, 85011) and an adult female (ZFMK 85012) with the same data as the holotype; an adult male (ROM 16453), an adult female (ROM 16326) and a juvenile (ROM 16459) from Balsas, Province of Chachapoyas, Region of Amazonas, Peru, collected 27 June 1986 by L.D. Wilson; two adult males (CORBIDI 05765, ZFMK 90860), an adult female (CORBIDI 05764) and a juvenile (ZFMK 90859) from Balsas, Province of Chachapoyas, Region of Amazonas, Peru (06°49’11.6’’S, 78°00’12.2’’W, 1000 m above sea level), collected on 19 April 2009 by A. Garcia Bravo and C. Koch; three adult males (KU 134829, 134830, 134832), an adult female (KU 134831) and a juvenile (KU 134833) from Balsas, Province of Chachapoyas, Region of Amazonas, Peru, collected on 29 April 1970 by T.H. Fritts; an adult male (ZFMK 90858) from Chacanto, Province of Celendin, Region of Cajamarca (06°50'41.5”S, 078°01’50.8”W, 852 m a.s.l.), collected on 16 April 2009 by A. Garcia Bravo and C. Koch; an adult female (ZFMK 90861) and a juvenile (CORBIDI 05766) from Zapatalgo, Province of Utcubamba, Region of Amazonas (06°04'S, 78°29'W, 1011–1029 m a.s.l.), collected on 07 December 2008 by A. Garcia Bravo and C. Koch.

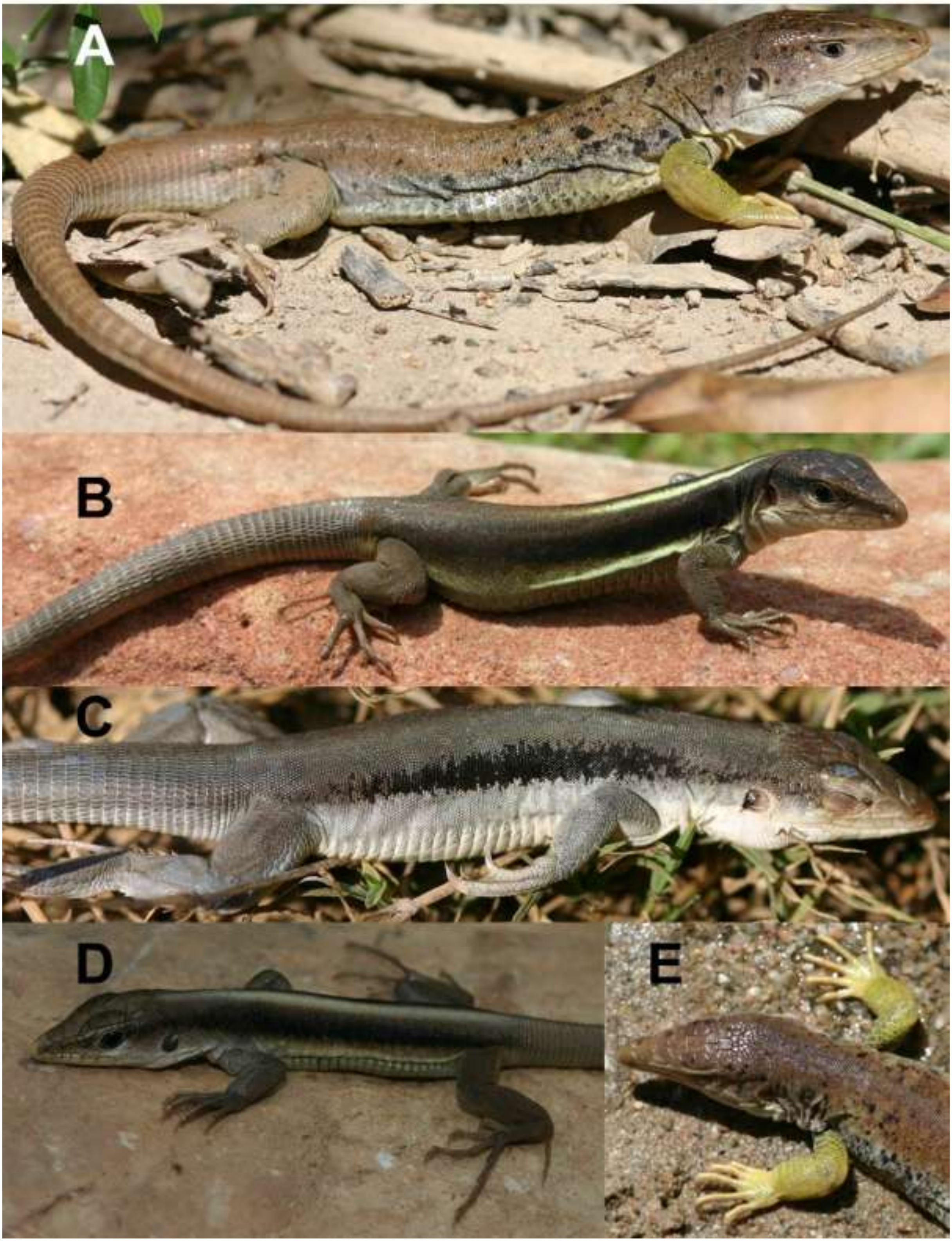

Figure 5.1.6. Male holotype of *Ameiva aggerecusans sp. nov.* (ZFMK 85024) from Balsas, Amazonas, Peru (**A**)**;** adult female (ZFMK 90861) from Zapatalgo, Amazonas, Peru with dorsal stripe (**B**)**;** adult male (ZFMK 85010) from Balsas, Amazonas, Peru with a dark, fringed dorsolateral stripe (**C**)**;** and juvenile (ZFMK 90859) from Balsas, Amazonas, Peru (**D**)**;** close-up of front leg coloration of ZFMK 85024 (**E**).

Description of paratypes: Maximum SVL in male paratypes 92.6 mm, maximum total length in male paratypes 327.6 mm (both ROM 16453); maximum SVL in female paratypes 71.2 mm, maximum total length in female paratypes 242.2 mm (both KU 134831). Shape of head, body, limbs as in holotype. HL 0.24–0.29 (0.28 ± 0.01, n = 20) times SVL in both sexes; HH 0.11–0.14 (0.13 ± 0.01, n = 12) times SVL; HW 0.11–0.13 (0.12 ± 0.01, n = 21) times SVL; SL 0.57–0.69 (0.63 ± 0.04, n = 12) times the HL; ED 0.23–0.36 (0.27 ± 0.04, n = 12) times the HL; DSN 0.10–0.18 (0.12 ± 0.02, n = 12) times the HL; DNE 0.27–0.35 (0.31 ± 0.02, n = 12) times the HL; DEE 0.20–0.26 (0.23 ± 0.02, n = 12) times the HL; TL 1.62–2.68 (2.30 ± 0.30, n = 18) times SVL; AGL 0.40–0.48 (0.44 ± 0.03, n = 12) times SVL; FLL 0.33–0.41 (0.37 ± 0.02, n = 12) times SVL, HLL 0.56–0.82 (0.73 ± 0.06, n = 12) times SVL, TIL 0.18–0.23 (0.2 ± 0.02, n = 12) times SVL; foot 0.36–0.43 (0.4 ± 0.02, n = 12) times SVL.

Arrangement, shape and surface of scales as in holotype except for the following variations:

Rostral in posterior part right- to acute-angled, in most specimens in anterior part laterally stretched, projecting beyond the nasal suture and in small contact with postnasal, in few specimens not projecting beyond the nasal suture and not contacting postnasals. Supranasals in short contact with first supralabial or not contacting supralabials. Postnasal trapezoid or almost triangular, in short contact with rostral or not contacting rostral, in contact with first and second supralabials and in some specimens also third supralabial. Oblique nasal suture passing through the superior half or centrally through nostril. Medial suture of prefrontals slightly longer or up to twice as long as medial suture between supranasals. Posterior frontal almost squarish or slightly pentagonal. Interparietal squarish, almost rectangular or irregularly pentagonal, as high or higher than wide; outermost parietals slightly smaller or larger than inner parietals; parietal series composed of 5–7 scales, mostly five, including interparietal. Supraoculars 3–5 (mostly four) at each side, the latter normally much smaller than the others. Circumorbital semicircle formed by 8–16 scales at left side, 16–31 scales combining both sides, bordering fourth up to middle or anterior portion of third supraoculars, occasionally extending to frontal suture and thus contacting second or even first supraocular and separating third supraocular from frontoparietals entirely (most specimens) or by parts; bordering posterior edge of last or last two supraoculars, and separating them from parietals by 2–4 rows of circumorbital scales. Laterally, second and third supraocular separated from supraciliaries by a single, occasionally double row of small scales; 22–28 combining both sides. Supraciliaries six or seven, anterior ones normally longer than those in posterior part. Loreal contacting third and fourth supralabials and occasionally in narrow contact with second and fifth supralabial and/or first supraocular, and first and/or second prefrontal. Preoculars 1–2. Postoculars in indistinct two rows, first consisting of 4–7 and second of 3–5 scales. Enlarged supralabials 5–7, fifth or sixth below center of eye; followed to commissure of mouth by 5–10 small scales. Row of slightly enlarged supratemporals distinguishable in most specimens, consisting of 4–9 scales decreasing in size posteriad. Temporal region with polygonal or rounded, slightly convex scales. External auditory meatus slightly oval or almost round. Postmental followed by 7–8 pairs of enlarged chinshields. First pair and in few specimens also second pair in contact with infralabials. Enlarged infralabials five or six (seven in one specimen), fifth or sixth below center of eye; followed to commissure by 6–10 smaller scales. Scales on nape and sides of neck similar in size or slightly smaller than dorsals. 144–198 (175 ± 14.60, n = 13) DL. 73–92 (85 ± 6.03, n = 13) DOM. Ventrals in 10–12 longitudinal and in 30–33 (32 ± 0.98, n = 21) transverse rows, outermost ventrals nearly as wide as those of the adjacent row or distinctly smaller. Preanal shield with 2–3 rows of enlarged scales. 12–22 (20 ± 2.16, n = 19) FP; not or only hardly visible in some female and juvenile specimens. Tail round or slightly pentagonal in cross section; 26–32 (29 ± 1.94, n = 13) SCF. Postbrachials not or hardly dilated. 1–2 rows of slightly to moderately enlarged irregular, hexagonal scales adjacent to brachials. On ventral aspect of shanks, two (occasionally three) rows of enlarged scales, anterior largest, dilated, and more or less trapezoidal, posterior one (or two) rhomboidal, decreasing in size from anterior toward posterior row. Tibiotarsal spurs form a cluster of 2–3 rows of about 3–6 sharply mucronate scales. Subdigital lamellae of toes mostly single, sometimes paired on inner toes. 16–20 (18 ± 1.00, n = 21) LFF; 31–39 (34 ± 1.87, n = 21) LFT.

Color variation: In life, juveniles (Figure 5.1.6D) show a dark brown dorsal ground color on head, body and limbs; a light cream-colored or vanilla-colored vertebral stripe, 4–15 scales in width, extending from behind the head to the base of the tail or less, very striking in anterior part and fading towards posterior part in most specimens; rostral, supralabials and infralabials light yellowish-brown; lower eye granules, suboculars and lower temporals cream-white; lateral body parts between armpit and groin cream-colored; tail dorsally reddish-brown or medium brown, lightening towards tip; venter cream-white or grayish-white, limbs and tail ventrally cream-white; tubercular lamellae of hands and feet accentuated with brown. Males dorsally reddish-brown or grayish-brown with or without a trace of a white to cream-colored vertebral stripe in anterior part, normally not reaching base of tail; sides brownish-gray or bluish-gray; dorsum of head and body and lateral body parts with or without mottling of tiny, indistinct black spots of various sizes; most specimens with a dark, fringed dorsolateral stripe, which begins faintly and discontinuously behind the eye and almost extends to the insertion of the hindlimbs, being broadest at midbody; dorsal coloration of the tail as in juveniles; head ventrally cream-white, immaculate; venter and ventral surface of limbs and tail immaculate, cream-white to pale yellow, especially frontlegs can show a yellow dorsal and ventral coloration in some males; tubercular lamellae of hands and feet as in juveniles. Females have a grayish-brown to bluish-gray or dark brown dorsal ground color, on body and limbs, head usually brown or grayish-brown; dorsum with (Figure 5.1.6B) or without a light vertebral stripe, with or without a dark, fringed dorsolateral stripe; lateral body parts between armpit and groin maybe bright cream-colored, dirty gray or whitish; tail dorsally as in juveniles and males; venter, limbs and tail ventrally as in juveniles as well as ventral parts of hands and feet.

In preservative, the general dorsal color is mainly grayish-brown or dark brownish-black; if present, the vertebral stripe is white or grayish-white, the dark dorsolateral, fringed stripes are dark brown to blackish-brown; the tail is grayish in anterior part fading posteriad into beige; no yellow coloration of male frontlegs visible; venter, limbs and tail ventrally cream-colored and may be interspersed with pale gray or bluish-gray.

ETYMOLOGY

The specific epithet is an agglutination of the Latin nomen “agger” which means dam and the verb “recusare” which means reject. As in *Ameiva nodam* sp. nov. this name was chosen to further emphasize our protest against the possible dam constructions along the Marañón river.

DISTRIBUTION AND NATURAL HISTORY

This species is endemic to the dry forest of the canyon of the Marañón River in the Northern Peruvian Andes (Figure 5.1.3) from Zapatalgo, Province of Utcubamba, Region of Amazonas (1029 m) to Balsas, Province of Chachapoyas, Region of Amazonas, where it reaches its so far highest known distributional level (1037 m, Figure 5.1.7). The lowest distributional level of this species is found in Chacanto, Province of Celendin, Region of Cajamarca (852 m).

Similar to the new *A. nodam* sp. nov., individuals of *Ameiva aggerecusans* sp. nov. were found moving quickly on the ground in low vegetation during daytime or sleeping under stones during nighttime. Air temperature during the active hours of the species was between 28.6°C and 42°C and substrate temperature of the ground was between 28.7°C and 46.8°C. This species was also found in the same habitat together with the tropidurid lizard *Microlophus stolzmanni*.

Figure 5.1.7. Habitat of *Ameiva aggerecusans* near Balsas, Amazonas, Peru.

***Ameiva concolor* Ruthven 1924**

Figures 5.1.8–5.1.9

Ameiva bifrontata concolor Ruthven, Occ. Pap. Mus. Zool. 155: 3–6. – Terra typica: Paipoy, Rio Crisnejas, 24 km from Marañòn (elevation 1067 m), province of Cajamarca, Peru. – 1924
Ameiva bifrontata concolor – Burt & Burt, Bulletin American Museum of Natural History, 61: 227–395. – 1931
Ameiva bifrontata concolor – Peters & Donoso-Barros, Smithsonian Institution Press, Washington D.C. & London: 20. – 1970
Ameiva bifrontata concolor – Peters & Donoso-Barros, Smithsonian Institution Press, Washington D.C. & London: 20. – 1986
Ameiva concolor – Harvey *et al.*, Zootaxa, 3459: 1–156. – 2012

DIAGNOSIS

A medium-sized *Ameiva* that can be distinguished from all other mainland congeners by the following combination of characters: (1) maximum known SVL of 128 mm; (2) lacking longitudinal ridge on frontal scale; (3) frontal plate divided in two subequal scales; (4) postnasals separated from prefrontals by frontonasals; (5) parietal scales usually 5; (6) median gular scales scarcely enlarged; (7) enlarged median mesoptychial scales slightly larger than largest gulars; (8) gulars posterior to the interauricular crease smaller than anterior gulars; (9) nasal suture passes centrally through nostril; (10) rostral projecting beyond the nasal suture and contacting postnasal; (11) supranasals not contacting supralabials; (12) circumorbital semicircle occasionally extending to frontal suture; (13) 31–33 enlarged ventral scales between gular and vent; (14) 10–12 longitudinal rows of ventral plates, outermost often distinctly smaller; (15) 80–93 DOM; (16) 174–196 DL; (17) postbrachials not or hardly dilated; (18) 34–41 LFT; (19) 29–35 SCF; (20) 10–21 FP; (21) vertebral region in most specimens with a trace of a pale vertebral streak.

DESCRIPTION AND VARIATION

Maximum known SVL in males 128 mm, maximum total length in males 404 mm (Holotype, UMMZ 59192); maximum SVL in females 85.8 mm, maximum total length in females 295.8 mm (ZFMK 91788). HL 0.26–0.32 (0.28 ± 0.02, n = 10) times SVL in both sexes; HH 0.11–0.14 (0.13 ± 0.1 n = 11) times SVL; HW 0.08–0.14 (0.11 ± 0.02, n = 10) times SVL; SL 0.59–0.80 (0.69 ± 0.08, n = 9) times the HL; ED 0.19–0.31 (0.24 ± 0.04, n = 9) times the HL; DSN 0.10–0.18 (0.13 ± 0.02, n = 9) times the HL; DNE 0.29–0.36 (0.31 ± 0.02, n = 9) times the HL; DEE 0.20–0.30 (0.23 ± 0.03, n = 9) times the HL. Tail round in cross section, tapering toward the tip; 2.25–2.67 (2.46 ± 0.16, n = 6) times SVL. Body cylindrical, AGL 0.40–0.54 (0.48 ± 0.04, n = 11) times SVL. Limbs well developed, FLL 0.33–0.44 (0.37 ± 0.04, n = 10) times SVL, HLL

0.63–0.87 (0.72 ± 0.02, n = 10) times SVL, TIL 0.15–0.21 (0.18 ± 0.02, n = 10) times SVL, foot 0.37–0.44 (0.4 ± 0.03, n = 10) times SVL.

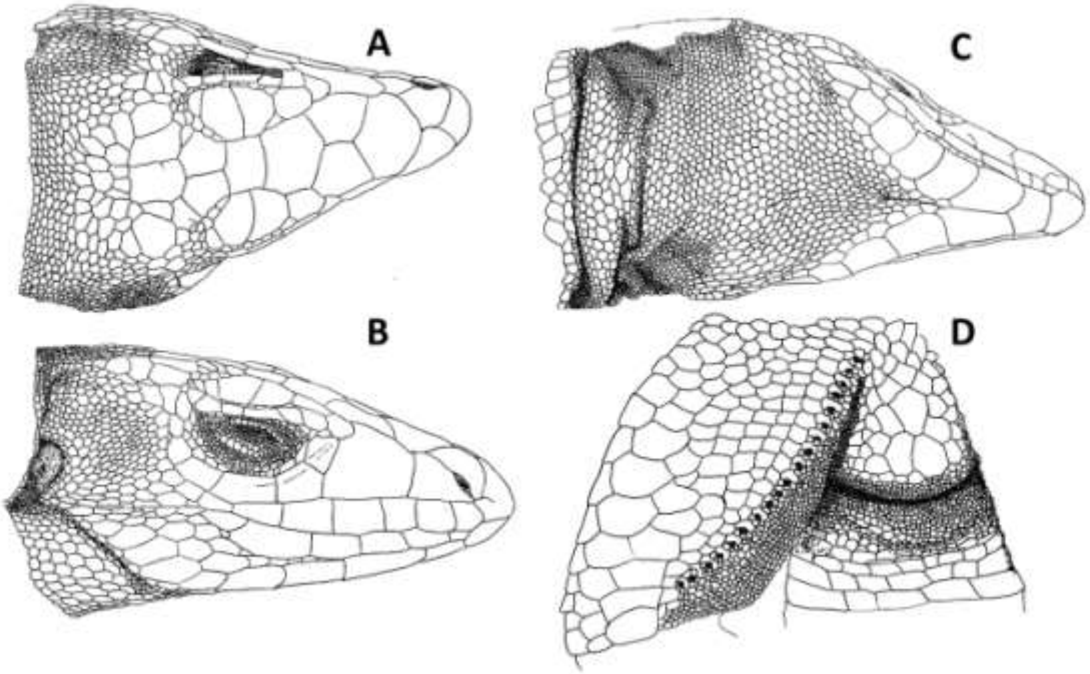

Figure 5.1.8. Male holotype of *Ameiva concolor* (UMMZ 59192): dorsal (**A**), lateral (**B**) and ventral (**C**) views of head, ventral view of cloacal region and right thigh with femoral pores (**D**).

Snout elongate, bluntly pointed; canthus rostralis distinct. Rostral in posterior part acute-angled and bordered by supranasals, in anterior part laterally stretched, projecting beyond the nasal suture and in short contact with postnasal; about as wide as high; smooth, except for a short posterolateral suture; visible from above. Supranasals almost triangular, in short medial contact, not contacting supralabials, bordered posteriorly by rhomboidal or oval frontonasal. Postnasal almost triangular, in short contact with rostral and frontonasal and in broad contact with loreal and first and second supralabials, in some specimens even in short contact with third supralabial. Oblique nasal suture passing centrally through oval nostril. Prefrontals paired and roughly pentagonal, with a medial suture longer than that between supranasals; laterally in contact with loreal and first supraocular and in some specimens in short contact with first supraciliary. Frontal plate divided transversely in two subequal scales, the suture between both scales forming a straight line; anterior frontal pentagonal, laterally in contact with first and second supraoculars, distinctly larger than posterior frontal; posterior frontal almost quadrate or rectangular, laterally in contact with second and third supraoculars. Pair of trapezoidal or irregular pentagonal frontoparietals, longer than wide and with long medial suture, fused in one specimen (ZFMK 91790); laterally separated from third supraocular by small circumorbital scales. Parietal series composed of 3–5 scales, mostly 5 including interparietal; interparietal more or less rectangular or irregularly pentagonal, higher than wide in most specimens, as wide or slightly wider than adjacent parietals, sutures with parietals straight or slightly oblique; lateral parietals irregularly shaped divided by oblique suture. Supraoculars 3–5 (mostly four) at each side, second and third largest. Circumorbital semicircle formed by 14–20 scales at left side, 29–37 scales combining both sides, bordering fourth up to middle or anterior portion of third supraoculars, occasionally extending to frontal suture and thus contacting second supraocular and separating third supraocular from frontoparietals; bordering posterior edge of last or last two supraoculars, and separating them from parietals by 2–4 rows of circumorbital scales. Laterally, all except first supraocular entirely separated from supraciliaries by a single, occasionally double row of small scales; 21–28 combining both sides. Supraciliaries 6–10 (on one side, mostly seven), first highest, middle longest, remaining ones subequal, anterior supraciliaries normally longer than those in posterior part. Loreal very large, single, in contact with postnasal, frontonasal, prefrontal, first supraciliary, all preoculars, first subocular, third and fourth supralabials and occasionally in narrow contact with second and fifth supralabial and first supraocular. Preoculars 1–2, if two, first one much smaller; second almost similar in size or slightly larger than first supraciliary, but distinctly smaller than suboculars. Suboculars three, all in contact with supralabials, normally longer than wide, second subocular longest. A curved keel reaching from preocular through first and second subocular. Postoculars 3–5. Enlarged supralabials 5–8 (mostly seven) to below center of eye; followed to commissure of mouth by 4–9 small scales. Supratemporals almost not distinguishable from surrounding scales. Temporal region with polygonal or rounded scales, smaller and almost granular centrally. External auditory meatus large, more or less round, bordered by granular scales. Tympanum recessed. All dorsal and lateral head scales juxtaposed and smooth. Mental anteriorly ellipsoid, posteriorly straight, bordered by first infralabials and postmental. Postmental single and pentagonal, in contact with first and second infralabials, followed by 7–8 pairs of enlarged chinshields. First pair (and in few specimens also second pair) in contact with infralabials and in broad medial contact. Remaining chinshields separated from infralabials by one row of small scales, and separated medially by scales of anterior gular region. Medial chin scales moderately small, slightly convex, smooth, juxtaposed, oval or polygonal, all subequal in size. Enlarged infralabials 5–7 (mostly six) to below center of eye; followed to commissure by 4–8 smaller scales. Gular region divided into two areas: anterior region with round or polygonal and flat scales in slightly oblique rows that usually remain subequal in size, delimited posteriorly by line uniting lower margin of ear openings. Posterior gular region covered by smaller polygonal or round scales in transverse rows. Mesoptychial scales slightly enlarged, in about two indistinct rows, polygonal or hexagonal, flat, smooth, and juxtaposed. Scales on nape and sides of neck slightly smaller than dorsals. Dorsals and scales on flanks granular, round, smooth, juxtaposed; slightly larger in vertebral region; 174–196 (188 ± 6.88, n = 11) DL. 80–93 (84 ± 4.69, n = 10) DOM. Ventrals large, smooth, rectangular, wider than long, in 10–12 longitudinal and 31–33 (32 ± 0.89, n = 11) transverse rows, outermost ventrals nearly as wide as those of the adjacent row or distinctly smaller; transition between ventrals and scales on flanks sharp. Preanal shield centrally with several enlarged scales, surrounded anteriorly and laterally by smaller scales; posteriorly by much smaller scales. FP 10–21 (16 ± 4.45, n = 6), in males in a continuous row along each thigh, with short gap medially; not visible in female and juvenile specimens. Each pore surrounded by four scales. Dorsal scales on tail slightly imbricate, rectangular, smaller than subcaudals, longer than wide, with a slightly oblique keel; in transverse and oblique rows, continuous with subcaudals around tail (except first few rows); 29–35 (31 ± 2.31, n = 10) SCF. Subcaudals rectangular; smaller than ventrals; wider than long close to base, longer than wide in most parts of the tail; smooth, mostly juxtaposed. Forelimbs with row of very large, smooth, slightly imbricate, almost rectangular (distinctly wider than long) antebrachial scales on anterodorsal aspect of forearms and similar but smaller brachial scales on upper arms that extend almost to insertion of forelimbs. Antebrachials and brachials usually separated by smaller scales at elbow. Dorsoposterior, posterior, and ventral aspect of arms granular, equal in size to dorsals, except for two rows of rhomboidal scales directly adjacent to antebrachials and some moderately enlarged irregular, hexagonal scales adjacent to brachials. Legs with large, smooth, imbricate scales on anterior and ventral aspects of thighs, and ventral aspect of shanks. Ventral scales on thigh, gradually becoming smaller and irregular toward pores. On ventral aspect of shanks enlarged scales arranged in two to three rows, anterior largest, dilated, and more or less trapezoidal, posterior one or two rhomboidal, decreasing in size from anterior toward posterior row. Tibiotarsal spurs not distinguishable from other scales in most specimens. Elsewhere on hindlimbs scales similar to dorsals. Supradigital scales dilated, single and smooth. 17–20 (19 ± 0.97, n = 10) LFF; 34–41 (37 ± 2.34, n = 11) LFT. Lamellae of hand transversely enlarged, convex, and single, moderately to distinctly tubercular towards base. Lamellae of outer and inner fingers continuing to wrist and only separated by few granules, tubercular and increasing in size towards it. Lamellae of toes mostly single sometimes paired; becoming distinctly tubercular towards base of second, third and fourth toe; continuing to heel on outer toe.

Coloration: No conspicuous difference in color pattern between males, females and juveniles present.

In life, color on dorsum, head and dorsal surface of limbs light to moderately brown or brownish-olive; dorsum and head with or without some small dark spots; vertebral region in most specimens with a trace of a pale vertebral streak; sides of body brownish or bluish-gray and heavily mottled with tiny dark-brown or black spots, that are often merged together, resulting in dark body sides, with in most specimens a smooth transition from the lighter vertebral region; rostral cream-colored; sides of head light reddish-brown or brownish-olive, supralabials sometimes darkly edged; tail dorsally reddish-brown or moderately brown, lightening towards tip; head and body ventrally pale yellow, cream-white or grayish-white; plates of 3 outer longitudinal rows of ventrals darkly-grayish edged, some ventrals of the outermost row even almost completely dark gray; limbs and tail ventrally cream-white; tubercular lamellae of hands and feet accentuated with brown.

In preservative, the general dorsal color is mainly grayish-brown or dark brownish-black; sides of the body are bluish–gray; the tail is grayish in anterior part fading posteriad into beige; head, body, limbs and tail ventrally pale yellowish, cream-white or grayish-white; edging of outer ventrals bluish-gray.

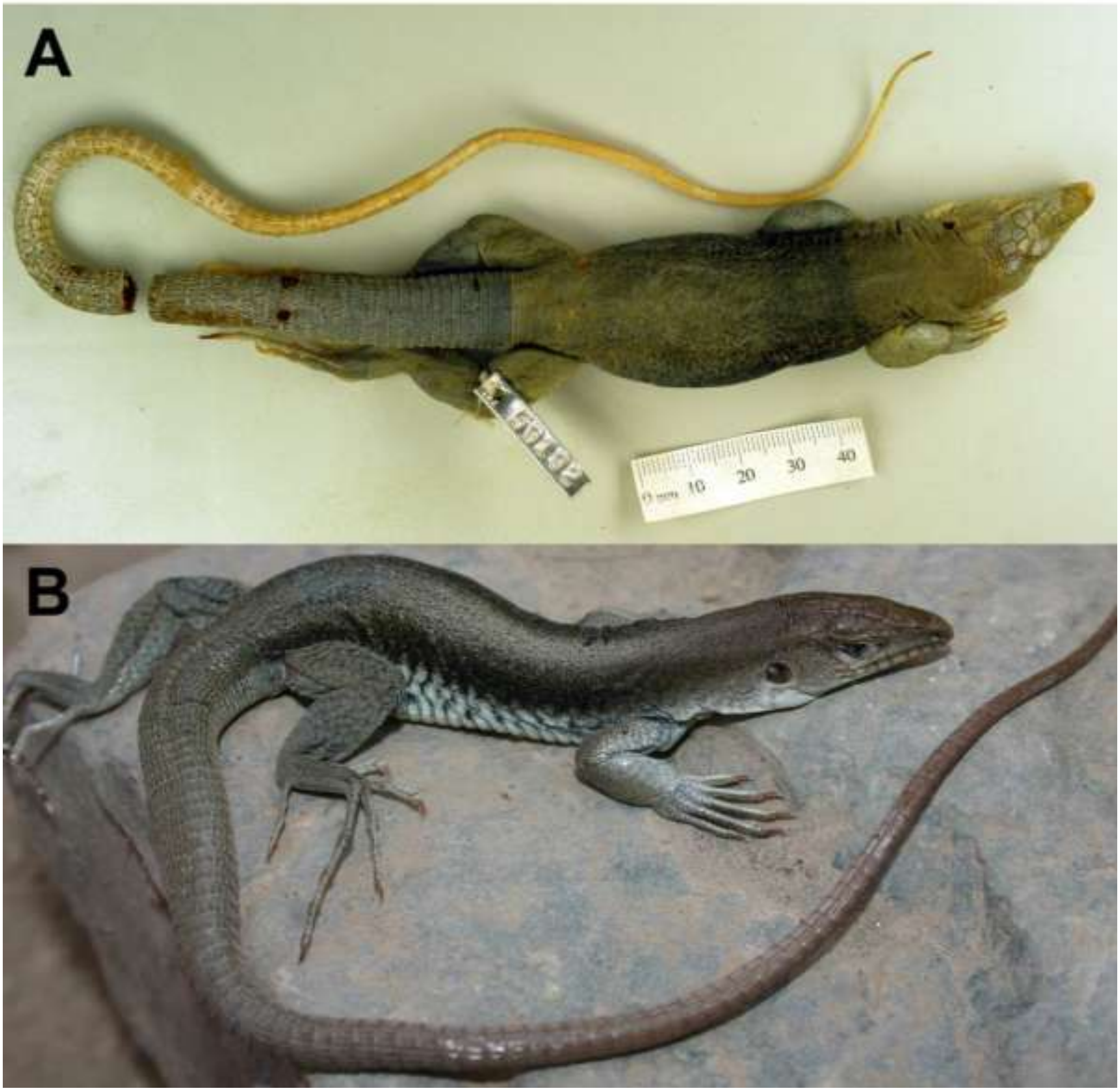

Figure 5.1.9. Male holotype of *Ameiva concolor* (UMMZ 59192) from Paipoy, Cajamarca, Peru (**A**), photograph by G. Schneider; adult female (ZFMK 91788) from Pías, La Libertad, Peru (**B**).

DISTRIBUTION AND NATURAL HISTORY

This species is endemic to the dry forest of the Canyons of the Crisnejas and Marañón River in the Northern Peruvian Andes (Figure 5.1.3) from the type locality Paipoy, Region of Cajamarca, 24 km from the Marañón (1067 m, Ruthven 1924) to Pías (Laguna), Province of Tayabamba, Region of La Libertad (1720 m, Figure 5.1.10). In addition to the locations from where we collected voucher specimens of *A. concolor*, we sighted this species in Vijus, Province of Pataz, Region of La Libertad, but did not collect voucher specimens.

Ameiva concolor was found during daytime moving hectically on the ground in low vegetation. In Pías, the habitat was interspersed with big stones and rocks underneath which they quickly sheltered when being scared. During night time individuals were found sleeping under stones. Air temperature during the active hours of this species was between 39.3°C and 41.4°C and substrate temperature of the ground was between 33.9°C and 41.2°C. Similar to the other two *Ameiva* species described herein, this species was also found in the same microhabitat as *Microlophus stolzmanni*.

Figure 5.1.10. Habitat of *Ameiva concolor* near Pías, La Libertad, Peru.

Niche comparisons

The first two axes (PC1 and PC2) of the PCA-env explain together 91.86% of the variation among the 19 bioclimatic variables in the analysis of *A. aggerecusans* versus *A. concolor*, 80.41% in the analysis of *A. aggerecusans* versus *A. nodam* and 84.59% in the analysis of *A. concolor* versus *A. nodam*. Correlation circles illustrating the contribution of each of the 19 bioclimatic variables to each PC are shown in Figure 5.1.11. For all three analysis the variables ‘annual mean temperature’ (BIO1), ‘temperature annual range’ (BIO7), ‘mean temperature of the wettest quarter’ (BIO8), ‘mean temperature of the warmest quarter’ (BIO10), ‘mean temperature of the coldest quarter’ (BIO11), ‘annual precipitation’ (BIO12), ‘precipitation of the wettest month’ (BIO13), and ‘max temperature of warmest month’ (BIO5) correlated negatively to PC1, whereas ‘temperature seasonality’ (BIO4), ‘mean temperature of the driest quarter’ (BIO9), and ‘min temperature of coldest month’ (BIO6) correlated positively to PC1.

A. nodam seems to use the greatest environmental space of the three species and *A. concolor* the smallest but this observation may be related with a higher number of species records in *A. nodam*.

There are a small differences in the climatic niches of *A. aggerecusans* and *A. concolor* in temperature related variables (BIO1, BIO7, BIO8, BIO10, BIO11) and precipitation related variables (BIO12, BIO13) with *A. aggerecusans* occupying slightly warmer and wetter regions than *A. concolor* (Figure 5.1.11A). The differences in PC2 between the niches of *A. aggerecusans* and *A. concolor* are only marginal. The climatic niche of *A. aggerecusans* is nested within the niche of *A. nodam* but there is a shift in the highest density of occurrences driven by precipitation and climatic seasonality (BIO14, BIO15, BIO16, BIO18, BIO19, see appendix II for a detailed description of the variables) with *A. nodam* occupying more humid regions with a higher climatic seasonality (Figure 5.1.11B). The differences in PC1 between the niches of *A. aggerecusans* and *A. concolor* are only marginal. The climatic niches of *A. concolor* and *A. nodam* differ in temperature related variables (BIO1, BIO7, BIO8, BIO10, BIO11) and in precipitation related variables (BIO12, BIO13) with *A. nodam* occupying warmer and wetter regions than *A. concolor* (Figure 5.1.11C). The differences in PC2 between the climatic niches of *A. concolor* and *A. nodam* are only marginal.

Pairwise comparison revealed low niche overlap values of D = 0.034 for A. *aggerecusans* versus *A. concolor*, D = 0.026 for *A. aggerecusans* versus *A. nodam* and D = 0.008 for *A. concolor* versus *A. nodam*. The hypothesis of niche equivalency was rejected for the three lineage pairs, due to significant differences between the niches of the sister taxa (niche equivalency test: P = 0.02). The results of the niche similarity are shown in Table 5.1.1 and were significant in one of the paired comparisons.

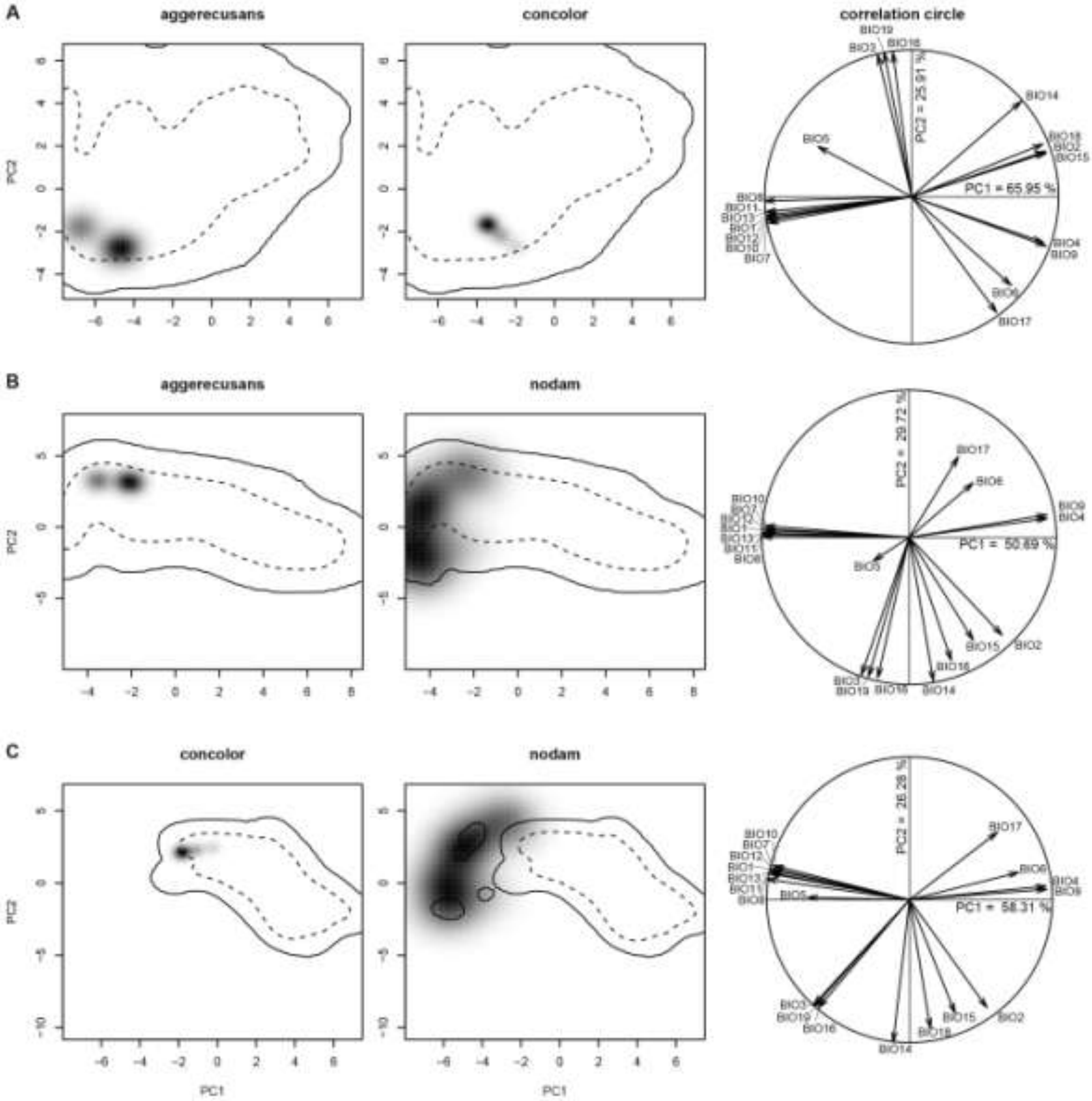

Figure 5.1.11. Principle component analysis plots (PCA-env) representing niche separation of *Ameiva aggerecusans* and *A. concolor* (**A**), *A. aggerecusans* and *A. nodam* (**B**) and *A. concolor* and *A. nodam* (**C**) along the first two axes of the PCA. The solid contour line describes 100% and the dashed line 50% of the available environmental space (background). The density of the occurrences of the species by cell is depicted by the gray shadings. The correlation circles explain the contribution of all 19 climatic variables (BIO1–BIO19, see Appendix II for a more detailed explanation of the variables) on the two PC axes and contains the percentage of variation explained by each axe.

Table 5.1.1. Results of the pairwise niche overlap evaluation: Schoener's D, p-values of the equivalency test and the similarity tests.

Compared taxa x→y	Niche overlap D	Equivalency test p-value	Similarity test x→y p-value	Similarity test y→x p-value
agger – conco	0.034	0.02	0.36	0.32
agger – nodam	0.026	0.02	0.2	0.59
conco – nodam	0.008	0.02	0.04*	0.18

*significance value of $p < 0.05$

Discussion

Presumably due to the misleading literature information (Ruthven 1924a; Burt & Burt 1931, 1933) on the occurrence of *Ameiva bifrontata divisa* in Peru, we detected specimens of *A. nodam* sp. nov. in one museum collection (KU, 13 specimens) under the name *A. bifrontata* and in five further museum collections (BM (three specimens), MCZ (eight specimens), MHNG (five specimens), ROM (one specimen), ZMB (one specimen)) even more specified under the subspecies name *A. bifrontata divisa*, which was originally described by Fischer in 1879 from Northern Colombia. *Ameiva aggerecusans* sp. nov. was detected under the name *A. bifrontata* in the collections of the KU (five specimens) and of the ROM (one specimen) and two further specimens of the species housed in the ROM were only identified up to genus level. *Ameiva aggerecusans* sp. nov. is morphologically difficult to distinguish from *A. concolor*, a species that is distributed only 50 km more to the South along the Marañón river. However, genetic analyses revealed paraphyly of *A. aggerecusans* sp. nov. and *A. concolor* in respect to the morphologically well differentiated and more distantly distributed (about 160 km) *A. nodam* sp. nov., which justifies the specific status of *A. aggerecusans* sp. nov.

The uplift of the Andes primarily followed a longitudinal south-to-north progression (Gregory-Wodzicki 2000; Doan 2003; Garzione *et al.* 2008). Hence the southern section of the central Andes (Bolivia to Southern Peru) was mainly uplifted prior to the Tertiary (Simpson 1979; Garzione *et al.* 2008) whereas the northern section (Central to Northern Peru) was uplifted in the middle and late Miocene (Gregory-Wodzicki 2000; Garzione *et al.* 2008; Poulsen *et al.* 2010). Doan (2003) proposed that speciation of high Andean taxa coincides with the progression of the Andean uplift and thus follows a south-to-north gradient (South-to-North Speciation Hypothesis). This implicates that the more basal species of a taxonomic group would occur in the southern section of the distribution range and the more derived species would occur in the northern section. So far the so called South-to-North Speciation Hypothesis (SNSH) appears to be valid for several independent Andean taxa for large-scale distribution patterns (e.g. Heindl & Schuchmann 1998; Doan 2003; Torres-Carvajal 2007; Picard *et al.* 2008; Chavez *et al.* 2011) but it seems to be less useful for explaining more finely scaled distribution patterns (e.g. Doan 2003; Torres-Carvajal 2007; Chavez *et al.* 2011).

If diversification of the Andean *Ameiva* species was closely related to Andean orogeny, the colonization process should have occurred from south (basal species) to north (youngest species), a dispersal pattern which cannot be confirmed for the species studied herein. More complex biogeographic and/or ecologic phenomena are evident and need further examination to explain the direction of dispersal.

The habitat of *A. nodam* sp. nov. (Figure 5.1.4) is composed of a seasonally dry vegetation with drought-resistant trees (e.g*. Acacia, Anadenanthera, Ceiba, Cordia, Prosopis*), dense shrubs (e.g. *Mimosa, Croton*) and ground vegetation layer (e.g. *Opuntia*, Poaceae). *A. aggerecusans* occupies a habitat (Figure 5.1.7) with more xeric vegetation dominated by less dense shrubs and cacti plants (e.g. *Armatocereus, Browningia, Espostoa*). *A. concolor* inhabits the driest environment (Figure 5.1.10) compared to its congeners with sparse vegetation and almost no ground vegetation layer. This observation coincides with the results of the niche analysis in which *A. nodam* sp. nov. occupied the warmest and wettest and *A. concolor* the coldest and driest habitat among the three species.

The niche overlap value between the genetically closer related taxa *A. nodam* sp. nov. and *A. concolor* was lower (D=0.008) than the overlap value between either of the sister taxa and the more distantly related *A. aggerecusans* sp. nov. (D=0.026 and D=0.034, respectively). This coincides with the observations made by Ahmadzadeh et al (2013a,b) who investigated the relationship between niche evolution and phylogenetic relatedness in a group of green lizards. The authors discovered that sister taxa often differ in many climatic parameters, whereas more distantly related species evolved similar niches. They suggest that the evolution of different niches is influenced by biotic interactions and thus competition between genetically similar taxa could drive them into different habitats.

Although a large revision of the genus *Ameiva* has recently been published (Harvey *et al.* 2012), for most of the species only sparse information on their biology and ecological needs is available (Leon & Ruiz 1971; Magnussen *et al.* 1985; Lewis & Saliva 1987; Martins 1991; Schwartz & Henderson 1991; Perry 1999; Zaluar & Rocha 2000; Simmons *et al.* 2005; Rudman *et al.* 2009; Henderson & Powell 2009; Zero *et al.* 2009), and almost nothing is known in this regards about the three species in the focus of this study.

The upper Marañón valley in northwestern Peru and its tributaries has a narrow fringe of insolated seasonally dry forest that shelters a high number of endemic birds and plants (Statterfield *et al.* 1998; Bridgewater *et al.* 2003; Särkinen *et al.* 2011). Although the information of reptile diversity from the Marañón dry forest is limited it is clear that the majority of species that occur in this ecosystem are endemic to this habitat (Koch *et al.* 2006). However, four species of endemic lizards have recently been described (Koch *et al.* 2006, 2011; Venegas *et al.* 2008) and description of other reptile species are pending. Furthermore, several endemic species of plant, birds and reptiles from the Marañón dry forest are restricted to some portions and a narrow elevational belt of the upper Marañón valley such as: *Maraniona lavinii,* an endemic genus and species of legume, restricted to the Balsas area in the southern portion of the upper Marañón river (Hughes *et al.* 2004); *Mimosa jaensis*, an endemic species of legume, narrowly restricted to the dry forest of a small part of the western side of the upper Marañón valley, near to Jaén, Region of Cajamarca, between 500–800 m elevation (Särkinen *et al.* 2011); *Incaspiza watkinsi,* an endemic sparrow, restricted to the low elevations at 350 and 900 m in the dry forest from the northern portion of the Marañón river, in the basins of Huancabamba, Chinchipe, Tabaconas, and Utcubamba (Garcia-Bravo 2011); *Phyllodactylus johnwrighti* that is restricted to the dry forest of the low portion of the Huancabamba basin (Dixon & Huey 1970); and *P. delsolari, P. thompsoni,* and *Phyllopezus maranjonensis*, restricted to the southern portion of the upper Marañón basin between Balsas and the Laguna de Pías (Koch & Beraún 2011). In the last years four hydroelectric projects are driven by the Peruvian government and the regional government of Amazonas (Cumba 4, Pongo de Rentema, Chadin 2 and La Balsa) (Q & V Ingenieros SAC 2007). All of these projects involve the construction of big dams which inundate big extensions of dry forest, and fragment the habitats of many endemic species with localized ranges, creating barriers for the genetic pool of these species. The habitat of *Ameiva nodam* sp. nov. is threatened by two of these four projects. Cumba 4 (825MW) will have a 185 m high wall, with a reservoir of around 37.50 km², and Pongo de Rentema will dam the rivers

Marañón, Chinchipe and Utcubamba (Garcia-Bravo 2011). The habitat of *Ameiva aggerecusans* sp. nov. is threatened by the projects Cumba 4 and Chadin 2 and the habitat of *A. concolor* and other endemic reptiles like *Phyllopezus maranjonensis, Phyllodactylus delsolari* and *P. thompsoni* are threatened by the projects Chadin 2 and La Balsa that have projected dams with high walls and big reservoirs.

The potential for the discovery of additional endemic, undescribed species in the Marañón region is high and with respect to the serious threats of their world unique habitat due to the dam construction activities concerted effort to characterize the composition and conversation status of the herpetofauna and the respective biological needs of each species should be undertaken at the earliest possible opportunity. As representing a biodiversity hotspot (Särkinen *et al.* 2011) authorities should seriously consider the dry forest of the Marañón valley for protection.

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6. CONCLUSIVE SUMMARY

The equatorial dry forest expands from southern Ecuador to the northern part of Peru, where it continues southward in two small strips into the La Libertad region, which either runs along the coast west of the Andes, or penetrates the Inter-Andean region of the Marañón River and its tributaries. This eco-region is part of a global biodiversity hotspot and is thus home to a large number of floral and faunal species with a high proportion of endemics. The Inter-Andean part of this dry forest habitat in northern Peru in particular has rarely been studied with respect to its flora and fauna although it is facing serious threats due to deforestation for firewood, agriculture and narcotics plantations, mining activities, and above all due to recent dam construction activities for four extensive hydroelectric projects that will lead to flooding of vast portions of the Inter-Andean dry forest valleys. Considering these threats, it is most likely that the populations of many of the endemic species will decline in the near future.

Long-term strategies for the conservation of the biodiversity of this important habitat with its unique flora and fauna should be developed and implemented as soon as possible. To do so, it is indispensable to characterize the composition and conservation status of the flora and fauna of this region and to gain knowledge regarding the respective biological needs of each species.

The present study was organized to contribute to the knowledge of the herpetofauna of this peculiar dry forest habitat. Several field surveys were conducted between July 2005 and November 2010 at 22 different localities along the Marañón River and some of its tributaries.

Section 1 gives deeper insights in the objectives of the research project and provides an overview on the topography, climate, vegetation, and fauna of the research area.

Section 2 is a checklist of the amphibians and reptiles of the 22 surveyed localities situated in this world-unique dry forest habitat, containing 14 species of amphibians and 45 species of reptiles. Detailed accounts, containing morphometric and pholidotic data, information on natural history, comments regarding their distribution, the conservation status and key literature are given for each collected species. At least six of the species discovered during the survey period are new to science. Seven additional taxa may also represent new species but more collected material is necessary to determine their statuses. One colubrid species could not be assigned to any of the known genera and represents a new and so far monotypic genus which will be described as soon as more data is available. For one snake species the first country record is provided and for nine further species new regional records are given.

Section 3 focuses on the neotropical representatives of the gecko family Phyllodactylidae.

In **chapter 3.1,** two new species of the genus *Phyllodactylus* are described based on material collected in the xeric surroundings of Balsas in the upper Marañón Valley, Province of Chachapoyas, Region of Amazonas, Peru. Both species are well differentiated from all other South American *Phyllodactylus* based on characteristics of their morphology. In the case of *P. delsolari*, its large adult size and lack of well-defined rows of strongly keeled scales differentiate it from other *Phyllodactylus*, whereas in the second species *P. thompsoni*, the presence of an enlarged postanal scale is diagnostic. Both species exhibit some similarities to other assemblages of sympatric *Phyllodactylus* in South America.

Chapter 3.2 reports on the collection of the recently described gekkonid species *Phyllodactylus thompsoni* and *P. delsolari* from seven and four new localities, respectively, extending the distribution of both species southward along the Marañón River valley in Peru by about 130 km and the altitudinal range to nearly 1,900 m a.s.l.

In **chapter 3.3**, the ecology of the four phyllodactylid geckos: *Phyllopezus maranjonensis, Phyllodactylus delsolari, P. thompsoni* and *P. reissii,* was studied in the Balsas area. *Phyllopezus maranjonensis* and *Phyllodactylus delsolari* were almost always encountered together and were exclusively found on rock faces; *P. thompsoni* was found in various microhabitats and coexisted with all three other species; *P. reissii* was rarely found and only in one locality on the walls of an abandoned house, coexisting solely with *P. thompsoni.* All species fed on arthropods with isopods, coleopterans and insect larvae dominating their diet, numerically. Stones and eggshells could be found in the stomachs of gravid *Phyllopezus maranjonensis* females. Dietary niche breadth values for all species are well above 1 and similar. Dietary niche overlap among all species is low, except for *Phyllodactylus delsolari* and *P. reissii,* which might be associated with the low abundance of *P.*

reissii in this area. Niche overlap among *Phyllopezus maranjonensis* and *Phyllodactylus delsolari* was low and probably makes their coexistence possible, despite their remarkable size.

Section 4 contributes to the knowledge of the iguanid lizards of the genus *Polychrus*. The new colorful species *Polychrus jacquelinae* is described from the surroundings of San Vicente/Pusaq, Province of Bolivar, Region of La Libertad. This new species exhibits a conspicuous sexual dimorphism and differs from all other *Polychrus* species, in having very small dorsal scales and thus a higher number of scales around midbody and in the mid-dorsal line from behind the occipital scales to the level of the posterior edge of the thigh. A re-description of *P. peruvianus* is given, whose original description is short and lacks information on intraspecific variation and sexual dimorphism. Examination and comparison of museum material of *P. spurrelli* and *P. gutturosus* resulted in the synonymization of *P. spurrelli* with *P. gutturosus.* Furthermore, information regarding intraspecific variation and the ecology of *P. gutturosus* is provided.

Section 5 is a taxonomic revision of the Andean representatives of the teiid lizard genus *Ameiva* Meyer, 1795 with a description of two new species. The new species *Ameiva nodam* and *Ameiva aggerecusans* share a divided frontal plate and are differentiated from each other and from their congeners based on genetic (12S and 16S rRNA genes) and morphological characteristics. *A. nodam* inhabits the Canyons of the Chinchipe, Chamaya, Huancabamba, Utcubamba and Marañón Rivers in the Regions of Amazonas and Cajamarca from La Balza, Province of San Ignacio at the Ecuadorian boarder, southwards to Puerto Malleta, Province of Cutervo. This new species has dilated postbrachials, a maximum known snout-vent length of 101 mm, 10 longitudinal rows of ventral plates, 86-113 midbody granules, 25-35 lamellae under the fourth toe, and a color pattern with 5 longitudinal yellow stripes on the dorsum. *Ameiva aggerecusans* is found in the Regions of Amazonas and Cajamarca from Zapatalgo, Province of Utcubamba, Region of Amazonas, southwards to Balsas, Province of Chachapoyas, Region of Amazonas. This newly described species has not or only hardly dilated postbrachials, a maximum known snout-vent length of 99.3 mm, 10-12 longitudinal rows of ventral plates, 73-92 mid-body granules, 31-39 lamellae under the fourth toe, and the females and juveniles of the species normally exhibit a cream-colored vertebral stripe on a dark dorsum ground color. A re-description of *A. concolor* is given, which has recently been elevated to species level. This species is distributed along the Canyons of the Crisnejas and Marañón Rivers from the type locality Paipoy, Region of Cajamarca, southwards to Pías (Laguna), Province of Tayabamba, Region of La Libertad. Furthermore, information on the environmental niches of the three taxa are provided and it was tested whether the niches of the more closely related taxa are more similar than those of the more distantly related ones.

The results of this dissertation provide a first checklist of the amphibians and reptiles of the interandean part of the equatorial dry forest in Northern Peru. The herpetofauna of this region is characterized by a high diversity and a high endemicity, with about half (29 of 59 species) of the recorded species being only known from this part of the equatorial dry forest. Six new species were discovered (*Phyllopezus maranjonensis, Phyllodactylus delsolari, P. thompsoni, Polychrus jacquelinae, Ameiva aggerecusans,* and *A. concolor*), a new country record was discovered (*Mastigodryas reticulatus*), and range extensions were provided for eight taxa (*Leptodactylus labrosus, Rulyrana mcdiarmidi, Phyllodactylus johnwrighti, Pseudogonatodes barbouri, Leptodeira septentrionalis larcorum, Sibynomorphus vagrans*, *Microlophus stolzmanni,* and *Phyllopezus maranjonensis)*. In addition, information on natural history and key literature are provided for most of the recorded dry forest species.

This investigation contributes valuable information on the knowledge of the amphibians and reptiles inhabiting the northern Peruvian dry forest and provides a basis for further studies as well as for the development of conservation strategies for this peculiar habitat and its herpetofauna. The high amount of endemic species and the high potential for the discovery of additional rare and endemic species together with the identified threats such as deforestation, mining activities and dam constructions for hydroelectric projects have high implications for conservation and further research.

To date no protected area has been established in the Marañón valley. If no conservation strategies will soon be developed and implemented the destruction of this unique habitat will proceed and the decline of its diversity will be irreversible.

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8. APPENDICES

8.1 Appendix of Chapter 2.1

Collected voucher specimens:

Ameiva aggerecusans.— AMAZONAS: Chachapoyas: Balsas: CORBIDI 5764, 5765, ZFMK 85009-85013, 85024, 90859, 90860 (06°49’11.6’’S, 78°00’12.2’’W, 1000 m a.s.l.); Utcubamba: Zapatalgo: CORBIDI 5766, ZFMK 90861 (06°04'S, 78°29'W, 1011–1029 m a.s.l.); CAJAMARCA: Celendin: Chacanto: ZFMK 90858 (06°50'41.5”S, 078°01’50.8”W, 852 m a.s.l.).

Ameiva concolor.— LA LIBERTAD: Bambamarca: Calemar: CORBIDI 7662, ZFMK 91789 (07°33'08.8"S, 077°42'35.9"W, 1125 m a.s.l.); CORBIDI 7661, 7663, ZFMK 91790, 91791 (07°32’S, 077°43', 1108–1126 m a.s.l.); Pataz: Chagual: CORBIDI 7659, 7660, ZFMK 91787 (07°49'51.7”S, 077°38'35.5”W, 1360 m a.s.l.); Pias: ZFMK 91788 (07°53'54.4”S, 077°34'45.0”W, 1720 m a.s.l.).

Ameiva nodam.— CAJAMARCA: Jaén: Bellavista: CORBIDI 1869, 1870, 1873 (05°38’15.6’’S, 78°37’59.2’’W, 390–440 m a.s.l.); CORBIDI 5762 (05°31’S, 078°31’W, 390–444 m a.s.l.); Gotas de Agua: ZFMK 88732, 88733 (05°42’28.2’’S, 78°47’18.4’’W, 719 m a.s.l.); CORBIDI 1910 (05°41’17.7’’S, 78°46’02.0’’W, 717 m a.s.l.); Pucará: ZFMK 88734 (06°01’51.2’’ S, 79°07’32.5’’ W, 1054 m a.s.l.); ZFMK 90862, CORBIDI 5761 (06°03’ S, 373 79°05’ W, 970 m a.s.l.); Perico: CORBIDI 5763, ZFMK 90863 (05°20’30.7’’S, 78°47’52.1’’W, 490 m a.s.l.); Cutervo: Puerto Malleta: ZFMK 90864 (06°03’57.1’’S, 78°36’21.1’’W, 509 m a.s.l.); AMAZONAS: Bagua: Bagua Chica: CORBIDI 1786, 1833, 1853, 1872, 1874, 1898, 1900, 1902, 1905, ZFMK 88735, 88736 (05°38’06.9’’S, 78°32’27.7’’W, 500 m a.s.l.); Cumba: Cumba: CORBIDI 5767-5769, ZFMK 90865, 90866 (05°56’14.6’’S, 78°39’50.4’’W, 465 m a.s.l.).

Amphisbaena pericensis.— CAJAMARCA: Jaén: Bellavista: CORBIDI 1867 (05°39’50.5’’S, 78°40’47.6’’W, 447 m a.s.l.); Gotas de Agua: ZFMK 88754 (05°41’17.7’’S, 78°46’02.0’’W, 717 m a.s.l.).

Boa constrictor ortonii.— AMAZONAS: Cumba: Cumba: CORBIDI 5795 (05°54’27.8’’ S, 78°40’46.1’’ W, 467 m a.s.l.).

Bothrops sp..— CAJAMARCA: Jaén: Bellavista: CORBIDI 1876 (05°37’52.9’’S, 78°39’28.8’’W, 430 m a.s.l.); LA LIBERTAD: Cajabamba: Santa Rosa (Marcamachay): ZFMK 91792 (07°21’37.3’’ S, 77°51’33.7’’ W, 1,100 m a.s.l.); Bambamarca: Calemar: CORBIDI 7646 (07°31’34.2’’ S, 77°42’53.9’’ W, 1,312 m a.s.l.).

Callopistes flavipunctatus.— CAJAMARCA: Jaén: Bellavista: CORBIDI 1875, ZFMK 88714 (05°39’S, 78°40’W, 447 m a.s.l.); CORBIDI 7645 (05°41’29.3’’S, 78°41’31.9’’W, 452 m a.s.l.).

Chironius exoletus.— AMAZONAS: Cumba: Cumba: CORBIDI 7668 (05°56’19.6’’ S, 78°39’21.5’’ W, 496 m a.s.l.).

Clelia clelia.— AMAZONAS: Cumba: Cumba: CORBIDI 7671 (05°56’14.6’’ S, 78°39’50.4’’ W, 465 m a.s.l.); Chachapoyas: Balsas: CORBIDI 1444 (06°49’11.6’’S, 78°00’12.2’’W, 1000 m a.s.l.).

Colubridae sp. — LA LIBERTAD: Cajabamba: Santa Rosa/El Tingo (Marcamachay): CK 430 (07°21’56.3’’ S, 77°53’53.0’’ W, 1,154 m a.s.l.); Pataz: Pias: CORBIDI 7726 (07°53'56.6’’ S, 077°34'43.8’’ W, 1,726 m a.s.l.).

Epictia cf. *rufidorsa*.— LA LIBERTAD: Cajabamba: Santa Rosa/El Tingo (Marcamachay): ZFMK 91800 (07°21’10.6” S, 77°50’04.2” W, 1,062 m a.s.l.); Pataz: Chagual: CORBIDI 7672-7674 (07°50’ S, 77°38’ W, 1,250-1,330 m a.s.l.); Vijus: CORBIDI 7675, ZFMK 91797, 91799 (07°43'12” S, 077°39'40” W, 1,294 m a.s.l.).

Epictia sp. 1.— CAJAMARCA: Celendin: Limon: ZFMK 90933 (06°52'34.2” S, 078°05'10.5” W, 2053 m a.s.l.).

Epictia sp. 2.— LA LIBERTAD: Pataz: Vijus: ZFMK 91799 (07°43'12.6” S, 077°39'36.2” W, 1,297 m a.s.l.).

Epictia sp. 3.— CAJAMARCA: Jaén: Santa Rosa de la Yunga: CORBIDI 7678 (05°25'53.3” S, 078°33'47.0” W, 1,268 m a.s.l.).

Epictia sp. 4.— PERU: AMAZONAS: Utcubamba: Zapatalgo: CORBIDI 5669 (06°04'47.7” S, 078°29'18.7” W, 934 m a.s.l.); CORBIDI 5670, ZFMK 90934 (06°04'44.0” S,078°29'16.7” W, 968 m a.s.l.).

Epictia sp. 5.— CAJAMARCA: Jaén: Bellavista: CORBIDI 1818 (05°39'50.5” S, 78°40'47.6” W, 447 m a.s.l.).

Excidobates mysteriosus.— CAJAMARCA: Jaén: Santa Rosa de la Yunga: CORBIDI 1765, 1768, 1770, 1771 (05°26' 23.9” S, 078°33'16.7” W, 1273 m a.s.l.); CORBIDI 5797 (05°26' 19.4” S, 078°33'16.3” W, 1305 m a.s.l.).

Gonatodes atricucullaris.— CAJAMARCA: Jaén: Gotas de Agua: ZFMK 88752 (05°41’ S, 78°46’ W); Santa Rosa de la Yunga: CORBIDI 1789 (05°25'59.2” S, 078°34'01.8” W, 1251 m a.s.l.); CORBIDI 1828 (05°26' 22.3” S, 078°33'47.0” W, 1184 m a.s.l.).

Hyloxalus elachyhistus.— CAJAMARCA: Jaén: Gotas de Agua: CORBIDI 1783, 1784, 1787, 1797, 1800, 1801, 1803, 1806, 1834, ZFMK 88779 (05°42’07.6” S, 78°48’53.6” W, 807 m a.s.l.); CORBIDI 1781, 1782, 1815, 1816, 1821, 1831, ZFMK 88780 (05°41’39.9” S, 78°48’52.1” W, 855 m a.s.l.); Santa Rosa de la Yunga: CORBIDI 1788, 1798, 1802, 5653, ZFMK 88781, 88782 (05°25'44.3” S, 078°33'47.7” W, 1281 m a.s.l.); CORBIDI 1820 (05°26'15.4” S, 078°34'36.8” W, 1240 m a.s.l.); CORBIDI 5654, 5655, ZFMK 90977, 90978 (05°26' S, 078°33' W, 1243-1265 m a.s.l.).

Hyloxalus insulatus.— CAJAMARCA: Celendin: Limon: CORBIDI 5656-5658, 5798-5800 (06°52'21.5” S, 078°05'03.5” W, 2008 m a.s.l.); ZFMK 90935-90937 (06°52'43.0” S, 078°05'05.9” W, 2092 m a.s.l.).

Leptodactylus labrosus.— CAJAMARCA: Jaén: Bellavista: CORBIDI 5663, 5664, ZFMK 90954-90957 (05°37’58.9”S, 78°38’13.6”W, 393 m a.s.l.); CORBIDI 5665, ZFMK 90958 (05°41’23.8” S, 078°41’58.2” W, 440 m a.s.l.); Perico: CORBIDI 5666, 5667 (05°20’ S, 78°48’ W, 470-490 m a.s.l.); ZFMK 90959 (05°22’29.8” S, 78°48’32.8” W, 652 m a.s.l.); CORBIDI 5668 (05°21’57.7” S, 78°47’41.5” W, 464 m a.s.l.); AMAZONAS: Bagua: Bagua Grande: CORBIDI 1882, ZFMK 88769 (05°47’33.3”S, 78°23’04.9”W, 568 m a.s.l).

Leptodactylus sp.— CAJAMARCA: San Ignacio: La Balza: CORBIDI 1860, ZFMK 88768 (04°59’44.3”S, 79°07’19.4”W, 926 m a.s.l.).

Leptodeira septentrionalis larcorum.— AMAZONAS: Chachapoyas: Balsas: ZFMK 85030 (06°48'26” S, 077°59'29” W, 1,000 m a.s.l.); Utcubamba: Zapatalgo: CORBIDI 5643 (06°05'32.7” S,078°29'48.2” W, 637 m a.s.l.); CORBIDI 5644 (06°03'35.6” S,078°30'07.8” W, 888 m a.s.l.); CAJAMARCA: Jaén:

Bellavista: CORBIDI 1865, 7664 (05°38' S, 78°39' W, 410-430 m a.s.l.); Pucará: ZFMK 90929 (06°01'54.6” S, 079°07'37.7” W, 1,014 m a.s.l.); ZFMK 90930 (06°03'13.6” S, 079°07'14.9” W, 900 m a.s.l.); LA LIBERTAD: Bambamarca: Calemar: ZFMK 91794 (07°31’13.0” S, 77°43’17.4” W, 1,143 m a.s.l.); Pataz: Chagual: CORBIDI 7665 (07°50’03.7” S, 77°38’03.9” W, 1,261 m a.s.l.); Vijus: CORBIDI 7666 (07°43'32.6” S, 077°39'13.2” W, 1,280 m a.s.l.); Pias: ZFMK 91793 (07°53'32.7” S, 077°33'50.3” W, 1,857 m a.s.l.).

Mastigodryas boddaerti.— LA LIBERTAD: Pataz: Pias: CORBIDI 7657 (07°53'50.5” S, 077°34'26.3” W, 1,817 m a.s.l.).

Mastigodryas heathii.— CAJAMARCA: Bolivar: San Vicente/Pusac: CORBIDI 7669 (06°59’43.9”S, 77°54’50.5”W, 1,507 m a.s.l.); LA LIBERTAD: Cajabamba: Santa Rosa/El Tingo (Marcamachay): ZFMK 91801 (07°21’36.8” S, 77°51’42.6” W, 1,128 m a.s.l.).

Mastigodryas reticulatus.— CAJAMARCA: Jaén: Perico: CORBIDI 1934 (05°22’33.5”S, 78°47’47.2”W, 669 m a.s.l.); Santa Rosa de la Yunga: CORBIDI 1003 (05°25'50.2” S, 078°33'56.2” W, 1,239 m a.s.l.); LA LIBERTAD: Bambamarca: Calemar: CORBIDI 7658 (07°31'15.2” S, 077°43'21.6” W, 1,109 m a.s.l.)

Microlophus stolzmanni.— AMAZONAS: Bagua: Bagua Grande: CORBIDI 1878, 1887, ZFMK 88723 (05°47'33.3" S, 078°23'04.9" W, 568 m a.s.l.); Bagua Chica: CORBIDI 1880, 1897, ZFMK 88724, 88725 (05°38'06.9" S, 078°32'27.7" W, 500 m a.s.l.); Chachapoyas: Balsas: CORBIDI 5775, ZFMK 90847 (06°50’20.7” S, 78°01’23.3” W, 859 m a.s.l.); CORBIDI 5776 (06°50’34.3” S, 78°01’28.8” W, 898 m a.s.l.); CORBIDI 5777 (06°49’28.2” S, 78°00’24.3” W, 917 m a.s.l.); ZFMK 90848 (06°50’54.3” S, 78°00’01.5” W, 1065 m a.s.l.); Utcubamba: Zapatalgo: CORBIDI 5782 (06°04'44.2” S,078°28'57.3” W, 976 m a.s.l.); Puerto Malleta: CORBIDI 5783, 5785, 5787, 5788 (06°03'54.1” S, 078°36'00.9” W, 502 m a.s.l.); CORBIDI 5786 (06°03'48.6” S, 078°35'48.6” W, 559 m a.s.l.); Cumba: Cumba: ZFMK 90855, 90856 (05°56'14.6” S,078°39'50.4” W, 465m a.s.l.); CORBIDI 5789 (05°56'13.2” S,078°39'10.3” W, 532 m a.s.l.); CAJAMARCA: Celendín: Chacanto: ZFMK 90850 (06°50’59.0” S, 78°02’14.6” W, 1087 m a.s.l.); ZFMK 90849 (06°51’08.9” S, 78°01’58.2” W, 992 m a.s.l.); ZFMK 90851 (06°51’14.1” S, 78°01’40.1” W, 969 m a.s.l.); Jaén: Santa Rosa de la Yunga: CORBIDI 1794 (05°26'38.4” S, 078°33'45.3” W, 1036 m a.s.l.); CORBIDI 1918, 1923, ZFMK 88718 (05°26'23.9” S, 078°33'16.7” W, 1273 m a.s.l.); CORBIDI 1892, 1925, ZFMK 88719, 88720 (05°26'17.3” S, 078°33'12.7” W, 1280 m a.s.l.); Bellavista: CORBIDI 1859, 1862, 1868, 1871, ZFMK 88715 (05°38'02.9"S, 78°38'08.1"W, 447 m a.s.l.); ZFMK 90845 (05°37'27.6” S, 078°38'49.5” W, 434 m a.s.l.); CORBIDI 5770, 5771, ZFMK 90846 (05°30'29.0” S, 078°30'23.6” W, 444 m a.s.l.); Gotas de Agua: CORBIDI 1885, 1906, 1917, ZFMK 88716, 88717 (05°41'08.9” S, 078°45'22.5” W, 660 m a.s.l.); CORBIDI 1888 (05°41'17.7” S, 078°46'02.0” W, 717 m a.s.l.); Perico: CORBIDI 5772, 5773 (05°21'35.0"S, 078°47'32.2"W, 439 m a.s.l.); CORBIDI 5774 (05°20'30.7"S, 078°47'52.1"W, 490 m a.s.l.); Pucará: CORBIDI 1839, ZFMK 88721, 90839-90841 (06°02'23.0” S, 079°07'59.4” W, 901 m a.s.l.); CORBIDI 1841, 1850, ZFMK 88722 (06°01'59.2” S, 079°07'27.7” W, 966 m a.s.l.); ZFMK 90842, 90843 (06°02'37.1” S, 079°08'15.5” W, 965 m a.s.l.); ZFMK 90844 (06°03'36.1” S, 079°03'16.4” W, 949 m a.s.l.); Cutervo: Puerto Malleta: CORBIDI 5784 (06°03’57.1” S, 78°36’21.1” W, 509 m a.s.l.); Cumba: ZFMK 90857 (05°54'24.1” S,078°39'50.4” W, 465 m a.s.l.); CORBIDI 5801 (05°54'29.6” S,078°41'43.9” W, 481 m a.s.l.); LA LIBERTAD: Bambamarca: Calemar: CORBIDI 7608, 7614, 7616–7618, ZFMK 91784–91786 (07°32’ S, 77°43’ W, 1,108–1,340 m a.s.l.); Bolívar: San Vicente/Pusac: CORBIDI 5778–5781, ZFMK 90852– 90854 (06°59’ S, 77°55’ W, 1,449-1,596 m a.s.l.); Cajabamba: Santa Rosa (Marcamachay): CORBIDI 7611–7613, ZFMK 91781, 91782 (07°22’06.1” S, 77°53’33.8” W, 1,185 m a.s.l.); ZFMK 91783 (07°22’03.9” S, 77°53’54.5” W, 1,235 m a.s.l.); Pataz: Chagual: CORBIDI 7606, 7607, 7620, 7621, ZFMK 91771, 91772 (07°50’ S, 77°38’ W, 1,239–1,363 m a.s.l.); Vijus: CORBIDI 7607, 7676, 7677, ZFMK 91773–91777 (07°43’ S, 77°39’ W, 1,290-1,408 m a.s.l.); Pias: CORBIDI 7605 (07°53’38.4” S, 77°33’50.8” W, 1,860 m a.s.l.); CORBIDI 7602 (07°53’56.6” S, 77°34’43.8” W, 1,726 m a.s.l.); CORBIDI 7603 (07°53’40.3” S, 77°33’49.8” W, 1,870 m a.s.l.); CORBIDI 7609, ZFMK 91778 (07°53’55.3” S, 77°33’55.5” W, 1,937 m a.s.l.); CORBIDI 7604 (07°53’43.7” S, 77°33’40.5” W, 1,875 m a.s.l.); ZFMK 91779 (07°53’47.7” S, 77°34’29.2” W, 1,883 m a.s.l.); CORBIDI 7610 (07°53’43.2” S, 77°34’09.1” W, 1,890 m a.s.l.); ZFMK 91780 (07°53’41.0” S, 77°33’58.3” W, 1,952 m a.s.l.).

Micrurus peruvianus.— CAJAMARCA: Jaén: Gotas de Agua: CORBIDI 1912 (05°41’ S, 78°46’ W).

Nymphargus posadae.— CAJAMARCA: Jaén: Santa Rosa de la Yunga: ZFMK 91820 (05°25'29.8” S, 078°35'31.7” W, 1225 m a.s.l.).

Oxybelis aeneus.— AMAZONAS: Utcubamba: Zapatalgo: ZFMK 90827 (06°06'05.2” S,078°29'54.5” W, 521 m a.s.l.); ZFMK 90826 (06°05'56.1” S,078°29'49.8” W, 527 m a.s.l.); Puerto Malleta: CORBIDI 5645 (06°04'09.2” S, 078°35'42.8” W, 495 m a.s.l.); Cumba: Cumba: CORBIDI 5746, 5747 (05°56'08.4” S,078°39'28.0” W, 498 m a.s.l.); CAJAMARCA: Jaén: Bellavista: ZFMK 90928 (05°38'08.9"S, 78°38'11.4"W, 392 m a.s.l.); Pucará: CORBIDI 1848 (06°03'32.7” S, 079°03'02.0” W, 900 m a.s.l.); LA LIBERTAD: Bambamarca: Calemar: ZFMK 91796 (07°29’53.2” S, 77°42’06.8” W, 1,500 m a.s.l.); Cajabamba: Santa Rosa (Marcamachay): CORBIDI 7670 (07°21’59.3” S, 77°53’53.0” W, 1,154 m a.s.l.).

Phyllodactylus delsolari.— AMAZONAS: Chachapoyas: Balsas: CORBIDI 5671, 5674, ZFMK 85001-85003, 90872-90874, 91762, MUSM 19566, 26327-26330, 26410, 26411 (06°49’ S, 78°00’ W, 865-1289 m a.s.l.); CAJAMARCA: Celendín: Chacanto: CORBIDI 5672, 5673, ZFMK 90871 (06°50’ S, 78°01’ W, 890 m a.s.l.); LA LIBERTAD: Bambamarca: Calemar: CORBIDI 7654, 7655, ZFMK 91755–91758 (07°30’ S, 77°42’ W, 1,230-1,400 m a.s.l.); Pataz: Vijus: CORBIDI 6912, 6913, 7656, ZFMK 91761 (07°43’ S, 77°39’ W, 1,260–1,315 m a.s.l.); Pias: CORBIDI 6914–6916, ZFMK 91759, 91760 (07°53’ S, 77°33’ W, 1,820–1,870 m a.s.l.).

Phyllodactylus interandinus.— AMAZONAS: Cutervo: Puerto Malleta: CORBIDI 5676-5678, ZFMK 90908, 90909 (06°04’ S, 78°36’ W, 504-580 m a.s.l.); CAJAMARCA: Cutervo: Puerto Malleta: CORBIDI 5679, ZFMK 90910 (06°04’15.1” S, 78°36’30.4” W, 513 m a.s.l.); Cumba: CORBIDI 5680-5682 (05°54’24.1” S, 78°41’28.6” W, 474 m a.s.l.); Jaén: Bellavista: CORBIDI 1808, 1813, 1814, 1826, 1827, 1830, 5675, ZFMK 88749, 88750, 90903-90907 (05°38’ S, 78°39’ W, 430 m a.s.l.); Gotas de Agua: CORBIDI 1799, ZFMK 88751 (05°41’17.4” S, 78°44’44.1” W, 613 m a.s.l.).

Phyllodactylus johnwrighti.— AMAZONAS: Cumba: Cumba: CORBIDI 5683, ZFMK 90923 (05°56’ S, 78°39’ W, 517 m a.s.l.); CAJAMARCA: Jaén: Pucará: CORBIDI 1763, 1764, 1766, 1772-1775, ZFMK 88746, 88747 (06°02’23.0” S, 79°07’59.4” W, 901 m a.s.l.).

Phyllodactylus reissii.— AMAZONAS: Bagua: Bagua Grande: CORBIDI 1881, 1886, ZFMK 88737 (05°47'39.8"S, 078°23'25.4"W, 527 m a.s.l.); Bagua Chica: CORBIDI 1855 (05°38'06.9"S, 078°32'27.7"W, 500 m a.s.l.); Chachapoyas: Balsas: CORBIDI 5700, 5701, ZFMK 90885 (06°51’ S, 78°01’ W, 896-900 m a.s.l.); ZFMK 90886 (06°50’45.0” S, 77°59’47.9” W, 1271 m a.s.l.); Utcubamba: Zapatalgo: CORBIDI 5703, ZFMK 90889, 90890 (06°04'27.7” S,078°29'31.1” W, 1030 m a.s.l.); CORBIDI 5704, 5705 (06°05' S,078°29' W, 830 m a.s.l.); CORBIDI 5706, ZFMK 90891, 90892 (06°04' S,078°30' W, 907 m a.s.l.); Puerto Malleta: CORBIDI 5710, ZFMK 90893-90895 (06°03'54.1” S, 078°36'00.9” W, 502 m a.s.l.); CORBIDI 5707-5709 (06°04'S, 078°36W, 490-505 m); Cumba: Cumba: ZFMK 90897-90902 (05°56'S,078°39'W, 465–550 m a.s.l.); CAJAMARCA: Jaén: Santa Rosa de la Yunga: CORBIDI 1819, 1928, ZFMK 88740, 88741, 88748 (05°26'23.7” S, 078°33'17.0” W, 1247 m a.s.l.); Bellavista: CORBIDI 1809, 1810, 1812, 1817, 1829, 1833 (05°39'50.5"S, 78°40'47.6"W, 447 m a.s.l.); CORBIDI 1823, 1836, 5694, ZFMK 90879-90881 (05°37' S, 078°38' W, 419-444 m a.s.l.); CORBIDI 5695 ZFMK 90882 (05°34'26.7” S, 078°38'14.3” W, 769 m a.s.l.); Gotas de Agua: CORBIDI 1895, ZFMK 88739 (05°41'02.9” S, 078°46'04.1” W, 708 m a.s.l.); CORBIDI 1913, ZFMK 88738 (05°41'17.7” S, 078°46'02.0” W, 717 m a.s.l.); Perico: CORBIDI 1933, ZFMK 88709 (05°20'30.7"S, 078°47'52.1"W, 490 m a.s.l.); Pucará: CORBIDI 1847, 1856, 2062, ZFMK 88742-88745 (06°02'23.0" S, 079°07'59.4" W, 901 m a.s.l.); CORBIDI 5684-5693, ZFMK 90875, 90876, 90878 (06°02'S, 079°08'W, 907–964 m a.s.l.); ZFMK 90877 (06°03'36.1" S, 079°03'16.4" W, 949 m a.s.l.); Cutervo: Puerto Malleta: CORBIDI 5711, 5802, ZFMK 90896 (06°04'27.7" S, 78°36'48.7" W, 541 m a.s.l.); LA LIBERTAD: Bolívar: San Vicente/Pusac: CORBIDI 5702, ZFMK 90887, 90888 (06°59' S, 77°55' W, 1,430 m a.s.l.).

Phyllodactylus thompsoni.— AMAZONAS: Chachapoyas: Balsas: CORBIDI 5712-5716, 5721, ZFMK 84998-85000, 90914, 90915, MUSM 19561, 19563 (06°51' S, 78°01' W, 896-1,000 m a.s.l.); CAJAMARCA: Celendín: Road between Chacanto and Limón: CORBIDI 5717–5720, ZFMK 90911-90913 (06°50' S, 78°02' W, 1,135 m a.s.l.); LA LIBERTAD: Bambamarca: Calemar: CORBIDI 7685-7687, ZFMK 91752–91754 (07°32' S, 77°42' W, 1,440-1,690 m a.s.l.); Bolívar: San Vicente/Pusac: CORBIDI 5722, 5723, ZFMK 90917-90922 (06°59' S, 77°55' W, 1,430-1,670 m a.s.l.); Cajabamba: Santa Rosa (Marcamachay): CORBIDI 7681–7684, ZFMK 91749–91751 (07°22' S, 77°53' W, 1,090-1,300 m a.s.l.); Pataz: Chagual: CORBIDI 6903–6905, ZFMK 91740–91742 (07°50' S, 77°38' W, 1290-1,370 m a.s.l.); Vijus: CORBIDI 6906-6908, ZFMK 91743-91745 (07°43' S, 77°40' W, 1,290 m a.s.l.); Pias: CORBIDI 6909–6911, ZFMK 91746-91748 (07°54' S, 77°34' W, 1,850–1,880 m a.s.l.).

Phyllopezus maranjonensis.— AMAZONAS: Chachapoyas: Balsas: CORBIDI 5659-5662, ZFMK 84995-84997, 90867, 90868, MUSM 19553-19555 (06°49' S, 78°00' W, 865-1258 m a.s.l.); CAJAMARCA: Celendín: Chacanto: ZFMK 90869, 90870 (06°51' S, 78°02' W, 866-901 m a.s.l.); LA LIBERTAD: Bambamarca: Calemar: CORBIDI 7651-7653, ZFMK 91768–91770 (07°31' S, 77°43' W, 1,227-1,312 m a.s.l.); Cajabamba: Santa Rosa (Marcamachay): CORBIDI 7647–7650, ZFMK 91765–91767 (07°21' S, 77°51' W, 1,076-1,128 m a.s.l.).

Polychrus jacquelinae.— LA LIBERTAD: Bolivar: San Vicente/Pusac: CORBIDI 5742, 7724, 7725, ZFMK 90834, 91763, 91764 (06°59'S, 77°54'W, approximately 1460–1570 m a.s.l.).

Polychrus peruvianus.— AMAZONAS: Bagua: Bagua Grande: CORBIDI 1852, ZFMK 88712, 88713 (05°47'33.3"S, 078°23'04.9"W, 570 m a.s.l.); Utcubamba: Zapatalgo: CORBIDI 5733-5735, ZFMK 90823-90825 (06°04'S,078°29'W, 900–1030 m a.s.l.); Puerto Malleta: CORBIDI 5736, 5738, ZFMK 90824, 90826-90828 (06°03'S, 078°36'W, 480–510 m a.s.l.); CORBIDI 5739, ZFMK 90829 (06°04'S, 078°36W, 535 m); Cumba: Cumba: CORBIDI 5740, 5741, ZFMK 90830-90833 (05°56'S,078°39'W, 450–500 m a.s.l); CAJAMARCA: Jaén: Santa Rosa de la Yunga: ZFMK 88710, CORBIDI 5731, 5732 (05°26'S, 078°33'W, 1250–1300 m a.s.l.); Bellavista: CORBIDI 1857, 1858, 1863, ZFMK 88707 (05°39'49.8"S, 78°40'13.9"W, 411 m a.s.l.); CORBIDI 5727, 5728, ZFMK 90818, 90819 (05°38'06.6"S, 078°39'36.2"W, 405 m a.s.l.); ZFMK 90820 (05°34'35.7"S, 078°38'10.8"W, 700m a.s.l.); Gotas de Agua: ZFMK 88708 (05°41'S, 078°46'W); Perico: CORBIDI 1933, ZFMK 88709 (05°21'16.5"S, 078°47'30.6"W, 443 m a.s.l.); CORBIDI 5729, 5730, ZFMK 90822, 90821 (05°21'S, 078°47'W, 460–720 m a.s.l.); Pucará: ZFMK 88711, 90817, CORBIDI 1846, 5724-5726 (06°02'S, 079°07'W, 900–930 m a.s.l.).

Pristimantis incomptus.— CAJAMARCA: Jaén: Santa Rosa de la Yunga: CORBIDI 1835, 5744, ZFMK 90976 (05°26'04.8" S, 078°33'03.3" W, 1,245 m a.s.l.); ZFMK 91821 (05°25'51.5" S, 078°35'19.6" W, 1,322 m a.s.l.).

Pristimantis lymani.— AMAZONAS: Bagua: Bagua Grande: CORBIDI 1879, 1908, ZFMK 88770 (05°47'39.8"S, 078°23'25.4"W, 527 m a.s.l.); Utcubamba: Zapatalgo: CORBIDI 5749-5751, ZFMK 90968 (06°04'27.7" S,078°29'31.1" W, 1,029 m a.s.l.); CORBIDI 5752 (06°04'35.3" S,078°29'17.8" W, 976 m a.s.l.); ZFMK 90969-90970 (06°04'47.0" S,078°29'20.8" W, 1,029 m a.s.l.); Cumba: Cumba: CORBIDI 5758-5760, ZFMK 90973-90975 (05°56'08.4" S,078°39'28.0" W, 470-500 m a.s.l); CAJAMARCA: Cutervo: Puerto Malleta: CORBIDI 5753-5757, ZFMK 90971, 90972 (06°04'32.1" S, 78°37'00.7" W, 540 m a.s.l.); Jaén: Santa Rosa de la Yunga: CORBIDI 1891, 1893, 1919, 1922, 1924, 1927, ZFMK 88775, 88776 (05°26'01.9” S, 078°33'52.2” W, 1,207 m a.s.l.); CORBIDI 5803, ZFMK 90967 (05°25' S, 078°35' W, 1,245 m a.s.l.); ZFMK 90992 (05°25'58.2” S, 078°33'10.4” W, 1,299 m a.s.l.); Bellavista: CORBIDI 5747 (05°41'23.3" S, 78°41'57.1" W, 453 m a.s.l.); CORBIDI 5746 (05°41'21.3" S, 078°41'52.8" W, 455 m a.s.l.); Gotas de Agua: CORBIDI 1796, ZFMK 88771 (05°42'07.6” S, 078°48'53.6” W, 807 m a.s.l.); CORBIDI 1793, 1866, 1909, 1914, 1916, ZFMK 88772 (05°41'02.9” S, 078°46'04.1” W, 708 m a.s.l.); Perico: CORBIDI 1929 (05°22'33.5" S, 078°47'47.2" W, 669 m a.s.l.); CORBIDI 1896, 1899, 1932, ZFMK 88777, 88778 (05°22'33.2” S, 078°48'30.2” W, 717 m a.s.l.); CORBIDI 5748, ZFMK 90964-90966 (05°20'26.7” S, 078°47'53.7” W, 461 m a.s.l.); ZFMK 90963 (05°22'29.8” S, 078°48'32.8” W, 652 m a.s.l.); Pucará: CORBIDI 1838, 1844, 1854, 1851, 2061, ZFMK 88774 (06°02'23.0” S, 079°07'59.4” W, 901 m a.s.l.); ZFMK 88773 (06°03'32.7” S, 079°03'02.0” W, 900 m a.s.l.); ZFMK 90960 (06°03'26.3” S, 079°07'10.1” W, 924 m a.s.l.); CORBIDI 5745, ZFMK 90961 (06°02'07.8” S, 079°07'35.5” W, 917-933 m a.s.l.); ZFMK 90962 (06°02'46.2” S, 079°07'37.5” W, 913 m a.s.l.).

Pristimantis percnopterus.— CAJAMARCA: Jaén: Santa Rosa de la Yunga: CORBIDI 1832 (05°26'23.9” S, 078°33'16.7” W, 1,273 m a.s.l.); CK131 (05°26'22.3” S, 078°33'47.0” W, 1,184 m a.s.l.).

Pseudogonatodes barbouri.— AMAZONAS: Utcubamba: Zapatalgo: CORBIDI 5743, ZFMK 90924 (06°04'27.7” S,078°29'31.1” W, 1,029 m a.s.l.); CORBIDI 5796, ZFMK 90925 (06°04'44.0” S,078°29'16.7” W, 968 m a.s.l.); CAJAMARCA: Perico: CORBIDI 1822 (05°23'08.7" S, 078°46'59.0" W, 515 m a.s.l.).

Rhinella limensis.— AMAZONAS: Chachapoyas: Balsas: CORBIDI 5636 (06°48’50.6” S, 77°59’54.7” W, 995 m a.s.l.); CAJAMARCA: Celendín: Chacanto: CORBIDI 5634, 5635, ZFMK 90979-90981 (06°51’ S, 78°01’ W, 893-928 m a.s.l.); LA LIBERTAD: Bambamarca: Calemar: CORBIDI 7638, 7643, ZFMK 91816–91819 (07°31’15.2” S, 77°43’21.6” W, 1,108 m a.s.l.); Bolívar: San Vicente/Pusac: CORBIDI 7679 (06°59’34.5” S, 77°56’30.9” W, 1,525 m a.s.l.); Cajabamba: Santa Rosa/El Tingo (Marcamachay): CORBIDI 7637, 7640-7642, ZFMK 91814, 91815 (07°21’10.6” S, 77°50’04.2” W, 1,062 m a.s.l.); Pataz: Chagual: CORBIDI 7631, ZFMK 91802 (07°50’03.4” S, 77°37’44.9” W, 1,302 m a.s.l.); ZFMK 91803 (07°50’08.1” S, 77°37’59.7” W, 1,295 m a.s.l.); CORBIDI 7632 (07°49’45.7” S, 77°37’56.6” W, 1,343 m a.s.l.); CORBIDI 7622-7625, 7633, ZFMK 91804-91806 (07°50’05.4” S, 77°38’05.7” W, 1,258 m a.s.l.); Vijus: CORBIDI 7626-7628, ZFMK 91807-91810 (07°43’09.3” S, 77°39’47.4” W, 1,290 m a.s.l.); CORBIDI 7635 (07°43’12.6” S, 77°39’36.2” W, 1,297 m a.s.l.); CORBIDI 7629 (07°43’22.5” S, 77°39’36.2” W, 1,220 m a.s.l.); Pias: CORBIDI 7630, 7636, ZFMK 91811-91813 (07°53’46.0” S, 77°33’51.7” W, 1,871 m a.s.l.); CORBIDI 7634 (07°53’26.1” S, 77°34’00.1” W, 1,869 m a.s.l.).

Rhinella margaritifera.— AMAZONAS: Utcubamba: Zapatalgo: CORBIDI 5619-5622, ZFMK 90950-90953 (06°04' S,078°29' W, 913-940 m a.s.l.); CAJAMARCA: Jaén: Gotas de Agua: ZFMK 88766 (05°42'39.2” S, 078°47'27.9” W, 723 m a.s.l.); Santa Rosa de la Yunga: CORBIDI 1921 (05°26'22.3” S, 078°33'47.0” W, 1,184 m a.s.l.); San Ignacio: La Balza: CORBIDI 1840, 1901, ZFMK 88767 (04°59’44.3”S, 79°07’19.4”W, 926 m a.s.l.).

Rhinella marina.— CAJAMARCA: Jaén: Santa Rosa de la Yunga: CORBIDI 7619 (05°26'06.8” S, 078°33'18.8” W, 1,332 m a.s.l.); CORBIDI 1894, 1926, ZFMK 88755, 88756 (05°26'38.4” S, 078°33'45.3” W, 1,036 m a.s.l.); San Ignacio: La Balza: CORBIDI 1904, 1907, 1915, ZFMK 88757, 88758 (04°59’ S, 79°07’ W, 926-959 m a.s.l.).

Rhinella poeppigii.— AMAZONAS: Bagua: Bagua Grande: CORBIDI 1883, ZFMK 88763 (05°47'33.3" S, 078°23'04.9" W, 568 m a.s.l.); Bagua Chica: ZFMK 88764, 88765 (05°38'06.9" S, 078°32'27.7" W, 500 m a.s.l.); Utcubamba: Zapatalgo: CORBIDI 5629-5631 (06°04'27.7” S,078°29'31.1” W, 1,029 m a.s.l.); Puerto Malleta: ZFMK 90987 (06°03'50.3” S, 078°36'08.8” W, 486 m a.s.l.); Cumba: Cumba:

ZFMK 90988 (05°56'13.4” S, 078°39'51.8” W, 457 m a.s.l); CORBIDI 5633, ZFMK 90989, 90990 (05°59'41.4” S, 078°39'02.4” W, 526 m a.s.l); ZFMK 90991 (05°56'14.6” S, 078°39'50.4” W, 465 m a.s.l); CAJAMARCA: Cutervo: Puerto Malleta: CORBIDI 5632 (06°04’32.1” S, 78°37’00.7” W, 540 m a.s.l.); Jaén: Bellavista: ZFMK 90983 (05°37'16.9" S, 78°39'20.2" W, 463 m a.s.l.); CORBIDI 5625 (05°30'30.7" S, 078°37'15.7" W, 384 m a.s.l.); CORBIDI 5623, 5624, ZFMK 90984, 90985 (05°30'33.2” S, 078°37'14.4” W, 394 m a.s.l.); Gotas de Agua: ZFMK 88762 (05°41'02.9” S, 078°46'04.1” W, 708 m a.s.l.); Perico: ZFMK 88759 (05°21'16.5” S, 078°47'30.6” W, 443 m a.s.l.); CORBIDI 5626-5628, ZFMK 90986 (05°20'26.7” S, 078°47'53.7” W, 461 m a.s.l.); Pucará: CORBIDI 1842, 1845, ZFMK 88760, 88761 (06°02'23.0” S, 079°07'59.4” W, 901 m a.s.l.); ZFMK 90982 (06°02'27.6” S, 079°07'57.0” W, 902 m a.s.l.).

Rylurana mcdiarmidi.– AMAZONAS: Utcubamba: Zapatalgo: CORBIDI 5737-5742, ZFMK 90944, 90945 (06°05'01.9” S,078°29'23.1” W, 824 m a.s.l.); ZFMK 90946-90949 (06°03'36.0” S,078°30'05.5” W, 907 m a.s.l.); CAJAMARCA: Jaén: Santa Rosa de la Yunga: CORBIDI 1769, 1771, ZFMK 88783 (05°25'29.8” S, 078°35'31.8” W, 1,205 m a.s.l.).

Sibynomorphus vagrans.– AMAZONAS: Cumba: Cumba: CORBIDI 5649, 7667, ZFMK 90931, 90932 (05°56' S,078°39' W, 458-487 m a.s.l.); CAJAMARCA: Jaén: Santa Rosa de la Yunga: CORBIDI 5648 (05°26'08.1” S, 078°34'11.8” W, 1,326 m a.s.l.).

Stenocercus huancabambae.– AMAZONAS: Cumba: Cumba: CORBIDI 5791, 5792, ZFMK 90838 (05°56'14.6” S,078°39'50.4” W, 465 m a.s.l.); CAJAMARCA: Jaén: Bellavista: CORBIDI 5790 (05°41'24.7" S, 78°41'36.2" W, 437 m a.s.l.); Gotas de Agua: CORBIDI 1903 (05°41'17.7" S, 78°46'02.0" W, 717 m a.s.l.); CORBIDI 1861, 1864, ZFMK 88726, 88727 (05°42'22.0" S, 78°46'59.6" W, 698 m a.s.l.); Perico: CORBIDI 1931, ZFMK 88729, 88730 (05°22'33.5" S, 078°47'47.2" W, 669 m a.s.l.); CORBIDI 1930 (05°22'41.3" S, 078°47'36.8" W, 653 m a.s.l.); Santa Rosa de la Yunga: CORBIDI 1889, 1920, ZFMK 88731 (05°26'17.3” S, 078°33'12.7” W, 1,280 m a.s.l.); ZFMK 90837 (05°26'15.7” S, 078°33'17.8” W, 1,318 m a.s.l.); San Ignacio: La Balza: ZFMK 88728 (04°59’44.3”S, 79°07’19.4”W, 926 m a.s.l.).

Tantilla melanocephala.– CAJAMARCA: Jaén: Gotas de Agua: CORBIDI 1843 (05°41’ S, 78°46’ W).

Varzea altamazonica.– AMAZONAS: Cumba: Cumba: CORBIDI 7644 (05°56'08.8” S,078°39'25.1” W, 487 m a.s.l.); CAJAMARCA: Jaén: Gotas de Agua: CORBIDI 1911, ZFMK 88753 (05°42’22.0” S, 78°46’59.6” W, 698 m a.s.l.); Santa Rosa de la Yunga: CORBIDI 1032, 1033 (05°25'50.2” S, 078°33'56.2” W, 1,239 m a.s.l.).

8.2 Appendix of Chapter 3.1

Additional Specimens examined:

Phyllodactylus kofordi.—PERU: Piura: UF 34719, 34722–34733, 34745–34749. *Phyllodactylus microphyllus*.—PERU: Piura: UF 34718, 34720–34721, 34738, 34743, 126944–126956.

Phyllodactylus reissi.—ECUADOR: Esmeraldas: UF 71934, Guayas: UF 39458–39459, 71502–71503, 90620–90631, 99334, 126957–126958, PERU: Cajamarca: UF 39454–39457, Piura: UF 34717, 34734–34737, 34739–34742, 34744, 126959–126967.

Phyllodactylus ventralis.—VENEZUELA: Falcon: UF 40739–40741, Guarico: UF 40709–40710, 40729–40737, 60946, Portuguesa: UF 40671–40708, 40742–40743.

8.3 Appendix of Chapter 4.1

Specimens examined:

Polychrus peruvianus. — PERU: *Cajamarca*: Jaén: Santa Rosa (05°26'S, 078°33'W, 1250–1300 m a.s.l.), ZFMK 88710, CORBIDI 5731, CORBIDI 5732; Bellavista (05°39'49.8"S, 78°40'13.9"W, 411 m a.s.l.), CORBIDI 1863, CORBIDI 1857–8, ZFMK 88707; (05°38'06.6"S, 078°39'36.2"W, 405 m a.s.l.), CORBIDI 5728, ZFMK 90819, CORBIDI 5727, ZFMK 90818; (05°34'35.7"S, 078°38'10.8"W, 700 m a.s.l.), ZFMK 90820; Gota de Agua (05°41'S, 078°46'W), ZFMK 88708; Perico (05°21'16.5"S, 078°47'30.6"W, 443 m a.s.l.), CORBIDI 1933, ZFMK 88709; Perico (05°21'S, 078°47'W, 460–720 m a.s.l.), CORBIDI 5730, ZFMK 90822, CORBIDI 5729, ZFMK 90821; Pucará (06°02'S, 079°07'W, 900–930 m a.s.l.), ZFMK 88711, CORBIDI 1846, CORBIDI 5726, ZFMK 90817, CORBIDI 5725, CORBIDI 5724; *Amazonas*: Bagua: Bagua Grande (05°47'33.3"S, 078°23'04.9"W, 570 m a.s.l.), ZFMK 88712, CORBIDI 1852, ZFMK 88713; Utcubamba: Zapatalgo (06°04'S, 078°29'W, 900–130 m a.s.l.), CORBIDI 5733, ZFMK 90824, CORBIDI 5734, ZFMK 90823, CORBIDI 5735, ZFMK 90825; Puerto Malleta: (06°03'S, 078°36'W, 480–510 m a.s.l.), ZFMK 90824, 90826–7, CORBIDI 5736–8, ZFMK 90828; (06°04'S, 078°36W, 535 m), ZFMK 90829, CORBIDI 5739; Cumba (05°56'S, 078°39'W, 450–500 m a.s.l.), CORBIDI 5741, ZFMK 90830, CORBIDI 5740, ZFMK 90831–2, ZFMK 90833.

Polychrus gutturosus. — COLOMBIA: BM 1923.10.12.16; *Chocó*: Condoto, ca.100 m: BM 1913.11.12.18–19; *Popayan*: ZFMK 21341 (holotype); COSTA RICA: ZFMK 19047, ZFMK 25729, ZFMK 45355 (from animal trade, place and date not further specified); Pozo Azul: BM 1907.6.28.2; *Turrialba*, 900 m: ZFMK 31444 (from animal trade in 1980); *Limón*: Comatré: ZFMK 40830–31; *Punta Arenas*: Palmar: ZFMK 40832, ZFMK 40833; NICARAGUA: Rio San Juan: near Rio San Juan, SMF 83024 (from animal trade on 21 May 2001, place not further specified); PANAMA: BM 94.6.29.10; ECUADOR: St. Javier (NW Ecuador): BM 1901.3.29.19–20; Paramba: BM 98.4.28.33; *Esmeraldas*: Comunidad Selva Alegre, Rio Santiago: QCAZ 3490, QCAZ 6934, QCAZ 8817, QCAZ 9788; *Pichincha*: La Union del Toachi: QCAZ 6749; Santo Domingo de los Colorados: MHNG 2437.029, MHNG 1117.036; *Cotopaxi*: San Francisco de Las Pampas: MHNG 2437.028; *Imbabura*: Lita: MHNG 2531.062.

Polychrus spurrelli. — COLOMBIA: *Chocó*: Condoto: Peña Lisa: BM 1946.8.8.33–34 (syntypes); Andagoya: BM 1916.4.25.2–3.

8.4 Appendix of Chapter 5.1

APPENDIX I

Specimens examined:

Ameiva concolor. – PERU: Cajamarca: Paipoy, Rio Crisnejas: 24 km from Marañón (1067 m a.s.l.), male holotype UMMZ 59192 (examined by photographs); La Libertad: Bambamarca: Calemar (07°33'08.8"S, 077°42'35.9"W, 1125 m a.s.l.), CORBIDI 07662, ZFMK 91789; (07°32'S, 077°43', 1108–1126 m a.s.l.) CORBIDI 07661, 07663, ZFMK 91790–91; Tayabamba: Chagual (07°49'51.7"S, 077°38'35.5"W, 1360 m a.s.l.), CORBIDI 07659–60, ZFMK 91787; Pías (07°53'54.4"S, 077°34'45.0"W, 1720 m a.s.l.), ZFMK 91788.

Ameiva bifrontata divisa. – COLOMBIA: near Baranquilla, ZMH 09545–9.

APPENDIX II

19 Bioclimatic variables obtained from the WorldClim database

Variable	Explanation
BIO1	Annual Mean Temperature
BIO2	Mean Diurnal Range (Mean of monthly (max temp – min temp))
BIO3	Isothermality (BIO2/BIO7) (* 100)
BIO4	Temperature Seasonality (standard deviation *100)
BIO5	Max Temperature of Warmest Month
BIO6	Min Temperature of Coldest Month
BIO7	Temperature Annual Range (BIO5–BIO6)
BIO8	Mean Temperature of Wettest Quarter
BIO9	Mean Temperature of Driest Quarter
BIO10	Mean Temperature of Warmest Quarter
BIO11	Mean Temperature of Coldest Quarter
BIO12	Annual Precipitation
BIO13	Precipitation of Wettest Month
BIO14	Precipitation of Driest Month
BIO15	Precipitation Seasonality (Coefficient of Variation)
BIO16	Precipitation of Wettest Quarter
BIO17	Precipitation of Driest Quarter
BIO18	Precipitation of Warmest Quarter
BIO19	Precipitation of Coldest Quarter

APPENDIX III

Specimens used in the molecular analysis, respective localities and GenBank accession numbers.

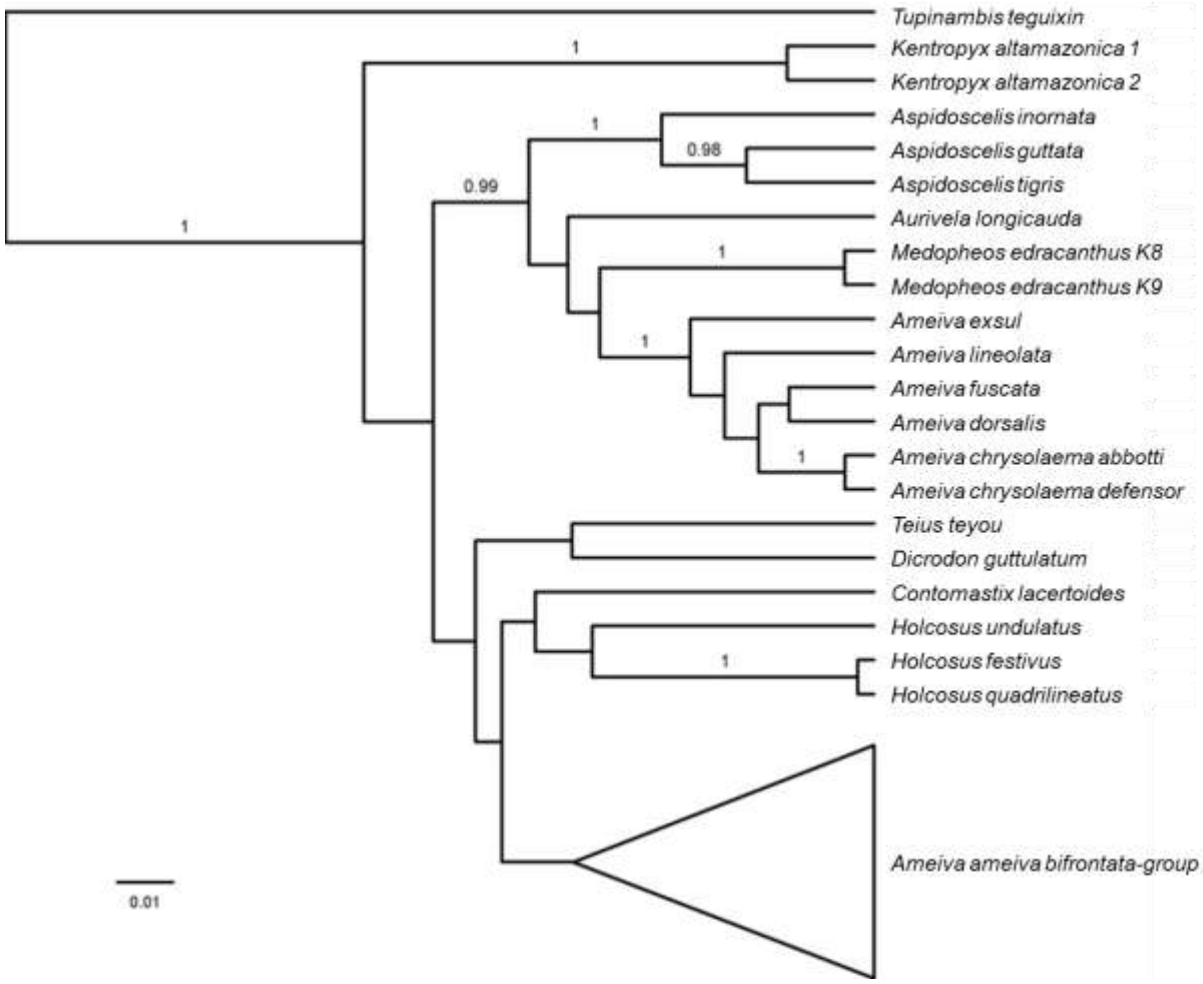
Species	Voucher No.	Locality	Reference	12S	16S
Ameiva aggerecusans sp. nov.	SDSU 3899	-	Reeder et al. 2002	AY046454	AY046496
Ameiva aggerecusans sp. nov. K11	ZFMK 90858	Peru: Region Cajamarca: Celendin: Chacanto	this study	KF742689	KF742705
Ameiva aggerecusans sp. nov. K5	ZFMK 90861	Peru: Region Amazonas: Utcubamba: Zapatalgo	this study	KF742697	KF742713
Ameiva ameiva 1	KU 205000	Peru: Region Madre de Dios: Puerto Maldonado	Reeder et al. 2002	AY046423	AY046465
Ameiva ameiva 2	ROM 20530	Guyana: Tukeit	Fu 2000	AF206586	AF206586
Ameiva ameiva 3	SBH 267103	Peru: Cuzco Amazónico	Hower & Hedges 2003	AY359473	AY359493
Ameiva ameiva K80	MTD 41641	Peru: Region Ucayali: Bolognesi	this study	KF742698	KF742714
Ameiva ameiva K81	MTD 41643	Peru: Region Pasco: Izcozacin	this study	KF742699	KF742715
Ameiva ameiva K82	MTD 46527	Peru: Region Pasco: Oxapampa	this study	KF742700	KF742716
Ameiva bifrontata divisa K84	MTD 10510	Colombia	this study	KF742701	KF742717
Ameiva bifrontata divisa K85	MTD 10511	Colombia	this study	KF742702	KF742718
Ameiva chrysolaema abbotti	SBH 194699	Dominican Republic: Pedernales Prov.: Isla Beata	Hower & Hedges 2003	AY359475	AY359495
Ameiva chrysolaema defensor	SBH 194588	Haiti: Dept. du Nord'Ouest: Bombardopolis	Hower & Hedges 2003	AY359476	AY359496
Ameiva concolor K13	CORBIDI 7659	Peru: Region La Libertad: Tayabamba: Chagual (Pataz)	this study	KF742691	KF742707
Ameiva concolor K14	ZFMK 91788	Peru: Region La Libertad: Tayabamba: Pias (Laguna)	this study	KF742692	KF742708
Ameiva concolor K15	CORBIDI 7661	Peru: Region La Libertad: Bambamarca: Calemar	this study	KF742693	KF742709
Ameiva dorsalis	SBH 194921	Jamaica: Kingston	Hower & Hedges 2003	AY359478	AY359498
Ameiva exsul	SBH 190726	Puerto Rico: Guánica	Hower & Hedges 2003	AY359480	AY359500
Ameiva fuscata	SBH 194215	Dominica: Soufrière Estate	Hower & Hedges 2003	AY359482	AY359502
Ameiva jacuba 1	CHUNB 47996	Brazil: Goiás: Mineiros	Giugliano et al. 2013	JQ762440	JQ762444
Ameiva jacuba 2	CHUNB 47997	Brazil: Goiás: Mineiros	Giugliano et al. 2013	JQ762441	JQ762445
Ameiva lineolata	SBH 194700	Dominican Republic: Pedernales Prov.: Isla Beata	Hower & Hedges 2003	AY359485	AY359505
Ameiva nodam sp. nov. K1	CORBIDI 1870	Peru: Region Cajamarca: Jaén: Bellavista	this study	KF742687	KF742703

(APPENDIX III continued)

Species	Voucher No.	Locality	Reference	12S	16S
Ameiva nodam sp. nov. K10	CORBIDI 5763	Peru: Region Cajamarca: Jaén: Perico	this study	KF742688	KF742704
Ameiva nodam sp. nov. K12	ZFMK 90865	Peru: Region Amazonas: Cumba: Cumba	this study	KF742690	KF742706
Ameiva nodam sp. nov. K16	CORBIDI 5762	Peru: Region Cajamarca: Jaén: Bellavista	this study	KF742694	KF742710
Ameiva nodam sp. nov. K2	ZFMK 88734	Peru: Region Cajamarca: Jaén: Pucará	this study	KF742695	KF742711
Ameiva nodam sp. nov. K3	CORBIDI 1874	Peru: Region Amazonas: Bagua: Bagua Chica	this study	KF742696	KF742712
Ameiva parecis 1	CHUNB 11655	Brazil: Rondônia: Vilhena	Giugliano et al. 2013	JQ762438	JQ762442
Ameiva parecis 2	CHUNB 11686	Brazil: Rondônia: Vilhena	Giugliano et al. 2013	JQ762439	JQ762443
Aspidoscelis guttata	MZFC 7044	Mexico: Oaxaca: 4.5 mi E jct Hwys 185 and 200	Reeder et al. 2002	AY046434	AY046476
Aspidoscelis inornata	AMNH R-126861	USA: Arizona: Coconino County	Reeder et al. 2002	AY046436	AY046478
Aspidoscelis tigris	ROM RWM647	Mexico: Baja California	Fu 2000	AF206585	AF206585
Aurivela longicauda	REE 130	Argentina: Mendoza Prov.: San Rafael: Embalse Nihuil	Reeder et al. 2002	AY046439	AY046481
Contomastix lacertoides	AMNH R-115938	Uruguay: Maldonado: Abra de Perdomo	Reeder et al. 2002	AY046437	AY046479
Dicrodon guttulatum	SDSU 3906	-	Reeder et al. 2002	AY046453	AY046495
Holcosus festivus	SBH 266426	Nicaragua: Matagalpa Prov.: El Carmen	Hower & Hedges 2003	AY359481	AY359501
Holcosus quadrilineatus	CRE 4807	Costa Rica: Limon: Guapiles	Reeder et al. 2002	AY046426	AY046468
Holcosus undulatus	SBH 266425	Guatemala: Izabal Prov.: Los Amates: Rancho Alegre	Hower & Hedges 2003	AY359491	AY359511
Kentropyx altamazonica 1	KU 205015	Peru: Region Madre de Dios: Puerto Maldonado	Reeder et al. 2002	AY046456	AY046498
Kentropyx altamazonica 2	AMNH R-134175	Venezuela: Amazonas: upper Rio Mavaca	Reeder et al. 2002	AY046455	AY046497
Medopheos edracanthus K8	ZFMK 85015	Peru: Region Lambayeque: Chaparri	this study	KF746173	KF746175
Medopheos edracanthus K9	ZFMK 45761	Ecuador	this study	KF746174	KF746176
Teius teyou	REE 150	Argentina: La Roija Prov.: Castro Barros	Reeder et al. 2002	AY046461	AY046503
Tupinambis teguixin	SBH 267102	Peru: Cuzco Amazónico	Hower & Hedges 2003	AY359490	AY359510

APPENDIX IV

Maximum clade credibility tree of the subfamily Teiinae inferred with BEAST using 653 bp of mitochondrial DNA (concatenated 12S and 16S rRNA). Values above branches are posterior probabilities.



9. PUBLICATIONS

CACCIALI, P., SCOTT, N. , YANOSKY, A., MOTTE, M. & C. KOCH (in prep.): Distribution of *Phyllopezus pollicaris* (Spix, 1825) (Sauria: Phyllodactylidae) in Paraguay with comments on diagnostic characters for subspecies.

AURICH, J., KOCH, C., FLECKS, M. & W. BÖHME (in prep.): First data on sexual dimorphism and reproduction of a gecko assemblage (Squamata: Phyllodactylidae) in the Marañón Region (Peru) consisting mostly of recently described species.

KOCH, C., VENEGAS, P.J. & W. BÖHME (in prep.): Annotated checklist and key to the species of amphibians and reptiles inhabiting the northern Peruvian dry forest along the andean valley of the Marañón River and its tributaries.

KOCH, C., VENEGAS, P.J., RÖDDER, D., FLECKS, M. & W. BÖHME (in press): Two new endemic species of *Ameiva* (Squamata: Teiidae) from the dry forest of northwestern Peru and additional information on *Ameiva concolor* Ruthven, 1924. – Zootaxa.

KOCH, C., VENEGAS, P.J., GARCIA-BRAVO, A. & W. BÖHME (2011): A new bush anole (Iguanidae: Polychrotinae: *Polychrus*) from the upper Marañon basin, Peru, with a redescription of *Polychrus peruvianus* (Noble, 1924) and additional information on *P. gutturosus* Berthold, 1845. – Zookeys 141: 79-107.

KOCH, C. & A.M. BERAÚN (2011): Notes on geographic distribution: Squamata, Phyllodactylidae, *Phyllodactylus thompsoni* Venegas, Townsend, Koch and Böhme, 2008 and *Phyllodactylus delsolari* Venegas, Townsend, Koch and Böhme, 2008: Latitudinal and altitudinal distribution extension and geographic distribution map. – Check List 7 (3): 272-275.

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KOCH, C. (2010): Geheimnisvolles Peru. – Reptilia 15 (82): 36-45.

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KOCH, C. (2008): Neu aus den Anden Perus: zwei Blattfingergeckos der Gattung *Phyllodactylus.* – Terraria 13: 82.

VENEGAS, P.J., TOWNSEND, J.H., KOCH, C. & W. BÖHME (2008): Two new sympatric species of leaf-toed geckos (Gekkonidae: *Phyllodactylus*) from the Balsas region of the upper Marañon Valley, Peru. – Journal of Herpetology 42 (2): 386-396.

KOCH, C. (2007): Freilanduntersuchungen an *Boa constrictor ortonii* im privaten Naturschutzreservat Chaparrí in Nordperu. In: **STÖCKL, H. & E. STÖCKL (2007)**: Reinrassige Boa constrictor. – M&S Verlag: 121-123.

RÖDDER, D. & C. KOCH (2007): Beschreibung des Anzeige- und Befreiungsrufes von *Phyllobates vittatus* (COPE, 1893). – Sauria 29 (4): 31-34.

KOCH, C. (2006): Die Reptilien und Amphibien zweier ausgewählter Gebiete des Tumbesischen Trockenwaldes in Nordperu. - unveröffentlichte Diplomarbeit, 222 S.

KOCH, C., VENEGAS, P.J. & W. BÖHME (2006): A remarkable discovery: Description of a big-growing new gecko (Squamata: Gekkonidae: *Phyllopezus*) from northwestern Peru. – Salamandra 42 (2/3): 145-150.