Amphibians and reptiles of the lower Río Llullapichis, Amazonian Peru: updated species list with ecological and biogeographical notes

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Abstract

A checklist of amphibians and reptiles of the lower Llullapichis drainage, upper Amazon basin, eastern Peru, and additional notes on ecology and distribution patterns of amphibians and reptiles are presented. One hundred and fifty three species of amphibians and reptiles are presently known from the Estación Biológica Panguana. The herpetofauna includes one caecilian, 73 anurans, two crocodiles, six turtles, one amphisbaenian, 26 lizards, and 44 snakes. Six anurans (1 dendrobatid, 1 hylid, 4 leptodactylids) are yet unassignable to species. Ten basic distribution patterns can be distinguished. Our results indicate that 57 % of the amphibian and 63 % of the reptile species are widely distributed, 31 % of amphibians and 16 % of reptiles are distributed in western Amazonia, and 12 % of the amphibians and 17 % of reptiles are restricted to different smaller areas of distribution. The composition of anurans and lizards of the lower Llullapichis reflects its intermediate geographic position within the upper Amazon basin. Data on habitat preferences, diel activity and food are presented.

Key words: Amphibia; Reptilia; species diversity; diel activity; food; distribution patterns; habitat preference; upper Amazon basin; Panguana; Peru.

1 Introduction

Information on herpetological communities of the upper Amazon Basin has been provided for Santa Cecilia, Ecuador (CRUMP 1974, DUELLMAN 1978), Panguana, Peru (SCHLÜTER 1984), Departamento Loreto, Peru (LESCURE & GASC 1986, DUELLMAN & MENDELSON 1995), Cocha Cashu, Peru (RODRÍGUEZ & CADLE 1990, RODRÍGUEZ 1992), Cuzco Amazónico, Peru (DUELLMAN & SALAS 1991), Serranía de Sira, Peru (HENZL 1991), Puerto Almacén, Bolivia (DE LA RIVA 1993), Balta, Río Curanje, Peru (DUELLMAN & THOMAS 1996), and Pakitza, Manu National Park, Peru (MORALES & MCDIARMID 1996). In addition, DUELLMAN (1990) compared anuran communities of ten study sites in the upper Amazon Basin.

Studies on anurans from the Estación Biológica Panguana, Río Llullapichis drainage, Departamento Huánuco, Peru, were carried out by TOFT (1976, 1980), TOFT & DUELLMAN (1979), SCHLÜTER (1979, 1980 a, b, c, 1981 a, b, 1984, 1987 a, b, c, 1990), REGÖS & SCHLÜTER (1984), AICHINGER (1987), SCHLÜTER & ICOCHEA (1995), SCHLÜTER & REGÖS (1981, 1996), SCHLÜTER & SALAS (1991) and HEDGES & SCHLÜTER (1992) (for detailed description of the area see TOFT & DUELLMAN 1979, HANAGARTH 1981 and SCHLÜTER 1979, 1984). MEEDE (1984) and HENZL (1991) conducted taxonomical and ecological studies on reptiles from the Panguana region. PODLOUCKY (1987) studied the turtles of the Llullapichis region. Additional relevant taxonomic data were contributed by HEYER (1994), HADDAD & MARTINS (1994), DUELLMAN & THOMAS (1996), HOOGMOED & GRUBER (1983), ERNST (1983), AVILA-PIRES (1995), DUELLMAN (1989) and DE LA RIVA & DUELLMAN (1997). The taxonomic status of some dendrobatids, leptodactylids, and hylids has to be treated as provisional, awaiting further revision.

The purpose of this paper is to present a species list for amphibians and reptiles of the lower Llullapichis drainage, supplemented by ecological and biogeographical notes.

2 Material and Methods

Specimens of most of the mentioned species were collected during discontinuous field research by the authors and colleagues between 1977 and 1998. Observations on life history were casual. Detecting the presence of snakes, crocodiles, turtles, and amphisbaenians as well as gymnophiones is difficult and accidental. Data on the abundance of lizards are easier to obtain, because most of them are common and relatively easy to collect at night while sleeping on vegetation. Most frogs can be traced during day work (e. g. aposematic dendrobatids) or, when breeding, during night time at water bodies. According to habitat preference and agility a combination of hand collecting and pitfall trapping was the most effective approach. Hand collecting was done by walking trails both by day and night. Pitfall traps were mainly established near water-filled depressions. These traps were checked each morning, again shortly before dark, and at night. All individuals were recorded with respect to habitat, time, height above ground and additional observations. If possible, tape recordings of frog voices were made. After being anesthetized with chlorobutanole specimens determined to become scientific vouchers, were preserved in 5 % formalin and transferred to 70 % ethanol.

Preserved herpetological material mainly collected by H-W. and M. KOEPCKE, A. SCHLÜTER (amphibians and reptiles), M. AICHINGER, M. HENZL, R. AUSSEM, C.A. TOFT (amphibians), U. MEEDE (lizards) and R. PODLOUCKY (turtles), is deposited at the Museo de Historia Natural, Universidad Mayor de San Marcos, Lima (MUSM; formely MHNSM), Staatliches Museum für Naturkunde Stuttgart (SMNS), Zoologisches Institut und Zoologisches Museum der Universität Hamburg (ZMH), The University of Kansas, Museum of Natural History, Lawrence, Kansas (KU), Naturhistorisches Museum Wien (NMW) and Staatliches Museum für Naturkunde Karlsruhe (SMNK). Stomach contents were sent to the Insect Identification and Beneficial Insect Introduction Institute in Beltsville, Maryland. Data of investigated material, along with others available from literature, were analyzed in order to understand distribution patterns of amphibian and reptile species.

3 Results

3.1 Species account

As presently understood, the herpetofauna of the investigated area consists of 153 species representing 24 families and 86 genera. Data on habitat, diel activity, and food are summarized in tables 1 and 2, combining schemes used by DUELLMAN (1989, 1990) and MORALES & MCDIARMID (1996).

Records of *Leptodactylus wagneri* (reported by DUELLMAN 1978, TOFT & DUELLMAN 1979, SCHLÜTER 1980c, 1984, 1987a, b) refer to *L. leptodactyloides* (sensu HEYER 1994). *Dendrobates quinquevittatus* (as reported by DUELLMAN 1978, TOFT & DUELLMAN 1979, SCHLÜTER 1980c, 1984, 1987a, b) shall be treated *D. ventrimaculatus* sensu lato and *Phyllobates pictus* as used by these authors is a member of the *Epipedobates hahneli* complex (comp. HADDAD & MARTINS 1994, DUELLMAN & THOMAS 1996). *Phyllobates femoralis* as reported in previous publications was allocated to the genus *Allobates* and may reflect a complex of species, too (ZIMMERMANN & ZIMMERMANN 1988, VENCES et al. 2000). The record of *Hyla rossalleni* was assigned to *H. leali* (DE LA RIVA & DUELLMAN 1997). CALDWELL et al. (2002) suggested that *Colostethus* from the upper Amazon Basin do not belong to *C. marchesianus* (as they were called previously) and that populations currently referred to as *C. marchesianus* (e. g. MORALES 2000) represent a number of similar species. The *Bufo margaritifer*-complex represents a

"special case". The taxonomy of the species in this group is largely unsolved (HOOGMOED 1986, 1989, 1990). In Panguana two forms, probably species, occurring in different habitats (form "A" in forest leaf litter; form "B" on open ground at river margins) can be distinguished.

MEEDE's (1984) earlier list of reptiles of that area has to be corrected as already indicated by HENZL (1991), e. g. the name *Phrynops nasutus* has to be changed to *P. gibbus* and *Platemys radiolata*, a species occurring in southeastern Brazil, does not occur at Panguana (see also PODLOUCKY 1987). *Podocnemis expansa*, known from the Río Pachitea, does not exist in the Llullapichis region; its name has to be replaced by *P. unifilis*. *Platemys platycephala* specimens have been identified herein as the subspecies *melanonota* (sensu ERNST 1983). The record of *Mabuya mabouya* (MEEDE 1984) represents *M. bistriata* (sensu HOOGMOED & GRUBER 1983). In the case of *Corallus enydris*, MCDIARMID et al. (1996) indicated that its proper name should be *C. hortulanus*. *Rhadinea brevirostris* has changed to the genus *Taeniophallus* (MYERS & CADLE 1994). Based on the morphology of the hemipenes, *Oxybelis argenteus* has to be allocated to the genus *Xenoxybelis* (RODRÍGUES 1993). The genus *Uracentron* is referred to as synonym of *Tropidurus* as stated by FROST & ETHERIDGE (1989). *Plica*, formely referred to as synonym of *Tropidurus* (FROST & ETHERIDGE 1989) has been resurrected by FROST et al. (2001).

3.2 Distribution patterns

The distribution patterns of the amphibian and reptilian species found in the study area can be divided into ten basic categories (SCHLÜTER 1984, HENZL 1991; cf. DUELLMAN 1978, HOOGMOED 1979) (figs. 1-4):

1. Widespread: The distribution patterns falling into this category extend far beyond the rain forests east of the Andes. They comprise different parts of Central America, the Chocó rain forests on the western slope of the Andes, the rain forests in the north of Colombia and Venezuela and partly gallery forests and savannah areas north and south of the Amazon basin.
2. Amazon: The catchment of the Amazon River with its tributaries. Species of this category partly occur in rain forests of the Guiana shield as well.
3. Amazon and Atlantic Forests: This disjunct distribution pattern is represented by numerous species. Only a few of them reach the upper Amazon basin.
4. Peripheral Amazon: This distribution pattern covers all the Amazonian edges, but does not reach the central basin.
5. Western Amazon: The upper Amazon basin of Colombia, Ecuador, and Peru.
6. South-western Amazon: Southern part of the upper Amazon basin south of the Marañón and Amazon Rivers (Peru, Bolivia and adjacent Brazil).
7. Cordillera Oriental: Eastern slopes of the Andes from Colombia to Bolivia.
8. Southern Cordillera Oriental: Eastern slopes of the Andes south of the Huancabamba Depression (Peru and Bolivia).
9. Ucayali: Species distributed only in central and southern Peru east of the Andes, confined to the area of the middle Ucayali River.
10. Pachitea: Species whose distribution is limited to the drainage of the Río Pachitea.

Our analysis revealed that 57 % of the amphibians and 63 % of the reptile species are widely distributed (categories "Widespread", "Amazon", "Amazon and Atlantic Forest"), 31 % of amphibians and 16 % of reptiles are distributed in western Amazonian, and 12 % of the amphibians and 17 % of reptiles are restricted to different small areas of distribution (figs. 1-4).

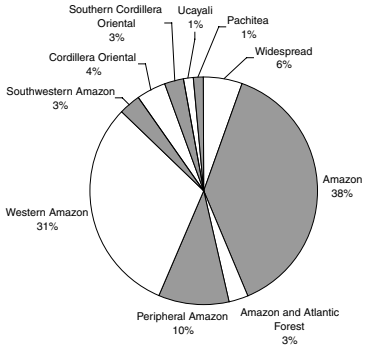

Fig. 1. Distribution patterns of amphibians of the lower Río Llullapichis.

Verbreitungstypen der am unteren Río Llullapichis nachgewiesenen Amphibien.

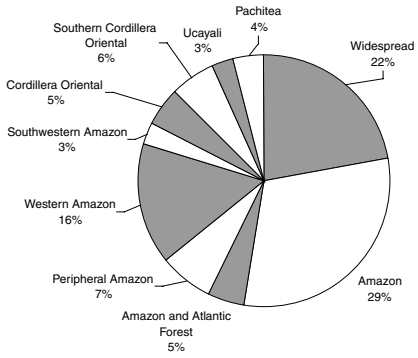

Fig. 2. Distribution patterns of reptiles (lizards and snakes) of the lower Río Llullapichis.

Verbreitungstypen der am unteren Río Llullapichis nachgewiesenen Reptilien (Eidechsen und Schlangen).

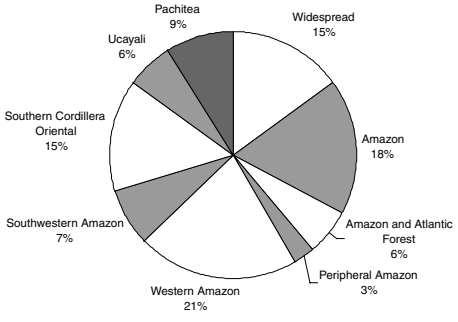

Fig. 3. Distribution patterns of lizards of the lower Río Llullapichis.

Verbreitungstypen der am unteren Río Llullapichis nachgewiesenen Eidechsen.

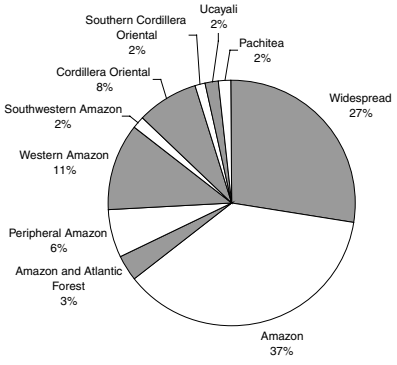

Fig. 4. Distribution patterns of snakes of the lower Río Llullapichis.

Verbreitungstypen der am unteren Río Llullapichis nachgewiesenen Schlangen.

3.3 Habitat preferences

According to figure 5, it is evident that a considerably greater number of amphibians and reptiles is found in forest habitats than in woodless regions. In riverine areas, the amphibian and reptile fauna is also species-rich. This is different in man-made, cleared habitats, which are markedly species-poor. The species which occur there are mainly

those which (in undisturbed regions) prefer open areas, such as river banks and clearings created by fallen trees (*Adenomera hylaedactyla*, *Bufo marinus*, *Ameiva ameiva, Kentropyx pelviceps, Mabuya bistriata, Leptophis ahaetulla, Oxybelis aeneus, Spilotes pullatus*). The snake species *Clelia clelia, Spilotes pullatus, Epicrates cenchria* and *Bothrops atrox* can frequently be seen foraging on clearings or in the vicinity of human settlements. *Bothrops* and *Clelia* are often observed beneath and under the huts of the Estación Biológica Panguana.

The importance of the time of the day for habitat preferences becomes apparent in figures 5 and 6. Diurnal frog species mainly occur on the ground, whereas nocturnal species are mostly arboreal. Similarly, diurnal reptiles mostly stay on the ground, whereas the percentage of arboreal species is higher at night (DUELLMAN & TRUEB 1986).

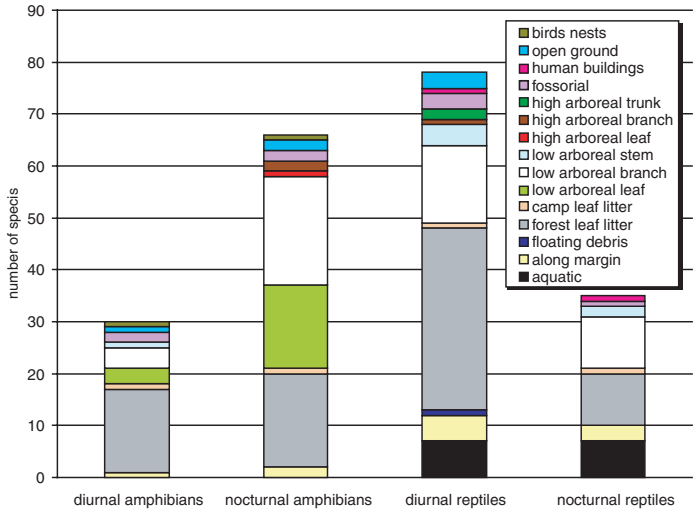

Fig. 5. Habitat preferences of diurnal and nocturnal amphibians and reptiles at the lower Río Llullapichis.

Habitatbindung tag- und nachtaktiver Amphibien und Reptilien des unteren Río Llullapichis.

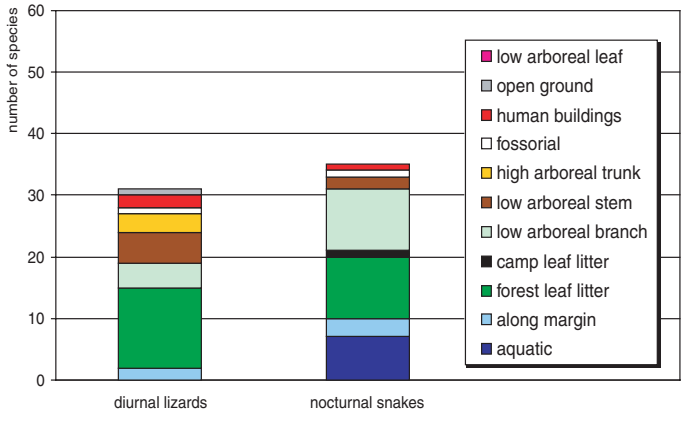

Fig. 6. Habitat preferences of diurnal and nocturnal snakes at the lower Río Llullapichis.

Habitatbindung tag- und nachtaktiver Schlangen des unteren Río Llullapichis.

Taxon	Habitat	Diel activity/ Circadiane Aktivität	Food/ Nahrung
GYMNOPHIONA			
Caeciliidae			
Siphonops annulatus (MIKAN, 1820)	fo	N	Ea
ANURA			
Bufonidae			
Bufo glaberrimus GÜNTHER, 1868	fl	?	I
Bufo marinus (LINNAEUS, 1758)	fl,og	N	I,An,Fr,Sn
Bufo margaritifer (LAURENTI, 1768) complex – var. "A"	fl	ND	I(An)
Bufo margaritifer (LAURENTI, 1768) complex – var. "B"	og	N	I(An)
Dendrophryniscus minutus (MELIN, 1941)	fl	ND	I(An)
Dendrobatidae			
Colostethus sp.	Fl,am	D	An
Dendrobates ventrimaculatus sensu lato SHREVE, 1935	lab	D	An
Allobates femoralis complex (BOULENGER, 1833)	fl	D	I
Epipedobates petersi SILVERSTONE, 1976	fl,og	D	
Epipedobates hahneli complex (BOULENGER, 1884 "1883")	fl	D	I(An)
Epipedobates trivittatus (SPIX, 1824)	fl	D	An
Hylidae			
Hyla boans (LINNAEUS, 1758)	lab,hab	N	I
Hyla brevifrons DUELLMAN & CRUMP, 1974	lal	ND	I
Hyla calcarata TROSCHEL, 1848	lab	N	I
Hyla fasciata GÜNTHER, 1859	lab	N	I
Hyla geographica SPIX, 1824	lab	N	I
Hyla granosa BOULENGER, 1882	lal	N	I
Hyla leali BOKERMANN, 1964	lal	N	I
Hyla leucophyllata (BEIREIS, 1783)	lab	ND	I
Hyla marmorata (LAURENTI, 1768)	lab	N	I
Hyla cf. *minuta* PETERS,1872	lal	N	I
Hyla parviceps BOULENGER, 1882	lal	N	I
Hyla rhodopepla GÜNTHER, 1859	lal	N	I
Hyla riveroi COCHRAN & GOIN, 1970	lal	N	I
Hyla sarayacuensis SHREVE, 1935	lal	N	I
Hyla sp.	lal	N	?
Osteocephalus leprieurii (DUMÉRIL & BIBRON, 1841)	lab	N	I
Osteocephalus planiceps COPE, 1874	lab	N	I
Osteocephalus taurinus STEINDACHNER, 1862	lab	N	I
Phrynohyas coriacea (PETERS, 1867)	lab	N	I
Phrynohyas resinifictrix (GOELDI, 1907)	lab	N	I
Phrynohyas venulosa (LAURENTI, 1768)	lab	N	I
Phyllomedusa palliata PETERS, 1872	lab,T	N	I
Phyllomedusa tarsius (COPE, 1868)	lab	N	I
Phyllomedusa tomopterna (COPE, 1868)	hab	N	I
Phyllomedusa vaillanti BOULENGER, 1882	lab	N	I
Scinax cruentomma (DUELLMAN, 1972)	lab	N	I
Scinax funereus (COPE, 1874)	lat	N	I
Scinax garbei (MIRANDA-RIBEIRO, 1926)	lat	ND	I
Scinax ruber LAURENTI, 1768	lab, ne	ND	I
Centrolenidae			
Cochranella midas (LYNCH & DUELLMAN, 1973)	lal	N	I
Hyalinobatrachium munozorum (LYNCH & DUELLMAN, 1973)	lal	N	I

Leptodactylidae			
Adenomera andreae (Müller, 1923)	fl	ND	I
Adenomera hylaedactyla (Cope, 1868)	cl	ND	I
Ceratohrys cornuta (Linnaeus,1758)	fl	ND	Fr
Edalorhina perezi Jiménez de la Espada, 1871	fl	ND	I
Eleutherodactylus acuminatus Shreve, 1835	fl	ND	
Eleutherodactylus altamazonicus Barbour & Dunn, 1921	lal	ND	I
Eleutherodactylus carvalhoi Lutz & Kloss, 1952	lal	N	I
Eleutherodactylus diadematus (Jiménez de la Espada, 1875)	las		
Eleutherodactylus eurydactylus Hedges & Schlüter, 1992	lal	N	I
Eleutherodactylus imitatrix Duellman, 1978	fl		
Eleutherodactylus lacrimosus (Jiménez de la Espada, 1875)	lal	N	I
Eleutherodactylus ockendeni (Boulenger, 1912)	lal,fl	ND	I
Eleutherodactylus peruvianus (Melin, 1941)	lab,fl	N	I
Eleutherodactylus sulcatus (Cope, 1874)	fl	ND	I
Eleutherodactylus toftae Duellman, 1978	lab	D	I
Eleutherodactylus ventrimarmoratus (Boulenger, 1912)	lab	N	I
Eleutherodactylus sp. "A"	fl	D	I
Eleutherodactylus sp. "B"	fl	ND	I
Eleutherodactylus sp. "C"	lab	N	I
Eleutherodactylus sp. "D"	lab	N	I
Ischnocnema quixensis (Jiménez de la Espada, 1872)	fl	N	I
Leptodactylus leptodactyloides (Andersson, 1945)	fl,am	ND	I
Leptodactylus pentadactylus (Laurenti, 1768)	fl,am	N	Fr,I
Leptodactylus rhodomystax Boulenger, 1883	fl	N	I
Leptodactylus rhodonotus (Günther, 1868)	fl	N	I
Lithodytes lineatus (Schneider, 1799)	fo,fl	ND	I
Phyllonastes myrmecoides (Lynch, 1978)	fl	?	?
Physalaemus petersi (Jiménez de la Espada, 1872)	fl	N	Te
Microhylidae			
Chiasmocleis ventrimaculata (Andersson, 1945)	fl	ND	I (An)
Ctenophryne geayi Mocquard, 1904	fo,fl	ND	I (An)
Hamptophryne boliviana (Parker, 1927)	fl	ND	I (An)

Tab. 1. Habitat preference, diel activity, and food categories of amphibians at the lower Río Llullapichis. Abbreviations: Habitat: aw = aquatic; am = along margins; af = on floating debris; fl = leaf litter in forest; cl = leaf litter in camp; lal = low arboreal on leaf; lab = low arboreal on branch; las = low arboreal on stem; hal = high arboreal on leaf; hab = high arboreal on branch; hat = high arboreal on trunk; fo = fossorial; b = Building in camp; og = open ground; ne = in birds nests. Diel activity: D = diurnal; N = nocturnal; ND nocturnal and diurnal. Food: An = ants, Ea = earthworms, Fr = frogs, I = insects and other small arthropods, I (An) = insects (mostly ants), I (An, Te) = insects (mostly ants and termites), Sn = snakes, Te = termites.

Biotopbindung, diurnale Aktivität und Nahrung der Amphibien des unteren Río Llullapichis. Abkürzungen: Biotop: aw = aquatisch; am = in Ufernähe; af = an auf dem Wasser liegenden Strukturen; fl = Falllaub im Wald; cl = Falllaub im Camp; lal = unterer Baumbereich auf Blättern; lab = unterer Baumbereich an Ästen; las = unterer Baumbereich am Stamm; hal = höhere Baumschichten auf Blättern; hab = höhere Baumschichten an Ästen; hat = höhere Baumschichten am Stamm; fo = eingegraben im Boden; b = Stationshaus; og = offener Untergrund; ne = in Vogelnestern. Diurnale Aktivität: D = tagaktiv; N = nachtaktiv; ND = nacht- und tagaktiv. Nahrung: An = Ameisen, Ea = Regenwürmer, Fr = Frösche, I = Insekten und andere Arthropoden, I (An) = Insekten (überwiegend Ameisen), I (An, Te) = Insekten (überwiegend Ameisen und Termiten), Sn = Schlangen, Te = Termiten.

Taxon	Habitat	Diel activity/ Circadiane Aktivität	Food/ Nahrung
CROCODYLIA			
Alligatoridae			
Caiman crocodilus crocodilus (LINNAEUS, 1758)	aw	N	Ma,Tu,Fi
Paleosuchus trigonatus (SCHNEIDER, 1801)	aw	N	Fi,Fr
TESTUDINES			
Pelomedusidae			
Podocnemis unifilis TROSCHEL, 1848	aw,af	D	H
Chelidae			
Phrynops geoffroanus (SCHWEIGGER, 1812)	aw	D	Fi,Fr,I,Al
Phrynops gibbus (SCHWEIGGER, 1812)	aw	D	Fi,Fr,I,Al
Platemys platycephala melanonota ERNST, 1983	aw	ND	Fi,Fr,I,Al,Ae
Testudinidae			
Chelonoidis denticulata (LINNAEUS, 1766)	fl	D	H
Kinosternidae			
Kinosternon scorpioides scorpioides (LINNAEUS, 1766)	aw	ND	Fi,Fr,I,Al
SQUAMATA			
Amphisbaenidae			
Amphisbaena slateri BOULENGER, 1907	fl	?	I
Hoplocercidae			
Enyalioides palpebralis (BOULENGER, 1883)	lab,las	DH	I
Iguanidae			
Iguana iguana LINNAEUS, 1758	hat,am	DH	H
Polychrotidae			
Anolis punctatus DAUDIN, 1802	lab,hat	DS	I
Norops fuscoauratus fuscoauratus (D'ORBIGNY IN DUMÉRIL & BIBRON, 1837)	fl,lab	DS	I
Norops ortonii (COPE, 1868)	lab	DH	I
Polychrus marmoratus (LINNAEUS, 1758)	hat,lat	DH	I
Tropiduridae			
Plica plica (LINNAEUS, 1758)	las	DH,DS	I(An,Te)
Plica umbra ochrocollaris (SPIX, 1825)	las	DS	I(An,Te)
Stenocercus aculeatus (O'SHAUGNESSY, 1879)	fl	D	?
Stenocercus roseiventris DUMÉRIL & BIBRON, 1837	fl	DH	I
Stenocercus tricristatus (DÚMERIL, 1851)	fl	D	
Tropidurus flaviceps (GUICHENOT, 1855)	hab	DH	I
Gekkonidae			
Gonatodes humeralis (GUICHENOT, 1855)	b,las	DH	I(Te)
Pseudogonatodes guianensis PARKER, 1935	fl	DS	I
Thecadactylus rapicaudus (HOUTTUYN, 1782)	b,las	N	I,Sp
Gymnophthalmidae			
Alopoglossus angulatus (LINNAEUS, 1758)	fl	DS	?
Arthrosaura reticulata (O'SHAUGNESSY, 1881)	fl	DS	I
Bachia peruana (WERNER, 1901)	fo	DS	?
Cercosaura ocellata bassleri RUIBAL, 1952	fl	DS	?
Iphisa elegans GRAY, 1851	fl	DS	I
Neusticurus ecpleopus COPE, 1875	am,fl,fo	DS	I
Prionodactylus argulus (PETERS, 1863)	fl	DH	I

Teiidae			
Ameiva ameiva (Linnaeus, 1758)	og	DH	I,Li
Kentropyx pelviceps Cope, 1868	fl,	DH	I
Tupinambis teguixin (Linnaeus, 1758)	og	DH	O
Scincidae			
Mabuya bistriata (Spix, 1825)	fl	DH	I
SQUAMATA – OPHIDIA			
Aniliidae			
Anilius scytale scytale (Linnaeus, 1758)	fo	ND	?
Boidae			
Boa constrictor constrictor Linnaeus, 1758	fl	ND	Ma
Corallus caninus (Linnaeus, 1758)	lab	N	Bi,Ma
Corallus hortulanus (Linnaeus, 1758)	lab	N	Bi,Ma
Epicrates cenchria cenchria (Linnaeus, 1758)	lab	N	Ma
Eunectes murinus murinus (Linnaeus, 1758)	aw,am	ND	Ma,Cr
Colubridae			
Chironius carinatus (Linnaeus, 1758)	fl	DH	Fr
Chironius fuscus (Linnaeus, 1758)	fl	DH	Fr,Li
Chironius multiventris multiventris Schmidt & Walker, 1943	fl	DH	Fr
Chironius scurrulus (Wagler, 1824)	fl	DH	Fr
Clelia clelia clelia (Daudin, 1803)	lab,fl	ND	Li,Sn
Dipsas catesbyi (Sentzen, 1796)	lab	N	Ga
Drepanoides anomalus (Jan, 1863)	fl	N	?
Drymarchon corais corais (Boie, 1827)	fl	DH	Li,Sn
Drymobius rhombifer (Günther, 1860)	fl	DH	Li
Drymoluber dichrous (Peters, 1863)	fl	DH	Fr,Li
Erythrolamprus aesculapii aesculapii (Linnaeus, 1766)	fl	DH	Sn
Helicops angulatus (Linnaeus, 1758)	am,aw	ND	Al,Fr,Fi
Imantodes cenchoa (Linnaeus, 1758)	lab,las	N	Li
Imantodes lentiferus (Cope, 1894)	lab	N	Fr
Leptodeira annulata annulata (Linnaeus, 1758)	fl,lab	N	Fr
Leptophis ahaetulla ((Linnaeus, 1758)	lab	DH	Fr
Leptophis cupreus (Cope, 1868)	lab	DH	Fr
Liophis reginae semilineata (Linnaeus, 1758)	lfl	DH	Fr
Oxybelis aeneus (Wagler, 1824)	lab	DH	Li
Oxybelis fulgidus (Daudin, 1803)	lab	DH	Bi
Oxyrhopus melanogenys (Tschudi, 1845)	fl	ND	Li
Oxyrhopus petola digitalis (Reuss, 1834)	fl	DN	?
Philodryas viridissimus (Linnaeus, 1758)	fl	DH	?
Pseustes poecilonotus (Günther, 1858)	lab,fl	DH	Bi,Ma
Pseustes sulphureus sulphureus (Wagler, 1824)	lab,fl	DH	Ma
Taeniophallus brevirostris (Peters, 1863)	fl	DH	Li
Siphlophis cervinus (Laurenti, 1768)	fl	N	Li
Spilotes pullatus pullatus (Linnaeus, 1758)	lab,fl	DH	Bi,Ma,Sn
Xenodon severus (Linnaeus, 1758)	fl	DH	Fr
Xenopholis scalaris (Wucherer, 1861)	fl	DS	?
Xenoxybelis argenteus (Daudin, 1803)	lab	DH	Fr,Li
Elapidae			
Micrurus annellatus annellatus (Peters, 1871)	fl	DS	?
Micrurus lemniscatus helleri Schmidt & Schmidt, 1925	og	DS	Fi
Micrurus surinamensis surinamensis (Cuvier, 1817)	fl,am,aw	ND	Fi
Viperidae			
Bothriopsis bilineata (Wied, 1825)	lab	ND	Bi,Fr,Ma
Bothrops atrox (Linnaeus, 1758)	fl,lab,cl	ND	Li,Fr,Ma

Lachesis muta muta (LINNAEUS, 1766)	fl	N	Ma
Leptotyphlopidae			
Leptotyphlops albifrons (WAGLER, 1824)	fo	?	An,Te

Tab. 2. Habitat utilization, diel activity, and food categories of reptiles at the lower Río Llullapichis. Habitat: aw = aquatic; am = along margins; af = on floating debris; fl = leaf litter in forest; cl = leaf litter in camp; lal = low arboreal on leaf; lab = low arboreal on branch; las = low arboreal on stem; hal = high arboreal on leaf; hab = high arboreal on branch; hat = high arboreal on trunk; fo = fossorial; b = Building in camp; og = open ground. Diel activity: DH = diurnal heliophlic; DS = diurnal shade; N = nocturnal; ND = nocturnal and diurnal. Food categories: Ae = anuran eggs; Al = anuran larvae; An = ants; Bi = birds; Cr = crocodiles; Ea = earthworms; Fi = fishes; Fr = frogs; H = herbivorous; I = insects and other small arthropods; I(An) = insects (mostly ants); I (An, Te) = Insects (mostly ants and termites); Li = lizards; Ma = mammals; O = omnivorous; Sn = snakes; Sp = spiders; Te = termites; Tu = turtles.

Biotopbindung, diurnale Aktivität und Nahrung der Reptilien des unteren Río Llullapichis. Abkürzungen: Biotop: aw = aquatisch; am = in Ufernähe; af = an auf dem Wasser liegenden Strukturen; fl = Falllaub im Wald; cl = Falllaub im Camp; lal = unterer Baumbereich auf Blättern; lab = unterer Baumbereich an Ästen; las = unterer Baumbereich am Stamm; hal = höhere Baumschichten auf Blättern; hab = höhere Baumschichten an Ästen; hat = höhere Baumschichten am Stamm; fo = eingegraben im Boden; b = Stationshaus; og = offener Untergrund. Diurnale Aktivität: DH = tagaktiv; heliophil; DS = tagaktiv; schattenliebend; N = nachtaktiv; ND = nacht- und tagaktiv. Nahrung: Ae = Amphibienlaich; Al = Kaulquappen; An = Ameisen; Bi = Vögel; Cr = Krokodile; Ea = Regenwürmer; Fi = Fische; Fr = Frösche, H = herbivor; I = Insekten und andere Arthropoden, I (An) = Insekten (überwiegend Ameisen); I (An, Te) = Insekten (überwiegend Ameisen und Termiten); Li = Eidechsen; Ma = Säugetiere; O = omnivor; Sn = Schlangen; Sp = Spinnen; Te = Termiten; Tu = Schildkröten.

	Panguana, Peru	Santa Cecilia, Ecuador	Northern Loreto, Peru	Cocha Cashu, Peru	Cuzco Amazónico, Peru	Manaus, Brazil
Panguana, Peru	**73** **26**	52 18	44 20	55 20	46 17	20 12
Santa Cecilia, Ecuador	*0,51* *0,47*	**81** **30**	49 18	51 16	42 16	26 9
Northern Loreto, Peru	*0,46* *0,67*	*0,67* *0,66*	**66** **24**	37 14	33 9	21 9
Cocha Cashu, Peru	*0,56* *0,76*	*0,63* *0,57*	*0,51* *0,56*	**80** **26**	51 16	21 10
Cuzco Amazónico, Peru	*0,61* *0,58*	*0,58* *0,61*	*0,51* *0,38*	*0,71* *0,65*	**64** **23**	20 10
Manaus, Brazil	*0,31* *0,37*	*0,42* *0,33*	*0,39* *0,38*	*0,34* *0,40*	*0,38* *0,42*	**42** **24**

Tab. 3. Species of anurans and lizards in six Amazonian regions, modified after DUELLMAN & MENDELSON (1995) including Panguana. The upper number each refers to anurans, the lower to lizards. Right hand side are numbers of species occuring in two regions (the total number of species in each region is in bold); left hand side in italics are WHITTAKER'S Coefficient of Biogeographic Resemblance.

Anuren- und Eidechsenarten in sechs amazonischen Gebieten modifiziert nach DUELLMAN & MENDELSON (1995) unter Einschluss von Panguana. Die obere Zahl bezieht sich jeweils auf Anuren, die untere auf Eidechsen. Rechts stehen die Zahlen der Arten, die gemeinsam in zwei Regionen vorkommen (die Gesamtzahl einer Region steht in fett); links WHITTAKER'S Biogeografischer Ähnlichkeitskoeffizient.

4 Discussion

As mentioned by DUELLMAN (1978), studies on ecological differences cannot be complete, because any kind of community consists of all of the organisms that live together in a particular place and time. Data on habitat, diel activity and food have been considered only in part of this study. We suspect that future investigations will increase the number of known amphibian and reptile species. A significant fact restricting our knowledge about the presence of reptiles is the difficulty to sample snakes in tropical rainforests. Therefore, the percentage of a snake fauna sampled is usually lower than for example that of amphibians given the same duration and intensity of investigation (MORALES & MCDIARMID 1996). As mentioned by these authors, the attempts to assign each specimen to its microhabitat may give a misleading interpretation of the ecology of species. Most of the amphibians and lizards at Panguana are arboreal, whereas the majority of the snakes are terrestrial throughout all habitats. Fifty six percent of the anurans and nearly half of the snake species contribute to the nocturnal herpetological forest community, but only one lizard (*Thecadactylus rapicaudus*) is nocturnal (tabs. 1-2; figs. 5-6). Microhylids were almost exclusively found at their breeding ponds during a period of 36 hours per year. Based on our experience during different periods and years, we know that the three microhylids occur in leaf litter or in burrows (SCHLÜTER & SALAS 1991). Juvenile *Lithodytes lineatus* can be observed on the forest floor by day and night, whereas adults are mainly nocturnal dwellers in nests of leaf cutting ants (SCHLÜTER 1980 c, SCHLÜTER & REGÖS 1981).

Peru is one of the twelve most species-rich countries on earth (MCNEELY et al. 1990). Referring to its amphibian and reptile fauna, it belongs to the five most diverse countries worldwide, i. e. Brazil (640 amphibians, 468 reptiles), Colombia (600/650), Ecuador (439/350), Peru (379/387) and Mexico (339/720) (e. g. CRUMP 1971, DUELLMAN & WILD 1993, CARRILLO DE ESPINOZA & ICOCHEA 1995, DUELLMAN & MENDELSSON, 1995, DUELLMAN & PRAMUK 1999, MORALES 1995, 1997, MORALES & MCDIARMID 1996, RODRÍGUEZ 1996, ICOCHEA & MITCHELL 1997, REYNOLDS et al. 1997, SALAS et al. 1999, DOAN & ARIZABAL ARRIAGA 2000, DUELLMAN 2000, LEHR 2002; http://www.amphibiaweb.org [inquiry: 15 January 2004]).

The species diversity of the investigated area reflects the typical characters of an upper Amazonian herpetofauna, i. e. widespread species and those with restricted occurrence represent an overlap of highly variable distribution patterns (comp. e. g. CADLE & PATTON 1988, DUELLMAN 1978, 1979, 1989, 1990, DIXON 1979, HENZL 1991, HEYER 1988, LYNCH 1979).

The faunistic resemblance of Panguana points to close relations to the Napo-Marañón as well as to the Madeira-Purus basins, whereas the similarities to the eastern Amazonian herpetofaunas are clearly less pronounced. Although collections from different Amazonian sites are far from complete, it may be possible to compare their herpetofaunas. DUELLMAN & MENDELSON (1995) compared the amphibians and lizards of five regions in Amazonia (Ecuador, Peru). When adding Panguana data provided here (tab. 3), it becomes evident that its biogeographic resemblance is highest with Cuzco Amazónico (anurans) and Cosha Cashu (lizards). We suggest that values in table 3 reflect the "intermediate" geographic position of Panguana in the lower Llullapichis drainage towards the other study sites mentioned.

Several attempts have been made to explain the biogeographic patterns in Amazonía, e. g. HAFFER's (1969) "refuge model" or alternative views of CAMPBELL et al. (1985), CAMPBELL (1990) and FRAILEY et al. (1988) on a "Lake Amazonas". HENZL (1991)

considers the biogeographic significance of the Pachitea area as that of a speciation centre, presuming the isolation of the Pachitea region during Holocene, when the gigantic lake covered the entire Amazon up to an elevation of 300 m. If this scenario applies, large parts of the recent lowland forests were formed during the last 10,000 years after the fresh water lake had been drained by the Amazon delta, and were inhabited from the edge of the basin. Adaptive species spread over large ranges of the developing lowland rainforest, whereas others only slightly enlarged their refuge areas at the edge of the basin. As mentioned by AVILA-PIRES (1995), it is not yet possible to reconstruct the evolutionary history of the Amazonian herpetofauna. Recent data on mammalian fossils (e. g., RANCY 1993 a, b) and on sediments (e. g. KRONBERG et al. 1991) have added interesting information and questions.

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Resumen

Anfibios y reptiles del bajo Río Llullapichis, Perú amazónico: lista actualizada con notas ecológicas y biogeográficas.

Se presenta por primera vez una lista entera de reptiles del bajo Río Llullapichis, alta Amazonía, Peru oriental, agregada por resultados sobre ecología y distribución de anfibios y reptiles del area. Ciento cincuenta y tres especies de anfibios y reptiles se han registrado en la zona de la Estación Biológica Panguana. La herpetofauna contiene 1 caecilio, 73 anuros, 2 lagartos, 6 tortugas, 1 amphisbaena, 26 lagartijas y 44 serpientes. Seis especies (1 dendrobátido, 1 hýlido y 4 leptodactylidos) no se puede identificar hasta ahora. Nuestros reultados indican que 57 % de los anfibios y 63 % de los reptiles tienen distribuciones amplias, 31 % de los anfibios y 16 % de los reptiles tienen la distribución alta Amazonía y 12 % de los anfibios y 17 % de los reptilies tienen distribuciones restrictivas. La composición de anuros y saurios del bajo Llullapichis refleja su intermedia posición geográfica dentro de la alta Amazonía. Se presenta datos sobre habitat preferido, actividad diurna y alimentación.

Palabras claves: Amphibia; Reptilia; diversidad de especies; estructura de comunidad; actividad diurna; alimentación; distribución; habitat pereferido; alta Amazonía; Panguana; Peru.

Amphibien und Reptilien des unteren Río Llullapichis, amazonisches Peru: aktualisierte Artenliste mit ökologischen und biogeografischen Anmerkungen

Eine Checkliste der Amphibien und Reptilien des unteren Río Llullapichis, oberes Amazonasbecken in Ost-Peru sowie Anmerkungen zu Ökologie und Verbreitung der Amphibien und Reptilien des Gebietes werden präsentiert. Insgesamt 153 Amphibien- und Reptilienarten konnten bisher in der Estación Biológica Panguana nachgewiesen werden. Die Herpetofauna setzt sich zusammen aus einer Blindwühle, 73 Anuren, zwei Krokodilen, sechs Schildkröten, einer Amphisbaene, 26 Eidechsen und 44 Schlangen. Sechs Arten (1 Dendrobatide, 1 Hylide und 4 Leptodactyliden) können vorläufig noch keiner Art zugeordnet werden. Unsere Ergebnisse zeigen, dass 57 % der Amphibien- und 63 % der Reptilienarten weit sowie 31 % der Amphibien und 16 %

der Reptilien in Westamazonien verbreitet sind; 12 % der Amphibien and 17 % der Reptilien verteilen sich auf unterschiedliche kleine Areale. Das Spektrum der Anuren- und Eidechsenarten des unteren Llullapichis spiegelt dessen intermediäre Lage innerhalb des oberen Amazonasbeckens wider. Auf Habitatpräferenz, Tagesaktivität und Nahrungsaspekte wird eingegangen.

Schlagwörter: Amphibia; Reptilia; Artendiversität; Tagesaktivität; Nahrung; Verbreitungsmuster; Lebensraum; oberes Amazonasbecken; Panguana; Peru.

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Appendix: Material Examined

PERU: Ucayali: lower Río Llullapichis: Caeciliidae: *Siphonops annulatus*: ZMH A01019; Leptodactylidae: *Adenomera andreae*: KU 154870-71, KU 171807; ZMH A02512-16; *Adenomera hylaedactyla*: KU 154872; SMNS 6384; ZMH A00897, ZMH A01374, ZMH A01375, ZMHA01376-79; *Ceratophrys cornuta*: SMNK 234; MHNSM 1478 (ZMH A01822-23); ZMH A00882; ZMH A01824-26, ZMH A02517-18, Larvae: ZMH A00883-88; *Edalorhina perezi*: KU 154757, KU 171825-30; SMNK 226-232; MHNSM 1467 (ZMH A01829), 19125; SMNS 6333; ZMH A00889, ZMH A02520-24, ZMH A01827-28, ZMH A02525, ZMH A02526-51; *Eleutherodactylus acuminatus*: ZMH A00891, A00892; *Eleutherodactylus altamazonicus*: SMNS 7149, *Eleutherodactylus carvalhoi*: MHNSM 19321; *Eleutherodactylus diadematus*: ZMH A00893; *Eleutherodactylus eurydactylus*: ZMH A01818 (holotype), SMNS 7868, KU 218292; MHNSM 14000 (paratypes); *Eleutherodactylus imitatrix*: MHNSM 19087; *Eleutherodactylus lacrimosus*: KU 154760; *Eleutherodactylus ockendeni*: SMNK 260; *Eleutherodactylus peruvianus*: SMNK 261-262; MHNSM 1470 (ZMH A01306); MHNSM 19077, 19085, 19109, 19148SMNS 6386, ZMH A00932-36, ZMH A01310-11, ZMH A01325, ZMH A01328-29, ZMH A01305, ZMH A01307, ZMH A01326-27, ZMH A01312-24, ZMH A01330-31, ZMH A01333, ZMH A01335-37, ZMH A01339-44; *Eleutherodactylus sulcatus*: ZMH A00894, ZMH A02552-55; *Eleutherodactylus toftae*: SMNS 6385, SMNS 6387; *Eleutherodactylus variabilis*: ZMH A01326-A01344; *Eleutherodactylus ventrimarmoratus*: KU 154801; *Ischnocnema quixensis*: SMNK 263-64; MHNSM 1496 (ZMH A02477-78), 19131, 19155; ZMH A00878, ZMH A00880, ZMH A02556-57; ZMH A02476, ZMH A02503, ZMH A02505-06, ZMH A02479-80, ZMH A02558; *Leptodactylus leptodactyloides*: SMNK 265; MHNSM 1501 (ZMH A01503),

19066, 19110, 19118, SMNS 6382-83, ZMH A01365-66, ZMH A01367, ZMH A01368-73, ZMH A01504, ZMH A02565-66; *Leptodactylus pentadactylus*: SMNK 255-56; MHNSM 1477 (ZMH A01833), MHNSM 1505 (ZMH A01836), ZMH A01832, ZMH A01834-35, ZMH A01837, ZMH A02559-60, ZMH A02561-62; *Leptodactylus rhodomystax*: ZMH A00898, ZMH A02563, ZMH A02564; *Leptodactylus rhodonotus*: SMNS 7093; *Lithodytes lineatus*: MHNSM 1497 (ZMH A02468); ZMH A00881, ZMH A02466-67; *Phyllonastes myrmecoides*: SMNS 7134; *Physalaemus petersi*: SMNK 266; MHNSM 1485 (ZMH A01349-50), 19068,19091, 19096, 19103, 19104, 19117, 19137, 19143, 19151, 19163; SMNS 6363-65, SMNS 6417; ZMH A01345-48, ZMH A01351-54, ZMH A01356-57, ZMH A01358-64, ZMH A02567-70; Bufonidae : *Bufo glaberrimus*: SMNK 258; ZMH A01502; *Bufo marinus*: SMNK 289-302; MHNSM 1480 (ZMH A02483-84), MHNSM 1487 (ZMH A02482), MHNSM 1480 (ZMH A02483-84), MHNSM 1508 (ZMH A02481), 19075, 19130, 19156; ZMH A00875, ZMH A02571-72; SMNS 6263-65; ZMH A02492-97, ZMH A02573-96; *Bufo margaritifer* complex: SMNK 285-88; MHNSM 1484 (ZMH A02471), 19105, 19106, SMNS 6257-62; ZMH A02469-70, ZMH A02472-75, ZMH A02597-607, ZMH A02608-43; *Dendrophryniscus minutus*: SMNK 279-84; MHNSM 1503 (ZMH A01865-70), MHNSM 1492 (ZMH A01871-74), MHNSM 1488 (ZMH A01880-82), MHNSM 1468 (ZMH A01886-88), MHNSM 1475 (ZMH A01883-85), 19094, 19154; SMNS 6334-62, ZMH A01846-64, ZMH A01875-79, ZMH A01889-1901, ZMH A02647; ZMH A02644-46; ZMH A02648-84; Dendrobatidae: *Colostethus* sp.: SMNK 254, SMNK 277-78; MHNSM 1486 (ZMH A01904-06), ZMH A01902-03, ZMH A01907-11; ZMH A02685-714, SMNS 8847; *Dendrobates ventrimaculatus* sensu lato: SMNK 253; MHNSM 1473 (ZMH A02441), ZMH A02440; ZMH A02718-21; *Allobates femoralis* complex: KU 154957-62, KU 172084-117; SMNK 251-52; MHNSM 1472 (ZMH A02270), 19058, 19061, 19078, 19090, 19140, 19141, SMNS 6380, ZMH A02268-69; ZMH A02722; ZMH A02723-42; *Epipedobates hahneli* complex: KU 154931-48, KU 171993-2022; SMNK 244-46; MHNSM 1476 (ZMH A01912), MHNSM 1494 (ZMH A01917-18), 19086, 19121, 19124, 19142, 19152, 19162; ZMH A01913-16, ZMH A01919-20; ZMH A02092; ZMH A02755; ZMH A02756-62. *Epipedobates petersi*: SMNK 247-50; SMNS 6379; ZMH A02743-54. *Epipedobates trivittatus*: KU 154950-56, KU 172026-81; SMNK 241-43; SMNS 6374-78, MHNSM 1511 (ZMH A02433-35), ZMH A02430-32, ZMH A02436-38; ZMH A02763-808. Hylidae: *Hyla boans*: KU 154673-74; SMNK 257; MHNSM 1479 (ZMH A02499); MHNSM 19054, 19108, 19119; ZMH A00899; ZMH A02498; *Hyla brevifrons*: SMNK 259; MHNSM 1490 (ZMH A0193245), SMNS 6241-50, ZMH A01921-31, ZMH A01946-60, ZMH A02090-91; ZMH A02811-20; *Hyla calcarata*: MHNSM 19153, ZMH A01961; *Hyla fasciata:* KU 154675-77, KU 172146-49; MHNSM 1481 (ZMH A02459), MHNSM 1482 (ZMH A02463), MHNSM 1495 (ZMH A02464-65), 19081, 19101; ZMH A00905, ZMH A02821; ZMH A02456-58, ZMH A02460-62; *Hyla geographica*: MHNSM 1469 (ZMH A02504), MHNSM 1500 (ZMH A02451), MHNSM 19065, 19119, ZMH A02452-55; *Hyla granosa*: KU 154709-10; MHNSM 1516 (ZMH A01967-70), 19128; ZMH A00907; SMNS 6255-56, ZMH A01962-66, ZMH A01971, ZMH A02823; *Hyla leali:* MHNSM 1471 (ZMH A02093, ZMH A02097); ZMH A00902; ZMH A02094-96, ZMH A02114; ZMH A00902; *Hyla leucophyllata*: ZMH A02439; MHNSM 19080, 19083, *Hyla marmorata*: ZMH A00909; ZMH A02824; *Hyla* cf. *minuta*; *Hyla parviceps*: KU 154714-15, KU 172150-52; MHNSM 1513 (ZMH A01989-2009), 19084; SMNS 6232-40; ZMH A00911-12, ZMH A02825-30; ZMH A01972-88, ZMH A02003-08, ZMH A02010-14, ZMH A02126, ZMH A02151; ZMH A02831-57; *Hyla rhodopepla*: KU 172153-57; MHNSM 1509 (ZMH A02029-49), MHNSM 1504 (ZMH A02069-72), MHNSM 1474 (ZMH A02089); KU 182348; SMNS 6204-17; ZMH A00913, ZMH A02858-59; ZMH A02015-28, ZMH A02050-68, ZMH A02073-86, ZMH A02088-89, ZMH A02116; ZMH A02860-72. *Hyla riveroi*: ZMH A00900, ZMH A00903; ZMH A02873-82; *Hyla sarayacuensis*: KU 154739; MHNSM 1498 (ZMH A02120-21, ZMH A02124), SMNS 6251-54, ZMH A02117-19, ZMH A02122-23, ZMH A02125; ZMH A02902-04; ZMH A02905-10; *Osteocephalus leprieurii*: KU 154741; MHNSM 1491 (ZMH A02128); ZMH A00915-16; *Osteocephalus planiceps*: ZMH A02127; *Osteocephalus taurinus*: ZMH A00917-18, ZMH A00920, ZMH A02911; ZMH A02129; *Phrynohyas coriacea*: MHNSM 1507 (ZMH A02134); ZMH A00921-22, ZMH A02912-13; ZMH A02130-33; ZMH A02914; *Phrynohyas resinifictrix*: SMNS 7122 (tadpole);

Phrynohyas venulosa: ZMH A00923, MHNSM 19129; *Phyllomedusa palliata*: ZMH A02915; *Phyllomedusa tarsius*: MHNSM 1489 (ZMH A02136), SMNS 6366-67, SMNS 6372-73; ZMH A00924; ZMH A02135; ZMH A02916-19; *Phyllomedusa tomopterna*: ZMH A02138; *Phyllomedusa vaillanti*: KU 154743, KU 172164; SMNK 240; MHNSM 1510 (ZMH A02145-49), 10098, 19115, SMNS 6368-71; ZMH A00925, ZMH A02137, ZMH A02139-44, ZMH A02150; ZMH A02920-21; *Scinax cruentomma*: SMNK 267; MHNSM 1514 (ZMH A02105-07, ZMH A02113); KU 172143; SMNS 6218-26, SMNS 6231, ZMH A02500; *Scinax funereus*: MHNSM 19147; *Scinax garbei*: ZMH A00906; ZMH A02822; *Scinax ruber*: KU 172159-62; SMNK 235-39; MHNSM 1514 (ZMH A02110-11), 19072, 19139, SMNS 6227-30; ZMH A00914; ZMH A02098-104, ZMH A02108-09, ZMH A02112, ZMH A02883-84; ZMH A02885-901; Centrolenidae: *Cochranella midas*: KU 172165-66; *Hyalinobatrachium munozorum*: KU 154749, KU 172167-69; Microhylidae: *Chiasmocleis ventrimaculata*: SMNK 268-71; MHNSM 1515 (ZMH A02215-41, MHNSM 1483 (ZMH A02255-65), MHNSM 1499 (ZMH A0244250), SMNS 6291-332; ZMH A00929-30; ZMH A02152-214, ZMH A02242-54, ZMH A02922-24; ZMH A02266-67, ZMH A02271-72; ZMH A02925-52; *Ctenophryne geayi*: SMNK 272-73; MHNSM 1506 (ZMH A02279-82), SMNS 6290; ZMH A00926; ZMH A01938; ZMH A02283-89; ZMH A02953-57; *Hamptophryne boliviana*: SMNK 274-76; MHNSM 1502 (ZMH A02300-03), MHNSM 1512 (ZMH A02304-13), MHNSM 1493 (ZMH A02321-23), SMNS 6266-89; ZMH A00927-28, ZMH A02958-60; ZMH A02273-75, ZMH A02290-99, ZMH A02314-20, ZMH A02324-35, ZMH A02501-02; ZMH A02276-78; ZMH A02961-3008. Crocodylidae: *Caiman crocodilus crocodilus*: SMNK 1123 (skull); MHNSM 6993; ZMH R01609; *Paleosuchus trigonatus*: MHNSM 8601, ZMH R01610; Pelomedusidae: *Podocnemis unifilis*: ZMH R01538-39; Cheliidae: *Phrynops geoffroanus*: MHNSM 7043, 7045; NMW 32488:1-2; *Phrynops gibbus*: MHNSM 7046, 7048; NMW 32489:1-2; ZMH R01540: *Platemys platycephala melanonota*: ZMH R01541; Testudinidae: *Chelonoidis denticulata*: MHNSM 7044; ZMH R01531; Kinosternidae: *Kinosternon scorpioides scorpioides*: SMNK 1164; MHNSM 7047; ZMH R01517; Amphisbaenidae: *Amphisbaena slateri*: ZMH R01282; Hoplocercidae: *Enyalioides palpebralis*: SMF 71561; ZMH R01497-99; KU 179057; Iguanidae: *Iguana iguana*: ZMH R01786; Polychrotidae: *Norops fuscoauratus fuscoauratus:* MHNSM 7024-25, 7031-32, 7034, 7037, 19082, 19089, 19093; ZMH R01286-91; *Norops ortonii*: MHNSM 7026, 7028, 7038, 7040; ZMH R01292-93; R01616; *Anolis punctatus*: MHNSM 7008-10, 7029; ZMH R01283-85, R01776; *Polychrus marmoratus*: MHNSM 6998; Tropiduridae: *Stenocercus aculeatus*: SMNK 1154; SMF 71562-63; *Stenocercus roseiventris*: SMNK 1158; SMF 71565; MHNSM 7005-06; ZMH R01500-03, R01774; *Stenocercus tricristatus*: KU 179058; *Tropidurus flaviceps*: MHNSM 6996-97; ZMH R01788-89; *Plica plica*: SMNK 1157; SMNS 6397; MHNSM 6994, 7001-02; ZMH R01614, R01630, R01773; *Plica umbra ochrocollaris*: SMNK 1161; SMF 71564; MHNSM 6999, 7004; Gekkonidae: *Gonatodes humeralis*: SMNK 1140-48; MHNSM 7033, 19079; SMNS 6399-401; ZMH R01486-89, R01623, R01769-70; R01779; R01782-83; *Pseudogonatodes guianensis*: SMNK 1149; *Thecadactylus rapicaudus*: SMNK 1151-56; MHNSM 7000, 7007; SMNS 6396; ZMH R01490-96, R01629, R01777; Gymnophthalmidae: *Alopoglossus angulatus*: MHNSM 19070, 19145; *Arthrosaura reticulata*: SMNK 1150; *Bachia peruana*: ZMH R01506, R01771, R01787, R03096; *Cercosaura ocellata bassleri*: SMF 71566-67; ZMH R01781; *Iphisa elegans*: SMNK 1162; *Neusticurus ecpleopus*: SMNS 6398, MHNSM 7003, 7011, 7012-15, 7017-20, 7022-23, 7039, 19069, 19134, 19146; ZMH R01615, R01618-19, R01621, R01625-26, R01634, R01764, R01767-68, R01778; Teiidae: *Ameiva ameiva*: SMNS 7800; MHNSM 19113; *Kentropyx* sp.: 6395; *Kentropyx. pelviceps:* SMNS 6395; *Tupinambis teguixin*: SMNK 1124; MHNSM 6992; Scincidae: *Mabuya* bistriata: MHNSM 7041; ZMH R01581, R01627, R01635; Aniliidae: *Anilius scytale scytale*: SMNK 1178, MHNSM 6982; Boidae: *Boa constrictor constrictor*: SMNK 1122, SMNK 1165; *Corallus caninus*: MHNSM 6971; SMNS 6393; *Epicrates cenchria cenchria*: ZMH R01307 (Skull), ZMH R01582; Colubridae: *Chironius carinatus*: SMNS 10256, 10318; *Chironius fuscus*: MHNSM 6969; ZMH R01585; *Chironius multiventris multiventris*: SMNK 1179; MHNSM 6967; ZMH R01306; *Chironius scurullus*: SMNK 1180; *Clelia clelia clelia*: ZMH R01799; *Dipsas catesbuyi*: MHNSM 6976; D*rymarchon corais corais*: SMNK 1170; ZMH R01305; *Drymobius rhombifer*: MHNSM 8613; *Drymoluber dichrous*: MHNSM 8609; ZMH R01586; *Erytrhrolamprus aesculapii*

aesculapii: SMNK 1171; MHNSM 6988; ZMH R01587-88, R01612; *Helicops angulatus*: MHNSM 6936; SMNS 6394; ZMH R01308, R01791, R01797; *Imantodes cenchoa*: ZMH R01596; *Imantodes lentiferus*: MHNSM 6986-87; ZMH R01638; *Leptodeira annulat*a *annulata*: MHNSM 6974; ZMH R01309 A-B: *Leptophis ahuetulla*: SMNK 1163; ZMH 1589: *Leptophis cupreus*: MHNSM; *Liophis reginae semilineata*: SMNS 3114, 3115, 3117; *Oxybelis aeneus*: ZMH R01611; *Xenoxybelis argenteus*: MHNSM 6981, 6985; ZMH R01590-94; R01637; *Oxybelis fulgidus*: MHNSM 19157, SMNK 1172; ZMH R01595; *Oxyrhopus melanogenys*: MHNSM 8614; ZMH R01763, R01796; *Oxyrhopus petola digitalis*: MHNSM 6983; ZMH R01790; *Philodryas viridissimus*: SMNS 3412, 4779; *Pseustes poecilon*otus: MHNSM 6964; ZMH R01304, R01597-1600; *Pseustes sulphureus sulphureus*: SMNK 1173; *Taeniophallus brevirostris*: AMNH 52776; *Siphlophis cervinus*: SMNK 1160, ZMH R01628; *Spilotes pullatus pullatus*: SMNK 1174-75; MHNSM 6972; ZMH R01303, R01701; *Xenodon severus*: SMNK 1176; MHNSM 6961-62; ZMH R01613, R01794; *Xenopholis scalaris*: NMW 32504; Elapidae: *Micrurus annellatus annellatus*: MHNSM 8607; ZMH R01310; R01601; R03098; *Micrurus lemniscatus helleri*: SMNK 41832; MHNSM 6989; *Micrurus surinamensis surinamensis*: ZMH R01301-02, R01798; Viperidae: *Bothriopsis bilineata*: KU 172207; *Bothrops atrox*: SMNK 1138 (skull), 1166-69, 1177; MHNSM 6977, 6979; SMNS 6415-16, ZMH R01602-07, R01699-1700; R01792-93; *Lachesis muta muta*: MHNSM 6965; ZMH R01608; Leptotyphlopidae: *Leptotyphlops albifrons*: ZMH R01636.

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