



Anolis podocarpus. Photo by A. Almendáriz.



Overview of the herpetofauna of the unexplored Cordillera del Cóndor of Ecuador

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Abstract.—The Cordillera del Cóndor is an area rich in unique vegetation assemblages and endemic faunal elements; the herpetofauna is especially diverse, particularly the anurans. The montane forest and sandstone tepuis, located atop large andesite and quartz formations, provide a variety of habitats and microhabitats in which the herpetofauna finds food, shelter, and reproductive sites, such as terrestrial and arboreal bromeliads and a soil type termed “bamba” that is covered with mosses and roots. Information compiled from publications and recent studies has revealed the presence of 120 species of amphibians and 59 species of reptiles, including 41 probable new species (36 amphibians and five reptiles) in the genera *Centrolene*, *Dendrobates*, *Pristimantis*, *Lynchius*, *Chiasmocleis*, *Bolitoglossa*, *Anolis*, *Erythrolamprus*, *Tantilla*, and *Dipsas*.

Resumen.—La Cordillera del Cóndor es un área rica en formaciones vegetales únicas y elementos faunísticos endémicos; presenta una singular diversidad herpetofaunística, particularmente de la anurofauna. Los bosques montanos y los de “tepuy,” asentados sobre piedras grandes de andesita y cuarzo crean variedad de hábitats y microhábitats, en donde la herpetofauna encuentra alimento, refugio y lugares para la reproducción, como por ejemplo las bromelias terrestres y arbóreas y un suelo denominado “bamba” que está cubierto de musgos y raíces. La información recopilada de material publicado y de los estudios realizados en los últimos años revela la presencia de 120 especies de anfibios y 59 especies de reptiles. Los resultados incluyen 41 especies posiblemente nuevas (36 anfibios y cinco reptiles) de los géneros: *Centrolene*, *Dendrobates*, *Pristimantis*, *Lynchius*, *Chiasmocleis*, *Bolitoglossa*, *Anolis*, *Erythrolamprus*, *Tantilla*, y *Dipsas*.

Key words. Ecuador, Cordillera del Cóndor, amphibian, reptile

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Introduction

The fauna of Ecuador, in general, has not been extensively studied, despite a notable increase in research activity in recent years (Albuja et al. 2012). In particular, the Cordillera del Cóndor region, in southern Ecuador along the border with Peru (Figure 1), is a very poorly known area. The purpose of this paper is to summarize and review herpetofaunal studies of the Cordillera del Cóndor region. Studies of the avian and mammalian fauna have been published elsewhere (e.g., Albuja and Patterson 1996; Brito and Arguero 2012; Freile et al. 2014).

The long-running border conflicts between Ecuador and Peru and the difficulty in accessing the region have

maintained the ecosystems of the Cordillera del Cóndor almost intact. It has only been since the end of the conflicts known as the Pasquisha War (which ended in February 1981) and the Alto Cenepa War (which ended in February 1995), that roads into the area have begun to open, which has resulted in incipient colonization and an awakened interest in mineral prospection in the region. Nevertheless, there are still some parts of the Cordillera del Cóndor that remain unaltered.

The Cordillera del Cóndor is part of a biologically diverse, discontinuous, sub-Andean cordillera that has several characteristics that distinguish it from the rest of the Andes. Whereas the main Andes are of metamorphic and igneous origin, the Cordillera del Cóndor is sedimentary, composed largely of limestone and sandstone (Schulenberg and Awbrey 1997). The region is dominated by

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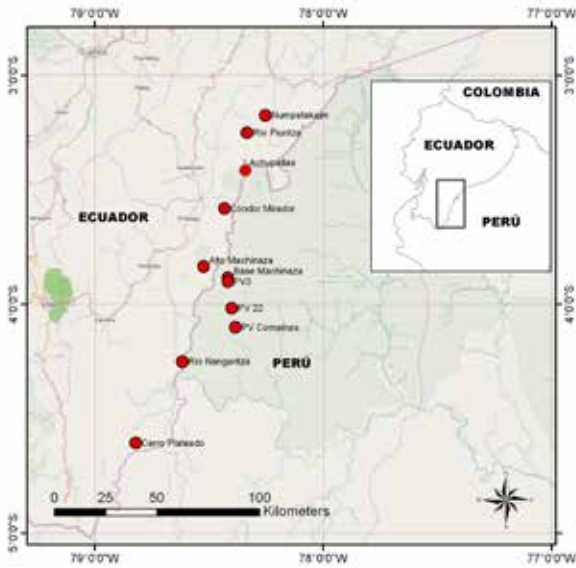


Fig. 1. Map of the Cordillera del Cóndor region.

geologically complex mountains topped with sandstone plateaus at elevations of 300 m to almost 3,000 m that support habitats similar to the sandstone mountains of the Guyana Shield (Figure 2); many of the plateaus have vegetation similar to that of the tepuis. Due to its location just northeast of the Huancabamba Depression, the lowest point in the Andes (Duellman 1999), the Cordillera del Cóndor receives moisture from both the Atlantic and the Pacific sides of the Andes—moisture from the Western slopes of the Andes as well as moisture moving east across the Amazon basin drops over the Cordillera del Cóndor, providing frequent, year-round precipitation (Schulenberg and Awbrey 1997).

The first systematic botanical studies of the region were carried out in 1990 and 1991 in the Río Nangaritza basin (in the southern region of the Cordillera del Cóndor), under the auspices of the Proyecto Promobot and the Tratado de Cooperación Amazónica, with the participation of both Ecuadorian and foreign scientists. These explorations were limited to areas below about 1,700 m

in altitude. In 1993, A. H. Gentry collected plants on one of the highest points of the mountain range (2,100 m) as part of a Rapid Assessment Program (RAP) survey, organized by Conservation International (CI, a non-governmental organization). Gentry found that the vegetation structure and families of plants were similar to those of the sandstone tepuis of the Guiana Highlands (Schulenberg and Awbrey 1997). In recent years, D. Neill and his collaborators have surveyed the flora at several points in the cordillera, publishing descriptions of new species and studying the environmental heterogeneity associated with variable types of soils (Neill 2005; Neill and Asanza 2012; Neill and Ulloa 2011; Riina et al. 2014; Ulloa et al. 2012). The diversity of plant assemblages on the sandstone plateaus produces a variety of microhabitats that provide food, shelter, and reproductive sites for the herpetofauna, particularly terrestrial and arboreal bromeliads; the “bamba” soils of many of these tepuis is thickly covered with mosses and roots, and serves to filter the tannins that darken the turbid water in creeks and streams (Figure 3).

According to the ecosystem classification for continental Ecuador (Ministerio del Ambiente del Ecuador 2012), the following ecosystems have been identified in the Cordillera del Cóndor:

- Evergreen piedmont forest in the Cóndor-Kutukú ranges
- Evergreen forest on the sandstone plateaus of the Cóndor range in the lower Ecuadorian Amazon



Fig. 2. Alto Paquisha, 2,400 m. Photo by A. Almendáriz.



Fig. 3. Vegetation in the interior of a tepui forest. Photo by A. Almendáriz.

- Lower montane evergreen forest in the Cóndor-Kutukú ranges
- Evergreen piedmont forest on the sandstone mesas of the Cóndor-Kutukú ranges
- Evergreen lower montane forests on the sandstone mesas of the Cóndor-Kutukú ranges
- Montane humid shrub in the Cóndor range
- Evergreen montane forests on the sandstone mesas of the Cóndor-Kutukú ranges
- Montane humid shrub with herbaceous rosette thickets (herbazales) in the Cóndor range

Materials and Methods

Herpetological surveys of the region have been few and limited (Figure 1). The information presented below is drawn from an extensive survey of the literature and recent field work. The majority of the studies have employed the Rapid Ecological Assessment strategy or RAP developed by CI (Sayre et al. 2002), in habitats where the presence of herpetofaunal elements was anticipated.

The northern zone of the Cordillera del Cóndor is known from three studies. The first was carried out in 1972 in conjunction with a privately funded orchid collecting expedition (accompanied by personnel from the Missouri Botanical Garden and the University of Kansas Museum of Natural History), at elevations of 870–2,000 m at the headwaters of the Río Piuntza, Río Chuchumbeza, Río Numpatacaini, and Río Santa Agueda in Morona Santiago Province (Duellman and Simmons 1988). The second survey was a RAP assessment conducted by CI, the Escuela Politécnica Nacional, Fundación Fedima, and the Universidad Nacional Mayor de San Marcos. The areas surveyed included the Ecuadorian flank of the Cordillera del Cóndor (Coangos and Achupallas in Morona Santiago Province [Figure 4], Miazí and Shaimi in Zamora Chinchipe Province). The Peruvian flank of the Cordillera del Condor was surveyed at the base of Cerro Machinaza, Alfonso Ugarte-PV3, Falso Paquisha-PV22, and Puesto de Vigilancia Comainas. Subsequently, a third survey was carried out by Fundación Natura (FN 2000) to establish the Parque El Cóndor, which inven-

toried the Comunidad Numpatakaime and confluence of the Río Tsuirim and the Río Coangos.

Another survey, conducted as part of the Proyecto Paz y Conservación Binacional en la Cordillera del Cóndor Ecuador-Perú by the Organización Internacional de las Maderas Tropicales, Conservation International, Fundación Natura, and the Instituto Nacional de Recursos Naturales (INRENA) in 2005 (Organización Internacional de las Maderas Tropicales and Fundación Natura y Conservación Internacional 2005), collected data from several localities in the southern sector on the Ecuadorian flank of the Cordillera del Cóndor, including Cóndor Mirador and Herradura. The corresponding Peruvian flank survey was focused on the Zona Reservada Santiago Comaina.

Between March 2008 and July 2012, the Escuela Politécnica Nacional team, under a contract with the Cardno-Entrix Corporation, carried out 16 expeditions to survey the herpetofauna of Alto Manchinaza. In 2009, a CI RAP survey was conducted by personnel from the Pontificia Universidad Católica del Ecuador, Louisiana State University, and Fundación Ecológica Arcoiris, with support from Secretaría Nacional de Ciencia y Tecnología del Ecuador (SENACYT) of the tepuyes of the upper basin of the Río Nangaritza (Guayasamín et al. 2011). In 2012, the Fundación Naturaleza y Cultura Internacional and the Universidad Estatal Amazónica organized an expedition to Cerro Plateado (Figure 5), the southern point of the Cordillera del Cóndor, which included researchers from the Escuela Politécnica Nacional.

Results

The 1972 survey of the northern zone of the Cordillera del Cóndor resulted in the capture of 30 species, including nine new species (e.g., Duellman and Simmons 1988, Lynch 1974, 1976, 1979; Lynch and Duellman 1980). Specimens and additional records from this survey are deposited in the Biodiversity Research Institute at the University of Kansas, along with additional related specimens accounting for 47 species total (Reynolds 1997; Schulenberg and Awbrey 1997).



Fig. 4. Achupallas sector, 2,100 m. Photo by A. Almendáriz.



Fig. 5. Peak of Cerro Plateado, 2,900 m. Photo by V. Carvajal.



Fig. 6. *Pristimantis* sp. Photo by A. Almendáriz.



Fig. 7. *Centrolene condor*. Photo by A. Almendáriz.



Fig. 8. *Excidobates condor*. Photo by A. Almendáriz.



Fig. 9. *Enyalioides rubrigularis* (female). Photo by A. Almendáriz.



Fig. 10. *Hyloscirtus condor*. Photo by J. Brito.

The second survey of the northern Zone of the Cordillera del Cóndor recorded a total of 34 species—27 amphibians and seven reptiles (Almendáriz 1997a, 1997b). Although the survey was conducted under adverse environmental conditions, geographic range extensions for several species were recorded. The Peruvian flank surveys recorded 58 species (35 anurans and 23 reptiles); the data from the Peruvian surveys was collected by personnel from the Museo de Historia Natural of the Universidad Nacional Mayor de San Marcos in 1987 (Reynolds and Icochea 1997a, 1997b) and expanded the ranges of two species for Peru, *Rhinella festae* and *Hemiphractus bubalus*. The Parque El Cóndor survey lists a total of 36 species (22 anurans, eight lizards, and six snakes), including nine species new to the Cordillera del Cóndor herpetofauna, and makes reference to the difficulty of identifying some of the material. The report summarizes information known up to the year 2000, and lists a total of 95 species for the region (56 amphibians and 39 reptiles).

The survey of the southern sector of the Cordillera del Cóndor collected specimens that were not identified to the species level of the genus *Pristimantis* (Figure 6), and a glass frog provisionally identified as *Centrolene cf. croceopodes* that in 2008 was named as *Centrolene condor* (Cisneros-Heredia and Morales-Mite 2008; Figure 7).

The surveys of Alto Manchinaza recorded 70 species of amphibians and 43 species of reptiles (Almendáriz et al. *in prep.*). The results of these surveys revealed the

presence of several little known or new species, including a new species of highland poison dart frog, *Excidobates condor* (Almendáriz et al. 2012; Figure 8) and geographic range extensions for *Phyllomedusa ecuatoriana*, *Centrolene condor*, *Chimerella mariaelenae*, *Hyloxalus mystax*, and *Enyalioides rubrigularis* (Figure 9), among others. In addition, ecological data and information on reproduction, vocalizations, and other aspects of the life history for these species was collected (Almendáriz and Batallas 2012a, 2012b; Batallas and Brito 2014; Brito et al. *in prep.*); at least 28 probably new species from different genera (*Centrolene*, *Bolitoglossa*, *Pristimantis*, *Anolis*, *Atractus*, *Erythrolamprus*, *Tantilla*, and *Dipsas*) were obtained, which are in the process of being described. This project included environmental education and community outreach work (Almendáriz 2012).

The 2009 Pontificia Universidad Católica del Ecuador survey recorded 27 species of amphibians and 17 reptiles, including a new species of anuran, *Pristimantis minimus* (Terán-Valdez and Guayasamin 2010). This project included the publication of a field guide to plants and animals of the tepuis of Nangaritza (Almendáriz 2010; Freile et al. 2010).

The 2012 expedition to Cerro Plateado (Almendáriz and Brito 2013) recorded 19 species. Of these, 14 were anurans and salamanders, including nine species of the family Craugastoridae (most were members of the genus *Pristimantis*). Based on the ecology of the area, it is assumed that more species occur at this locality, including members of the family Centrolenidae. A new species of torrent frog, *Hyloscirtus condor* (Figure 10), was described based on specimens obtained on this expedition (Almendáriz et al. 2014), and at least eight new species in the genera *Lynchius*, *Pristimantis*, and *Bolitoglossa* were obtained that will be described in the future.

Discussion

The Cordillera del Cóndor is of particular importance due to its high biodiversity and the presence of several unique ecosystems (e.g., the sandstone formations similar to tepuis). The Cóndor region, with its diverse range of habitats, contains numerous species that correspond to three faunal components: (1) Amazonian lowlands; (2) eastern flanks of the Andes, and (3) an endemic fauna limited to the southern part of Ecuador (Duellman and Lynch 1988). As shown in Figure 11, the Baja Amazonia herpetofaunal assemblage contains more reptile species (63%) than amphibian species (28%). In the herpetofaunal assemblages associated with the eastern slopes of the Andes there are slightly more amphibian species (34% and 32%). The percentages relative to the endemic component of the Cordillera del Cóndor are notably higher in amphibians than in reptiles (41% and 7%).

A summary of the herpetofaunal diversity of the region is provided in Tables 1 and 2; a comparison of known species diversity and predicted species diversity

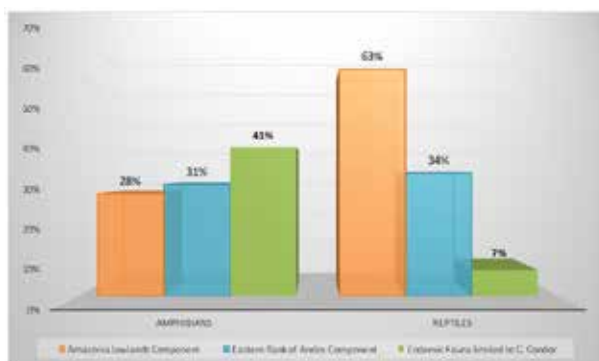


Fig. 11. Herpetofaunal assemblages and endemics from the Cordillera del Cóndor.

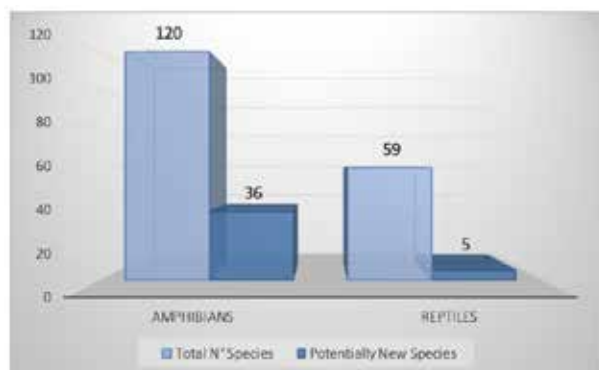


Fig. 12. Documented and predicted species diversity in the Cordillera del Cóndor.



Fig. 13. *Lynchius* sp. Photo by J. Brito.



Fig. 14. *Pristimantis muscosus*. Photo by A. Almendáriz.



Fig. 15. *Cercosaura dicra*. Photo by G. Gallardo.



Fig. 16. *Erythrolamprus* sp. Photo by A. Almendáriz.



Fig. 17. *Tantilla* sp. Photo by A. Almendáriz.



Fig. 18. *Anolis podocarpus*. Photo by A. Almendáriz.

for the region is provided in Figure 12. Some of the more distinctive species found in the region include frogs of the genera *Lynchius* (Craugastoridae; Figure 13) and *Pristimantis* (Craugastoridae; Figure 14), the gymnophthalmid lizard *Cercosaura dicra* (Figure 15), and the colubrid snakes *Erythrolamprus* (Figure 16) and *Tantilla* (Figure 17).

During the last five years, the following species have been described based on material from the Cordillera del

Cóndor: *Enyaliodes rubrigularis* (Torres-Carvajal et al. 2009; Figure 9), *Anolis podocarpus* (Ayala-Varela and Torres-Carvajal 2010; Figure 18), *Pristimantis minimus* (Terán-Valdez and Guayasamín 2010), *Excidobates condor* (Almendáriz et al. 2012; Figure 8), *Hyloscirtus condor* (Almendáriz et al. 2014; Figure 10), and *Siphlophis ayauma* (Sheehy et al. 2014). The work has expanded the known geographic distribution of *Anolis soini* (Ayala-Varela et al. 2011; Figure 19) and revealed new distribu-

tion and natural history information for two other species of the genera *Centrolene* and *Hyloxalus* (Almendáriz and Batallas 2012a, 2012b). It is also noteworthy that several new species are in the process of being described in the genera *Pristimantis* and *Chiasmocleis* (Almendáriz et al. *in prep.*). A detailed publication about the herpetofauna of the Cóndor region is in preparation (Almendáriz et al. *in prep.*).

Based on information published in the most recent studies conducted in the Cordillera del Cóndor, there are a total of 120 amphibian species (11 families, 31 genera), and 59 reptile species (nine families, 28 genera), not including those found at elevations below 850 m (Figure 20). In addition, based on the specimens discussed above, the area contains approximately 41 potentially new species (36 amphibians and five reptiles; see Figure 12). These numbers indicate that the region has significant endemic diversity (see Table 1, Table 2, and Figure 11).

Conclusion

Within the Cordillera del Cóndor, four areas protected by the Sistema Nacional de Areas Protegidas have been established: (1) Reserva Biológica El Cóndor; (2) Reserva Biológica El Quimi; (3) Reserva Biológica Cerro Plateado; and (4) Refugio de Vida Silvestre El Zarza. On the eastern flank, the Peruvian government has concentrated its efforts to create Parque Nacional Ichigkat Muja-Cordillera del Cóndor (SERNANP 2012). Nevertheless, the ecosystems in the Cordillera del Cóndor are threatened by imminent human colonization and settlement, the introduction of agriculture and livestock, and mining; the latter activity poses the greatest threat to the conservation of the tepui-like forests and the health of the aquatic ecosystems, which are the reproductive habitats of many species of anurans, including hylids and centrolenids. On the other hand, the fact the amphibians of the Andean region have limited distribution makes them susceptible to extinction, and in some cases, the protection of their habitat does not improve their chance of survival (Guayasamín et al. 2011). This situation warrants intensified research and conservation studies of these vertebrates, especially in little explored areas as in the case of the Cordillera del Cóndor. The preliminary results of surveys of Alto Machinaza and Cerro Plateado have revealed the presence of possibly new species in these areas, indicating that future interventions in these areas should comply strictly with the measures to protect ecosystems, environmental mitigation, and management plans.

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Fig. 19. *Anolis soini*. Photo by J. Vaca G.

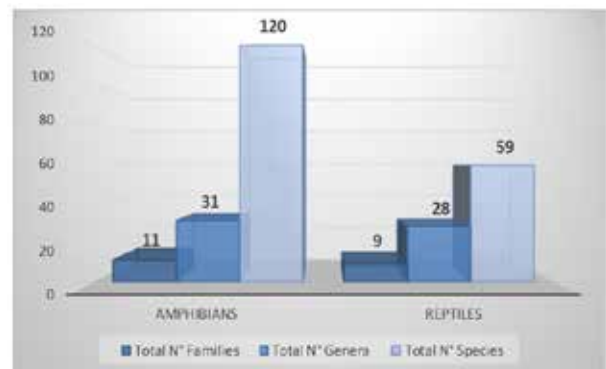


Fig. 20. Familial, generic, and specific diversity of amphibians and reptiles in the Cordillera del Cóndor.

Plateado. Thanks also to Bruce MacBryde and the late Milan D. Fiske for the opportunity to participate in the 1972 expedition into the Cordillera del Cóndor.

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Table 1. Species of amphibians recorded from the Cordillera del Cóndor.

Location	Alto Machinaza	Cerro Plateado	Alto Nangarita	Condor Mirador / La Heradura	Quebrada Shingana	Nump-atkaim / ríos Tsuirim y Coangos	RAP 7	RAP 7	Río Puintza	Base de Datos MEPN
Authority	Almendáriz et al., <i>in prep.</i>	Almendáriz and Brito 2013	Guayasaín et al. 2011	Proy. Paz y Conservación, 2005 (Ecuador)	Proy. Paz y Conservación, 2005 (Peru)	Fundación Natura 2000	Reynolds & Icochea 1997	Almendáriz 1997	Duellman & Lynch 1988	Registros Adicionales
Elevation	1300-1850 msnm	1600-2860 msnm	950-1850 msnm	1700 msnm	850-1200 msnm	930-1050 msnm	665-1750 msnm	900-2200 msnm	1550-1830 msnm	800-1700 msnm
ANURA										
Aromobatidae										
<i>Allobates kingsburyi</i>	X		X							
Bufonidae										
<i>Atelopus boulengeri</i>									X	
<i>Atelopus pulcher</i>					X					
<i>Atelopus spumarius</i>							X			
<i>Atelopus cf. palmatus</i>										
<i>Rhinella festae</i>	X	X	X	X		X	X		X	
<i>Rhinella marina</i>	X									
<i>Rhinella margaritifera</i>	X									
Centroleniidae										
<i>Centrolene audax</i>	X									
<i>Centrolene condor</i>	X									
<i>Chimerella mariaelenae</i>	X									
<i>Hyalinobatrachium pellucidum</i>										
<i>Nymphargus chancoas</i>										
<i>Nymphargus cochranae</i>	X									
<i>Nymphargus posadae</i>	X									
<i>Rulyrana flavopunctata</i>	X									X
<i>Rulyrana mcdiarmidi</i>	X									X
<i>Centrolene cf. wileyi</i>	X									

Herpetofauna of the Cordillera del Cóndor of Ecuador

Location	Alto Machinaza msnm	Alto Machinaza msnm	Alto Nangariza msnm	Condor Mirador / La Heradura msnm	Quebrada Shingana msnm	Nump-atkaim / ríos Tsurim y Coangos msnm	RAP 7 msnm	RAP 7 msnm	Río Puintza msnm	Base de Datos MEPN msnm
<i>Centrolene</i> sp. nov.	X									800-1700
Craugastoridae										Registros Adicionales
<i>Noblella lochites</i>	X		X			X		X	Duellman & Lynch 1988	1550-1830
<i>Lynchius simmonsii</i>						X				
<i>Lynchius</i> sp. nov.		X								
<i>Pristimantis achuar</i>						X		X		
<i>Pristimantis altamazonicus</i>	X							X		
<i>Pristimantis</i> cf. <i>bromeliaceus</i>	X							X		
<i>Pristimantis condor</i>	X							X		
<i>Pristimantis croceoringuis</i>										
<i>Pristimantis diadematus</i>										
<i>Pristimantis exoristus</i>	X									
<i>Pristimantis galdi</i>	X									
<i>Pristimantis incompertus</i>	X									
<i>Pristimantis martiae</i>										
<i>Pristimantis minimus</i>										
<i>Pristimantis muscosus</i>										
<i>Pristimantis pecki</i>	X									
<i>Pristimantis peruvianus</i>	X									
<i>Pristimantis prolatus</i>	X									
<i>Pristimantis proserpens</i>	X									
<i>Pristimantis quaquaversus</i>	X									
<i>Pristimantis rhodostichus</i>	X									

Location	Alto Machinaza	Cerro Plateado	Alto Nangariza	Condor Mirador / La Heradura	Quebrada Shingana	Nump-atkaim / ríos Tsurim y Coangos	RAP 7	RAP 7	Río Puintza	Base de Datos MEPN
Authority	Almendáriz et al., <i>in prep.</i>	Almendáriz and Brito 2013	Guayamin et al. 2011	Proy. Paz y Conservación, 2005 (Ecuador)	Proy. Paz y Conservación, 2005 (Perú)	Fundación Natura 2000	Reynolds & Icochea 1997	Almendáriz 1997	Duellman & Lynch 1988	Registros Adicionales
Elevation	1300-1850 msnm	1600-2860 msnm	950-1850 msnm	1700 msnm	850-1200 msnm	930-1050 msnm	665-1750 msnm	900-2200 msnm	1550-1830 msnm	800-1700 msnm
<i>Pristimantis</i> cf. <i>schultzei</i>	X							X		
<i>Pristimantis spinosus</i>	X		X						X	
<i>Pristimantis trachylepharis</i>										
<i>Pristimantis ventrimarmoratus</i>			X			X				
<i>Pristimantis</i> cf. <i>atratus</i>	X									
<i>Pristimantis</i> cf. <i>serendipitus</i>	X									
<i>Pristimantis</i> cf. <i>versicolor</i>	X									
<i>Pristimantis</i> sp. A										
<i>Pristimantis</i> sp. B										
<i>Pristimantis</i> sp. 1			X							
<i>Pristimantis</i> sp. 2			X							
<i>Pristimantis</i> sp. 3			X							
<i>Pristimantis</i> sp. 4			X							
<i>Pristimantis</i> sp. 5			X							
<i>Pristimantis</i> sp. 6			X							
<i>Pristimantis</i> sp. 7			X							
<i>Pristimantis</i> sp. 8			X							
<i>Pristimantis</i> sp. 9	X									
<i>Pristimantis</i> sp. 10	X									
<i>Pristimantis</i> sp. 11										
<i>Pristimantis</i> sp. 12			X							
<i>Pristimantis</i> sp. 13			X							
<i>Pristimantis</i> sp. 14	X									

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Location	Alto Machinaza	Cerro Plateado	Alto Nanagaritza	Condor Mirador / La Heradura	Quebrada Shingana	Nump-atkaim / ríos Tsurim y Coangos	RAP 7	RAP 7	Río Puintza	Base de Datos MEPN
Authority	Almendáriz et al., <i>in prep.</i>	Almendáriz and Brito 2013	Guayamin et al. 2011	Proy. Paz y Conservación, 2005 (Ecuador)	Proy. Paz y Conservación, 2005 (Perú)	Fundación Natura 2000	Reynolds & Icochea 1997	Almendáriz 1997	Duellman & Lynch 1988	Registros Adicionales
Elevation	1300-1850 msnm	1600-2860 msnm	950-1850 msnm	1700 msnm	850-1200 msnm	930-1050 msnm	665-1750 msnm	900-2200 msnm	1550-1830 msnm	800-1700 msnm
<i>Pristimantis</i> sp. 15	X									
<i>Pristimantis</i> sp. 16	X									
<i>Pristimantis</i> sp. 17		X								
<i>Pristimantis</i> sp. 18	X									
<i>Pristimantis</i> sp. 19	X									
<i>Pristimantis</i> sp. 20		X								
<i>Pristimantis</i> sp. 21								X		
<i>Pristimantis</i> sp. 22								X		
<i>Pristimantis</i> sp. 23										
<i>Pristimantis</i> sp. 24		X								
<i>Pristimantis</i> sp. 25		X								
<i>Pristimantis</i> sp. 26		X								
<i>Pristimantis</i> sp. 27		X								
<i>Pristimantis</i> sp. 28		X								
Dendrobatiidae										
<i>Colostethus fugax</i>										X
<i>Dendrobates</i> sp.										
<i>Excidobates condor</i>		X								
<i>Hyloxalus exasperatus</i>									X	
<i>Hyloxalus mystax</i>		X								
<i>Hyloxalus shuar</i>										X
<i>Ranitomeya variabilis</i>										

Location	Alto Machinaza msnm	1300-1850 msnm	1850-2400 msnm	Cerro Plateado msnm	1600-2860 msnm	Alto Nanagaritza msnm	950-1850 msnm	Condor Mirador / La Heradura msnm	1700 msnm	Quebrada Shingana msnm	850-1200 msnm	Nump-atkaim / ríos Tsurim y Coangos msnm	930-1050 msnm	RAP 7 msnm	900-2200 msnm	RAP 7 msnm	665-1750 msnm	Río Puintza msnm	1550-1830 msnm	Base de Datos MEPN msnm	Registros Adicionales msnm	800-1700 msnm	
Hemiphractidae																							
<i>Gastrotheca testudinea</i>	X														X			X					
<i>Gastrotheca weinlandii</i>	X																	X					
<i>Hemiphractus bubalus</i>	X					X											X						
<i>Hemiphractus proboscideus</i>	X																						
<i>Hemiphractus scutatus</i>	X																						
Hylidae																							
<i>Dendropsophus bifurcus</i>								X							X								
<i>Dendropsophus rhodopeplus</i>									X														
<i>Dendropsophus sarayacuensis</i>																							
<i>Dendropsophus minutus</i>	X		X			X																	
<i>Hyloscirtus condor</i>					X																		
<i>Hyloscirtus phyllognathus</i>	X		X																				
<i>Hypsiboas almdarizae</i>	X																						
<i>Hypsiboas boans</i>																							
<i>Hypsiboas cinerascens</i>	X																						
<i>Hypsiboas fasciatus</i>	X																						
<i>Hypsiboas geographicus</i>	X																						
<i>Hypsiboas lanciformis</i>	X																						
<i>Osteocephalus buckleyi</i>	X																						
<i>Osteocephalus festae</i>	X																						
<i>Osteocephalus taurinus</i>	X																						
<i>Osteocephalus</i> sp. A																							

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Location	Alto Machinaza	Cerro Plateado	Alto Nanagaritza	Condor Mirador / La Heradura	Quebrada Shingana	Nump-atkaim / ríos Tsurim y Coangos	RAP 7	RAP 7	Río Puintza	Base de Datos MEPN
Authority	Almendáriz et al., <i>in prep.</i>	Almendáriz and Brito 2013	Guayasamin et al. 2011	Proy. Paz y Conservación, 2005 (Ecuador)	Proy. Paz y Conservación, 2005 (Perú)	Fundación Natura 2000	Reynolds & Icochea 1997	Almendáriz 1997	Duellman & Lynch 1988	Registros Adicionales
Elevation	1300-1850 msnm	1600-2860 msnm	950-1850 msnm	1700 msnm	850-1200 msnm	930-1050 msnm	665-1750 msnm	900-2200 msnm	1550-1830 msnm	800-1700 msnm
<i>Phyllomedusa ecuatoriana</i>	X									X
<i>Scinax garbei</i>										
Leptodactylidae										
<i>Adenomera hylaedactylus</i>										X
<i>Leptodactylus leptodactyloides</i>	X							X		
<i>Leptodactylus pentadactylus</i>	X			X						
<i>Leptodactylus wagneri</i>										
<i>Lithodytes lineatus</i>						X				
Microhylidae										
<i>Chiasmocleis antenori</i>								X		
<i>Chiasmocleis</i> sp. nov.	X									
CAUDATA										
Plethodontidae										
<i>Bolitoglossa</i> sp. 1										
<i>Bolitoglossa</i> sp. 2		X								
<i>Bolitoglossa</i> sp. 3		X								
<i>Bolitoglossa</i> sp. 4			X							
GYMNOPHIONA										
Caeciliidae										
<i>Caecilia crassiquama</i>										X

Table 2. Species of amphibians recorded from the Cordillera del Cóndor.

Location	Alto Machinaza	Cerro Plateado	Alto Nangarita	Condor Mirador / La Herradura	Quebrada Shingangatza	Quebrada Shingangatza	RAP 7	RAP 7
Authority	Almendáriz et al., <i>in prep.</i>	Almendáriz and Brito 2013	Guayasamín et al. 2011	Proy. Paz y Conservación 2005 (Ecuador)	Proy. Paz y Conservación 2005 (Perú)	Almendáriz 1997	Reynolds & Icochea 1997	
Elevation	1300-1800 msnm	1600-2860 msnm	950-1850 msnm	1700 msnm	850-1200 msnm	900-2200 msnm	665-1750 msnm	
SAURIA								
Gymnophthalmidae								
<i>Alopoglossus atriventris</i>			X					
<i>Alopoglossus buckleyi</i>	X	X	X				X	
<i>Cercosaura argula</i>	X							
<i>Cercosaura dichra</i>	X							
<i>Potamites cochranae</i>	X		X	X				
<i>Potamites epleopus</i>	X							
<i>Potamites strangulatus</i>	X							
<i>Riama cf. anatoloris</i>		X						
<i>Pholidobolus machrydei</i>								
Iguanidae								
<i>Erythroides cofanorum</i>								
<i>Erythroides praestabilis</i>								
<i>Erythroides rubrigularis</i>	X							
<i>Erythroides</i> sp. A								
<i>Anolis cf. fitchi</i>								
<i>Anolis fuscoauratus</i>	X							
<i>Anolis ortonii</i>								
<i>Anolis podocarpus</i>	X							
<i>Anolis punctatus</i>	X							
<i>Anolis somii</i>	X							
<i>Anolis scyphus</i>								
Sphaerodactylidae								
<i>Lepidoblepharis festae</i>	X							
Teiidae								
<i>Kentropyx altamazonica</i>								X

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Location	Alto Machinaza Almendáriz et al., <i>in prep.</i> 1300-1800 msnm	Cerro Plateado Almendáriz and Brito 2013 1600-2860 msnm	Alto Nan-garitza Guayasamin et al. 2011 950-1850 msnm	Condor Mirador / La Herradura Proy. Paz y Conservación 2005 (Ecuador) 1700 msnm	Quebrada Shinganatza Proy. Paz y Conservación 2005 (Perú) 850-1200 msnm	Quebrada Shingaganatza Proy. Paz y Conservación 2005 (Perú) 850-1200 msnm	RAP 7 Almendáriz 1997 900-2200 msnm	RAP 7 Reynolds & Icochea 1997 665-1750 msnm
SERPENTES								
Boidae								
<i>Epicrateres cenchria cenchria</i>	X							X
Colubridae								
<i>Atractus major</i>	X							
<i>Atractus</i> sp.		X						
<i>Chironius carinatus</i>	X	X						X
<i>Chironius monticola</i>	X		X					
<i>Chironius scurrulus</i>	X		X			X		
<i>Clelia clelia</i>	X							
<i>Dipsas catesbyi</i>	X							
<i>Dipsas indica</i>	X							
<i>Dipsas pavonina</i>	X							
<i>Dipsas peruana</i>	X							
<i>Dipsas vermiculata</i>	X							
<i>Dipsas</i> cf. <i>peruana</i>	X							
<i>Erythrolamprus cobella</i>	X							
<i>Erythrolamprus festae</i>	X							
<i>Erythrolamprus mimus micrurus</i>	X							
<i>Erythrolamprus regina</i>	X							
<i>Erythrolamprus</i> sp. 1	X							
<i>Imantodes cenchoa</i>	X	X						
<i>Imantodes lentiferus</i>	X							
<i>Leptodeira annulata</i>	X							
<i>Oxyrhopus leucomelas</i>	X							
<i>Oxyrhopus melanogenys</i>	X							
<i>Oxyrhopus petolaris</i>	X							
<i>Siphilophis ayatama</i>	X							

Location	Alto Machinaza Almendáriz et al., <i>in prep.</i> 1300-1800 msnm	Cerro Plateado Almendáriz and Brito 2013 1600-2860 msnm	Alto Nan- garitza Guayasamin et al. 2011 950-1850 msnm	Condor Mirador / La Herradura Proy. Paz y Conservación 2005 (Ecuador) 1700 msnm	Quebrada Shinganatza Proy. Paz y Conservación 2005 (Perú) 850-1200 msnm	Quebrada Shin- ganatza Proy. Paz y Conservación 2005 (Perú) 850-1200 msnm	RAP 7 Almendáriz 1997 900-2200 msnm	RAP 7 Reynolds & Icochea 1997 665-1750 msnm
<i>Symphis bicolor</i>	X		X			X		X
<i>Tantilla</i> sp.								
<i>Xenodon rhabdocephalus</i>		X						
<i>Xenodon severus</i>								
Elapidae								
<i>Micrurus peruvianus</i>	X							
<i>Micrurus petersi</i>	X							
<i>Micrurus steindachneri steindachneri</i>	X							
<i>Micrurus</i> cf. <i>peruvianus</i>	X							
Tropidophiidae								
<i>Tropidophis taczanowski</i>		X						
Viperidae								
<i>Bothrocophias microphthalmus</i>	X		X				X	
<i>Bothrops atrox</i>	X		X					
<i>Bothrops pulchra</i>	X							
<i>Bothrops taeniata</i>								

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