



Amphibians and reptiles of Wildsumaco Wildlife Sanctuary, Napo Province, Ecuador

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Abstract

We conducted a long-term inventory of the herpetofauna of Wildsumaco Wildlife Sanctuary in the eastern part of the Napo Province in Ecuador. This private preserve is about 500 ha in size and is located on the southern slopes of Volcán Sumaco. The preserve contains primary forest, secondary forest, and pasture habitats. Based mostly on nocturnal transect sampling we documented 39 species of amphibians including one species of salamander, two species of caecilians, and 36 species of frogs. Rain frogs (*Pristimantis* Jimenez de la Espada, 1871) were diverse with 14 species documented. A diverse species assemblage of 45 reptile species was also documented on the preserve. Six amphibian species found were listed by the IUCN Red List. At least three species exhibited substantial geographic range extensions and seven species showed elevational range extensions. We discovered several undescribed species including one salamander, three frogs, one lizard, and one snake.

Keywords

Amphibians, Andes, Ecuador, herpetofauna, reptiles

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Introduction

The rapid and ongoing decline of biological diversity is one of the most pressing current environmental problems. To help lower extinction rates, population monitoring on protected lands such as Wildsumaco Wildlife Sanctuary and Sumaco National Park must become routine procedure. However, before population monitoring can begin, the biota of a given area must be documented. New

species of amphibians and reptiles are being discovered in Ecuador at a relatively high rate (Ron and Pramuk 1999; Cisneros-Heredia 2007; Cisneros-Heredia and McDiarmid 2007; Cisneros-Heredia and Meza-Ramos 2007; Cisneros-Heredia et al. 2008; Lehr and Coloma 2008; Harvey et al. 2013; Caminer and Ron 2014; Guayasamin et al. 2019; Reyes-Puig et al. 2019; Torres-Carvajal et al. 2019),

indicating much undetected biodiversity may still exist in this region. As part of the eastern Andean biodiversity hotspot (Myers et al. 2000), the Sumaco region is known for high levels of species richness.

Volcán Sumaco is a dormant volcano located about 50 km east of the Cordillera Oriental of the northern Andes in Ecuador and straddling the border between Napo and Orellana provinces. The volcano reaches 3732 m elevation with paramo habitat at its highest regions. Two endemic species of frogs have been described from Volcán Sumaco and include *Pristimantis ernesti* (Flores, 1987) and *Osornophryne sumacoensis* (Gluesenkamp, 1995), indicating that endemism exists on this disjunct mountain. The objective of this study was to document the herpetofauna of the Wildsumaco Wildlife Sanctuary (hereafter WWS), a private preserve on the southern flanks of Volcán Sumaco in the Napo Province (Fig. 1). WWS is about 500 ha in size with elevations ranging from 1200–1500 m. The northern portion of the property borders the buffer zone for the Sumaco National Park (SNP). Both WWS and SNP are part of the Gran Sumaco Biosphere Reserve, which encompasses over 9 million ha and includes habitats ranging from 500 to 3732 m elevation (UNESCO 2019). Threats to the herpetofauna in this region include forest clearing for agriculture and emerging infectious diseases such as chytridiomycosis. The objective of this study is to inventory the herpetofauna of this little studied region with the long-term goal of developing monitoring programs for the declining species.

Study Site

The forests at WWS are classified as lower premontane forest (Albuja et al. 2012). WWS consists of primary forest, secondary forest of various ages, and pasture. The property also has the Wildsumaco Lodge (00.6756° S, 077.6012°W, WGS 84, 1504 m elevation) which is an ecotourist destination primarily used by bird watchers and is a compound consisting of six buildings surrounded by manicured plantings. The Wildsumaco Biological Station (hereafter WBS, 00.6715°S, 077.5986°W, 1530 m elevation) is an academic field station consisting of five buildings. Both the lodge and WBS were built along the single unpaved road that bisects the property and terminates in the nearby village of Pacto Sumaco. The property has 12 named and intersecting trails that traverse all habitat types. Many specimens were collected in primary forest on the F.A.C.E. Trail which is named for the Fundación Adelanto Comunitario Ecuatoriano. Specimens collected from the vicinity of Pacto Sumaco which is only 500 m from WBS were also included in this species list. This region receives more than 2000 mm of precipitation annually with no dry season (Torres-Carvajal et al. 2020). There are two short relatively dry periods in late July–August and in December–January.

Methods

We began the survey in December 2008 and the first author conducted fieldwork at WWS on 12–22 December 2008, 9 July–1 August 2010, 19 July–2 August 2012,

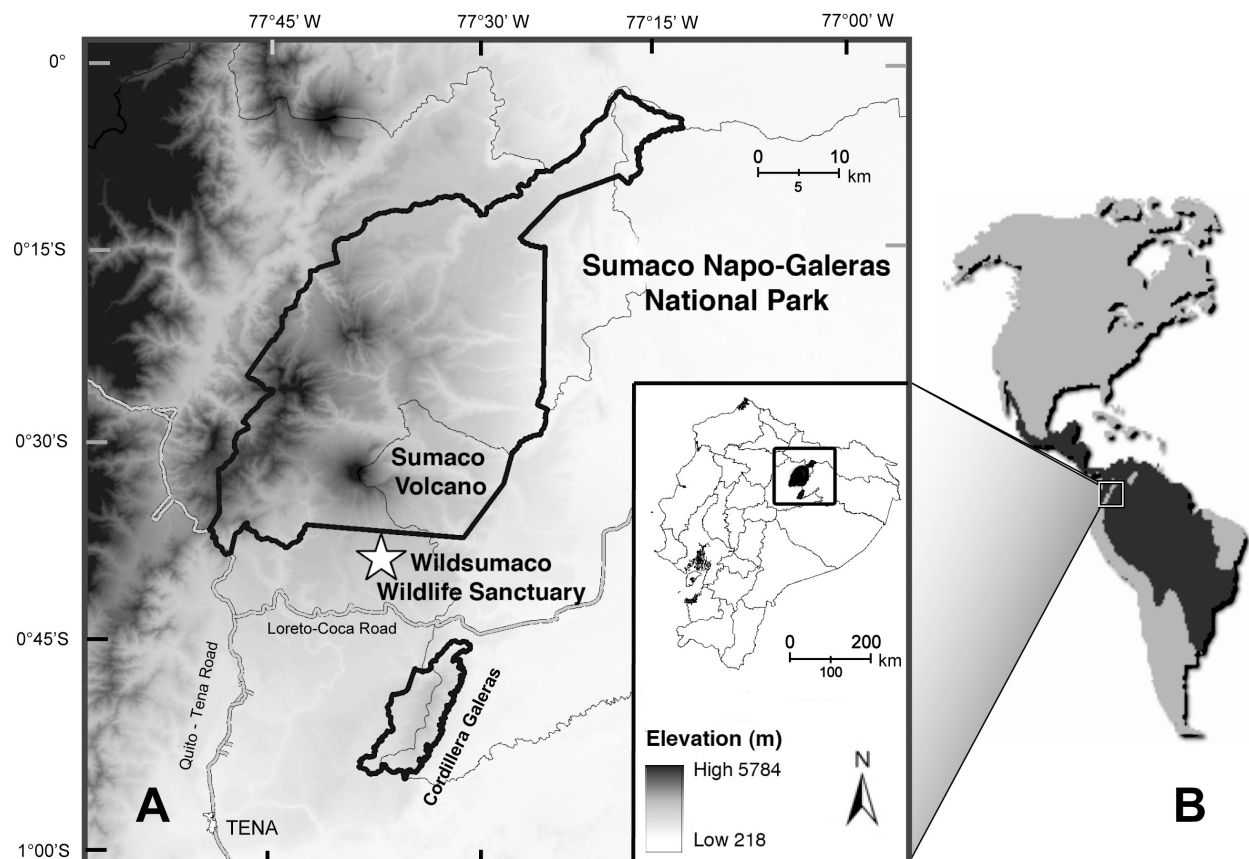


Figure 1. Map of Ecuador showing the study area indicated by a white star.

3–17 July 2013, 17–31 July 2014, 19 July–1 August 2016, 11–19 March 2017, 12–19 July 2018, and 6–15 August 2019. Most specimens were collected along trails at night usually between 1930–2400 h. The trails served as transects and they amounted to approximately 6.5 km in length. Most trails traversed secondary forest with sections of some trails going through primary forest as well. Relatively short sections of only three trails crossed pasture habitat. Additional specimens were collected on trails during the day, on roads or at the lodge or WBS compounds. Amphibians were euthanized in a 10% ethanol solution and reptiles were euthanized using cotton balls soaked in isoflurane. We took liver or skeletal muscle tissue or toe clips in 95% ethanol for DNA analysis for most specimens. All specimens and tissues were deposited in QCAZ at PUCE and in the collection at Universidad Tecnológica Indoamérica (MZUTI). Collecting was conducted under permits to SRR and OTC.

Results

Caudata (Table 1)

Plethodontidae

Bolitoglossa palmata (Werner, 1897)

Material examined. ECUADOR • 2 adults; Napo Province, near village of Pacto Sumaco on the slope of Volcán

Sumaco; 00.5669°S, 077.5941°W; 2200 m a.s.l.; 16 Aug. 1991; QCAZ 1577 to 1578 • 3 adults; Napo Province, WWS; 00.6757°S, 077.6013°W; 1485 m a.s.l.; 19 Apr. 2014; MZUTI 3526 to 3528.

Identification. This moderate-sized salamander can be distinguished from sympatric congeners by a combination of rounded toe tips, a mottled venter and 24–27 maxillary teeth (Ron et al. 2019).

Remarks. This species is listed as Vulnerable by the IUCN Red List and Endangered by the Ecuadorian Red List (Ron et al. 2019).

Gymnophiona

Caeciliidae

Caecilia abitaguae Dunn, 1942

Figure 2A

Material examined. ECUADOR • 1 adult, 1,565 mm; Napo Province, WWS; 00.6766°S, 077.6026°W; 29 July 2012; QCAZ 57707 • 1 juvenile, 216 mm; Napo Province, WWS, Coati Trail; 15 July 2013; QCAZ 56921 • 1 adult, 592 mm; Napo Province, WWS, Piha Trail, about 100 m down slope from intersection with Mannakin Trail, 00.6867°S, 077.5995°W; 1415 m a.s.l.; 4 July 2013; QCAZ 56884.

Identification. This large blue to bluish-gray caecilian can be distinguished from congeners by having 139–150

Table 1. Amphibian species documented at Wildsumaco Wildlife Sanctuary, Napo Province, Ecuador, and associated voucher specimen numbers for specimens deposited at Pontificia Universidad Católica del Ecuador (QCAZ).

Family, species	Voucher number	Family, species	Voucher number
Plethodontidae		<i>Scinax ruber</i> (Laurenti, 1768)	QCAZ 56885
<i>Bolitoglossa palmata</i> (Werner, 1897) [†]	QCAZ 74819	Leptodactylidae	
Rhinatreumatidae		<i>Adenomera hylaedactyla</i> (Cope, 1868) [§]	QCAZ 64290
<i>Epicriniops petersi</i> (Noble, 1927)	QCAZ 56870	<i>Leptodactylus leptodactyloides</i> (Andersson, 1945) [§]	QCAZ 76426
Caeciliidae		<i>Leptodactylus wagneri</i> (Peters, 1862)	QCAZ 57757
<i>Caecilia abitaguae</i> Dunn, 1942 [†]	QCAZ 48724	Microhylidae	
Bufonidae		<i>Chiasmocleis ventrimaculata</i> (Andersson, 1945)	Photo voucher AM077
<i>Rhinella margaritifera</i> (Laurenti, 1768)	QCAZ 74799	Strabomantidae	
<i>Rhinella marina</i> (Linnaeus, 1758)	QCAZ 74800	<i>Niceforonia elassodisca</i> (Lynch, 1973) [†]	QCAZ 48924
Centrolenidae		<i>Niceforonia nigrovittatus</i> (Andersson, 1945) [§]	QCAZ 74809
<i>Nymphargus cochranae</i> (Goin, 1961)	QCAZ 64296	<i>Pristimantis altamazonicus</i> (Barbour & Dunn, 1921)	QCAZ 48901
<i>Rulyrana flavopunctata</i> (Lynch & Duellman, 1973)	QCAZ 56877	<i>Pristimantis altamnis</i> Elmer & Cannatella, 2008 [‡]	QCAZ 48942
Hylidae		<i>Pristimantis bicantus</i> Guayasamin & Funk, 2009	QCAZ 57304
<i>Boana almandarizae</i> (Caminer & Ron, 2014) [‡]	QCAZ 74805	<i>Pristimantis conspicillatus</i> (Gunther, 1858) [§]	QCAZ 74811
<i>Boana calcarata</i> (Troschel, 1848)	QCAZ 53958	<i>Pristimantis cremnobates</i> (Lynch & Duellman, 1980) ^{†‡}	QCAZ 74810
<i>Boana lanciformis</i> Cope, 1871	QCAZ 53976	<i>Pristimantis incomptus</i> (Lynch & Duellman, 1980) ^{†‡}	QCAZ 41106
<i>Dendropsophus bifurcus</i> (Andersson, 1945) [§]	QCAZ 66730	<i>Pristimantis katoptroides</i> (Flores, 1988)	QCAZ 56887
<i>Dendropsophus marmoratus</i> (Laurenti, 1768) [§]	QCAZ 10912	<i>Pristimantis lanthanites</i> (Lynch, 1975)	QCAZ 48918
<i>Dendropsophus minutus</i> (Peters, 1872) complex	QCAZ 66737	<i>Pristimantis prolatus</i> (Lynch & Duellman, 1980) ^{†‡}	QCAZ 48896
<i>Dendropsophus parviceps</i> (Boulenger, 1882)	QCAZ 57714	<i>Pristimantis quaquaversus</i> (Lynch, 1974)	QCAZ 57314
<i>Dendropsophus sarayacuensis</i> (Shreve, 1935)	QCAZ 66741	<i>Pristimantis rubicundus</i> (Jimenez de la Espada, 1875) ^{†‡}	QCAZ 57302
<i>Hyloscirtus phyllognathus</i> (Melin, 1941)	QCAZ 74807	<i>Pristimantis trachyblepharis</i> (Boulenger, 1918)	QCAZ 36268
<i>Osteocephalus taurinus</i> (Steindachner, 1862)	Photo voucher AH881	<i>Pristimantis variabilis</i> (Lynch, 1968)	QCAZ 57736
<i>Osteocephalus verruciger</i> (Werner, 1901)	QCAZ 57743	<i>Pristimantis ventrimarmoratus</i> (Boulenger, 1912)	QCAZ 48897

* The species is on the IUCN Red List.

† Provincial record.

‡ The species is on the Ecuadorian Red List.

§ Elevational record.



Figure 2. Species of amphibians found at Wildsumaco Wildlife Sanctuary. **A.** *Caecilia abitaguae*, QCAZ 57707. **B.** *Rhinella maragaritifera*, QCAZ 74799. **C.** *Dendropsophus sarayacuensis*. **D.** *Osteocephalus verruciger* juvenile. **E.** *Scinax ruber*. **F.** *Adenomera hylaedactyla*, QCAZ 76423. **G.** *Pristimantis conspicillatus* QCAZ 74811. **H.** *Pristimantis katoptroides* QCAZ 76442. Photographs: A, B, F by JDC; D by TWK; C, H by T. Wright; E, G by K. Wheatly.

primary annuli and the body length divided by the body width 43.7–59 times (Taylor 1968; Ron et al. 2019).

Habitat. This fossorial species has been observed above ground in primary and secondary forest, along roads and in pasture. They are active above ground at night and during the day especially after heavy rains.

Remarks. This specimen represents a range extension of about 94 km to the northeast and the first record for Napo Province (Ron et al. 2019). The specimen QCAZ 57707 represents a new size record for the species, with the previous record being 1302 mm (Taylor 1968).

Rhinatreumatidae

Epicrionops petersi (Noble, 1927)

Material examined. ECUADOR • 1 adult; Napo Province, WWS, 0.6797°S, 077.6008°W; 1494 m a.s.l.; 4 April 2013; QCAZ 56870.

Identification. These small black tailed caecilians reach 286.5 mm in total length. Tail length/body length = 21–23.6, splenial teeth are 13–13 to 16–16, premaxillary and maxillary teeth are 17–17 to 21–21, and there are 269–316 annuli (Taylor 1968).

Anura

Bufonidae

Rhinella margaritifera (Laurenti, 1768)

Figure 2B

Material examined. ECUADOR • 1 juvenile; Napo Province, WWS; 00.6875°S, 077.6008°W; 1427 m a.s.l.; 16 July 2018; QCAZ 74799 • 1 adult; Napo Province, WWS, same locality; 6 Aug. 2019; QCAZ 76416.

Identification. This species can be distinguished from other toads in the region by the pronounced cranial crests, pointed snout and the row of tubercles running alongside the body. The paratoid glands are well developed but rather small.

Habitat. Both specimens of this species were collected along trails in secondary forest.

Rhinella marina (Linnaeus, 1758)

Material examined. ECUADOR • 1 adult; Napo Province, private residence adjacent to WWS; 00.6821°S, 077.6027°W; 1474 m a.s.l.; 13 July 2010; QCAZ 48910 • 1 adult; Napo Province, WBS; 00.6715°S, 077.5986°W; 1530 m a.s.l.; 4 July 2013; QCAZ 56876.

Identification. These large toads can easily be identified by their enormous paratoid glands which extend part way down the side of the body. They usually are some shade of medium to dark brown with various amounts of light and/or dark speckling. The cranial crests are well developed.

Habitat. This species was found in heavily disturbed habitats around buildings and on and around roads. We did not observe this species in secondary or primary forest.

Centrolenidae

Nymphargus cochranae (Goin, 1961)

Material examined. ECUADOR • 1 adult; Napo Province, WWS, waterfall; 00.6859°S, 077.5986°W; 1405 m a.s.l.; 10 July 2010; QCAZ 48899 • 2 adults; Napo Province, WWS, Streamcreeper trail; 00.6714°S, 077.5987°W; 24 July 2014; QCAZ 57741 to 57742.

Identification. These small frogs are green dorsally with small blue dots and a white opaque peritoneum ventrally. They lack finger webbing and humeral spines present in some other species of glass frogs. Males range from 24.0–26.2 mm SVL and females 27.8–30.2 mm SVL (Ron et al. 2019).

Habitat. These glass frogs were found in both primary and secondary forest along trails. One specimen was found in the spray zone of the waterfall.

Rulyrana flavopunctata (Lynch & Duellman, 1973)

Material examined. ECUADOR • 3 adults; Napo Province, WWS, waterfall; 00.6859°S, 077.5986°W; 1405 m a.s.l.; 25 July 2014; QCAZ 57751 to 57753 • 1 adult; Napo Province, WWS, Piha Trail, about 50 m from road; 12 July 2018; QCAZ 74801.

Identification. These small frogs have bright green slightly granular skin with small yellow spots dorsally. The venter has an opaque white peritoneum. There is moderate webbing between fingers III and IV, and humeral spines are absent. Males are 20.6–23.2 mm SVL and females are 24.12–25.7 mm SVL (Ron et al. 2019).

Habitat. This species was found in association with waterfalls and streams in both primary and secondary forest. Only one specimen was found along a trail in secondary forest and not along a water course.

Hylidae

Boana almendarizae (Caminer & Ron, 2014)

Material examined. ECUADOR • 1 adult; Napo Province, WWS Lodge; 00.6756°S, 077.6012°W; 1504 m a.s.l.; 8 July 2018; QCAZ 74805 • 1 adult; Napo Province, WWS; 00.6759°S, 077.5998°W; 1485 m a.s.l.; 18 Apr. 2014; MZUTI 3532.

Identification. This species can be distinguished from the sympatric *Boana calcarata* by the shape of the heel tubercle which is large and conical in *B. almendarizae* but large and triangular in *B. calcarata* (Caminer and Ron 2014). The vertical dark and light lines on the flanks of *B. almendarizae* are narrower than in *B. calcarata*.

Habitat. One specimen was collected in secondary forest and the other around buildings in the WWS lodge.

Remarks. This species is listed as Near Threatened by the Ecuadorian Red List (Ron et al. 2019).

Boana calcarata (Troschel, 1848)

Material examined. ECUADOR • 2 adults; Napo Province, WWS, lower part of Coopman's Trail; 00.6763°S,

077.5998°W; 25 July 2012; QCAZ 53958 to 53959.

Identification. See *Boana almendarizae* species account.

Habitat. This species was found along the edge of secondary forest.

Remarks. These specimens represent an 850 m elevational range extension (Caminer and Ron 2014).

***Boana lanciformis* Cope, 1871**

Material examined. ECUADOR • 1 adult; Napo Province, WBS; 00.6715°S, 077.5986°W; 1530 m a.s.l.; 28 July 2012; QCAZ 53976.

Identification. This large treefrog has a pointed snout, tan dorsum with some light bands and a black vertebral stripe in some individuals, and a pale stripe along the upper lip. It has a dark canthal stripe that extends through the tympanum and along the side of the body. The throat is brown or maroon with pale flecks. The venter is cream-colored.

***Dendropsophus bifurcus* (Andersson, 1945)**

Material examined. ECUADOR • 1 adult; Napo Province, pasture across road from WBS; 00.67161°S, 077.59932°W; 1530 m a.s.l.; 20 July 2012; QCAZ 53927.

Identification. This small treefrog has expanded pads on the digits, and the dorsal ground color is maroon with yellow, orange, or whitish markings. The dorsal markings have rather straight borders and are lacking on the shank.

Habitat. The single specimen from WWS was found in a pasture which was partially flooded.

Remarks. This record increases the elevation over 300 m above previous records in Ecuador (Ron et al. 2019).

***Dendropsophus marmoratus* (Laurenti, 1768)**

Material examined. ECUADOR • 1 adult; Napo Province, Pacto Sumaco, 00.7260°S, 077.5660°W; 1530 m a.s.l.; 1 Jan. 1996; QCAZ 10912.

Identification. This small treefrog has a variable dorsal color pattern with lichen-like markings and a pale venter with bold black spotting. The fingers and toes are extensively webbed, and there is a fringe of skin with scalloped edges along the limbs.

Remarks. Our record increases the elevational range of this species by 500 m a.s.l. (Ron et al. 2019).

***Dendropsophus minutus* (Peters, 1872)**

Material examined. ECUADOR • 4 adults; Napo Province, WWS, shallow pond in pasture; 00.6801°S, 077.6071°W; 1406 m a.s.l.; 28 July 2012; QCAZ 53977 to 53980 • 1 juvenile; Napo Province, WWS, F.A.C.E. Trail; 7 Aug. 2019; QCAZ 76419 • 1 adult; Napo Province, WWS, along road approximately 100 m down slope from WBS; 14 Aug. 2019; QCAZ 76422.

Identification. These tiny treefrogs range in dorsal coloration from cream to greenish to maroon with tiny black flecks. They usually have a darker triangular marking between the eyes with the apex pointing posteriorly. There

is a pale stripe running from the cloaca to the heel.

Habitat. Large choruses of this species inhabit a pond in a pasture near secondary forest. Specimens have also been found in primary forest and along the edge of secondary forest.

Taxonomic notes. A molecular phylogeny by Gehara et al. (2014) indicates that Ecuadorian populations of *D. minutus* may represent an undescribed species.

***Dendropsophus parviceps* (Boulenger, 1882)**

Material examined. ECUADOR • 1 adult; Napo Province, WWS; 00.6875°S, 077.6008°W; 1427 m a.s.l.; 20 July 2010; QCAZ 48919 • 4 adults; Napo Province, WWS; 00.6866°S, 077.6013°W; 1430 m a.s.l.; 27 July 2010; QCAZ 48928 to 48931 • 1 adult; Napo Province, WBS; 00.6715°S, 077.5986°W; 1530 m a.s.l.; 17 July 2014; QCAZ 57714.

Identification. These tiny treefrogs are reddish brown to gray dorsally and with a white spot below the eye. The posterior surfaces of the thigh are dark with bold white spotting, and a large orange patch is prominent on the ventral surface of the shank.

Habitat. This species has been found in clearings in secondary forest and at WBS which is adjacent to secondary forest.

***Dendropsophus sarayacuensis* (Shreve, 1935)**

Figure 2C

Material examined. ECUADOR • 1 adult; Napo Province, WWS, lower part of Coopman's Trail; 00.6763°S, 077.5998°W; 25 July 2012; QCAZ 53957 • 2 adults; Napo Province, WWS, shallow pond in pasture; 00.6801°S, 077.6071°W; 1406 m a.s.l.; 11 Aug. 2019; QCAZ 76420 to 76421.

Identification. These small treefrogs have a purplish-brown ground color similar to *D. bifurcus*, but with larger, yellowish-orange blotches that have ragged edges. These blotches are also present on the wrists and elbows of the forelimbs and on the shank and heels of the hindlimbs.

Habitat. This species was encountered in a marsh habitat in a pasture along secondary forest edge habitat.

***Hyloscirtus phyllognathus* (Medlin, 1941)**

Material examined. ECUADOR • 1 tailed juvenile; Napo Province, WWS, in vegetation along a stream; 00.6801°S, 077.6071°W; 1240 m a.s.l.; 17 July 2018; QCAZ 74807.

Identification. This species is medium green with black and white dots dorsally and a yellowish venter. It has a yellow supralabial stripe and a distinctive tympanum.

Habitat. The single individual was found less than 1 m above ground along a stream. It was a metamorph that still had part of its tail.

Remarks. This species is listed as Vulnerable in the Red List of Ecuadorian amphibians (Ron et al. 2019).

***Osteocephalus taurinus* (Steindachner, 1862)**

Material examined. ECUADOR • 1 adult; Napo Province, WWS; photo voucher AH881.

Identification. This extremely large treefrog is brown dorsally with a cream venter. There are large finger disks, slight webbing between the fingers and a subarticular tubercle on the ventral surfaces of the fingers. The iris is greenish bronze with black reticulations. Males reach 76 mm SVL and females 94 mm SVL.

***Osteocephalus verruciger* (Werner, 1901)**

Figure 2D

Material examined. ECUADOR • 1 adult; Napo Province, WWS, Streamcreeper trail; 00.6714°S, 077.5987°W; 24 July 2014; QCAZ 57743 • 1 adult; Napo Province, WWS, F.A.C.E. Trail; 22 July 2014; QCAZ 57740.

Identification. This large treefrog has a uniform brown dorsum. The iris is plain brown without reticulations. The tympanum is about ¼ the length of the head and males have abundant keratinized tubercles covering the dorsum.

Habitat. This species occurs in both primary and secondary forests and has also been recorded in disturbed areas near buildings.

Remarks. Newly metamorphosed *Osteocephalus verruciger* from WWS have orange and yellow mottling on the limbs which is not present in other populations of this species; however, the adults exhibit the typical color for the species (Ron et al. 2010).

***Scinax ruber* (Laurenti, 1768)**

Figure 2E

Material examined. ECUADOR • 1 adult; Napo Province, WWS; 00.6797°S, 077.6008°W; 1494 m a.s.l.; 12 July 2010; QCAZ 48903 • 2 adults; Napo Province, private residence adjacent to WWS; 00.6821°S, 077.6027°W; 1474 m a.s.l.; 12 July 2010; QCAZ 48906 to 48907 • 1 adult; Napo Province, WBS; 00.6715°S, 077.5986°W; 1530 m a.s.l.; 5 July 2013; QCAZ 56885.

Identification. This species has a dorsal coloration that ranges from medium brown to greenish yellow with a cream or yellow belly. It has yellow to orange spots on the back of the thigh, has toe webbing, and lacks conspicuous tubercles.

Habitat. *Scinax ruber* is one of the most abundant frogs at WWS. They occupy primary and secondary forest as well as ruderal habitats. They have been collected on the sides of buildings, and they call from inside large plastic cisterns used to collect rainwater. The cisterns seem to greatly amplify the volume of their calls.

Leptodactylidae

***Adenomera hylaedactyla* (Cope, 1868)**

Figure 2F

Material examined. ECUADOR • 1 adult; Napo Province, WWS, Wildsumaco Lodge; 00.6756°S, 077.6012°W;

1500 m a.s.l.; 15 July 2010; QCAZ 48914 • 1 adult; Napo Province, WBS; 00.6715°S, 077.5986°W; 1530 m a.s.l.; 21 July 2012; QCAZ 53940 • 1 adult; Napo Province, WWS; 00.6875°S, 077.6008°W; 1427 m a.s.l.; 23 July 2016; QCAZ 64290.

Identification. This small frog, <29 mm SVL, has reddish orange forearms and a cream venter. Fingers I and II are identical in length, there is no digital webbing, expanded discs are absent as well as dorsolateral folds. It has a pointed snout and lacks fringes of skin on the fingers.

Habitat. This species inhabits both primary and secondary forests at WWS and is found around disturbed areas near buildings.

Remarks. The species was found at about 1530 m a.s.l. in this study, which extends the elevational range of this species over 500 m (Ron et al. 2019).

***Leptodactylus leptodactyloides* (Andersson, 1945)**

Material examined. ECUADOR • 2 adults; Napo Province, WWS, shallow pond in pasture; 00.6801°S, 077.6071°W; 1406 m a.s.l.; 11 Aug. 2019; QCAZ 76426 to 76427.

Identification. This medium-brown frog has clear lines on the posterior surface of the thigh and a yellowish-cream venter with gray mottling restricted to the anterior one-third of the body. Finger I is longer than finger II, and it has epidermal ridges along the toes. Males reach 40 mm SVL, and females grow up to 47 mm SVL.

Remarks. This species was found at about 1400 m in this study, extending its elevational range by 400 m higher (Ron et al. 2019).

***Leptodactylus wagneri* (Peters, 1862)**

Material examined. ECUADOR • 2 adults; Napo Province, pond on private residence adjacent to WWS; 00.6821°S, 077.6027°W; 1474 m a.s.l.; 12 July 2010; QCAZ 48908 to 48909 • 2 adults; Napo Province, WWS, pasture across road from WBS; 00.6716°S, 077.5993°W; 1525 m a.s.l.; 20 July 2012; QCAZ 53934 to 53935.

Identification. This species is larger than *L. leptodactyloides* and with gray mottling covering the entire ventral surface. It is brown dorsally, with black and white bars on the lips, inconspicuous dorsolateral folds, and scattered spicules on the back. Finger I is longer than finger II, epidermal ridges occur along the toes, and the toes usually lack expanded discs. Males reach 60 mm SVL, and females grow up to almost 82 mm SVL.

Habitat. This species frequently calls from marsh habitat in pastures. It has also been taken from a farm pond at a private residence next to WWS.

Microhylidae

***Chiasmocleis ventrimaculata* (Andersson, 1945)**

Material examined. ECUADOR • 1 adult; Napo Province, WWS; photo voucher AM077.

Identification. This small, dark-brown frog has a pointed head and a ventral pattern of black and white marbling. The back and sides are the same color. The tympanum is concealed, there is no webbing between the fingers or toes, and there are five toes present.

Remarks. Ron et al. (2019) indicated that this species ranges up to 400 m a.s.l., so this record increases the elevational range of this species by approximately 1,000 m a.s.l.

Strabomantidae

Niceforonia elassodisca (Lynch, 1973)

Material examined. ECUADOR • 1 adult; Napo Province, WWS; 00.6882°S, 077.6077°W; 1290 m a.s.l.; 25 July 2010; QCAZ 28924.

Identification. This small, brownish frog has a yellowish belly, thin digital discs, and a sloping snout. Toe III is the same length as finger V. Males reach a maximum size of 29 mm SVL, and females almost reach 37 mm SVL (Ron et al. 2019).

Remarks. This species is listed as Near Threatened by the Ecuadorian Red List and Endangered by the IUCN Red List. Ron et al. (2019) gave the altitudinal range of this species as 2300–2900 m a.s.l., so this record extends the elevational range about 1,000 m a.s.l. lower.

Niceforonia nigrovittata (Andersson, 1945)

Material examined. ECUADOR • 1 adult; Napo Province, WWS; Puffbird Trail; 00.6876°S, 077.6014°W; 1412 m a.s.l.; 17 March 2017; QCAZ 66729 • 1 adult; Napo Province, WWS; 8 July 2018; QCAZ 74809 • 1 adult; Napo Province, WWS, F.A.C.E. Trail; 7 Aug. 2019; QCAZ 76437.

Identification. This small, brownish frog has black inguinal spots, a smooth cream venter, thin digital discs, and a sloping snout. The inner metatarsal tubercle is twice the size of the outer metatarsal tubercle. Toe III is the same length as finger V. Males have a fleshy upper lip and snout tip. Males reach 24.6 mm SVL, and females attain a maximum size of 30.5 mm SVL (Ron et al. 2019).

Habitat. This small terrestrial frog was found in both primary and secondary forest at WWS.

Remarks. This species was found as high as 1500 m a.s.l. at WWS, which extends the elevational range about 600 m a.s.l. higher (Ron et al. 2019).

Pristimantis altamazonicus (Barbour & Dunn, 1921)

Material examined. ECUADOR • 1 adult; Napo Province, WWS, Streamcreeper Trail; 00.6779°S, 077.6030°W; 1440 m a.s.l.; 12 July 2010; QCAZ 48901 • 1 juvenile; Napo Province, WWS, Antpitta Trail; 6 July 2013; QCAZ 56895 • 1 adult; Napo Province, WWS; 00.6798°S, 077.6007°W; 30 July 2016; QCAZ 63555 • 1 adult; Napo Province, WWS, along a small stream; 00.6801°S, 077.6071°W; 1240 m; 9 Aug. 2019; QCAZ 76443.

Identification. This small, brown frog has a red to orange groin with black spots, a tubercle on the upper

eyelid, a visible tympanum, and a venter that is cream, light gray, or pale red. Males reach 19.8 mm SVL, and females 30 mm SVL (Ron et al. 2019).

Habitat. This small terrestrial species was found in only secondary forest.

Pristimantis altamnis Elmer & Cannatella, 2008

Material examined. ECUADOR • 1 adult; Napo Province, WWS, Piha Trail; 00.6897°S, 077.5979°W; 1312 m a.s.l.; 30 July 2010; QCAZ 48942 • 1 adult; Napo Province, WWS, F.A.C.E. Trail; 22 July 2016; QCAZ 64302 • 1 adult; Napo Province, WWS, Wildsumaco Lodge; 00.6756°S, 077.6012°W; 1504 m a.s.l.; 22 July 2016; QCAZ 64300.

Identification. This small, brown frog has a cream venter with brown reticulations, W-shaped dermal ridges in the scapular region, low eyelid tubercles, and subconical heel tubercles. Males reach a maximum SVL of 19.9 mm and females 27.6 mm (Ron et al. 2019).

Habitat. *Pristimantis altamnis* was found both primary and secondary forest. One specimen was collected near the WWS lodge in disturbed habitat.

Remarks. The Red List of Ecuadorian amphibians lists this species as Vulnerable (Ron et al. 2019). It has been recorded at about 1500 m a.s.l. at WWS, which increases its altitudinal occurrence by about 500 m.

Pristimantis bicantus Guayasamin & Funk, 2009

Material examined. ECUADOR • 1 adult; Napo Province, WWS, Waterfall Trail; 00.6847°S, 077.6002°W; 3 April 2014; QCAZ 57304.

Identification. This small, brown frog lacks dermal ridges and folds as well as heel tubercles. The finger discs are only slightly expanded, the snout is rounded, and dentigerous processes of the vomer bone are present. Red pigment is usually present in the groin region. Males reach 14.2 mm SVL and females 21.7 mm SVL (Ron et al. 2019).

Habitat. The single specimen found in this study was collected in secondary forest.

Pristimantis conspicillatus (Gunther, 1858)

Figure 2G

Material examined. ECUADOR • 1 adult; Napo Province, WWS, F.A.C.E. Trail; 30 July 2016; QCAZ 64341 • 1 adult; Napo Province, WWS; 00.6865°S, 077.6015°W; 1420 m a.s.l.; 12 July 2018; QCAZ 74811 • 1 adult; Napo Province, WWS, Piha Trail; 16 July 2018; QCAZ 74817.

Identification. This is one of the largest *Pristimantis* species at WWS, with a maximum SVL of 30 mm in males and 48.8 mm in females (Ron et al. 2019). The dorsal coloration is medium brown, and a dark interorbital bar is present. Finger I is longer than finger II, a dorso-lateral fold is present, and the back of the thighs exhibit small orange or red spots. The upper lip is gray or brown, and there is a basal membrane between the toes.

Habitat. This species was found in both primary and

secondary forest. One specimen was found along the edge of secondary forest.

Taxonomic notes. This anuran is part of a species complex which is being taxonomically revised (Ron et al. 2019).

Remarks. This species has been found up to 1500 m a.s.l. at WWS, which extends the elevational range upwards by approximately 500 m (Ron et al. 2019).

***Pristimantis cremnobates* (Lynch & Duellman, 1980)**

Material examined. ECUADOR • 1 adult; Napo Province, WBS; 00.6715°S, 077.5986°W; 1530 m a.s.l.; 7 July 2018; QCAZ 74812 • 1 adult; Napo Province, WWS, Piha Trail about 50 m from road; 00.6865°S, 077.6015°W; 1420 m a.s.l.; 12 July 2018; QCAZ 74810 • 1 adult; Napo Province, WWS, F.A.C.E. Trail; 11 July 2018; QCAZ 74813 • 2 adults; Napo Province, WWS, F.A.C.E. Trail; 15 July 2018; QCAZ 74815 to 74816. • 1 adult; Napo Province, WWS, Piha Trail; 16 July 2018; QCAZ 74818 • 6 adults; Napo Province, WWS, 00.6875°S, 077.6008°W; 1427 m a.s.l.; 6 Aug. 2019; QCAZ 76428 to 76429 and 76432 to 76435.

Identification. This species has a medium-brown patterned dorsum with occipital ridges. There are non-conical tubercles on the eyelids, heels, and tarsi. The finger discs are widely expanded. Finger I is slightly shorter than finger II, the tympanic membrane is visible, and there is no basal membrane between the toes. Males reach 30.6 mm SVL and females 51.7 mm SVL (Ron et al. 2019).

Habitat. This species inhabits both primary and secondary forest at WWS.

Remarks. This species is considered Endangered by both Ecuador and the IUCN.

***Pristimantis incomptus* (Lynch & Duellman, 1980)**

Material examined. ECUADOR • 1 adult; Napo Province, along the Pucuno River on the trail from Pacto Sumaco to Volcán Sumaco; 00.6339°S, 077.5923°W; 3 March 2009; QCAZ 41106 • 2 adults; Napo Province, WWS; 00.6759°S, 077.5998°W; 1485 m a.s.l.; 18 Apr. 2014; MZUTI 3534 to 3535.

Identification. This small, brown frog is unique in having scapular folds in a) (shape. It has greatly expanded finger discs, brown or cream in the groin and back of thighs, and it lacks a basal membrane between the toes. Other *Pristimantis* with scapular folds are W- or X-shaped. Males reach 18.8 mm SVL and females 25.9 mm (Ron et al. 2019).

Remarks. This species is considered Vulnerable on the IUCN Red List and Near Threatened on the Ecuadorian Red List (Ron et al. 2019).

***Pristimantis katoptroides* (Flores, 1988)**

Figure 2H

Material examined. ECUADOR • 1 adult; Napo Province, WWS, intersection of Antpitta Trail and small

stream; 00.6769°S, 077.5984°W; 1480 m a.s.l.; 5 July 2013; QCAZ 56887 • 1 adult; Napo Province, WWS, along a small stream; 00.6801°S, 077.6071°W; 1240 m; 9 Aug. 2019; QCAZ 76442.

Identification. This is a small, green frog with tubercles on the eyelids, heels, and tarsi. It has well-developed finger discs and no basal membrane between the toes. The most distinctive character is the dark-blue pigmentation in the groin and on the backs of the thighs which is not present on any other *Pristimantis* on the eastern slopes of the Andes in Ecuador.

Habitat. This species has been observed twice at WWS, both times along streams. The first specimen collected was found at night in the crotch of a small tree about 1.5 m above ground. The second specimen (Fig. 2G) was injured and found on the ground during the day about 2 m from a stream and died later that day.

***Pristimantis lanthanites* (Lynch, 1975)**

Material examined. ECUADOR • 1 adult; Napo Province, WWS; 00.6865°S, 077.6015°W; 1420 m a.s.l.; 19 July 2010; QCAZ 48918 • 1 adult; Napo Province, WWS, Lanisoma Trail; 00.6827°S, 077.5943°W; 1420 m a.s.l.; 21 July 2010; QCAZ 48946 • 2 adults; Napo Province, WWS; 0.6785°S, 077.6008°W; 1427 m a.s.l.; 6 Aug. 2019; QCAZ 76430 to 76431 • 2 adults; Napo Province, WWS, Manakin Trail; 8 August 2019; QCAZ 76439 to 76440.

Identification. The dorsal coloration of this species ranges from light to dark brown. The ventral skin is smooth, and there is gray or black and white mottling on the throat and chest but not on the pale gray belly. Finger I equals finger II in length, the finger discs are expanded, dorsolateral folds are present, and the heel tubercle is conical. Males reach 26 mm SVL and females 42 mm (Ron et al. 2019).

Habitat. This frog was found only in secondary forest at WWS, usually on vegetation within 1 m of the substrate.

***Pristimantis librarius* (Flores & Vigle, 1994)**

Material examined. ECUADOR • 1 adult; Napo Province, WWS, Piha Trail bottom; 00.6897°S, 077.5979°W; 1312 m a.s.l.; 8 Aug. 2019; QCAZ 76438.

Identification. This small, brown frog can be recognized by having an orange to red groin, a tubercle on the eyelid, expanded finger discs, an exposed tympanum, and no scapular folds. It also lacks basal membranes between the toes, as well as heel tubercles, and the backs of the thighs are unmarked and medium brown. Males reach 18.5 mm SVL and females 30.7 mm SVL (Ron et al. 2019).

***Pristimantis prolatus* (Lynch & Duellman, 1980)**

Material examined. ECUADOR • 1 adult; Napo Province, WWS; 00.6888°S, 077.6030°W; 1406 m a.s.l.; 9 July 2010; QCAZ 48896 • 1 adult; Napo Province, WWS; 00.6779°S, 077.6030°W; 1440 m a.s.l.; 12 July 2010; QCAZ 48902 • 1 adult; Napo Province, WWS, Piha Trail about 20 m down slope of junction with the Mannakin

Trail; 00.6893°S, 077.5995°W; 1400 m a.s.l.; 30 July 2010; QCAZ 48944 • 2 adults; Napo Province, WWS; 00.6759°S, 077.5998°W; 1485 m a.s.l.; 19 Apr. 2014; MZUTI 3530 and 3533.

Identification. This small, brown frog's most distinctive character is the H-shaped dermal ridges on the scapular region of the back. It has tuberculate skin, with conical tubercles on the eyelid, heel, and several on the tarsi. The back of the thigh is uniformly dark brown, with no markings. The finger discs are expanded, and there is no basal membrane between the toes. Males reach a maximum SVL of 18.4 mm and females 24.1 mm (Ron et al. 2019).

Habitat. This species was found in secondary forest and in a clearing within secondary forest.

Remarks. This species is listed as endangered by both the IUCN and Ecuadorean Red Lists (Ron et al. 2019).

Pristimantis quaquaversus (Lynch, 1974)

Material examined. ECUADOR • 1 adult; Napo Province, WWS, Waterfall Trail; 00.6847°S, 077.6002°W; 3 April 2014; QCAZ 57314.

Identification. This species has a hidden tympanum, expanded finger discs, conical eyelid and heel tubercles, and several smaller tarsal tubercles. The groin can be cream, pink, or purple. This species lacks basal toe membranes, dorsolateral folds, and scapular ridges. Males reach 22.5 mm and females 31.3 mm (Ron et al. 2019).

Pristimantis rubicundus (Jimenez de la Espada, 1875)

Material examined. ECUADOR • 1 adult; Napo Province, WWS, F.A.C.E. Trail; 22 July 2016; QCAZ 5730.

Identification. This is a rather large species of brown *Pristimantis* with finger I slightly longer than finger II. The tympanum is visible, and a large conical heel tubercle and several tarsal tubercles are present. The dorsal skin is tuberculate, and there are eyelid tubercles as well. The finger discs are expanded, and basal toe membranes are absent. Males reach 35.6 mm SVL and females 51.2 mm SVL (Ron et al. 2019).

Habitat. The single specimen found in this study came from primary forest.

Remarks. Both the IUCN and Ecuadorian Red lists identify this species as Endangered.

Pristimantis trachyblepharis (Boulenger, 1918)

Material examined. ECUADOR • 1 adult; Napo Province, Pacto Sumaco; 27 July 1992; QCAZ 36268 • 3 adults; Napo Province, WWS; 00.6759°S, 077.5998°W; 1485 m a.s.l.; 18 Apr. 2014; MZUTI 3531, 3537 to 3538.

Identification. This may be the smallest species of *Pristimantis* in South America (Lynch and Duellman 1980). The back is pale yellow, light brown, or reddish brown, the flanks are yellow, and the axillary region is brown. There is a brown cloacal triangle, and the back of the thighs are brown to gray. The venter is gray to brown, with a yellow to brown throat with brown spots. The iris is pale gray with a horizontal reddish-brown line. Males

reach a maximum SVL of 15.8 mm and females 19.2 mm SVL (Ron et al. 2019).

Pristimantis variabilis (Lynch, 1968)

Material examined. ECUADOR • 1 adult; Napo Province, WWS, F.A.C.E. Trail; 22 July 2014; QCAZ 57736.

Identification. This species' most distinctive character is the bright-yellow groin, which may be reddish orange in some individuals. The finger discs are expanded but truncated anteriorly. The snout is long and pointed, and the tympanum is visible. Males reach 22 mm SVL and females almost 27 mm SVL (Ron et al. 2019).

Habitat. Only one specimen was found in this study and it was located in primary forest.

Pristimantis ventrimarmoratus (Boulenger, 1912)

Material examined. ECUADOR • 1 adult; Napo Province, WWS; 00.6875°S, 077.6008°W; 1427 m; 9 July 2010; QCAZ 48897 • 1 adult; Napo Province, WWS, Puffbird Trail; 15 July 2010; QCAZ 48913 • 1 adult; Napo Province, WWS, Benavides Trail; 00.6774°S, 077.6013°W; 1465 m a.s.l.; 15 July 2010; QCAZ 48915.

Identification. This small to medium-sized frog can easily be distinguished from its congeners by its black and white marbled belly. The tympanum is hidden, and the finger discs are greatly expanded. The smaller males have orange on the flanks or the groin. Females reach almost 44 mm SVL and males 25.5 mm SVL (Ron et al. 2019).

Habitat. This is one of the most abundant frogs at WWS. They occupy primary and secondary forest as well as ruderal habitats. They have been collected near buildings on cement pillars holding up water collecting cisterns.

Squamata (Table 2)

Alopoglossidae

Alopoglossus atriventris Duellman, 1973

Material examined. ECUADOR • 1 adult; Napo Province, WWS, waterfall; 00.6859°S, 077.5986°W; 1405 m a.s.l.; 11 July 2010; QCAZ 10638 • 1 adult; Napo Province, WWS, Piha Trail; 00.6897°S, 077.5979°W; 1312 m a.s.l.; 19 July 2010; QCAZ 10647 • 1 adult; Napo Province, WWS, Antpitta Trail near WBS; 13 July 2013; QCAZ 11995 • 1 adult; Napo Province, WWS, F.A.C.E. Trail; 23 July 2014; QCAZ 12801.

Identification. These small lizards are medium brown with dark brown along the flanks and sides of the head and a pale stripe from the corner of the mouth to the hindlimb insertion. Males have a dark venter. The gular scales are not in rows, and there are small tuberculate scales on the side of the neck. The dorsal and flank scales are strongly keeled, rhomboid, and mucronate. The ventrals and gulars are strongly keeled, and the preanal and femoral pores are in continuous rows.

Habitat. These small, diurnal lizards were found in both primary and secondary forest around the bases of trees or under debris such as fallen bromeliads.

Table 2. Reptile species documented at Wildsumaco Wildlife Sanctuary, Napo Province, Ecuador, and associated voucher specimen numbers for specimens deposited at Pontificia Universidad Católica del Ecuador (QCAZ).

Family, species	Voucher number	Family, species	Voucher number
Alopoglossidae		<i>Dipsas catesbyi</i> (Sentzen, 1796)	
<i>Alopoglossus atriventris</i> Duellman, 1973	QCAZ 10638	<i>Dipsas palmeri</i> (Boulenger, 1912)	QCAZ 12799
<i>Alopoglossus buckleyi</i> (O'Shaughnessy, 1881)	QCAZ 10649	<i>Dipsas pavonina</i> Schlegel (1837)	QCAZ 17534
<i>Ptychoglossus brevifrontalis</i> Boulenger, 1912	QCAZ 10640	<i>Erythrolamprus aesculapii</i> (Linnaeus, 1758)	QCAZ 14063
Amphisbaenidae		<i>Erythrolamprus breviceps</i> (Cope 1860)	QCAZ 17539
<i>Amphisbaenia bassleri</i> (Vanzolini, 2002)	Photo only	<i>Erythrolamprus reginae</i> (Linnaeus, 1758)	QCAZ 12808
Dactyloidae		<i>Imantodes cenchoa</i> (Linnaeus, 1758)	QCAZ 10634
<i>Anolis fuscoauratus</i> d'Orbigny, 1837	QCAZ 5066	<i>Imantodes lentiferus</i> (Cope, 1894)	QCAZ 17126
Gymnophthalmidae		<i>Leptodeira annulata</i> (Linnaeus, 1758)	QCAZ 11989
<i>Anadia petersi</i> Oftedal, 1974 [†]	QCAZ 5068	<i>Ninia hudsonii</i> Parker, 1940	QCAZ 10635
<i>Gelanesaurus cochranae</i> (Burt & Burt, 1931)	QCAZ 10642	<i>Oxyrhopus melanogenys</i> (Tschudi, 1845)	QCAZ 17124
<i>Gelanesaurus flavogularis</i> Altamirano-Benavides et al., 2013	QCAZ 10650	<i>Oxyrhopus occipitalis</i> (Wagler, 1824)	QCAZ 10643
<i>Potamites ecleopus</i> (Cope, 1876)	QCAZ 11994	<i>Oxyrhopus petolarii</i> (Linnaeus, 1758)	QCAZ 10657
<i>Potamites strangulatus</i> (Cope, 1868)	MZ UTI 3524	<i>Philodryas viridissima</i> (Linnaeus, 1758)	Photo only
Hoplocercidae		<i>Siphlophis ayauma</i> Sheehy et al., 2014	QCAZ 12634
<i>Enyalioides microlepis</i> (O'Shaughnessy, 1881)	QCAZ 14834	<i>Synophis bogerti</i> Torres-Carvajal et al., 2015	QCAZ 5072
<i>Enyalioides praestabilis</i> (O'Shaughnessy, 1881)	QCAZ 12800	<i>Taeniophallus brevirostris</i> (Peters, 1863)	QCAZ 10636
Sphaerodactylidae		<i>Xenopholis scalaris</i> (Wucherer, 1861) [†]	QCAZ 17540
<i>Lepidoblepharis festae</i> (Peracca, 1897)	QCAZ 10641	Elapidae	
Boidae		<i>Micrurus lemniscatus</i> (Linnaeus, 1754)	Photo only
<i>Epicrates cenchrina</i> (Linnaeus, 1758)	QCAZ 12807	<i>Micrurus spixii</i> Wagler, 1824	QCAZ 17541
Colubridae		<i>Micrurus steindachneri</i> (Werner, 1901)	Photo only
<i>Chironius exoletus</i> (Linnaeus, 1758)	QCAZ 10644	Typhlopidae	
<i>Chironius scurrulus</i> (Wagler, 1824)	QCAZ 10648	<i>Amerotyphlops reticulatus</i> (Linnaeus, 1758) [§]	Photo only
<i>Drymoluber dichrous</i> (Peters, 1863)	No voucher	Viperidae	
Dipsasidae		<i>Bothrops pulcher</i> (Peters, 1863)	Photo only
<i>Atractus major</i> Boulenger, 1894	QCAZ 5071	<i>Bothrops taeniatus</i> Wagler, 1824	Photo only
<i>Atractus orcesi</i> (Savage, 1955)	QCAZ 10633	<i>Lachesis muta</i> (Linnaeus, 1766)	Photo only
<i>Clelia clelia</i> (Daudin, 1803)	QCAZ 17123		

[†]Provincial record.

[§]Elevational record.

Alopoglossus buckleyi (O'Shaughnessy, 1881)

Material examined. ECUADOR • 1 adult; Napo Province, WWS; 00.6774°S, 077.6013°W; 1465 m a.s.l.; 21 July 2010; QCAZ 10649 • 1 adult; Napo Province, WWS, Lanisoma Trail; 00.6827°S, 077.5943°W; 26 July 2010; QCAZ 10653 • 1 adult; Napo Province, WWS, 50 m upslope of waterfall; 00.6855°S, 077.5993°W; 1450 m a.s.l.; 28 July 2010; QCAZ 10654 • 1 adult; Napo Province, WWS, F.A.C.E. Trail; 21 July 2012; QCAZ 5067.

Identification. This species can be distinguished from *A. atriventris* by having smooth ventral scales. The gulars are not in rows, and the lateral neck scales are small, tuberculate, and almost in transverse rows. The flank scales are almost hexagonal, strongly keeled, and mucronate. The gulars are smooth to slightly keeled.

Habitat. This species was found in both primary and secondary forest in leaf litter or under debris during daylight.

Ptychoglossus brevifrontalis Boulenger, 1912

Figure 3E

Material examined. ECUADOR • 1 adult; Napo Province, WWS, private residence adjacent to WWS; 00.6821°S, 077.6027°W; 1474 m a.s.l.; 13 July 2010; QCAZ 10640 • 1 adult; Napo Province, WWS, Puffbird

Trail; 19 July 2010; QCAZ 10646 • 1 adult; Napo Province, WWS, Powerline Trail by road; 00.6888°S, 077.6030°W; 1406 m a.s.l.; 10 July 2010; QCAZ 10637 • 1 adult; Napo Province, WWS; 00.6715°S, 077.5986°W; 1530 m a.s.l.; 8 July 2013; QCAZ 11992.

Identification. This small, brown lizard has an orange venter in smaller individuals; in larger specimens, it is pink. Four supraocular scales are present, prefrontal scales are present, and dorsal scales occur in 31–33 transverse rows, with 28–38 scales at midbody. There are eight longitudinal rows of ventral scales in 18 or 19 rows.

Habitat. This species is one of the most abundant lizards at WWS and has been found in primary and secondary forest and near buildings. One specimen was even found in a student's shoe in a dormitory room at WWS.

Amphisbaenidae

Amphisbaenia bassleri (Vanzolini, 2002)

Figure 3A

Material examined. ECUADOR • 1 adult; Napo Province, WWS; 00.6865°S, 077.6015°W; 1420 m a.s.l.; 2 July 2012; photograph.

Identification. Amphisbaenians, or worm lizards, are the only reptiles with annuli around their bodies. This



Figure 3. Lizards and amphisbaenians found at Wildsumaco Wildlife Sanctuary. **A.** *Amphisbaenia bassleri*. **B.** *Anolis fuscoauratus*, QCAZ 17530. **C.** *Lepidoblepharis festae*, QCAZ 10641. **D.** *Enyalioides praestabilis* male. **E.** *Ptychoglossus brevifrontalis*. **F.** *Gelaneseaurus cochranae*. Photographs: A by C. Vogt; B by K. Wheatly; C, E; F by M. Nordgren; D by JDC.

species is limbless and is white to cream with dark spots and blotches. The caecilians at WWS are either solid black or solid blue, with moist skin and scales not visible to the naked eye.

Dactyloidae

Anolis fuscoauratus D'Orbigny, 1837

Figure 3B

Material examined. ECUADOR • 1 adult; Napo Province, WWS; 00.6754°S, 077.5999°W; 21 July 2012; QCAZ 5066 • 1 adult; Napo Province, WWS, Benavides Trail; 1 Aug. 2012; QCAZ 5075 • 1 adult; Napo Province,

WWS, Wildsumaco Lodge; 00.6756°S, 077.6012°W; 1504 m a.s.l.; 18 July 2014; QCAZ 12790 • 1 adult; Napo Province, WWS, Powerline Trail; 12 July 2018; QCAZ 17122 • 1 adult; Napo Province, WWS, F.A.C.E. Trail; 7 Aug. 2019; QCAZ 17530.

Identification. *Anolis* lizards have widened third and fourth phalanges on the toes, with ventral lamellae for adhesion and gular folds present in both sexes or in males only depending on the species. Gular folds in *A. fuscoauratus* are found in males only and are unicolor pinkish-violet with white borders and white scales. This species has smooth and imbricate ventral scales and 14–19 lamellae

on the third and fourth phalanges of the fourth hind toe. The iris is brown, and the tail is banded. Males reach a maximum SVL of 51 mm and females 54 mm (Torres-Carvajal et al. 2020).

Habitat. This is the only anole documented from WWS so far. It has been found in both primary and secondary forest. Road killed specimens and those found near buildings indicate that it can use disturbed habitats.

Gymnophthalmidae

Anadia petersi Oftedal, 1974

Material examined. ECUADOR • 1 adult; Napo Province, WBS; 00.6715°S, 077.5986°W; 1530 m a.s.l.; 24 July 2012; QCAZ 5068, GenBank accession numbers are *12S* KU902127, *16S* KU902208, *ND4* KU902283, and *c-mos* KU902048.

Identification. This species is a smooth-scaled, brown lizard with an extremely long tail and black-bordered ocelli along the flanks. The genera *Gelenesaurus* and *Potamites* have ocelli on the flanks, but they have tubercles, strongly keeled scales, and much shorter tails. *Anadia petersi* also has 39–56 transverse dorsal scale rows, 31–33 scales around the middle of the body, 0–2 scales between the supraocular and supraciliary rows, and unpigmented lower eyelid scales. The suboculars are heterogeneous in size, with one protruding between supralabials 4 and 5.

Remarks. This specimen represents a range extension for the species of 110 km north-northeast from Nuevo Israel, Morona Santiago Province and is also a new record for the Napo Province (Betancourt et al. 2018).

Gelanesaurus cochranae (Burt & Burt, 1931)

Figure 3F

Material examined. ECUADOR • 1 adult; Napo Province, WWS, Piha Trail; 00.6897°S, 077.5979°W; 1310 m a.s.l.; 14 July 2010; QCAZ 10642 • 1 adult; Napo Province, WWS, Streamcreeper Trail; 00.6713°S, 077.5987°W; 24 July 2016; QCAZ 14836.

Identification. Lizards of the genus *Gelanesaurus* have a black spot surrounding the nostril. The tail is longer, 1.53–1.58 times the SVL, than its congener. It is also keeled. The loreal scale is large in this species, taking up most of the suture with the nasal scale. Sexual dichromatism is absent in this species.

Habitat. This species was found at night on vegetation often close to streams. It inhabits both primary and secondary forest.

Gelanesaurus flavogularis (Altamirano-Benavides et al., 2013)

Material examined. ECUADOR • 1 adult; Napo Province, WWS, Streamcreeper Trail; 00.6779°S, 077.6030°W; 1440 m a.s.l.; 21 July 2010; QCAZ 10650 • 1 adult; Napo Province, WWS, Puffbird Trail; 00.6875°S, 077.6008°W; 1427 m a.s.l.; QCAZ 10651 • 1 adult;

Napo Province, WWS, Coopman's Trail; 00.6764°S, 077.5998°W; 25 July 2012; QCAZ 5070 • 1 adult; Napo Province, WWS, Piha Trail downslope from waterfall; 00.6774°S, 077.6013°W; 4 July 2013; QCAZ 11987.

Identification. This species has a shorter tail than its congener, with its tail 1.34–1.41 times the SVL. It also has dorsolateral and paravertebral rows of tubercles which are homogeneous in size and strongly keeled. The loreal scale is small, and sexual dichromatism is markedly present, with males having a white throat outlined in black.

Habitat. This species is usually found near and along streams. It has been found in both primary and secondary forest. However, at least two specimens have been found in forest and not near streams.

Potamites ecleopus (Cope, 1876)

Material examined. ECUADOR • 1 adult; Napo Province, WWS, pasture across road from WBS; 00.6715°S, 077.5986°W; 1530 m a.s.l.; 10 July 2013; QCAZ 11994 • 1 adult; Napo Province, WWS, Waterfall Trail; 20 July 2014; QCAZ 12796 • 1 juvenile; Napo Province, WWS; 00.6875°S, 077.6008°W; 23 July 2016; QCAZ14840 • 1 juvenile; Napo Province, WWS, Antipitta Trail at stream; 00.6769°S, 077.5984°W; 1480 m a.s.l.; 30 July 2016; QCAZ 14839.

Identification. This species is characterized by a single frontonasal scale, 4–6 paravertebral rows of tubercular scales surrounded by smaller scales, and tubercular scales along the flanks. There are incomplete rings of large, keeled scales around the tail which are interrupted by small, smooth scales. The ventral scales are in 18–23 transverse rows.

Habitat. This species is usually found near and along streams. It has been found in both primary and secondary forest and in pasture. Juveniles were found under cover objects in mud along the edge of streams.

Potamites strangulatus Cope, 1868

Material examined. ECUADOR • 1 adult; Napo Province, WWS; 00.67589°S, 077.5998°W; 1485 m a.s.l.; 19 Apr. 2014; MZUTI 3524.

Identification. This species has the tympanum on the surface of the head, and therefore it lacks an external auditory meatus. The caudal, dorsal, and lateral ridges are weakly keeled, and the tail is slightly compressed. The oval disc in the lower eyelid is usually divided by a vertical groove into two sections. There are two rows of enlarged preanal scales, with the middle pair the largest, and there are eight longitudinal rows of ventrals.

Hoplocercidae

Enyalioides microlepis (O'Shaughnessy, 1881)

Material examined. ECUADOR • 1 adult; Napo Province, WWS, F.A.C.E. Trail; 00.6797°S, 077.6008°W; 22 July 2016; QCAZ 14834.

Identification. *Enyalioides* are the largest lizards known

from WWS, and they have large heads and an enlarged vertebral row of scales. This species lacks enlarged scales on the back (other than the vertebral row), flanks, and limbs. It has >40 dorsolateral scales at midbody and strongly keeled ventral scales.

Habitat. The single specimen of this species found in this study was sleeping on low vegetation about 30 cm above the ground in primary forest.

***Enyalioides praestabilis* (O'Shaughnessy, 1881)**

Figure 3D

Material examined. ECUADOR • 1 adult female; Napo Province, WWS, Piha Trail; 00.6897°S, 077.5979°W; 1310 m a.s.l.; 30 July 2010; QCAZ 10656 • 1 adult; Napo Province, WWS, F.A.C.E. Trail; 00.6797°S, 077.6008°W; 22 July 2014; QCAZ 12800 • 1 adult; Napo Province, WWS, Puffbird Trail; 00.6876°S, 077.6014°W; 1412 m a.s.l.; 17 March 2017; QCAZ 15412 • 1 adult; Napo Province, WWS, Coati Trail, about 30 m up slope from stream; 00.6743°S, 077.6021°W; 18 July 2018; QCAZ 17121 • 1 adult; Napo Province, WWS, F.A.C.E. Trail; 00.6801°S, 077.6001°W; 7 Aug. 2019; QCAZ 17531.

Identification. This species has smooth or only weakly keeled ventral scales, and there is only one femoral pore. Males have a yellow gular patch, and in the WWS population there is a large black spot in the center of the gular patch.

Habitat. *Enyalioides praestabilis* occurs in both primary and secondary forest at WWS. They are found at night while asleep on tree trunks or branches at 0.5–2.5 m above the ground.

Sphaerodactylidae

***Lepidoblepharis festae* Peracca, 1897**

Figure 3C

Material examined. ECUADOR • 1 adult; Napo Province, WWS; 00.6866°S, 077.6013°W; 1433 m a.s.l.; 13 July 2010; QCAZ 10641.

Identification. This tiny gecko is the only gecko species found at WWS. It can be distinguished from other sphaerodactylid geckoes by the following combination of characters: 14 or 15 lamellae on toe IV; 14–16 transverse rows of ventral scales; dorsal scales smooth, uniform in size, and non-overlapping; snout scales not elongated; and snout granules larger than dorsal granules (Torres-Carvajal et al. 2020).

Boidae

***Epicrates cenchria* (Linnaeus, 1758)**

Figure 4A

Material examined. ECUADOR • 1 adult; Napo Province, 4 km down slope from WWS Lodge, dead on road to Pacto Sumaco; 00.6714°S, 077.5987°W; 1100 m a.s.l.; 25 July 2014; QCAZ 12807 • 1 adult; Napo Province, dead on road to Pacto Sumaco; 00.6932°S, 077.6040°W; 1267 m a.s.l.; 8 Aug. 2019; QCAZ 17532.



Figure 4. Snakes found at Wildsumaco Wildlife Sanctuary. **A.** *Epicrates cenchria*. **B.** *Chironius exoletus*. **C.** *Immantodes cenchoa*, QCAZ 10634. **D.** *Immantodes lentiferus*. **E.** *Ninia hudsoni*, QCAZ 10635. **F.** *Oxyrhopus occipitalis*. **G.** *Oxyrhopus petolarius* QCAZ 10657. **H.** *Micrurus spixii*. **I.** *Micrurus steindachneri* dorsal view. **J.** *Micrurus steindachneri* ventral view of same specimen. Photographs: A, F by JN; D by M. Nordgren; H by T. Walker; others by JDC.

Identification. This species can be identified by its unique color pattern of red, blue, and yellow with prominent ocelli along the sides of the body. There are >245 ventral scales and >45 subcaudal scales. These large snakes often exceed 1.5 m in SVL.

Habitat. This species was found in both primary and secondary forest as well as around human habitations. Live specimens have been seen at WWS lodge (00.6756°S, 077.6012°W, 1504 m a.s.l.) and at WBS (00.6715°S, 077.5986°W; 1530 m a.s.l.) (J Nilsson pers. obs.).

Colubridae

***Chironius exoletus* (Linnaeus, 1758)**

Figure 4B

Material examined. ECUADOR • 1 adult; Napo Province, dead on Loreto Road, about 10 km W. Wawa

Sumaco; 00.7190°S, 077.6350°W; 19 July 2010; QCAZ 10644 • 1 adult; Napo Province, WWS, Powerline Trail; 00.6876°S, 077.6021°W; 1430 m a.s.l.; 19 July 2010; QCAZ 10648.

Identification. This species has a green, unmarked color pattern and a dorsal scale formula of 12-12-8. The cloacal plate is usually divided, and the paravertebral scale rows are keeled in males and weakly keeled in females. The ventral scales number 123–162.

Habitat. The live specimen was found during mid-morning about 2 m above ground on the edge of secondary forest.

Chironius scurrulus (Wagler, 1824)

Material examined. ECUADOR • 1 juvenile; Napo Province, WWS, Lodge; 00.6756°S, 077.6012°W; 1504 m a.s.l.; 11 March 2017; QCAZ 15407.

Identification. This species has a color pattern of irregular, reddish-brown splotches on a blackish ground color. They have only 10 dorsal scale rows at midbody. Dorsal scales are smooth, the cloacal plate is undivided, and the ventral edges of the supralabial scales are light colored.

Drymoluber dichrous (Peters, 1863)

Material examined. ECUADOR • 1 juvenile; Napo Province, WWS; 00.6866°S, 077.6013°W; 1433 m a.s.l.; 11 July 2010; observation.

Identification. The juvenile color pattern of this species consists of medium-brown and cream bands with yellow bands across the head, while adults are uniformly dark brown with yellowish on the sides of the neck and pale supralabials. The dorsal scale row formula is 15-15-15. Two apical pits are present on the dorsal scales, there are two anterior temporal scales, and the cloacal plate is undivided. Ventral scales are 160–180 in females and 157–173 in males.

Dipsadidae

Atractus major Boulenger, 1894

Material examined. ECUADOR • 1 adult; Napo Province, WBS; 00.6715°S, 077.5986°W; 1530 m a.s.l.; 26 July 2012; QCAZ 5071 • 1 adult; Napo Province, dead on road about 3 km downslope of Pacto Sumaco; 31 July 2012; QCAZ 5074.

Identification. This snake has a reddish-brown dorsum with dark brown bands edged with light brown. There are 17-17-17 dorsal scale rows, 7 or 8 supralabial scales, with the third the largest, and 5–7 infralabials. The loreal scale is 2.5–3 times as long as it is high, the frontal scale is slightly triangular, there are 1+2 temporal scales, and the cloacal plate is undivided. This species has 6 or 7 maxillary teeth, 157–181 ventrals in females and 148–172 in males, and subcaudals number 27–37 in females and 31–49 in males.

Habitat. This species was found in secondary forest and in pasture indicating a tolerance for disturbed habitats.

Atractus orcesi Savage, 1955

Material examined. ECUADOR • 1 adult; Napo Province, WWS, dead on road at F.A.C.E. trailhead; 0.6797°S, 077.6008°W; 1494 m a.s.l.; 11 July 2010; QCAZ 10633.

Identification. This dark-brown snake has a lighter brown occipital band and a wide, dark stripe in the center of the belly. There are 15-15-15 dorsal scale rows, 2 postocular scales, 1+2 temporals, 8 supralabials, and 7 infralabials. Females have 142–158 ventrals, whereas males have 134–152; females have 13–22 subcaudals and males 18–34 (Torres-Carvajal et al. 2020).

Clelia clelia (Daudin, 1803)

Material examined. ECUADOR • 1 437 mm SVL juvenile; Napo Province, WWS, F.A.C.E. Loop Trail; 00.6833°S, 077.5966°W; 1393 m a.s.l.; 15 July 2018; QCAZ 17123 • 1 female adult; Napo Province, WWS, alive on road; 00.6865°S, 077.6015°W; 1420 m a.s.l.; 6 Aug. 2019; QCAZ 17533.

Identification. Adults are solid black dorsally, with the central portions of the ventrals pale, whereas juveniles have a black head, white to yellowish nape band with a dark blotch posterior to the nape band, and a red body. There are 17–19 dorsal scale rows at midbody, 7 or 8 supralabials, 8 infralabials, 1 preocular, 2 postoculars, and a divided cloacal plate. Ventrals in males are 218–225 whereas females have 228–242. Subcaudals range from 94–96 in males and 77–86 in females.

Habitat. A juvenile specimen was found in along a trail in primary forest and adult was found on a road in secondary forest.

Dipsas catesbyi (Sentzen, 1796)

Material examined. ECUADOR • 1 adult; Napo Province, WBS; 00.6715°S, 077.5986°W; 1530 m a.s.l.; 5 July 2013; QCAZ 11988 • 1 adult; Napo Province, dead on road in Pacto Sumaco, 00.7260°S, 077.5660°W; 27 July 2016; QCAZ 14833.

Identification. These attenuate snakes have the head conspicuously wider than the neck and very large eyes. They are black dorsally, with pale bands of varying width that sometimes contain reddish pigment. There are 13-13 rows of smooth dorsal scales, 2 prefrontal scales, 8–10 supralabials, 10–11 infralabials, and an undivided cloacal plate. Males have 160–220 ventrals and females 160–200 ventrals. Subcaudals are 70–120 in males and 60–100 in females.

Habitat. This species was found at WBS, and a road killed specimen was found along a pasture.

Dipsas palmeri (Boulenger, 1912)

Material examined. ECUADOR • 1 adult; Napo Province, WWS, F.A.C.E. Loop Trail; 00.6797°S, 077.6008°W; 22 July 2014; QCAZ 12799.

Identification. These attenuate snakes have the head wider than the neck and very large eyes. They are light brown dorsally and with black mottling ventrally. There

are brown or black circular spots with pale edges present as well. The dorsal scales are smooth and in 15-15 rows with the vertebral row enlarged. There is 1 loreal and 1 preocular that contact the orbit. Supralabials number 3–8, and 1 pair of infralabials contact the symphyseal scale. Males have 172–202 ventrals and females have 181–200. Subcaudals range from 91–118 in males and 86–102 in females.

Habitat. The single specimen found was active at night on vegetation about 1 m above ground along a trail in primary forest.

Dipsas pavonina (Schlegel, 1837)

Material examined. ECUADOR • 1 adult; Napo Province, WWS; 00.6866°S, 077.6013°W; 1433 m a.s.l.; 6 Aug. 2019; QCAZ 17534.

Identification. These attenuate snakes have the head wider than the neck and very large eyes. These banded snakes have rectangular spots fused across the vertebral row of dorsal scales. There is a white band on the snout across the prefrontals, nasals, and the first 3 supralabials; the head is black. There is a white collar, and the venter is cream with irregular dark spots. The loreal scale enters the orbit and there are 0–1 preocular and 2–3 postocular scales. Males have 190–230 ventrals and females have 180–220. Subcaudals range from 80–130 in males and 70–130 in females.

Habitat. This specimen was found in a small tree at night in a clearing in secondary forest.

Remarks. This is only the second record for Napo Province and extends the known range of this species 40 km northeast (Torres-Carvajal et al. 2020).

Erythrolamprus aesculapii (Linnaeus, 1758)

Material examined. ECUADOR • 1 adult female; Napo Province, WWS; 00.6761°S, 077.5993°W, 22 July 2015; QCAZ 14063.

Identification. These coral snake mimics have a dorsal pattern of wide red bands bordered by black bands and narrow yellow to whitish bands contained within the black bands. The snout is yellowish, followed by a black band over the eyes, which is then followed by a yellow band behind the eyes. The dorsal scales are in 15 rows; there are 2 secondary temporals, 2 postoculars, 2 pair of genial scales, and the cloacal plate is divided.

Erythrolamprus breviceps (Cope, 1860)

Material examined. ECUADOR • 1 adult female; Napo Province, WWS, F.A.C.E. Trail; 00.6801°S, 077.6001°W; 1406 m a.s.l.; 10 Aug. 2019; QCAZ 17539.

Identification. This brown snake has black spots along the sides that coalesce into a black line on the posterior half of the body, a black stripe extends posterior from the eyes, and the supralabials are whitish. This species has 17-17-15 dorsal scale rows, 7 supralabials, 1 preocular, 2 postoculars, 1+2 temporals, 8 or 9 infralabials, and a

divided cloacal plate. Ventrals number 155–157 and subcaudals 46–57.

Erythrolamprus reginae (Linnaeus, 1758)

Material examined. ECUADOR • 1 juvenile; Napo Province, WWS, alive on road near lodge; 00.6756°S, 077.6012°W; 1504 m a.s.l.; 25 July 2014; QCAZ 12808 • 1 adult; Napo Province, WWS, pasture across road from WBS; 00.6716°S, 077.5993°W; 27 July 2014; QCAZ 12811.

Identification. Adults have a reticulate dorsal pattern with black speckles on a green to gray ground color. The ventrals are black and yellow, but there is no black on the subcaudals. There are 17 rows of smooth dorsal scales at midbody, 1 preocular, 8 or 9 supralabials, and a divided cloacal plate. Ventral scales are <150, and there are 55–78 subcaudals.

Habitat. One juvenile specimen was found crossing the road during the day in secondary forest and an adult was found in a pasture.

Imantodes cenchoa (Linnaeus, 1758)

Figure 4C

Material examined. ECUADOR • 1 adult; Napo Province, WWS; 00.6875°S, 078.6008°W; 1427 m a.s.l.; 9 July 2010; QCAZ 10634 • 1 juvenile; Napo Province, WWS, F.A.C.E. Trail; 00.6801°S, 077.6001°W; 1406 m a.s.l.; 7 Aug. 2019; QCAZ 17537.

Identification. These very thin snakes have a chunky head, very thin neck, and a laterally compressed body. The smooth dorsal scales are in 15–17 rows and have apical pits. The vertebral row is enlarged. The head is dark brown with light edging to the scales. There are 31–52, usually <48, grayish to brown blotches on the back. There is 1 rostral scale, 2 internasals, 2 prefrontals, 1 frontal, 1 nasal, 1 loreal, 1 supraocular, 1–3 preoculars, 2 or 3 postoculars, 8 supralabials, and 10–11 infralabials. Males have 244–288 ventral scales and females have 223–268 ventrals. Subcaudals range from 158–195 in males and 147–177 in females.

Habitat. This snake was found mainly in secondary forest, near buildings and in vegetation along the road at WWS.

Imantodes lentiferus (Cope, 1894)

Figure 4D

Material examined. ECUADOR • 1 650 mm SVL adult female; Napo Province, WWS, alive on road next to WBS; 00.6715°S, 077.5986°W; 1530 m a.s.l.; 11 July 2018; QCAZ 17126.

Identification. These very thin snakes have an oval head, very thin neck, and a laterally compressed body. The smooth dorsal scales are in 15-15-15 rows, and the vertebral row is enlarged. The dorsal color pattern consists of 31–52 reddish to brown spots, and the venter is pinkish tan with black spots. There may be a V- or Y-shaped pattern of black spots on the back of the head,

and the iris is yellowish tan. This species has 8 supralabials, 10 or 11 infralabials, 1 preocular, and 2 postoculars. Ventrals range from 212–236 and subcaudal scales from 127–153.

Habitat. This species has been observed in primary and secondary forest at WWS. On the night of 17 December 2008, one gravid female was seen in vegetation about 1.3 m above ground in primary forest on the F.A.C.E. Trail. QCAZ 17126 was found on the road near the edge of secondary forest.

Leptodeira annulata (Linnaeus, 1758)

Material examined. ECUADOR • 1 adult, 595 mm SVL female; Napo Province, WBS; 00.6715°S, 077.5986°W; 1530 m a.s.l.; 5 July 2013; QCAZ 11989 • 1 adult; Napo Province, WWS, Waterfall Trail below waterfall; 25 July 2014; QCAZ 12809 • 1 female, 419 mm SVL; Napo Province, WWS, Piha Trail; 00.6897°S, 077.5979°W; 1315 m a.s.l.; 15 March 2017; QCAZ 15408 • 1 adult; Napo Province, WWS, lodge; 00.6756°S, 077.6012°W; 1504 m a.s.l.; 18 July 2018; QCAZ 17127.

Identification. These snakes have a thin neck and a distinct head, and the eyes have vertically elliptical pupils. A thick nuchal band extending posterior from the parietal scales is also characteristic. The dorsal pattern consists of brown blotches on a tan ground color and the venter is unmarked. The dorsal scales are smooth and in 17–25 rows at midbody, which reduce to 11–19 rows posteriorly. The vertebral row of dorsal scales is not enlarged. There are 1–4, usually 2, preocular and postocular scales. Supralabials range from 7–9, with 8 most frequent, and infralabials are 8–12 with 10 the modal number (Torres-Carvajal et al. 2020). There are 151–204 ventrals and 54–102 subcaudals.

Habitat. These snakes have been found in primary and secondary forest as well as around and inside buildings. QCAZ 11989 was found under sheet metal on a wood pile and contained the hindlimbs of a frog, probably *Leptodactylus*, which was swallowed headfirst.

Ninia hudsoni Parker, 1940

Figure 4E

Material examined. ECUADOR • 1 adult; Napo Province, WWS; 00.6866°S, 077.6013°W; 1433 m a.s.l.; 9 July 2010; QCAZ 10635 • 1 adult; Napo Province, WWS; 00.6875°S, 077.6008°W; 1427 m a.s.l.; 17 July 2010; QCAZ 10645 • 1 adult; Napo Province, WWS, Benavides Trail at road; 1433 m a.s.l.; 25 July 2012; QCAZ 5069 • 1 adult female, 338 mm SVL; Napo Province, WWS; 00.6875°S, 077.6008°W; 1427 m a.s.l.; 7 July 2013; QCAZ 11991 • 1 adult male, 302 mm; Napo Province, WBS; 00.6715°S, 077.5986°W; 1530 m a.s.l.; 15 Mar. 2017; QCAZ 15409 • 1 female, 268 mm SVL; Napo Province, WWS, lodge; 00.6756°S, 077.60116°W; 1504 m a.s.l.; 15 Mar. 2017; QCAZ 15410 • 1 adult, 212 mm SVL; Napo Province, WWS, F.A.C.E. Loop Trail; 00.6833°S, 077.5966°W; 1393 m a.s.l.; 15 July 2018; QCAZ 17129.

Identification. This small, dark-gray to black snake has a white nape and a pale venter. There are 21–21–21 keeled dorsal scale rows, an elongated loreal scale, no preocular scale, and <76 subcaudal scales.

Habitat. This is the most frequently encountered snake at WWS, where it is usually found under cover objects. It has been taken in both primary and secondary forest and around buildings and in pastures.

Oxyrhopus melanogenys (Tschudi, 1845)

Material examined. ECUADOR • 1 juvenile, 364 mm SVL; Napo Province, WWS; 00.6774°S, 077.6013°W; 24 July 2016; QCAZ 14838.

Identification. This species has 19–19–19 smooth dorsal scale rows, <97 subcaudal scales, and an undivided cloacal plate. There are 10 infralabial scales with 6 contacting the genials, and the single preocular scale contacts the frontal scale. The posterior dorsal color pattern of adults consists of triads of red-black-cream-black-cream-black-red. There is a red, orange, or yellowish nuchal band. Some larger individuals are melanistic.

Habitat. One juvenile specimen was found in a pasture during the day.

Oxyrhopus occipitalis (Wagler, 1824)

Figure 4F

Material examined. ECUADOR • 1 adult; Napo Province, roadkill at edge of Pacto Sumaco; 00.6680°S, 077.5959°W; 17 July 2010; QCAZ 10643 • 1 juvenile; Napo Province, WWS, F.A.C.E. Trail; 00.6801°S, 077.6007°W; 1406 m a.s.l.; 8 Aug. 2019; QCAZ 14838.

Identification. This species has 19–19–19 smooth dorsal scale rows, 1 preocular scale which is not in contact with the frontal, 2 postoculars, an undivided cloacal plate, and 2 anterior temporal scales. There are 8 supralabials and 7–10 infralabials, ventrals are <215, and subcaudals range from 66–95. Juveniles are banded, but adults usually lack banding. Adults have a yellow snout, a medium-to dark-brown top of head, and a reddish body. The iris is reddish, and the tongue is black.

Habitat. The adult specimen was a roadkill at the edge of the village of Pacto Sumaco and was surrounded by pasture. The juvenile was found in primary forest.

Oxyrhopus petolarius (Linnaeus, 1758)

Figure 4G

Material examined. ECUADOR • 1 adult; Napo Province, private residence adjacent to WWS; 00.6821°S, 077.6027°W; 13 July 2010; QCAZ 10657 • 1 juvenile; Napo Province, WWS, near lodge; 00.6756°S, 077.6012°W; 1500 m a.s.l.; 22 July 2010; QCAZ 10652 • 1 adult; Napo Province, WWS, Benavides Trail; 00.6774°S, 077.6013°W; 6 July 2013; QCAZ 11990 • 1 adult; Napo Province, WWS, alive on road near Coopman's Trail; 00.6764°S, 077.5998°W; 17 July 2014; QCAZ 12788 • 1 adult; Napo Province, WWS, lodge; 00.6756°S, 077.6012°W; 1504 m a.s.l.; 7 July 2018; QCAZ 17124.

Identification. This snake has 19-19-17 dorsal scale rows and 2+3 temporal scales. There are 8 or 9 supralabials with 4–5 or 5–6 entering the orbit. There are 10 infralabials with 1–6 contacting the genials. Males have 193–218 ventrals, and females have 191–222. The subcaudals range from 91–126 in males and 77–110 in females. The adult color pattern consists of red and black bands, and there are no triads. The young have a pale, white to cream nuchal band and cream to pale orange bands on the body. Some larger individuals are melanistic.

Habitat. This is a common snake at WWS, and it is often found under cover objects. They have been taken in both primary and secondary forest and around buildings and in pastures.

***Philodryas viridissima* (Linnaeus, 1758)**

Material examined. ECUADOR • 1 adult; Napo Province, WWS, intersection of Antpitta Trail and small stream; 00.6769°S, 077.5984°W; 1480 m a.s.l.; 15 July 2018; photograph.

Identification. This species has a solid green back with 19 dorsal scale rows at midbody and a normal rostral scale lacking any accessory scales. Ventrals number >205 and lack black borders. This species lack the vertebral zig-zag stripe of its congeners.

***Siphlophis ayauma* Sheehy et al., 2014**

Material examined. ECUADOR • 1 adult; Napo Province, WWS, Benavides Trail; 00.6766°S, 077.6006°W; 1496 m a.s.l.; 4 Apr. 2014; QCAZ 12634.

Identification. This species has 17 midbody dorsal scales rows, with the vertebral row slightly enlarged. There are 19–29 black rings crossing the belly. The upper head scales are black, and there may be some red to orange on the back of the head. It differs from *Oxyrhopus* species in having dark rings ventrally and 17, not 19, dorsal scale rows at midbody.

Habitat. This specimen was found in secondary forest.

***Synophis bogerti* Torres-Carvajal et al., 2015**

Material examined. ECUADOR • 1 adult male; Napo Province, WWS, Waterfall Trail, approximately 50 m upslope from the waterfall; 00.6859°S, 077.5986°W; 26 July 2012; QCAZ 5072 • 1 adult male, 367 mm SVL; Napo Province, WWS, Coati Trail; 00.6743°S, 077.6021°W; 18 July 2014; QCAZ 12791 • 1 adult; Napo Province, WWS; 00.6757°S, 077.6013°W; 19 Apr. 2014; MZUTI 3529.

Identification. These thin snakes are solid black dorsally, with 19 rows of strongly keeled scales at midbody. There are 2 postoculars, 8 supralabials, and 10 or 11 infralabials. The internasal scales are in contact. Males have 154–163 ventrals, whereas females have 161–168. Subcaudals range from 101–115 in males and 98–111 in females. *Synophis lasallei* (Nicéforo-María, 1950), which can be sympatric, has 21 or 22 dorsal scale rows at midbody (Torres-Carvajal et al. 2020).

Habitat. Both specimens were found in secondary forest at night. One was on the ground, and the other on a horizontal branch about 0.5 m above the substrate.

***Taeniophallus brevirostris* (Peters, 1863)**

Material examined. ECUADOR • 1 adult; Napo Province, WWS; 00.6888°S, 077.6030°W; 1406 m a.s.l.; 10 July 2010; QCAZ 10636 • 1 adult; Napo Province, WWS; 00.6875°S, 077.6008°W; 1427 m a.s.l.; 27 July 2014; QCAZ 12810.

Identification. These small snakes have a pair of tan to gray paravertebral stripes about 2 scales wide with darker brown above and below them. The dorsal scales are smooth and in 17 rows at midbody and with apical pits usually present. There are 8 supralabial scales, with the second in contact with the loreal scale, and supralabials 3–5 contacting the orbit. There are conspicuous light spots on the last two supralabials. Ventral scales range from 137–166, the cloacal plate is divided, and subcaudals are 36–61. The pupil is round. This species lacks paired pale spots on the neck.

Habitat. One specimen was found moving during the day in secondary forest. The second specimen was found under rotting wooden boards in a small clearing in secondary forest.

***Xenopholis scalaris* (Wucherer, 1861)**

Material examined. ECUADOR • 1 juvenile; Napo Province, WWS, F.A.C.E. Trail; 00.6801°S, 077.6001°W; 1406 m a.s.l.; 10 Aug. 2019; QCAZ 17540.

Identification. These small snakes are unique in having prefrontal scales fused into a single scute. The dorsal pattern consists of 24–30 cross-shaped markings on a reddish-brown to pinkish-orange ground color. The loreal scale is longer than wide, the cloacal plate is undivided, and there are 28–36 subcaudals (Torres-Carvajal et al. 2020).

Remarks. Our record represents both a 164 km range extension to the west-southwest and a new record for Napo Province (Torres-Carvajal et al. 2020).

Elapidae

***Micrurus lemniscatus* (Linnaeus, 1754)**

Material examined. ECUADOR • 1 adult; Napo Province, WWS, lodge; 00.6756°S, 077.6012°W; 1504 m a.s.l.; photograph.

Identification. Coral snakes usually have short, rounded snouts and short tails. This species has a pale ring, band, or spot in front of the eyes. The anterior most red ring covers the posterior tips of the parietal scales and the first 4 dorsal scales. There are 8–11 triads that consist of red-black-white-black-white-black-red. The black rings are wider than the white rings, and the red rings are usually wider than the black rings. Ventral scales are 230–248 in males and 240–260 in females.

***Micrurus spixii* Wagler, 1824**

Figure 4H

Material examined. ECUADOR • 1 adult female, 1200 mm SVL; Napo Province, WWS lodge; 00.6756°S, 077.6012°W; 1504 m a.s.l.; 24 July 2016; QCAZ 14837, scale clip only • 1 adult; Napo Province, WWS, alive on road at lodge; 00.6756°S, 077.6012°W; 1504 m a.s.l.; 8 Aug. 2019; QCAZ 17541.

Identification. This large coral snake has 4–9 body triads, with each triad consisting of broad red-narrow black-broad yellow-narrow black-broad yellow-narrow black-broad red rings. The yellow and red scales are suffused with black at their posterior borders (Duellman 2005). There are usually 1+1 temporal scales. Ventrals are 200–227 in males but 207–229 in females. Several anterior subcaudals may be undivided, and they number 16–25 in males and 15–24 in females.

Habitat. One specimen was found next to a building at the lodge, and the other was alive on the road in front of the lodge surrounded by secondary forest and pasture habitat.

***Micrurus steindachneri* (Werner, 1901)**

Figure 4I, J

Material examined. ECUADOR • 1 adult; Napo Province, WWS; 20 Dec. 2008; photograph. • 1 adult; Napo Province, WWS; 10 Feb. 2009; photograph.

Identification. These dark snakes have yellow bands that are only ½–1 scale long, the red bands are often black dorsally with the red pigment confined to the sides of the body, and the black rings number 28–42. The venter has long, black bands 3 or 4 ventrals, yellow bands covering 2 or 3 ventrals, and reddish-brown bands 1 ventral long. Males have 200–208 ventrals, and females have 227–231 ventrals. Subcaudals are 42–48 in males and 35–38 in females.

Remarks. We have observed at least four individuals of this species, with three appearing melanistic as in Figure 4I. A photograph of a road killed specimen by TWK appears to be a specimen with normal coloration. Therefore, a color pattern polymorphism is present in this population.

Typhlopidae

***Amerotyphlops reticulatus* (Linnaeus, 1758)**

Material examined. ECUADOR • 1 adult; Napo Province, WWS; photograph.

Identification. Blind snakes have vestigial eyes and lack enlarged ventral and subcaudal scales in most species. This species has 20–20–18 scale rows. The snout is white, and the tail has a white band which may be broken into one or more spots. The tail is very short and ends in a spine. The belly is pale and only the 9 dorsal-most rows of scales are pigmented.

Remarks. Our record of *A. reticulatus* extends the known range in Ecuador by about 39 km west and upwards in

elevation by 1000 m. It is also a new record for Napo Province (Torres-Carvajal et al. 2020).

Viperidae

***Bothrops pulcher* (Peters, 1863)**

Figure 5A, B

Material examined. ECUADOR • 1 adult; Napo Province, WWS; 18 Nov. 2009; photograph • 1 adult; Napo Province, WWS; 10 Dec. 2017; photograph.

Identification. Pit-vipers have triangular heads and one pair of heat sensing pits located between the nostrils and eyes. This species has a black stripe on each side of the face which runs from the eye to the corner of the mouth. There is also a pair of wavy black stripes on top of the head. The dorsal pattern consists of up to 29 dark bands outlined with cream (Campbell and Lamar 2004). The scales between the bands may be greenish gray to pinkish. The second supralabial contacts the prelacunal scale. Midbody dorsal scale rows are usually 21 but they range from 19–23. The ventral scales number 167–178 in males and 173–181 in females. The subcaudal scales are usually uniformly dark and are 63–64 in males and 53–60 in females, with some distal subcaudals undivided. The tail is prehensile.

Remarks. Some specimens observed at WWS have a pinkish caste in the light areas between the dark bands (Fig. 5B). Other specimens lack this pink pigment as shown in Figure 5A.

***Bothrops taeinatus* Wagler, 1824**

Figure 5C

Material examined. ECUADOR • 1 adult; Napo Province, WWS; 00.6865°S, 077.6015°W; 1420 m a.s.l.; 25 June 2010; photograph.

Identification. This species has a long, spear-shaped head and exceptionally long fangs. The back is streaked with lichen-green, black, and yellow. There is a lateral row of white spots at the juncture of the ventrals and the first dorsal scale row. The iris, infralabial, and gular scales are mottled, and the posterior part of the belly is heavily pigmented. A lacunolabial scale is present. Midbody dorsal scale rows are usually 27 but range from 25–29 (Torres-Carvajal et al. 2020). In males, ventrals are 203–252, whereas in females there are 228–254. The prehensile tail has 70–91 undivided subcaudal scales in males and 66–80 in females.

***Lachesis muta* (Linnaeus, 1766)**

Figure 5D

Material examined. ECUADOR • 1 adult; Napo Province, WWS; 00.6875°S, 077.6008°W; 1427 m a.s.l.; 1 Jan. 2008; photograph • 1 adult; Napo Province, WWS, F.A.C.E. Trail; 29 July 2014; photograph.

Identification. This large pitviper has a dorsal color pattern of diamond-shaped spots, and the dorsal scales are tuberculate. There are usually 35 rows of dorsal scales,



Figure 5. Pitvipers found at Wildsumaco Wildlife Sanctuary. **A.** *Bothrops pulcher*. **B.** *Bothrops pulcher* showing pink coloration common at this locality. **C.** *Bothrops taeniatus*. **D.** *Lachesis muta*. Photographs: D by B. Olson; others by JN.

but they range from 31–38. A lacunolabial scale is present, and there are 9–12 smooth to slightly keeled intersupraocular scales. Males have 213–231 ventrals and females have 220–236. The subcaudals are normally pale and number 31–56 in males and 33–50 in females. They are paired proximally but become more finely divided distally into 2–4 rows.

Habitat. This species has been seen in both primary and secondary forest at WWS. Road-killed specimens indicate that they cross pastures and roads.

Remarks. In addition to the observations listed above, *L. muta* has been observed twice at WWS where two road-killed specimens were found on the road leading to Pacto Sumaco at elevations of 1303 m and 1335 m a.s.l. (J. Nilsson pers. obs.).

Discussion

We documented a diverse assemblage of amphibians (39 species) and reptiles (45 species) from WWS. Additionally, there are four undescribed species of amphibians and two undescribed species of reptiles known from WWS. The amphibians include one species of salamander in the genus *Bolitoglossa* Duméril, Bibron & Duméril, 1854, two species of *Noblella* Barbour, 1930, and one species

of *Pristimantis*. The *Noblella* species will be described in an upcoming revision of the genus in Ecuador (SRR and JDC unpubl. data). The *Pristimantis* species is being described by SRR and colleagues, and the salamander will be described by SRR and JDC. The reptiles include an undescribed lizard in the gymnophthalmid genus *Selysaura* Moravec et al., 2018 and one species of snake in the dipsadid genus *Atractus* Wagler, 1828. Both are being described by OTC and colleagues. We have a photograph of a lizard taken at the WWS Lodge that appears to be a *Euspondylus maculatus* (Tschudi, 1845), as defined by Kohler and Lehr (2004) and Torres-Carvajal et al. (2020).

The biogeographic affinities of this fauna lie mainly with the lowland Amazonian forest. Both amphibians with 60% (24 of 40 species) and reptiles with 82% (36 of 44 species) are lowland forms (Ron et al. 2019; Torres-Carvajal et al. 2020). Highland species were the next largest portion of this sample with 30% (12 of 40) for amphibians and 14% (6 of 44) for reptiles. Mid-elevation species were the smallest component of the herpetofauna at WWS with 10% for amphibians and only 4.5% for reptiles. It is suspected that the isolated nature of Volcán Sumaco may contribute to a dearth of middle and higher elevation species in this area. Similar findings were discussed by Duellmann and Toft (1979), Duellman and Lynch (1988), and Almendariz et al. (2014). Duellman

and Toft (1979) found 65% of anuran species in the Serranía de Sira were lowland forms. However, both Duellman and Lynch (1988) and Amendariz et al. (2014) found only 28% of amphibian species had lowland affinities. The latter study found that 41% of amphibians from the Cordillera del Cóndor were endemic. Most reptiles found here were lowland forms as was found by Almendariz et al. (2014) for the Cordillera Cóndor (63%).

Because no previous herpetological inventory was conducted at this site, we confine our comparisons to other highland areas east of the Andes. Our findings are comparable to species lists from other mountain masses lying east of the Andes. Twenty-five species in six families of anuran amphibians were documented in the Cordillera de Cutucú, Morona Santiago Province, Ecuador (Duellman and Lynch 1988). The Cordillera del Cóndor along the southern Ecuadorian–Peruvian border had 120 species of amphibians in 11 families and 59 species of reptiles in nine families (Almendariz et al. 2014). However, the Cordillera del Cóndor study covered a much greater elevational range (850–2860 m) and encompassed a much larger geographic area. Duellman and Toft (1979) found 17 species of anurans in eight families in the Serranía de Sira of Perú at elevations of 500–2000 m. Relatively few species were shared between WWS and the Cordillera Cutucú and Serranía de Sira, with only four species of frogs shared with Cordillera de Cutucú, and two species with the Serranía de Sira (Duellman and Toft 1979; Duellman and Lynch 1988). More species were shared with the Cordillera del Cóndor, including 18 amphibians and 20 reptile species (Almendariz et al. 2014). In agreement with the previously mentioned studies, we did not find *Pristimantis w-nigrum* (Boettger, 1892) at WWS. The lack of shared fauna between WWS and the Cordillera de Cutucú and the Serranía de Sira may be due to the great distances isolating these sites with vast stretches of lowland between them. The former is at least 210 km south and the latter over 1100 km south of WWS.

Important goals of conservation biology should be the detection and monitoring of rare and declining species (Heyer et al. 1994). We documented four Endangered species of amphibians in this study including *Bolitoglossa palmata*, *Pristimantis cremnobates*, *Pristimantis prolatus* and *Pristimantis rubicundus* (Ron et al. 2019). Additionally, three Near Threatened species *Boana almendarizae*, *Dendropsophus minutus*, and *Pristimantis incomptus* were found in this study. *Pristimantis altamnis* was the only Vulnerable species. No reptiles of conservation concern were found at WWS. However, 31 of 44 (70%) of the reptiles have not been evaluated or are Data Deficient (Torres-Carvajal et al. 2020). More effort is needed to evaluate the conservation status of reptiles as concern for their conservation has lagged behind that of amphibians (Todd et al. 2010).

Anurans of the families Aromobatidae and Dendrobatidae, as well as those of the genus *Atelopus*, were not found at WWS. These frogs were particularly susceptible to the amphibian killing fungus, *Batrachochytrium*

dendrobatidis (Bd) Longcore, Pessier, & Nichols 1999 (Lips et al. 2008), which was found at WWS (J.D. Camper unpubl. data). One of the former owners informed JDC that local residents indicated seeing colorful frogs in the past that are no longer found there (J. Olson pers. comm.). Perhaps these frogs have been extirpated from WWS by this pathogen. Studies are ongoing to determine the Bd infection rates at WWS.

At WWS we found a species-rich fauna of rain frogs (*Pristimantis*), which included 14 species. This may be an underestimate because several specimens are awaiting identification. *Pristimantis* occur in species-rich communities at similar elevations along the eastern slopes of the Andes. Lynch and Duellman (1980) found 11 species at 1740 m a.s.l. They found seven species between 1410 and 1490 m a.s.l., which are elevations encompassed in our study. At four locations including elevations similar to those sampled in our study, Almendariz et al. (2014) found 31 species of *Pristimantis* in the Cordillera del Cóndor.

We documented a diverse herpetofauna at a mid-elevational equatorial site that is isolated from the Cordillera Oriental of the Andes in Ecuador. Several species found were of conservation concern. We detected at least six undescribed species, which are being described or awaiting description, in this inventory. Several range extensions and elevational records were also found. Future work at this site will focus on adding to the species list, developing monitoring programs for species at risk, and determining the extent of emerging infectious diseases at this site. Much more field work is needed at WWS to discover the complete herpetofaunal diversity that undoubtedly exists at this site.

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Authors’ Contributions

JDC conducted fieldwork, processed specimens, identified specimens, and wrote manuscript; OTC and SRR aided with fieldwork, permits, and specimen

identification; AA aided in field work and provided photographs, BSA and TWK aided in fieldwork; JN aided in fieldwork and provided access to the property.

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