THE PROCESS OF DISCOVERY IN AND NEW SPECIES FROM NORTHERN PERU, CORDILLERA COLÁN, DEPARTMENT AMAZONAS, PROVINCE BAGUA

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ABSTRACT

A review of discoveries of plants and animals by a 1978 expedition from Louisiana State University to Peru is presented. Genesis of this study was owing to the senior author's observation of unusually high species richness in Araceae among a collection of plants made in northern Peru. A subsequent review showed that the region was rich in many ways. Determinations to date include 983 species belonging to 513 genera and 145 families of which 81 species are endemic. Included are 59 plant taxa new to science described elsewhere. Eleven aroids (Araceae) from northern Peru are described herein and illustrated as new. Some records represent new taxa described from voucher specimens independently collected by botanists at prior or later dates and different localities. A collection was assigned the nov. sp. category of noteworthiness if Tropicos database (http://www.tropicos.org) showed either the Alwyn H. Gentry, et al. and or the Philip J. Barbour accession to be the first such collection known. Specimen searches in Tropicos by senior collector as Philip Barbour and separately by Gentry and constrained by appropriate dates revealed 1687 independent determined voucher specimens of which 1545 are noteworthy (92%) by the designated categories. Noteworthy categories are described and presented in appendices 2 and 3. Extralimital plant distribution records are not described here. Four new bird species/subspecies and seven new frog species were discovered on this expedition. It is important to note that after only 43 years much of the region where many of these discoveries were made is now largely devoid of natural vegetation. Appendix 4 provides detailed descriptions of habitat on Cordillera de Colán as recent as 2017. This study is a reminder that areas newly opened for exploration should be thoroughly and quickly studied to capture the greatest scientific benefit. It shows how much could be attained in a small span of time by a small but dedicated group of biologists.

RESUMEN

Se presenta una revisión de los descubrimientos de plantas y animales durante una expedición realizada en 1978 desde la Universidad Estatal de Luisiana a Perú. El origen de este estudio se debió a la observación del autor principal de una riqueza de especies inusualmente alta de Araceae en una colección de plantas procedente del norte de Perú. Una revisión posterior mostró que la región era rica en muchos sentidos. Las determinaciones hasta la fecha incluyen 983 especies, pertenecientes a 513 géneros y 145 familias, de las cuales 81 especies son endémicas. Se incluyen 59 taxones de plantas nuevas para la ciencia descritas en diversas publicaciones. Once aráceas (Araceae) del norte de Perú se describen e ilustran como nuevas. Algunos registros representan nuevos taxones descritos a partir de especímenes de testigos recolectados independientemente por botánicos en fechas anteriores o posteriores y en diferentes localidades. A una recolección se le hubiera asignado la notable categoría de sp. nov. si la base de datos Tropicos (http://www.tropicos.org) mostrara las muestras de Alwyn H. Gentry et al. o las de Philip J. Barbour, por ser las primeras recolecciones conocidas. Las búsquedas de especímenes en Trópicos por parte de un coleccionista principal, como Philip Barbour, y por separado por Gentry y restringidas por fechas apropiadas revelaron 1687 especímenes testigo determinados independientemente, de los cuales 1545 son dignos de mención (92%) por las categorías designadas. Las categorías dignas de mención se describen y presentan en los apéndices 2 y 3. Los registros de distribución de plantas fuera de los límites no se describen aquí. En esta expedición se descubrieron cuatro nuevas especies y subespecies de aves y siete nuevas especies de ranas. Es importante señalar que después de solo 43 años, gran parte de la región, donde se hicieron muchos de estos descubrimientos, ahora está desprovista de vegetación natural. El Apéndice 4 proporciona descripciones detalladas del hábitat en Cordillera de Colán tan reciente como 2017. Este estudio es un recordatorio de que las áreas recientemente abiertas para exploración deben estudiarse a fondo y rápidamente para capturar el mayor beneficio científico. Ello mostraría cuánto se podría lograr en un pequeño lapso de tiempo por un pequeño pero dedicado grupo de biólogos.

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INTRODUCTION

An ornithological expedition by biologists from Louisiana State University (LSU), Baton Rouge, Louisiana, to Peru in 1978, resulted in discovery of many new species of plants and new species of frogs and birds. This isolated region is in La Peca District of Province Bagua of Department Amazonas in northern Peru (Fig. 1A). Cordillera de Colán in the Serrania de Bagua had not previously been explored and has not since been similarly studied by biologists or botanists to our knowledge. The region is in Lower montane wet forest life zone with cloud forest, elfin forest and paramo at highest elevations. Presently, a portion of this protected area is designated as Cordillera de Colán National Sanctuary (Deguignet et al. 2014). Expedition members worked in Peru from 29 May–9 November but mostly worked from base camps on Cordillera de Colán beginning at Camp 1, 8.9 trail km NE of the town of La Peca and ending at Camp 5, 19.9 trail km NE of La Peca at elevations between 1600 and 3358 m (Figs. 1A, 1B, 1C). Plant collections from Cordillera de Colán were primarily made during a five-month period between 10 June (*Barbour 2188*)–22 October (*Barbour 4222*), 1978. While collections of all organisms were made throughout this entire range, plant collections were made at elevations between 1600 and 3358 m.

A team led by Dr. Al Gentry (1945–1993) from Missouri Botanical Garden arrived on Cordillera de Colán on 13 June and departed 16 June 1978, and collected accession numbers *Gentry et al. 22843–23079* (Figs. 2A, 2B, 2C). This team included Dr. Mike Dillon, a National Endowment to the Arts Postdoctoral Fellow, Missouri Botanical Garden; James C. Aronson, field work coordinator, Flora of Peru project, Missouri Botanical Garden; and Peruvian botanist Camilo Diaz Santibanez. The expedition attracted a broad array of participants including mammologists Lynn Barkley (LSU) and Bernie Peyton with New York Zoological Society (NYZS). Peyton, then a bear biologist, joined the LSU group to conduct a rapid assessment of the status of Andean Spectacled Bear (*Tremarctos ornatus* Cuvier), a rare and vulnerable species unique to South America (Fig. 3A). Peruvian guide Enrique Ortiz assisted LSU while staging for field work from Gustavo del Solar's hacienda in his lemon orchards at Las Pampas in Department Lambayeque (Fig. 3B). Morris Williams, an LSU graduate student, joined the group during the latter half of the expedition (Fig. 4). LSU typically conducted one primary expedition in Peru a year for as long as six months, but would also have individuals doing field work simultaneously in various locations. Ornithologists Bill Eley (LSU), Ted Parker (LSU), David Hunter (LSU), Richard Semba (Yale) and Peruvian guide Manual Sanchez made a return trip from the previous year to Cerro Chinguela east of Huancabamba, Department Piura, to work at an elevation of 2900 m (Fig. 5). From Cerro Chinguela this group later traveled east and descended to a lower elevation of 1675 m to an area known as Playón. These trips were primarily to collect bird specimens for the LSU ornithological collection housed at LSU Museum of Natural Science, Baton Rouge, Louisiana. Richard Semba collected bird eyeballs for collaborative work with Charles Sibley, an American ornithologist and molecular biologist at Peabody Museum Yale University (Fig. 5). Gary Graves (LSU) joined this same group later in early July to study *Diglossa* flowerpiercers (Thraupidae) (Fig. 5).

Bat specialist Gary Graham (LSU) brought undergraduate botany students Philip Barbour (LSU) and Katherine Shaw (LSU) into the group with the original intention of collecting plants with ecological implications for bat activity (Figs. 6, 7). After this proved infeasible owing to the difficulty of representative sampling of bats and plants in canopies, Barbour began collecting all plants at different elevations (Figs. 8A, 8B). Because of the constant wet conditions, collecting techniques necessitated forgoing drying plant specimens in the field. Plant material was pressed in plant presses with aluminum corrugates and after sufficiently relaxed, were then wrapped in newspaper and tied in bundles (Figs. 9A, 9B). Three to four bundles each were then placed in a heavy plastic bag to which enough of a local form of consumable alcohol was added until thoroughly wetted. These bags where tightly sealed and periodically taken down to La Peca for storage until eventual air shipment to Missouri Botanical Garden (Figs. 10A, 10B). The group made a thorough collection of plants and birds but also collected amphibians, reptiles and mammals as time allowed.

Fortunately, the group included emergency room physician Scott Emerson, M.D., (Marquette, Michigan), a friend of Gary Graham, whose suturing skills proved invaluable when Al Gentry sustained a cut above his right eye by disarticulation of a fully extended clipper pole. Peruvian guides for the LSU group were Manuel Sánchez and Klaus Wehr, both also long-term field assistants for ecologist John Terborgh (Duke University) (Fig. 10B). A team of primatologists joined the LSU team to study the critically endangered Yellow-tailed Woolly Monkey (*Oreonax flavicauda* Humbolt). Their Peruvian team included Mariella Leo, Roberto Rodriquez, Reinhold Pape and two local field assistants (Figs. 11A, 11B).

Ted Parker and Al Gentry were killed 3 August 1993 when their plane crashed during an exploratory flight over cloud forest in the Guayaquil region of Ecuador. Ted and Al had been doing Rapid Assessment Program surveys for Conservation International at the time (Fig. 12).

At the time of the expedition most participants were graduate students at LSU. Cordillera de Colán as a location for an expedition was chosen by ornithologist Tom Schulenberg and bat specialist Gary Graham who noted that because the location was remote from other known areas it had high potential for being home to new species (Figs. 13A, 13B). Ornithologist, Dr. John P. O'Neill, from LSU Museum of Natural History, Baton Rouge, Louisiana, coordinated funding and used his extensive network of connections in Peru to facilitate obtaining permits, lodging and other logistics. O'Neill arrived at Cordillera de Colán on 25 June 1978 and spent a few days at first camp (Fig. 14). O'Neill was in route to a site along Rio Cenepa where he and Dr. Brent Berlin (then at University of California, Berkley) were conducting research on the nature of ethnobiological knowledge among the Aguaruna and Huasbisa, two Jivaroan Indian populations of the rain forests of north-central Peru (Berlin & O'Neill 1981).

Botanist Philip J. Barbour, who now has a Ph.D. and is a retired wildlife biologist with USDA Natural Resources Conservation Service in Ft. Worth, Texas, collected most of the plant material from the region. Barbour was an undergraduate at LSU, and worked primarily alone. In 1978, he moved to different camps along with other biologists and collected all forms of plants including fungi, mosses, lichens, ferns and spermatophytes. It was most fortunate that a botanist was able to visit this remote area because of the high species richness and endemism in the region.

Plants were collected along an approximately 20-km route (mostly accessible only by foot) which began at the town of La Peca (el. 1650 m) and ended at Camp 5, the highest base camp (el. 3358 m) (Figs. 15A, 15B). From each base camp, cloud forest, elfin forest and paramo were sampled from trails created for access to adjacent habitat. Departures off centerline of trails were seldom more than 50–100 m on either side due to difficulty of working in undisturbed, very wet cloud forest, elfin forest and paramo.

TAXONOMIC TREATEMENT

Anthurium barbourii Croat, **sp. nov.** (**Fig. 16**). TYPE: PERU. AMAZONAS: near O'Neill base camp, ca. 12 trail km E of La Peca in Serrania de Bagua, 5°34'S, 78°17'W, 1650–1800 m, lower montane wet forest, 13–14 Jun 1978, *A. Gentry, M. Dillon, J. Aronson, C. Diaz & P. Barbour 23028* (HOLOTYPE: MO-2686511).

The species is a member of section *Belolonchium* characterized by its obpyriform blades with moderately close primary lateral veins and the collective veins arising from one of the lowermost pairs of basal veins as well as by the hooding green spathe and moderately narrowly cylindroid-tapered, sessile dark maroon to blackish spadix.

Epiphytic or terrestrial to 2 m; **internodes** short, 1 cm long, 1.5 cm diam.; **cataphylls** persisting as fibrous sheaths 5–16 cm long, drying light brown to reddish brown. **LEAVES** 104–157 cm long with **petioles** 53.5–89.2 cm long (average 60) 0.4–0.8 cm diam., drying acutely and narrowly V-shaped, medium to dark brown; **blades** obpyriform, 50.5–67.7 cm long, 35.5–37 cm wide, broadest at the level of the petiolar plexus, 1.5 times longer than wide, 0.9 times longer than petiole, **anterior lobe** broadly convex, 33.5–53.5 cm long, acuminate at apex; **posterior lobes** 17.8–18.7 cm long, 12.9–13.5 cm wide; **sinus** broadly parabolic 13.4–14.2 cm long, 9–11 cm wide; **basal veins** 6 pairs, 1st pair free to the base, 2nd and 3rd pair fused 1 cm, 3rd and 4th pair fused 1.7 cm, 5th and 6th pairs fused 2.7 cm, posterior rib naked to 4.5 cm and with leaf edge increasing thereafter; **midrib** narrowly rounded above, drying acutely 2–3-ribbed, narrowly rounded below with a medial rib, drying acutely ribbed medially; **primary lateral veins** 14–16 pairs arising from the midrib at a 50°–60° angle,

drying concolorous and less conspicuous on upper surface, acutely raised and drying darker brown on lower surface; **collective veins** arising from one of the lowermost pairs of basal veins, 2–4 mm from margin, loop-connecting with primary lateral veins; **upper surface** semiglossy, minutely ridged and alveolate; **lower surface** smooth but minutely granular upon magnification; both surfaces drying medium reddish brown to dark brown. **INFLORESCENCE** 52.6 cm long, erect; **peduncle** 23.2–64.5 cm long, 0.2–0.4 cm diam., drying V-shaped, dark brown; **spathe** light green, 6.5–12.5 cm long, 0.8–1.6 cm wide, drying dark brown; **spadix** dark maroon to blackish, 7.5–12.8 cm long, 0.8–1.1 cm diam., drying dark brown; **flowers** 9–10 visible per spiral, 1.8 mm long by 1.5 mm wide, lateral **tepals** covered with a brownish crustiose layer of a wax-like substance which scratches off; lateral tepals 1.2 mm wide, outer margin obtusely 3-sided, broadly rounded on inner margin. **INFRUCTESCENCE** 12.8 cm long by 1.4 cm diam., drying dark brown.

The species is not apparently close to any other described species. In the *Lucid Anthurium Key,* the species tracks to *Anthurium bogotense* Schott*, A. chorense* Engl.*, A. macleanii* Schott and *A. obpyriforme* Leimbeck. *Anthurium bogotense, A. chorense and A. macleanii* all differ in having the posterior lobes either directed outward or inward. *Anthurium obpyriforme* is also found in Ecuador, Loja Province and may be distinguished by having fewer primary lateral veins, a spathe that is 3 times wider and a spadix that is green, more prominently tapered, pendant and longer than that of *A. barbourii*.

Distribution.—*Anthurium barbourii* is endemic to Peru, known only from the type locality in the Serrania de Bagua at 1650–1800 m in a *Lower montane wet forest* life zone.

Etymology.—The species is named in honor of Dr. Philip J. Barbour who was responsible for making most of the collections of plants from the La Peca region and who helped with the collection of this species that bears his name. Barbour's incredible efforts collecting for months and living in harsh field conditions has made this study possible.

Anthurium camiloi Croat, **sp. nov.** (**Fig. 17**). TYPE: PERU. AMAZONAS: near O'Neill base camp, ca. 12 trail km E of La Peca in Serrania de Bagua, 5°34'S, 78°23'W, 1650–1800 m, lower montane wet forest, 13–14 Jun 1978, *A. Gentry, M. Dillon, J. Aronson, C. Diaz & P. Barbour 23074* (HOLOTYPE: MO-2805637; ISOTYPE: USM).

The species is a member of section *Belolonchium* characterized by its epiphytic habit, short internodes, persistent reddish-brown cataphyll fibers, subterete, sulcate petioles, triangular-ovate blades which are sagittate-hastate at base, brown-drying with dense purple-brown speckles on the lower surface as well as by the somewhat hooding green spathe and short-stipitate, pinkish gray, moderately long-tapered spadix.

Epiphyte; stem to 3 cm diam.; internodes short; catapylls persisting as red-brown fibers. **LEAVES** 97.6 cm long with **petioles** 59.2 cm long, 0.6 cm diam., drying broadly sulcate with a medial rib, medium brown; **blades** ovate-sagittate, 40.6 cm long, 30 cm wide at the point of petiole attachment; **anterior lobe** 26 cm long, narrowly long acuminate (apiculum 2.2 cm long); **posterior lobes** 16 cm long, 15 cm wide, directed downward; **sinus** broadly hippocrepiform, 10 cm long, 13 cm wide; **midrib** narrowly rounded and darker than blade surface on upper surface, dominantly and narrowly raised on lower surface, drying concolorous; **basal veins** 7 pairs, naked to the 5th pair, 1st pair free to the base, 2nd to 4th each fused 1.2–2 cm to the subsequent basal vein, 5th, 6th and 7th branching off at the same point; **primary lateral veins** 6 pairs, arising from the midrib at 30°–40°, narrowly flattened and sunken above, acutely raised and more prominent below; **collective veins** arising from the lowermost basal veins, loop-connecting to the other basal veins and the primary lateral veins 3–5 mm from the margin; **upper** and **lower surfaces** epunctate, minutely granular, drying semiglossy, dark grayish brown with dark purple-brown speckles on the lower surface. **INFLORESCENCE** to 73.8 cm long, sub-pendant; **peduncle** 62 cm long, 6 mm diam., terete, drying dark brown; **spathe** green, 10.2 cm long, 2.4 cm wide, positioned at 180° from the peduncle and hooding spadix, drying medium brown; **spadix** pinkish gray, tapering, 11.8 cm long, 0.8 cm diam.; **flowers** 8–9 visible per spiral, 2.5 mm long, 2.7 mm wide, lateral tepals 1.6 mm wide, the outer margins 2-sided, inner margin slightly convex, anthers 0.35 mm long, 0.4 mm wide, not yet emerging.

In the *Lucid Anthurium Key, Anthurium camiloi* keys to *A. chacoense* Croat, which differs in having a much longer naked portion of the posterior rib (mostly 7–13 cm) and a purple to red spadix; *A. flavolineatum* Sodiro,

differing in having a much narrower, more triangular blade and a purplish spathe with prominent green lines; *A. macleanii*, differing in having more than 20 primary lateral veins and a shorter peduncle (to 20 cm long); *A. tonianum* Sodiro, differing in having a larger blade (more than 60 cm long) with more prominently concave margins and a purple, more cylindroid spadix; and *A. tremulum* Sodiro, differing in having a much longer, more narrowly tapered blades and purplish violet spadices.

Distribution.—*Anthurium camiloi* is endemic to Peru, known only from Amazonas Department in the Serrania de Bagua at 1650–1800 m in a *Lower montane wet forest* life zone.

Etymology.—The species is named in honor of the Peruvian botanist, Camilo Diaz who helped collect the type specimen. Diaz is one of the best plant collectors in Peru and has collected many new and interesting Araceae. Camilo was a member of the expedition to La Peca carried out by Al Gentry, Mike Dillon and Jim Aronson in 1978. At the present time he is Profesor Auxiliar in the Department of Ciencias Farmacéuticas at the Universidad Peruana Cayetano Heredia in Peru.

Anthurium dillonii Croat, **sp. nov.** (**Fig. 18**). TYPE: PERU. AMAZONAS: near O'Neill base camp, ca. 12 trail km E of La Peca in Serrania de Bagua, 05°34'S, 78°17'W, 1650–1800 m, lower montane wet forest, 13–14 Jun 1978, *A. Gentry, M. Dillon, J. Aronson, C. Diaz, & P. Barbour 23075* (HOLOTYPE: MO-2805635; ISOTYPE: USM-46692).

The species is a member of section *Calomystrium* characterized by its moderately elongate internodes (for a member of section *Calomystrium*), broadly ovate blade with the collective veins arising from the 3rd or 4th basal veins, surfaces which lack both dark dots and short pale lineations, the lanceolate, green spathe and the pinkish to yellowish shortly cylindroid-tapered spadix.

Epiphytic; **internodes** 0.5–2.0 cm, 1 cm diam.; **cataphylls** persisting with a few short dark brown fibers. **LEAVES** 106.1 cm long with **petioles** 66–67 cm long, 0.4–0.6 cm diam., drying finely ribbed, dark brown, broadly and acutely sulcate to flattened abaxially; **blades** broadly ovate, 38–39.4 cm long, 29.5–31 cm wide, broadest 1.5 cm above the point of petiole attachment, 1.3 times longer than broad, 0.6 times as long as petiole, broadly acute at apex, cordate at the base, subcoriaceous; **upper surface** drying semiglossy, dark greenish brown, densely and minutely granular, lacking short pale lineations or dark dots; **lower surface** lighter yellowish brown, minutely and densely reddish brown-speckled, not dark-dotted or short-pale- lineate; **midrib** drying concolorous and acutely raised above, broadly convex below; **anterior lobe** 24.8 cm long, broadly convex on margins; **posterior lobes** 11.2–13.9 cm long, 11.5–13.5 cm wide; **sinus** hippocrepiform, 8.2–9.6 cm long, 14 cm wide; **basal veins** 5 pairs with prominent secondary veins branching out from the 1st and 2nd basal veins and extending to the collective veins, 1st and 2nd pairs free to the base, the 3rd and 4th fused for 0.8 cm, 4th and 5th pairs fused 0.5 cm; **primary lateral veins** 9 pairs arising at a 50°–60° angle, acutely raised on lower surface, inconspicuous on the upper surface; **collective veins** arising from the 3rd pair of basal veins, loop-connected to the basal and primary lateral veins 2–4 mm from the margin. **INFLORESCENCE** 32.2 cm long, erect; **peduncle** 25 cm long, 0.5 cm diam., drying broadly sulcate, coarsely ribbed, dark brown; **spathe** green, oblanceolate, 10–11.5 cm long, 2.2–2.8 cm wide, erect-spreading drying dark brown; **spadix** sessile, shortly cylindroid, pinkish to yellowish, 7.3 cm long, 1.5 cm wide; **flowers** 8 visible per spiral, 4.5 mm long, 4.3 mm wide, tepals smooth, drying dark brown, lateral tepals 3.0 mm wide, outer margins 3-sided, inner margins straight. **INFRUCTESCENCE** with berries, drying dark brown.

In the *Lucid Anthurium Key,* the species tracks to both *Anthurium linganii* Croat and *A. magdae* Croat & Lingán, both of which may be distinguished by having more narrowly ovate blades, long, more intact cataphylls (In contrast *A. dillonii* has only a few cataphyll fibers persisting at lower nodes). In addition, *A. dillonii* has 8 flowers visible per spiral and the flowers are 4 mm wide whereas *A. linganii* and *A. magdae* both have 12–15 flowers visible per spiral and the flowers are only 2 mm wide. The spadix of *A. dillonii* is pink to yellowish while the spadices of *A. linganii* are creamy, light green and *A. magdae* are white.

Distribution.—*Anthurium dillonii* is known only from the type locality in the Serrania de Bagua at 1650–1800 m in a *Lower montane wet forest* life zone in cloud forest.

Etymology.—The species is named in honor of American botanist Michael Dillon (retired) from the Field Museum of Natural History in Chicago who helped collect the specimen. Dillon, an old friend and former employee of the Missouri Botanical Garden, has collected many interesting and new species, especially in

Peru and Chile. He is an expert on the Asteraceae and the floristics of the lomas, a characteristic vegetation type along the Pacific coast of Chile and Peru.

Anthurium grahamii Croat, **sp. nov.** (**Fig. 19**). TYPE: PERU. AMAZONAS: Serrania de Bagua, near O'Neill base camp, ca. 12 km E of La Peca, 5°34'S, 78°17'W, 1650–1800 m, lower montane cloud forest,13–14 Jun 1978, *A. Gentry, M. Dillon, J. Aronson, C. Diaz, & P. Barbour 22913* (HOLOTYPE: MO-2686519; ISOTYPES: F, 22913 USM).

Anthurium grahamii is a member of section *Caloymystrium* characterized by its epiphytic habit, short internodes, persistent intact cataphyll fibers, subterete, sulcate petioles, ovate-triangular, sagittate-hastate blades, drying dark grayish brown with the collective veins arising from one of the lower pairs of basal veins and 4 pairs of basal veins as well as by the green lanceolate spathe and pinkish gray moderately tapered spadix.

Epiphytic, low-creeping; **internodes** 1–1.5 cm long, 1.2 cm diam.; cataphylls persisting intact or as shredded fibers 7–18.8 cm long, drying dark brown. **LEAVES** 54 cm long with **petioles** subterete, drying C-shaped with medial rib 21.4–45.5 cm long (averaging 31 cm), 3–4 mm diam., drying dark brown; **blades** ovate-sagittate, 19.5–25 cm long, 10.6–18.3 cm wide, 1.4–2.3 times longer than wide (averaging 1.7), 0.4–1 times longer than petiole (averaging 0.75); **anterior lobe** 18.2–18.6 cm long, margin convex; **posterior lobes** 7.3–8.8 cm long, 6–9.2 cm wide; sinus broadly parabolic, 4.3–5.1 cm long, 3.3–4.2 cm wide; **midrib** narrowly rounded on upper surface, more broadly rounded on lower surface, **basal veins** 4 pairs arising free from the base; **primary lateral veins** 6 pairs arising at 50°–60° from the midrib; **collective veins** arising from the 3rd pair of basal veins, running 1–3 mm from the margin; all veins more prominent on the lower surface, narrowly rounded and drying concolorous**; upper surface** drying matte dark brown to nearly black, minutely granular; **lower surface** drying lighter reddish brown, minutely granular and with scattered round, white pustules 0.3–0.5 mm diam. **INFLORESCENCE** 33.5 cm long, erect with **peduncle** 14.8–26.6 cm long, 3.5–4.5 mm diam., 1.7–2.6 times longer than spathe, broadly C-shaped, drying medium to dark brown; **spathe** greenish cream 8.4–10.2 cm long, 1.7–2.8 wide, drying reddish brown; **spadix** greenish cream-colored, 9.5–15.7 cm long, 1.2–1.8 cm diam., **flowers** 7–9 visible per spiral, 3.2–3.7 mm long, 3.2–3.5 mm wide; lateral **tepals** 3-sided, 3.2 mm wide.

The species is similar to *A. striatipes* Sodiro, but that species is a member of section *Belolonchium* and differs by having leaf blade more conspicuously constricted on the anterior lobe, has the lower surface dark reddish brown with speckling scarcely darker than the rest of the surface as well as by having the major veins on the lower surface lacking acute medial ribs. In addition, *A. striatipes* has a spadix that is red or dark violet rather than pinkish gray.

Distribution.—*Anthurium grahamii* is endemic to Peru, known only from the type locality in the Serrania de Bagua in the Department of Amazonas at 1650–1900 m, in a *Lower montane wet forest* life zone.

Etymology.—The species is named in honor of zoologist, Dr. Gary L. Graham who was one of the main contributors to the expedition to Cordillera de Colán and was instrumental in providing information about the collecting sites of the expedition. At the time of the expedition Dr. Graham was a graduate student studying bats at the LSU Museum of Natural History, Baton Rouge. He later earned his Ph.D. at the University of New Mexico, Albuquerque.

Paratypes: PERU. Amazonas: Serrania de Bagua, near O'Neill base camp, ca. 12 km E of La Peca, 5°34'S, 78°17'W, 1650–1800 m, 13–14 Jun 1978, *A. Gentry, M. Dillon, J. Aronson, C. Diaz & P. Barbour 22929* (MO, USM); ca. 17 trail km E of La Peca, 1850–1900 m, *22984* (MO).

Anthurium katherineshawiae Croat, **sp. nov.** (**Figs. 20A–D**). TYPE: PERU. AMAZONAS: Prov. Bagua, Cordillera Colán, SE of La Peca, 5°34'S, 78°19'W, 2286–2407 m, 30 Sep 1978, *P. Barbour 3720* (HOLOTYPE: MO-2795923–26).

The species is a member of section *Calomystrium* characterized by its usually short internodes, persisting intact cataphylls, terete petioles, large gray-drying narrowly cordate-sagittate blades with the collective veins arising from one of the lowermost primary lateral veins and the acutely ribbed basal veins (numbering up to 10) which are mostly fused into a broadly arching posterior rib.

Epiphytic; **stem** erect; **internodes** short; **cataphylls** persisting intact, reddish brown; **petiole** terete, 1.6 cm diam. when fresh; **blades** cordate-sagittate, 87–112 cm long, 66–67 cm wide, 1.3–1.6 times longer than broad, broadest at point of petiole attachment, narrowly acuminate at apex, **posterior lobes** 32.5 cm long, 31.8 cm wide; **sinus** broadly reniform, 18.3 cm long, 20 cm wide; **midrib** drying narrowly rounded above, broadly

rounded below; **basal veins** 10 pairs, 1st pair free to the base, posterior rib naked to 5th pair and broadly arching to 12.8 cm, 2nd to 8th pairs each fused to the subsequent pair for 0.5–2.5 cm; **primary lateral veins** 6 pairs, arising at 35°–45° from the midrib, drying narrowly rounded, medium brown on the upper surface, narrowly rounded and slightly more prominent on the lower surface; **collective veins** arising from the 1st pair of primary lateral veins, loop-connecting to higher primary lateral veins, 2–3 mm from the margin; **upper surface** epunctate, drying with reticulate venation, glossy, medium gray-green; **lower surface** epunctate, drying reticulate, semiglossy, medium brown. **INFLORESCENCE** 105.3 cm long, subpendant; **peduncle** 84.8 cm long, 0.8 cm diam., drying brown and coarsely ribbed; **spathe** green, 25 cm long, 8.5 cm wide, directed at 180° from the peduncle, hooding the spadix; **spadix** brown, 20.5 cm long, 1.8 cm diam., tapering, drying dark brown; **flowers** 19–21 visible per spiral, 2.3 mm long, 2.4 mm wide; lateral tepals 1.1 mm wide, outer margins 2-sided, inner margins curving downward.

In the *Lucid Anthurium Key,* the species tracks to *Anthurium effusispathum* Croat, a similarly large *Calomystrium*, which is found a few hundred miles north in Ecuador, but that species has 11–17 pairs of primary lateral veins while *A. colanense* has 6–8 pairs of primary lateral veins. Collective veins arise from basal veins in *A. effusispathum* whereas in *A. katherineshawiae* they arise from the 3rd or 4th pairs of primary lateral veins. In addition, *A. effusispathum* has 13–15 flowers visible per spiral in the spadix while *A. katherineshawiae* has 19–21 flowers visible per spiral. Because of the large size of its blade, spathe, and spadix, no other *Anthurium* sect. *Calomystrium* specimens from the La Peca area may be confused with *A. katherineshawiae*.

Distribution.—*Anthurium katherineshawiae* is endemic to Peru, known only from the type locality in the Peruvian Department of Amazonas in the Province of Bagua in the Cordillera de Colán, at 2286–2407 m in a *Lower montane wet forest* life zone.

Etymology.—*Anthurium katherineshawiae* is named in honor of Katherine Shaw Barbour, who at the time was an LSU undergraduate botany student and dear friend of Philip J. Barbour.

Anthurium lapecaense Croat & Hormell, **sp. nov.** (**Fig. 21**). TYPE: PERU. AMAZONAS: Prov. Bagua, Cordillera Colán, SE of La Peca, third camp, 5°34'S, 78°19'W, 2743 m, humid cloud forest-elfin forest ecotone, 25 Sep 1978, *Philip Barbour 3584* (HOLOTYPE: MO-2800703, ISOTYPE: USM).

Anthurium lapecense is a member of section *Cardiolonchium* characterized by its terrestrial habit, subterete petioles, ovate-sagittate, bullate, greenish drying, ovate-sagittate blades and the pink-red spathe and orange-red spadix.

Terrestrial; stem not seen. **LEAVES** with **petioles** subterete, estimated to be 45 cm long, diam 0.3 cm., obtusely sulcate adaxially, drying prominently and deeply ribbed, greenish yellow, matte, sheathed to 11 cm; geniculum 2.5 cm long, slightly darker than petiole; **blades** ovate-sagittate, 38.3–47 cm long, 20.2–24.3 cm wide, broadest near petiole attachment, 1.89–1.93 times longer than wide, blade 1.3 times longer than petiole, abruptly acuminate at apex, deeply lobed at base, somewhat bullate, dark green and matte above, scarcely paler and matte below; **midrib** narrowly rounded and slightly paler above and below; **primary lateral veins** 11–14 pairs, weakly raised and concolorous above, narrowly round-raised and paler, densely granular-punctate below; **anterior lobe** 28–35.2 cm long, broadly convex along margins; **posterior lobes** 12.3–14.3 cm long, narrowly rounded at apex; **sinus** narrowly hippocrepiform to spathulate, 9.8–10.8 cm deep, 11.5–14.5 cm wide; **basal veins** 7–8 pairs, 1st pair free to the base, 2nd pair fused 1.3–2.5 cm, 3rd pair fused 3.5–4.5 cm; **posterior ribs** naked 2.7–3 cm; **collective veins** arising from 3rd–4th pair of basal veins; tertiary veins in part prominently raised below; **upper surface** moderately smooth, densely short pale-lineate when young; **lower surface** densely granular and short-pale lineate when young, becoming more conspicuously granular but more sparsely short-pale lineate on older leaves. **INFLORESCENCE** 42.5 cm long, erect; **peduncle** 28.8 cm long with stipe 0.4 cm long; **spathe** pink-red (lost); **spadix** moderately long-tapered, orange-red, 14.7 cm long, 0.5 cm diam.; **flowers** 7–8 visible per spiral, 1.8–2.2 mm long, 1.3–1.8 mm wide; **tepals** minutely granular; lateral tepals 0.9–1 mm wide, the outer margins 2–3-sided; stamens held just above the edge of the tepals; anthers 0.6–0.8 mm wide and long; pollen yellow-orange when fresh, drying yellowish.

The species is similar to *Anthurium ionanthum* Croat which has blades of similar size, but that species has blades that are smooth, not at all bullate and has a spadix which is much shorter and somewhat

lavender-purple not orange-red at anthesis. *Anthurium lapecense* might also be confused with *A. benktsparrei* Croat from southern Ecuador and northern Peru but that species differs in having a shorter, short-tapered spadix that is typically blue-purple and usually with the leaf blades more narrowly triangular and often with concave margins on the anterior lobe. In addition, it is usually lacking leaf blades that are in any way bullate on the upper surface and with the lower surface with less conspicuous tertiary veins. In the *Lucid Anthurium Key, Anthurium lapecense* tracks with *A. lappoanum* Croat from Ecuador which differs in having blade surfaces that are markedly bullate, the first 3 basal veins are all free to the base, the collective vein arises from the 1st basal vein and the spadix is green to yellow.

The species is a member of sect. *Cardiolonchium* characterized by its terrestrial habit, subterete petioles, ovate-sagittate, bullate, greenish-drying, ovate-sagittate blades and the pink-red spathe and orange-red spadix. The species is similar to *Anthurium ionanthum* Croat which has blades of similar size, but that species has blades that are smooth, not at all bullate and has a spadix that is much shorter and somewhat lavender-purple, not orange-red at anthesis.

In the *Lucid Anthurium Key,* the species tracks to *Anthurium benktsparrei* Croat which differs by having blades more narrowly triangular with the lateral margins usually straight to concave and with a shorter, much more cylindroid spadix; *A. coripatense* N. E. Br. which differs by having a dark purple spadix and *A. sanguineum* Engl., differing by having a much broader spathe and thicker green spadix and an unpublished species from Ecuador which differs in having blade surfaces that are markedly bullate, the 1st–3rd basal veins which are all free to the base, the collective vein arising from the 1st basal vein and the spadix which is green to yellow (*B. Sparre 18990*; *Croat 91427, 103718*).

Distribution.—Anthurium lapecense is known only from the type locality in the Cordillera de Colán SE of La Peca in Amazonas Department of Peru, at 2743 m in a *Lower montane wet forest* life zone.

Etymology.—Anthurium lapecense is named for the type locality near the village of La Peca in the Cordillera Colán in Amazonas Department of Peru.

Anthurium oneillii Croat, **sp. nov.** (**Fig. 22**). Type: PERU. Amazonas: Prov. Bagua: 12 km E of La Peca (by trail), 5°34'S, 78°17'W, 1700 m, 6 Jul 1978, *Philip Barbour 2642* (holotype: MO-2674248; isotype: USM).

The species is a member of section *Calomystrium* characterized by its epiphytic habit, short internodes, long-petiolate leaves, narrow brown-drying blades with conspicuous, slender lobes and with inconspicuous primary lateral veins as well as by the long-pedunculate inflorescence with a reflexed green, lanceolate spathe and a long-tapered pale yellow-green, sessile spadix.

Epiphytic; **internodes** short (ca. 0.6 cm long), ca. 1.5 cm diam. when fresh, drying ca. 1 cm diam.; **cataphyll** 14.7 cm long, deciduous, drying medium yellow-brown. **LEAVES** 67–74 cm long with **petioles** 35.5–37.8 cm long, 0.3 cm diam., terete drying ribbed, medium yellow-brown; **blades** narrowly oblong-ovate in outline with long narrow posterior lobes, 31.5–36 cm long, 6.6–7.5 cm wide, 4.8–5.2 times longer than wide, 0.83–0.90 times as long as petioles, subcoriaceous, drying moderately thin; **anterior lobes** 24–25 cm long, margins are slightly convex at the apex becoming straight at the sides and along the **posterior lobes**, the latter 7.5–8.0 cm long, 2.4–2.9 cm wide; **sinus** 7.3–8.5 cm deep, 0.8–1.2 cm wide; **midrib** narrowly rounded, 1.5 mm wide, drying darker than surface, finely ribbed above, broadly rounded to medially sunken, concolorous below; **basal veins** 10–12 pairs, branching into a fine network**; primary lateral veins** not apparent, neither straight nor obviously more different from the interprimary lateral veins, superficially appearing to be 60–70 pairs and branching into a fine network; **collective veins** 0.5 cm from margin barely distinguishable as they trace through the marginal reticulum; **upper surface** matte, drying medium yellow-brown, moderately smooth; **lower surface** matte, somewhat lighter yellow-brown, densely granular upon magnification. **INFLORESCENCE** 53.3 cm long, erect with **peduncle** 35.4–37 cm long, terete drying ribbed medium yellow-brown; **spathe** 8.2–9.8 cm long, 0.8–1.0 cm wide, reflexed, lanceolate, light green, drying dark brown; **spadix** 16.3–20.5 cm long, 2–4 mm diam., sessile, long-tapered, dull yellow-green, drying dark brown; **flowers** 5–6 visible per spiral, 1.8–2.2 mm long, 1.4–1.6 mm wide; tepals moderately smooth, lateral tepals 1.0–1.2 mm wide, the outer margin broadly 2-sided; stamens held just above the tepals; anthers 1.3 mm long, 2.3 mm wide, thecae ovoid to subrounded, moderately divaricate.

In the *Lucid Anthurium Key, Anthurium oneillii* tracks to *A. andreanum* Linden which may be distinguished by its shorter ovate blades (18–30 cm long) and especially by its broad red spathe and usually yellow spadix; *A. longissimilobum* Croat, which differs by its very distinctive triangular blade which is 30–70 cm long (versus almost oblong for *A. oneillii*) in addition to a broad sinus that is V-shaped with the lobes (10–15 cm long) directed outward, In addition *A. longissimilobum* has numerous, inconspicuous primary lateral veins which arise from the midrib at a very obtuse angle (70–80°).

Distribution.—*Anthurium oneillii* is endemic to Peru, known only from the type locality in Amazonas Department, Province of Bagua in the mountains east of La Peca at 1700 m in a *Lower montane wet forest* life zone.

Etymology.—The species is named in honor of Dr. John O'Neill, an ornithologist from Louisiana State University, who helped organize and fund the expeditions to the La Peca region that allowed Philip Barbour to make so many new collections of Araceae there. O'Neill also found many new species of birds in the region.

Anthurium perlatum Croat, **sp. nov.** (**Fig. 23**). TYPE: PERU. AMAZONAS: Bagua Province: slopes of Cerro Colán, ca. 20 km E. of La Peca; humid cloud forest, along small quebrada, 1700 m, 12 Aug 1978, *Philip Barbour 2857* (HOLOTYPE: MO-2802285).

The species is a member of sect. *Belolonchium* and is characterized by its terrestrial habit, short internodes, persisting reddish brown persistent cataphyll fibers, long, more or less D-shaped yellowish brown-drying petioles, prominently sagittate brownish drying blades with 8 pairs of heavily branched (with 4–6 lateral branches) basal veins, none of which are free to the base, a well-developed weakly curved posterior rib which is naked about half its length, collective veins arising from the 2nd pair of basal veins and 4–5 mm from the margin as well as by its long-pedunculate inflorescence with a green lanceolate spreading spathe and a weakly tapered maroon spadix.

Terrestrial, stem short; **internodes** short, 2.5–3.5 cm diam.; **cataphylls** persisting as reddish brown fibers; **petioles** 57 cm long, drying weakly glossy, yellowish brown, 7–8 mm diam., more or less D-shaped in cross-section, broadly convex adaxially with a slightly spreading margin, rounded abaxially; **blades** sagittate, 36.3 cm long, 36 cm wide, about as long as wide, drying yellow-brown and weakly glossy above, grayish yellow-brown and weakly glossy below; **anterior lobe** 24.3 cm long, the margin somewhat concave midway; **posterior lobes** 17–18 cm long, 12.4–13 cm wide, directed outward and downward; **basal veins** 8 pairs, 1st pair fused 8–10 mm; 2nd pair fused 3 cm; 4th pair fused 4.5 cm, 5th pairs fused 6.6 cm; 6th & 7th pairs fused 10 cm; secondary veins (branches of the basal veins 4–6 pairs for the major veins; **posterior ribs** broadly spreading, naked 5–5.3 cm, about half its length; **collective veins** arising from the 2nd pair of basal veins and 4–5 mm from the margin, moderately loop-connecting the primary veins; **primary lateral veins** 8–10 pairs arising at a 50° angle, convex and concolorous above, bluntly acute and concolorous below. **INFLORESCENCE** erect-spreading, long-pedunculate; **peduncle** 25.5 cm long, slightly more narrow than petioles; **spathe** green, lanceolate, 11.5 cm long, 2.5 cm wide, green, spreading; **spadix** 10 cm long, drying 6 mm diam., maroon, drying dark reddish brown, matte, weakly tapered; **flowers** 7–8 visible per spiral, 1.8 mm long, 1.3 mm wide; lateral tepals 0.8–1 mm wide; inner margin broadly rounded, outer margin 2-sided.

In the *Lucid Anthurium Key,* the species tracks to *Anthurium cymbispathum* Sodiro from Ecuador which differs by its much more prominently constricted anterior lobe and its stipitate spadix; *A. dolichophyllum* Sodiro from Ecuador differing by its fine scabridulous ribs on the major veins of lower surface as well as by its stipitate spadix; *A. effusilobum* Croat, differing by its much smaller stature, more slender, most prominently spreading posterior lobes, the shorter hooding spathe and the moderately short stipitate spadix; *A. flavolineatum* Sodiro, differing by its slender spreading posterior lobes, the purplish spathe with greenish veins and the stipitate spadix; *A. herthae* K. Krause, differing by its much narrower, more prominently spreading posterior lobes and stipitate spadix and *A. schunkei* K. Krause which differs by its proportionately longer and narrower leaf blades, spathulate sinus and stipitate spadix.

Distribution.—*Anthurium perlatum* is endemic to Peru, known only from the type locality in Amazonas Department on Cordillera de Colán at 1700 m in a *Premontane rainforest* life zone.

Etymology.—The species epithet is from the Latin "perlate" (meaning very broadly), referring to the very broadly arching sinus.

Anthurium philipii Croat, **sp. nov.** (**Fig. 24**). Type: PERU. Amazonas: near O'Neill base camp, ca. 12 trail km E of La Peca in Serrania de Bagua, 05°34'S 78°23'W, 1981 m, humid cloud forest, 20 Jul 1978, *P. Barbour 2737* (holotype: MO-2674392).

The species is a member of section *Calomystrium* characterized by its terete petioles, narrowly ovate-sagittate blades dark-punctate on the lower surface and short pale-lineate on the upper surface with a hippocrepiform to closed sinus and with the collective veins arising from the 1st or 2nd pair of basal veins and extending to the apex very close to the margin as well as by the green spathe and spadix.

Terrestrial; **internodes** 0.3–0.5 cm long, 1.3 diam., **cataphylls** persisting as reddish brown fibers 3–5 cm. **LEAVES** 98.5 cm long with **petioles** reddish, 49 cm long, 3.5–5 mm diam., drying C-shaped with medial rib adaxially, broadly rounded abaxially, medium to dark brown; **blades** ovate, 49.5 cm long, 29.2 cm wide, broadest at the point of attachment of the petiole, 1.7 times longer than wide, nearly equal to petiole in length, abruptly acuminate (apiculum 1.2 cm long), prominently lobed at base, drying subcoriaceous, semiglossy, medium yellow-brown on both surfaces; **anterior lobe** 35.7 cm long, essentially convex but slightly concave near middle; **posterior lobes** 17 cm long, 11.5 cm wide, directed inward toward base; **sinus** spathulate, 13.8 cm long, 6.5 cm wide; **midrib** narrowly rounded in valley above, prominently convex below; **basal veins** 6 pairs, each subsequent pair fused to the next for 0.6–1.2 cm, **primary lateral veins** 11 pairs, arising at a 40°–50° angle, acutely raised on both surfaces but more prominent so on the lower surface; **collective veins** arising from the lowermost pair of basal veins and running 2–3 mm from the margin; **upper surface** minutely granular, sparsely short-pale-lineate, lacking dark dots; **lower surface** conspicuously dark-dotted, minutely granular, sparsely pustular, lacking short pale lineations. **INFLORESCENCE** 45.8 cm long with **peduncle** reddish, 35.7 cm long, 3.5 mm diam., narrowly sulcate adaxially; **spathe** green with reddish edges near the apex; **spadix stipitate (**stipe ca. 4 mm long), darker green, 9.8–10.1 cm long, 1.8 cm wide, drying 8 mm diam., slightly tapered, medium yellow-brown; **flowers** 5–6 visible per spiral, 3.2 mm long x 2.5 mm wide, **tepals** conspicuously granular-ridged; lateral tepals 1.5 mm wide, outer margins bluntly 3-sided, **stamens** exserted, filaments emerging to 2 mm above the tepals; anthers oval, 0.6 x 0.8 mm, thecae scarcely divaricate.

Anthurium philipii is similar to *Anthurium dillonii* which is found in the same area, but that species has blades 1.3 times longer than broad, a sinus that is broader and hippocrepiform and a shorter cylindroid spadix with 10–12 flowers visible per spiral and larger flowers (4 mm long) versus having blades 1.7 times longer than broad, a narrower, spathulate sinus and a long-tapered spadix with 5–6 flowers visible per spiral and flowers to 3.2 mm wide in *A. philipii*.

In the *Lucid Anthurium Key, Anthurium philipii* tracks with *A. lutescens* Engl. which may be distinguished by longer petioles and peduncles, (50–60 cm long), a large, ovate spathe (18 × 3.5 cm) and a sessile spadix; *A. grande* N.E. Br. ex Engl. also has a large spathe (20 cm × 4 cm), sessile spadix and fewer primary lateral veins (4–7).

Distribution.—*Anthurium philipii* is known only from the type locality in the Serrania de Bagua at 1981 m in a *Lower montane wet forest* life zone.

Etymology.—The species is named in honor of American botanist, Dr. Philip J. Barbour, formerly an undergraduate at LSU who collected most of the plants from the LSU Cordillera de Colán Expedition. While at Missouri Botanical Garden, Barbour was a graduate student at St. Louis University. He later earned an M.S. degree from Louisiana State University. After farming in Mississippi for 18 years he returned to graduate school and earned a Ph.D. in Forest and Wildlife Ecology from Mississippi State University. Philip now retired with the USDA National Resources Conservation Service as a Central Region Biologist and Botanist at the Central National Technology Support Center in Fort Worth, Texas.

Anthurium schulenbergii Croat, **sp. nov.** (**Fig. 25**). Type: PERU. Amazonas: near O'Neill base camp, ca. 12 trail km E of La Peca in Serrania de Bagua, 1981 m, humid cloud forest, 20 Jul 1978, *P. Barbour* 2737A (MO-2674391.

The species is a member of section *Belolonchium*, characterized by its terrestrial habit, short internodes, semi-intact, shredding fibrous cataphylls, petioles narrowly sulcate when dried, narrowly ovate-sagittate, brown-drying blades with a spathulate sinus and a collective vein arising from the 3rd and 4th pairs of basal veins as well as by the long-pedunculate inflorescence with a hooding green spathe and a short-stipitate, cylindroid, curved green spadix.

Terrestrial; **internodes** short, 0.5–0.8 cm long, 1 cm diam.; **cataphylls** 6–13 cm long, persisting as fibrous sheaths or shredded fibers, drying light, reddish brown. **LEAVES** at least 56.9 cm long, with **petioles** reddish, drying narrowly sulcate adaxially with a prominent medial rib, unknown length, 3 mm diam., drying

medium reddish brown; geniculum 1 cm long, drying darker brown; **blades** upper surface dark green, obpyriform, 36 cm long, 19.5 cm wide at the point of petiole attachment, sides nearly straight, 1.9 times longer than broad, 1.7 times longer than petiole; **anterior lobe** 26.7 cm long, abruptly acuminate at apex, margins straight; **posterior lobes** directed inward 9.7 cm long, 7 cm wide; **sinus** spathulate, 8.5 cm long, 4.9 cm wide; **midrib** rounded-convex on lower surface; **basal veins** 5 pairs, 1st pair free to the base, 2nd, 3rd and 4th pairs are each fused to the subsequent pair 0.5–1 cm, the 5th pair branching directly from the 4th pair, **posterior rib** naked 4 cm; **primary lateral veins** 9 pairs, arising from the midrib at a 40°–50° angle, concolorous, inconspicuous above, narrowly rounded, concolorous below; **collective veins** arising from the 3rd or 4th pairs of basal veins and running 1–3 mm from the margin; all veins drying narrowly rounded, concolorous and more prominent on the lower surface; **upper surface** epunctate, drying matte, very dark brown with minutely granular texture; **lower surface** epunctate, drying semiglossy, medium reddish brown, minutely granular. **INFLORESCENCE** 58.9 cm long, pendant; with reddish **peduncle** 51.4 cm long, 5 mm diam., drying coarsely ribbed, dark brown; **stipe** 0.5 cm; **spathe** green with reddish coloring along the edges and near the apex, oblong-elliptic, 8.6 cm long, 1.8 cm wide drying medium reddish brown; **spadix** cylindroid, barely tapered, darker green, 9.8 cm long, 1.8 cm diam.; **flowers** 10–12 visible per spiral, 3.0 mm long, 2.8 mm wide, lateral tepals 1.7–1.8 mm wide, outer margins 2-sided, inner margin broadly rounded.

In the *Lucid Anthurium Key,* it tracks with *Anthurium angustatum* (Kunth) Schott which may be distinguished by its shorter peduncles (30 cm long), broadly ovate spathe (3–4 cm wide) and 2 cm stipe; *Anthurium oxybelium* Schott which has slenderer blades (2.3 length-width ratio versus 1.9 length-width ratio, 1st and 2nd basal veins usually free to the base and a longer spadix (10–20 cm long).

Distribution.—*Anthurium schulenbergii* is endemic to Peru, known only from Amazonas Department in the Serrania de Bagua on Cordillera de Colán near La Peca, Peru at about 2000 m in an area of *Lower montane wet forest* life zone.

Etymology.—The species is named in honor of ornithologist, Dr. Thomas S. Schulenberg of Cornell University, Ithaca, New York. Schulenberg was one of the main contributors to the expedition to Cordillera de Colán and was instrumental in providing information about the collecting sites of the expedition. At the time of the expedition Schulenberg was a graduate student at Louisiana State University. He later received his Ph.D. from the University of Chicago and worked for the Field Museum in Chicago. In the same way that we have found new species of plants, Schulenberg discovered new species of birds for the area.

Rhodospatha barbourii Croat, **sp. nov.** (**Figs. 26A–C**). TYPE: PERU. AMAZONAS: Prov. Bagua. Cordillera Colán SE of La Peca, humid cloud forest, third camp, 1798–1866 m, 17 Oct 1978, *P. Barbour 4143* (HOLOTYPE: MO-2800734, ISOTYPES: US, USM).

Rhodospatha barbourii is most similar to *Rhodospatha latifolia* Poeppig found at lower elevations (200–800 m), but that species has larger blades (25–50 cm long and 11–17 cm wide) which are proportionately narrower (length to width ratio of 2.5–2.8 versus 1.6–2 for *R. barbourii*), has 30 or more primary lateral veins (versus 14–22 pairs for *R. barbourii*), has the petioles sheath persisting intact sheath and has 15–17 flowers visible per spiral on the spadix.

Epiphytic, somewhat scandent; **internodes** short or up to 2 cm long, to 2 cm diam; **cataphylls** deciduous or persisting as fibers. **LEAVES** 50.6 cm long with **petioles** 24.7–31.5 cm long (average 28.1 cm) 0.3–0.4 cm diam., drying medium brown, sulcate adaxially, broadly rounded abaxially, usually sheathed to the geniculum; sheath becoming pale-fibrous with some fragments of epidermis; **geniculum** slightly thicker than petiole, drying darker brown, becoming fissured; **blades** ovate-elliptic 17–27.7 cm long (average 22.5 cm), 8.4–16 cm wide (average 12.8 cm), 1.6–2.0 times longer than broad, 0.84 times longer than petiole, abruptly acuminate at apex, obtuse to subcordate at base, dark green above, lighter green below, drying subcoriaceous, semiglossy, dark brown above, medium brown, minutely granular below; **midrib** concolorous, broadly sulcate above, light brown, rounded-raised below, **primary lateral veins** 14–22 pairs, arising from the midvein at a 70°–80° angle, drying flattened, concolorous above, acutely raised, light brown below; **collective veins** absent, primary lateral veins extend along margin occasionally overlapping. **INFLORESCENCE** 23.8 cm long with **peduncle** 8–11 cm long, 0.5–0.6 cm diam., drying sulcate, light brown; **spathe** white, drying dark brown subcoriaceous, 13.5–18.5 cm long, 5–6 cm wide, hooding spadix; **spadix** white, 12–17 cm long, 1.5–2 cm diam., 6–10 flowers visible per spiral, style irregularly 4–5 sided, 4.5 mm long, 5.5 mm wide, light tan.

Distribution.—*Rhodospatha barbourii* is endemic to Peru, known only from the Department of Amazonas in the Cordillera Colán, southeast of La Peca at 1798–1866 m elevation in a *Lower montane wet forest* life zone.

Etymology.—The species is named for my old friend Dr. Philip J. Barbour, who collected the type specimen of this species and was responsible for collecting most of the plants from the La Peca Region. Without his great efforts this paper would not have been possible.

MATERIALS AND METHODS

Appendix 1 was compiled from data in Appendices 2 and 3. Appendices 2 and 3 were primarily compiled from analyses in Missouri Botanical Garden Herbarium (MO) database (Tropicos.org 2019). Additional online herbarium databases examined were Aarhus University Herbarium (AAU), Aarhus, Denmark, (Aarhus University Herbarium.org.2019); British Museum of Natural History (BM), London, England, (British Museum of Natural History.org 2019.); Field Museum of Natural History (F), Chicago, Illinois, (Field Museum of Natural History.org. 2019); Museum National d'Histoire Naturelle (PC), Paris, France, (Museum National d'Histoire Naturelle.org. 2019); New York Botanical Garden (NY), Bronx, New York, (New York Botanical Garden.org. 2109); Swedish Museum of Natural History (S), Stockholm, Sweden, (Swedish Museum of Natural History.org. 2019); and United States National Museum of Natural History (US), Washington, D.C., (United States National Museum of Natural History.org. 2019). Appendix 4 is a report on a trip back to Cordillera de Colán by Dr. Gary Graham in 2017. Creation of categories of noteworthiness was for assigning a factor of significance as related to individual collections to gain a sense of how important these collections are to science. Seven categories range from highest value (sp. nov.) to relatively least important albeit still noteworthy (1st collection for Province Bagua). Voucher specimens that did not fall into any of the categories were excluded from the analyses except for a few that were determined to genus only yet noteworthy. The analyses in Tropicos were primarily from specimen searches by senior collector as Barbour (advanced search, date from 05/01/1978–12/01/1978 and separately by Gentry (advanced search, date from 13/06/1978–16/06/1978. Because Tropicos was the primary database used for compiling appendices, most inferences are constrained to what is in the database. The authors recognize that active management of Tropicos and other online databases results in updates and changes in nomenclature that may be different from what is reported here.

RESULTS

On the 1978 LSU expedition Barbour cataloged 2572 accession numbers from 2188–4978 represented by 8370 voucher specimens based on an average of three specimens for each number. Many of the collections have proven to be new, including four Araceae (Croat et al. 2014), published elsewhere, and 11 new aroid species, described herein. Based on a search of collections by Philip Barbour and by Alwyn H. Gentry et. al., in Tropicos http://www.tropicos.org/ there are 1702 herbarium specimens (excluding fungi and lichens) of which 1192 are determined to a taxon and 510 are not fully determined. After more than 41 years 285 records still lack family identification, 18 records are to family only and 207 records are to genus only. The indeterminates include four Gentry et al. collections, of which three are shown as Pteridophyta J.Y. Bergen & B.M. Davis (AHG et al., *22905A, 22978, 23084*), and one has no designated taxon (AHG et al., *23019*) (Appendix 1). Determinations to date include 983 species belonging to 513 genera and 145 families. Included are 59 plant taxa new to science described elsewhere. Families included are two fungi: Baeomycetaceae and Tremellaceae; one alga: Characeae; eight lichen: Cladoniaceae, Coccocarpiaceae, Collemataceae, Icmadophilaceae, Parmeliaceae, Pyrenulaceae, Stereocaulaceae and Teloschistaceae; three mosses: Neckeraceae, Plagiochilaceae and Rhizogoniaceae. Families represented by 22 species or more (number in parentheses) are Asteraceae (77), Orchidaceae (55), Rubiaceae (45), Araceae (43), Solanaceae (32), Poaceae (27), Pteridaceae (26), Polypodiaceae (25), Melastomaceae (24), Hymenophyllaceae (23), Bromeliaceae (22) and Dryopteridaceae (22). Brako & Zarucchi (1993) does not include Magnoliaceae in the flora of Peru. Gentry (1993) does not include *Magnolia* in Northwest South America (Columbia, Ecuador, Peru). The noteworthy collection Gentry et al., 22968, *Magnolia elfina* A. Vazquez, a new species known only from the type locality may be the first addition of this family to the flora. Extensions of known distributions of taxa are not included. A summary of plant families

collected is presented in Appendix 1. Noteworthy collections of fungi, alga, lichens, mosses, club mosses, spike mosses, horsetails, quillworts, ferns and gymnosperms are listed in Appendix 2 and noteworthy angiosperms in Appendix 3. Most of the vascular plant collections made in the La Peca region are at Missouri Botanical Garden. Searches in Tropicos revealed 1687 independent (unique to Barbour and Gentry et al. then combined) determined herbarium voucher specimens of which 1545 are noteworthy by designated measures (92%). Species in category of noteworthiness—sp. nov.—with notation of—not used for a type—indicates that those specimens were first collections for Peru based on collection dates. Species with notation—not from Cordillera de Colán (212 accessions)—indicates that those voucher specimens were not collected on Cordillera de Colán (as defined by locality from La Peca to Camp 5), but were collected in Department Amazonas, or Province Bagua or during the expedition and as such were considered noteworthy collections for purposes of this report. Eighty-one species are endemic to Peru (Table 1).

Arrangement of families is based on *Plant Systematics—a phylogenetic approach* (Judd et al. 1999) updated from Angiosperm Phylogeny Website (Stevens 2001). Fern allies collected are nine species of club mosses, Lycopodiaceae; 10 species of spike mosses, Selaginelliaceae; one species of horsetail, Equisetaceae; two species of quillwort, Isoetaceae (Fig. 27); two species of large frond, fleshy root ferns, Marattiaceae; 23 species of filmy ferns, Hymenophyllaceae; 20 species of tree ferns, Cyathaceae; 138 species of other ferns in 16 families (187 fern species in 20 families total) and two collections of Gymnosperms, both *Podocarpus*, Podocarpaceae; two families of early angiosperms Nymphaeles grade: Nymphaeaceae and Chloranthaceae; six families of Magnolids (non-monocot paleo-herbs): Aristolochiaceae, Piperaceae, Lauraceae, Siparunaceae, Annonaceae, and Magnoliaceae; 21 monocot families: Araceae, Tofieldiaceae, Dioscoreaceae, Cyclanthaceae, Alstroemeriaceae, Smilacaceae, Amaryllidaceae, Orchidacaeae, Arecaceae, Bromeliaceae, Cyperaceae, Eriocaulaceae, Juncaceae, Poaceae, Xyridaceae, Commelinaceae, Haemodoraceae, Costaceae, Heliconiaceae, Marantaceae, and Zingiberaceae; 84 dicot families including three Eudicots: Berberidaceae, Ranunculaceae, and Sabiaceae; 30 Rosids: Vitaceae, Oxalidaceae, Clusiaceae, Euphorbiaceae, Hypericaceae, Malpighiaceae, Ochnaceae, Passifloraceae, Phyllanthaceae, Violaceae, Fabaceae, Polygalaceae, Moraceae, Rosaceae, Urticaceae, Begoniaceae, Cucurbitaceae, Geraniaceae, Combretaceae, Melastomataceae, Myrtaceae, Onagraceae, Staphyleaceae, Sapindaceae, Malvaceae, Muntingiaceae, Brassicaceae, Caricaceae, Cleomaceae, and Tropaeolaceae; 12 Superasterids: Balanophoraceae, Loranthaceae, Olacaceae, Opiliaceae, Santalaceae, Amaranthaceae, Cactaceae, Caryophyllaceae, Nyctacginaceae, Phytolaccaceae, Polygonaceae, and Talinaceae; nine Asterids: Hydrangeaceae, Loasaceae, Clethraceae, Ericaceae, Lecythidaceae, Marcgraviaceae, Myrsinaceae, Primulaceae, and Styracaceae; 16 Lamiids: Convolvulaceae, Solanaceae, Apocynaceae, Gentianaceae, Rubiaceae, Acanthaceae, Bignoniaceae, Calceolariaceae, Lamiaceae, Lentibulariaceae, Gesneriaceae, Orobanchaceae, Plantaginaceae, Scrophulariaceae, Verbenaceae, and Boraginaceae; and six Campanulids: Aquifoliaceae, Asteraceae, Campanulaceae, Apiaceae, Araliaceae, and Caprifoliaceae.

Approximately 1800 P. Barbour lichen collections are deposited at LSU Herbarium (Jennie Kluse, LSU Herbarium personal communication). To date, of 1800 records only a small set of 166 collections have been determined which resulted in 58 distinct taxa. A *Checklist of Lichens of Peru* (as of 1 September 2016, by Dr. Tassilo Fuerer, University of Hamburg) lists 298 taxa at: http://www.lichens.uni-hamburg.de/lichens/southamerica/peru_l.htm). Appendix 2 includes 16 species of lichens, eight of which are on Dr. Fuerer's checklist, eight of which are not. Barbour's lichen collections suggest that once identified, many new taxa may be added to the known lichen flora of Peru. Importantly, we recognize very cautiously limited inferences from having not done a literature review on published lichen records from Peru.

The Cordillera de Colán plant collections yielded many non-angiosperm novelties even though a considerable number remain undetermined. Eleven new species, or varieties are listed in Appendix 2: a club moss, Lycopodiaceae: *Phlegmariurus colánensis* B. Øllgaard, PJB *3384* HT (MO), IT (AAU, USM), PJB *3446* (MO); three tree ferns, Cyathaceae: *Cyathea cystolepis* var. *boreopallescens* Lehnert, PJB *3611* (AAU, MO), *3745* (US), not used for type; *Cyathea obnoxia* Lehnert, PJB *2836* (MO, US), *3612* (MO, US), *3723* (F, MO), not used for type; *Cyathea werffii* R.C. Moran, PJB *4516* (MO), not used for type; other ferns, an Athyriaceae: *Callipteris*

Table 1. Species endemic to Peru.

Family	Species
Lycopodiaceae	*Huperzia colánensis* B. Øllgaard, PJB 3446 (MO), 3384 HT (MO), IT (AAU, USM); endemic to type locality
Dryopteridaceae	*Elaphoglossum mickeliorum* F.B. Matos & R.C. Moran, AHG et al., 22977 (F, MO, NY); not used for a type; endemic to Peru
Dryopteridaceae	*Elaphoglossum pachyrrhizum* Mickel, PJB 4111 HT (MO), IT (US); endemic to type locality
Polypodiaceae	*Campyloneurum amazonensis* B. León, AHG et al., 22930 HT (USM), IT (F, MO, US), PJB 2487 (MO), 2495 (F, MO); endemic to Peru
Thelypteridaceae	*Thelypteris ctenitoides* A.R. Smith, PJB 3416 HT (MO); endemic to type locality
Thelypteridaceae	*Thelypteris erythrothrix* A.R. Smith, PJB 3894A HT (MO); endemic to type locality
Alstroemeriaceae	*Bomarea macranthera* Kraenzl., PJB 3419 (MO); endemic to Peru
Alstroemeriaceae	*Bomarea sclerophylla* Kraenzl., PJB 3182 (MO), 3190 (MO), 3226 (MO); endemic to Peru
Amaryllidaceae	*Rauhia staminosa* Ravenna, PJB 4234 (USM); endemic to Peru
Araceae	*Anthurium barbourii* Croat, AHG et al., 22914 HT (F, MO), 23028 (MO, USM), endemic to type locality
Araceae	*Anthurium camiloi* Croat, AHG et al., 23074 HT (MO); endemic to type locality
Araceae	*Anthurium dillonii* Croat, AHG et al., 23075 HT (MO); endemic to type locality
Araceae	*Anthurium grahamii* Croat, AHG et al., 22913 HT (F, MO, USM), 22929 (MO, USM), 22984 (MO, USM); endemic to type locality
Araceae	*Anthurium katherineshawiae* Croat, PJB 3720 HT (MO); endemic to type locality
Araceae	*Anthurium lapecaense* Croat, PJB 3584 HT (MO); endemic to type locality
Araceae	*Anthurium oneillii* Croat, PJB 2642 HT (MO); endemic to type locality
Araceae	*Anthurium perlatum* Croat, PJB 2857 HT (MO); endemic to type locality
Araceae	*Anthurium schulenbergii* Croat, PJB 2737A HT (MO); endemic to type locality
Araceae	*Philodendron barbourii* Croat, PJB 4511 HT (MO), IT (USM); endemic to type locality; not from Cordillera de Colán
Araceae	*Philodendron dillonii* Croat, AHG et al., 22965 HT (MO); endemic to type locality
Araceae	*Rhodospatha barbourii* Croat, PJB 4143 HT (MO), IT (US, USM); endemic to type locality
Araceae	*Spathiphyllum gracile* G.S. Bunting, PJB 4517 (MO); not from Cordillera de Colán; endemic to Peru
Araceae	*Xanthosoma barbourii* Croat & Delannay, PJB 2694 (MO), 3967 HT (MO); endemic to type locality
Arecaceae	*Pholidostachys amazonensis* A.J. Hend., PJB 4471 HT (USM), IT (MO); not from Cordillera de Colán; endemic to type locality
Bromeliaceae	*Pepinia peruana* H. Luther, PJB 2868 (MO, US); not used for a type, endemic to Peru
Bromeliaceae	*Pitcairnia scandens* Ule, AHG et al., 23066 (MO); endemic to Peru
Bromeliaceae	*Puya pitcairnioides* L.B. Sm., PJB 4224 (MO); not from Cordillera de Colán; endemic to Peru
Bromeliaceae	*Puya* aff. *pratensis* L.B. Sm., PJB 3375 (MO); endemic to Peru
Marantaceae	*Ischnosiphon fusiformis* Anderson, PJB 4430* HT (MO), IT (GB); not from Cordillera de Colán; endemic to Peru
Orchidaceae	*Elleanthus hirsutis* Barringer, AHG et al., 22990 HT (F), IT (F, MO), PJB 2518 (F, MO), endemic to Peru
Orchidaceae	*Malaxis termensis* var. *elata* C. Schweinf., PJB 2865 (MO); endemic to Peru
Acanthaceae	*Aulonemia humillima* (Pilg.) McClure, AHG et al., 22898 (MO, US); endemic to Peru
Acanthaceae	*Chusquea aspera* L.G. Clark, AHG 22931 (MO, US); endemic to Peru
Acanthaceae	*Aphelandra jacobinioides* Lindau, AHG et al., 22912 (US), PJB 2543 (MO, US); endemic to Peru
Acanthaceae	*Sanchezia* cf. *flava* Leonard, AHG et al., 22835 (MO); not from Cordillera de Colán; endemic to Peru
Annonaceae	*Cremastosperma oblongum* R.E. Fr., AHG et al., 23009 (MO); endemic to Peru
Aquifoliaceae	*Ilex microphylla* Hook., PJB 3176 (MO), 3463 (MO); endemic to Peru
Araliaceae	*Schefflera* vel sp. nov. JR. Forst. & G.Forst., PJB 3742 (MO); *Schefflera gayleriana* sp. nov., det. Marcela Mora 2018; endemic to type locality
Asteraceae	*Gynoxys colánensis* Dillon & Sagástegui, PJB 3409 HT (F), IT (HUT, MO); endemic to type locality
Asteraceae	*Liabum wurdackii* Ferreyra, PJB 4304 (MO, US); not from Cordillera de Colán; endemic to Peru
Asteraceae	*Munnozia olearioides* (Muschl.) H. Rob. & Brettell, PJB 3175 (MO); endemic to Peru
Asteraceae	*Onoseris weberbaueri* Ferreyra, AHG et al., 23110A (MO); not from Cordillera de Colán; endemic to Peru
Asteraceae	*Pentacalia barbourii* M.O. Dillon & Sagástegui, PJB 3450 HT (F), IT (LSU, MO), now *Monticalia barbourii*
Asteraceae	*Pentacalia cutervonis* H. Rob. & Cuatrec., PJB 3966 (US), 4124 PT (MO, US); endemic to Peru
Asteraceae	*Pentacalia miniaurita* (Sagast. & M.O., Dillon) Cuatrec., PJB 3410 (US); endemic to Peru
Asteraceae	*Pseudogynoxys poeppigii* (DC.) H. Rob. & Cuatrec., AHG et al., 22822 (MO): not from Cordillera de Colán; endemic to Peru
Asteraceae	*Senecio miniauritus* Sagástegui & Dillon, PJB 3410 (F, MO); not used for a type; endemic to Peru
Asteraceae	*Verbesina lopez-mirandae* Sagast., AHG et al., 22833 (MO, US); not from Cordillera de Colán; endemic to Peru
Asteraceae	*Vernonia jalcana* Cuatrec., PJB 3760 (MO); endemic to Peru
Berberidaceae	*Berberis tomentosa* Ruiz & Pav., PJB 3171 (MO), 3390 (MO); endemic to Peru
Calceolariaceae	*Calceolaria arbuscula* Molau, PJB 3432 HT (GB), IT (MO), PJB 3147 (MO); endemic to type locality
Calceolariaceae	*Calceolaria hirsuta* Molau, PJB 3404 HT (GB), IT (MO); endemic to type locality
Campanulaceae	*Centropogon eborinus* E. Wimm., PJB 4010 (MO); endemic to Peru
Campanulaceae	*Centropogon lasiodorus* B.A. Stein, PJB 4116 (MO), endemic to Peru; not used for a type

Table 1. continued

Family	Species
Campanulaceae	*Lysipomia gracilis* (E. Wimm.) E. Wimm, PJB 3422 (MO); endemic to Peru
Caprifoliaceae	*Valeriana ledoides* Graebner, PJB 3206 (MO), 3234 (MO); endemic to Peru
Ericaceae	*Disterigma baguensis* Pedraza, PJB 4102 HT (MO), IT (F, NY); endemic to type locality
Gentianaceae	*Gentianella chlorantha* Pringle, PJB 3439 HT (MO), IT (HAM), 3456 (MO), endemic to type locality
Gentianaceae	*Gentianella oreosilene* J.S. Pringle, PJB 3387 (MO), 3538 (MO); endemic to Peru
Gentianaceae	*Halenia mathewsii* Gilg, PJB 3435 (MO); endemic to Peru
Gentianaceae	*Symbolanthus nebulosus* J. E. Molina & Struwe, PJB 3252 HT (MO); endemic to Province Bagua
Gesneriaceae	*Besleria placita* C.V. Morton, AHG et al., 23027 (MO, US), PJB 2965 (MO, US), 3689 (MO), 4014 (MO, US), 4331 E (MO, US); not from Cordillera de Colán; endemic to Peru
Loasaceae	*Nasa colánii* Dostert & Weigend, PJB 3573 HT (MO); endemic to the type locality
Loasaceae	*Nasa dyeri* subsp. *australis* Dostert & Weigend, AHG et al., 22856 (MO); not used for a type; endemic to Peru
Magnoliaceae	*Magnolia elfina* A. Vázquez, AHG et al., 22968 HT (MO), IT (F), endemic to type locality
Malpighiaceae	*Stigmaphyllon peruvianum* Nied., AHG et al., 22784 (MO), not from Cordillera de Colán; endemic to Peru
Malvaceae	*Abutilon piurense* Ulbrich, PJB 2143 (MO); not from Department Amazonas; endemic to Peru
Melastomataceae	*Brachyotum maximowiczii* Cogniaux, PJB 3227 (MO, US); endemic to Peru
Melastomataceae	*Miconia hamata* Cogniaux, Gentry et al. 23006 (MO, US), PJB 2745 (MO, US); endemic to Peru
Onagraceae	*Fuchsia llewelynii* MacBride, PJB 3700 (MO), 3828 (MO, US), 4147 (MO); endemic to Peru
Piperaceae	*Peperomia boekei* Callejas, PJB 3240 PT (MO, NY); endemic to Department Amazonas
Primulaceae	*Cybianthus incognitus* Pipoly, AHG et al., 22859 PT (F, MO, USM), 22911 (MO), PJB 2405 PT (AMAZ, F, MO, USM), 2567 PT, (AMAZ, BRIT, F, MO, NY, US); endemic to Peru
Primulaceae	*Myrsine dilloniana* Pipoly, PJB 3257 HT (MO), IT (AMAZ, F, LL-TEX, USM); endemic to type locality
Rubiaceae	*Agouticarpa spinosa* C.H. Perss. & Delprete, PJB 2977 (MO), not used for a type; endemic to Peru
Rubiaceae	*Psychotria* cf. *moyobamba* Standl., AHG et al., 23036 (MO); endemic to Peru
Sabiaceae	*Meliosma pumila*? A.H. Gentry, PJB 4158 (MO); endemic to Peru
Solanaceae	*Deprea pecaensis* S. Leiva, Deanna & Barboza, AHG 22873 (MO), 23032 (MO); PJB 2682 (MO); not use for a type; endemic to Province Bagu
Tropaeolaceae	*Tropaeolum bicolor* Ruiz & Pav., PJB 3574 (MO); endemic to Peru
Urticaceae	*Pilea minutiflora* Krause, PJB 2958 (MO); endemic to Peru
Urticaceae	*Pilea ramosissima*? Killip, PJB 4152 (MO); endemic to Peru

andina L. Pacheco & R.C. Moran, PJB *2858* (MO), not used for type; three Dryopteridaceae: *Elaphoglossum mickeliorum* F.B. Matos & R.C. Moran, AHG et al., *22977* (F, MO, NY), not used for type; *Elaphoglossum pachyrrhizum* Mickel, PJB *4111* HT (MO); *Megalastrum pubirachis* R.C. Moran, J. Prady & Sundue, PJB *2394* (MO), not used for type; a Polypodiaceae: *Campyloneurum amazonensis* B. Leon, AHG et. al. *22930* HT (MO), IT (MO); two Thelypteridaceae: *Thelypteris ctenitoides* A.R. Smith, PJB *3416* HT (MO) and *T. erythrothrix* A.R. Smith, PJB *3894* HT (MO); 58 new species are listed in Appendix 3: 17 Araceae: *Anthurium barbourii* sp. nov. Croat, AHG et al., *22914* (F, MO, USM), *23028* HT (MO, USM); *Anthurium camiloi* sp. nov. Croat, AHG et al., *23074* HT (MO, USM); *Anthurium dillonii* sp. nov. Croat, AHG et al., *23075* HT (MO); *Anthurium grahamii* sp. nov. Croat, AHG et al., *22913* HT (F, MO, USM), *22929* (MO, USM), *22984* (MO, USM); *Anthurium katherineshawiae* sp. nov. Croat, PJB *3720* HT (MO); *Anthurium lapecaense* sp. nov., Croat, PJB *3584* HT (MO); *Anthurium oneillii* sp. nov. Croat, PJB *2642* HT (MO); *Anthurium perlatum* sp. nov. Croat, PJB *2857* HT (MO); *Anthurium philipii* sp. nov. Croat, PJB *2641* (MO), *2737* (MO), *2816* (MO); *Anthurium schulenbergii* sp. nov. Croat, PJB *2737A* HT (MO); *Philodendron barbourii* Croat, PJB *4511* HT (MO), IT (USM); *Philodendron dillonii* Croat, AHG et al., *23075* HT (MO); *Rhodospatha barbourii* sp. nov. Croat, PJB *4143* HT (MO), IT (US, USM), *Spathiphyllum barbourii* Croat, PJB *4460* HT (MO), *Xanthosoma barbourii* Croat & Delannay, PJB *2694* (MO), *3967* HT (MO), (Fig. 28); one Arecaceae: *Pholidostachys amozoensis* A.J. Hend., PJB *4471* HT (USM), IT (MO); two Bromeliaceae: *Pepinia peruana* H. Luther, PJB *2868* (MO, US); not used for type; *Puya cajasensis* Manzan. & W. Till, PJB *3471A* (MO); not used for type; one Cyclanthaceae: *Sphaeradenia oxystigma* R. Erikss., PJB *2546* (MO); not used for a type; one Marantaceae: *Ischnosiphon fusiformis* Anderson, PJB *4430* HT (MO), IT (GB), not from Cordillera de Colán; six Orchidaceae: *Elleanthus hirsutis* Barringer, AHG et al., *22990* HT (F), IT (F, MO), PJB

2518 (F, MO); *Epidendrum recurvitepalostachyum* Hagsater & E. Santiago, PJB *3202* (F, MO), not used for a type; *Epidendrum rhopalostele* Hagsater & Dodson, AHG et al., *22871* (MO, NY), *22996* (MO); PJB *2485* (MO), *2549* (MO), not used as type; *Fernandezia* cf. *hagsateri* (Dodson) M.W. Chase, PJB *3163* (MO), not used for a type; *Maxillaria patella* J.T. Atwood, PJB *3256* (MO), not used for a type; *Pityphyllum huancabambae* (Kraenzl.) Whitten, PJB *2708* (MO), not used for type; *Sphyrastylis dalstromii* Dodson, AHG et al., *23062* (MO), PJB *2468* (MO), *2469* (MO), *2550* (MO), *2551* (MO), *2577* (MO), *2661* (MO), *2688* (MO), not used for a type; one Araliaceae: *Schefflera gayleriana* JR. Forst. & G. Forst., PJB *3742* (MO); four Asteraceae: *Gynoxys colánensis* Dillon & Sagástegui, PJB *3409* HT, (F), IT (HUT, MO); *Pentacalia barbourii* Dillon & Sagástegui, PJB *3450* HT (F), IT (LSU, MO) (Fig. 29.) and *Pentacalia cutervonis* H. Rob & Cuatrec., PJB *3966* (US), *4124* (MO, US); not used for a type, *Senecio miniauritus* Sagastegui & Dillon, PJB *3410* (MO), not used for a type; two Calceolariaceae: *Calceolaria arbuscula* Molau, PJB *3432* HT (GB), IT (MO), PJB *3147* (MO)and *C. hirsuta* Molau, PJB *3404* HT (GB), IT (MO); one Cleomaceae*: Podandrogyne roseoleuca* Cochrane, PJB *2681* HT (WIS), IT (F, MO, US), *2467* (F, MO); one Ericaceae: *Disterigma baguensis* Pedraza-Peñalosa, PJB *4102* HT (MO), IT (F, NY); three Gentianaceae: *Gentianella chlorantha* Pringle, PJB *3439* HT (MO), IT (HAM), *3456* (MO); *Macrocarpaea jactans* J.E. Grant, AHG et al., *23030* (MO), PJB *2635* (MO); not used for a type; *Symbolanthus nebulosus* J.E. Molina & Struwe, PJB *3252** HT (MO); one Geraniaceae: *Geranium sibbaldioides* subsp. *beckianum* Aedo, AHG et al., *23147* (MO), PJB *3423* (MO); not used for a type; two Gesneriaceae: *Columnea katzensteiniae* (Wiehler) L.E. Skog & L.P. Kvist, AHG *22920* et al., (MO, US); not used for a type and *Glossoloma baguense* (L.E. Skog) J.L. Clark, AHG et al., *22908* HT (NY), IT (MO, NY), PJB *2747* (MO, US), *2973* HT (US), IT (C, MO), *2747* (MO, US), *2973* HT (US), *3836* (MO, US, USM); one Lecythidaceae: *Eschweilera baguensis* Mori, AHG et al., *22908* HT (NY), IT (MO, NY), PJB *2536* (MO) (Fig. 30); two Loasaceae: *Nasa andersonii* Weigend, PJB *3570* (F, MO), not used for a type, *Nasa colánii* Dostert & Weigend, PJB *3573* HT (MO), endemic; one Loranthaceae: *Psittacanthus baguensis* Kuijt, PJB *3583* (F, LEA, MO), not used for a type; one Magnoliaceae: *Magnolia elfina* A. Vazquez, AHG et al., *22968* HT (MO), IT (F), endemic to type locality; one Melastomaceae: *Quipuanthus epipetricus* Michelang. & C. Ulloa, PJB *4451* (MO), not used for type, not from Cordillera de Colán; a Myrsinaceae: *Cybianthus pastensis* (Mez) G. Agostini, PJB *3599* (MO, US); a Piperaceae: *Peperomia boekei* Callejas, PJB *3240* PT (MO, NY); endemic to Department Amazonas (Fig. 31); a Polygonaceae: *Muehlenbeckia tilifolia* var. *glabra* Brandbyge, PJB *3576* (MO), *4084* (MO): not used for a type; three Primulaceae*: Cybanthus incognitius* Pipoly, AHG et al., *22859* PT (F, MO, USM), *22911* (MO); PJB *2405* PT (AMAZ, F, MO, USM), *2567* PT (AMAZ, BRIT, F, MO, NY, US); not used for a type; *Myrsine cupuliformis* Pipoly, PJB *3758* (MO); not used for a type; *Myrsine dilloniana* Pipoly, PJB *3257* HT (MO), IT (AMAZ, F, LL-TEX, USM), endemic to type locality; two Rubiaceae: *Agouticarpa spinosa* C.H. Perss. & Delprete, PJB *2977* (MO); not used for a type; *Notopleura acuta* C.M. Taylor, AHG et al., *22878* (MO), not used for a type; a Siparunaceae: *Siparuna cascada* S.S. Renner & Hausner, PJB *2946* (MO), not used for a type; a Solanaceae: *Deprea pecaensis* S. Leiva, Deanna & Barboza, AHG et al., *22873* (MO), *23032* (MO), PJB *2682* (MO), not used for type; and one Styracaceae*: Styrax nui* B. Walln., PJB *3254* PT (MO); not used for a type.

DISCUSSION

A team led by Dr. Al Gentry from Missouri Botanical Garden including Dr. Mike Dillon, a specialist on Asteraceae from Chicago Field Museum, graduate student James C. Aronson and Peruvian botanist Camilo Diaz Santibanez, arrived at LSU Camp 1 on 13 June and departed 16 June 1978. Philip Barbour collected with Gentry and his crew while they were on Cordillera de Colán and was encouraged by Gentry to come to Missouri Botanical Garden in St. Louis for graduate work, which he did. Barbour returned to Peru in summer 1980 as a graduate student at St. Louis University and as an employee of Missouri Botanical Garden. He collected plants for three months 64 river km SW of Puerto Maldonado for Flora of Peru Project (then under Gentry's jurisdiction). Home base for this collecting trip was Explorer's Inn Lodge at the confluence of Rio La Torre and Rio Tambopata in Department Madre de Dios.

Large numbers of lichens, mosses and fungi were also collected on Cordillera de Colán. Lichens were

deposited at LSU herbarium, Baton Rouge with plant anatomist and lichenologist Dr. Shirley Tucker and these collections are mostly undetermined. Fungi were deposited in Bernard Lowry Mycological Herbarium at LSU. One Basidiomycete specimen, *Tremella fibulifera* Moller, PJB 2189 (LSU) established a new record for Peru. Mosses were deposited at Missouri Botanical Garden.

Collecting sites in La Peca region were located on ridges and slopes of Cordillera de Colán ENE of the village of La Peca. Now 43 years after this major expedition, and with Google Earth, we were able to come up with what appear to be accurate coordinates for collection localities. The latitude–longitude coordinates plus elevations of lowest and highest camps in the collection area are estimated respectively at 5°34.94'S, 78°23.36'W (1600 m) and 5°33.67'S, 78°19.42'W (3358 m). Life zones based on Holdridge life zone system (Holdridge 1979) range from Tropical lower montane wet forest up in elevation through Tropical montane wet forest. Forests throughout the elevational gradient are more commonly referred to as cloud forests with elfin forests at highest forested areas and along ridge tops. A relatively small area of paramo occurs above tree line within arctic alpine zone starting about 3200 m.

The expedition established a total of five base camps at different elevations on Cordillera de Colán. In 2017 Gary Graham relocated camps 1 and 2 with a Garmin GPSMap©64s and provided reliable estimates on camps 3, 4 and 5 (Appendix 4). All members of the LSU expedition and temporary visiting friends of members helped in the preparation of bird voucher specimens for the Museum of Natural Science.

Camp 1: S 5°34.941', W 78°23.356', at 1764 m (900 m above la Peca), 8.9 trail km from La Peca. Specimens were collected between 1600 and 1900 m. Personnel were Philip Barbour, Lynn Barkley, Scott Emerson, Gary Graham, Tom Schulenberg, and Katherine Shaw. This also was the camp that was visited by Al Gentry, Mike Dillon, Jim Aronson, and Camilo Diaz.

Camp 2: S 5°34.890', W 78°22.501', at 1993 m (229 m higher than Camp 1 and 2.0 trail km from Camp 1). Camp 2 was used from 9–17 July and later from 9–17 August. Personnel in July were Barbour, Barkley, Emerson, Graham, David Hunter (August), Schulenberg, Shaw (July) and Morris Williams (August) and in August were Barkley, Graham, Hunter, Schulenberg and Williams. The primatology team of Mariella Leo (graduate student), Roberto Rodriguez (undergraduate student of Amazonian mammals) and Reinhold Pape (friend of Roberto Rodriguez) worked out of Camp 2. In 1980 Leo published the *First Field Study of the* Yellow-*tailed Woolly Monkey* (Leo 1980). Her paper reported results of spending five months in Peru studying the Yellow-tailed Wooley Monkey. In her paper, the locality El Arenal, correlates with LSU camp 2. The Peruvian National Office for Evaluation of Natural Resources (ONERN 1976) would classify this area as having two life zones. Premontane tropical humid forest (bh-PT) and low montane tropical humid forest (bh-MBT) with elevations of 1800–2200 m. Leo provides a habitat description that is worth quoting. "The monkey's habitat is one of steep gorges and ravines, with trees 20–40 m high, depending on the zone; the trunks are usually under 1 m diameter, except for some *Cedrela* sp. and *Ficus* spp. In the lower zones the understorey is dense with many Palmaceae species; on the most humid side of the mountain there are many vines and Bromeliaceae and Orchidaceae and in the upper parts and on top 'suro' *Chusquea* sp. is a predominant. The variations result in several microclimates. The lowest temperature registered was 8° C (46.4° F) (Santa Catalina and Yambrasbamba) and the highest 25° C (77° F) (Yambrasbamba, Pucatambo, Shillac). Although the study was made in the so-called dry season (Mar–Sep) it drizzled almost every day, with changes in intensity and duration and occasional showers [50 mm (1.96 in) in two days in San Cristobal]. Every morning the fog crept up the mountain, making the forest humid and cold." (Luna 1980). Mariella Leo Luna's paper *Conservation* of *the Yellow-tailed Woolly Monkey* made recommendations to the Peruvian government for the protection and conservation of the endangered monkey through the establishment of protected areas, enforced legislation, conservation education and ecological planning of human settlement and development in the region (Luna 1982). Also, in Camp 2 was bear biologist Bernie Peyton. Peyton was conducting a two-year survey (1977–1979) of the Andean Spectacled Bear for the Ministerio de Agricultura Departamento de Flora y Fauna in collaboration with the New York Zoological Society (Peyton 1980, 1981). In addition to looking for Andean Spectacled Bear, Peyton was also interested in finding Mountain Tapir also called Woolly Tapir.

Camp 3: S5°34.747', W 78°19.993', at 2446 m and 5.0 km above camp 2. Specimens were collected from 2446–3050 m elevation). The camp was used between 21 August and 17 September 1978. Personnel were Barbour, Barkley, Graham, Hunter, Schulenberg, and Williams.

Camp 4: S5°34.644', W78°19.265', at 3097 m and 1.8 km above camp 3, with collections made between 3097 and 3300 m. This camp was used between 27 August and 17 September. Personnel were the same as for Camp 3.

Camp 5: S5°33.668', W78°19.423', at 3358 m and 2.9 km above camp 4, with specimens collected between 3330 m and 3358 m. This camp was used between 8 and 24 October. Personnel were Barbour, Barkley, Patty Brown, Graham, Schulenberg, and Williams.

From each base camp, cloud forest, elfin forest and paramo were sampled from trails created for access to adjacent habitat. Departures off centerline of trails were not more than 30 m on each side due to difficulty of working in undisturbed, very wet cloud forest, elfin forest and paramo. The paramo at times was exceedingly difficult to navigate due to extremely dense fog that greatly impaired orientation. The geographical extent from which most of the plants on Cordillera de Colán were collected was estimated to be 122 ha (301 ac) which is the area within a rectangle 20 km long by 60 m wide. Even with such an unscientific estimation of the geographical extent it is evident that Cordillera de Colán was very species rich. Barbour's collecting was not systematic but opportunistic in that he collected everything he could get to that was fertile, in flower, fruiting or both. Sterile specimens were not collected.

The La Peca region was rich in endemic species of plants and in birds. All members of the expedition helped prepare museum specimens for the LSU Museum of Natural History collection in Baton Rouge. Several new species or subspecies were discovered during the Colán expedition with one species where a 1978 site was a type locality. New bird species or subspecies described from the region include a hummingbird, Coppery Metaltail, *Metallura thesesiae parkeri* G.R. Graves, (Trochilidae), (Graves 1981); Unstreaked Tit-Tyrant, *Uromyias agraphia plengei* T. Schulenberg & G. Graham, (Tyrannidae), (Schulenberg & Graham 1981); Plain-tailed Wren, *Pheugopedius euophrys schulenbergi* T.A. Parker & J.P. O'Neill, (Troglodytidae), (Parker & O'Neill 1985); and Pale-billed Antpitta, *Grallaria carrikeri* T. Schulenberg & M. Williams, (Grallariidae) (Schulenberg & Williams 1982).

Additionally, new species of birds were collected at Cordillera de Colán that also have been collected elsewhere, contributing greatly to the description of each of these species even though the type locality was not Cordillera de Colán: Cinnamon Screech-Owl, *Megascops petersoni* J.W. Fitzpatrick & J.P. O'Neill, (Strigidae) (Fitzpatrick & O'Neill 1986); Chestnut Antpitta, *Grallaria blakei* G.R. Graves, (Grallariidae) (Graves 1987); Chachapoyas Antpitta, *Grallaria gravesi* M.L. Isler, R.T. Chesser, M.B. Robbins & P.A. Hosner (Grallariidae) (Isler et al. 2020); Ochre-fronted Antpitta, *Grallaricula ochraceifrons* G.R. Graves, (Grallariidae) (Graves et al. 1983); White-winged Tapaculo, *Scytalopus krabbe*i T.S. Schulenberg, D.F. Lane, A.J. Spencer, F. Angulo & and C.D. Cadena (Rhinocryptidae) (Krabbe et al. 2020); Cinnamon-breasted Tody-Tyrant, *Hemitriccus cinnamomeipectus* J.W. Fitzpatrick & J.P. O'Neill (Tyrannidae) (Fitzpatrick & O'Neill 1979); and Johnson's Tody-Flycatcher, *Poecilotriccus luluae* N.K. Johnson & R.E. Jones (Tyrannidae), (Johnson & Jones 2001). Other collections represented important records for Peru including Mountain Avocetbill, *Opisthoprora euryptera* (Trochilidae) (Schulenberg et al. 2010); Imperial Snipe, *Gallinago imperialis* (Scolopacidae) (Schulenberg et al. 2010); Long-whiskered Owlet, *Xenoglaux loweryi* J.P. O'Neill & G.R. Graves (Strigidae) (O'Neill & Graves 1977); Ocellated Tapaculo, *Acropternis orthonyx* (Rhinocryptidae) (Schulenberg et al. 2010); and Rufous-browed Hemispingus, *Poospiza rufosuperciliaris*, E.R. Blake, & P. Hocking (Thraupidae) (Blake & Hocking 1974).

Bat specimens, data on bat behavior and their ecological relationships were collected by Gary Graham with assistance of other expedition members. This information resulted in a series of articles which made important contributions to knowledge of these mammals in Peru (Graham 1983, 1986, 1987, 1990; Graham & Barkley 1984).

In addition to birds and mammals, collections of amphibians and reptiles were made. Seven new species of frogs were described based on specimens collected by Lynn Barkley, Tom Schulenberg, and Morris

Williams. New species described from Cordillera de Colán were *Gastrotheca abdita* Duellman 1987 (Hylidae); *Colostethus spilotogaster* Duellman 2004 (Dendrobatidae); *Eleutherodactylus avicuporum* Duellman & Pramuk 1999; *Eleutherodactylus atrabracus* Duellman & Pramuk 1999; *Eleutherodactylus serendipitus* Duellman & Pramuk 1999; *Eleutherodactylus cuneirostris* Duellman & Pramuk 1999 (all *Eleutherodactylus*, Leptodactylidae); and *Telmatobius colanensis* Wiens 1983 (Leptodactylidae). Three snakes were collected and deposited at LSU: a bright yellow-black arboreal pit viper *Bothriopsis oliolepis* Werner, a *Bothrops atrox* L. and a large *Micrurus* Wagler (Tom Schulenberg, pers. com.).

Cordillera de Colán has a population of Critically Endangered Yellow-tailed Woolly Monkey (*Oreonax flavicauda* Humbolt), the largest endemic primate found in Peru (DeLuycker 2007). Yellow-tailed Woolly Monkey was observed multiple times in several locations and photographed by 1978 expedition members. Gary Graham reports from his 2017 trip to Cordillera de Colán that although they did not see Yellow-tailed Woolly Monkey, locals assured them that it was still reasonably common within their narrow elevational range. Graham's group did see freshly torn branches at 2423 m apparently used in their displays. We were also aware of potential presence of the very rare and endangered Mountain Tapir or Woolly Tapir (*Tapirus pinchaque* Roulin). Mountain Tapir lives at high elevations (2000 m–4300 m) thus above rainforests and is endemic to the eastern and central cordilleras cloud forests and paramo in Ecuador, Columbia and Peru. Although no tapir sign was found in 1978, on Gary Graham's trip back to Cordillera de Colán in 2017 his group found one set of clear foot prints in mud at about 2070 m along a game trail. Another mammal of interest on Cordillera de Colán was Peruvian endemic Hairy Long-nosed Armadillo, *Dasypus pilosus* Fitzinger. Morris Williams collected a specimen for LSU Museum of Natural Science (LSU 21888, ♂, 3200 m, 5th camp; 12 September 1978).

Noteworthy is Gary Graham's documentation of habitat changes that have occurred between 1978 and 2017 (Appendix 4). In 1978 most habitat loss was below first camp. The original LSU Camp 1 had been surrounded by tall, undisturbed forest. In 2017, between ½ to ¾ of forest between La Peca and Graham's camp 1 had been cut and converted to grazing. Some patches remained along streams and on some steeper slopes. The area around LSU Camp 1 was cleared of all woody vegetation. Recent forest clearing was most severe near the trail used in 1978 between camps 1 and 2, which had also been used back then then by mules apparently traveling from valleys and communities further south. An old small lumber cutting hut had been built, but abandoned, almost exactly where Camp 2 had been placed. Forest cutting continues and is advancing east. Gary reports, "I could stand on Colán ridge near our 1978 Camp 4 and not see any signs of humanity, which continues to be an inspiration for me and provides hope for conservation of the unique elfin forest habitats and all their endemic species."

Most of Philip Barbour's collections are in Missouri Botanical Garden herbarium and many of these remain undetermined. Total aroid flora from the region is not particularly large (Brako & Zarucchi 1993) with only 41 species (Appendix 3) including 27 species of *Anthurium* (13 of which are new), five species of *Philodendron* (two new species), two species of *Rhodospatha* (one new species), three species of *Spathiphyllum* (one new species), two species of *Stenospermation* and two species of *Xanthosoma* (one new species).

This study of exploration of Cordillera de Colán in Department Amazonas of northern Peru highlights the importance of joint efforts by botanists and zoologists to concentrate efforts on poorly known areas at a time when collection of specimens is possible and to conduct thorough and intensive studies. These rich collections will continue to provide science with more records and a better understanding of tropical species diversity in animal and plant populations for years to come.

Many of the cryptogamic collections remain undetermined and many phanerogamic collections remain undetermined even after 41 years. The importance and timing of the LSU expedition is more important when we consider that today lower elevations where these 1978 collections were made, and which have proved so valuable to our understanding of the biodiversity of Peru, are nearly devoid of vegetation. Already by the late 1980s, when the area was visited by ornithologist Jaime Garcia-Moreno, much of the natural vegetation around species-rich 1st camp was gone. This emphasizes the importance of such expeditions that take time and effort to explore remote areas. However, even remote areas are not remote for very long. The miserable

trail from Bagua to La Peca, with knee-deep mud in places and on which the senior author finally gave up and turned back during his trip to the region in April 1984, has now been replaced with a good road. What happened to the ecology of the La Peca region and what happens everywhere simultaneously points out the need for more such prolonged studies in areas where vegetation still exists.

Since the LSU 1978 Colán expedition, the Santuario Nacional Cordillera de Colán (SNCC) was established in 2009 providing protection for a large area east of the Colán crest where the 1978 camp 4 had been located. At 39,215.80 hectares, this national park was established for water conservation and to protect biodiversity. (http://www.sernanp.gob.pe/cordillera-de-Colán). In 2011, the Copallín Private Conservation Area (ACP) was established to conserve the biodiversity of cloud forests and watersheds on private and community lands west of Cordillera Colán ridge and to provide a buffer for the SNCC. The Copallín ACP is 11,549 hectares and includes the mid and higher elevations of the 1978 LSU expedition research area. For a well-done video of the Copallín ACP visit http://www.conservamospornaturaleza.org/video/acp-Copallín/, which includes Mariella Leo Luna, who joined the 1978 LSU research effort so she could study Yellow-tailed Woolly Monkey. ACPs are designed to be complementary to the national system and are formally approved by a ministerial resolution (https://www.iucn.org/downloads/peru_en.pdf). As such, ACPs are not designated by the government, but instead are recognized by it. Landowners within an ACP voluntarily accept specific terms and conditions of use, with a view to ensuring conservation of biological diversity, landscapes and environmental services. Given the voluntary basis for ACP, they do not have as much enforcement strength and capacity as do the nationally protected areas, many of which struggle against similar threats facing ACPs. Implementation and enforcement of conservation goals on national parks are not effective enough: staff numbers and management budgets are inadequate and political support is insufficient. Such challenges are amplified with ACPs. The Copallín ACP currently has strong leadership and bylaws with good community support. They also are assisted by a very smart, competent Peace Corp volunteer who has helped them develop business and implementation plans and has helped acquire scientific data, including use of wildlife cameras to monitor Andean Spectacled Bears. Although the ACP have taken actions to limit forest clearing, they can only afford two park guards to cover the entire 11,500 hectares. These two gentlemen are very well informed and do exceptional work increasing awareness in the ACP communities and enforcing the ACP rules. But, the area is very large, and they are not reliably paid, which is a problem that offers an opportunity for additional outside assistance.

Fig. 1A. Peru, Department Amazonas, Province Bagua, location of town of La Peca. Image credit: Philip J. Barbour.

Fig. 1B. Map of camps 1–5 on Cordillera de Colán. Credit: Gary Graham.

Fig. 1C. Katherine Shaw and Scott Emerson standing next to drying coffee berries on an unpaved street in La Peca with Cordillera de Colán in background; Jun 1978. Photo by Philip J. Barbour.

Fig. 2A. Cordillera de Colán, Camp 1. Typical camp set up with plastic tarps, support poles, tents and campfire. Klaus Wehr, Scott Emerson and Lynn Barkley, el. 1764 m; cloud forest; mid-Jun 1978. Photo by Philip J. Barbour.

Fig. 2B. Cordillera de Colán, Camp 1. Lynn Barkley (front), Peruvian assistant, Al Gentry, Mike Dillon, Katherine Shaw, Scott Emerson (facing away), Jim Aronson, Camilo Diaz Santibanez and a local Peruvian boy; el. 1764 m; 13–16 Jun 1978. Note the white bandage above Gentry's right eye. Photo by Philip J. Barbour.

Fig. 2C. Cordillera de Colán, Camp 1. Jim Aronson (front), Gary Graham, Al Gentry, Mike Dillon, Scott Emerson, Philip Barbour, Camilio Diaz Santibanez; el. 1764 m; 13–16 Jun 1978. Photo provided by Philip J. Barbour.

Fig. 3A. LSU expedition collaborators Bob Olney (Bernie's younger step-brother), Bernie Peyton (New York Zoological Society) and Gustavo Del Solar holding a White-winged Guan while staging for field work from Chiclayo, Department Lambayeque, Peru. Gustavo was a significant supporter of LSU research and owned several large lemon orchards in Olmos from which other expedition members staged for simultaneous field projects; 7 Aug 1978. Photo by Philip J. Barbour.

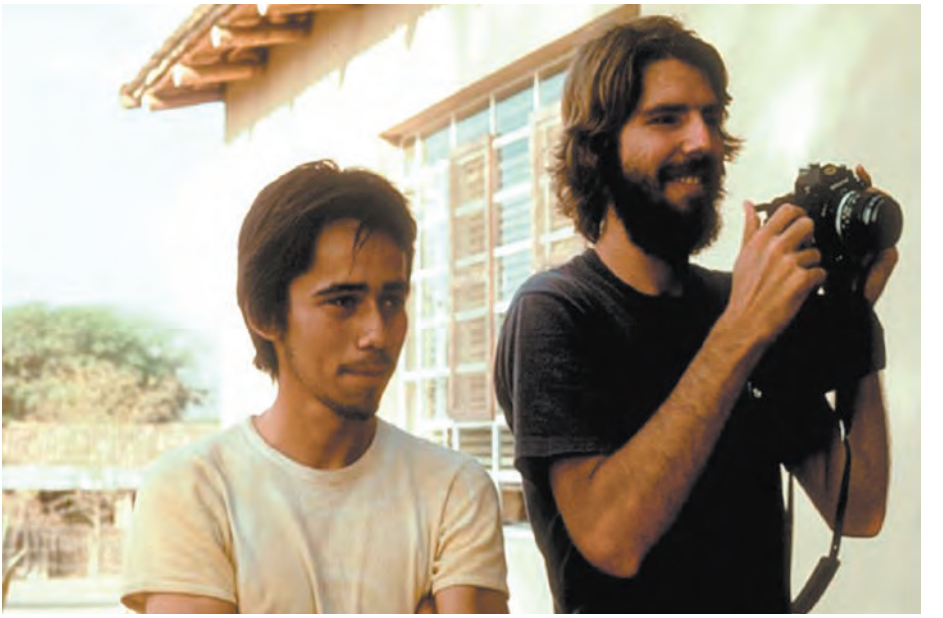

Fig. 3B. Enrique Ortiz, a Peruvian collaborator and LSU ornithologist Ted Parker at Las Pampas–lemon orchards owned by Gustavo del Solar in Olmos, Department Lambayeque, Peru, Jun 1978. Photo provided by Ted Floyd.

Fig. 4. Dr. John P. O'Neill, LSU principal investigator, examining a Western Fire-eye, *Pyriglena maura*. Camp 1, el. 1764 m; late Jun 1978. Photo by Tom Schulenberg.

Fig. 5. 1978 LSU ornithological expedition members staging for field work from Gustavo Del Solar's lemon orchards "Las Pampas" north of Olmos, Department Lambayeque, Peru; May 1978. Back standing—Manual Sanchez, Morris Williams, Bill Eley, Gary Graves, Tom Schulenberg; front—Ted Parker (kneeling), sitting—Philip Barbour, Katherine Shaw, Gary Graham, Lynn Barkley, Richard Semba and Scott Emerson. Photo by Enrique Ortiz.

Fig. 6. Lynn Barkley (back, sitting), Katherine Shaw, Scott Emerson, Tom Schulenberg, & Gary Graham preparing to depart Bagua Chica for Chiclayo then Lima to renew visas; 26 July 1978. Klaus Wehr remained in Bagua Chica. Photo by Philip J. Barbour.

Fig. 7. Philip Barbour, undergraduate botany student, LSU equipped for lichen collecting and bird watching, Cordillera de Colán, 1st camp, el. 1764 m; May 1978. Photo by Katherine Shaw.

Fig. 8A. Philip Barbour cataloging and pressing plants, Cordillera de Colán, 3rd camp, el. 2446 m; mid–late Aug 1978. Photo by Philip J. Barbour.

Fig. 8B. Plant specimens to be pressed and locally sourced furniture, Cordillera de Colán, 3rd camp, el 2446 m; cloud forest/elfin forest ecotone; Aug 1978. Photo by Philip J. Barbour.

Fig. 9A. Plants collected, catalogued and pressed. Note aluminum corrugates, standard equipment in wet cloud forest, Cordillera de Colán, 3rd camp, el. 2446 m; Aug 1978. Photo by Philip J. Barbour.

Fig. 9B. Collected plant specimens ready to be processed. Note the folded aluminum plant dryer under the table on the left. Despite trying, the dryer was not practical in constantly wet conditions, Cordillera de Colán, 3rd camp, el 2446 m; Aug 1978. Photo by Philip J. Barbour.

Fig. 10A. Katherine Shaw & Scott Emerson packing plant specimens down from Cordillera de Colán, 1st camp to La Peca for storage until air-shipped to Missouri Botanical Garden; late Jun 1978. Photo by Philip J. Barbour.

Fig. 10B. Peruvian guides, Manual Sanchez (left) & Klaus Wehr preparing to hike down to La Peca for R&R with moss and lichen voucher specimens, Cordillera de Colán, 3rd camp; mid–late Aug 1978. Photo by Philip J. Barbour.

Fig. 11A. Zoologists Mariella Leo, Reinhold Pape, a Peruvian hunter/guide with shotgun, and zoologist Roberto Rodriguez visiting the LSU camps while studying Yellow-tailed Woolly Monkey, Cordillera de Colán, 2nd camp, el. 1993 m; cloud forest; mid—July 1978. Photo by Philip J. Barbour.

Fig. 11B. Roberto Rodriguez, Reinhold Pape, Mariella Leo, Scott Emerson and Lynn Barkley preparing a museum specimen of a Yellow-tailed Woolly Monkey, Cordillera de Colán, 2nd camp, el. 1993 m; mid-July 1978. Photo by Philip J. Barbour.

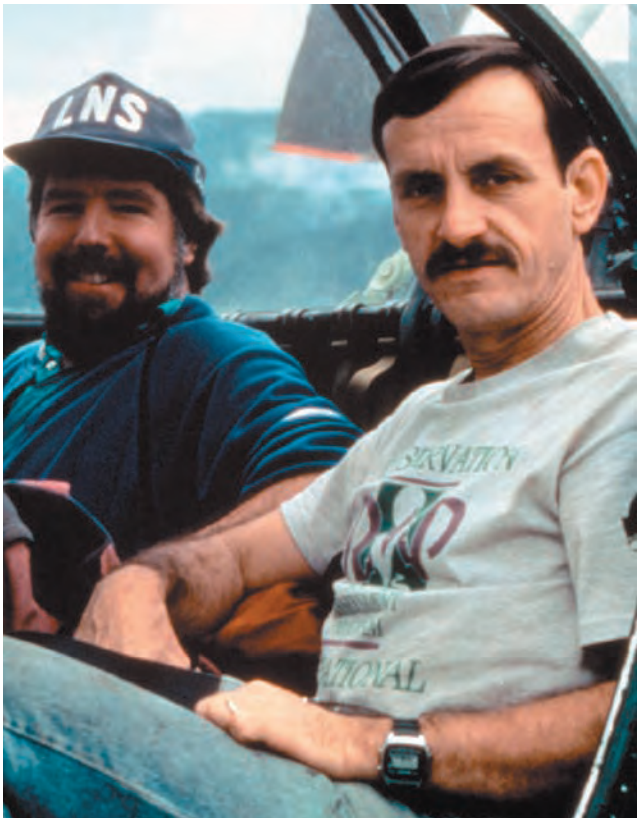

Fig. 12. Ted Parker (left) and Al Gentry in a helicopter in Ecuador. Conservation International photo by Kim Awbrey.

Fig. 13A. Tom Schulenberg holding a mist-netted Yungas Pygmy-Owl, *Glaucidium bolivianum*, Cordillera de Colán, 3rd camp, el. 1993 m; mid–late Aug 1978. Photo by Philip J. Barbour.

Fig. 13B. Gary Graham, crossing a stream via a log bridge between Cordillera de Colán camps 2 and 3. Photo provided by Gary Graham.

Fig. 14. Town of La Peca. Katherine Shaw, Dr. Scott Emerson and Dr. John P. O'Neill, LSU principal investigator, with young Peruvian admirers. We were the first North Americans to visit La Peca, Jun 1978. Photo by Philip J. Barbour.

Fig. 15A. Undisturbed elfin-forest ridge tops, Cordillera de Colán between 4th camp (el. 3097 m) & 5th camp (el. 3358 m). Looking SE down at 4th camp. Note the very small white area on the ridge top which are plastic tent tarpaulins; Aug 1978. Photo by Philip J. Barbour.

Fig. 15B. Tom Schulenberg, Manuel Sánchez, and Morris Williams, Cordillera de Colán, 5th camp, el. 3358 m; paramo; late Aug–early Sep 1978. Photo by Philip J. Barbour.

Fig. 16. *Anthurium barbourii* Croat. Holotype. Scan of Missouri Botanical Garden specimen (*Gentry et al. 23028* MO). Tropicos.org. Missouri Botanical Garden. 11 Apr 2019 http://www.tropicos.org/Image/100541470.

Fig. 17. *Anthurium camiloi* Croat. Holotype. Scan of Missouri Botanical Garden specimen (*Gentry et al.,* 23074, MO). Tropicos.org. Missouri Botanical Garden. 11 Apr 2019 http://www.tropicos.org/Image/100604651.

Fig. 18. *Anthurium dillonii* Croat. Holotype. Scan of Missouri Botanical Garden specimen (*Gentry et al. 23075*, MO). Tropicos.org. Missouri Botanical Garden. 11 Apr 2019 http://www.tropicos.org/Image/100604673.

Fig. 19. *Anthurium grahamii* Croat. Holotype. Scan of Missouri Botanical Garden specimen (*Gentry et al. 22913*, MO). Tropicos.org. Missouri Botanical Garden. 11 Apr 2019 http://www.tropicos.org/Image/100622913.

Fig. 20A. *Anthurium katherineshawiae* Croat. Holotype. Scan of Missouri Botanical Garden specimen (*Philip J. Barbour 3720*, sheet 1 of 4, MO). Tropicos. org. Missouri Botanical Garden. 11 Apr 2019 http://www.tropicos.org/Image/100604669.

Fig. 20B. *Anthurium katherineshawiae* Croat. Holotype. Scan of Missouri Botanical Garden specimen (*Philip J. Barbour 3720*, sheet 2 of 4, MO). Tropicos.org. Missouri Botanical Garden. 11 Apr 2019 http://www.tropicos.org/Image/100604670.

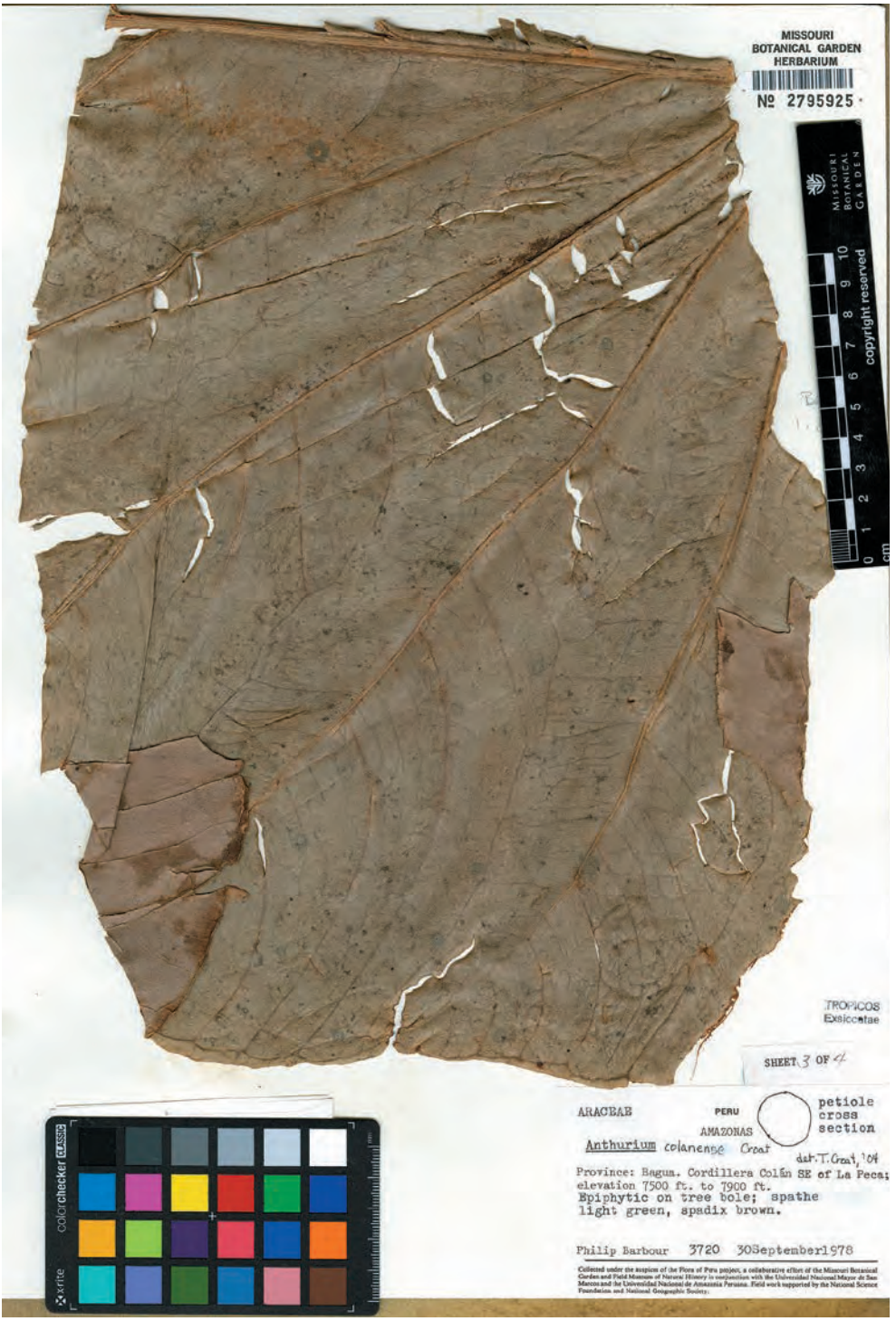

Fig. 20C. *Anthurium katherineshawiae* Croat. Holotype. Scan of Missouri Botanical Garden specimen (*Philip J. Barbour 3720*, sheet 3 of 4, MO). Tropicos. org. Missouri Botanical Garden. 11 Apr 2019 http://www.tropicos.org/Image/100604671.

Fig. 20D. *Anthurium katherineshawiae* Croat. Holotype. Scan of Missouri Botanical Garden specimen (*Philip J. Barbour 3720*, sheet 4 of 4, MO). Tropicos.org. Missouri Botanical Garden. 11 Apr 2019 http://www.tropicos.org/Image/100604672.

Fig. 21. *Anthurium lapecaense* Croat. Holotype. Scan of Missouri Botanical Garden specimen (*Philip J. Barbour 3584*, MO). Tropicos.org. Missouri Botanical Garden. 1 May 2019. http://www.tropicos.org/Image/50254162.

Fig. 22. *Anthurium oneillii* Croat. Holotype. Scan of Missouri Botanical Garden specimen (*Philip J. Barbour 2642* MO). Tropicos.org. Missouri Botanical Garden. 11 Apr 2019 http://www.tropicos.org/Image/100363848.

Fig. 23. *Anthurium perlatum* Croat. Holotype. Scan of Missouri Botanical Garden specimen (*Philip J. Barbour 2857*, MO). Tropicos.org. Missouri Botanical Garden. 11 Apr 2019 http://www.tropicos.org/Image/100599038.

Fig. 24. *Anthurium philipii* Croat. Holotype. Scan of Missouri Botanical Garden specimen (*Philip J. Barbour 2737* MO). Tropicos.org. Missouri Botanical Garden. 11 Apr 2019 http://www.tropicos.org/Image/100541492.

Fig. 25. *Anthurium schulenbergii* Croat. Holotype. Scan of Missouri Botanical Garden specimen (*Philip J. Barbour 2737A* MO). Tropicos.org. Missouri Botanical Garden. 11 Apr 2019 http://www.tropicos.org/Image/100541469.

Fig. 26A. *Rhodospatha barbourii* Croat. Holotype (MO). Scan of Missouri Botanical Garden specimen (*Philip J. Barbour 4143*, sheet 1 of 3, MO). Tropicos.org. Missouri Botanical Garden. 11 Apr 2019 http://www.tropicos.org/Image/100605018.

Fig. 26B. *Rhodospatha barbourii* Croat. Isotype (US). Scan of Missouri Botanical Garden specimen (*Philip J. Barbour 4143*, sheet 2 of 3, MO). Tropicos.org. Missouri Botanical Garden. 11 Apr 2019 http://www.tropicos.org/Image/100605021.

Fig. 26C. *Rhodospatha barbourii* Croat. Isotype (USM). Scan of Missouri Botanical Garden specimen (*Philip J. Barbour 4143*, sheet 3 of 3, MO). Tropicos.org. Missouri Botanical Garden. 11 Apr 2019 http://www.tropicos.org/Image/100605022.

Fig. 27. *Isoetes novo-granadensis* H.P. Fuchs, (Isoetaceae) a quillwort; only collection for Peru, (*Philip J. Barbour 3189,* MO); Cordillera de Colán, 5th camp, el. 3350 m; paramo; 25 Aug 1978. Photo by Philip J. Barbour.

Fig. 28. *Xanthosoma barbourii* Croat & Delannay (Araceae) Holotype. Scans of Missouri Botanical Garden specimens (*Philip J. Barbour 3967*, Sheets 1 & 2, MO). Tropicos.org. Missouri Botanical Garden. 10 Apr 2019 http://www.tropicos.org/Image/100526520 (sheet 1 of 2), http://www.tropicos.org/Image/100526448 (sheet 2 of 2); Cordillera de Colán, 3rd camp, el. 2446 m; cloud forest; endemic to type locality.

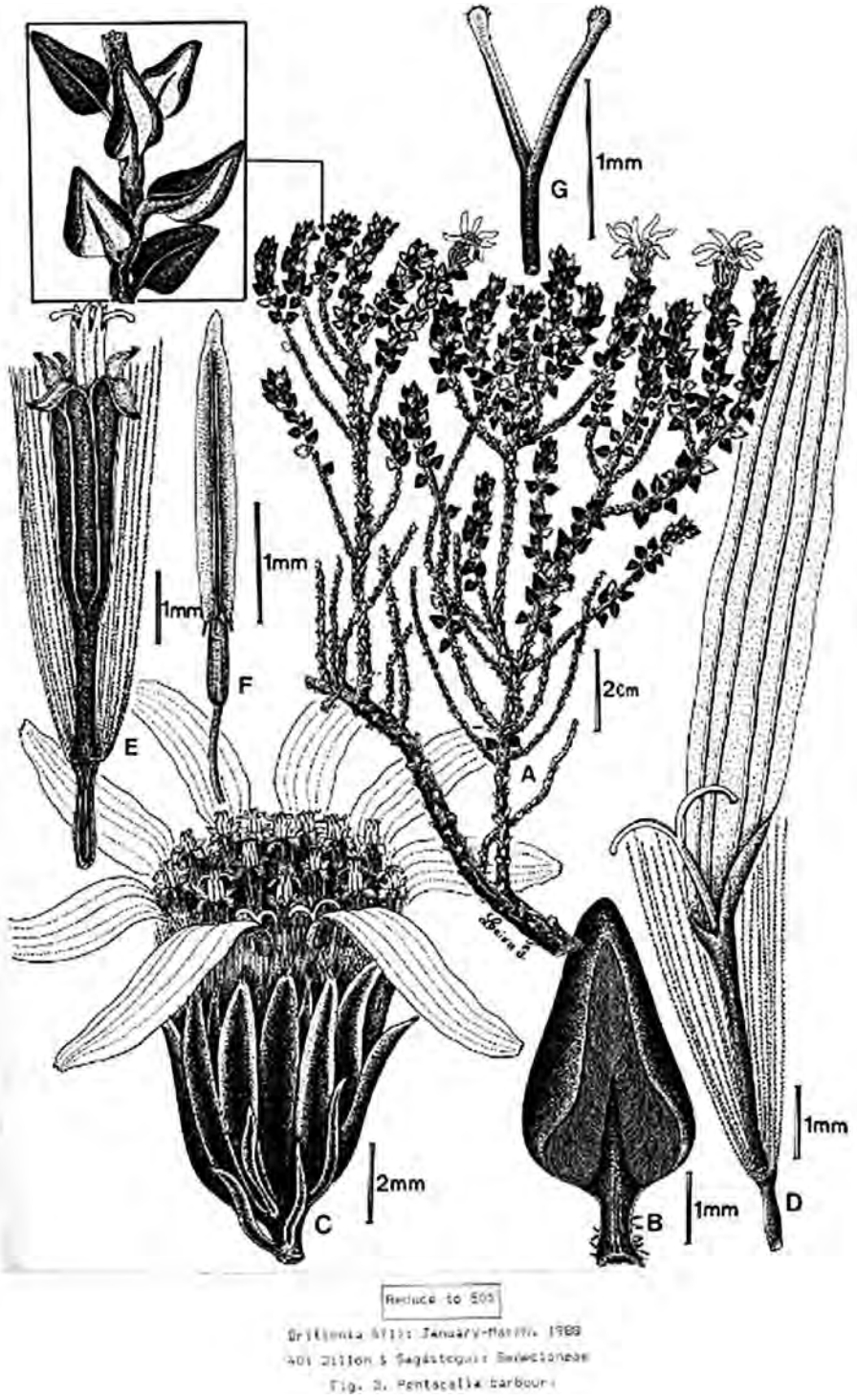

Fig. 29. *Pentacalia barbourii* M.O. Dillon & Sagast., (Asteraceae). Line drawing of Holotype, Field Museum of Natural History (*Philip J. Barbour 3450*, F) now *Monticalia barbourii* (M.O. Dillon & Sagast.) Pruski. Endemic to type locality on Cordillera de Colán. Photo by Philip J. Barbour.

Fig. 30. *Eschweilera baguensis* S.A. Mori, (Lecythidaceae); flowers and leaves of a new tree species from Cordillera de Colán, *Gentry, et al. 22908* holotype (NY), isotype (MO, NY), & *Philip J. Barbour 2536* (MO); 1st camp, el. 1764 m; 14 & 28 Jun 1978. Photo by Philip J. Barbour.

Fig. 31. *Peperomia boekei* Callejas, (Piperaceae). A unique shrub-like *Peperomia*, endemic to Peru; Cordillera de Colán, 4th camp, el. 3097 m; *Philip J. Barbour* 3240, MO, NY; specimens were collected with a machete; 28 Aug 1978. Photo by Philip J. Barbour.

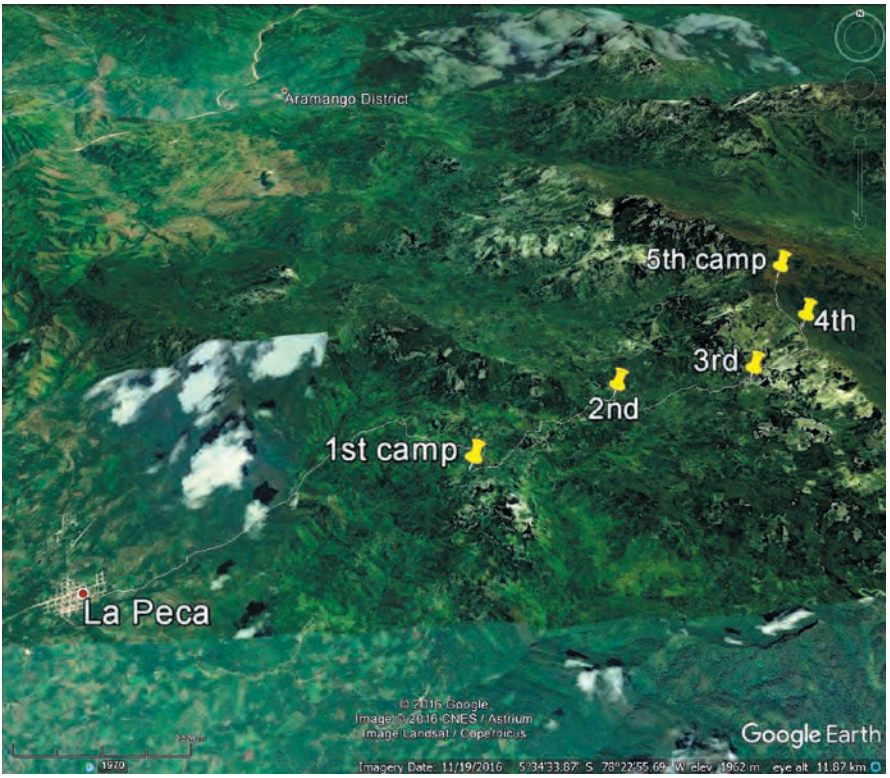

Fig. 32. Map of camps 1–5 on Cordillera de Colán (see also Fig. 1B).

Fig. 33. Map of Graham 2017 camps 1–3 and 1978 LSU camps 1–5 plus trails on Cordillera Colán.

Fig. 34. Deforestation at exact site of 1978 LSU camp 1. Compare with publication figures 2 A–C, 4, and 7.

Fig. 35. View east from Colán ridge near 1978 LSU Camp 4 on October 9, 2017 showing a pristine forest with Jove (left) and Gary Graham in the foreground.

APPENDIX 1. SUMMARY OF PLANT FAMILIES FROM CERRO COLAN (CORDILLERA DE COLÁN)

			FAMILY	Gen. PJB	Sp.* PJB	Det. spec. PJB	Indets. PJB	Gen. AHG	Sp. AHG	Det. Spec. AHG	Indets. AHG	Gen. shared by AHG & PJB both/fam.	shared by both AHG & PJB	Sp. shared by both	Indpt sp./ fam. shared by both AHG by both
FUNGI	**2 Fam**														
		1	Baeomycetaceae	1	2	2	0	0	0	0	0	0		0	2
		1	Tremellaceae	1	1	1	0	0	0	0	0	0		0	1
ALGA	**1 Fam**														
		1	Characeae	1	1	1	0	0	0	0	0	0		0	1
LICHENS	**8 Fam**														
		1	Cladoniaceae	2	6	7	0	0	0	0	0	0		0	6
		1	Coccocarpiaceae	1	2	2	0	0	0	0	0	0		0	2
		1	Collemataceae	1	3	4	0	0	0	0	0	0		0	3
		1	Icmadophilaceae	1	1	1	0	0	0	0	0	0		0	1
		1	Parmeliaceae	1	1	1	0	0	0	0	0	0		0	1
		1	Pyrenulaceae	1	1	1	0	0	0	0	0	0		0	1
		1	Stereocaulaceae	1	1	1	0	0	0	0	0	0		0	1
		1	Teloschistaceae	1	1	1	0	0	0	0	0	0		0	1
BRYOPHYTES															
Rhizogoniales	**1 Fam**	1	Rhizogoniaceae	0	0	0	0	1	1	1	0	0		0	1
Hypnales	**2 Fam**	1	Neckeraceae	1	1	1	0	0	0	0	0	0		0	1
		1	Plagiotheciaceae	0	0	0	0	1	1	1	0	0		0	1
LYCOPHYTES															
Lycopodiales	**1 Fam**	1	Lycopodiaceae	2	8	13	2	1	1	1	0	1		0	9
Isoetales	**1 Fam**	1	Isoetaceae	1	2	3	0	0	0	0	0	0		0	2
Selaginellales	**1 Fam**	1	Selaginellaceae	1	9	14	1	1	2	2	0	1		1	10
EUPHYLLOPHYTTES															
Equisetales	**1 Fam**	1	Equisetaceae	1	1	5	0	0	0	0	0	0		0	1
MONILOPHYTES -FERNS															
Ophioglossales	**1 Fam**	1	Ophioglossaceae	1	1	3	0	0	0	0	0	0		0	1
Marattiales	**1 Fam**	1	Marattiaceae	2	2	6	0	0	0	0	0	0		0	2
Hymenophyllales	**1 Fam**	1	Hymenophyllaceae	2	23	40	1	1	2	2	0	1		2	23
Gleicheniales	**1 Fam**	1	Gleicheniaceae	2	4	10	0	0	0	0	0	0		0	4
Cyatheales	**3 Fam**	1	Cyatheaceae	3	18	37	2	1	1	1	0	1		1	18
		1	Dicksoniaceae	2	2	9	0	0	0	0	0	0		0	2
		1	Metaxyaceae	1	1	2	0	0	0	0	0	0		0	1

APPENDIX 1 continued

			FAMILY	Gen. PJB	Sp.* PJB	Det. spec. PJB	Indets. PJB	Gen. AHG	Sp. AHG	Det. Spec. AHG	Indets. AHG	Gen. shared by AHG & PJB both/fam.	shared by both AHG & PJB	Sp. shared by both	Indpt sp./ fam. shared by both AHG by both
POLYPODIALES	**13 Fam**														
Eupolypods i	**5 Fam**	1	Polypodiaceae	9	25	49	3	43	3	5	2	3		3	25
		1	Dryopteridaceae	6	20	34	3	2	3	53	0	2		1	22
		1	Hemidictyaceae	1	1	1	0	0	0	0	0	0		0	1
		1	Tectariaceae	1	2	2	0	1	1	1	0	1		0	3
		1	Nephrolepidaceae	1	3	4	0	0	0	0	0	0		0	3
Eupolypods ii	**8 Fam**	1	Aspleniaceae	1	16	35	1	1	1	2	1	1		1	16
		1	Athyriaceae	2	8	18	0	0	0	0	0	0		0	8
		1	Blechnaceae	2	13	21	3	1	1	3	0	1		1	13
		1	Dennstaedtiaceae	2	6	18	0	0	0	0	0	0		0	6
		1	Lindsaeaceae	1	3	3	0	0	0	0	0	0		0	3
		1	Pteridaceae	9	25	52	2	5	8	13	0	5		7	26
		1	Saccolomataceae	1	1	5	0	0	0	0	0	0		0	1
		1	Thelypteridaceae	2	9	17	2	0	0	0	0	0		0	9
GYMNOSPERMS															
Pinales	**1 Fam**	1	Podocarpaceae	1	2	2	0	0	0	0	0	0		0	2
EARLY ANGIOSPERMS—NYMPHAEALES GRADE															
Nymphaeales	**1 Fam**	1	Nymphaeaceae	1	1	1	0	0	0	0	0	0		0	1
Chloranthales	**1 Fam**	1	Chloranthaceae	0	0	0	0	1	1	2	0	0		0	1
MAGNOLIDS															
Piperales	**2 Fam**	1	Aristolochiaceae	0	0	0	0	1	1	1	0	0		0	1
		1	Piperaceae	3	26	48	8	3	8	16	6	3		5	29
Laurales	**2 Fam**	1	Lauraceae	0	0	0	0	1	1	2	0	0		0	1
		1	Siparunaceae	1	3	3	0	1	1	1	0	1		1	3
Magnoliales	**2 Fam**	1	Annonaceae	1	1	1	0	2	3	3	0	1		0	4
		1	Magnoliaceae	0	0	0	0	1	1	2	0	0		0	1
Alismatales	**2 Fam**	1	Araceae	6	34	83	2	3	17	25	3	3	6	8	43
		1	Tofieldiaceae	1	1	3	0	0	0	0	0	0		0	1
Dioscoreales	**1 Fam**	1	Dioscoreaceae	1	2	4	0	0	0	0	0	0		0	2
Pandanales	**1 Fam**	1	Cyclanthaceae	5	7	7	3	1	1	1	2	1		1	7
Liliales	**2 Fam**	1	Alstroemeriaceae	1	9	18	0	1	1	1	0	1	1	1	9
		1	Smilacaceae	1	1	1	0	1	1	1	0	1		0	2

			FAMILY	Gen. PJB	Sp.* PJB	Det. spec. PJB	Indets. PJB	Gen. AHG	Sp. AHG	Det. Spec. AHG	Indets. AHG	Gen. shared by AHG & PJB both/fam.	shared by both AHG & PJB	Sp. shared by both	Indpt sp./ fam. shared by both AHG by both
Asparagales	**2 Fam**	1	Amaryllidaceae	1	1	1	0	0	0	0	0	0	1	0	1
		1	Orchidaceae	20	55	73	65	6	9	12	10	5		9	55
COMMELINIDS															
Arecales	**1 Fam**	1	Arecaceae	7	13	21	1	4	2	5	0	2		2	13
Poales	**5 Fam**	1	Bromeliaceae	9	15	31	1	5	11	15	1	4		4	22
		1	Cyperaceae	56	18	21	0	2	2	4	0	1		1	19
		1	Eriocaulaceae	1	1	1	0	0	0	0	0	0		0	1
		1	Poaceae	19	23	29	1	4	4	6	0	3		0	27
		1	Xyridaceae	1	2	2	0	0	0	0	0	0		0	2
Commelinales	**2 Fam**	1	Commelinaceae	2	2	3	1	2	2	2	0	1		1	3
		1	Haemodoraceae	1	1	1	0	0	0	0	0	0		0	1
Zingiberales	**4 Fam**	1	Costaceae	1	2	2	2	1	1	1	0	1		1	2
		1	Heliconiaceae	1	4	7	0	1	5	5	1	1		1	8
		1	Marantaceae	2	2	3	0	1	1	1	0	1		0	3
		1	Zingiberiaceae	1	3	8	0	1	2	3	0	1		1	4
EUDICOTS															
Ranunculales	**2 Fam**	1	Berberidaceae	1	1	2	0	0	0	0	0	0		0	1
		1	Ranunculaceae	1	1	1	0	0	1	0	0	1		1	1
Proteales	**1 Fam**	1	Sabiaceae	1	1	1	0	0	0	0	0	0		0	1
ROSIDS															
Vitales	**1 Fam**	1	Vitaceae	1	1	1	0	1	1	1	0	1		0	2
FABIDS															
Oxalidales	**1 Fam**	1	Oxalidaceae	1	4	8	0	1	4	4	0	1		2	6
Malpighiales	**8 Fam**	1	Clusiaceae	3	3	4	0	2	3	3	1	2		0	6
		1	Euphorbiaceae	8	10	11	0	4	4	6	4	2		0	14
		1	Hypericaceae	2	2	3	1	0	0	0	0	0		0	2
		1	Malpighiaceae	2	2	2	0	2	2	2	0	0		0	4
		1	Ochnaceae	1	1	1	0	0	0	0	0	0		0	1
		1	Passifloraceae	1	1	1	0	1	1	1	0	1		0	2
		1	Phyllanthaceae	0	0	0	0	1	1	1	1	0		0	1
		1	Violaceae	1	1	1	0	0	0	0	0	0		0	1
Fabales	**2 Fam**	1	Fabaceae	13	13	15	0	5	6	6	0	2		0	19

APPENDIX 1 continued

			FAMILY	Gen. PJB	Sp.* PJB	Det. spec. PJB	Indets. PJB	Gen. AHG	Sp. AHG	Det. Spec. AHG	Indets. AHG	Gen. shared by AHG & PJB both/fam.	shared by both AHG & PJB	Sp. shared by both	Indpt sp./ fam. shared by both AHG by both
		1	Polygalaceae	3	3	4	1	1	1	1	0	1		1	3
Rosales	**3 Fam**	1	Moraceae	0	0	0	0	1	1	1	0	0		0	1
		1	Rosaceae	2	4	4	0	1	1	1	0	0		0	5
		1	Urticaceae	3	13	14	0	2	3	3	0	1		0	16
Cucurbitales	**2 Fam**	1	Begoniaceae	1	5	7	0	0	0	0	0	0		0	5
		1	Cucurbitaceae	1	1	2	0	0	0	0	0	0		0	1
Geraniales	**1 Fam**	1	Geraniaceae	1	1	1	0	1	1	1	0	1		1	1
			MALVIDS												
Myrtales	**4 Fam**	1	Combretaceae	1	1	1	0	0	0	0	0	0		0	1
		1	Melastomataceae	9	21	36	5	4	4	7	2	2		1	24
		1	Myrtaceae	1	1	1	0	1	0	1	1	0		0	1
		1	Onagraceae	2	4	15	0	2	5	5	3	2		2	7
Crossosomatales	**1 Fam**	1	Staphyleaceae	1	1	1	0	0	0	0	0	0		0	1
Sapindales	**2 Fam**	1	Anacardiaceae	1	1	1	0	0	0	0	0	0		0	1
		1	Sapindaceae	2	2	2	0	0	2	2	0	1		0	4
Malvales	**2 Fam**	1	Malvaceae	6	8	9	1	7	7	8	0	0		0	15
		1	Muntingiaceae	1	1	2	0	1	1	1	0	1		1	1
Brassicales	**4 Fam**	1	Brassicaceae	1	1	2	0	0	0	0	0	0		0	1
		1	Caricaceae	1	1	2	0	1	1	1	0	1		1	1
		1	Cleomaceae	2	4	10	0	1	1	1	0	1		0	5
		1	Tropaeolaceae	1	4	4	0	1	1	1	0	1		1	4
			SUPERASTERIDS												
Santalales	**5 Fam**	1	Balanophoraceae	3	3	3	0	1	1	1	0	1		1	3
		1	Loranthaceae	4	4	7	0	1	1	1	0	0		0	5
		1	Olacaceae	0	0	0	0	1	1	1	0	0		0	1
		1	Opiliaceae	1	1	1	0	0	0	0	0	0		0	1
		1	Santalaceae	2	4	4	6	1	1	1	0	0		0	5
Caryophyllales	**8 Fam**	1	Amaranthaceae	2	4	7	0	0	0	0	0	0		0	4
		1	Cactaceae	0	0	0	0	1	1	1	1	0		0	0
		1	Caryophyllaceae	1	2	3	0	1	1	1	0	1		0	2
		1	Nyctaginaceae	1	1	1	0	0	0	0	0	0		0	1
		1	Petiveriaceae	1	1	1	0	0	0	0	0	0		0	1

			FAMILY	Gen. PJB	Sp.* PJB	Det. spec. PJB	Indets. PJB	Gen. AHG	Sp. AHG	Det. Spec. AHG	Indets. AHG	Gen. shared by AHG & PJB both/fam.	shared by both AHG & PJB	Sp. shared by both	Indpt sp./ fam. shared by both AHG by both
		1	Phytolaccaceae	1	1	1	0	0	0	0	0	0		0	1
		1	Polygonaceae	2	3	4	0	1	1	1	0	1		1	3
		1	Talinaceae	1	1	1	0	0	0	0	0	0		0	1
ASTERIDS															
Cornales	**2 Fam**	1	Hydrangeaceae	1	1	1	0	0	0	0	0	0		0	1
		1	Loasaceae	5	6	8	0	1	1	1	0	1		0	7
Ericales	**7 Fam**	1	Clethraceae	1	1	1	0	0	0	0	0	0		0	1
		1	Ericaceae	10	16	46	1	6	6	9	0	2		3	19
		1	Lecythidaceae	1	1	1	0	1	1	3	0	1		1	1
		1	Marcgraviaceae	0	0	0	0	1	2	2	0	0		0	2
		1	Myrsinaceae	1	1	2	0	0	0	0	0	0		0	1
		1	Primulaceae	5	10	26	0	2	2	5	0	2		2	10
		1	Styracaceae	1	1	1	0	1	1	1	0	1		0	2
LAMIIDS															
Solanales	**2 Fam**	1	Convolvulaceae	2	2	4	1	3	5	5	0	2		0	7
		1	Solanaceae	9	27	40	10	5	10	15	4	3		5	32
Gentianales	**1 Fam**	1	Apocynaceae	2	2	4	1	0	0	0	0	0		0	2
Lamiales	**12 Fam**	1	Gentianaceae	4	6	9	0	2	2	2	0	1		1	7
		1	Rubiaceae	15	40	51	1	6	11	15	4	4		6	45
		1	Acanthaceae	4	6	8	7	2	5	7	0	2		2	10
		1	Bignoniaceae	2	2	2	0	2	2	2	0	1		0	4
		1	Calceolariaceae	1	3	6	0	0	0	0	0	0		0	3
		1	Gesneriaceae	9	15	45	3	6	9	17	3	5		6	18
		1	Lamiaceae	5	5	6	0	1	1	1	0	1		1	5
		1	Lentibulariaceae	1	1	4	0	0	0	0	0	0		0	1
		1	Orobanchaceae	1	1	1	0	0	0	0	0	0		0	1
		1	Plantaginaceae	3	4	4	1	1	1	1	0	1		0	5
		1	Scrophulariaceae	2	2	2	0	1	1	1	0	0		0	3
		1	Verbenaceae	3	4	4		3	3	4	0	2		1	6
Boraginales	**1 Fam**	1	Boraginaceae	2	2	2	1	2	3	3	0	0		0	5

APPENDIX 1 continued

			FAMILY	Gen. PJB	Sp.* PJB	Det. spec. PJB	Indets. PJB	Gen. AHG	Sp. AHG	Det. Spec. AHG	Indets. AHG	Gen. shared by AHG & PJB both/fam.	shared by both AHG & PJB	Sp. shared by both	Indpt sp./ fam. shared by both AHG by both
			CAMPANULIDS												
Aquifoliales	**1 Fam**	1	Aquifoliaceae	1	3	4	1	0	0	0	0	0		0	3
Asterales	**2 Fam**	1	Asteraceae	33	48	78	7	30	37	49	7	13		8	77
		1	Campanulaceae	3	8	16	3	1	2	2	1	2		2	8
Apiales	**2 Fam**	1	Apiaceae	2	2	2	0	0	0	0	0	0		0	2
		1	Araliaceae	2	4	5	2	0	0	0	0	0		0	4
Dipsacales	**1 Fam**	1	Caprifoliaceae	1	3	4	1	0	0	0	0	0		0	3
	145 Fam	**145**		**440**	**823**	**1387**	**158**	**190**	**264**	**404**	**58**	**117**		**104**	**982**

*includes subsp., var.				
BARBOUR	**440 genera**	**823 species**	**1387 specimens**	**158 indets.**
GENTRY	**190 genera**	**264 species**	**404 specimens**	**58 indets.**
TOTALS SHARED	**440+190= 630 total genera**	**823+264 = 1087 total species**	**1387+404=1791 total PJB+AHG specimens**	**158+58=216**	**1791 dets. + 216 indets. = 2007 voucher specimens**
TOTALS PJB SHARED—AHG SHARED =independent collections	**630 genera—117 shared genera= 513 independent genera**	**1087-104=983 independent species (982+ 1= 983 the 1 is a Gentry et al. 23019, not yet put into a family)**	**1791 det. specimens—104 species shared by both = 1687 independent det. specimens**	**158+58=216 total indets.**

App.2 11 sp. nov., App.3 58 sp. nov.

Noteworthy records (species or genera) = App 2 (409) + App 3 (1138) = 1545

1791 dets.—104 species shared by both = 1687 independent dets./of 1687 independent determined specimens 1545 are noteworthy = 0.915 or 92% (1545/1687)

1791 dets. + 216 indets. = 2017 total specimens

App. 2 has 7 endemics, App. 3 has 74 endemics = 81 total endemics

983 independent species, 513 genera, 145 families

Families most represented by species: Asteraceae (77), Orchidaceae (55), Rubiaceae (45), Solanaceae (32), Poaceae (27), Pteridaceae (26), Polypodiaceae (25), Melastomaceae (24), Hymenophyllaceae (23), Bromeliaceae (22), Dryopteridaceae (22)

APPENDIX 2 . NOTEWORTHY COLLECTIONS OF CERRO COLAN (CORDILLERA DE COLÁN) PLANTS OTHER THAN ANGIOSPERMS

The annotated list is divided into Fungi, Alga, Lichens, Mosses, Club Mosses, Spike Mosses, Horsetails, Quillworts, Large Frond Fleshy Root Ferns, Filmy Ferns, Tree Ferns, and Other Ferns; Families, genera, and species are arranged alphabetically beneath each heading. Nomenclature follows what is used in TROPICS. Names of collectors are abbreviated as follows: **AHG et al.** = Al Gentry, Mike Dillion, Jim Aronson, Camilo Diaz, Philip J. Barbour, **PJB** = Philip Barbour. Voucher specimens are deposited in the following herbaria: Aarhus University (AAU), Universidad Nacional de la amazonia Peruana (AMAZ), British Museum of Natural History (BM), University of Copenhagen (C), Universidad Nacional San Antonio Abad del Cusco (CUZ), Field Museum of Natural History (F), Universidad Nacional de La Libertad-Trujillo (HUT), University of Lethbridge (LEA), Missouri Botanical Garden (MO), Museum National d'Histoire Naturelle (PC), New York Botanical Garden (NY), Swedish Museum of Natural History (S), Universidad Nacional Mayor de San Marcos (USM), United States National Museum of Natural History (US).

	Noteworthiness	sp. nov.*	only coll. Peru	1st coll. Peru	only coll. Am. Dept.	1st coll. Am. Dept.	only coll. Bagua Prov.	1st coll. Bagua Prov.
FUNGI								
Baeomycetaceae								
Baeomyces fungoides Acharius, PJB 3121 (LSU)	1st collection for Dept. Amazonas					1		
Baeomyces imbricatus var. *erythrellus* B.G. de Vries, PJB 3355 (LSU)	Possibly only collection for Peru		1					
Tremellaceae								
Tremella fibulifera Moller, PJB 2189 (LSU)	Only collection for Peru		1					
ALGA								
Nitella acuminata A. Braun ex Wallman, PJB 4476 (NY)	Only collection for Peru		1					
LICHENS								
Cladoniaceae								
Cladina boliviana Ahti**, PJB 3508 (LSU)	Only collection for Peru		1					
Cladina laevigata Gyelnik**, PJB 3017 (LSU)	Only collection for Peru		1					
Cladonia calycantha Nylander, PJB 1487 (LSU), 3019 (BM)	1st collection for Peru, only collection for Dept. Amazonas			1	1			
Cladonia furcata Schardi**, PJB 3473 (LSU)	Only collection for Dept. Amazonas				1			
Cladonia miniata Meyer**, PJB 3133 (LSU)	Possibly only collection for Peru		1					
Cladonia verticillaris Fries, PJB 3020C (LSU)	Only collection for Dept. Amazonas				1		1	
Coccocarpiaceae								
Coccocarpia domingensis Vainio**, PJB 2915 (LSU)	Possibly 1st collection for Peru, only collection for Dept. Amazonas			1	1			
Coccocarpia epiphylla Muller Argoviensis**, PJB 3889A (LSU)	Possibly only collection for Peru		1					
Collemataceae								
Leptogium foveolatum Nylander**, PJB 3638 (LSU)	Only collection for Peru		1					

APPENDIX 2 continued

	Noteworthiness	sp. nov.*	only coll. Peru	1st coll. Peru	only coll. Am. Dept.	1st coll. Am. Dept.	only coll. Bagua Prov.	1st coll. Bagua Prov.
Leptogium moluccanum (Pers.) Vainio.**, PJB 2291A (LSU)	Only collection for Peru		1					
Leptogium phyllocarpum Montagne, PJB 2305 (LSU), 2456 (LSU)	Possibly 1st collection for Peru, only collection for Dept. Amazonas			1	1			
Icmadophilaceae								
Glossodium aversum Nylander**, PJB 3115 (LSU)	Possibly only collection for Peru		1					
Parmeliaceae								
Everniastrum cirrhatum Hale ex Sipman, PJB 2781B (LSU)	1st collection for Dept. Amazonas					1		
Pyrenulaceae								
Pyrenula dermatodes Schaerer**, PJB 3847 (LSU)	Possibly only collection for Peru		1					
Stereocaulaceae								
Stereocaulon ramulosum Rausch, PJB 3502 (LSU)	Only collection for Dept. Amazonas				1			
Teloschistaceae								
Teloschistes flavicans Norman, PJB 2596 (LSU)	1st collection for Dept. Amazonas					1		
MOSSES								
Neckeracee								
Thamnobryum fasiculatum(Sw. ex Hedw.) I. Sastre, PJB 2822 (MO)	1st collection for Dept. Amazonas, only collection for Province Bagua					1	1	
Plagiochilaceae								
Plagiochila grandicrista Steph., AHG 22862 p.p. (MO)	Only collection for Peru		1					
Rhizogoniaceae								
Pyrrhobryum spiniforme (Hedw.) Mitt., AHG 23019 (MO, NY)	1st collection for Dept. Amazonas, only collection for Province Bagua					1	1	
CLUB MOSSES								
Lycopodiaceae								
Huperzia brevifolia (Grev. & Hook.) Holub, PJB 3381 (MO)	1st collection for Dept. Amazonas, only collection for Province Bagua					1	1	
Huperzia colánensis B. Øllgaard, PJB 3446 (MO), 3384 HT (MO), IT (AAU, USM); endemic to type locality	sp. nov., only collections for Peru	1	1					
Huperizia cf. *sellifolia* B. Øllgaard, PJB 3382 (MO)	1st collection for Peru, only collection for Dept. Amazonas			1	1			

	Noteworthiness	sp. nov.*	only coll. Peru	1st coll. Peru	only coll. Am. Dept.	1st coll. Am. Dept.	only coll. Bagua Prov.	1st coll. Bagua Prov.
Lycopodium jussiaei Desv. ex Poiret, PJB 3262 (MO)	Only collection for Dept. Amazonas				1			
Lycopodium pendulinum Hooker, PJB 3199 (MO)	Only collection for Province Bagua						1	
Lycopodium subulatum Desv. ex Poir., AHG et al., 22904 (MO)	1st collection for Peru, only collection for Dept. Amazonas			1	1			
Lycopodium vestitum Desv. ex Poiret, PJB 3193 (MO), 3261 (MO)	Only collections for Province Bagua						1	
SPIKE MOSSES								
Selaginellaceae								
Selaginella asperula Spring, PJB 4458 (MO), 4459 (MO); not from Cerro Colán	1st collections for Dept. Amazonas, only collections for Province Bagua					1	1	
Selaginella geniculata (C. Presl) Spring, PJB 4438 (MO)	Only collection for Province Bagua				1		1	
Selaginella haenkeana Spring, PJB 2820 (MO), 2961 (MO), 4145 (MO)	Only collections for Peru		1					
Selaginella hartwegiana Spring, AHG et al., 23015 (MO)	1st collection for Peru, only collection for Province Bagua			1			1	
Selaginella lechleri Hieronymus, PJB 4505 (MO)	1st collection for Province Bagua							1
Selaginella parkeri (Hook. & Grev.) Spring, PJB 4504 (MO)	1st collection for Dept. Amazonas					1		
Selaginella poeppigiana Spring, AHG et al., 23065 (MO), PJB 2819 (MO), 2493 (MO)	Only collections for Dept. Amazonas				1			
Selaginella revoluta Baker, PJB 4347 (MO)	Only collection for Dept. Amazonas				1			
Selaginella silvestris Asplund, PJB 2962 (MO), 3912 (MO)	Only collections for Province Bagua						1	
Selaginella trisulcata Asplund, PJB 4144 (MO)	1st collection for Dept. Amazonas, only collection for Province Bagua					1	1	
HORSETAILS								
Equisetaceae								
Equisetum giganteum Linnaeus, PJB 2160***(MO), only collection for Dept. Piura	Only collection for Dept. Piura				1			
Equisetum giganteum Linnaeus, PJB 2879 (MO), 2880 (MO), 4360 (F, MO, US)	1st collections for Dept. Amazonas					1		
QUILLWORTS								
Isoetaceae								
Isoetes andicola (Amstutz) L.D. Gómez, PJB 3431 (MO)	Only collection for Dept. Amazonas				1			
Isoetes novo-granadensis H.P. Fuchs, PJB 3189 (MO, US)	Only collection for Peru		1					

APPENDIX 2 continued

	Noteworthiness	sp. nov.*	only coll. Peru	1st coll. Peru	only coll. Am. Dept.	1st coll. Am. Dept.	only coll. Bagua Prov.	1st coll. Bagua Prov.
LARGE FROND FLESHY ROOT FERNS								
Marattiaceae								
Danaea moritziana C. Presl, PJB 2969 (MO), 4520 (MO)	1st collections for Peru, only collections for Province Bagua			1			1	
Marattia laevis Sm., PJB 2479 (F, MO), 3900 (MO, US)	Only collections for Dept. Amazonas				1			
FILMY FERNS								
Hymenophyllaceae								
Hymenophyllum elegantulum Bosch, PJB 3415 (MO, US)	1st collection for Peru, only collection for Dept. Amazonas			1	1			
Hymenophyllum fendlerianum J.W. Sturm, PJB 3539 (MO)	1st collection for Peru, only collection for Province Bagua			1			1	
Hymenophyllum fucoides Swartz, PJB 3598 (MO), AHG et al., 23034 (US)	Only collections for Province Bagua						1	
Hymenophyllum fucoides var. *calodictyon* (Bosch) Stolze, PJB 3586 (MO), 3733 (MO)	1st collections for Peru, only collections for Dept. Amazonas			1	1			
Hymenophyllum fucoides (Sw.) Sw. var. *fucoides,* AHG et al., 23034 (MO), PJB 4091 (MO)	1st collections for Peru, only collections for Province Bagua			1			1	
Hymenophyllum fucoides var. *pedicellatum* (Kunze ex Klotzsch) Hieronymus, PJB 3976 (MO)	1st collection for Peru, only collection for Dept. Amazonas			1	1			
Hymenophyllum hirsutum (L.) Swartz, PJB 2753 (MO)	1st collection for Dept. Amazonas, 1st collection for Province Bagua					1		1
Hymenophyllum lindenii Hooker, PJB 3554 (MO), 3602 (MO), 3751 (MO)	1st collections for Peru, only collections for Province Bagua			1			1	
Hymenophyllum microcarpum Desvaux, PJB 2547 (MO)	1st collection for Peru, only collection for Province Bagua			1			1	
Hymenophyllum multialatum C.V. Morton, PJB 3740 (MO, US)	Only collection for Dept. Amazonas				1			
Hymenophyllum polyanthos (Sw.) Swartz, PJB 2466A (MO), 3752 (MO)	1st collections for Dept. Amazonas, only collections for Province Bagua					1	1	
Hymenophyllum ruizianum (Klotzsch) Kunze, PJB 2840 (MO), 3602 (US), 4092 (MO)	Only collections for Province Bagua						1	
Hymenophyllum undulatum (Sw.) Swartz, PJB 3738 (MO)	Only collection for Dept. Amazonas				1			
Trichomanes accedens C. Presl, PJB 4515 (MO); not from Cerro Colán	1st collection for Dept. Amazonas, only collection for Province Bagua					1	1	

	Noteworthiness	sp. nov.*	only coll. Peru	1st coll. Peru	only coll. Am. Dept.	1st coll. Am. Dept.	only coll. Bagua Prov.	1st coll. Bagua Prov.
Trichomanes botryoides Kaulfuss, PJB 4524 (MO, US); not from Cerro Colán	Only collection for Peru		1					
Trichomanes cellulosum Klotzsch, PJB 4455 (MO); not from Cerro Colán	1st collection for Dept. Amazonas, 1st collection for Province Bagua					1		1
Trichomanes crispum Linnaeus, PJB 4518 (MO, US); not from Cerro Colán	1st collection for Peru and only collection for Dept. Amazonas			1	1			
Trichomanes elegans Richard, PJB 4441 (MO), 4456 (MO); not from Cerro Colán	1st collections for Province Bagua							1
Trichomanes hymenophylloides Bosch, PJB 3904 (MO, US)	Only collection for Peru		1					
Trichomanes krausii Hooker & Greville, PJB 3903 (MO, US)	Only collection for Peru		1					
Trichomanes lucens Swartz, PJB 3371 (F, MO, US)	Only collection for Province Bagua						1	
Trichomanes pellucens Kunze, PJB 4461 (MO); not from Cerro Colán	1st collection for Dept. Amazonas, 1st collection for Province Bagua					1		1
Trichomanes trollii Bergdolt, PJB 4461A (MO), 4462 (MO, US); not from Cerro Colán	1st collections for Dept. Amazonas, 1st collections for Province Bagua					1		1
	TREE FERNS							
Cyatheaceae								
Cyathea bipinnatifida (Baker) Domin, PJB 2764 (MO), 3987 (US)	1st collection for Peru, 1st collection for Dept. Amazonas, 1st collection for Province Bagua			1		1		1
Cyathea caracasana (Klotzsch) Domin, AHG et al., 22897 (MO), PJB 3923 (MO)	Only collections for Province Bagua						1	
Cyathea caracasana var. *boliviensis* (Rosenst.) R.M. Tryon, PJB 2637 (MO), 3611 (US)	1st collection for Peru, only collection for Dept. Amazonas			1	1			
Cyathea conjugata (Spruce ex Hook.) Domin, PJB 3750 (MO)	Only collection for Dept. Amazonas, only collection for Province Bagua				1		1	
Cyathea cystolepis var. *boreopallescens* Lehnert, PJB 3611 (AAU, MO), 3745 (US); not used as a type	var. nov., only collection for Peru	1	1					
Cyathea cystolepis Sodiro, PJB 3745 (MO)	only collection for Peru		1					
Cyathea lasiosora Domin, PJB 4465 (MO, US); not from Cerro Colán	1st collection for Peru, 1st collection for Dept. Amazonas, 1st collection for Province Bagua			1		1		1
Cyathea obnoxia Lehnert, PJB 2836 (MO, US), 3612 (MO, US), 3723 (F, MO); not used as a type	sp. nov., 1st collections for Peru, only collections for Province Bagua	1		1			1	

APPENDIX 2 continued

	Noteworthiness	sp. nov.*	only coll. Peru	1st coll. Peru	only coll. Am. Dept.	1st coll. Am. Dept.	only coll. Bagua Prov.	1st coll. Bagua Prov.
Cyathea pallescens (Sodiro) Domin, PJB 3918 (MO), 4015 (MO)	1st collections for Peru, only collections for Dept. Amazonas, only collections for Province Bagua			1	1		1	
Cyathea cf. *patens* H. Karst., PJB 3590 (MO)	1st collection for Peru, only collection for Dept. Amazonas, only collection for Province Bagua			1	1		1	
Cyathea patens hort. ex Houlston & Moore, PJB 3757 (MO)	1st collection for Peru, only collection for Dept. Amazonas, only collection for Province Bagua			1	1		1	
Cyathea poeppigii (Hook.) Domin, PJB 4385 (MO); not from Cerro Colán	1st collection for Dept. Amazonas, 1st collection for Province Bagua					1		1
Cyathea pungens (Willd.) Domin, PJB 2505 (MO), 4440 (MO), 4445 (MO), 4516 (US)	1st collections for Province Bagua							1
Cyathea squamipes H. Karsten, PJB 3722 (MO, US), 3921 (MO)	1st collections for Peru, 1st collections for Dept. Amazonas, only collections for Province Bagua			1		1	1	
Cyathea straminea (A. Gepp) Alderwerelt, PJB 3453 (MO, US)	1st collection for Peru, 1st collection for Dept. Amazonas, only collection for Province Bagua			1		1	1	
Cyathea werffii R.C. Moran, PJB 4516 (MO); not used for type; not from Cerro Colán	sp. nov., 1st collection for Peru, only collection for Dept. Amazonas	1		1	1			
Sphaeropteris quindiuensis (H. Karst.) R.M. Tryon, PJB 3749 (MO)	Only collection for Dept. Amazonas				1			
Trichipteris pubescens R.M. Tryon, PJB 2529 (MO), 2530 (MO)	1st collections for Peru, only collections for Dept. Amazonas			1	1			
Dicksoniaceae								
Dicksonia sellowiana Hook., PJB 2833 (MO), 2870 (F, MO, US), 3922 (F, MO)	1st collections for Dept. Amazonas, only collections for Province Bagua					1	1	
Lophosoria quadripinnata (J.F. Gmel.) C. Chr., PJB 2833 (F), 3987 (MO), 3988 (MO)	Only collections from Province Bagua						1	
OTHER FERNS								
Aspleniaceae								
Asplenium achilleifolium (M. Martens & Galeotti) Liebmann, PJB 2759 (F, MO)	Only collection for Peru		1					
Asplenium alatum Humb. & Bonpl. Ex Willd., PJB 3901 (US)	1st collection for Peru, only collection for Dept. Amazonas			1	1			

	Noteworthiness	sp. nov.*	only coll. Peru	1st coll. Peru	only coll. Am. Dept.	1st coll. Am. Dept.	only coll. Bagua Prov.	1st coll. Bagua Prov.
Asplenium auriculatum Swartz, PJB 2492 (F, MO)	1st collection for Dept. Amazonas, only collection for Province Bagua					1	1	
Asplenium auritum Swartz, AHG et al., 22997 (F, MO), PJB 2474 (F), 2488 (AAU), 2570 (F, MO), 3715 (MO), 4181 (US), 4191 (MO)	1st collections for Province Bagua							1
Asplenium cirrhatum Richard ex Willdenow, PJB 2501 (MO), 4439 (MO)	1st collections for Dept. Amazonas, 1st collections for Province Bagua					1		1
Asplenium cladolepton Fée, PJB 3896 (MO, US)	1st collection for Peru, 1st collection for Dept. Amazonas, only collection for Province Bagua			1		1	1	
Asplenium feei Kunze ex Fée, PJB 2404 (MO)	Only collection for Peru		1					
Asplenium harpeodes Kunze, PJB 2490 (MO)	1st collection for Dept. Amazonas, only collection for Province Bagua					1	1	
Asplenium laetum Swartz, PJB 2500 (MO), 4181 (MO)	Only collection for Dept. Amazonas				1			
Asplenium macrurum Mickel & Stolze, PJB 2501 (AAU)	1st collection for Peru, only collection for Dept. Amazonas			1	1			
Asplenium perkinsii Jenman, PJB 2821 (MO)	Only collection for Peru		1					
Asplenium radicans var. *uniseriale* (Raddi) L.D. Gomez, PJB 4003 (MO)	1st collection for Peru, only collection for Dept. Amazonas			1	1			
Asplenium rutaceum (Willd.) Mettenius, PJB 4123 (MO, US)	1st collection for Peru, 1st collection for Dept. Amazonas, 1st collection for Province Bagua			1		1		1
Asplenium serra Langsdorf & Fischer, PJB 2477 (MO), 2478 (MO), 2846 (MO, US), 3983 (MO)	1st collections for Dept. Amazonas, only collections for Province Bagua					1	1	
Asplenium serratum Linnaeus, PJB 4513 (MO)	1st collection for Dept. Amazonas, 1st collection for Province Bagua					1		1
Asplenium tricholepis Rosenstock, PJB 2522 (MO), 2376A (MO, US)	Only collections for Dept. Amazonas				1			
Athyriaceae								
Callipteris andina L. Pacheco & R.C. Moran, PJB 2858 (MO); not used for type	sp. nov. only collection for Peru	1		1				
Diplazium divergens Rosenstock, PJB 4191 (MO, US)	1st collection for Peru, only collection for Dept. Amazonas			1	1			
Diplazium pinnatifidum Kunze, PJB 2588 (F, MO), 2814 (F, MO)	1st collections for Peru, 1st collections for Dept. Amazonas, only collections for Province Bagua			1		1		1

APPENDIX 2 continued

	Noteworthiness	sp. nov.*	only coll. Peru	1st coll. Peru	only coll. Am. Dept.	1st coll. Am. Dept.	only coll. Bagua Prov.	1st coll. Bagua Prov.
Diplazium remotum Fée, PJB 2763 (F, MO), 3724 (F, MO, US)	1st collections for Peru, only collections for Dept. Amazonas			1	1			
Diplazium robustum (Sodiro) A. Rojas, PJB 3695 (MO)	Only collection for Peru		1					
Diplazium roemerianum (Kunze) C. Presl, PJB 2647 (F, MO)	1st collection for Dept. Amazonas, 1st collection for Province Bagua					1		1
Diplazium tungurahuae (Sodiro) C. Christensen, PJB 3693 (MO)	1st collection for Peru, only collection for Province Bagua			1			1	
Diplazium venulosum (Baker) Diels, PJB 4189 (MO, US)	1st collection for Peru, only collection for Dept. Amazonas			1	1			
Blechnaceae								
Blechnum acutum (Desv.) Mett., PJB 2501A (F)	Only collection for Peru		1					
Blechnum asplenioides Swartz, PJB 4509 (MO); not from Cerro Colán	1st collection for Dept. Amazonas, 1st collection for Province Bagua					1		1
Blechnum auratum (Fee) R.M. Tryon & Stolze subsp. *auratum,* PJB 3186 (MO), 3204 (MO)	Only collections for Peru		1					
Blechnum auratum subsp. *columbiense* (Hieron.) R.M. Tryon & Stolze, PJB 3372 (MO)	Only collection for Peru		1					
Blechnum binervatum (Poir.) C.V. Morton & Lellinger, PJB 2762 (F, MO)	Only collections for Province Bagua						1	
Blechnum binervatum subsp. *acutum* R.M. Tryon & Stolze, PJB 2507 (MO)	1st collection for Dept. Amazonas, 1st collection for Province Bagua					1		1
Blechnum binervatum subsp. *fragile* (Liebm.) Nissen, PJB 2483 (F, MO)	1st collection for Peru, only collection for Dept. Amazonas			1			1	
Blechnum buchtienii Rosenstock, PJB 3756 (F, MO)	Only collection for Dept. Amazonas				1			
Blechnum cordatum (Desv.) Hieronymus, PJB 4108 (MO)	1st collection for Province Bagua							1
Blechnum fuscosquamosum A. Rojas, PJB 4012 (MO)	1st collection for Peru, only collection for Province Bagua			1			1	
Blechnum loxense (Kunth) Hook. ex Salomon, PJB 3170 (MO), 3179 (MO, US)	Only collections for Dept. Amazonas				1			
Blechnum stipitellatum (Sodiro) C. Christensen, PJB 3467 (MO, US)	1st collection for Peru, 1st collection for Dept. Amazonas, only collection for Province Bagua			1		1	1	
Salpichlaena volubilis (Kaulf.) J. Sm., AHG et al., 22905 (F, MO, US), PJB 2402 (F, MO)	1st collections for Dept. Amazonas, only collections for Province Bagua					1	1	

	Noteworthiness	sp. nov.*	only coll. Peru	1st coll. Peru	only coll. Am. Dept.	1st coll. Am. Dept.	only coll. Bagua Prov.	1st coll. Bagua Prov.
Dennstaedtiaceae								
Dennstaedtia arborescens (Willd.) Ekman ex Maxon, PJB 3982 (MO), 4138 (F, MO, US), 4190 (MO)	1st collections for Peru, 1st collectionf for Dept. Amazonas, only collections Province Bagua			1		1	1	
Dennstaedtia cicutaria (Sw.) T. Moore, PJB 4312 (F)	Only collection for Peru		1					
Dennstaedtia dissecta (Sw.) T. Moore, PJB 2498 (F, MO, US), 4184 (MO)	1st collections for Dept. Amazonas, only collections for Province Bagua					1	1	
Dennstaedtia obtusifolia (Sw.) T. Moore, PJB 3981 (F, MO), 4184 (US)	1st collection for Peru, only collection for Dept. Amazonas			1	1			
Dennstaedtia wercklei (Christ) R.M. Tyron, PJB 2572 (F, MO)	1st collection for Peru, only collection for Dept. Amazonas			1	1			
Pteridium caudatum (L.) Maxon, PJB 4311 (F, MO, US); not from Cerro Colán	1st collection for Dept. Amazonas, 1st collection for Province Bagua					1		1
Dryopteridaceae								
Cyclodium meniscioides (Willd.) C. Presl, PJB 4401A (MO), 4421A (MO); not from Cerro Colán	1st collections for Province Bagua							1
Didymachlaena truncatula (Sw.) J. Smith, PJB 2390 (MO)	1st collection for Dept. Amazonas, 1st collection for Province Bagua					1		1
Elaphoglossum andicola (Fee) T. Moore, AHG et al., 22886 (F)	1st collection for Peru			1	1			
Elaphoglossum bakeri (Sodiro) Christ, PJB 2815 (F, MO)	1st collection for Peru, 1st collection for Dept. Amazonas, only collection for Province Bagua			1		1	1	
Elaphoglossum barbatum (H. Karst.) Hieron., PJB 2847 (MO)	1st collection for Peru, 1st collection for Dept. Amazonas, only collection for Province Bagua			1		1	1	
Elaphoglossum castaneum (Baker) Diels, PJB 3588 (MO, US)	1st collection for Peru, only collection for Dept. Amazonas			1	1			
Elaphoglossum erinaceum (Fee) T. Moore, PJB 2757 (MO)	1st collection for Dept. Amazonas, only collection for Province Bagua					1	1	
Elaphoglossum guamanianum (Sodiro) C. Chr., PJB 2564 (F, MO)	1st collection for Peru, only collection for Dept. Amazonas			1	1			
Elaphoglossum lechlerianum (Mett.) T. Moore, PJB 2954 (MO)	1st collection for Dept. Amazonas, 1st collection for Province Bagua					1		1

APPENDIX 2 continued

	Noteworthiness	sp. nov.*	only coll. Peru	1st coll. Peru	only coll. Am. Dept.	1st coll. Am. Dept.	only coll. Bagua Prov.	1st coll. Bagua Prov.
Elaphoglossum mickeliorum F.B. Matos & R.C. Moran, AHG et al., 22977 (F, MO, NY); not used for a type; endemic to Peru	sp. nov., 1st collection for Peru, only collection for Dept. Amazonas	1		1	1			
Elaphoglossum pachyphyllum (Kunze) C. Chr., AHG et al., 22886 (MO)	1st collection for Peru, 1st collection for Dept. Amazonas, only collection for Province Bagua			1		1	1	
Elaphoglossum pachyrrhizum Mickel, PJB 4111 HT (MO), IT (US); endemic to type locality	sp. nov.	1	1					
Elaphoglossum propinquum (Mett. ex Kuhn) Christ PJB 4175 (MO)	1st collection for Peru, 1st collection for Dept. Amazonas, only collection for Province Bagua			1		1	1	
Elaphoglossum scolopendrifolium (Raddi) J. Smith, PJB 2528 (MO)	1st collection for Peru, only collection for Dept. Amazonas			1	1			
Elaphoglossum styriacum Mickel, PJB 4464 (MO, US); not from Cerro Colán	1st collection for Peru, only collection for Dept. Amazonas			1	1			
Megalastrum andicola (C. Chr.) A.R. Smith & R.C. Moran, AHG et al., 22867 (MO), PJB 2587 (MO)	1st collections for Peru, 1st collections for Dept. Amazonas, only collections for Province Bagua			1		1	1	
Megalastrum honestum (Kunze) A.R. Smith & R.C. Moran, PJB 2499 (F, MO)	1st collection for Peru and only collection for Dept. Amazonas			1	1			
Megalastrum pubirachis R.C. Moran, J. Prado & Sundue, PJB 2394 (MO); not used for a type	sp. nov.; only collection for Peru	1	1					
Megalastrum cf. *vastum* A.R. Sm. & R.C. Moran, PJB 2504 (MO)	Only collection for Amzonas Dept.				1			
Olfersia cervina (L.) Kunze, PJB 2625* (F, MO), 4514 (MO, US)	1st collection for Peru*, 1st collections for Dept. Amazonas, 1st collections for Province Bagua			1		1		1
Polystichum dubium (H. Karst.) Diels, PJB 3898 (F)								
Polystichum montevidense (Spreng.) Rosenstock, PJB 2872 (MO), 3696 (MO), 3905 (MO)	1st collections for Peru, 1st collections for Dept. Amazonas, only collections for Province Bagua			1		1	1	
Polystichum platyphyllum (Willd.) C. Presl, PJB 2400 (F, MO), 2875 (MO)	1st collections for Peru, 1st collections for Dept. Amazonas, only collections for Province Bagua			1		1`	1	

	Noteworthiness	sp. nov.*	only coll. Peru	1st coll. Peru	only coll. Am. Dept.	1st coll. Am. Dept.	only coll. Bagua Prov.	1st coll. Bagua Prov.
Gleicheniaceae								
Gleichenella pectinata (Willd.) Ching, PJB 4488 (MO, US), 4489 (MO)	1st collections for Dept. Amazonas, 1st collections for Province Bagua					1		1
Gleichenia tomentosa (Cav. ex Sw.) Sprengel, PJB 3980 (MO)	1st collection for Peru, 1st collection for Dept. Amazonas, only collection for Province Bagua			1		1		1
Sticherus bifidus (Willd.) Ching, PJB 4331D (MO), 4490 (MO), 4486A (MO); not from Cerro Colán	1st collections for Dept. Amazonas, only collections for Province Bagua					1	1	
Sticherus remotus (Kaulf.) Chrysler, PJB 4485 (MO, US), 4486 (MO); not from Cerro Colán	1st collections for Dept. Amazonas, 1st collections for Province Bagua					1		1
Hemidictyaceae								
Hemidictyum marginatum (L.) C. Presl, PJB 2582 (MO)	1st collection for Dept. Amazonas, only collection for Province Bagua					1	1	
Lindsaeaceae								
Lindsaea divaricata Klotzsch, PJB 4421 (MO); not from Cerro Colán	1st collection for Dept. Amazonas, 1st collection for Province Bagua					1		1
Lindsaea hemiglossa K.U. Kramer, PJB 4463 (MO); not from Cerro Colán	1st collection for Dept. Amazonas, 1st collection for Province Bagua					1		1
Lindsaea lancea (L.) Bedd. var. lancea, PJB 4325 (MO); not from Cerro Colán	1st collection for Dept. Amazonas, 1st collection for Province Bagua					1		1
Metaxyaceae								
Metaxya rostrata (Humb. & Bonpl. ex Willd.) C. Presl, PJB 4414 (MO), 4442 (MO); not from Cerro Colán	1st collection for Province Bagua							1
Nephrolepidaceae								
Nephrolepis biserrata (Sw.) Schott, PJB 4331 (MO); not from Cerro Colán	1st collection for Dept. Amazonas					1		
Nephrolepis pectinata (Willd.) Schott, PJB 4401 (MO, US); not from Cerro Colán	1st collection for Province Bagua							1
Nephrolepis pendula (Raddi) J. Sm., PJB 2616 (MO)	1st collection for Dept. Amazonas, 1st collection for Province Bagua					1		1
Ophioglossaceae								
Ophioglossum palmatum L., PJB 2512 (MO), 2860 (MO), 2940 (MO)	Only collection for Province Bagua						1	
Polypodiaceae								

APPENDIX 2 continued

	Noteworthiness	sp. nov.*	only coll. Peru	1st coll. Peru	only coll. Am. Dept.	1st coll. Am. Dept.	only coll. Bagua Prov.	1st coll. Bagua Prov.
Campyloneurum amazonensis B. León, AHG et al., 22930 HT (USM), IT (F, MO, US), PJB 2487 (MO), 2495 (F, MO); endemic to Peru	sp. nov.; 1st collections for Peru, 1st collections for Dept. Amazonas, only collections for Province Bagua	1		1		1	1	
Campyloneurum angustifolium (Sw.) Fée, PJB 2491 (MO), 2565 (MO)	1st collections for Dept. Amazonas, 1st collections for Province Bagua					1		1
Campyloneurum fasciale (Humb. & Bonpl. ex Willd.) C. Presl, PJB 2487A (MO)	1st collection for Dept. Amazonas, only collection for Province Bagua					1	1	
Campyloneurum phyllitidis (L.) C. Presl, PJB 3986 (MO)	1st collection for Dept. Amazonas, 1st collection for Province Bagua					1		1
Campyloneurum repens (Aubl.) C. Presl, PJB 2812 (MO), 3894B (MO), 4188 (MO, US)	1st collections for Province Bagua							1
Campyloneurum sphenodes (Kunze ex Klotzsch) Fée, PJB 3893 (MO)	Only collection for Dept. Amazonas				1			
Campyloneurum vulpinum (Lindm.) Ching, PJB 2585 (MO)	Only collection for Dept. Amazonas				1			
Enterosora parietina (Klotzsch) L.E. Bishop, PJB 2723 (MO, US)	1st collection for Peru, 1st collection for Dept. Amazonas, only collection for Province Bagua			1		1	1	
Grammitis andicola ? Stolze, PJB 3556 (MO)	1st collection for Peru, only collection for Dept. Amazonas			1	1			
Grammitis firma (J. Sm.) C.V. Morton, PJB 2521 (MO)	1st collection for Peru, 1st collection for Dept. Amazonas, only collection for Province Bagua			1		1	1	
Grammitis herrerae (Copel.) C.V. Morton, PJB 2767 (F, MO)	1st collection for Peru, only collection for Dept. Amazonas			1	1			
Grammitis leucosticta (J. Sm.) C.V. Morton, AHG et al., 23016 (MO), PJB 4137 (MO), 4177 (MO)	1st collections for Peru, only collections for Dept. Amazonas			1	1			
Grammitis moniliformis (Lag. ex Sw.) Proctor, PJB 3152 (MO), 3608 (MO)	Only collections for Province Bagua						1	
Grammitis taxifolia (L.) Proctor, PJB 2835 (MO)	1st collection for Dept. Amazonas, only collection for Province Bagua					1	1	
Grammitis moniliformis (Lag. ex Sw.) Proctor, PJB 3152 (US), 3608 (MO)	Only collections for Province Bagua						1	
Niphidium crassifolium (L.) Lellinger, PJB 2560 (MO)	1st collection for Province Bagua							1
Pecluma eurybasis var. *villosa* (A.M. Evans) Lellinger, PJB 3585 (MO, US), 3731 (MO), 3732 (MO)	1st collections for Peru and only collections for Dept. Amazonas			1	1			
Pleopeltis macrocarpa (Bory ex Willd.) Kaulfuss, PJB 2473 (MO)	Only collection for Province Bagua						1	

	Noteworthiness	sp. nov.*	only coll. Peru	1st coll. Peru	only coll. Am. Dept.	1st coll. Am. Dept.	only coll. Bagua Prov.	1st coll. Bagua Prov.
Polypodium bolivianum Rosenstock, PJB 4109 (MO), 4170 (MO)	1st collections for Peru, only collection for Dept. Amazonas			1	1			
Polypodium eurybasis C. Christensen, PJB 2844 (MO)	1st collection for Peru, 1st collection for Dept. Amazonas, only collection for Province Bagua			1		1	1	
Serpocaulon fraxinifolium (Jacq.) A.R. Smith, PJB 2489 (MO), 2589 (MO), 2760 (MO), 4521 (MO)	1st collections for Province Bagua							1
Serpocaulon lasiopus (Klotzsch) A.R. Smith, PJB 2508 (F, MO)	1st collection for Dept. Amazonas, only collection for Province Bagua					1	1	
Serpocaulon levigatum (Cav.) A.R. Smith, AHG et al., 22906 (F, MO); PJB 2403 (MO), 2534 (MO), 2752 (MO), 2585 (MO)	1st collections for Dept. Amazonas, only collections for Province Bagua					1	1	
Serpocaulon loriceum (L.) A.R. Smith, PJB 3466 (MO), 3979 (MO), 4110 (MO)	Only collections for Province Bagua						1	
Terpsichore communis Moguel, PJB 3601 (MO)	1st collection for Dept. Amazonas, only collection for Province Bagua					1	1	
Pteridaceae								
Adiantum concinnum Humb. & Bonpl. Ex Willd., PJB 2154***(MO); not from Cerro Colan	1st collection for Peru, only collection for Dept. Piura			1	1			
Adiantum macrophyllum Swartz, AHG et al., 23085 (F, MO, US), PJB 4316 (F, MO); not from Cerro Colán	Only collections for Dept. Amazonas				1			
Adiantum polyphyllum Willd., PJB 4315 (MO); not from Cerro Colán	Only collection for Peru		1					
Adiantum subvolubile Mettenius ex Kuhn, PJB 4314 (F, MO); not from Cerro Colán	Only collection for Dept. Amazonas				1			
Antrophytum lineatum (Sw.) Kaulfuss, PJB 2806A (MO)	1st collection for Peru, 1st collection for Dept. Amazonas, only collection for Province Bagua			1		1	1	
Browallia americana L., PJB 2144***(MO); not from Cerro Colan	Only collection for Province Piura***						1	
Eriosorus aureonitens (Hook.) E. Copeland, PJB 3370 (F, MO)	Only collection for Province Bagua						1	
Eriosorus flexuosus (Kunth) E. Copeland, PJB 3592 (MO)	Only collection for Province Bagua						1	
Eriosorus flexuosus (Kunth) Copel. var. *flexuosus* PJB 3754 (F, MO)	Only collection for Dept. Amazonas				1			
Jamesonia imbricata var. *glutinosa* (H. Karst.) A.F. Tryon, AHG 23167 (MO); PJB 3166 (F, MO, US)	Only collections for Province Bagua						1	
Pityrogramma ebenea (L.) Proctor, PJB 3730 (MO)	1st collection for Peru, only collection for Dept. Amazonas			1	1			

APPENDIX 2 continued

	Noteworthiness	sp. nov.*	only coll. Peru	1st coll. Peru	only coll. Am. Dept.	1st coll. Am. Dept.	only coll. Bagua Prov.	1st coll. Bagua Prov.
Pityrogramma trifoliata (L.) R.M. Tryon, PJB 2142***(MO), PJB 2159***(MO); not from Cerro Colan	Only collections for Dept. Piura***				1			
Pityrogramma trifoliata (L.) R.M. Tryon, PJB 4410 (MO)	1st collection for Dept. Amazonas, 1st collection for Province Bagua					1		1
Pteris decurrens C. Presl, AHG et al., 22864 (US)	Only collection for Peru		1					
Pteris deflexa Link, PJB 2701 (F, MO)	1st collection for Peru, 1st collections for Dept. Amazonas, only collection for Province Bagua			1		1	1	
Pteris grandifolia Linnaeus, PJB 4333 (MO); not from Cerro Colán	1st collection for Dept. Amazonas, 1st collection for Province Bagua					1		1
Pteris horizontalis (Fee) Rosenstock, AHG et al., 22864 (MO), PJB 2497 (MO)	Only collections for Peru		1					
Pteris livida Mettenius, AHG et al., 22864 (F), PJB 2497 (F), 2971 (F, MO, US), 3989 (F, MO)	Only collections for Dept. Amazonas				1			
Pteris muricata Hooker, PJB 4192 (MO, US)	1st collection for Dept. Amazonas, only collection for Province Bagua					1	1	
Pteris podophylla Swartz, PJB 2480 (F, MO), 3746 (F, MO, US), 4193 (F, MO)	1st collections for Dept. Amazonas, only collections for Province Bagua					1	1	
Radiovittaria moritziana (Mett.) E.H. Crane, AHG et al., 23017 (MO), PJB 2476 (MO)	1st collections for Peru, only collections for Dept. Amazonas			1	1			
Radiovittaria remota (Fee) E.H. Crane, PJB 3596 (MO)	1st collection for Peru, 1st collection for Dept. Amazonas, only collection for Province Bagua			1		1	1	
Radiovittaria stipitata (Kunze) E.H. Crane, AHG et al., 23076 (F, MO); PJB 2566 (MO), 2766 (MO)	Only collections for Province Bagua						1	
Vittaria gardneriana Fée, PJB 2842 (MO), 3977 (MO, US)	1st collections for Peru, only collections for Dept. Amazonas			1	1			
Vittaria graminifolia Kaulfuss, PJB 2976 (MO, US), 3587 (MO)	1st collections for Peru, 1st collections for Dept. Amazonas, only collections for Province Bagua			1		1	1	
Vittaria lineata (L.) Sm., AHG et al., 22895 (MO, US)	Only collection for Province Bagua						1	
Vittaria stipitata Kunze, AHG et al., 23076 (MO), PJB 2566 (MO), 2766 (MO)	Only collections for Province Bagua						1	

	Noteworthiness	sp. nov.*	only coll. Peru	1st coll. Peru	only coll. Am. Dept.	1st coll. Am. Dept.	only coll. Bagua Prov.	1st coll. Bagua Prov.
Saccolomataceae								
Saccoloma nigrescens (Mett.) A. Rojas, PJB 2481 (MO), 2626 (MO, 3917 (MO), 3985 (MO), 4519 (MO)	1st collections for Peru, 1st collections for Dept. Amazonas, only collections for Province Bagua			1		1	1	
Tectariaceae								
Tectaria buchtienii (Rosenst.) Maxon, AHG et al., 23046 (MO)	Only collection for Peru		1					
Tectaria incisa Cavanilles, PJB 2496 (MO)	Only for Province Bagua						1	
Thelypteridaceae								
Macrothelypteris torresiana (Gaudich.) Ching, PJB 4380 (MO), 4404 (MO); not from Cerro Colán	1st collections for Dept. Amazonas, 1st collections for Province Bagua					1		1
Thelypteris angustifolia (Willd.) Proctor, PJB 4399 (MO); not from Cerro Colán	1st collection for Dept. Amazonas, 1st collection for Province Bagua					1		1
Thelypteris ctenitoides A.R. Smith, PJB 3416 HT (MO); endemic to type locality	sp. nov., only collection for Peru	1	1					
Thelypteris erythrothrix A.R. Smith, PJB 3894A HT (MO); endemic to type locality	sp. nov., only collection for Peru	1	1					
Thelypteris opposita Ching, PJB 4369 (MO)	1st collection for Dept. Amazonas, only collection for Province Bagua					1	1	
Thelypteris opulenta (Kaulf.) Fosberg, PJB 4332 (MO). 4402 (MO, US), 4487 (MO), 4529 (MO); not from Cerro Colán	1st collections for Dept. Amazonas, 1st collections for Province Bagua					1		1
Thelypteris patens (Sw.) Small var. *patens*; PJB 2161***(MO); not from Cerro Colan	1st collection for Peru, only collection for Dept. Piura			1	1			
Thelypteris rudis (Kunze) Proctor, PJB 3694 (MO), 3741 (MO), 4011 (MO), 4106 (MO)	1st collections for Dept. Amazonas, only collections for Province Bagua					1	1	
Thelypteris serrata (Cav.) Alston, PJB 4336 (MO)	Only collection for Dept. Amazonas				1			
	GYMNOSPERMS							
Podocarpaceae								
Podocarpus oleifolius D. Don ex Lamb., PJB 2770 (MO)	1st collection for Dept. Amazonas, only collection for Province Bagua					1	1	
Podocarpus oleifolius D. Don ex Lamb. var. *oleifolius*, PJB 3259 (MO)	1st collection for Peru, 1st collection for Dept. Amazonas, only collection for Province Bagua			1		1	1	
		11	35	81	68	84	87	43

APPENDIX 2 continued

	Noteworthiness	sp. nov.*	only coll. Peru	1st coll. Peru	only coll. Am. Dept.	1st coll. Am. Dept.	only coll. Bagua Prov.	1st coll. Bagua Prov.
7 endemics	Noteworthy records for Peru non-angiosperms	409						
*includes var. nov.								
** not on Checklist of Lichens of Peru, 1 September 2016, Tassilo Fuerer, University of Hamburg								
# Sources: (1) Lois Brako and James L. Zarucchi. 1993. Catalogue of the flowering plants and gymnosperms of Peru. Monogr. Syst. Bot. Missouri Bot. Gard. 45:1–1286.								
(2) Tropicos.org Missouri Botanical Garden December 2018.								
not from Cerro Colan = 4								
(3) Lichens were based on herbarium records from Louisiana State University-Shirley Tucker, pers. comm.								
Ctenitis aff. *submarginalis* (Langsd. & Fisch.) Ching, PJB 3146 (MO)	1st collection for Peru			1				

APPENDIX 3. ANNOTATED LIST OF NOTEWORTHY ANGIOSPERMS FROM CERRO COLAN

The annotated list is divided into Angiosperms, which is subdivided into monocots and dicots. Families, genera, and species are arranged alphabetically beneath each heading. Nomenclature follows what is used in TROPICS. Names of collectors are abbreviated as follows: **AHG et al.** = Al Gentry, Mike Dillion, Jim Aronson, Camilo Diaz, Philip J. Barbour, **PJB** = Philip Barbour. Voucher specimens are deposited in the following herbaria: Aarhus University (AAU), Universidad Nacional de la amazonia Peruana (AMAZ), British Museum of Natural History (BM), Botanical Research Institute of Texas (BRIT), University of Copenhagen (C), Universidad Nacional San Antonio Abad del Cusco (CUZ), Field Museum of Natural History (F), Royal Botanical Gardens Herbarium (HAM), Universidad Nacional de La Libertad-Trujillo (HUT), University of Lethbridge (LEA), University of Texas Austin Herbarium (LL-TEX), Missouri Botanical Garden (MO), Museum National d'Histoire Naturelle (PC), New York Botanical Garden (NY), Swedish Museum of Natural History (S), Universidad Nacional Mayor de San Marcos (USM), United States National Museum of Natural History (US).

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Alstroemeriaceae								
Bomarea amazonica Hofreiter & E. Rodr., AHG et al., 22943 (MO), PJB 2523 (MO), 2859 (MO), 3686 (MO), 4002 (MO)	1st collections for Peru, only collections for Dept. Amaz.			1	1			
Bomarea brevis Baker, PJB 4087 (MO)	Only collection for Dept. Amaz.				1			
Bomarea crassifolia Baker, PJB 3195 (MO), 3418 (MO)	1st collections for Dept. Amaz., only collections for Province Bagua					1	1	
Bomarea distichifolia (Ruiz & Pav.) Baker, PJB 3707 (MO)	1st collection for Dept. Amaz.					1		
Bomarea macranthera Kraenzl., PJB 3419 (MO); endemic to Peru	Only collection Dept. Amaz.				1			
Bomarea nervosa (Herb.) Baker, PJB 3915 (MO)	Only collection for Province Bagua						1	
Bomarea pardina Herb., PJB 2615 (MO), 2680 (MO)	1st collections for Dept. Amaz.					1		
Bomarea sclerophylla Kraenzl., PJB 3182 (MO), 3190 (MO), 3226 (MO); endemic to Peru	1st collections for Peru, only collections for Dept. Amaz.				1		1	
Bomarea setacea (Ruiz & Pav.) Herb., PJB 3168 (MO), 3417 (MO), 3420 (MO)	1st collections for Dept. Amaz., only collections for Province Bagua					1	1	
Amaryllidaceae								
Rauhia staminosa Ravenna, PJB 4234 (USM); endemic to Peru	Only collection for Peru		1					
Araceae								
Anthurium amoenum Kunth & Bouche, AHG et al., 23053 (MO), PJB 2634 (MO), 2643 (MO), 4115 (MO)	1st collections for Dept. Amaz.					1		
Anthurium apaporanum R.E. Schultes, PJB 4506 (MO)	1st collection for Dept. Amaz.					1		
Anthurium aronsonii Croat, AHG et al., 22913 HT (F, MO, USM), 22929 (MO, USM), 22984 (MO, USM); endemic to type locality	sp. nov.; only collections for Peru	1	1					
Anthurium barbourii Croat, AHG et al., 22914 HT (F, MO), 23028 (MO, USM), endemic to type locality	sp. nov., only collections for Peru	1	1					
Anthurium sect. *Belolonchium* (Schott) Engl., PJB 2732 (MO)	1st collection for Dept. Amaz.					1		
Anthurium bogneri Croat, AHG et al., 22894 (MO), PJB 2543 (MO)	1st collections for Peru			1				

APPENDIX 3. ANNOTATED LIST OF ANGIOSPERMS continued

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Anthurium camiloi Croat, AHG et al., 23074 HT (MO); endemic to type locality	sp. nov., only collection for Peru	1	1					
Anthurium coripatense N.E. BR. ex Engl., PJB 2867 (MO) collection for Province Bagua	1st collection for Dept. Amaz., only					1	1	
Anthurium crassinervium (Jacq.) Schott, PJB 2810 (MO)	Only collection for Dept. Amaz.				1			
Anthurium dillonii Croat, AHG et al., 23075 HT (MO); endemic to type locality	sp. nov., only collection for Peru	1	1					
Anthurium ernesti Engl., AHG 23009 (MO), PJB 4429 (MO)	1st collections for Province Bagua							1
Anthurium grahamii Croat, AHG et al., 23037 HT (MO); endemic to type locality	sp. nov.	1						
Anthurium katherineshawae Croat, PJB 3720 HT (MO); endemic to type locality	sp. nov.	1						
Anthurium lingua Sodiro, AHG et al, 22961* (MO), 22985* (MO, USM), PJB 3721 (MO)	1st collections for Dept. Amaz.*, only collections for Province Bagua					1	1	
Anthurium malacophyllum Sodiro, PJB 3968 (MO)	Only collection for Dept. Amaz.				1			
Anthurium oneillii Croat, PJB 2642 HT (MO); endemic to type locality	sp. nov., only collection for Peru	1	1					
Anthurium ovatifolium Engl., AHG et al., 22876 (F, MO, USM), PJB 2540 (F, MO), 2724 (MO),	1st collections for Peru			1				
Anthurium oxybelium Schott, PJB 2874 (MO), 3759 (MO)	1st collections for Dept. Amaz., only collections for Province Bagua					1	1	
Anthurium perlatum Croat, PJB 2857 HT (MO); endemic to type locality	sp. nov., only collection for Peru	1	1					
Anthurium schulenbergii Croat, PJB 2737A HT (MO); endemic to type locality	sp. nov., only collection for Peru	1	1					
Anthurium soukupii Croat, AHG 22969 (MO), PJB 2735 (MO), 2746 (MO)	1st collections for Dept. Amaz., only collections for Province Bagua					1	1	
*Anthurium triphyllum*Brongn. ex Schott, AHG et al., 23005* (MO), 23035* (MO), PJB 2856 (MO)	1st collections for Dept. Amaz.*, only collections for Province Bagua					1	1	
Anthurium variegatum Sodiro, AHG et al., 22995 (MO), PJB 2736 (MO), 2801 (MO), 2838 (MO), 2864 (MO)	1st collections for Peru, only collections for Province Bagua			1			1	
Anthurium versicolor Sodiro, AHG et al., 22965 (MO), 22966* (MO, USM), PJB 2672 (MO), 2698 (MO), 2721 (MO), 2738 (MO), 2830 (MO)	1st collections for Dept. Amaz.*					1		

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Philodendron barbourii Croat, PJB 4511 HT (MO), IT (USM); endemic to type locality; not from Cerro Colán	sp. nov., only collection for Peru	1	1					
Philodendron dillonii Croat, AHG et al., 22965 HT (MO); endemic to type locality	sp. nov., only collection for Peru	1	1					
Philodendron exile G.S. Bunting, PJB 2689 (MO)	only collection for Province Bagua						1	
Philodendron insigne Schott, PJB 4523 (MO), not from Cerro Colán	1st collection for Dept. Amaz.					1		
Philodendron ornatum Schott, AHG et al., 22916 (MO)	1st collection for Dept. Amaz.					1		
Rhodospatha barbourii Croat, PJB 4143 HT (MO), IT (US, USM); endemic to type locality	sp. nov., only collection for Peru	1	1					
Spathiphyllum barbourii Croat, PJB 4460 HT (MO); not from Cerro Colán	sp. nov., 1st collection for Peru	1		1				
Spathiphyllum cannifolium (Dryand. ex Sims) Schott, PJB 4497 (MO); not from Cerro Colán	1st collection for Peru			1				
Spathiphyllum gracile G.S. Bunting, PJB 4517 (MO); not from Cerro Colán; endemic to Peru	1st collection for Dept. Amaz.					1		
Stenospermation amomifolium (Poepp.) Schott, PJB 2510 (MO)	1st collection for Dept. Amaz.					1		
Stenospermation zeacarpium Madison, PJB 2527 (MO), 2630 (MO)	Only collections for Province Bagua						1	
Xanthosoma barbourii Croat & Delannay, PJB 2694 (MO), 3967 HT (MO); endemic to type locality	sp. nov., only collections for Peru	1	1					
Xanthosoma brevispathaceum Engl., AHG et al., 23106 (MO)	1st collection for Province Bagua							1
Arecaceae								
Aiphanes weberbaueri Buerret, AHG et al., 22935 (MO)	1st collection for Dept. Amaz.					1		
Chamaedorea pinnatifrons (Jacq.) Oerst., AHG et al., 22875 (MO), PJB 2386 (MO), 2409 (MO), 2649 (MO), 2677 (MO), 2678 (MO), 3892 (MO), 3954 (MO)	1st collections for Province Bagua							1
Geonoma densa Linden & H. Wendl., PJB 2531 (MO), 2726 (MO), 2831 (MO), 3990 (MO)	1st collections for Peru, only collections for Dept. Amaz.			1	1			
Geonoma deversa (Poit.) Kunth, PJB 4798 (MO)	Only collection from Dept. Amaz.				1			
Geonoma orbignyana Mart. subsp. *orbignyana,* PJB 2742 (MO, NY), 3718 (MO)	1st collections for Dept. Amaz., only collections for Province Bagua					1	1	
Genoma pulcherrima Burret, AHG et al., 22880 (MO)	Only collection for Peru		1					
Geonoma stricta subsp. *divaricata* A.J. Hend., PJB 4446 (MO, NY)	1st collection for Province Bagua							1

APPENDIX 3. ANNOTATED LIST OF ANGIOSPERMS continued

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Geonoma undata Klotzsch subsp. *undata*, PJB 2726 (NY), 4126 (MO, NY)	1st collection for Peru, only collection for Province Bagua			1			1	
Hyospathe elegans Mart. subsp. *elegans,* PJB 2656 (MO, NY)	1st collection for Peru, only collection for Province Bagua			1			1	
Pholidostachys amazonensis A.J. Hend., PJB 4471 HT (USM), IT (MO); not from Cerro Colán; endemic to type locality	sp. nov., only collection for Peru	1	1					
Pholidostachys synanthera (Mart.) H.E. Moore, PJB 4474 (MO)	1st collection for Province Bagua							1
Pholidostachys synanthera (Mart.) H.E. Moore subsp. *synanthera*, PJB 4474 (NY)	1st collection for Peru, 1st collection for Dept. Amaz., only collection for Province Bagua			1		1	1	
Prestoea carderi (W. Bull) Hook. f., AHG et al., 22872 (MO, NY), PJB 2408 (MO, NY), 2632 (MO, NY)	1st collections for Dept. Amaz.					1		
Socratea salazarii H.E. Moore, PJB 4473 (MO), not from Cerro Colán	1st collection for Province Bagua							1
Wettinia drudei (O.F. Cook & Doyle) A.J. Hend., PJB 4472 (MO), not from Cerro Colán	1st collection for Dept. Amaz.					1		
Bromeliaceae								
Aechmea veitchii Baker, AHG et al., 23000 (MO), PJB 2532 (F, MO), 2640 (F, MO)	1st collections for Dept. Amaz., only collections for Province Bagua					1	1	
Guzmania altsonii L.B. Smith, PJB 4470 (MO) not from Cerro Colán for Dept. Amaz.	1st collection for Peru, only collection			1	1			
Guzmania morreniana (Linden ex E. Morren) Mez, AHG et al., 22907 (F, MO)	Only collection for Dept. Amaz.				1			
Guzmania paniculata Mez, PJB 2968 (MO), 3973 (F, MO)	Only collections for Dept. Amaz.				1			
Pepinia peruana H. Luther, PJB 2868 (MO, US); not used for a type, endemic to Peru	sp. nov., 1st collection for Peru, only collection for Dept. Amaz.	1		1	1			
Pitcairnia paniculata (Ruiz & Pav.) Ruiz & Pav., AHG et al., 22955 (MO)	Only collection for Dept. Amaz.				1			
Pitcairnia riparia Mez, PJB 3541 (MO)	1st collection for Peru, only collection for Province Bagua			1			1	
Pitcairnia scandens Ule, AHG et al., 23066 (MO); endemic to Peru	1st collection for Dept. Amaz.					1		
Puya cajasensis Manzan. & W. Till, PJB 3471A (MO); not used for a type	sp. nov., 1st collection for Peru, only collection for Dept. Amaz.	1		1	1			
Puya pitcairnioides L.B. Sm., PJB 4224 (MO); not from Cerro Colán; endemic to Peru	Only collection for Dept. Amaz.					1		

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Puya aff. *pratensis* L.B. Sm., PJB 3375 (MO); endemic to Peru	Only collection for Peru		1					
Racinaea parviflora (Ruiz & Pav.) M.A. Spencer & L.B. Sm., AHG et al., 23067 (MO), PJB 2658 (F, MO), 2659 (MO)	1st collections Province Bagua							1
Racinaea schumanniana (Wittm.) J.R. Grant, AHG et al., 23011 (MO)	1st collection for Dept. Amaz., only collection for Province Bagua					1	1	
Racinaea seemannii (Baker) M.A. Spencer & L.B. Sm., PJB 3203 (F, MO)	1st collections for Dept. Amaz., only collections for Province Bagua					1	1	
Tillandsia biflora Ruiz & Pav., AHG et al., 23038 (MO) Province Bagua	1st collection for Peru, only collection for			1			1	
Tillandsia clavigera Mez, AHG et al., 23058 (MO, US)	Only collection for Dept. Amaz.				1			
Tillandsia complanata Bentham, AHG et al., 22953 (MO), PJB 3743 (F, MO), 3744 (MO)	Only collections for Province Bagua						1	
Tillandsia ferreyrae L.B. Sm., AHG et al.*, 23107 (F, MO); not from Cerro Colán	only collection for Province Bagua						1	
Tillandsia marantoidea Rusby, PJB 2808 (F, MO)	1st collection for Peru, only collection for Province Bagua			1			1	
Tillandsia stenoura Harms, PJB 2772 (F, MO), 3180 (MO), 3244 (MO)	1st collections for Peru, only collections for Dept. Amaz.			1	1			
Tillandsia tovarensis Mez, AHG et al., 22910 (F, MO), PJB 2873 (F, MO)	Only collections from Province Bagua						1	
Vresea espinosae (L.B. Sm.) Gilmartin, PJB 2158*** (MO); not from Cerro Colán	1st collection for Peru, only collection for Dept. Piura***			1	1			
Commelinaceae								
Commelina erecta L., AHG et al., 22831* (MO), PJB 4245 (US); not from Cerro Colán	1st collection for Dept. Amaz., only collection for Province Bagua					1	1	
Gibasis geniculata (Jacq.) Rohweder, AHG et al., 23088 (MO)	1st collection for Province Bagua							1
Tripogandra serrulata (Vahl) Handlos, PJB 4348 (MO, US), not from Cerro Colán	1st collection for Dept. Amaz.					1		
Costaceae								
Costus asplundii (Maas) Maas, AHG et al., 23122 (MO), PJB 4350 (MO), not from Cerro Colán	1st collections for Province Bagua							1
Costus scaber Ruiz & Pav., PJB 4334 (MO), not from Cerro Colán	1st collection for Province Bagua							1

APPENDIX 3. ANNOTATED LIST OF ANGIOSPERMS continued

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Cyclanthaceae								
Asplundia aff. *flavovaginata* Harling, PJB 2633 (MO)	Only collection for Dept. Amaz.				1			
Asplundia aff. *heliocotricha* (Harling) Harling, PJB 4426 (MO), not from Cerro Colán	Only collection for Dept. Amaz.				1			
Carludovica palmata Ruiz & Pav., PJB 4335 (MO), not from Cerro Colán	1st collection for Province Bagua							1
Cyclanthus bipartitus Poit. ex A. Rich., PJB 4424 (MO), not from Cerro Colán	1st collection for Province Bagua							1
Dicranopygium pygmaeum (Gleason) Harling, PJB 4512 (MO), not from Cerro Colán	1st collection for Province Bagua							1
Sphaeradenia oxystigma R. Erikss., PJB 2546 (MO), not used as a type	sp. nov., 1st collection for Peru, only collection for Province Bagua	1		1			1	
Sphaeradenia steyermarkii (Harling) Harling, AHG et al., 23078 (MO), PJB 3553 (MO)	1st collections for Peru, only collections for Province Bagua			1			1	
Cyperaceae								
Cyperus andreanus Maury, PJB 2964 (MO)	1st collection for Peru, only collection for Dept. Amaz.			1	1			
Cyperus digitatus Roxburgh, PJB 4413 (MO), not from Cerro Colán Dept. Amaz.	1st collection for Peru, only collection for			1	1			
Cyperus distans L. f., PJB 4342 (MO), not from Cerro Colán collections for Province Bagua	1st collections for Dept. Amaz., only					1	1	
Cyperus ligularis L., PJB 4370 (F, MO), not from Cerro Colán	1st collection for Dept. Amaz.					1		
Cyperus ochraceus Vahl, M., PJB 4284 (MO), 4395 (MO), not from Cerro Colán	1st collections for Peru				1			
Cyperus odoratus L., PJB 2125 (F), 4246 (MO), not from Cerro Colán	1st collection for Province Bagua							1
Cyperus pichinchensis Kunth, PJB 3449 (MO)	1st collection for Peru, 1st collection for Dept. Amaz., only collection for Province Bagua			1		1	1	
Cyperus surinamensis Rottb., PJB 4343 (MO), not from Cerro Colán collection for Province Bagua	1st collection for Dept. Amaz., only					1	1	
Eleocharis acutangula subsp. *neotropica* D.J. Rosen, PJB 4355 (MO), not from Cerro Colán	Only collection for Dept. Amaz.				1			

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Eleocharis elegans (Kunth) Roem. & Schult., PJB 4406 (MO), not from Cerro Colán	1st collection for Dept. Amaz.					1		
Eleocharis geniculata (L.) Roem. & Schult., PJB 2153*** (MO); not from Cerro Colán	1st collection for Dept. Piura, only collection for Province Piura***					1	1	
Eleocharis geniculata (L.) Roem. & Schult., AHG et al., 22798* (MO), PJB 4495 (MO)	1st collections for Dept. Amaz.					1		
Kyllinga pumila Michx., AHG et al., 22802* (MO), 22855A* (MO), 22885A* (MO)	Only collections for Province Bagua						1	
Rhynchospora aff. *locuples* C.B. Clarke, PJB 3414 (MO)	Only collection for Dept. Amaz.				1			
Rhynchospora macrochaeta Steud. Ex Boeckeler, PJB 3156 (MO) collection for Province Bagua	1st collection for Dept. Amaz., only					1	1	
Rhynchospora paniculata A. Gray, PJB 3577 (MO) Province Bagua	1st collection for Peru, only collection for			1			1	
Scleria macrophylla J. Presl & C. Presl, PJB 4354 (MO), not from Cerro Colán	Only collection for Dept. Amaz.				1			
Scleria microcarpa var. *latifolia* Boeckeler, PJB 4331K (MO), not from Cerro Colán	Only collection for Dept. Amaz.				1			
Uncinia hamata (Sw.) Urb., PJB 3842 (MO), PJB 3914 (MO) Dept. Amaz.	1st collections for Peru, only collections for			1	1			
Dioscoreaceae								
Dioscorea huallagensis Knuth, PJB 4166 (MO, USM)	Only collection for Peru		1					
Dioscorea syringifolia Kunth & M.R. Schomb., PJB 2729 (MO), 3406 (MO)	1st collection for Dept. Amaz.					1		
Eriocaulaceae								
Paepalanthus pilosus (Kunth) Kunth, PJB 3247 (MO) collection for Province Bagua	1st collection for Dept. Amaz., only					1	1	
Haemodoraceae								
Xiphidium caeruleum Aubl., PJB 4337 (MO), not from Cerro Colán	1st collection for Province Bagua							1
Heliconiaceae								
Heliconia aemygdiana Burle-Marx, AHG et al., 22917 (MO)	1st collection for Province Bagua							1
Heliconia chartacea Lane ex Barreiros, AHG et al., 23116* (MO), not from Cerro Colán	1st collection for Province Bagua							1

APPENDIX 3. ANNOTATED LIST OF ANGIOSPERMS continued

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Heliconia dielsiana Loesener, PJB 2391 (MO), 2392 (MO), AHG et al., 23099 (F)	1st collections for Peru		1					
Heliconia scarlatina Abalo & Morales, PJB 2628 (MO) Dept. Amaz., only collection for Province Bagua	1st collection for Peru, 1st collection for			1		1	1	
Heliconia subulata Ruiz & Pav., PJB 2388 (MO), 2638 (MO), 2648 (MO) collections for Province Bagua	1st collections for Dept. Amaz., only					1	1	
Heliconia vellerigera Poepp., AHG et al., 23104* (MO), not from Cerro Colán	1st collection for Province Bagua							1
Heliconia velutina L. Andersson, PJB 4448 (MO), not from Cerro Colán	1st collection for Province Bagua							1
Heliconia wagneriana Petersen, AHG et al., 23105* (MO), not from Cerro Colán	1st collection for Peru, only collection for Dept. Amaz.			1	1			
Marantaceae								
Calathea attenuata H. Kenn., PJB 2869 (MO)	1st collection for Province Bagua							1
Calathea nigricans Gagnep., AHG et al., 23095 (MO)	Only collection for Dept. Amaz.				1			
Ischnosiphon fusiformis Anderson, PJB 4430* HT (MO), IT (GB); not from Cerro Colán; endemic to Peru	sp. nov., 1st collection for Dept. Amaz., 1st x 1st collection for Province Bagua	1				1		1
Orchidaceae								
Brachionidium elegans Luer & Hirtz, PJB 3561A (MO)	1st collection for Peru, only collection for Dept. Amaz.			1	1			
Brachionidium furfuraceum Leur, PJB 3561 (MO) Dept. Amaz.	1st collection for Peru, only collection for			1	1			
Cranichis ciliata (Kunth) Kunth, PJB 3567 (MO)	Only collection for Province Bagua						1	
Cyrtochilum cimiciferum (Rchb. f.) Dalstrom, PJB 2559 (MO)	1st collection for Peru, only collection for Dept. Amaz.			1	1			
Cyrtochilum macranthum Kraenzlin, PJB 3594 (MO), 4103 (MO)	Only collections for Province Bagua						1	
Dichaea muricata (Sw.) Lindl., PJB 3955 (MO)	1st collection for Peru, first collection for Dept. Amaz., only collection for Province Bagua			1		1	1	
Elleanthus hirsutis Barringer, AHG et al., 22990 HT (F), IT (F, MO), PJB 2518 (F, MO), endemic to Peru	sp. nov., 1st collections for Peru, 1st collections for Dept. Amaz., only collections for Province Bagua	1		1		1	1	

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Elleanthus linifolius C. Presl, PJB 2586 (MO)	Only collection for Dept. Amaz.				1			
Epidendrum elatum C. Schweinf., PJB 4099 (MO), 4100 (MO)	Only collections for Dept. Amaz.						1	
Epidendrum jajense Rchb. f., AHG et al., 22924 (MO)	1st collection for Dept. Amaz., only collection for Province Bagua					1		1
Epidendrum laceratum C. Schweinf., PJB 3238 (MO)	Only collection for Peru		1					
Epidendrum macrostachyum Lindley, PJB 3241 (MO), 3242 (MO),) 3251 (MO), 3780 (MO	1st collections for Peru, only collections for Province Bagua		1		1			
Epidendrum cf. *macrostachyum* Lindl. PJB 3251 (MO)	1st collections for Peru, only collections for Province Bagua		1		1			
Epidendrum recurvitepalostachyum Hagsater & E. Santiago, PJB 3202 (F, MO), not used for a type	sp. nov., only collection for Peru	1	1					
Epidendrum cf. *rhombochilum* L. Williams, PJB 3165 (MO)	1st collection for Peru, only collection for Dept. Amaz.		1	1				
Epidendrum rhopalostele Hagsater & Dodson, AHG et al., 22871 (MO, NY), 22996 (MO), PJB 2485 (MO), 2549 (MO), not used for a type	sp. nov., 1st collections for Peru, 1st collections for Dept. Amaz., only collections for Province Bagua	1		1		1	1	
Epidendrum rigidum Jacquin, PJB 3468 (MO)	Only collection for Dept. Amaz.				1			
Epidendron scabrum Ruiz & Pav., PJB 3766 (MO)	Only collection for Dept. Amaz.				1			
Epidendron sophronitoides Lehmann & Kraenzlin, PJB 3765 (MO)	Only collection for Peru		1					
Eulophia alta Fawcett & Rendle, PJB 4356 (MO), not from Cerro Colán	1st collection for Dept. Amaz., only collection for Province Bagua					1	1	
Fernandezia crystallina (Lindl.) M.W. Chase, PJB 3258 (F, MO)	Only collection for Dept. Amaz.				1			
Fernandezia distichoides M.W. Chase, PJB 3563 (MO), 3771 (MO)	Only collections for Province Bagua						1	
Fernandezia cf. *hagsateri* (Dodson) M.W. Chase, PJB 3163 (MO), not used for a type	sp. nov., 1st collection for Peru, 1st collection for Dept. Amaz., only collection for Province Bagua	1		1		1	1	
Galeottia acuminata (C. Schweinf.) Dressler & Christenson, AHG et al., 22874 (MO)	1st collection for Peru, only collection for Dept. Amaz.			1	1			
Gomphichis valida Rchb. f., PJB 3184 (MO)	1st collection for Peru, only collection for Dept. Amaz.			1	1			
Malaxis termensis var. *elata* C. Schweinf., PJB 2865 (MO); endemic to Peru	1st collection for Peru, only collection x to Peru		1				1	

APPENDIX 3. ANNOTATED LIST OF ANGIOSPERMS continued

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Masdevallia bicolor Poepp. & Endl. AHG et al., 22925 (MO)	1st collection for Peru, only collection for Dept. Amaz.		1	1				
Masdevallia ustulata Luer, PJB 3684 (MO), 4097 (MO)	1st collections for Peru, only collections for Dept. Amaz.		1	1				
Masdevallia cf. *xanthina* Rchb. f., AHG et al., 23014 (MO)	1st collection for Peru, only collection for Province Bagua		1			1		
Maxillaria alpestris Lindley, PJB 3548 (MO), 3727 (MO), 3779 (MO) Dept. Amaz.	1st collections for Peru, only collections for		1	1				
Maxillaria alticola C. Schweinf., PJB 3774 (MO) Dept. Amaz.	1st collection for Peru, only collection for		1	1				
Maxillaria aurea var. *gigantea* Schweinfurth, PJB 3728 (MO), 3782 (MO)	1st collections for Dept. Amaz., only collections for Province Bagua				1	1		
Maxillaria ecuadorensis Schlechter, AHG et al., 22958 (MO)	Only collections for Peru		1					
Maxillaria cf. *ecuadorensis* Schltr., PJB 2513 (MO)	Only collection for Peru		1					
Maxillaria floribunda Lundl., PJB 3566 (F, MO), 3781 (MO)	Only collections for Dept. Amaz.				1			
Maxillaria aff. *grandiflora* (Kunth) Lindl., PJB 3552 (MO)	1st collection for Peru, only collection for Province Bagua			1			1	
Maxillaria grandiflora vel sp. aff. (Kunth) Lindl., PJB 3773 (MO) Province Bagua	1st collection for Peru, only collection for			1			1	
Maxillaria hastulata Lindl., PJB 3247 (MO), 3777 (MO)	1st collections for Peru, only collections for Dept. Amaz.			1	1			
Maxillaria cf. *hastulata* Lindl., PJB 3247 (MO)	1st collection for Peru, only collection for Dept. Amaz.			1	1			
Maxillaria jamesonii Garay & Schweinfurth, AHG 22999 (F, MO), PJB 2725 (MO), 2862 (MO)	1st collections for Peru, only collections for Province Bagua			1			1	
Maxillaria lepidota Lindl., AHG et al., 22987 (F, MO)	1st collections for Peru, only collections for Province Bagua			1			1	
Maxillaria cf. *lepidota* Lindl., PJB 2512A (MO)	1st collections for Peru, only collections for Province Bagua			1			1	
Maxillaria mapiriensis (Kraenzl.) L.O. Williams, AHG et al., 23077 (MO)	1st collection for Peru, only collection for Dept. Amaz.			1	1			
Maxillaria cf. *mapiriensis* (Kraenzl.) L.O. Williams, PJB 2416 (MO)	1st collection for Peru, only collection for Dept. Amaz.			1	1			

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Maxillaria meridensis Lindley, PJB 2515 (MO)	Only collection for Dept. Amaz.				1			
Maxillaria notylioglossa Rchb. f. PJB 2556 (MO)	Only collection for Province Bagua						1	
Maxillaria patella J.T. Atwood, PJB 3256 (MO), not used for a type	sp. nov., 1st collection for Peru, only collection for Amazonas	1		1	1			
Maxillaria pseudonubigena J.T. Atwood, PJB 2574 (MO)	1st collection for Dept. Amaz., only collection for Province Bagua					1	1	
Maxillaria cf. *rotundilabia* C. Schweinf., PJB 3159 (MO) collection for Province Bagua	1st collection for Dept. Amaz., only					1	1	
Maxillaria cf. *setigera* Lindl., PJB 2557 (MO)	Only collection for Dept. Amaz.				1			
Maxillaria spilotantha Reichenbach, PJB 2727 (MO)	Only collection for Dept. Amaz.				1			
Maxillaria aff. *splendens* Poepp. & Endl., PJB 2771 (MO)	1st collection for Dept. Amaz., only collection for Province Bagua					1	1	
Octomeria tridentata Lindl., PJB 4452 (MO); not from Cerro Colán	1st collection for Dept. Amaz.					1		
Odontoglossum graminifolium C. Schweinf., PJB 2758 (MO), 3685 (MO)	Only collections for Dept. Amaz.				1			
Odontoglossum cf. *graminifolium* C. Schweinf., PJB 3593 (MO)	Only collections for Dept. Amaz.				1			
Pityphyllum huancabambae (Kraenzl.) Whitten, PJB 2708 (MO)	1st collection for Peru, 1st collection for Dept. Amaz., only collection for Province Bagua			1		1	1	
Pleurothallis acestrophylla Luer, PJB 2803 (MO); previously endemic to Ecuador	Only collection for Peru		1					
Pleurothallis bivalvis Lindl., PJB 2728 (F, MO, NY)	1st collection for Peru, only collection for Province Bagua			1			1	
Pleurothallis cf. *setigera* Lindl., PJB 2579 (MO)	Only collection for Peru		1					
Pleurothallis trachysepala Kraenzl., AHG et al., 22921 (F, MO)	1st collection for Amazonas, only collection for Province Bagua					1	1	
Prosthechea vespa (Vell.) W.E. Higgins, PJB 4453 (MO), not from Cerro Colán	1st collections for Dept. Amaz., 1st collections for Province Bagua					1	1	
Prosthechea cf. *vespa* (Vell.) W.E. Higgins, AHG et al., 22951 (MO), PJB 2663 (MO), 2697 (MO); not from Cerro Colán	1st collections for Dept. Amaz., 1st collections for Province Bagua					1	1	
Psilochilus macrophyllus (Lindl.) Ames, AHG et al., 22923 (MO), PJB 2509 (MO), 2524 (MO)	1st collections for Peru, only collections for Province Bagua			1			1	

APPENDIX 3. ANNOTATED LIST OF ANGIOSPERMS continued

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Sphyrastylis dalstromii Dodson, AHG et al., 23062 (MO), PJB 2468 (MO), 2469 (MO), 2550 (MO), 2551 (MO), 2577 (MO), 2661 (MO), 2688 (MO), not used for a type	sp. nov., only collections for Peru	1	1					
Stelis bicornis Lindl., PJB 2841 (F, MO)	1st collection for Peru, only collection for Province Bagua			1			1	
Stelis chachapoyensis Rchb. f., PJB 3560 (MO)	Only collection for Dept. Amaz.				1			
Stelis platystachya Garay & Dunst., PJB 3699 (MO)	Only collection for Peru		1					
Stelis triseta Lindl., AHG et al., 22979 (MO), 22983 (MO)	1st collections for Dept. Amaz., only collections for Province Bagua					1	1	
Telipogon venustus Schltr., PJB 3183 (MO)	1st collection for Peru, only collection for			1			1	
Trichosalpinx arbuscula (Lindl.) Leur, PJB 3569 (MO) Province Bagua	1st collection for Peru, only collection for Province Bagua		1			1		
Poaceae								
Arthrostylidium venezuelae McClure, PJB 3610 (F, MO)	Only collection for Peru		1					
Arundinella berteroniana (Schult.) Hitchc. & Chase, PJB 4477 (MO)	1st collectioin for Dept. Amaz., 1st collection for Province Bagua					1		1
Aulonemia humillima (Pilg.) McClure, AHG et al., 22898 (MO, US); endemic to Peru	Only collection Dept. Amaz.				1			
Brachiaria mutica (Forssk.) Stapf, PJB 2137*** (MO); not from Cerro Colán	only collection for Dept. Piura***				1			
Calamagrostis recta Trinius, PJB 3245 (MO), 3469 (MO)	Only collections for Province Bagua						1	
Cenchrus bambusiformis (E. Fourn.) Morrone, PJB 4141 (MO) for Province Bagua	1st collection for Dept. Amaz., 1st collection					1		1
Cenchrus purpureus (Schumach.) Morone, PJB 4407 (MO) not from Cerro Colán	1st collection for Dept. Amaz., 1st collection for Province Bagua					1		1
Chloris elata Desvaux, PJB 4235 (MO, NY)	Only collection for Dept. Amaz.				1			
Chusquea aspera L.G. Clark, AHG 22931 (MO, US); endemic to Peru	Only collection for Dept. Amaz.				1			
Chusquea neurophylla L.G. Clark, PJB 3547 (MO)	Only collection for Peru		1					
Chusquea scandens Kunth, PJB 3472 (MO, US) collection for Province Bagua	1st collection for Dept. Amaz., only					1	1	
Cortaderia bifida Pilg., PJB 3555 (MO)	Only collection for Province Bagua						1	

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Eleusine indica (L.) Gaertn., PJB 4247 (MO), not from Cerro Colán	1st collection for Dept. Amaz., 1st collection for Province Bagua					1		1
Eragrostis atrovirens (Desfontaines) Trinius ex Steudel, PJB 4351 (MO)	1st collection for Peru, only collection for Dept. Amaz.			1	1			
Eragrostis prolifera (Swartz) Steudel, PJB 4351 (MO)	Only collection for Dept. Amaz.				1			
Ichnanthus nemorosus (Sw.) Doll, PJB 2396 (MO)	1st collection for Peru, only collection for Dept. Amaz.		1	1				
Lasiacis ligulata Hitchc. & Chase, AHG et al., 22837* (MO), not from Cerro Colán	1st collection for Province Bagua							1
Lasiacis nigra Davidse, PJB 2693 (MO)	Only collection for Province Bagua						1	
Neurolepis aristata ((Munro) A. Hitchcock, PJB 3155 (MO, US), 3377 (MO)	1st collections for Peru, only collections for Dept. Amaz.			1	1			
Orthoclada laxa (Rich.) P. Beauv., PJB 4423 (MO), not from Cerro Colán	1st collection for Province Bagua				1			
Oryza alta Swallen, PJB 4405 (F)	Only collection for Dept. Amaz.				1			
Oryza latifolia Desv., PJB 4405 (F)	Only collection for Dept. Amaz.				1			
Panicum trichoides Sw., PJB 2145*** (MO); not from Cerro Colán	only collection for Dept. Piura***				1			
Panicum trichoides Sw., PJB 2145 (MO)	1st collection for Province Bagua							1
Paspalum conjugatum P.J. Bergius, PJB 4377 (MO), not from Cerro Colán	1st collection for Province Bagua							1
Paspalum scabrum Scribn., AHG et al., 22937 (MO)	Only collection for Dept. Amaz.				1			
Rugoloa pilosa (Sw.) Zuloaga, PJB 4387 (MO), not from Cerro Colán	1st collection for Province Bagua							1
Smilacaceae								
Smilax domingensis Willd, PJB 3712 (MO)	1st collection for Province Bagua							1
Smilax purhampuy Ruiz, AHG et al., 22902 (MO)	1st collection for Province Bagua							1
Tofieldiaceae								
Harperocallis falcata (Ruiz & Pav.) L.M. Campb. & Dorr, PJB 3188 (MO), 3229 (MO), 3444 (MO)	Only collections for Province Bagua						1	
Xyridaceae								
Xyris subulata Ruiz & Pav., PJB 3542 (MO)	Only collection for Province Bagua						1	
Xyris subulata var. *breviscapa* Idrobo & L.B. Sm., PJB 3454 (MO)	1st collection for Peru, only collection for Dept. Amaz.			1	1			

APPENDIX 3. ANNOTATED LIST OF ANGIOSPERMS continued

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Zingiberaceae								
Renealmia stelluata Steyerm., AHG et al., 22950 (MO), PJB 2717 (MO), 2807 (MO)	Only collections for Peru		1					
Renealmia thyrsoidea (Ruiz & Pav.) Poepp. & Endl., AHG et al., 22950 (MO), 23055 (MO)	1st collections for Province Bagua							1
Renealmia thyrsoidea (Ruiz & Pav.) Poepp. & Endl. subsp. *thyrsoidea*, PJB 2413 (MO), 2414 (MO), 2636 (MO), 2740 (MO), 2837 (MO)	1st collections for Province Bagua							1
Renealmia wurdackii Maas, PJB 2690 (MO)	1st collection for Peru, 1st collection for Amazonas Province, only collection for Province Bagua		1		1	1		
	DICOTYLEDONS							
Acanthaceae								
Aphelandra campii Wassh., AHG et al., 22912 (F, MO)	Only collection for Peru		1					
Aphelandra dasyantha Wassh., AHG et al., 23092 (MO)	Only collection for Peru		1					
Aphelandra jacobinioides Lindau, AHG et al., 22912 (US), PJB 2543 (MO, US); endemic to Peru	Only collections for Dept. Amaz.				1			
Aphelandra wurdackii Wasshausen, PJB 3991 (MO)	1st collection for Peru, only collection for Province Bagua			1			1	
Razisea ericae Mildbr. ex Wassh., PJB 2564A (MO)	1st collection for for Dept. Amaz., only collection for Province Bagua					1	1	
Ruellia zeylanica Roxb., PJB 4134 (MO, US)	Only collection for Peru		1					
Sanchezia cf. *flava* Leonard, AHG et al., 22835 (MO); not from Cerro x collection for Province Bagua	Only collection for Province Bagua						1	
Sanchezia megalia Leonard & L.B. Sm., AHG et al., 23100 (MO, US), PJB 4358 (MO); not from Cerro Colán	1st collections for Province Bagua							1
Sanchezia oxysepala Mildbr., PJB 4349 (US)	1st collection for Province Bagua							1
Amaranthaceae								
Alternanthera halimifolia (Lam.) Standl. ex Pittier, PJB 4250 (F, MO)	Only collection for Dept. Amaz.				1			
Alternanthera mexicana vel sp. aff. Moq., PJB 4275 (MO)	Only collection for Province Bagua						1	
Alternanthera mexicana Moq., PJB 4005 (MO)	Only collection for Province Bagua						1	
Alternanthera porrigens (Jacq.) Kuntze, PJB 2155*** (MO); not from Cerro Colán	1st collectioin for Province Piura***							1

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Iresine diffusa Humb. & Bonpl. ex Willd., PJB 2967 (MO), 4118 (MO)	1st collections for Province Bagua							1
Anacardiaceae								
Schinus molle L., PJB 2855*** (MO); not from Cerro Colán	1st collections for Dept. Cajamarca***					1		
Annonaceae								
Cremastosperma oblongum R.E. Fr., AHG et al., 23009 (MO); endemic to Peru	Only collection for Dept. Amaz.				1			
Cremastosperma yamayakatense Pirie, PJB 4432 (MO)	1st collection for Province Bagua							1
Guatteria cf. *asplundiana* R.E. Fr., AHG et al., 22860 (MO)	1st collection for Peru		1					
Guatteria punctata (Aubl.) R.A. Howard, AHG et al., 22870 (MO)	1st collection for Province Bagua							1
Apiaceae								
Azorella multifida (Ruiz & Pav.) Pers., PJB 3379 (MO)	Only collection for Province Bagua						1	
Spananthe paniculata Jacquin var. *paniculata*, PJB 4265 (MO) Dept. Amaz.	1st collection for Peru, only collection for			1		1		
Apocynaceae								
Asclepias curassavica L., PJB 4228 (F, MO), not from Cerro Colán, along roadside between La Peca and Bagua Chica	1st collection for Dept. Amaz.					1		
Odontadenia verucosa (Roem. & Schult.) K. Schum. ex Markgr., PJB 4412 (F, MO)	1st collection for Province Bagua							1
Aquifoliaceae								
Ilex microphylla Hook., PJB 3176 (MO), 3463 (MO); endemic to Peru	1st collections for Peru, only collections for Province Bagua			1			1	
Ilex nervosa Triana, PJB 3761 (MO)	1st collection for Peru, only collection for Dept. Amaz.			1	1			
Ilex teratopis Loes., PJB 3191 (MO)	1st collection for Peru, only collection for Province Bagua			1			1	
Araliaceae								
Hydrocotyle bonplandii var. *glabra* Mathias, PJB 3441 (MO)	Only collection for Peru		1					
Hydrocotyle quinqueloba Ruiz & Parvón, PJB 3590 (MO), 4012A (MO)	Only collections for Peru		1					
Hydrocotyle steyermarkii Mathias & Constance, PJB 3711 (MO)	1st collection for Peru			1		1		
Schefflera vel sp. nov. JR. Forst. & G.Forst., PJB 3742 (MO); *Schefflera gayleriana* sp. nov., det. Marcela Mora 2018; endemic to type locality	sp. nov., only collection for Peru	1	1					

APPENDIX 3. ANNOTATED LIST OF ANGIOSPERMS continued

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Aristolochiaceae								
Aristolochia deltoidea Kunth, AHG et al., 22804* (MO), not from Cerro Colán	Only collection for Dept. Amaz.				1			
Asteraceae								
Acmella brachyglossa Cass., PJB 4294 (MO, US), 4298 (MO, US), not from Cerro Colán	1st collection for Province Bagua							1
Acmella ciliata (Kunth) Cass., PJB 2120*** (MO)	Only collection for Dept. Lambayeque				1			
Adenostemma fosbergii R.M. King & H. Rob., PJB 4305 (MO); not from Cerro Colán	1st collection for Province Bagua							1
Ageratum conyzoides L., AHG et al., 22844 (MO), 22947 (MO), PJB 4300 (MO)	1st collections for Peru, only collections for Province Bagua			1			1	
Ageratum conyzoides subsp. *conyzoides* L., AHG et al., 22844 (US), 22947 (US)	Only collections for Peru		1	1			1	
Ambrosia tenuifolia Spreng., PJB 2126*** (MO)	1st collection for Peru, only collection for Dept. Lambayeque			1		1		
Austroeupatorium decemflorum (DC.) R.M. King & H. Rob., AHG et al., 22854 (MO, US)	1st collection for Dept. Amaz., only collection for Province Bagua					1	1	
Ayapana elata (Steetz) R.M. King & H. Rob., PJB 4397 (MO), not from Cerro Colán	1st collection for Dept. Amaz.					1		
Baccharis brachylaenoides DC., PJB 2948 (MO), 3830 (MO)	Only collections for Province Bagua						1	
Baccharis pedunculata (Mill.) Cabrera, AHG et al., 23082 (MO), not from Cerro Colán	1st collection for Dept. Amaz., only x not from Cerro Colán					1	1	
Baccharis salicifolia (Ruiz & Pav.) Pers., AHG et al., 23223 (MO), not from Cerro Colán	1st collection for Dept. Amaz.					1		
Baccharis sinuata Kunth, AHG et al., 23149 (MO), PJB 3378 (MO)	Only collections for Dept. Amaz.				1			
Baccharis trinervis Pers., AHG et al., 23215 (MO), not from Cerro Colán	Only collection from Province Bagua						1	
Bidens pilosa L., AHG et al., 22855 (MO), PJB 4252 (MO)	1st collection for Province Bagua							1
Bidens squarrosa vel sp. aff. Kunth, AHG et al., 22811 (MO): not from Cerro Colán	1st collection for Dept. Amaz., only collection for Province Bagua	1	1					
Brickellia diffusa (Vahl) A. Gray, PJB 4268 (MO); not from Cerro Colán	Only collection for Province Bagua						1	

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Chaptalia oblonga D. Don, PJB 3158 (MO), 3244 (MO)	1st collections for Peru, only collections for Dept. Amaz.		1	1				
Chromolaena odorata (L.) R.M. King & H. Rob., PJB 2152*** (MO); not from Cerro Colán	only collection for Dept. Piura***		1					
Chromolaena odorata (L.) R.M. King & H. Rob., AHG et al., 22809 (MO); not from Cerro Colán	1st collection for Dept. Amaz., only collection for Province Bagua					1	1	
Clibadium peruvianum Poepp. ex DC., AHG et al., 23125 (MO), not from Cerro Colán	Only collection for Dept. Amaz.				1			
Clibadium surinamense L., PJB 4299 (MO), not from Cerro Colán	Only collection for Dept. Amaz.				1			
Conyza sumatrensis var. *leiotheca* (S.F. Blake) Pruski & G. Sancho, AHG et al., 22946 (MO)	1st collection for Province Bagua							1
Conyza sumatrensis (Retz.) E. Walker var. *sumatrensis,* PJB 4264 (MO)	Only collection for Dept. Amaz.				1			
Critoniella acuminata (Kunth) R.M., AHG et al., 22848 (MO, US)	1st collection for Peru, only collection for Province Bagua			1			1	
Cuatrecasanthus jelskii (Hieron.) H. Rob., PJB 3735 (MO)	1st collection for Peru, only collection for Dept. Amaz.			1	1			
Cyrtocymura scorpioides (Lam.) H. Rob., AHG et al., 22845 (MO)	1st collection for Dept. Amaz.					1		
Diplostephium sagasteguii Cuatrec., PJB 3162 (MO)	1st collection for Peru, only collection for Province Bagua			1			1	
Eclipta prostrata (L.) L., PJB 4371 (MO), not from Cerro Colán	1st collection for Province Bagua							1
Elephantopus mollis Kunth, AHG et al., 22850 (MO)	1st collection for Province Bagua							1
Erato polymniodes DC., AHG et al., 22847 (MO)	1st collection for Dept. Amaz.					1		
Erechtites hieraciifolius (L.) Raf. ex DC., AHG et al., 22901 (F, MO)	1st collection for Amasonas Dept., only collection for Province Bagua							1
Erechtites valerianifolius (Link ex Spreng.) DC., AHG et al., 22857 (MO)	1st collection for Dept. Amaz., only collection for Province Bagua					1	1	
Ericentrodea mirabilis (Sherff) S.F. Blake & Sherff, PJB 2809 (MO)	1st collection for Peru, only collection for Amazonas			1	1			
Flaveria bidentis (L.) Kuntze, AHG et al., 22797 (MO): not from Cerro Colán	1st collection for Province Bagua						1	
Fleischmannia microstemon (Cass.) R.M. King & H. Rob., AHG et al., x Cerro Colán	Only collection for Province Bagua						1	
Gamochaeta coarctata (Willd.) Kerguelen, AHG et al., 22945 (MO)	Only collection for Dept. Amaz.				1			

APPENDIX 3. ANNOTATED LIST OF ANGIOSPERMS continued

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Gamochaeta spicata Cabrera, PJB 3579 (MO), 4096 (MO)	Only collections for Dept. Amaz.				1			
Garcilassa rivularis Poepp., PJB 4266 (MO) not from Cerro Colán	Only collection for Province Bagua						1	
Gynoxys colánensis Dillon & Sagástegui, PJB 3409 HT (F), IT (HUT, MO); endemic to type locality	sp. nov., only collection for Province Bagua	1					1	
Hebeclinium macrophyllum (L.) DC., PJB 4302 (MO), not from Cerro Colán	1st collection for Province Bagua							1
Jaegeria hirta (Lag.) Less., AHG et al., 22944 (MO)	1st collection for Dept. Amaz.					1		
Lagascea mollis Cav., AHG et al., 22832 (MO), PJB 4251 (MO), not from Cerro Colán	1st collections for Province Bagua							1
Liabum floribundum Less., PJB 3996 (MO, US)	1st collection for Dept. Amaz., only collection for Province Bagua					1	1	
Liabum wurdackii Ferreyra, PJB 4304 (MO, US); not from Cerro Colán; endemic to Peru	1st collection for Province Bagua							1
Loricaria thuyoides (Lam.) Sch. Bip. var. *thuyoides,* PJB 3546 (MO)	1st collection for Peru, only collection for Dept. Amaz.			1	1			
Mikania aschersonii Hieron., PJB 3961 (MO, US)	Only collection for Province Bagua						1	
Mikania brachyphylla Hieron., PJB 3373 (F, MO)	1st collection for Peru, only collection for Dept. Amaz.			1	1			
Mikania decora Poepp., PJB 3762 (MO, US)	1st collection for Dept. Amaz.					1		
Mikania cf. *hitchcockii* B.L. Rob., PJB 4132 (MO)	1st collection for Peru, only collection for Dept. Amaz.			1	1			
Mikania micrantha Kunth, AHG et al., 22852 (MO)	1st collection for Province Bagua							1
Mikania speciosa DC., AHG et al., 22882 (MO)	Only collection for Dept. Amaz.				1			
Munnozia olearioides (Muschl.) H. Rob. & Brettell, PJB 3175 (MO); endemic to Peru	1st collection for Peru, only collections for Province Bagua			1			1	
Munnozia senecionidis Bentham, AHG et al. 22152 (MO), 22889 (F, MO), PJB 2470 (MO, US), 2743 (MO), 2956 (MO), 3999 (MO), 4095 (MO)	Only collections for Province Bagua						1	
Onoseris acerifolia Kunth AHG et al., 23108 (MO), not from Cerro Colán	1st collection for Province Bagua							1
Onoseris weberbaueri Ferreyra, AHG et al., 23110A (MO); not from Cerro Colán; endemic to Peru	1st collection for Dept. Amaz.					1		

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Oritrophium peruvianum Cuatrec., AHG 23165 (MO), PJB 3429 (MO)	1st collection for Dept. Amaz., only collection for Province Bagua					1	1	
Pentacalia andicola Cuatrec., PJB 3148 (MO)	1st collection for Peru, only collection for Province Bagua			1		1		
Pentacalia barbourii M.O. Dillon & Sagástegui, PJB 3450 HT (F), IT (LSU, MO), now *Monticalia barbourii* (M.O. Dillon & Sagast.) Pruski; det. John Pruski (MO) 2018; endemic to type locality	sp. nov., only collection for Peru	1	1					
Pentacalia cutervonis H. Rob. & Cuatrec., PJB 3966 (US), 4124 PT (MO, US); endemic to Peru	sp. nov., 1st collection for Peru, only collection for Dept. Amaz.	1		1	1			
Pentacalia loretensis (Cuatrec.) Cuatrec., PJB 3717 (US)	1st collection for Peru			1				
Pentacalia miniaurita (Sagast. & M.O., Dillon) Cuatrec., PJB 3410 (US); endemic to Peru	Only collection for Peru		1					
Pentacalia reflexa (Kunth) Cuatrec., PJB 2877 (MO, US)	Only collection for Dept. Amaz.				1			
Piptocarpha asterotrichia (Poepp.) Baker, AHG et al., 23112 (MO); not from Cerro Colán	1st collection for Province Bagua							1
Pseudelephantopus spiralis (Less.) Cronquist, AHG et al., 23094 (MO); PJB 4345 (MO)	1st collection for Province Bagua							1
Pseudogynoxys poeppigii (DC.) H. Rob. & Cuatrec., AHG et al., 22822 (MO): not from Cerro Colán; endemic to Peru	Only collection for Dept. Amaz.				1			
Pseudogynoxys sonchoides (Kunth) Cuatrec., PJB 2147*** (MO); not from Cerro Colán	Only collection for Province Piura***						1	
Schistocarpha eupatorioides (Fenzl) Kuntze, AHG et al., 22818 (MO, US), 23124 (MO), PJB 4263 (MO), 4322 (MO), 4323(MO), not from Cerro Colán	Only collections for Province Bagua						1	
Senecio miniauritus Sagástegui & Dillon, PJB 3410 (F, MO); not used for a type; endemic to Peru for Province Bagua	sp. nov., 1st collection for Peru, 1st collection for Dept. Amaz., only collection	1		1		1	1	
Senecio praeruptorum Sch. Bip. ex Klatt, PJB 2426 (MO)	Only collection for Dept. Amaz.				1			
Tessaria integrifolia Ruiz & Pav., AHG et al., 23081 (HUT, MO)	1st collection for Dept. Amaz.					1		
Verbesina lopez-mirandae Sagast., AHG et al., 22833 (MO, US); not from Cerro Colán; endemic to Peru	1st collection for Dept. Amaz.l, only collection for Province Bagua					1	1	
Vernonia jalcana Cuatrec., PJB 3760 (MO); endemic to Peru	Only collection for Province Bagua						1	
Vernonia mapirensis Gleason, AHG et al., 22884 (MO), PJB 2399 (MO), 2666 (MO), 3962 (MO)	1st collections for Peru, only collections for Dept. Amaz.			1	1			

APPENDIX 3. ANNOTATED LIST OF ANGIOSPERMS continued

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Vernonia patens Kunth, AHG et al., 23119 (MO), not from Cerro Colán	1st collections for Province Bagua							1
Vernonia pycnantha Benth., PJB 4159 (MO)	Only collection for Province Bagua						1	
Viguiera lepidostephana Cuatrec., PJB 2151*** (MO); not from Cerro Colán	1st collection for Peru, only collection for Dept. Piura***			1	1			
Wedelia latifolia DC., AHG et al., 22785 (MO, US): not from Cerro Colán	1st collection for Dept. Amaz.					1		
Balanophoraceae								
Corynaea crassa Hooker, AHG et al. 22970 (MO), PJB 2715 (MO)	1st collections for Peru, only collections for Dept. Amaz.			1	1			
Langsdorffia hypogaea Mart., PJB 2646 (MO)	1st collection for Province Bagua							1
Scybalium depressum(Hook. F.) Eichler, PJB 4131 (MO)	Only collection for Peru		1					
Begoniaceae								
Begonia hitchcockii Irmsch., PJB 4119 (MO)	1st collection for Dept. Amaz., only collection for Province Bagua					1	1	
Begonia monadelpha (Klotzsch) Ruiz & Pav. ex A. DC., PJB 3993 (MO)	1st collection for Dept. Amaz., only collection for Province Bagua					1	1	
Begonia parviflora Poepp. & Endl., PJB 2389 (MO)	1st collection for Dept. Amaz.					1		
Begonia peruviana A. DC., PJB 4148 (MO)	1st collection for Dept. Amaz.					1		
Begonia urticae L. f., PJB 3701 (MO, US), 4013 (MO)	Only collections for Province Bagua						1	
Berberidaceae								
Berberis tomentosa Ruiz & Pav., PJB 3171 (MO), 3390 (MO); endemic to Peru	1st collections for Dept. Amaz., only x to Peru					1	1	
Bignoniaceae								
Amphilophium paniculatum var. *molle* (Schltdl. & Cham.) Standl., AGH 22948A* (MO); not from Cerro Colán	Only collection for Province Bagua						1	
Distictis occidentalis A. Gentry, PJB 3739 (MO)	1st collection for Dept. Amaz., only collection for Province Bagua					1	1	
Fridericia patellifera (Schltdl.) L.G. Lohmann, AHG 23102 (MO)	1st collection for Province Bagua							1
Handroanthus chrysantha subsp. *meridionalis* (A.H. Gentry) S.O. Grose, PJB 3975 (MO)	Only collection for Dept. Amaz.				1			

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Boraginaceae								
Cordia lutea Lam., AHG et al., 22783* (MO), not from Cerro Colán	Only collection for Province Bagua						1	
Cordia saccellia Gottschling & J.S. Mill. AHG et al., 22817* (MO), not from Cerro Colán	1st collection for Dept. Amaz.					1		
Moritzia lindenii (A. DC.) Benth. ex Gurke, PJB 3374 (MO)	1st collection for Peru, only collection for Dept. Amaz.			1	1			
Tournefortia undulata Ruiz & Pav., PJB 3399 (MO)	1st collection Dept. Amaz., only collection for Province Bagua					1	1	
Varronia dichotoma Ruiz & Pav., AHG et al., 22805 (MO), not from Cerro Colán	1st collection for Province Bagua							1
Brassicaceae								
Cardamine ovata Bentham, PJB 2878 (MO), 3708 (MO)	1st collections for Dept. Amaz.					1		
Cactaceae								
Gentry et al., 22932 (MO)								
Calceolariaceae								
Calceolaria arbuscula Molau, PJB 3432 HT (GB), IT (MO), PJB 3147 (MO); endemic to type locality	sp. nov., only collections for Peru	1	1					
Calceolaria hirsuta Molau, PJB 3404 HT (GB), IT (MO); endemic to type locality	sp. nov., only collection for Peru	1	1					
Calceolaria tripartita Ruiz & Pav., PJB 3710 (MO)	1st collections for Dept. Amaz., only collection for Province Bagua					1	1	
Campanulaceae								
Centropogon altus E. Wimm., AHG et al., 22938 (MO), PJB 4010A (MO)	1st collections for Peru, only collections for Dept. Amaz.			1	1			
Centropogon altus vel sp. aff. E. Wimm., PJB 4011A (MO)	1st collections for Peru, only collections for Dept. Amaz.			1	1			
Centropogon eborinus E. Wimm., PJB 4010 (MO); endemic to Peru	Only collection for Peru		1					
Centropogon ferrugineus (L. f.) Gleason, PJB 3413 (MO), 3837 (MO)	Only collections for Dept. Amaz.				1			
Centropogon granulosus s. lat. C. Presl, PJB 2406 (MO), 3692 (MO), 4007 (MO)	1st collections for Province Bagua						1	
Centropogon granulosus subsp. *lateriflorus* (E. Wimm.) B.A. Stein, AHG et al. 22974 (MO), PJB 2806 (MO), 2955A (MO), 2975 (MO), 3906 (MO), 4117 (MO)	Only collections for Dept. Amaz.				1			

APPENDIX 3. ANNOTATED LIST OF ANGIOSPERMS continued

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Centropogon lasiodorus B.A. Stein, PJB 4116 (MO), endemic to Peru; not used for a type	sp. nov., 1st collection for Peru, only collection for Dept. Amaz.	1		1	1			
Lysipomia gracilis (E. Wimm.) E. Wimm, PJB 3422 (MO); endemic to Peru	Only collection for Peru		1					
Siphocampylus jelskii Zahlbr., PJB 3452 (MO)	Only collection for Province Bagua						1	
Caprifoliaceae								
Valeriana adscendens Turcz., PJB 3447 (MO)	Only collection for Province Bagua						1	
Valeriana ledoides Graebner, PJB 3206 (MO), 3234 (MO); endemic to Peru	Only collections for Dept. Amaz.				1			
Valeriana microphylla Kunth, PJB 3460 (MO)	Only collection for Province Bagua						1	
Caricaceae								
Carica microcarpa Jacq., AHG et al., 23045 (MO), PJB 2472 (MO), 2703 (MO)	1st collections for Province Bagua							1
Caryophyllaceae								
Stellaria cuspidata Willd. ex D.F. K. Schltdl., PJB 3575 (F, MO), 4085 (MO)	Only collections for Dept. Amaz.				1			
Stellaria ovata Willd. ex D.F.K. Schltdl., AHG et al., 22881 (MO)	1st collection for Dept. Amaz., only collection for Province Bagua					1	1	
Chloranthaceae								
Hedyosmum dombeyanum Solms, AHG et al., 23013 (F, MO)	1st collection for Peru			1				
Cleomaceae								
Cleome gigantea L., PJB 4392 (MO), not from Cerro Colán	1st collection from Dept. Amaz.					1		
Cleome lechleri Eichler, PJB 3716 (MO)	Only collection for Province Bagua						1	
Podandrogyne brachycarpa (DC.) Woodson, AHG 23043 (MO)	1st collection for Dept. Amaz., only collection for Province Bagua					1	1	
Podandrogyne decipiens (Triana & Planch.) Woodson, PJB 2953 (MO), PJB 3972 (MO)	1st collection for Dept. Amaz.					1		
Podandrogyne roseoleuca Cochrane, PJB 2467 (F, MO), 2681 HT (WIS), IT (F, MO, US)	sp. nov., 1st collection for Peru, only collection for Dept. Amaz.	1		1	1			
Clethraceae								
Clethra ovalifolia Turczaninow, PJB 3239 (MO)	1st collection for Province Bagua							1

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Clusiaceae								
Chrysochlamys membranacea Planch. & Triana, AHG et al., 22926 (MO)	1st collection for Province Bagua							1
Chrysochlamys weberbaueri Engl., PJB 2650 (MO)	1st collection for Province Bagua							1
Clusia ducuoides Engl. AHG et al., 22888 (MO)	Only collection for Province Bagua						1	
Clusia pavonii Planch. & Triana, PJB 3549 (MO), 3763 (MO)	Only collections for Dept. Amaz.				1			
Clusia peruviana Szyszył. AHG et al., 23056 (MO)	1st collection for Dept. Amaz., only collection for Dept. Amaz.					1	1	
Tovomita krukovii A.C. Sm., PJB 4507 (MO)	Only collection for Province Bagua						1	
Combretaceae								
Terminalia macrophylla (Eichler) Gere & Boatwr., PJB 4353 (MO), not from Cerro Colán	1st collection for Dept. Amaz.					1		
Convolvulaceae								
Ipomoea alba L., AHG et al., 22806* (MO), not from Cerro Colán	1st collection for Province Bagua							1
Ipomoea carnea subsp. *fistulosa* (Mart. ex Choisy) D.F. Austin, PJB 4226 (F, MO, NY), not from Cerro Colán	Only collection for Dept. Amaz.				1			
Ipomoea clavata (G. Don) Ooststr. ex J.F. Macbr., AHG et al., 22840* (MO), not from Cerro Colán	Only collection for Dept. Amaz.				1			
Jacquemontia velutina Choisy, AHG et al., 22782* (MO), not from Cerro Colán	Only collection for Peru		1					
Merremia aegyptia (L.) Urb., AHG et al., 22803 (MO), not from Cerro Colán	Only collection for Dept. Amaz.				1			
Merremia quinquefolia (L.) Hallier f., AHG et al., 22819* (MO): not from Cerro Colán	Only collection for Dept. Amaz.				1			
Merremia umbellata (L.) Hallier f., PJB 4283 (MO), not from Cerro Colán	1st collection for Province Bagua							1
Curcurbitaceae								
Gurania eriantha (Poepp. & Endl.) Cogn., PJB 2569 (F, MO)	1st collection for Dept. Amaz.					1		
Ericaceae								
Bejaria resinosa Mutis ex L. f., PJB 3151 (MO, NY)	1st collection for Dept. Amaz., only collection for Province Bagua					1	1	

APPENDIX 3. ANNOTATED LIST OF ANGIOSPERMS continued

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Cavendishia bracteata (Ruiz & Pav. ex J. St.-Hil.) Hoerold, AHG et al., 23054 (MO, NY)	1st collection for Province Bagua							1
Cavendishia sirensis Luteyn, PJB 4466 (MO); not from Cerro Colán	1st collection for Peru			1				
Disterigma acuminatum (Kunth) Nied., PJB 2526 (MO), 3233 (MO)	1st collections for Dept. Amaz., only collections for Province Bagua					1	1	
Disterigma baguensis Pedraza, PJB 4102 HT (MO), IT (F, NY); endemic to type locality	sp. nov., only collection for Peru	1	1					
Disterigma empetrifolium (Kunth) Drude, PJB 3458 (MO, NY)	1st collection for Dept. Amaz., only collection for Province Bagua					1	1	
Gaultheria erecta Vent., PJB 3178 (MO, NY), 3465 (MO, NY)	Only collections for Province Bagua						1	
Gaultheria megalodonta A.C. Smith, PJB 3150 (MO, NY), 3459 (MO)	Only collections for Peru		1					
Gaultheria reticulata Kunth, PJB 3260 (F, MO, NY)	Only collection for Province Bagua						1	
Gaultheria vaccinioides Weddell, PJB 3172 (MO, NY)	1st collection for Dept. Amaz., only collection for Province Bagua					1	1	
Orthaea abbreviata Drake, AHG et al. 22903 (F, MO), PJB 2941 (F, MO, NY)	1st collections for Peru, only collections for Province Bagua			1			1	
Pernettya prostrata (Cav.) DC., AHG et al. 23177 (MO), PJB 3461* (MO, NY), PJB 4351* (MO)	Only collections for Province Bagua						1	
Psammisia corarctata (Ruiz & Pav.) A.C. Sm., AHG et al., 22993 (MO, NY), PJB 2741 (F, MO, NY)	1st collections for Province Bagua							1
Psammisia ulbrichiana Hoerold, PJB 2955 (MO, NY), 3713 (MO, NY), x NY), PJB 2741 (F, MO, NY)	1st collections for Dept. Amaz., 1st collections for Province Bagua					1		1
Satyria warszewiczii Klotzsch, PJB 3726 (MO, NY)	1st collection for Peru, only collection for Province Bagua			1			1	
Sphyrospermum buxifolium Poepp. & Endl., AHG et al., 23103 (NY)	1st collection for Province Bagua							1
Sphyrospermum cordifolium Benth., AHG et al., 23103 (MO)	1st collection for Province Bagua							1
Themistoclesia dependens (Benth.) A.C. Sm., PJB 3205 (MO, NY)	Only collection for Peru		1					
Vaccinium floribundum Kunth, PJB 3192 (F, MO, NY), 3236 (MO, NY)	1st collections for Province Bagua							1
Euphorbiaceae								
Acalypha diversifolia Jacq., PJB 4480 (MO), not from Cerro Colán	Only collection for Province Bagua						1	
Acalypha padifolia Kunth, AHG et al., 22941 (MO, F)	Only collection for Province Bagua						1	

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Aparisthmium cordatum (A. Juss.) Baill., PJB 4484 (MO), not from Cerro Colán	1st collection for Province Bagua							1
Cnidoscolus aconitifolius (Mill.) I.M. Johnst., PJB 2141*** (MO); not from Cerro Colán	only collection for Dept. Piura***				1			
Croton adipatus Kunth AHG et al., 23109* (F, MO), not from Cerro Colán	1st collection for Peru			1				
Croton thurifer Kunth, PJB 4230 (F, MO), not from Cerro Colán	1st collection for Dept. Amaz.					1		
Euphorbia heterophylla L., PJB 4258 (MO), not from Cerro Colán	1st collection for Dept. Amaz.					1		
Euphorbia hyssopifolia L., PJB 4331H (MO), not from Cerro Colán	1st collection for Dept. Amaz.					1		
Euphorbia lasiocarpa Klotzsch, PJB 4227 (MO), not from Cerro Colán	Only collection for Province Bagua						1	
Hura crepitans L., AHG et al., 22836* (MO), not from Cerro Colán	1st collecton for Province Bagua							1
Mabea cf. *macbridei* I.M. Johnst., AHG et al., 23021 (MO)	1st collection for Dept. Amaz., only collection for Province Bagua					1	1	
Ricinus communis L., PJB 4280 (MO), not from Cerro Colán	Only collection for Province Bagua						1	
Sapium stylare Mueller Arg., PJB 2561 (MO)	1st collection for Peru, only collection for Dept. Amaz.			1	1			
Senefeldera inclinata Muell. Arg., PJB 4498 (MO), not from Cerro Colán	1st collection for Province Bagua							1
Fabaceae								
Aeschynomene scabra G. Don, AHG et al., 23212 (MO)	1st collection for Dept. Amaz.					1		
Bauhinia tarapotensis Benth. ex J.F. Macbr., PJB 4478 (MO), not from Cerro Colán	1st collection for Province Bagua							1
Crotalaria incana L. var. *incana*, PJB 4271 (MO), not from Cerro Colán	1st collection for Peru, only collection for Dept. Amaz.			1	1			
Cyathostegia mathewsii (Benth.) Schery, AHG et al., 22815* (MO), not from Cerro Colán	1st collection for Dept. Amaz., 1st collection for Province Bagua					1		1
Dioclea virgata (Rich.) Amshoff, PJB 4339 (MO), not from Cerro Colán	Only collection for Province Bagua						1	
Erythrina megistophylla Diels, PJB 4125 (MO)	Only collection for Peru		1					
Indigofera suffruticosa Mill., PJB 4278 (MO), not from Cerro Colán	1st collection for Dept. Amaz.					1		
Inga ruiziana G. Don, PJB 4479 (MO), not from Cerro Colán	1st collection for Province Bagua							1
Lablab purpureus (L.) Sweet, AHG et al., 22839* (MO), not from Cerro Colán	1st collection for Peru, only collection for Dept. Amaz.			1	1			

APPENDIX 3. ANNOTATED LIST OF ANGIOSPERMS continued

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Macroptilium lathyroides (L.) Urb., PJB 4363 (MO); not from Cerro Colán	Only collection for Dept. Amaz.				1			
Mucuna elliptica (Ruiz & Pav.) DC., PJB 4483 (MO), not from Cerro Colán	1st collection for Province Bagua							1
Pueraria phaseoloides (Roxb.) Benth., PJB 4525 (MO), not from Cerro Colán	1st collection for Province Bagua							1
Rhynchosia edulis Griseb., PJB 4249 (MO); not from Cerro Colán	1st collection for Peru, only collection for Dept. Amaz.			1	1			
Rhynchosia minima (L.) DC., AHG et al., 22830 (MO)	1st collection for Dept. Amaz., 1st collection for Province Bagua					1		1
Senegalia weberbaueri (Harms) Seigler & Ebinger, PJB 4231 (MO), not from Cerro Colán	1st collection for Dept. Amaz., only collection for Province Bagua					1	1	
Senna hirsuta var. *hirta* H.S. Irwin & Barneby, AHG et al., 22820* (MO), not from Cerro Colán	1st collection for Dept. Amaz., only collection for Province Bagua					1	1	
Senna pallida var. *nemorosa* (Kunth) H.S. Irwin & Barneby, AHG et al., 22779* (MO); not from Cerro Colán	1st collection for Peru, only collection for Dept. Amaz.			1	1			
Senna ruiziana (G. Don) H.S. Irwin & Barneby, PJB 4528 (MO, NY), 4361 (NY); not from Cerro Colán	1st collection for Province Bagua							1
Vigna adenantha (G. Mey.) Marechal, Mascherpa & Stainer, PJB 2150*** (MO); not from Cerro Colán	only collection for Dept. Piura***				1			
Gentianaceae								
Chelonanthus acutangulus (Ruiz & Pav.) Gilg, AHG et al., 23113* (MO), not from Cerro Colán	1st collection for Dept. Amaz.					1		
Gentianella chlorantha Pringle, PJB 3439 HT (MO), IT (HAM), 3456 (MO), endemic to type locality	sp. nov., only collections for Peru	1	1					
Gentianella oreosilene J.S. Pringle, PJB 3387 (MO), 3538 (MO); endemic to Peru	Only collections for Province Bagua						1	
Halenia longicaulis J.S. Pringle, PJB 3385 (MO)	1st collection for Peru, only collection for Province Bagua			1			1	
Halenia mathewsii Gilg, PJB 3435 (MO); endemic to Peru	Only collection for Peru		1					
Macrocarpaea jactans J.R. Grant, AHG et al., 23030 (MO), PJB 2635 (MO); not used for a type	sp. nov., 1st collections for Peru, only collections Amazonas Province	1		1	1			

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Symbolanthus nebulosus J. E. Molina & Struwe, PJB 3252 HT (MO); endemic to Province Bagua	sp. nov., 1st collection for Peru	1	1					
Geraniaceae								
Geranium sibbaldioides subsp. *beckianum* Aedo, AHG et al., 23174 (MO)*, PJB 3423 (MO); not used for a type	sp. nov., 1st collections for Peru, only collections for Dept. Amaz.	1		1	1			
Gesneriaceae								
Alloplectus peruvianus (Zahlbr.) L.P. Kvist & L.E. Skog, PJB 3400 (MO, US)	1st collection for Dept. Amaz., only collection for Province Bagua					1	1	
Anodiscus xanthophyllus (Poep.) Mansf.Voucher, PJB 4365 (MO, US), not from Cerro Colán	1st collection for Dept. Amaz.					1		
Besleria placita C.V. Morton, AHG et al., 23027 (MO, US), PJB 2965 (MO, US), 3689 (MO), 4014 (MO, US), 4331 E (MO, US); not from Cerro Colán; endemic to Peru	1st collections for Province Bagua							1
Columnea inaequilatera Poepp., AHG et al., 22988 (MO, US), PJB 2749 (MO, US)	1st collections for Dept. Amaz.					1		
Columnea katzensteiniae (Wiehler) L.E. Skog & L.P. Kvist, AHG 22920 (MO, US); not used for a type	sp. nov., only collection for Peru	1	1					
Columnea spathulata Mansf., PJB 4114 (MO)	1st collection for Peru, only collection for Dept. Amaz.			1	1			
Columnea strigosa Benth., PJB 3688 (MO, US)	1st collection for Peru, only collection for Province Bagua			1			1	
Columnea tessmannii Mansf., AHG et al., 22927, (MO, US), PJB 2525 (MO, US), 2545 (MO), 2624 (MO, US)	1st collections for Peru			1				
Columnea villosissima Mansf., PJB 4163 (MO)	Only collection for Province Bagua						1	
Corytoplectus speciosus (Poepp.) Wiehler, AHG et al., 23080 (MO)	1st collection for Dept. Amaz., 1st collection for Province Bagua					1		1
Corytoplectus speciosus var. *orbicularis* Rodr.-Flores & L.E. Skog, AHG et al., 23080 (US)	1st collection for Dept. Amaz., 1st collection for Province Bagua		1					
Drymonia semicordata (Poepp.) Wiehler, AHG et al., 22863 (MO, US), PJB 2657 (MO, US), 4496 (MO)	1st collections for Dept. Amaz.					1		
Drymonia teuscheri (Raymond) J.L. Clark, PJB 3691 (MO), 3696A (MO), 3702 (MO)	1st collections for Peru, only collections for Dept. Amaz.			1	1			
Drymonia urceolata Wiehler, PJB 3911 (MO)	1st collection for Province Bagua							1

APPENDIX 3. ANNOTATED LIST OF ANGIOSPERMS continued

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Gasteranthus wendlandianus (Hanst.) Wiehler, PJB 3841 (MO, US)	Only collection for Dept. Amaz.				1			
Glossoloma baguense (L.E. Skog) J.L. Clark, AHG et al., 22908 HT (NY), IT (MO, NY), PJB 2747 (MO, US), 2973 HT (US), IT (C, MO), 3836 (MO, US, USM)	sp. nov., only collections for Dept. Amaz.	1			1			
Nautilocalyx pallidus (Sprague) Sprague, PJB 4522 (MO, US), not from Cerro Colán	1st collection for Province Bagua							1
Trichodrymonia metamorphophylla (Donn. Sm.) M.M. Mora & J.L. Clark, AHG et al., 22991 (MO, US), PJB 2751 (MO, US), 2828 (MO, US)	1st collections for Peru, only collections for Dept. Amaz.			1	1			
Hydrangeaceae								
Hydrangea diplostemona ? (Donn. Sm.) Standl., PJB 2695 (MO)	Only collection for Dept. Amaz.				1			
Hypericaceae								
Hypericum struthiolifolium Juss., PJB 3174 (MO), 3230 (MO)	1st collections for Dept. Amaz., only collections for Province Bagua					1	1	
Vismia Vand., PJB 4491 (MO); not from Cerro Colán	1st collection for Province Bagua							1
Lamiaceae								
Clinopodium nubigenum (Kunth) Kuntze, PJB 3440 (MO)	Only collection for Dept. Amaz.				1			
Hyptis capitata Jacq., PJB 4362 (MO), not from Cerro Colán	Only collection for Province Bagua						1	
Ocimum campechianum Mill., PJB 4373 (MO), 4375 (MO), not from Cerro Colán	1st collections or Dept. Amaz.					1		
Salvia occidentalis Sw., AHG et al., 23089 (MO), PJB 4296 (MO); not from Cerro Colán	1st collections for Dept. Amaz., only collections for Province Bagua					1	1	
Stachys micheliana Briq., PJB 4301 (MO); not from Cerro Colán	1st collection for Dept. Amaz., only collection for Province Bagua					1	1	
Lauraceae								
Aniba coto (Rusby) Kosterm., AHG et al., 22862 (F, MO)	1st collection for Peru, only collection for x collection for Province Bagua			1	1			
Lecythidaceae								
Eschweilera baguensis Mori, AHG et al., 22908 HT (NY), IT (MO, NY), PJB 2536 (MO)	sp. nov., only collections for Peru	1	1					

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Lentibulariaceae								
Pinguicula involuta Ruiz & Pavón, PJB 3222 (F, MO), 3425 (F, MO)	1st collections for Dept. Amaz., only collections for Province Bagua					1	1	
Loasaceae								
Klaprothia mentzeliodes Bonpl. & Kunth, PJB 3704 (MO), 3992 (MO)	Only collections for Province Bagua						1	
Loasa biccornuta Weigend, PJB 2139*** (MO); not from Cerro Colán	Only collection for Province Piura***						1	
Mentzelia aspera L., PJB 4267 (MO), not from Cerro Colán	1st collection for Dept. Amaz.					1		
Nasa andersonii Weigend, PJB 3570 (F, MO); not used for a type	sp. nov., 1st collection for Peru, only collection for Dept. Amaz.	1		1	1			
Nasa colánii Dostert & Weigend, PJB 3573 HT (MO); endemic to the type locality	sp. nov., only collection for Peru	1	1					
Nasa dyeri subsp. *australis* Dostert & Weigend, AHG et al., 22856 (MO); not used for a type; endemic to Peru	sp. nov., 1st collection for Peru	1		1				
Sclerothrix fasciculata C. Presl, PJB 4153 (MO)	Only collection for Dept. Amaz.				1			
Loranthaceae								
Gaiadendron punctatum (Ruiz & Pav.) G. Don, PJB 3185 (MO)	Only collection for Province Bagua						1	
Oryctanthus alveolatus (Kunth) Kuijt, AHG et al., 23010 (MO)	1st collection for Province Bagua							1
Phthirusa hutchisonii Kuijt, PJB 2511 (F, MO)	1st collection for Peru, only collection for Dept. Amaz.			1	1			
Psittacanthus baguensis Kuijt, PJB 3583 (F, LEA, MO); not used for a type	sp. nov.	1		1	1	1		
Tristerix grandiflorus (Ruiz & Pav.) Brlow & Wiens, PJB 3591 (MO)	1st collection for Dept. Amaz., only collection for Province Bagua					1	1	
Magnoliaceae								
Magnolia elfina A. Vázquez, AHG et al., 22968 HT (MO), IT (F), endemic to type locality	sp. nov.	1	1					
Malpighiaceae								
Amorimia amazonica (Nied.) W.R. Anderson, PJB 4256 (MO); not from Cerro Colán	1st collection for Dept. Amaz., 1st collection for Province Bagua					1		1
Banisteriopsis lutea (Griseb.) Cuatrec., PJB 4255 (MO); not from Cerro Colán	Only collection for Dept. Amaz.				1			
Malpighia glabra L., AHG et al., 22792* (MO), not from Cerro Colán	1st collection for Dept. Amaz., 1st collection for Province Bagua					1		1

APPENDIX 3. ANNOTATED LIST OF ANGIOSPERMS continued

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Stigmaphyllon peruvianum Nied., AHG et al., 22784* (MO), not from Cerro Colán; endemic to Peru	1st collection for Dept. Amaz., 1st collection for Province Bagua					1		1
Malvaceae								
Abutilon piurense Ulbrich, PJB 2143*** (MO); not from Dept. Amaz.; endemic to Peru	only collection for Dept. Piura***				1			
Byttneria hirsuta vel sp. aff. Ruiz & Pav., AHG et al., 22790* (MO), not from Cerro Colán	Only collection for Province Bagua						1	
Ceiba insignis (Kunth) P.E. Gibbs & Semir, AHG et al., 22776* (MO), not from Cerro Colán	1st collection for Dept. Amaz., 1st collection for Province Bagua					1		1
Corchorus siliquosus L, AHG et al., 22801 (MO), not from Cerro Colán	1st collection for Dept. Amaz., 1st collection for Province Bagua					1		1
Gossypium barbadense L., PJB 4240 (F, MO), not from Cerro Colán	1st collection for Province Bagua							1
Heliocarpus americanus L., AHG et al., 22861 (MO, US)	1st collection for Province Bagua							1
Malachra aleceifolia Jacq., AHG et al., 22796* (MO), not from Cerro Colán	1st collection for Dept. Amaz., 1st collection for Province Bagua					1		1
Melochia lupulina Sw., AHG et al., 22823* (MO), not from Cerro Colán	Only collection from Province Bagua						1	
Ochroma pyramidale (Cav. ex Lam.) Urb., PJB 4382 (MO), not from Cerro Colán	1st collection for Province Bagua							1
Pavonia fruticosa (Mill.) Fawc. & Rendle, PJB 4400 (MO); not from Cerro Colán	1st collection for Province Bagua							1
Sida glomerata Cav., PJB 4252A (MO)	Only collection for Dept. Amaz.				1			
Sida setosa Mart. ex Colla, PJB 4269 (MO); not from Cerro Colán	Only collection for Province Bagua						1	
Sida spinosa Linnaeus, PJB 4376 (MO), not from Cerro Colán	1st collection for Peru, only collection for Dept. Amaz.			1	1			
Tetrasida polyantha Ulbr., AHG et al., 22788 (MO), not from Cerro Colán	1st collection for Dept. Amaz., 1st collection for Province Bagua					1		1
Theobroma subinacanum Mart., PJB 4499 (MO); not from Cerro Colán	1st collection for Province Bagua							1
Marcgraviaceae								
Marcgravia pedunculosa Triana & Planch., AHG et al., 22915 (MO)	Only collection for Province Bagua						1	

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Marcgravia strenua J.F. Macbr., AHG et al., 23096 (MO)	1st collection for Province Bagua							1
Melastomataceae								
Brachyotum maximowiczii Cogniaux, PJB 3227 (MO, US); endemic to Peru	Only collection for Province Bagua						1	
Centronia laurifolia D. Don, AHG et al., 23026 (MO, US)	1st collection for Peru, 1st collection for Dept. Amaz., 1st collection for Province Bagua			1		1		1
Clidemia dentata Pav. ex D. Don, PJB 4319 (MO), 4331A (MO), not from Cerro Colán	1st collections for Province Bagua							1
Clidemia hirta (L.) D. Don, PJB 4331B (MO), not from Cerro Colán	1st collection for Province Bagua							1
Clidemia juruensis (Pilg.) Gleason, PJB 4450 (MO, US), not from Cerro Colán	Only collection for Dept. Amaz.				1			
Graffenrieda aff. *emarginata* (Ruiz & Pav.) Triana, AHG et al., 22891 (MO, US)	1st collection for Peru, 1st collection for Dept. Amaz., only collection for Province Bagua			1		1	1	
Maieta guianensis Aubl., PJB 4449 (MO), not from Cerro Colán	1st collection for Province Bagua							1
Meriania haemantha (Planch. & Lindl.) Humberto Med. & Fern. Alonso, PJB 2943 (MO, US)	Only collection for Peru		1					
Miconia asperrima Triana, PJB 3960 (MO, US)	Only collections for Peru		1					
Miconia calvescens DC., PJB 4154 (MO, US)	1st collection for Province Bagua							1
Miconia clathrantha Triana ex Cogn., PJB 2629 (MO, US)	1st collection for Peru, only collection for Dept. Amaz.			1	1			
Miconia dorsiloba Gleason, PJB 2655 (MO, US)	1st collection for Dept. Amaz., 1st collection for Province Bagua					1		1
Miconia erioclada Triana, PJB 4398 (MO, US), not from Cerro Colán	1st collection for Dept. Amaz., 1st collection for Province Bagua					1		1
Miconia hamata Cogniaux, Gentry et al. 23006 (MO, US), PJB 2745 (MO, US); endemic to Peru	Only collections for Peru		1					
Miconia lasiocalyx Cogn. PJB 2966 (MO, US)	Only collecion for Province Bagua						1	
Miconia laurina (D. Don) Naudin, PJB 3161 (MO), PJB 3838 (MO)	Only collections for Dept. Amaz.				1			
Miconia neriifolia Triana, PJB 3392 (MO)	Only collection for Province Bagua						1	
Miconia aff. *nitida* (D. Don) Naudin, PJB 3388 (MO)	Only collection for Dept. Amaz.				1			

APPENDIX 3. ANNOTATED LIST OF ANGIOSPERMS continued

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Miconia thyrsiflora (D. Don) Naudin, PJB 3388 (US)	1st collection for Peru, only collection for Dept. Amaz.			1	1			
Ossaea boliviensis (Cogn.) Gleason, PJB 4500 (MO), not from Cerro Colán	1st collection for Province Bagua							1
Quipuanthus epipetricus Michelang. & C. Ulloa, PJB 4451 PT (MO); not from Colán	sp. nov., 1st collection for Peru	1		1				
Tibouchina longifolia (Vahl) Baill., PJB 4328 (MO), 4340 (US); not from Cerro Colán	1st collection for Province Bagua							1
Tibouchina ochypetala (Ruiz & Pav.) Baill., Gentry et al, 23115* (MO), not from Cerro Colán	1st collection from Province Bagua							1
Tococa juruensis Pilg., PJB 4433 (MO, US), 4449 (US), not from Cerro Colán	1st collection for Province Bagua							1
Moraceae								
Helicostylis tovarensis (Klotzsch & H. Karst.) C.C. Berg, AHG et al., 22909 (MO)	1st collection for Peru, 1st collection for Dept. Amaz., only collection for Province Bagua			1		1	1	
Muntingiaceae								
Muntingia calabura L., AHG et al., 22808* (MO), PJB 4287 (F, MO), not from Cerro Colán	1st collections for Dept. Amaz., 1st collections for Province Bagua					1		1
Myrsinaceae								
Cybianthus pastensis (Mez) G. Agostini, PJB 3599 (MO, US)	1st collection for Dept. Amaz., only collection for Province Bagua					1	1	
Myrtaceae								
Psidium guajava L., PJB 4391 (MO), not from Cerro Colán	1st collection for Province Bagua							1
Nyctaginaceae								
Colignonia rufopilosa Kuntze, PJB 4001 (MO)	1st collection for Dept. Amaz., only collection for Province Bagua					1	1	
Nymphaeaceae								
Nymphaea glandulifera Rodschied, PJB 4408 (MO), not from Cerro Colán	1st collection for Peru, only collection for Dept. Amaz.			1	1			

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Ochnaceae								
Sauvagesia erecta L., PJB 4327 (MO); not from Cerro Colán	1st collection for Province Bagua							1
Olacaceae								
Heisteria acuminata (Bonpl.) Engl., AHG et al., 23052 (MO)	1st collection for Province Bagua							1
Onagraceae								
Fuchsia aff. *andrei* I.M. Johnst., PJB 3995 (MO), 4083 (MO)	Only collections for Province Bagua						1	
Fuchsia glaberrima Johnston, I. M., AGH et al., 23023 (US), PJB 2581 (MO), 2668 (MO), 2686 (MO), 2718 (MO, US), 2734 (MO), 2851 (MO), 4171 (MO)	1st collections for Peru			1				
Fuchsia llewelynii MacBride, PJB 3700 (MO), 3828 (MO, US), 4147 (MO); endemic to Peru	Only collections for Province Bagua						1	
Ludwigia erecta (L.) H. Hara, AHG et al., 22814* (MO), not from Cerro Colán	Only collection from Dept. Amaz.				1			
Ludwigia octovalvis (Jacq.) P.H. Raven, AHG et al., 22807, (MO), PJB 4310 (MO); not from Cerro Colán	1st collections for Province Bagua							1
Ludwigia peploides (Kunth) P.H. Raven subsp. *peploides*, AHG et al., 22800 (MO), not from Cerro Colán	Only collection for Dept. Amaz.				1			
Ludwigia peruviana (L.) H. Hara, AHG et al., 22940 (MO)	Only collection for Province Bagua						1	
Opiliaceae								
Agonandra excelsa Griseb., PJB 4239 (MO); not from Cerro Colán	1st collection for Dept. Amaz., only collection for Province Bagua					1	1	
Orobanchaceae								
Bartsia trichophylla Wedd., PJB 3424 (MO)	1st collection for Peru, 1st collection for Dept. Amaz., only collection for Province Bagua			1		1	1	
Oxalidaceae								
Oxalis dolichopda Diels, PJB 3228 (MO), 3401 (MO)	Only collections for Dept. Amaz.				1			
Oxalis integra R. Knuth, PJB 2876 (MO), 3571 (MO), 4089 (MO)	1st collections for Peru, only collections for Dept. Amaz.			1	1			
Oxalis lotoides Kunth, AHG et al, 23139* (MO), PJB 3402 (MO)	Only collections for Dept. Amaz.				1			
Oxalis ortgiesii Regel, AHG et al., 23101 (MO)	Only collection for Dept. Amaz.				1			

APPENDIX 3. ANNOTATED LIST OF ANGIOSPERMS continued

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Oxalis aff. *scandens* Kunth, AHG et al., 22994 (MO), PJB 3604 (MO), 3729 (MO)	Only collections for Peru		1					
Oxalis scandens Kunth, AHG et al., 22967 (MO)	Only collections for Peru		1					
Passifloraceae								
Passiflora cumbalensis (H. Karst.) Harms, PJB 3403 (MO)	1st collection for Dept. Amaz., only collection for Province Bagua					1	1	
Passiflora foetida L., AHG et al., 22780* (MO), not from Cerro Colán	1st collection for Province Bagua							1
Petiveriaceae								
Rivina humilis L., PJB 2156*** (MO); not from Cerro Colán	only collection for Dept. Piura***				1			
Phyllanthaceae								
Croizatia Steyerm., AHG et al., 22989 (MO)	Only collection for Peru		1					
Phytolaccaceae								
Phytolacca rivinoides Kunth & C.D. Bouche, PJB 4139 (MO)	1st collection for Province Bagua							1
Piperaceae								
Peperomia angularis C. DC., AHG et al., 22919 (F, MO, USM), 22963 (MO), PJB 2486 (MO)	1st collections for Peru, only collections for Dept. Amaz.			1	1			
Peperomia boekei Callejas, PJB 3240 PT (MO, NY); endemic to Dept. Amaz.	sp. nov**., 1st collection for Dept. Amaz., only collection for Province Bagua	1				1	1	
Peperomia cainarachiana Yunck., PJB 4501 (F, MO); not from Cerro Colán	Only collection for Dept. Amaz.				1			
Peperomia connixa Trel. & Yunck., AHG et al., 23003 (MO), 23070 (MO), PJB 2482 (F, MO)	1st collections for Peru, only collections for Dept. Amaz.		1		1			
Peperomia dolabriformis Kunth, AHG et al., 23111 (F, MO)	Only collection for Province Bagua						1	
Peperomia glabella Dietrich, PJB 4129 (F, MO)	1st collection for Dept. Amaz., only collection for Province Bagua					1	1	
Peperomia juniniana Trel., PJB 4127 (MO)	1st collection for Peru, only collection for Amazonas			1	1			
Peperomia lancifolia Hooker, AHG et al., 22998 (MO), PJB 2739 (MO, NY), 4149 (MO)	1st collections for Dept. Amaz.					1		
Peperomia rhombea Ruiz & Pav., PJB 2802 (F, MO), 2850 (MO)	Only collections for Province Bagua						1	
Peperomia rubens Trelease, PJB 3959 (MO), 4122 (F, MO, NY)	Only collections for Province Bagua						1	

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Peperomia stelechophila C. DC., PJB 2950 (MO)	1st collection for Peru, 1st collection for Dept. Amaz., only collection for Province Bagua			1		1	1	
Peperomia striata Ruiz & Pav., PJB 2748 (MO)	1st collection for Dept. Amaz., 1st collection for Province Bagua					1		1
Peperomia talinifolia Kunth, PJB 3408 (F, MO)	1st collection for Peru, only collection for Dept. Amaz.			1	1			
Peperomia tovariana C. DC., PJB 3969 (F, MO, NY)	1st collection for Peru, 1st collection for Dept. Amaz., only collection for Province Bagua			1		1	1	
Peperomia trichopus Trel., PJB 2553 (F, MO)	1st collection for Province Bagua							1
Piper aequale Vahl, PJB 4136 (F, MO)	1st collection for Province Bagua							1
Piper carrilloanum Candolle, A.C. de, PJB 2683 (MO)	Only collection for Peru		1					
Piper caucaense Yunck, AHG et al, 23025 (F, NY)	Only collection for Peru		1			1	1	
Piper cordatum Candiole, A.C. de, AHG 22879 (MO, NY), PJB 2674 (MO)	1st collections for Dept. Amaz., only collections for Province Bagua					1	1	
Piper costatum Candiole, A.C. de, PJB 2571 (MO, NY)	1st collections for Dept. Amazonas, 1st collection for Province Bagua					1		1
Piper cuspidilimbum C. DC., PJB 2684 (MO), 4164 (MO)	1st collections for Peru, 1st collections for Dept. Amaz., only collections for Province Bagua			1		1	1	
Piper dasyoura (Miq.) C. DC., PJB 4146 (MO)	1st collection for Peru, 1st collection for Dept. Amaz., only collection for Province Bagua			1		1	1	
Piper eriocladum Sodiro, PJB 2852 (MO)	Only collection for Peru		1					
Piper heterophyllum Ruiz & Pav., PJB 4329 (MO), not from Cerro Colán	1st collection for Province Bagua							1
Piper immutatum Trel., PJB 2393 (MO), 2673 (MO), 2675 (MO), 2676 (MO)	1st collections for Province Bagua							1
Piper macrorhynchon C. DC., PJB 4121 (MO, USM)	Only collection for Province Bagua						1	
Piper perareolatum C. DC., AHG et al. 23025 (MO, USM), PJB 2582 (F)	1st collection for Dept. Amaz., only collection for Province Bagua					1	1	

APPENDIX 3. ANNOTATED LIST OF ANGIOSPERMS continued

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Pothomorphe umbellata (L.) Miq., PJB 2157*** (MO); not from Cerro Colán	only collection for Dept. Piura***				1			
Pothomorphe umbellata (L.) Miq., AHG et al., 23114* (MO); not from Cerro Colán	1st collection for Province Bagua							1
Plantaginaceae								
Aragoa Kunth, PJB 3457 (MO)	Only collection for Peru		1					
Plantago australis Lam., AHG et al., 22883 (MO)	1st collection for Dept. Amaz., only collection for Province Bagua					1	1	
Plantago major L., PJB 2138*** (MO); not from Cerro Colán	Only collection for Province Piura***						1	
Plantago rigida Kunth, PJB 3471 (MO)	Only collection for Dept. Amaz.				1			
Stemodia durantifolia (L.) Sw., PJB 4374 (MO), not from Cerro Colán	1st collection for Dept. Amaz., 1st collection for Province Bagua					1		1
Polygalaceae								
Monnina ebracteata Ferreyra, AHG et al., 22896 (MO), PJB 2544 (MO), 2944 (MO)	1st collections for Peru, only collections for Dept. Amaz.			1	1			
Polygala paniculata L., PJB 4384 (MO), not from Cerro Colán	1st collection for Province Bagua							1
Securidaca rivinifolia A. St.-Hil., PJB 4352 (MO), not from Cerro Colán	1st collection for Dept. Amaz., only collection for Province Bagua					1	1	
Polygonaceae								
Muehlenbeckia tamnifolia (Kunth) Meisn., AHG et al., 22893 (MO), PJB 4008 (MO)	Only collections for Province Bagua						1	
Muehlenbeckia tiliifolia var. *glabra* Brandbyge, PJB 3576, (MO), 4084 (MO), not used for a type	sp. nov., 1st collections for Peru, only collections for Dept. Amaz.	1		1	1			
Persicaria punctata (Elliott) Small, PJB 4341***, (MO); not from Cerro Colán	1st collection for Province Bagua							1
Primulaceae								
Cybianthus incognitus Pipoly, AHG et al., 22859 PT (F, MO, USM), 22911 (MO), PJB 2405 PT (AMAZ, F, MO, USM), 2567 PT, (AMAZ, BRIT, F, MO, NY, US); endemic to Peru	sp. nov., 1st collections for Dept. Amaz., 1st collections for Province Bagua	1				1	1	
Cybianthus marginatus (Benth.) Pipoly, PJB 3255 (MO)	1st collection for Dept. Amaz., only collection for Province Bagua	1				1		

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Cybianthus pastensis (Mez) G. Agostini, PJB 3599 (MO)	1st collection for Dept. Amaz., only collection for Province Bagua					1	1	
Jacquinia mucronata Roem. & Schult., AHG et al. 22775* (MO), PJB 4229 (MO)	1st collections for Dept. Amaz., 1st a collections for Province Bagu					1	1	
Lysimachia andina Sandwith, PJB 3433 (MO, US)	1st collection for Peru, 1st collection for Dept. Amaz., only collection for Province Bagua			1		1	1	
Myrsine cupuliformis Pipoly, PJB 3758 (MO), not used for a type	sp. nov., only collection for Peru	1	1					
Myrsine dependens (Ruiz & Pav.) Spreng., PJB 3160 (MO), 3393 (MO), 3462 (MO)	1st collections for Dept. Amaz., only collections for Province Bagua					1	1	
Myrsine dilloniana Pipoly, PJB 3257 HT (MO), IT (AMAZ, F, LL-TEX, USM); endemic to type locality	sp. nov., only collections for Peru	1	1					
Stylogyne ardisioides (Kunth) Mez, PJB 4135 (MO)	1st collection for Province Bagua							1
Stylogyne micrantha (Kunth) Mez, PJB 4135A (MO)	Only collection for Peru		1					
Ranunculaceae								
Ranunculus krapfia DC. ex Deless., AHG 23164 (MO), PJB 3380 (MO)	Only collection for Province Bagua						1	
Rosaceae								
Alchemilla lechleriana Grisebach, PJB 3438 (MO)	Only collection for Peru		1					
Alchemilla nivalis Kunth, PJB 3448 (MO)	1st collection for Peru, 1st collection for Dept. Amaz., only collection for Province Bagua			1		1	1	
Prunus stipulata J. F. MacBride, AHG et al. 22992 (MO)	1st collection for Province Bagua							1
Rubus glabratus Kunth, PJB 3397 (MO)	1st collection for Peru, only collection for Dept. Amaz.			1	1			
Rubus rusbyi Britton, PJB 3386 (MO)	Only collection for Peru		1					
Rubiaceae								
Agouticarpa spinosa C.H. Perss. & Delprete, PJB 2977 (MO), not used for a type; endemic to Peru for Province Bagua	sp. nov., 1st collection for Peru, 1st collection for Dept. Amaz., only collection	1		1		1		1
Arcytophyllum filiforme (Ruiz & Pav.) Standl., PJB 3442 (MO)	Only collection for Province Bagua						1	
Arcytophyllum setosum (Ruiz & Pav.) Schltdl., AHG 23152 (MO),) PJB 3164 (MO), 3187 (MO	1st collections for Dept. Amaz., only collections for Province Bagua					1	1	

APPENDIX 3. ANNOTATED LIST OF ANGIOSPERMS continued

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Borreria remota (Lam.) Bacigalupo & E.L. Cabral, AHG et al., 22825 (MO), 22890 (MO), 22952 (MO)	1st collections for Province Bagua							1
Cinchona cf. *krauseana* L. Anderson, PJB 3181A (MO)	1st collection for Departmnet Amazonas, only collection for Province Bagua					1	1	
Coccocypselum P. Browne, AHG et al., 23098 (MO)	Only collection for Peru		1					
Coussarea longiflora (Mart) Muller Argoviensis, PJB 2654 (MO)	1st collection for Dept. Amaz., 1st collection for Province Bagua					1		1
Faramea cf. *coerulescens* K. Schum. & K. Krause, PJB 3597 (MO)	1st collection for Peru, 1st collection for Dept. Amaz., only collection for Province Bagua			1		1	1	
Geophila cordifolia var. *peruviana* Steyerm., PJB 4415 (MO), not from Cerro Colán	Only collection for Province Bagua				1			
Hillia parasitica Jacquin, PJB 2614 (MO)	Only collection for Dept. Amaz.				1			
Hoffmannia latifolia (Bartl. ex DC.) Kuntze, PJB 3910 (MO)	1st collection for Dept. Amaz., 1st collection for Province Bagua					1		1
Isertia laevis (Triana) B.M. Boom, PJB 4493 (MO); not from Cerro Colán	1st collection for Province Bagua							1
Manettia thysanophora Wernham, PJB 2974 (F, MO)	Only collection for Province Bagua						1	
Nertera granadensis (Mutis ex L. f.) Druce, PJB 3443 (MO)	Only collection for Province Bagua						1	
Notopleura acuta C.M. Taylor, AHG et al., 22878 (MO); not used for a type	sp. nov., 1st collection for Peru, 1st collection for Dept. Amaz., only collection for Province Bagua	1		1		1		1
Notopleura capacifolia (Dwyer) C.M. Taylor, PJB 3834 (MO)	1st collection for Province Bagua							1
Notopleura congesta C.M. Taylor, PJB 4510 (MO), not from Cerro Colán	1st collection for Peru, 1st collection for Dept. Amaz., 1st collection for Province Bagua			1		1		1
Notopleura dukei (Dwyer) C.M. Taylor, PJB 3687 (MO), 3908 (MO)	Only collections for Peru		1					
Notopleura leucantha (K. Krause) C.M. Taylor, AHG et al., 22980 (MO), PJB 2652 (MO)	1st collections for Province Bagua							1
Palicourea andina subsp. *andina* C.M. Taylor, AHG et al., 23024 (F, MO)	Only collection for Province Bagua						1	
Palicourera buchtienii Standl., AHG et al. 22900 (MO), PJB 2949 (MO)	1st collections for Dept. Amaz., only collection for Province Bagua					1	1	

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Palicourea cajamarcana C.M. Taylor, PJB 2669 (MO)	1st collection for Dept. Amaz., only collection for Province Bagua					1	1	
Palicourea graciliflora Standl., AHG et al., 22975 (MO), PJB 2584 (MO), 2687 (MO)	1st collections for Peru, 1st collections for Dept. Amaz., only collections for Province Bagua			1		1		1
Palicourea herrerae Standl., PJB 3407 (MO)	Only collection for Dept. Amaz.				1			
Palicourea heterochroma K. Schum. & K. Krause, PJB 4120 (MO)	Only collection for Peru		1					
Palicourea jelskii Standl., PJB 2744 (MO), 4167 (MO)	1st collections for Peru, 1st collections for Dept. Amaz., only collections for Province Bagua			1		1	1	
Palicourea lasiantha K. Krause, PJB 4330 (MO), not from Cerro Colán	1st collection for Province Bagua							1
Palicourea lucidula Standl., PJB 4435 (MO), not from Cerro Colán	1st collection for Province Bagua							1
Palicourea cf. *lyristipula* Wernham, PJB 3398 (MO)	Only collection for Dept. Amaz.				1			
Palicourea lyristipula Wernham, PJB 3703 (MO)	Only collection for Dept. Amaz.				1			
Palicourea paratinctoria C.M. Taylor, AHG 23042 (MO), PJB 2653 (MO), 3971 (MO)	Only collections for Province Bagua						1	
Palicourea racemosa (Aubl.) Borhidi, PJB 4436 (MO); not from Cerro Colán	1st collection for Province Bagua							1
Palicourea stipularis Benth., PJB 3600 (MO)	Only collection for Province Bagua						1	
Palicourea ulloana C.M. Taylor, PJB 2818 (MO), 4161 (MO)	Only collections for Peru		1					
Palicourea vulcanalis Standl. ex C.M. Taylor, PJB 2750 (MO), 2849 (MO, US)	1st collections for Peru, only collections for Dept. Amaz.			1	1			
Psychotria cf. *amita* Standl., PJB 2552 (MO)	1st collection for Peru, only collection for Dept. Amaz.			1	1			
Psychotria chaponiana Standl., AHG et al, 22868 (MO), 23022 (MO), PJB 2384 (MO), 2651 (MO)	1st collections for Peru, only collections for Dept. Amaz.			1	1			
Psychotria davidsmithiana C.M. Taylor, PJB 3833 (MO)	Only collection for Province Bagua						1	
Psychotria fortuita Standl., PJB 2817 (MO)	1st collection for Peru, 1st collection for Dept. Amaz., 1st collection for Province Bagua			1		1		1
Psychotria macrophylla Ruiz & Pav., PJB 2407 (MO)	1st collection for Province Bagua							1
Psychotria microbotrys Ruiz & Pav., PJB 4434 (MO), 4503 (MO), not from Cerro Colán	1st collections for Province Bagua							1

APPENDIX 3. ANNOTATED LIST OF ANGIOSPERMS continued

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Psychotria cf. *moyobamba* Standl., AHG et al., 23036 (MO); endemic to Peru	Only collection for Dept. Amaz.				1			
Psychotria pebasensis (Standl.) C.M. Taylor, PJB 3835 (MO)	Only collection for Province Bagua						1	
Psychotria platypoda DC., PJB 4502 (MO), not from Cerro Colán	1st collection for Province Bagua							1
Warscewiczia coccinea Klotzsch, PJB 4331J (MO), not from Cerro Colán	1st collection for Province Bagua							1
Sabiaceae								
Meliosma pumila? A.H. Gentry, PJB 4158 (MO); endemic to Peru	1st collection for Province Bagua							1
Santalaceae								
Antidaphne andina Kuijt, PJB 3224 (MO)	Only collection for Province Bagua						1	
Dendrophthora lindeniana van Tieghem, PJB 3196 (MO)	Only collection for Province Bagua						1	
Dendrophthora aff. *lindeniana* van Tieghem, PJB 3557 (MO)	Only collection for Province Bagua						1	
Dendrophthora obliqua (C. Presl) Wiens, PJB 2945 (MO)	1st collection for Dept. Amaz., 1st collection for Province Bagua					1		1
Phoradendron argentinum Urb., AHG et al., 22777 (MO); not from Cerro Colán	Only collection for Dept. Amaz.				1			
Sapindaceae								
Cardiospermum halicacabum L., AHG et al., 22781 (MO); not from Cerro Colán	1st collection for Province Bagua							1
Cardiospermum halicacabum var. *microcarpum* (Kunth) Blume, PJB 4257 (MO), not from Cerro Colán	1st collection for Province Bagua							1
Cardiospermum microcarpum Kunth, AHG et al., 22827* (MO); not from Cerro Colán	1st collection for Province Bagua							
Serjania dibotrya Poepp., PJB 4281 (MO), not from Cerro Colán	1st collection for Peru, only collection for Dept. Amaz.			1	1			
Scrophulariaceae								
Alonsoa meridionalis (L.f.) Kuntze, AHG et al., 22939 (MO)	1st collection for Dept. Amaz., only collection for Province Bagua			1	1			
Buddleja americana L., PJB 4307 (MO), not from Cerro Colán	1st collection for Dept. Amaz., 1st collection for Province Bagua					1		1
Capraria peruviana Benth., PJB 2117*** (MO); not from Cerro Colán	1st collection for Province Lambayeque***							1

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Siparunaceae								
Siparuna cascada S.S. Renner & Hausner, PJB 2946 (MO); not used for a type	sp. nov., 1st collection for Peru, only collection for Dept. Amaz.	1		1	1			
Siparuna grandiflora (Kunth) Perkins, PJB 2631 (MO)	1st collection for Dept. Amaz., 1st collection for Province Bagua					1		1
Siparuna subinodora (Ruiz & Pav.) A. DC., AHG et al., 22956 (MO), PJB 4157 (MO)	1st collections for Dept. Amaz., 1st collections for Province Bagua					1		1
Solanaceae								
Cestrum cf. *auriculatum* L'Hér., PJB 4276 (MO)	1st collection for Dept. Amaz., only collection for Province Bagua					1	1	
Datura inoxia Mill., PJB 4242 (MO, PC); not from Cerro Colán	1st collection for Dept. Amaz., 1st collection for Province Bagua					1		1
Deprea glabra (Standl.) Hunz., PJB 2662 (MO)	Only collection for Peru		1					
Deprea lutea (S. Leiva) Deanna, PJB 3974 (MO), 4156 (MO)	1st collections for Peru, only collections for Province Bagua			1		1		
Deprea pecaensis S. Leiva, Deanna & Barboza, AHG 22873 (MO), 23032 (MO); PJB 2682 (MO); not used for a type; endemic to Province Bagu	sp. nov., 1st collections for Peru, 1st collections for Dept. Amaz., 1st collections for Province Bagua	1		1		1		1
Larnax cf. *peruviana* (Zahlbr.) Hunz., PJB 3832 (MO)	1st collection for Province Bagua							1
Lycianthes acutifolia (Ruiz & Pav.) Bitter, PJB 3963 (MO)	1st collection for Province Bagua							1
Lycianthes cf. *acutifolia* (Ruiz & Pav.) Bitter, PJB 4151 (MO)	1st collection for Province Bagua							1
Lycianthes radiata (Sendtn.) Bitter, AHG et al., 23002 (MO), 23047) (MO	1st collections for Dept. Amaz., only collections for Province Bagua					1	1	
Nicandra physalodes (L.) Gaertn., PJB 2149*** (MO); not from Cerro Colán	Only collection for District Piura***						1	
Nicotiana glutinosa L., PJB 4232 (MO); not from Cerro Colán	1st collection for Province Bagua							1
Solanum abitaguense S. Knapp, PJB 2699 (MO), 2871 (MO)	1st collections for Peru, 1st collections for Dept. Amaz., only collections for Province Bagua			1		1	1	
Solanum achorum S. Stern, AHG et al., 23007 (MO, NY)	1st collections for Peru, 1st collections for Dept. Amaz., 1st collections for Province Bagua			1		1		1

APPENDIX 3. ANNOTATED LIST OF ANGIOSPERMS continued

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Solanum adenobasis M. Nee & Farruggia, PJB 4390 (NY)	1st collection for Peru, 1st collection for Dept. Amaz., 1st collection for Province Bagua			1		1		1
Solanum americanum Mill., PJB 3958 (MO), 4248 (MO)	1st collections for Province Bagua							1
Solanum anceps Ruiz & Pav., AHG et al., 23051 (MO), PJB 2667 (MO, NY)	1st collections for Province Bagua							1
Solanum anisophyllum Van Heurck & Mull. Arg., AHG et al., 22869 (MO, NY)	1st collection for Province Bagua							1
Solanum antisuyo Sarkinen & S. Knapp, PJB 4088 (MO)	1st collection for Dept. Amaz., only collection for Province Bagua					1	1	
Solanum confine Dunal, PJB 2854 (MO, NY)	Only collection for Dept. Amaz.				1			
Solanum endopogon (Bitter) Bohs, PJB 4366 (MO), not from Cerro Colán	1st collection for Province Bagua							1
Solanum laevigatum Dunal, PJB 3405 (MO, NY), 3595 (BM, MO, NY)	1st collections for Peru, only collections for Dept. Amaz.			1	1			
Solanum longifilamentum Sarkinen & P. Gonzales, PJB 3958 (NY)	1st collection for Province Bagua							1
Solanum sect. *Micracantha* Dunal, AHG et al., 22949 (MO), 23007 (MO)	1st collections for Peru, only collections for Dept. Amaz.			1	1			
Solanum mite Ruiz & Pav., AHG et al., 23086 (MO), PJB 3831 (MO)	1st collections for Dept. Amaz., only collections for Province Bagua					1	1	
Solanum pimpinellifolium L., PJB 4253 (MO, NY), not from Cerro Colán	Only collection for Dept. Amaz.				1			
Solanum riparium Pers., PJB 4238 (NY)								
Solanum sessiliflorum Dunal, PJB 4409 (MO)	1st collection for Province Bagua							1
Solanum ternatum Ruiz & Pav., PJB 3829 (MO), 4160 (MO)	Only collections for Province Bagua						1	
Solanum urticans Dunal, PJB 4390 (MO)	Only collection for Province Bagua						1	
Trianaea nobilis Planch. & Linden, AHG et al., 23020 (MO), PJB 2660 (MO)	1st collections for Dept. Amaz.l, only collectins for Province Bagua					1	1	
Trianaea speciosa (Drake) Solereder, AHG et al., 22934 (MO), PJB 2644 (MO), 4113 (MO)	1st collections for Dept. Amaz., only collections for Province Bagua					1	1	
Witheringia L'Her., AHG et al., 22973 (MO)	Only collection for Peru		1					

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Staphyleaceae								
Staphylea occidentalis Sw., PJB 2562 (MO)	Only collection for Province Bagua						1	
Styracaceae								
Styrax nui B. Walln., PJB 3254 (MO); not used for a type	sp. nov., 1st collection for Peru, only collection for Dept. Amaz.	1		1	1			
Styrax pentlandianus J. Remy, AHG et al., 23048 (MO)	Only collection for Dept. Amaz.				1			
Talinaceae								
Talinum paniculatum (Jacq.) Gaertn., PJB 4270 (MO); not from Cerro Colán	1st collection for Dept. Amaz., only collection for Province Bagua				1		1	
Tropaeolaceae								
Tropaeolum bicolor Ruiz & Pav., PJB 3574 (MO); endemic to Peru	Only collection for Dept. Amaz.				1			
Tropaeolum fintelmannii H. Wagener ex Schltdl., AHG et al., 22843 (MO), PJB 3572 (MO)	1st collections for Peru, only collections for Dept. Amaz.			1	1			
Tropaeolum pubescens Kunth, PJB 3994 (MO)	1st collection for Peru, only collection for Dept. Amaz.		1	1				
Tropaeolum repandum? Heilborn, PJB 4112 (MO)	Only collection for Province Bagua						1	
Urticaceae								
Boehmeria ulmifolia Wedd., PJB 4133 (MO)	1st collection for Dept. Amaz., only collection for Province Bagua				1	1		
Phenax cf. *integrifolius* Wedd., PJB 4086 (MO)	Only collection for Peru		1					
Pilea hirsuta Wedd., PJB 3603 (MO), 4009 (MO)	Only collection for Dept. Amaz.				1			
Pilea hydrocotyliflora Killip, AHG et al., 22971 (MO)	1st collection for Peru, only collection for Dept. Amaz.			1	1			
Pilea jamesoniana Wedd., PJB 4155 (MO)	1st collection for Peru, only collectiion for Dept. Amaz.			1	1			
Pilea minutiflora Krause, PJB 2958 (MO); endemic to Peru	1st collection for Peru, only collection for Dept. Amaz.			1	1			
Pilea myriantha Killip, PJB 3737 (MO)	1st collection for Dept. Amaz., only collection for Province Bagua					1	1	
Pilea myriophylla? Killip, PJB 3582 (MO)	1st collection for Peru, only collection for Province Bagua			1			1	

APPENDIX 3. ANNOTATED LIST OF ANGIOSPERMS continued

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Pilea obetiifolia vel sp. nov. Killip, PJB 4093 (MO)	1st collection for Peru, only collection for x Province Bagua			1	1			
Pilea obetiifolia Killip, PJB 4170 (MO)	1st collection for Peru, only collection for x Province Bagua			1	1			
Pilea pulegifolia (Poir.) Wedd. PJB 4094 (MO)	1st collection for Dept. Amaz., only collection for Province Bagua					1	1	
Pilea ramosissima? Killip, PJB 4152 (MO); endemic to Peru	1st collection for Peru, only collection for Dept. Amaz.			1	1			
Pilea strigosa Wedd., PJB 3997 (MO)	1st collection for Peru, 1st collection for Dept. Amaz., only collection for Province Bagua			1		1	1	
Pilea sublobata vel sp. nov. Rusby, PJB 4090 (MO)	Only collection for Dept. Amaz.				1			
Pourouma apiculata Spruce ex Mildbr., AHG et al. 22865 (MO)	Only collection for Peru		1					
Pourouma aff. *mollis* Trecul, AHG et al., 22866 (MO)	1st collection for Province Bagua							1
Verbenaceae								
Lantana cujabensis Schauer, AHG et al., 22828* (MO), not from Cerro Colán	1st collection for Province Bagua							1
Lantana trifolia L., PJB 4394 (MO), not from Cerro Colán	1st collection for Province Bagua							1
Lantana urticifolia Miller, PJB 4261 (MO), not from Cerro Colán	1st collection for Peru, only collection for Dept. Amaz.			1	1			
Phyla nodiflora var. *reptans* (Kunth) Moldenke, AHG et al., 22799* (MO), not from Cerro Colán	1st collection for Dept. Amaz., only collection for Province Bagua					1	1	
Priva lappulacea (L.) Pers., PJB 4273 (MO), not from Cerro Colán	Only collection for Province Bagua						1	
Stachytarpheta cayennensis (Rich.) Vahl, AHG et al., 22824 (MO), 23087 (MO), PJB 4244 (MO)	1st collections for Province Bagua							1
Violaceae								
Viola scandens Humb. & Bonpl. ex Schult., PJB 3389 (MO)	1st collection for Dept. Amaz., only collection for Province Bagua					1	1	
Vitaceae								
Cissus erosa Rich., AHG et al., 23120* (MO), not from Cerro Colán	1st collection for Province Bagua							1

ANGIOSPERMS/MONOCOTYLEDONS	NOTEWORTHINESS	sp. nov.	only coll. Peru	1st coll. Peru	only coll. Amaz. D.	1st coll. Amaz. D.	only coll. Bagua P.	1st coll. Bagua P.
Cissus verticillata (L.) Nicolson & C.E. Jarvis subsp. *verticillata*, PJB 4359 (MO), not from Cerro Colán	1st collection for Province Bagua							1
		58	**81**	**175**	**190**	**209**	**243**	**178**

# Sources: (1) Lois Brako and James L. Zarucchi. 1993. Catalogue of the flowering plants and gymnosperms of Peru. Monogr. Syst. Bot. Missouri Bot. Gard. 45:1–1286.		
(2) Tropicos.org Missouri Botanical Garden September 2013.		
sp. nov. Appendix 2 = 11;	11 + 58 = 69 sp. nov.	
sp. nov. Appendix 3 = 58	Appendix 2	409
74 endemics; not from Cerro Colán = 208	Appendix 3	1136
*AHG et al., but not PJB; **HT collected in 1977	**Totals**	**1545**
***not from Dept. Amaz.		

APPENDIX 4

RAPID HABITAT ASSESSMENT REPORT OF CORDILLERA COLÁN, DEPARTMENT OF AMAZONAS, PERU IN 2017, 43 YEARS AFTER INITIAL RESEARCH EXPLORATION BY LOUISIANA STATE UNIVERSITY

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ABSTRACT

In October 2017, a small team led by the author explored trails, camps, and habitats of the Cordillera Colán originally used during the 1978 Louisiana State University research expedition. Our purpose was to document the habitat losses that occurred during the 43 years between expeditions and georeference the camps used in 1978. Most of the habitat above 2,300 m remains in the same high-quality condition observed during the original expedition. Forest cutting for timber and conversion to grazing intensifies below that and between ½ to ¾ of the forest between La Peca and our first 2017 camp at 2,200 m had been cut or fragmented. Accurate latitude, longitude, and elevation data for the 1978 and 2017 are provided. We observed during our 2017 trip several of the unique or new bird species from the 1978 expedition. A large area (39,215.80 hectares) east of the Colán ridge is now protected by the Santuario Nacional Cordillera de Colán (SNCC) established in 2009. In 2011, the Copallín Private Conservation Area (ACP, 11,549 hectares) was established to conserve the biodiversity of cloud forests and watersheds on private and community lands west of the Cordillera Colán ridge and to provide a buffer for the SNCC.

The ACP needs additional guards to provide adequate protection and community awareness. I provide an outline for potential assistance in the Conclusions.

RESUMEN

En octubre de 2017, un pequeño equipo dirigido por el autor exploró senderos, campamentos y hábitats de la Cordillera Colán originalmente utilizados durante la expedición de investigación de 1978 de la Universidad Estatal de Louisiana. Nuestro propósito fue documentar las pérdidas de hábitat que ocurrieron durante los 43 años entre las expediciones y la georreferenciación de los campamentos utilizados en 1978. La mayor parte del hábitat por encima de los 2,300 m permanece en la misma condición de alta calidad observada durante la expedición original. La tala de bosques para la madera y la conversión al pastoreo se intensifica por debajo de eso elevación. Entre ½ a to ¾ del bosque desde La Peca hasta nuestro primer campamento de 2017 a 2,200 m se había cortado o fragmentado. Se proporcionan datos precisos de latitud, longitud y elevación para 1978 y 2017. Observamos durante nuestro viaje de 2017 varias de las especies de aves únicas o nuevas de la expedición de 1978. Una gran área (39,215.80 hectáreas) al este de la cordillera de Colán ahora está protegida por el Santuario Nacional Cordillera de Colán (SNCC) establecido en 2009. En 2011, el Área de Conservación Privada Copallín (ACP, 11,549 hectáreas) se estableció para conservar la biodiversidad de bosques nubosos y cuencas hidrográficas en terrenos privados y comunitarios al oeste de la cordillera del Colán y para proporcionar un amortiguador para el SNCC. La ACP necesita guardias adicionales para proporcionar una protección adecuada y conciencia de la comunidad. Proporciono un resumen de la asistencia potencial en las Conclusiones.

INTRODUCTION

In the decades following the 1978 expedition, given habitat losses around the world, I had become increasingly concerned about the potential for major habitat and species losses within the area we were so fortunate to have studied as described above this publication. Finally, with a great deal of assistance from Fernando Rubio, a local expedition organizer from Tarapoto and Leyda Gueiler Rimarachín, former park guard for the Copallín Private Conservation Area (ACP), and my son, Jove Graham, I was able to organize a 10-day expedition to rapidly assess the conservation status of the Cordillera Colán area.

MATERIALS AND METHODS

With a great deal of assistance from Fernando Rubio, a local expedition organizer from Tarapoto and Leyda Gueiler Rimarachín, former park guard for the Copallín Private Conservation Area (ACP), and my son, Jove Graham, I was able to organize a 10-day expedition to rapidly assess the conservation status of the Cordillera Colán area. Mr. Rubio and I developed the 10-day plan for reaching each 1978 camp. We used Google Earth (GE) in planning to approximate locations for the 1978 camps and trails and a Garmin GPSMap©64s to measure with more precision the exact locations of the LSU and 2017 camps.

In addition to myself, participants included Jove Graham, Brooke Danaher (Jove's wife), Reyes Rivera (friend and LSU field assistant for over 40 years), and Leyda.

September 28, 2017.—After securing additional supplies in Jaen, Department of Cajamarca, the previous

day, we departed early using a rented truck and driver to go from Jaen to La Peca where we picked up Leyda and continued on the road 1 km E toward Arenal. There, as previously arranged, we met Sr. Urbano Diaz and loaded our equipment onto his three mules. We hiked with the mules to Arenal where we met our principal local contacts Sr. Elder Centurion and Salvador Diaz and had lunch. Arenal is a wonderful tiny little community that had not changed at all in 43 years and has the best coffee I've ever had. Some of the older people there remembered us and were grateful we had returned. We then hiked following Urbano with his mules and Salvador through LSU camps 1 & 2 to our 2017 camp 1, which was beneath a shed used by ACP staff.

September 29.—Hiked east on super muddy trail in newly cut pasture for about 0.5 km then cut trail led by Salvador almost to the Quebrada Copallín. Jove cut three of his knuckles from the razor-sharp cut bamboo trunks. These cuts required serious bandages but no stitches. We were lucky it was his left hand because he was the primary machetero using his right hand. We returned to our first camp for another night.

September 30.—Leyda and Salvador finished cutting the trail to the Quebrada where Salvador pointed Leyda to the "general" area for the 1978 LSU camp 3. Jove and Brooke took a large backpack load each to Quebrada Copallín. My cold started this day. We spent one more night at 2017 camp 1.

October 1.—Moved entire camp 2.5 km east to our 2017 camp 2. Sr. Diaz left early from 2017 camp 1 destined for Lima. I had not distinguished with Salvador beforehand the difference between an exact location and a general region for camp 3 and erroneously thought he was guiding us to the actual LSU camp 3. I did not discover this until I arrived at the Quebrada. Given the time lost already, the apparent proximity of an ACP trail to, or near to, the Colán ridge, the worsening of my cold, and the slower than anticipated rate we have been able to cut trails, I decided to try to reach the Colán ridge and, I hoped LSU camps 4 & 5 using the ACP trails before trying to locate actual LSU camp 3, if time permitted. We set up tarps and tents for our second camp about 100 m up from the quebrada in a reasonably flat, dry area on a forested SW running ridge that connected with the ACP trail. I could see a flattened, bamboo laden area about a km north of our 2017 camp 2 where I was reasonably sure that LSU camp 3 had been located. But given the above challenges, we opted to proceed east toward the Colán ridge. We obtained water up from the quebrada.

October 2.—With a full-blown cold, I stayed in camp while Jove and Brooke retrieved some of the equipment we had left along the trail the previous day. Leyda and Reyes cut a primitive path to the existing ACP trail and located the ACP refuge hut where Leyda recommended we establish our 3rd camp. Most of the area around our camp had been cleared for grazing and was basically a marsh except on parts of the ridge. The mud and cattle-hoof pits made for very tough moving around. Leyda and Reyes got turned around coming down at night and did not return to camp until 10:00 pm.

October 3.—Moved 2.3 trail kms to 2017 camp 3 inside a primitive ACP hut. Hard rain much of the afternoon. Jove and Brooke made two trips between camps. Given my cold (and age I have to admit), I was slower, so Reyes hiked with me, each carrying a good backpack load and arriving at the hut at 4:30pm. Leyda was much faster, and after dropping off her backpack located the trail that turned east off from the ACP mule trail and explored part of the way up to where the ACP wildlife cameras were placed. Obtained and treated water from a small natural sinkhole about 50 m from the hut.

October 4.—Brooke and Jove made one more trip down to 2017 camp 2 for remaining food and equipment. Another very hard rain most of the afternoon when they returned. The ACP camera trail was only about ¾ km up the trail so Leyda, Reyes and I used machetes to cut our way up toward the ridge through thick elfin forest and bamboo along the steep slope. Thus, the going was slow, and we returned to camp that night after a long day. After assessing our slow progress, I arranged through my wife Lauren in MA using our satellite phone, and Fernando Rubio, our trip coordinator out of Tarapoto, to confirm our expedition would take 10 days to reach the ridge.

October 5.—We cut a rough trail to the Colán ridge. Top third was very hard—steep and no obvious ridge to follow. After confirming that we were in fact on the ridge, Leyda and I hiked north toward LSU camps 4 & 5 for about 15 minutes before running out of time. Returned to camp about 2 hours after sunset. Ridge

trail followed a well-worn bear trail with old signs (few cut branches) that someone (probably a park guard) had made their way along the ridge part of the distance toward the old LSU camp sites.

October 6.—We all made the long hike up to the Colán ridge following the bear trail that had fresh bear tracks along the way. A small patch of wetland (paramo-like) had a hole apparently dug by the bear for drinking water. Fresh debris on the edge had apparently been recently removed from the hole by the bear. We cut our way north to within about 0.5 km of LSU camp 4 before deciding there was no way we could make it to LSU camp 4 before nightfall given that everyone was worn out. I was fighting off my cold, Brooke was having difficulty with one of her eyes that had been hit by a twig, and a lightning storm was rapidly approaching. We established where we were on the GPS compared to where LSU camp 4 was mapped on GE. I examined all the land features I could see beyond a small hill between us and camp 4. The hill prevented me from seeing the actual LSU campsite, but I could see just north of where we had camped in 1978 thus establishing that the GE mapped location was accurate. I could also see where the ridge ran into the flatter area at the north end of the ridge where we established LSU camp 5 in 1978. The area appeared the same as I remembered, mostly paramo mixed with small patches of elfin forest and a few rock outcrops. I could see the large stream that was close to camp 5 and easy to see on the GE map, which makes me confident that LSU camp 5 is also mapped close to where we had built the camp in 1978. I was the last one to make it into camp a couple of hours after dark. I was bone tired, but happy we had made it to the top for Jove and Brooke to see what it was like to have camped there as we did in 1978.

October 7.—Two park guards (Dioni Silva and Julio Cabrera) plus another worker arrived around 10:00 am. They helped carry the equipment down from our 2017 camp 3 to Cambio-Pitec. About 30 minutes down trail from the junction of the ACP trail with the trail we had cut from 2017 camp 2, the park guards showed us a large beautiful set of waterfalls they had recently discovered. I did not make it all the way to the waterfalls, but Jove and Brooke did. I cut the knuckle of my left hand middle finger on bamboo similar to Jove's cut. It too required bandages but no stitches. The hike down took considerably longer than expected, mainly because I was dragging with the cold. It was also depressing to be leaving such a pristine landscape, one of my favorites on earth, and re-entering areas with people, pastures, and cows. I arrived at Cambio about half an hour before dark. We cleaned up a little and threw our backpacks into the back of a pickup we had arranged for before the trip. After dropping Leyda off at her house in Bagua Grande, we drove to Chachapoyas arriving at 10:00 pm where we met my younger son, Fory Graham. The hot shower was one the best, but it took me half an hour to remove the caked mud that had been on my calves and feet since day one.

October 12.—After a couple days rest and visiting ruins and the endemic Marvelous Spatuletail near Chachapoyas with Jove, Brooke and Fory, we took a rented truck and driver to Copallín where I gave a summary of our 1978 research findings and our 2017 expedition. This presentation was a requirement for obtaining permission to enter the Copallín ACP and Colán area. I emphasized the important need to increase protection of the area for water, biodiversity, and tourism services.

RESULTS

LSU 1978 Camp Sites and Paths.—The locations of all the 1978 LSU camps and paths are presented in Figure 32. In 2017, I located LSU 1978 camps # 1 & 2 using a local resident (Salvador Diaz) from Arenal (small community nearby) to guide us to camps from Arenal. I recognized parts of the trail, especially the little jog south from the main mule trail to camp 1, a small lagoon near camp 2, and the sandy soil forest leading to camp 2. The actual camps were easy to recognize once I arrived there. The trails were the same ones we used in 1978 with a few minor deviations. The GPS data for LSU Camp 1 was S 5°34.941', W 78°23.356', at 1,764 m (900 m above La Peca), and 6.9 trail km from La Peca (including 2.0 trail km from Arenal). LSU Camp 2 was S 5°34.890', W 78°22.501', 1,993 m (229 m higher than camp 1), and 2.0 trail km from camp 1.

We did not rediscover exact locations of LSU camps 3, 4 & 5. We were misled by Sr. Diaz that he could lead us to camp 3. Instead, he led us to a general region where he was told as a kid that LSU had camped. That area was 2 km southeast of where we had mapped LSU camp 3 on GE. In addition, it took us a day longer than planned to cut a trail to this region and move everything to 2017 camp 2. Leyda said that at 2017 camp 1 we

were close to a trail used by the park to access their hut and ultimately the ridge. These factors combined with my having a cold led me to the decision to try to use the ACP trails to get to the Colán ridge line and ultimately LSU camps 4 & 5 sooner and work on finding LSU camp 3 on the way down as time permitted.

Unfortunately, it also took us 2 days longer than expected to cut a connecting trail to the ACP trail and move camp to the ACP hut (one day was with torrential rain). Then it took a day longer than planned to cut a trail to the Colán ridge. On our 9th day we hiked to the ridge and as far north along it toward LSU camps 4 and 5 as we could, less than ½ km from 1978 camp 4, before having to turn around due to an approaching storm and running out of daylight. From that vantage point I could follow with binoculars the Colán ridge up to a small hill beyond which we had mapped LSU camp 4 on GE. I could see enough details of the ridge to determine that LSU camp 4 was, in fact, just beyond that hill as mapped on GE. I also could recognize, using binoculars, parts of the ridge between LSU camps 4 & 5 as well as the general area where we had made LSU camp 5 in 1978. I later re-examined 1978 photos of LSU camps 4 and 5 and used landscape features to confirm more precisely on GE maps where the camps were originally located. For camp 4 I used the drainage patterns on the east facing slope. Although the landslides are different, as expected after 43 years, the major drainages can reliably be recognized in the photos and GE maps. For camp 5, I used the rocky features in the photos (two medium and one small cliffs) to find the flat place on the GE map where the tent was placed. Consequently, I'm confident that the location for LSU Camp 4 is S 5°34.644', W 78°19.265' at 3,097 m. LSU Camp 5 is located at S 5°33.368', W 78°19.423' with an elevation of 3,358 m.

We ran out of time and did not descend along the ridge from near LSU Camp 4 to where LSU camp 3 had been established. I could, however, see with binoculars from 2017 camp 2 a flattened area along the ridge approximately where we had placed LSU camp 3 on the GE map. It had the features I remembered for camp 3: a small reasonably flat area along the ridge, mostly bamboo, not very far from the Quebrada Copallín, and not far downhill from a small cliff we had to climb to get from LSU camp 3 to LSU camp 4. These combined factors made me confident that the location of LSU camp 3 is approximately S 5° 34.747', W 78° 19.993' at 2,446 m.

Given the locations of LSU camps 3, 4, & 5 and GE mapped paths between them based on the best of my recollections, the following distances apply using GE path measurements: LSU camp 2 to LSU camp 3 about 5.0 km, LSU camp 3 to LSU camp 4 about 1.8 km, and LSU camp 4 to LSU camp 5 about 2.9 km. The total kilometers from La Peca to LSU camp 5 as measured on GE map is about 18.5 km.

2017 Camp Sites and Paths.—Figure 33 shows the 2017 camps and paths superimposed onto the 1978 camps and trails. 2017 camp 1 was located at S 5°35.016', W 78°21.940' with an elevation of 2,113 m, 2017 camp 2 was S 5°35.484', W 78°21.051' at 2,042 m, 2017 camp 3 was at S 5°35.550', W 78°20.205' with an elevation of 2,423 m. The GE mapped path distances between the camps were 2.5 km for our camps 1 to 2 and 2.3 km for camps 2 to 3. We cut a 1.6 km trail upslope east from the ACP trail near our camp 3 to the Colán ridge then another 1.3 km to our most distant point north along the ridge.

Habitat changes.—A primary goal of this trip was to document the extent of cloud forest loss during the 43 years that have passed since the 1978 LSU expedition. In 1978, most of the habitat loss was below the first camp but with a small pasture actively being cut adjacent to and west of the trail about ½ km from LSU camp 1 toward camp 2 at about 1,950 m. The LSU camp 1 had been surrounded by tall forest (see Figs. 7–9 in the primary publication associated with this Appendix).

In 2017, between ½ to ¾ of the forest between La Peca and our 2017 camp 1 had been cut and converted to grazing. Some patches remained along streams and on some steeper slopes. The area around LSU camp 1 was cleared of all woody vegetation (Fig. 34). Recent forest clearing was most severe near the trail we used in 1978 between camps 1 and 2, which had also been used back then then by mules apparently traveling from valleys and communities further south. An old small lumber cutting hut had been built, but abandoned, almost exactly where LSU camp 2 had been placed.

Forest cutting continues, and is advancing east, as evidenced that the area around 2017 camp that was the most recently cleared, including a patch about 0.5 km east of the camp where most cut trees remained on the ground.

Forest cutting was more extensive along the Quebrada Copallín valley (south and east of 2017 camp 1) up to and slightly beyond our 2017 camp 2. Large patches of forest had been recently cut east and upslope from that camp. GE images show that clearing on both slopes had moved up Copallín valley to the point where the 1978 path had crossed Quebrada Copallín. Most of these clearings were below 2,200 m, but there was an abandoned pasture around our 2017 camp 3 at 2,400 m. It had been abandoned after the Copallín ACP was established in 2011. Most of the forest cutting on Colán appears to be for grazing, but some has been for wood products and materials for buildings. Many in the area are concerned about commercial harvesting of select species, but I did not see evidence of such activity.

That I could still stand in 2017 on Colán ridge near our 1978 camp 4 and not see any signs of humanity (Fig. 35) in all directions, other than to the west, continues to be an inspiration for me and provide hope for conservation of the unique cloud and elfin forest habitats and all their endemic species.

Bird and Other Wildlife Notes.—It basically took all my time and energy to make sure we made it to the Colán ridge. Consequently, I spent very little time actually looking for birds. I did, however, make the following noteworthy observations:

Turkey Vulture (*Cathartes aura*). I include this vulture because it was common around 2017 camps 1 & 2 but were not included in Tom Schulenberg's Unpublished List Birds of the Cordillera Colán, Amazonas, Peru. The difference between 1978 and 2017 probably reflects the extensive conversion of cloud forest to grazing pastures up to 2,100 m.

Long-whiskered Owlet (*Xenoglaux loweryi*). We heard a single individual calling from mid-level in trees very near 2017 camp 2 (2,113 m) about an hour after dark on both nights at this camp. The bird responded to recorded calls on my phone projected through a small speaker, but I did not see it.

Andean Potoo (*Nyctibius maculosus*). Heard at dusk all three nights near 2017 camp 2 with a call that is unmistakable. I've heard it before on the Manu road, and I had a Xeno-canto recording from Ecuador on my phone at the camp for comparison. Immediate area around camp 2 was cleared for grazing with dead tree poles scattered throughout. Uncut forest was 150 m north of camp and a small patch 150 m east of camp. Calls seemed to come from the edge but could have come from one of the dead trees in the clearing. I did not attempt to locate the birds and did not see any flying around.

Yellow-browed Toucanet (*Aulacorhynchus huallagae*). Dan Lane suggested that we look for this species. We did not locate any after carefully examining five or so A. prasinus between 2017 camps 1 and 3 looking specifically for the yellow brow line and yellow undertail coverts.

Chestnut Antpita (*Grallaria blakei*). I'm pretty sure, but not certain, that I heard this bird singing on the trail near 2017 camp 3. I listened to its song on my phone later that night in camp and thought it was close. I did not play its song on the trail to determine a response because it was raining hard, and I was worn out and in a hurry to get to camp.

Johnson (Lulu's) Tody-flycatcher (*Poecilotriccus luluae*). This flycatcher was common around 2017 camp 2 where I saw and heard it several times each day. The birds readily responded to my recorded calls of the species.

We were very fortunate to discover one set of clear foot prints in mud of the very rare and endangered Mountain Tapir (*Tapirus pinchaque*), the only tapir to live at high elevations, thus above rainforests. We found the tracks between our 2017 camps 1 & 2 at about 2,070 m. It was following a game trail. We were told by the local guide that they are still hunted, to which I responded that it was against the law. We did not see the animal, nor did we discover any signs of the animal during the 1978 research.

We did not actually see an Andean Spectacled Bear (*Tremarctos ornatus*), although many signs, including several sets of fresh tracks and recently eaten bromeliads, were abundant east of the Quebrada Copallín. We were very close to one, judging by how fresh the tracks were, while hiking the last day along the Cordillera Colán crest. Our local guide carried a shotgun because he was afraid of being attacked by a bear. I told him and others in Copallín that an attack was extremely rare and that it was illegal to shoot a bear.

We did not see, nor hear, the Yellow-tailed Wooly Monkey (*Oreonax flavicauda*), although locals assured

us the species was still reasonably common within their narrow elevational range. We did see freshly torn branches near 2017 camp 3, apparently used in their displays.

DISCUSSION

While acknowledging concerns about the extent and rate of habitat destruction described above, I'm encouraged by the local and governmental efforts to protect the remaining intact forests. Since our LSU 1978 Colán expedition, the Santuario Nacional Cordillera de Colán (SNCC) was established in 2009 providing protection for a large area east of the Colán crest where our 1978 camp 4 had been located. At 39,215.80 hectares, this national park was established for water conservation and to protect biodiversity. (http://www.sernanp.gob.pe/cordillera-de-Colán).

In 2011, the Copallín Private Conservation Area (ACP) was established to conserve the biodiversity of cloud forests and watersheds on private and community lands west of the Cordillera Colán ridge and to provide a buffer for the SNCC. The Copallín ACP is 11,549 hectares and includes the mid and higher elevations of the 1978 LSU expedition research area down to our 2017 camp 1 at 2,100 m (http://www.apeco.org.pe/web/images/programas/bosques_montanos/FICHA%20ACP%20Copall%C3%ADn.pdf). For a beautiful, well-done video of the Copallín ACP visit: http://www.conservamospornaturaleza.org/video/acp-Copallín/. It is narrated by Mariella Leo Luna who joined the 1978 LSU research effort to study the Yellow-tailed Wooly Monkey.

ACPs are designed to be complementary to the national system and are formally approved by a ministerial resolution (https://www.iucn.org/downloads/peru_en.pdf). As such, ACPs are not designated by the government, but instead are recognized by it. Landowners within an ACP voluntarily accept specific terms and conditions of use, with a view to ensuring the conservation of biological diversity, landscapes and environmental services. Given the voluntary basis for ACP, they do not have as much enforcement strength and capacity as do the nationally protected areas, many of which struggle against similar threats faced by ACPs. Implementation and enforcement of conservation goals on the national parks are not effective enough: staff numbers and management budgets are inadequate, and political support is insufficient. Such challenges are amplified with ACPs.

The Copallín ACP currently has strong leadership and bylaws with good community support. They were assisted by a very smart, competent Peace Corp volunteer who has helped them develop business and implementation plans plus helping acquire scientific data, including use of wildlife cameras to monitor Andean Spectacled Bears. Although the ACP have taken actions to limit the forest clearing, they can only afford two park guards to cover the entire 11,500 hectares. These two gentlemen are very well informed and do exceptional work increasing awareness in the ACP communities and enforcing the ACP rules. But the area is very large, and they are not reliably paid, which is a problem that offers an opportunity for additional outside assistance.

I am working with the Copallín ACP team on a plan to help fund one more park guard. The basic idea is to use a US-based conservation NGO to accept donations that would be tax deductible for US donors and would be transferred to a credible Peru organization like the Asociación Peruana Para La Conservación De La Naturaleza (APECO) to directly fund the position through the Copallín ACP. The Peru organization would also provide oversight to make sure the funds are not used for anything other than to support another park guard. Each park guard makes about $5,500 a year. That salary plus operating costs would be less than $10,000 a year and the funding would need to be sustainable.

The view from the Colán summit was inspiring in 1978 and perhaps even more so in 2017. It makes me hopeful for all things natural and motivates me to continue working for their conservation.

APPENDIX 4 ACKNOWLEDGMENTS

I feel privileged to have been a member of the 1978 LSU group that conducted the biological inventory of this wonderful area, which led to the discovery of many new species of plants and animals. I'm fortunate to now have been able to conduct this 2017 rapid habitat assessment with my son Jove, his wife Brooke, my Peruvian friend and colleague of 40 years, Reyes, and Leyda. I would not have been physically able to make the

expedition without the extensive help of these wonderful people. Jove was amazing in how much weight he carried while taking the lead cutting trails. Brooke was wonderful at planning and preparing meals plus also carrying heavy loads on the trails. Leyda, who manages her own cloud forest ACP near Bagua Grande, was exceptionally helpful with many aspects, but especially with her knowledge of plants and their uses. Reyes, a slow hiker like me, was always by my side on the trails. Fernando Rubio of Tarapoto was invaluable coordinating all aspects of the trip from securing transportation and mules to arranging rent of the satellite phone. Lauren Sullivan, my wife, was very helpful coordinating communications and logistics while we were on the expedition because the satellite phone we had rented only worked for international calls. She was also very patient with me during the several months I was preparing for this expedition.

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