Supplementary Online Material for "An Integrative Approach to Species-Level Systematics Reveals the Depth of Diversification in an Andean Thamnophilid, the Long-Tailed Antbird"

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APPENDIX 1. List of tissues sequenced for this paper by study group and recommended nomenclature (in parentheses), including sample code, country, state or department, locality, and geographic coordinates. Geographic coordinates are expressed in degrees to hundredths of a degree, longitude followed by latitude, positive values for north latitude. For museum acronyms see Acknowledgments.

1. *klagesi* (*D. klagesi*): COP-JM586 and COP-JM593, Venezuela, Falcón, Sierra de San Luis, –69.70, 11.18.
2. *aristeguietana* (*D. klagesi*): JPL258 and AMC1045, Colombia, Cesar, Serranía del Perijá, –72.95, 10.37.
3. Norte de Santander (*D. klagesi*): ICN35570, Colombia, Norte de Santander, Ocaña, Agua de la Virgen, –73.40, 08.23.
4. *hellmayri* (*D. hellmayri*): ANDES-BT994, Colombia, Magdalena, Santa Marta, –74.10, 11.10.
5. Santander (*D. caudata*): JEAC640, Colombia, Santander, Galán, –73.24, 06.38.
6. Upper Magdalena (*D. caudata*): IAvH.BT7494 and IAvH.BT7506, Colombia, Huila, Parque Nacional Natural Cueva de los Guácharos, –76.08, 01.39.
7. *striaticeps* (*D. striaticeps*): IAvH.BT2145 and IAvH.BT7845, Colombia, Antioquia, Amalfi, –75.06, 06.49; ANDES-BT AMC1171, Colombia, Antioquia, Envigado, –75.33, 06.07; IAvH.BT5199, Colombia, Antioquia, Páramo de Frontino, –76.08, 06.43; IAvH.BT4016, Colombia, Risaralda, Parque Nacional Natural Tatáma, –76.02, 05.16.
8. *occidentalis* (*D. striaticeps*): ANSP19428, Ecuador, Napo, Mirador, –77.49, –00.23; ANSP19156, Ecuador, Zamora Chinchipe, Panguri, –78.58, –04.37; LSUMZ-B33728 and LSUMZ-B33729, Peru, Cajamarca, Nuevo Perú, –78.40, –05.17; LSUMZ-B43491, LSUMZ-B43533, LSUMZ-B43578, LSUMZ-B44045, LSUMZ-B44594, LSUMZ-B44394, and LSUMZ-B44460, Peru, San Martín, ~22–24 km ENE Florida, –77.75, –05.69.
9. *peruviana* (*D. striaticeps*): LSUMZ-B1641, LSUMZ-B1823, and LSUMZ-B1836, Peru, Pasco, Santa Cruz, –75.33, –10.62; KUNHM16639, Peru, Ayacucho, Tutumbaro, –73.57, –12.44; FMNH 398030, Peru, Cusco, Suecia, –71.34, –13.06.
10. *boliviana* (*D. striaticeps*): LSUMZ-B572, Peru, Puno, Abra de Maruncunca, –69.13, –14.12.

Cercomacra parkeri: IAvH.BT4962; *Hypocnemis hypoxantha*: LSUMZ-B10573; *Drymophila genei*: FMNH432972; *Drymophila ferruginea*: LSUMZ-B37217; *Drymophila malura*: LSUMZ-B25950; *Drymophila devillei*: LSUMZ-B9683 (outgroups).

APPENDIX 2. Recordings examined by study group and recommended nomenclature (in parentheses). The following list identifies recordings used by population, country, state or department, location of recording, geographic coordinates (see Appendix 1 for notation), elevation where known, and recordist. Numbers following the recordist's name identify the number of cuts per recordist per location. Acronyms for archives of recording: XC = Xeno-Canto database (www.xeno-canto.org), BSA = Banco de Sonidos Animales (Instituto Alexander von Humboldt, Bogotá, Colombia), ML = Macaulay Library (Cornell Laboratory of Ornithology, Ithaca, NY); ISL = recordings not yet archived in an institutional collection but that have been copied into the inventory maintained by MLI and Phyllis Isler. Many of these unarchived recordings either are in the process of being archived or will eventually be archived by the recordists.

1. *klagesi* (*D. klagesi*, 25 recordings, 6 locations): Venezuela: Mérida: Zea, –71.78, 08.38 (Schwartz 1 ML); Lara: Parque Nacional Yacambú, –69.53, 09.68, 1500 m (Athanas 1 XC, Spencer 1 XC, Stejskal 1 ISL); Aragua: Rancho Grande, –67.68, 10.37, 700–950 m (Behrstock 1 ISL, Lane 2 ISL, Schwartz 10 ML, Zimmer 2 ISL), Tarma, 550 m (MacDonald 1 ML); Distrito Federal: –66.92, 10.50, 900 m (Coopmans 1 ML, Schwartz 4 ML).
2. *aristeguietana* (*D. klagesi,* 2 recordings, 1 location): Colombia: Cesar: Serranía del Perijá, –72.95, 10.37, 1900 m (Cuervo 1 ISL, Marín 1 ISL).
3. Norte de Santander (*D. klagesi,* 8 recordings, 1 location): Colombia: Norte de Santander: Agua de la Virgen, –73.40, 08.23, 1600 m (Donegan 1 XC, Lambert 1 XC, Laverde 6 XC).
4. *hellmayri* (*D. hellmayri,* 7 recordings, 3 locations): Colombia: Magdalena: Reserva Natural El Congo, –74.07, 10.98 (Strewe 1 BSA), Cuchilla San Lorenzo, –74.12, 11.17, 1450 m (Krabbe 4 ISL), Parque Nacional Natural Sierra Nevada de Santa Marta, –74.08, 11.25 (Strewe 2 BSA).
6. Upper Magdalena (*D. caudata,* 7 recordings, 3 locations): Colombia: Caquetá: Parque Nacional Natural Cordillera de los Picachos, –74.85, 02.78 (Alvarez 2 BSA); Huila: Parque Nacional Natural Cueva de Los Guácharos, –76.00, 01.58, 1950 m (Hilty 2 ISL, Parra 4 BSA, Whitney 1 ISL).
7. *striaticeps* (*D. striaticeps,* 57 recordings, 18 locations): Colombia: Antioquia: Alto El Silencio, –75.68, 06.17, 2750 m (Pulgarín 2 ISL), Páramo de Frontino, –76.07, 06.47, 2800 m (Lambert 1 XC), El Viao, –75.22, 06.07, 1950–2050 m (Cuervo 10 ISL), Fizebad 2300 m (Krabbe 1 ISL), Jardín Gaviria (Cuervo 2 ISL), Amalfi, 0649N7506, 1800–1900 m (Cuervo 9 ISL); Caldas: Reserva Natural Río Blanco, –75.50, 05.08, 2500–2600 m (Bradley 1 XC, Cuervo 3 ISL, Kaestner 2 ISL, López 1 BSA, Mark 2 XC), Aranzazu (Álvarez 3 BSA); Risaralda: Parque Municipal Natural Campo Alegre, –75.52,04.87 (Córdoba 6 BSA), Parque Nacional Natural Tatáma –76.17, 05.08 (Córdoba 1 BSA), Otún-Quimbaya, –75.58, 04.73, 2180 m (Cadena 2 ISL); Quindío: La Línea–La Torres Road, –75.62, 04.55, 2350 m (Marín 1 ISL), Reserva Natural La Patasola, –75.55, 04.70, 2450 m (Ospina 1 ISL), Tolima: Ibagué, –75.23, 04.45, 2400 m (Moreno 1 XC), Juntas, –75.25, 04.60, 2300 m (Laverde 2 BSA); Valle del Cauca: Cerro Inglés, –76.32, 04.75 (Cuervo 2 ISL), La Cumbre, –76.55, 03.65, 1940 m (Montealegre 1 XC), Queremal, –76.72, 03.52, 1950 m (Whitney 3 ISL).

8. *occidentalis* (*D. striaticeps,* 86 recordings, 25 locations): Colombia: Nariño: Reserva Natural La Planada, –78.25, 01.25, 1800 m (Laverde 3 XC, Salaman 2 BSA, Stiles 5 BSA), San Ramón, –77.95, 01.05, 2050–2100 m (Fernandez 5 ISL). Ecuador: Carchi: Chical, –78.20, 00.90, 1650 m (Robbins 3 ML), Tufino, –77.92, 00.80 (Lane 1 ISL); Pichincha: Reserva Bellavista, –78.67, –00.02 (Tobias/Seddon 1 XC), Chiriboga, –78.73, –00.25, 1500 m (Behrstock 1 ISL, Zimmer 2 ISL), Mindo region, ~–78.80, –00.02, 1400–2200 m (Ahlman 1 XC, Arvin 1 ISL, Behrstock 1 ISL, Halfwerk 1 XC, Krabbe 1 ISL, Lane 1 XC, G. Rosenberg 1 ISL, Lane 1 ISL, Whitney 5 ISL), Cordillera Tandayapa, –78.68, –00.02, 2300 m (Vogt 1 XC, Whitney 1 ISL), Yanayacu Biological Station, –77.90, –00.60 (Tobias/Seddon 1 XC); Napo: Cosanga, –77.87, –00.57, 2000–2100 m (Ahlman 2 XC, Arvin 1 ISL, Athanas 1 XC, Behrstock 1 ISL, López-Lanús 1 XC, Spencer 1 XC), Cordillera de Guacamayos, –77.83, –00.62, 2300 m (Krabbe 1 ISL), Volcán Sumaco, –77.63, –00.57 (Whitney 1 ISL); Morona-Santiago: Limón, –78.42, –02.93 (Whitney 2 ISL); Loja: Río Cosanga (Arvin 1 ISL); El Oro: Piñas, –79.73, –03.67 (Kaestner 1 ISL); Zamora-Chinchipe: Chinapinza, –78.57, –04.00 (Krabbe 6 ISL), Río Blanco, –79.28, –04.58, 2550 m (Krabbe 1 ISL), Reserva Tapichalaca, –79.12, –04.48, 1750–2600 m (Athanas 2 XC, Lambert 1 XC). Peru: Cajamarca: Cordillera del Cóndor, –78.85, –05.03, 1770 m (Mark 2 XC, Schulenberg 3 ISL), Quebrada Las Palmas, –79.20, –05.67, 2200 m (Lane 1 ISL), San José de Lourdes, –78.90, –05.07 (Lane 2 ISL); San Martín: 22 km ENE Florida, –77.75, –05.68, 1850 m (Lane 1 ISL), Pardo de Miguel, –77.82, –05.70, 2000–2200 m (Geale 1 XC, Hornbuckle 2 XC, Lambert 1 XC, Lane 2 ISL, van Oosten 1 XC, Zimmer 6 ISL), Laguna Pomacochas, –77.92, –05.83 (Whitney 2 ISL).
9. *peruviana* (*D. striaticeps,* 22 recordings, 6 locations): Peru: Huánuco: Carpish Tunnel, –76.10, –09.72, 2500 m (Edwards 1 XC, Whitney 1 ISL), Paty Trail, 2050–2200 m (Fjeldså 1 ISL, Hornbuckle 1 XC, Krabbe 1 ISL, Parker 2 ML, Spencer 1 ML, van den Berg 2 ML); Pasco: Oxapampa, –75.40, –10.55, 1850 m (Schulenberg 5 ML); Junín: Cordillera de Vilcabamba, –73.63, –11.57 (Schulenberg 5 ISL); Cusco: Apuntinye, –72.53, –13.00 (Edwards 1 ML), San Pedro, –71.55, –13.05, 1960 m (Jankowski 1 XC).
10. *boliviana* (*D. striaticeps,* 10 recordings, 2 locations): Peru: Puno: Abra Maruncunca, –69.22, –14.20, 2000–2100 m (Cuervo 3 ISL, Lane 1 ISL, Spencer 1 XC). Bolivia: above Apa Apa –67.50, –16.35, 2000–2200 m (Hennessey 3 XC, Lambert 1 XC, Whitney 1 ISL).

APPENDIX 3. Additional data including sample sizes and descriptions of vocal and plumage characters of study groups.

Male loudsongs. (1) Number of whistled notes. An aberrant recording of *occidentalis* from Nariño had three whistled notes but lacked the change of frequency of upper Magdalena loudsongs. (2) Peak frequency of whistled notes. Northern study groups have significantly lower peak frequencies of the initial note (mean 3599 ± 159 Hz, range 3205–3906, *n* = 44) than do the remaining groups (mean 4767 ± 296 Hz, range 4616–5576, *n* = 59). (3) Change in peak frequency of whistled notes. All study groups except upper Magdalena show little change; peaks in upper Magdalena increase (mean 845 ± 291 Hz, range 434–1186). (4) Presence of clear introductory element of initial raspy notes. *klagesi*, *aristeguietana*, and Norte de Santander loudsongs (*n* = 29) all lack an introductory element present in all other study groups. (5) Duration of whistled notes: Initial notes of four northern study groups (*klagesi*, *aristeguietana*, Norte de Santander, *hellmayri*) are longer in duration (mean 111 ± 9 msec, range 96–126, *n* = 35) than those of southern groups (mean 69 ± 9 millisec, range 52–86, *n* = 45), and durations of *striaticeps* notes are intermediate (mean 91 ± 9 msec, range 78–105, *n* = 18). Provisional: Absence of clear terminal element of initial (and sometimes final) raspy notes in *occidentalis* loudsongs (*n* = 13).

Female loudsongs. (1) Peak frequencies of whistled notes were measured at initial and terminal notes: values of initial notes of *klagesi*, *aristeguietana*, and Norte de Santander (mean 3526 ± 262 Hz, range 2953–4123, *n* = 15); those of all other study groups except *hellmayri* (mean 4569 ± 211 Hz, range 4208–4975, *n* = 25). Although whistled notes of *hellmayri* are also lower pitched, differences between *hellmayri* and remaining groups are not significant. (2) Change in peak frequency of whistled notes: Peaks in upper Magdalena loudsongs rise in frequency, usually to between the third and fourth notes (*n* = 3), whereas peaks of notes of all other groups decline. (3) Presence of clear introductory element of initial raspy notes: As in male loudsongs, the three northern study groups (*klagesi*, *aristeguietana*, and Norte de Santander) lack a clear introductory element present in all other groups. Additional characteristic. (1) Number of whistled notes. Five northern study groups (*klagesi*, *aristeguietana*, Norte de Santander, *hellmayri*, and upper Magdalena) delivered more whistled notes (5–9, *n* = 26; although one *hellmayri* song had 4) than did the remaining groups (3–5, typically 4; *n* = 28).

Short-note calls. The mean duration of the first note is 0.065 ± 0.008 sec (range 0.054– 0.077; *n* = 9) in *striaticeps* but 0.034 ± 0.009 sec (range 0.020– 0.049; *n* = 11) in the other study groups. The distributions barely fail our test that there might be overlap with larger samples. Furthermore, in four of ten recordings of *striaticeps*, this call is reduced to one note, whereas that condition is not found in any recordings of the more southerly groups. The single short-note call of *hellmayri* contains a similarly patterned call of two short notes but differs in the notes having lower frequency peaks (~4300 Hz) and in the longer interval (0.155 sec) between the notes. The single short-note call of *klagesi* contains an abrupt note of 0.053 sec, similar in shape to calls of *striaticeps*, but the peak frequency is lower (4340 Hz compared to 5540). No short-note calls of the *aristeguietana*, upper Magdalena, and Norte de Santander study groups have been recorded.

Long-note calls (sample sizes are examples, not individuals). Calls of *striaticeps*, *occidentalis*, *peruviana*, and *boliviana* include longer notes (mean of first note = 0.189 sec, range 0.108–0.279) shaped like an inverted U with a drawn-out ending (mean peak frequency of first note = 5232 Hz, range 4724–6227). Calls of *striaticeps* (n = 7) are all single noted. Of the long-note calls of *occidentalis* (n = 20), 3 are 1-noted, 14 are 2-noted, and 3 are 3-noted. The only long-note calls (n = 1 each) recorded of *peruviana* and *boliviana* are 1-noted. Calls of *klagesi* consist of a fundamental in the 2300–3000 Hz range and a first harmonic peaking in the 4700–6100 Hz range; the fundamental and harmonic are usually equally intense; duration 0.126–0.176 sec. The single recording of a long-note call of *hellmayri* (Fig. 4I) consists of a series of 4–5 short (~0.030 sec) notes with peaks typically rising in frequency (~4200–4600 Hz) and ending in a long (0.120–0.140 sec) note which consists of a fundamental (2050 Hz) and harmonics (first harmonic 4050 Hz) similar to the call of *klagesi,* although note shape is an inverted U. No long-note calls of the Upper Magdalena or *aristeguietana* study groups have been recorded.

Males' tail pattern. The relatively narrow white tip of the tail of *hellmayri* is bordered by a clearly demarcated and broad blackish band that contrasts with the reddish brown of the bulk of the tail. In other study groups the black patch is variable, often apparent only ventrally and blending gradually into the tail's gray color. Sizes of the white tips and black patches vary among study groups, but feather wear, uncertain ages of specimens, and small sample sizes prohibited diagnosis. The original description of *boliviana* (Carriker 1935) specified a greatly reduced black patch, confirmed by examination of the type, but additional specimens are needed for verification.

Males' and females' tail color. Gray tails of some study groups are tinged brown or olive, but assessment of differences among them will have to account for molt and age differences and await larger samples than are currently available.

Males' underparts streaking. The adult male syntype of *caudata* (BMNH 1889.9.20.360) is probably the most heavily streaked specimen we encountered. The width and darkness of streaking varies among study groups, but its value as a character awaits larger samples and assessments of potential age effects.

Coloration of females' upperparts. There is great variation among study groups as well as within study groups, and diagnosability is limited by small samples of most populations. The light streaks of most females are more rufous on the crown and crissum than on the back. The upperparts of *occidentalis* are more consistently light reddish-yellow-brown and less contrasting.

Coloration of females' underparts. As for the upperparts, assessment of diagnosability of underpart coloration among many study groups is limited by sample size. "Model" females have the throat very pale to pale buff, the breast pale buff streaked blackish, the belly and crissum yellowish brown and unstreaked, and the flanks tinged chestnut. Underparts of *hellmayri* resemble this model. The distinctly paler underparts of *klagesi*, *aristeguietana*, and Norte de Santander include whitish extending from the throat through the center of the belly, as streaking is minimal or absent through the center of the throat and breast. Females of the upper Magdalena study group have buffy throats and are also buffy whitish through the center of the belly, but streaking is complete on the throat and breast. The single available specimen from Santander (ICN 68392) has a buffy throat but its underparts are otherwise extensively reddish brown throughout; the only other specimen from Colombia with underparts as dark is a "Bogota" skin at BMNH

(1846.7.16.165), although it appears to differ somewhat from the Santander specimen in upperpart coloration. As for the western and southern study groups, females of *striaticeps* are variable; they have white or buff on the throat and a buffy upper breast but are rufous posteriorly. The flanks of *occidentalis* are only slightly more rufous than the belly, whereas in *peruviana* the rufous-chestnut flanks contrast sharply with the belly color. The two females of *boliviana* available were similar to *peruviana* but with the streaking extending into the rufous flanks and the terminal dark and white bands of the tail reduced.