

Henicorhina anachoreta (Troglodytidae), another endemic bird species for the Sierra Nevada de Santa Marta, Colombia

Henichorhina anachoreta (Troglodytidae), otra especie de ave endémica

de la Sierra Nevada de Santa Marta, Colombia

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Abstract

In a previous study, we presented evidence that the *Henicorhina* wood-wren inhabiting the upper slopes of the Sierra Nevada de Santa Marta, *H. anachoreta*, merits status as a species distinct from the lower elevation taxon, *H. bangsi*, based on genetic and phenotypic evidence as well as differences in song. Moreover, in a narrow zone of sympatry we found that they showed differential responses to the songs of their own vs. the other form. However, we did not present the differences in plumage and morphometrics in detail, and did not make a formal taxonomic recommendation regarding their taxonomic status. We do so here, and present more detailed description of the differences in plumage and morphometrics in support of this recommendation.

Key words: *Henichorhina* wrens, speciation, Sierra Nevada de Santa Marta, taxonomy.

Resumen

En un estudio previo, presentamos evidencia que el cucaracho del género *Henichorhina* que habita las elevaciones superiores de la Sierra Nevada de Santa Marta, *H. anachoreta*, amerita el rango de una especie distinta del taxón de elevaciones más bajas, *H. bangsi*, con base en diferencias genéticas y fenotípicas y de sus cantos. Además, encontramos que en una zona estrecha de simpatria, ellos mostraron respuestas diferentes a sus propios cantos vs. los del otro taxón. Sin embargo, no presentamos en detalle las diferencias en plumaje y medidas morfométricas y no presentamos una recomendación taxonómica formal. Aquí hacemos tal recomendación y describimos en detalle las diferencias en plumaje y mediciones para apoyar esta recomendación.

Palabras clave: cucaracheros *Henichorhina*, especiación, Sierra Nevada de Santa Marta, taxonomía.

The isolated Sierra Nevada de Santa Marta (SNSM), a protected area in the World (Le Saout *et al.* 2013). Re-a mountain massif in Northern Colombia that rises markedly, the true species endemism of the SNSM from sea level up to ca. 5,800 m elevation, is a may still be considerably underestimated due to center of endemism for multiple plant and animal adherence to historical taxonomic treatments and groups (Todd & Carriker 1922, Cleef *et al.* 1984, insufficient revisionary work. In birds, more than 50 Hernández-Camacho *et al.* 1992). Based on its striking endemism, the SNSM National Park was recently regarded as the most irreplaceable protected (i.e., plumage) variation. With greater knowledge of

vocalizations and patterns of genetic differentiation, it has become increasingly apparent that a number of endemic taxa remain undescribed (Rheindt *et al.* 2013), and that several populations endemic to the SNSM and traditionally regarded as subspecies of widespread species are sufficiently differentiated to be accorded full species status (Krabbe & Schulenberg 1997, Krabbe 2008, Cadena & Cuervo 2010, Isler *et al.* 2012, Collar & Salaman 2013, Lozano-Jaramillo *et al.* 2014). Here, we propose the restitution of species status for yet another taxon endemic to the SNSM.

Wrens in the genus *Henicorhina* (Troglodytidae) are widely distributed in the Neotropical region. Although their taxonomic diversity at the subspecies level is high (33 taxa), only four species are currently recognized (Kroodsma & Brewer 2005, Remsen *et al.* 2015). For many years, the genus was thought to include only two species, the White-breasted Wood-Wren (*H. leucosticta*) occurring in the lowlands and the Grey-breasted Wood-Wren (*H. leucophrys*) in montane areas. The other two species were discovered in recent decades: the Bar-winged Wood-Wren (*H. leucoptera*) in southern Ecuador and northern Peru (Fitzpatrick *et al.* 1977), and the Munchique Wood-Wren (*H. negreti*) in the Western Cordillera of Colombia (Salaman *et al.* 2003). The existence of marked geographic variation in plumage, vocalizations and mitochondrial DNA sequences within both *H. leucosticta* and *H. leucophrys* suggests that each of these widespread taxa may comprise more than one species (Winker *et al.* 1996; Dingle *et al.* 2006, 2008).

In the SNSM, two forms of *H. leucophrys* described from museum specimens on the basis of subtle but consistent differences in morphometrics and coloration replace each other along elevational gradients (Bangs 1899, Ridgway 1903, Todd & Carriker 1922, Hilty & Brown 1986). The form occurring at higher elevations was originally descri-

bed as a distinct species, *H. anachoreta* (Bangs 1899), whereas the form occurring at lower elevations (*bangsi*) was described as a subspecies of *H. hiliaris* (Ridgway 1903), a taxon later considered conspecific with *H. leucophrys* (e.g., Hellmayr 1934). Although *bangsi* was listed as a separate species by Brabourne & Chubb (1912), most authors initially treated both *anachoreta* and *bangsi* as subspecies of *H. hiliaris* and then more broadly as part of *H. leucophrys* (e.g., Ridgway 1904, Todd & Carriker 1922, Hellmayr 1934, Mayr & Greenway 1960).

Caro *et al.* (2013) conducted a morphological, genetic, and behavioral study of wood-wren populations along an elevational gradient in the northwestern SNSM, and found that *anachoreta* and *bangsi* are not only phenotypically and genetically distinct, but also that they are sympatric over a narrow elevational range. In addition, based on response patterns to local and foreign songs assessed using playback experiments, Caro *et al.* (2013) hypothesized that vocal differences likely served as a behavioral barrier to gene flow between forms. Taken together, these results demonstrated marked divergence and evidence of reproductive isolation in sympatry (see also Burbidge *et al.* 2015 for confirmation of vocal recognition patterns), which indicated that the two wood-wren populations from the SNSM represent separate species. However, formal taxonomic recommendations have not been proposed in light of these findings.

Phylogeographic analyses based on mitochondrial DNA sequences revealed evidence that *bangsi* and *anachoreta* are relatively distant relatives within *H. leucophrys*, implying they did not derive from a single ancestor colonizing the SNSM but rather from separate colonization events (Caro *et al.* 2013). Furthermore, *bangsi*, the form of the foothills and lower montane forests up to ca. 2270 m in the SNSM, is relatively weakly differentiated in



Figure 1. *Henicorhina anachoreta* (Hermit Wood-Wren), an overlooked species endemic to upper montane forests of the Sierra Nevada de Santa Marta, Colombia. Photograph by N. Athanas taken at El Dorado Nature Reserve, San Lorenzo Ridge.

mitochondrial DNA from populations of *H. leucophrys* occurring on the nearby western slopes of the Serranía de Perijá (Caro *et al.* 2013). The wood-wren populations from Perijá are likely assignable to *H. l. manastarae* (López-O. *et al.* 2014), a subspecies described from the eastern (Venezuelan) slope of that mountain range (Aveledo Hostos & Ginés 1952). In turn, the form occurring in upper montane forest above *ca.* 2270 m in the SNSM, *anachoreta*, is more divergent from all other sampled populations of *H. leucophrys* and appears to have been an earlier colonist to Santa Marta likely derived from Andean stock (Caro *et al.* 2013, J. L. Pérez-Emán *et al.*, unpublished data). In addition, variation at six microsatellite loci revealed the existence of two genetic clusters in the SNSM and Perijá, one of which corresponded to *bangsi* and *manastarae* from western Peri-

já, and the other to *anachoreta* (Caro *et al.* 2013).

We recognize that considerable additional research centered on genetic divergence and gene flow and differentiation in vocal and behavioral signals (no such analyses outside of the SNSM were conducted in the earlier study, but see Dingle *et al.* 2008, Burbidge *et al.* 2015) is still required to acquire a complete understanding of speciation in *Henicorhina* wood-wrens and species limits in *H. leucophrys*. Nonetheless, the present evidence firmly shows that the two populations from the SNSM referred to *H. leucophrys* belong to different species. In addition, available data indicate that the population from higher elevations is more divergent from populations outside the SNSM referable to *H. leucophrys* than is the population from lower elevations. Based on the above,

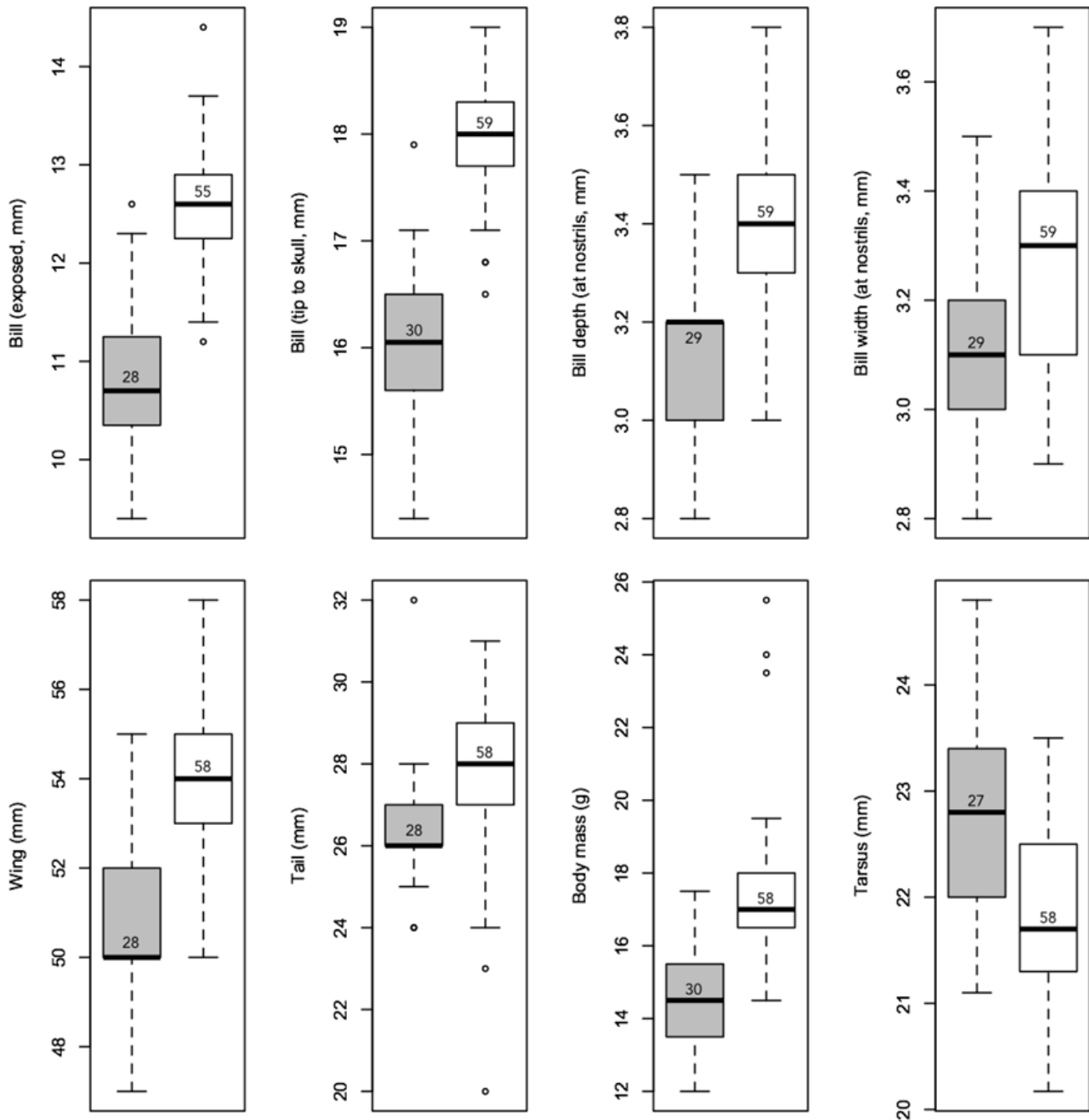


Figure 2. Box plots summarizing measurements of individuals captured in the field in the Sierra Nevada de Santa Marta and assigned to *Henicorhina anachoreta* (gray) or *H. leucophrys bangsi* (white) based on multivariate analyses of morphometric and molecular data (data from Caro *et al.* 2013). For each trait and taxon, plots show median, lower and upper quartiles, 5% and 95% percentiles, and outliers. Numbers on each plot indicate sample sizes per taxon. Note the smaller overall size of *anachoreta* in body and bill dimensions, with the exception of tarsus length.

we recommend treating the highland population occurring in the SNSM as a distinct species, *Henicorhina anachoreta* Bangs, 1899 (Figure 1). Based on the meaning of the latin name *anachoreta*, we propose Hermit Wood-Wren as an English name.

The holotype of *H. anachoreta* (housed at the Museum of Comparative Zoology, MCZ 106494) is from Páramo de Chiruqua, 12,000 ft (*ca.* 3940 m; Bangs 1899), whereas the type of *H. l. bangsi* (housed at the National Museum of Natural Histo-

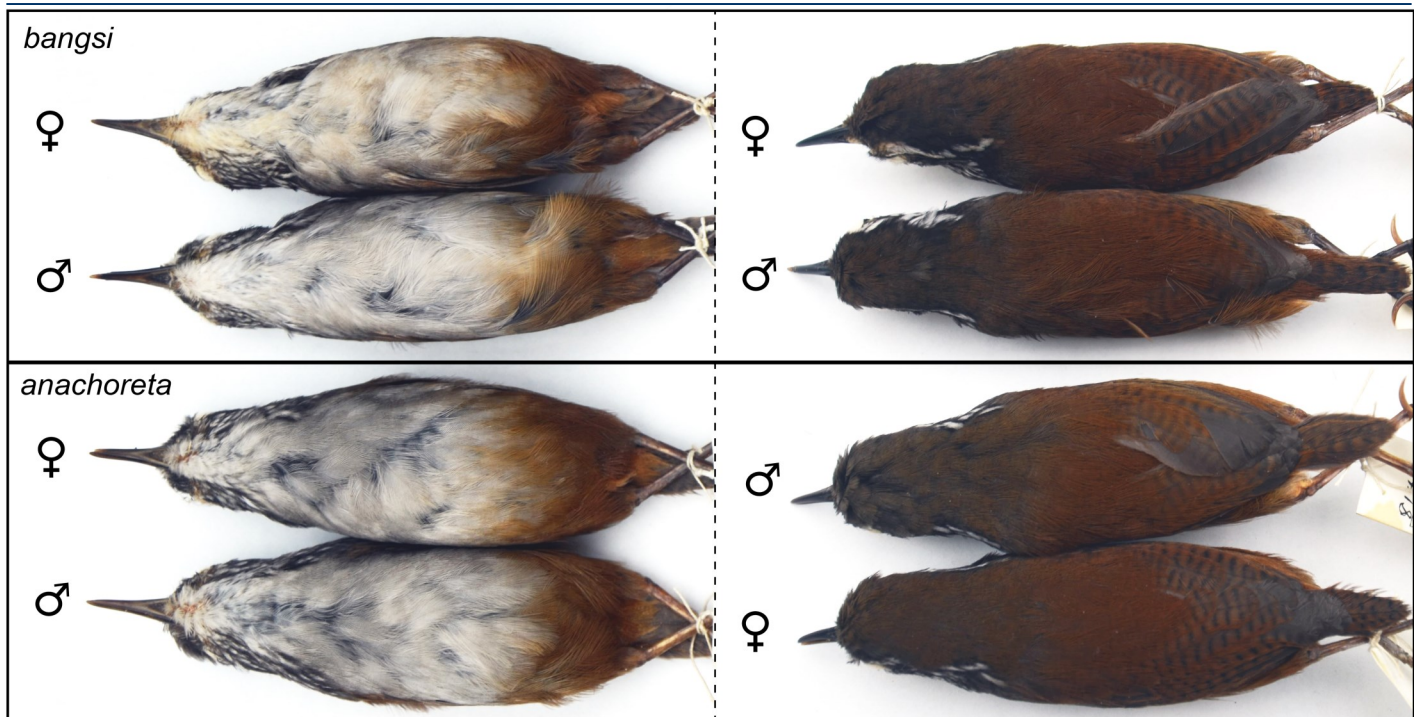


Figure 3. Representative specimens of wood-wrens from the Sierra Nevada de Santa Marta illustrating overall differences in plumage coloration between *H. l. bangsi* and *H. anachoreta*. All specimens were prepared by M. A. Carriker, Jr. and are housed at the USNM. *H. l. bangsi* (from Depto. Magdalena, Hacienda Cincinnati): 387788 (female, ca. 1520 m) and 374501 (male, 1060–2020 m); *H. anachoreta* (from Depto. Cesar, upper Río Guatapurí): 387761 (female, 3050–3300 m) and 387771 (male, 2450–2900 m). Note the overall darker coloration of *H. anachoreta* ventrally; dorsally, it tends to be more lightly colored than *H. l. bangsi* (see text for details). Photographs by David Ocampo.

ry, USNM 163791) was collected above Pueblo Viejo, Depto. Magdalena, in the foothills of the SNSM. Hence, there is no doubt that the name *anachoreta* applies to the upper-montane species.

Todd & Carriker (1922) noted that "[*H. anachoreta*] is so similar to *H. hiliaris bangsi* as to be practically indistinguishable in life". The similarity of the two species, compounded with the possibility of finding individuals with intermediate phenotypes due to limited hybridization and introgression (Todd & Carriker 1922, Hellmayr 1934, Caro *et al.* 2013), implies that reliable identification in the field is challenging. Nonetheless, noticeable differences between the two taxa exist in morphology and coloration. As noted by Caro *et al.* (2013), *H. anachoreta* is smaller overall (contra Bangs 1899), with lower body mass and shorter wings, and a smaller bill (*cf.* Ridgway 1903, Hellmayr 1934; Figure 2). However, none of these traits are diagnostic by

themselves because there is some overlap between forms, so we suggest the species are best diagnosed based on a combination of measurements. In terms of plumage coloration (Figure 3), *H. anachoreta* differs from *H. l. bangsi* in its lighter, more russet tone of the flanks and upperparts (including tail, rump, wings and mantle), tending to sooty or ferruginous brown instead of deep chestnut. In addition, the nape and pileum in *H. anachoreta* are olive brown and may blend into gray towards the forehead, instead of being uniformly dark brown as in *H. l. bangsi*. Ventrally, the throat of *H. anachoreta* is whitish gray with indistinct streaks instead of the uniform grayish white throat of *H. l. bangsi*, and the breast is decidedly darker and less suffused with buffy tones relative to *H. l. bangsi* (*cf.* Bangs 1899, Ridgway 1903, Todd & Carriker 1922, Hellmayr 1934). The songs of *H. anachoreta* and *H. l. bangsi* differ significantly (*i.e.*, the former sings at a higher frequency

and over a greater frequency range), but because vocalizations are variable within *H. l. bangsi* and because songs vary more gradually than morphology along elevational gradients (Caro *et al.* 2013), care must be exercised when identifying individuals based only on vocal cues.

We note that our proposed recognition of *H. anachoreta* as a species would imply recognizing a paraphyletic species *H. leucophrys* (Caro *et al.* 2013). Species-level paraphyly is expected when speciation occurs in the periphery of the geographic ranges of widespread lineages (Funk & Omland 2003) and the existing taxonomy of wrens (Lara *et al.* 2012, Remsen *et al.* 2015) already accepts paraphyletic species. In particular, *H. leucosticta* is paraphyletic with respect to *H. leucoptera* (Dingle *et al.* 2006). In addition, ongoing work indicates that *H. negreti* is nested within *H. leucophrys* (J. L. Pérez-Emán *et al.* unpubl. data). We believe that paraphyly in Neotropical wren species partly reflects speciation in the periphery of ranges, but also faulty taxonomy (Ross 2014). We suspect that future analyses will likely conclude that *H. leucophrys* comprises multiple species-level taxa, and we may arrive at a stable classification in the future in which species are accurately delimited and monophyletic. For the time being, however, we consider it best to begin by recognizing the well-differentiated *H. anachoreta* as distinct in a first step towards a revised classification of the group.

The case of *anachoreta* and *bangsi*, in which two forms traditionally treated as subspecies of a single species segregated by elevation prove to be representatives of distinct species not sister to each other is not unique among Neotropical birds; similar situations are documented in various complexes including *Sclerurus* (d'Horta *et al.* 2013), *Schiffornis* (Nyári 2007), *Zimmerius* (Rheindt *et al.* 2013), *Mionectes* (Hilty & Ascanio 2014), and *Arremon* (Cadena & Cuervo 2010). This suggests that

an important task for taxonomists working on Neotropical montane birds is to examine the status of populations currently treated as subspecies differing in elevational distributions. We believe that elevation is likely an important geographic dimension along which cryptic species diversity has been overlooked.

Finally, because *H. anachoreta* is widespread and common in the SNSM, tolerates some habitat disturbance, and occurs in several protected areas in the region including the SNSM National Park, we do not consider it to be threatened from a conservation standpoint. However, we encourage monitoring of populations especially given looming threats faced by montane birds from the SNSM as a consequence of climatic change (Jankowski *et al.* 2010, Velásquez-Tibatá *et al.* 2013, Ramírez-Villegas *et al.* 2014)

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