

**Diagnoses of hybrid hummingbirds (Aves: Trochilidae).  
4. Hybrid origin of *Calothorax decoratus* Gould**

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*Abstract.*—*Calothorax decoratus* Gould 1860 is shown to be a hybrid between *Acestrura heliodor* and *Acestrura mulsant*. Plumage characters of the hybrid are a blended combination of those of the parental species. External measurements of the hybrid approximate the values expected from least squares regression of parental measurements. This is the first conclusively documented case of hybridization among the diminutive woodstars (*Acestrura*).

The systematics and taxonomy of the Andean woodstars (Trochilidae: *Acestrura*) have yet to be resolved. In particular the validity of *Calothorax decoratus* Gould 1860 (hereafter *Acestrura decorata*), described from a unique specimen (No. 1888.7.25.203 in the Natural History Museum (formerly British Museum [Natural History]), has been questioned since Salvin (1892: 408) pronounced it "a species of doubtful value, intermediate between *A. mulsanti* and *A. heliodor*." Since then, *A. decorata* either has been placed in the synonymy of *A. heliodor* (Cory 1918) or considered as a doubtful species or hybrid (Berlioz & Jouanin 1944, Peters 1945, Meyer de Schauensee 1949, Morony et al. 1975). In this paper I confirm the hybrid origin of *A. decorata* using the methods outlined in Graves (1990) and Graves & Zusi (1990).

#### Materials and Methods

Species of *Acestrura* are sexually dimorphic. The unsexed type of *A. decoratus* appears to be in definitive male plumage and lacks striations on the ramphothecum at 10 × magnification, indicating adulthood. Gould (1860) believed that the specimen was collected in Antioquia, Colombia.

However, as pointed out by Berlioz & Jouanin (1944), specimens exported from "Bogotá" and other Colombian localities during the 19th century could have been collected nearly anywhere in northwestern South America. Assuming a hybrid origin of *A. decorata*, the pool of potential parental species would include all the hummingbirds known to occur in Colombia (Hilty & Brown 1986), and possibly Ecuador (Chapman 1926, Fjeldså & Krabbe 1990) and Venezuela (Meyer de Schauensee & Phelps 1978).

The diminutive type of *Acestrura decorata* as noted by Gould (1860), Salvin (1892), and Hartert (1922) is, in fact, so similar in appearance to *A. heliodor* and *A. mulsant* that I focused my analysis on adult males of the five unquestioned species of *Acestrura* (*heliodor*, *astreans*, *mulsant*, *berlepschi*, *bombus*; see Graves 1986), and on other species of "woodstars" known from northwestern South America (*Myrmia micrura*, *Chaetocercus jourdanii*, *Philodice mitchellii*, *Calliphlox amethystina*) (taxonomy of Sibley & Monroe 1990). I compared the type of *A. decorata* directly with series of these species in the Natural History Museum (BM[NH]), Tring. Photographs, videotape, and notes later were compared with specimens in the American

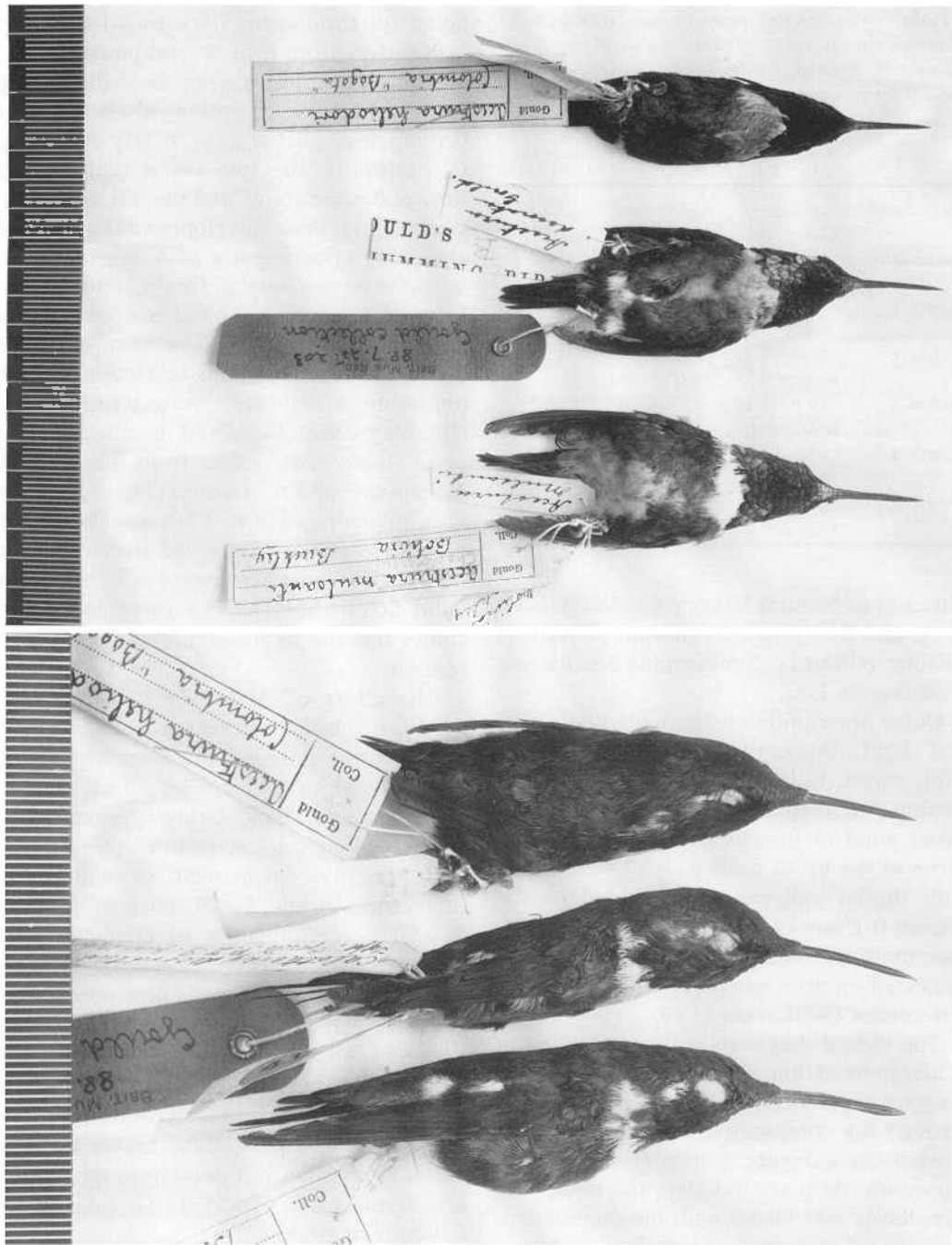


Fig. 1. Ventral and lateral views of male *Acestura heliodor* (top), *A. mulsant* (bottom), and their putative hybrid, *A. decorata* (BM[NH] 1888.7.25.203; = *Calothorax decoratus* Gould),

Table 1.—Ranges and means ( $\pm$  standard deviation) of measurements (mm) of adult males of *Acestrura heliodor*, *A. mulsant*, and the hybrid, *A. heliodor*  $\times$  *A. mulsant* [= *A. decorata* (Gould)].

	<i>heliodor</i> (n = 12)	<i>mulsant</i> (n = 9)	Hybrid BM [NH] 1888.7.25.203
Wing chord	26.8–29.0 27.5 $\pm$ 0.6	37.6–39.8 38.9 $\pm$ 0.8	32.1
Bill length	11.8–13.4 12.5 $\pm$ 0.5	15.8–17.3 16.3 $\pm$ 0.5	14.3
Rectrix 1	8.3–9.2 8.8 $\pm$ 0.4	14.8–16.9 15.6 $\pm$ 0.6	11.8
Rectrix 2	10.8–13.4 12.1 $\pm$ 0.7	18.0–20.6 18.0 $\pm$ 20.1	13.8
Rectrix 3	19.1–21.1 20.0 $\pm$ 0.6	22.8–26.1 24.5 $\pm$ 1.2	22.1
Rectrix 4	17.8–19.8 18.8 $\pm$ 0.6	22.8–25.4 24.3 $\pm$ 0.8	21.2
Rectrix 5	12.7–14.7 13.6 $\pm$ 0.6	19.3–21.6 20.4 $\pm$ 0.8	15.9

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Color descriptions were made under natural light (Appendix). Measurements of wing chord, bill length (from anterior extension of feathers), and rectrix length (from point of insertion of the central rectrices to the tip of each rectrix) were taken with digital calipers and rounded to the nearest 0.1 mm (Table 1). Least squares regression lines and confidence intervals were projected on bivariate plots to illustrate size differences (Wilkinson 1989).

The hybrid diagnosis was approached in a hierarchical manner. I hypothesized the presumed parental species of *A. decorata* through the comparative analysis of plumage pattern and color, feather shape, and bill curvature. As a second step, the restrictive hypothesis was tested with the quantitative analysis of size and external proportions. Agreement of results is regarded as strong support for the hypothesis (Graves 1990, 1993, 1996; Graves & Zusi 1990).

#### Results and Discussion

Gould (1860:309) noted "this species [*Acestrura decorata*] might easily be mis-

taken for *Calothorax* [*Acestrura*] *heliodori* ... it differs from it in several particulars,— in being larger, in having the frill in front of the throat not so prolonged on the sides (in which respect it more nearly resembles *C. mulsanti*), the two centre tail-feathers finer and more spiny, and the bill much longer." Could a rare developmental or genetic aberrancy affecting size of *A. mulsant* or *A. heliodor* be responsible for the unique specimen of *A. decorata*? Neither dwarfism nor gigantism has ever been documented within the Trochilidae, and bona fide cases of those phenomena are very rare within birds (Buckley 1982). Details of the plumage color of *A. decorata* differ from that of both *A. heliodor* and *A. mulsant* (Fig. 1, Appendix), indicating that it is not a scale version of either species. Thus, we may conclude that *A. decorata* represents a hybrid or a valid taxon. My analysis presented below shows that the hybrid hypothesis cannot be refuted.

Characters of *Acestrura decorata* relevant for hybrid diagnosis include: brilliant violet-purple gorget with elongated lateral feathers; white feathers on chin; grayish-white pectoral band below gorget; white feathers along midline of lower breast; lack of rufous pigment in rectrices; and widths of rectrices 4 and 5  $< \frac{1}{2}$  those of rectrices 1–3. This combination of characters can only be derived from *Acestrura heliodor* and *A. mulsant* among the nine species (36 possible pairs of species) in the restricted pool (see Appendix). The plumage of *A. decorata* is almost perfectly intermediate in appearance between *A. heliodor* and *A. mulsant*, whose geographic ranges and elevational distributions overlap in the Cordillera Central and Cordillera Oriental of the Colombian Andes.

Hybridization between other species could not have produced the plumage characters present in the type of *Acestrura decorata*. *Chaetocercus jourdani*, *Acestrura bombus*, *Myrmia micrura*, *Philodice mitchellii*, and *Calliphlox amethystina* can be eliminated as possibilities because all pos-

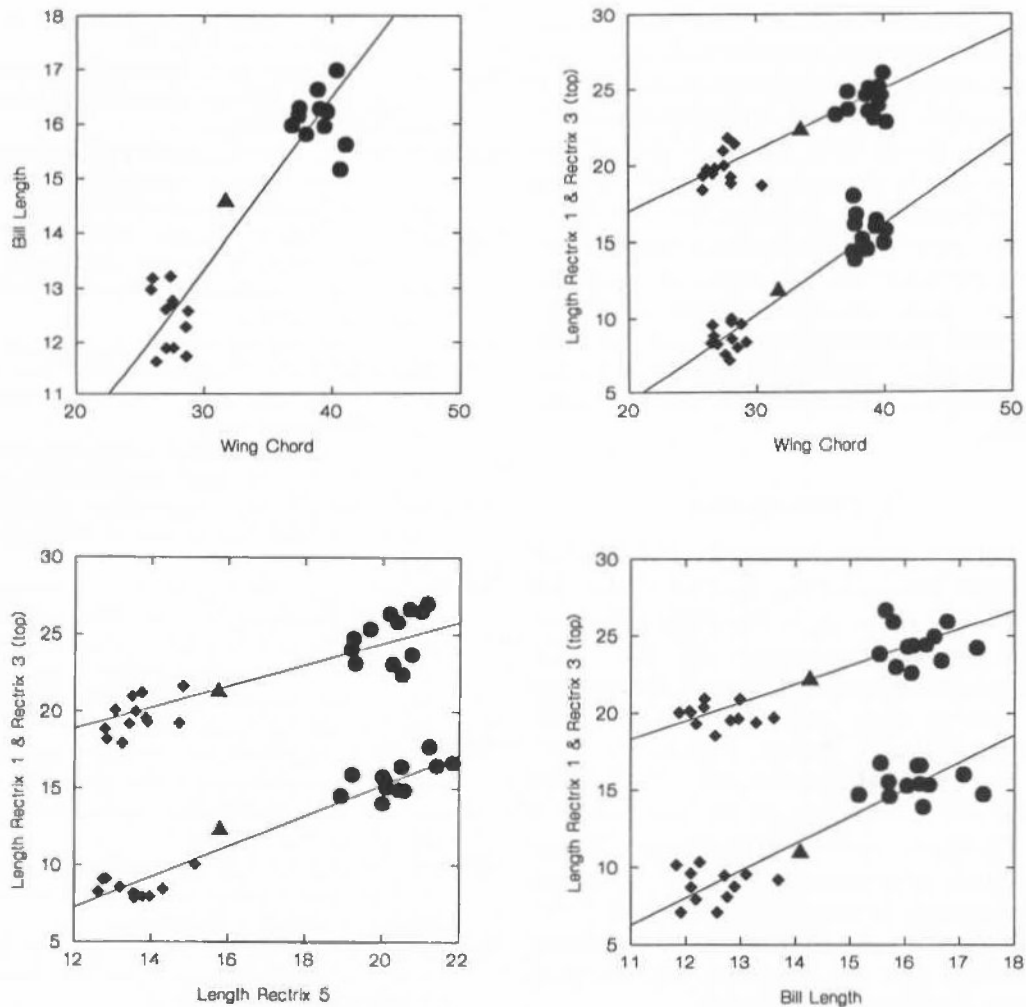


Fig. 2. Bivariate plots of selected measurements (see Table 1) of male *Acestrura heliodor* (diamonds), *A. mulsant* (filled circles), and their putative hybrid (triangle), *A. decorata* (BM[NH] 1888.7.25.203; = *Calothorax decoratus* Gould).

sess rufous, buff, or cinnamon-colored pigmentation on the rectrices and ventral plumage; *A. decorata* lacks any trace of such coloration. The geographic range of *Acestrura astreans*, which is restricted to the Sierra Nevada de Santa Marta, does not overlap the ranges of the other eight species in the restricted pool. *Acestrura astreans* also possesses a dark red gorget, which is not expressed in the type of *A. decorata*. The poorly-known woodstar *A. berlepschi* has a limited range in the lowlands of western Ecuador (Collar et al. 1992) and co-oc-

curs only with woodstar species possessing buff or rufous plumage characters (e.g., *Myrmia micrura*). These facts constitute ample reason for removing *A. astreans* and *A. berlepschi* from the list of potential parental species.

*External measurements.*—Measurements of *Acestrura decorata* fall between the character means of the hypothesized parents (Table 1, Fig. 2). Despite the significant difference in size between the parental species (character means for *A. mulsant* are 22–77% larger than those for *heliodor*), both

species and *A. decorata* share unusual tail proportions where rectrices 1, 2, and 5, are substantially shorter than rectrices 3 and 4. This offers additional support for the conclusion drawn from plumage pattern and color, that *A. decorata* is a hybrid between *A. mulsant* and *A. heliodor*, the first documented case of hybridization involving species of *Acestrura*. As such, *A. decorata* (= *Calothorax decoratus* Gould) should be removed from the synonymy of *A. heliodor* (contra Cory 1918) and relegated to the growing list of documented trochiline hybrids.

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## Appendix

Comparative descriptions of diagnostic plumage characters of adult male *Acestrura heliodor*, *A. mulsant*, and their hybrid. BM[NH] 1888.7.25.203 (= *Calothorax decoratus* Gould 1860). Descriptions of structural colors are unusually subjective, as color seen by the observer varies according to the angle of inspection and direction of light. For this reason I use general color descriptions.

In *heliodor*, plumage of the capital and spinal tract is dark green, toned on the back, rump and uppertail coverts with bluish-green. Bluish reflections are slightly less evident on homologous plumage tracts in *mulsant* and the hybrid.

Gorget color in *heliodor* exhibits postmortem color change in specimens (Graves 1986), becoming pinker, less purple over time. The gorget color of the hybrid and 19th century specimens of *heliodor* and *mulsant* is pinkish-purple. Most specimens of *heliodor* possess a few buffy-white barbs on feathers at the anterior apex of the gorget. The pale chin spot of *mulsant* is significantly larger, whereas that of the hybrid is intermediate in size. The bases of gorget feathers in *helio-*

*dor* are grayish-buff separated from the pinkish-purple tip by a narrow transitional zone tinted green. Gorget feathers are patterned similarly in *mulsant* and in the hybrid, but the transitional bands are dark green and greenish-black, respectively. Lateral gorget feathers are much more elongated in *heliodor* (pinkish-purple tip, width = 1.6 mm, length = 4.7 mm) than in *mulsant* (width = 2.8 mm, length = 2.1 mm); gorget dimensions in the hybrid are intermediate (2.7 × 2.7).

The underparts of *heliodor* (posterior to the gorget) are similar in pattern but significantly darker than those of *mulsant* (Fig. 1). The hybrid is intermediate in appearance—in the darkness of the pectoral band, the width and intensity of the midline stripe, and in the distribution of white on the lower belly.

Rectrix color of *heliodor*: rectrix 1 is dark green; rectrix 2 is black medially and blackish-green laterally; rectrices 3–5 are black. Rectrix 1 of *mulsant* is dark green, the others (2–5) are black. Rectrices of the hybrid are intermediate in color: rectrix 1 is dark green with a blackish tip; rectrix 2 is black medially and blackish-green laterally; the outermost rectrices (3–5) are black.