On the female plumage of Glow-throated Hummingbird Selasphorus ardens Salvin, 1870

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On the female plumage of Glow-throated Hummingbird *Selasphorus ardens* Salvin, 1870

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Summary.—Glow-throated Hummingbird *Selasphorus ardens* is a poorly known trochilid described from the highlands of western Panama. It is documented by no more than 12 putative specimens of which the last was collected in 1924. Most specimens have ambiguous or untraceable localities. There are few recent reports, and the lack of reliable diagnostic criteria has limited efforts to understand the status, distribution and life history of *S. ardens*. We reviewed the extant specimen material and demonstrate that published descriptions of female plumage cannot be verified and that female plumage is unknown.

Glow-throated Hummingbird *Selasphorus ardens* Salvin, 1870, is a poorly known species endemic to the humid highlands of west-central Panama. Very little has been published concerning its life history, ecology or possible movements (Collar *et al*. 1992, 1994) and the taxon has recently been classified as Endangered (BirdLife International 2013). There are very few recent reports of *S. ardens* in life (Collar *et al*. 1992, Angehr *et al*. 2008) and we know of no unambiguous photographs. Uncertainty regarding its identification criteria and distribution has led to confusion with the widespread Scintillant Hummingbird *S. scintilla* and has hampered efforts to locate and identify the species in the field. *S. ardens* is known from very few localities, and vagueness and unreliability of locality data have also contributed to the uncertainty of identification criteria. Female plumage has been described from a very small number of putative specimens, all with ambiguous label data, and including some that are certainly misidentified (Table 1). There is no material basis for published descriptions of female plumage, and therefore the female plumage is unknown. In this study, we review the available specimen material of *S. ardens* and compare it with published descriptions in the hope of clarifying diagnostic characters for female plumage.

History

Salvin (1870) described *Selasphorus ardens* from two undated specimens taken by Arcé in the highlands of western Panama (Serranía de Tabasará) at localities believed to be in present-day Veraguas province (Wetmore 1968, Siegel & Olson 2008; Fig. 1). The two syntypes comprise an adult male labelled as being from 'El Castillo' (Natural History Museum, Tring, NHMUK 1887:3.22.1076; Fig. 2) and an immature male from 'Calovévora' (NHMUK 1887.3.22.1077; Fig. 2). Salvin (1870) provided a description of plumage characters to distinguish the adult male from Volcano Hummingbird *S. flammula* and *S. torridus* (now *S. flammula torridus*), including tail pattern, purplish-red throat and absence of elongated throat feathers, but he did not distinguish *S. ardens* from *S. scintilla*.

Selasphorus hummingbirds collected at Volcán Barva in central Costa Rica during the late 19th century were included in *S. ardens* until Carriker (1910) described these as *S. simoni* (Fig. 3), a restricted-range endemic now treated as a subspecies of *S. flammula* following Stiles (1983). The Volcán Barva birds have also been referred to *S. ardens underwoodi*, but

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TABLE 1
Data and identification of specimens catalogued as *S. ardens* in natural history museums or identified as *S. ardens* in the literature (excluding '*S. a. underwoodi*'). For measuring protocols see Methods and materials. Measurements in mm. All specimens examined by both authors and measured by DD, except NHMUK material, which was examined by ACV and measured by Hein van Grouw, and the SFN specimen measured by Thais Zanata, who also measured AMNH specimens with closely similar results to DD. For acronyms see Acknowledgements.

Reg. no.	Age, sex	Label data	Wing chord	Bill	Tail	Species identity	Remarks
NHMUK 1887.3.22.1076	ad. ♂	E. Arcé, Castillo	38.6	11.9	27	*S. ardens*	Syntype
NHMUK 1887.3.22.1077	imm. ♂	E. Arcé, Castillo [struck through] Calovévora	39.5	11.7	24	*S. ardens*	Syntype
NHMUK 1913.3.20.588	ad. ♂	R. J. Balston, Veragua, 1907	38.9	11.5	28	*S. ardens*	
AMNH 37832	ad. ♂	E. Arcé, Costa Rica [struck through, 'Veragua!' in pencil]	41.4	11.2	31	*S. ardens*	Erroneous locality? Elliot collection
AMNH 37833	ad. ♂	E. Arcé, Costa Rica	39.4	11.1	30	*S. ardens*	Erroneous locality? Elliot collection
AMNH 37834	(juv.?) probable ♀	Costa Rica [struck through], 'Veragua' [in black ink]	40.5	12.7	26	Not certainly *S. ardens*	Label identical to Arcé specimens; erroneous locality? From Boucard; Elliot collection
AMNH 37835	ad. ♂	'Veragua '	40.5	11.1	33	*S. ardens*	From Boucard; Elliot collection
AMNH 484754	ad. ♂	E. Arcé [pencil annotation] Chiriquí [In pencil:] 'Veraguas? AW'	39.4	11.7	32	*S. ardens*	Rosenberg & Rothschild collection labels
SFN 81965	ad. ♂	H. Whitely Veragua July 1882	39.1	12.0	30	*S. ardens*	Berlepsch collection label
FMNH 46464	ad. ♂	E. Arcé 1875 Veragua; [Boucard label reads] Chiriquí	37.6	n/a (bill broken)	28	*S. ardens*	Boucard, Rosenberg collection labels
AMNH 182684	ad. ♂	L. Griscom Cerro Flores, Chiriquí, (3,600 ft.?) 9 March 1924	40.3	10.3	29	*S. ardens*	
AMNH 182682	ad. ♂	L. Griscom, Cerro Flores, Chiriquí, (3,600 ft.?) 12 March 1924	40.0	11.4	28	*S. ardens*	
AMNH 182685	♀	L. Griscom, Cerro Flores, Chiriquí (3,600 ft.?) 11 March 1924	38.0	11	26	*S. scintilla*	
LSUMZ 177697	ad. ♂	J. T. Weir, Cerro Colorado, Chiriquí, 12 April 2003	34.5	10	27	*S. scintilla*	
LSUMZ 177698	ad. ♂	J. T. Weir, Cerro Colorado, Chiriquí, 12 April 2003	36.0	9		*S. scintilla*	
LSUMZ 177699	imm. ♂	J. T. Weir, Cerro Colorado, Chiriquí, 13 April 2003	37.0	9	22	*S. scintilla*	
UWBM 113266	♀	J. T. Weir, Cerro Colorado, Chiriquí, 13 April 2003	36.8	11	25	*S. scintilla*	

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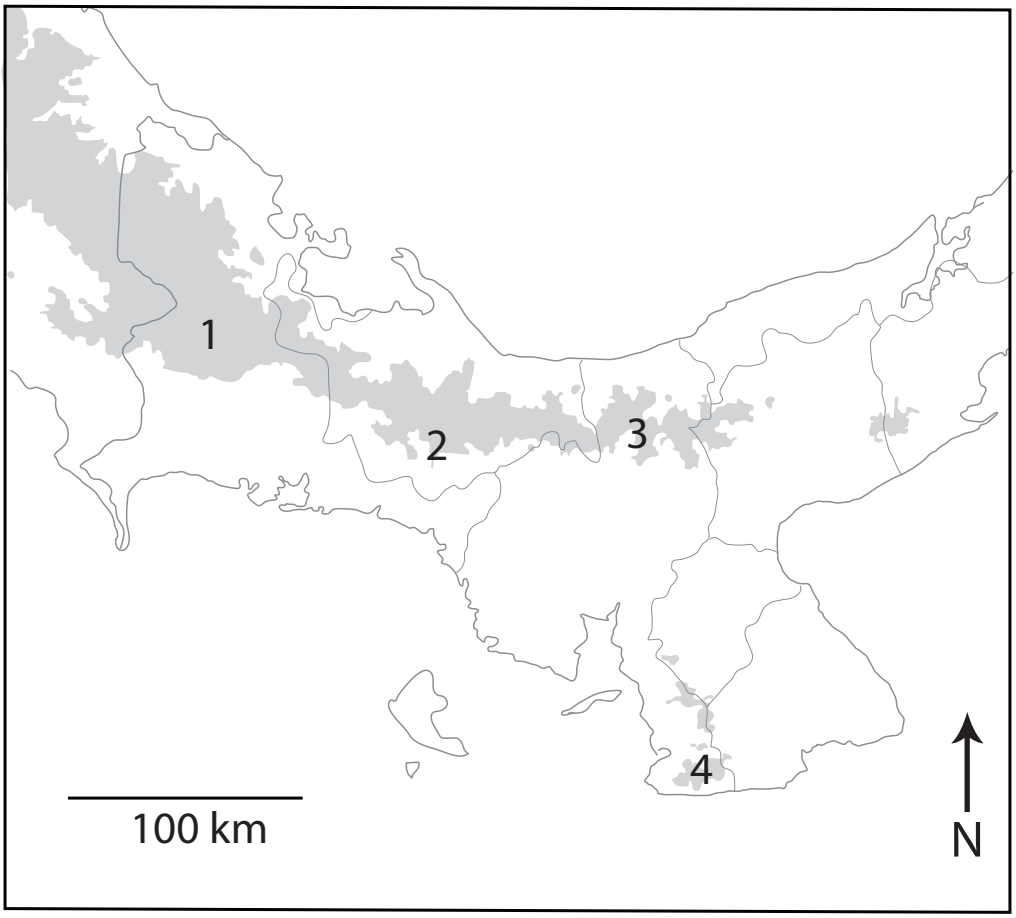

Figure 1. Map of western Panama showing localities mentioned in the text: (1) Volcán Barú; (2) Cerro Santiago; (3) Santa Fé; and (4) Cerro Hoya. Grey shading denotes areas above 700 m elevation.

Stiles (1983) demonstrated that the type of *underwoodi* is not of this taxon, but rather that it probably represents a hybrid between *S. scintilla* and *S. flammula*.

Elliot (1878) published the first description of the female, which included 'middle tail feathers bronzy-green, lateral ones buff with a black bar across their central part'. Elliot's description was repeated in full by Sharpe (1887) together with Gould's illustration of the syntypes. Boucard (1894–95) described both sexes using wording very close to that of Elliot (1878) and his description of the female tail is identical. Ridgway (1911) provided a detailed description of adult female *S. ardens* but remarked in a footnote that this was based on a single specimen and that he was 'very doubtful... whether this is not in reality a female of *S. scintilla*.' No other description of female plumage appeared in the literature until Wetmore (1968) reported his examination of 12 specimens of *S. ardens*, which from his account comprised nine males and three females. None of these authors stressed characters that distinguish *S. ardens* from *S. scintilla*. Stiles (1983) provided a diagram of female *Selasphorus* rectrix shape and markings. Brief descriptions of the female are also given in Ridgely & Gwynne (1989), Angehr & Dean (2010) and Stiles (1999).

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Figure 2. Specimens of Glow-throated Hummingbird *Selasphorus ardens* at Tring museum: (a) NHMUK 1887.3.22.1076 dorsal, syntype; (b) NHMUK 1913.3.20.588 dorsal; (c) NHMUK 1887.3.22.1077 dorsal, syntype; (d) NHMUK 1887.3.22.1076 ventral, syntype; (e) NHMUK 1913.3.20.588 ventral; and (f) NHMUK 1887.3.22.1077 ventral, syntype (Hein van Grouw, © Natural History Museum, London)

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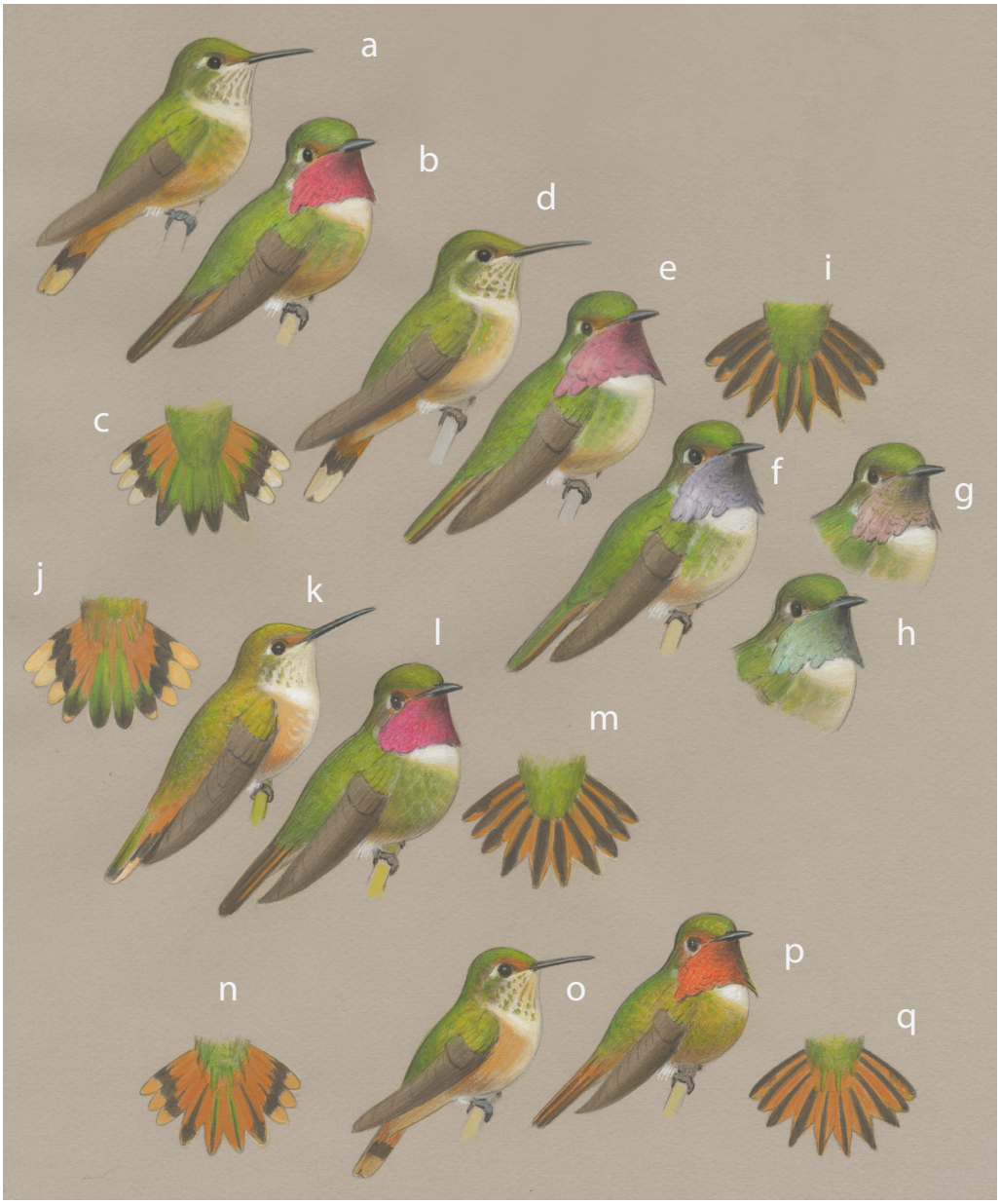

Figure 3. Plumages of the southern *Selasphorus* hummingbirds: (a) Volcano Hummingbird *S. flammula simoni* female; (b) *S. flammula simoni* male; (c) *S. f. flammula* female tail; (d) *S. f. flammula* female; (e) *S. f. flammula* male; (f) *S. f. torridus* male; (g) *S. f. torridus* male variant; (h) *S. f. torridus* male variant; (i) *S. f. flammula* male tail; (j) probable Glow-throated Hummingbird *S. ardens* female tail based on AMNH 37834; (k) probable female *S. ardens* based on AMNH 37834; (l) *S. ardens* male; (m) *S. ardens* male tail; (n) Scintillant Hummingbird *S. scintilla* female tail; (o) *S. scintilla* female; (p) *S. scintilla* male; and (q) *S. scintilla* male tail (Dale Dyer)

Methods and materials

We searched museum collection databases, reviewed relevant literature and consulted specialists (see Acknowledgements) to compile a list of specimens catalogued as *S. ardens*,

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exclusive of '*S. ardens simoni*' or '*S. ardens underwoodi*'. We examined all of these personally or via photographs, and where possible we obtained measurements of bill length (exposed culmen), wing chord and tail length (base to tip of longest rectrix). In an effort to verify published descriptions of female plumage, we compared these with available specimen material.

Results

We located 17 specimens identified as *S. ardens* in the literature or museum catalogues, and determined 12 of these to be *S. ardens* or possibly *S. ardens* (Table 1). The majority (≥ 11) of specimens are male. The single possible female does not bear complete or unambiguous label data that includes collector, a traceable locality and date, and thus its identity is uncertain. Identification of adult males is relatively straightforward and uncontroversial using the characters proposed by Salvin (1870), Ridgway (1911) and Stiles (1983), but in one case a recent series of male *S. scintilla* was misidentified as *S. ardens* (McGuire *et al*. 2014).

Discussion

Tracing localities.—Salvin (1870) provided a map of western Panama, but was unable to place many of Arcé's localities, including 'El Castillo', and equally others have remained unresolved (Siegel & Olson 2008). One syntype (NHMUK 1887:3.22.1076) is denoted as being from 'El Castillo', but there are several localities bearing this name in western Panama. Cerro El Castillo, east of Santa Fé and reaching 1,297 m, is thought probably to be the locality concerned (G. Angehr *in litt*. 2016). A label on the second syntype (BMNH 1887.3.22.1077) is marked 'Calovévora' (although 'El Castillo' is also given, struck through). Salvin's map (1870) placed Pico Calovévora north of Santa Fé (Fig. 1), and also shows a 'Rio Calovévora.' Siegel & Olson (2008) traced Pico Calovévora to near what is now called Cerro Tute, and gave its elevation as 1,400 m, but this is doubtful. Cerro Cabeza de Toro (1,412 m), 8 km due west of Santa Fé and part of the same massif as Cerro Tute, is the peak that actually lies above the headwaters of the río Calovébora and is therefore perhaps the best candidate for 'Pico Calovébora' based on the name. There are, however, several other peaks nearly due north of Santa Fé that are also potential candidates, the highest being Saro at 1,518 m. Six other (Arcé?) specimens are labelled 'Veragua'. We note, however, that for 19th century naturalists, 'Veragua' referred to the entirety of modern-day west Panama to the Costa Rica border (Siegel & Olson 2008). Boucard (1894–95), for instance, wrote that the species 'was discovered on the Volcano of Chiriqui, Veragua (Colombia) by Mr. Arcé.' The name 'Chiriquí' is also problematic as it can refer to any of several features including the province or the volcano (now Volcán Barú).

In the American Museum of Natural History, New York, an adult male (AMNH 484754) is marked 'Chiriquí', and two adult males (AMNH 37832–833) and another individual labelled a female (AMNH 37834) are marked 'Costa Rica'. Of these specimens Wetmore (1968) wrote that the locality data is 'unquestionably incorrect. In view of the known range it is believed that all 3 [*sic*] are from Veraguas'. Given how little is known of the species' morphology, and present or past distribution, Wetmore's reasoning appears circular, and as to Chiriquí province it is contradicted by two specimens mentioned in his own account (see below). The AMNH males labelled 'Costa Rica' are morphologically consistent with the Veraguas and Chiriquí *S. ardens*, and not with *S. f. simoni*. While we accept Wetmore's (1968) assertion that identification of these males to *S. ardens* is correct, we cannot infer that their locality is 'unquestionably incorrect'. Annotators have deleted 'Costa Rica' on the labels of AMNH 37832 and 37834 and written 'Veragua'. Although AMNH 37832–835 were acquired

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by the museum from Elliot in 1888, Elliot (1878) listed '*Hab*. Veragua' with no mention of Costa Rica.

In 1924, two adult males (AMNH 182682, 182684) were collected by Griscom at '3,600 ft.' (*c*.1,100 m) on Cerro Flores (1,605 m) in eastern Chiriquí province. These are the only specimens with elevational data. The site is near Cerro Santiago (Siegel & Olson 2008), which is within modern-day Comarca Ngäbe-Buglé, west of Veraguas. In addition, Griscom (1935) identified a male collected on Cerro Flores (also at '3,600 ft.') as *S. scintilla* (AMNH 182683). This established an eastern range extension for *S. scintilla* and the first documentation of sympatry between *S. scintilla* and *S. ardens*. Stiles (1983) doubted that *S. scintilla* was resident on Cerro Flores, supposing that two specimens (which must be AMNH 182683 and AMNH 182685) 'could have arrived via post breeding dispersal.' In recent years, *S. scintilla* has been regularly reported from nearby Cerro Colorado (G. Angehr *in litt*. 2016). We know of no basis for Griscom's (1935) inclusion of Veraguas in the range of *S. scintilla*.

In 1994, F. S. Delgado collected an immature male *Selasphorus* showing characters consistent with *S. ardens* at Cerro Hoya, Veraguas, on the Azuero Peninsula (Engleman 1994). The specimen was examined by G. Angehr and R. S. Ridgely, but has subsequently been lost (G. Angehr *in litt*. 2016). If the identity of the specimen was confirmed as *S. ardens* this would establish a new locality for the species, 75 km from the type localities and separated by lowlands (Fig. 1). In 2011, a small male hummingbird matching well with *S. ardens* was photographed on Cerro Hoya (Miller *et al*. 2015). Those authors concluded, however, that 'unless a specimen is collected and deposited in a formal natural history collection, we recommend removing *Selasphorus* from the list of species occurring in Cerro Hoya' (2015).

There have been sporadic sight reports of *S. ardens* from the Cerro Colorado area in recent decades. These observations are mainly from above 1,200 m on the road to Cerro Colorado (G. Angehr *in litt*. 2016). There were sight reports from near Cerro Tute, of a male *Selasphorus* at 800 m in 1974 (F. G. Stiles *in litt*. 2016) and another male in 1982 (Collar *et al*. 1992) but there are no recent reports from this region (Angehr *et al*. 2008; G. Angehr *in litt*. 2016). The species has not been reliably reported from any other locality since the 19th century, unless the Cerro Hoya birds prove to be of this species. In conclusion, while the collecting localities of the two syntypes are believed to be in central Veraguas province, and we can be confident in tracing the two Griscom specimens, the geographic provenance of the remaining eight known specimens remains obscure.

Female specimens and plumage characters.—We are unable to reconcile the currently available specimen material with that referred to in the literature. No previous authors have provided specimen numbers to identify their material unambiguously. In the following, we review putative female specimens in relation to published descriptions of female plumage.

Among 19th century skins marked 'Costa Rica' is one (AMNH 37834) also marked 'female' (Fig. 3). It is consistent in preparation and label style with males of *S. ardens* labelled 'Costa Rica' (AMNH 37832–833, collected by Arcé). Based on the AMNH catalogue, this specimen came into the museum's collection from Elliot along with a male *S. ardens* (AMNH 37835), and both had previously been purchased from Boucard. Elliot's (1878) brief description is fairly consistent with this bird. This 'female' was accepted as *S. ardens* by Wetmore (1968). The tail diagram presented in Stiles (1983) also is a fair match for the same specimen, but the pale tips to the outer rectrices of the specimen appear larger. Its rectrices are thin and weak, so it may be a juvenile, and therefore cannot be determined as certainly female based on plumage. The bill (12.7 mm), however, is longer than any of the *S. ardens* males, which is consistent with the pattern of dimorphism in *Selasphorus* (*cf*. Stiles 1983). Also, according to our observations immature male *Selasphorus* often show some

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spots of glittering colour on their throats, which this bird lacks. The specimen is distinctive in several respects from females of *S. scintilla*, which is sympatric with *S. ardens* in Panama and which occurs also in Costa Rica (Fig. 3). Wing chord (40.5 mm) is longer than in female *scintilla* (36.2–38.8 mm; Wetmore 1968). Its central rectrices are mostly green with narrow rufous basal margins, whereas the typical pattern for female *scintilla* is mostly rufous with a narrow green median stripe. This specimen's outer rectrix tips are paler than most *S. scintilla*. Compared to most female *S. flammula*, it is more rufous above and below, has a less spotted throat, more cinnamon-tinged outer rectrix tips, and although its tail is incomplete it appears to lack the pointed central rectrices of adult female *flammula* (Fig. 3). Each of these characters is shared by some *S. flammula* specimens, especially juveniles. Its wing chord is comparable to female *S. flammula*, as expected for female *S. ardens*, because male *ardens* are within the size range of male *S. flammula*. The specimen lacks undertail-coverts. Based on morphology alone, we cannot eliminate the possibility that it is *S. flammula*. *S. ardens* and *S. flammula* are believed to be allopatric but, without faith in the data, identification cannot be based on locality.

Boucard was a dealer, and at least three of the known specimens passed through his hands (AMNH 37834–835, and Senckenberg Forschungsinstitut und Naturmuseum Frankfurt, SFN 81965). In 1892, he wrote 'I have two very fine males and one female of this rare species.' However, by 1888 AMNH 37834 (the 'female') and AMNH 39835 had passed into the New York collection via Elliot, and so he could not have been referring to these birds. We cannot ascertain if the specimens referred to by Boucard (1894–95) are extant.

We cannot determine what specimen Ridgway's (1911) female description was based upon, but we share his concern as to its identity. Wetmore (1968) stated 'Ridgway had available only two males and female from the American Museum', but we doubt that his descriptions were based on AMNH birds. The museum at that time had four specimens, including three males, and he probably would have measured all three. He did not mention 'Costa Rica', as three of those AMNH skins are labeled—the only localities he gave are those of the syntypes and Volcán Chiriquí. We have not discovered any specimen of *S. ardens* from Volcán Chiriquí, which lies 100 km west of any documented locality, and no subsequent author has included the Chiriquí / Talamanca range in the range of *S. ardens*. Ridgway (1911) gave the wing chord for his female as 1 mm shorter than that for the AMNH female (37834), although his bill measurement matches well. Most significantly, he included 'under tail-coverts pale cinnamon-buff' in his description, but AMNH 37834 lacks undertail-coverts. We cannot be certain what individual Ridgway was describing—perhaps a bird from Volcán Chiriquí (where both *S. scintilla* and *S. flammula* occur)—but it was probably not, as he feared, an individual of *S. ardens*.

Griscom collected a female (AMNH 182685) on Cerro Flores initially identified as *S. ardens*. Wetmore (1968) accepted this identification, but we do not and neither did Stiles (1983, see above). Its wing chord is 38 mm, large for a *S. scintilla* but smaller than all but one known specimen of *S. ardens* (a male). Because females are larger than males in *Selasphorus* (Stiles 1983), these measurements are probably too small for a female *S. ardens*. Its plumage characters, including central rectrix pattern, are consistent with female *S. scintilla*, and differ from the 'Costa Rica' female (AMNH 37834) mentioned above. Stiles (1983) determined it as a juvenile female, but we cannot confidently age it.

McGuire *et al*. (2014) presented a phylogenetic hypothesis for the Trochilidae based on molecular data and including four tissue samples listed as *S. ardens* (Table 1). These samples are from four birds taken by J. T. Weir in 2003 at Cerro Colorado and deposited at the Louisiana State University Museum of Zoology, Baton Rouge (LSUMZ), and Burke Museum University of Washington, Seattle (UWBM). One is a female. All were found

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in their analysis to be close to an individual of *S. scintilla*. We examined the three males (LSUMZ 177697–699), two adults and one immature, and determined them as *S. scintilla* based on their small size and orange-red gorget. A fourth specimen from this series, the female, was deposited at UWBM (113266). Our examination indicated that it is also too small for any known *S. ardens* (wing 36.8 mm). It is consistent with S. *scintilla* in size, and also in central rectrix pattern. We believe that the Burke Museum female is also an example of the widespread *S. scintilla*.

Following the discussion of the syntypes (males) Wetmore (1968) wrote that he had 'examined these 2 specimens and also a female, all collected by Arcé, in the British Museum'. However, there are currently three males and no female *S. ardens* at NHMUK. Wetmore gave measurements of females based on '3 from eastern Chiriquí and Veraguas'. It is possible that he placed his data for one male specimen in the wrong set. His means are not halfway between his longest and shortest measurements, and therefore a third bird must have been included. It would be highly desirable to see a female collected by Arcé from a topotypical locality, but Wetmore (1968) offered no more information concerning his supposed NHMUK female.

Like Wetmore's (1968) account, Stiles' (1983) data for females are puzzling. His Table 1 gives three as the number of adult females measured. These three probably included the AMNH 'Costa Rica' skin (AMNH 37834), but we cannot determine what, if any, additional material he possibly examined. None of the other collections Stiles consulted possess skins of *S. ardens*. Stiles' measurements closely recall, but are not identical, to Wetmore's (1968).

While we have arrived at the same number of specimens for the species (12) as Wetmore (1968) and Stiles (1983), our list is different as to material included, and Wetmore's and Stiles' differ from each other. While Wetmore (1968) and Stiles (1983) both give three as the number of females examined, the individual specimens referred to in these two accounts cannot be reconciled with each other.

Conclusions

Definite localities for *S. ardens* are all in the highlands of central Veraguas province and what is now eastern Comarca Ngäbe-Buglé (Fig. 1). The species is rare in collections and most specimens are male. Three specimens (AMNH 37832–834), including the only probable female (AMNH 37834), bear a dubious locality attribution ('Costa Rica'). Despite the confident assertions of earlier workers, no unambiguous characters documented from extant specimens are known to distinguish females of *S. ardens* from females of other *Selasphorus*. Until future collecting efforts can secure a female specimen, or a female specimen is confirmed to be *S. ardens* using molecular techniques, the female plumage of *S. ardens* remains unknown.

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References:
Angehr, G. R. & Dean, R. 2010. *The birds of Panama*. Cornell Univ. Press, Ithaca, NY & London, UK.
Angehr, G. R., Engleman, D. & Engleman, L. 2008. *A bird-finding guide to Panama*. Panama Audubon Society, Panama City.
BirdLife International. 2013. Species factsheet: *Selasphorus ardens*. http://datazone.birdlife.org/species/factsheet/22688308 (accessed 24 August 2016).
Boucard, A. 1894–95. Genera of humming birds. *Humming Bird* 2: 1–56.
Carriker, M. A. 1910. An annotated list of the birds of Costa Rica, including Cocos Island. *Ann. Carnegie Mus*. 6: 314–915.
Collar, N. J., Gonzaga, L. P., Krabbe, N., Madroño Nieto, A., Naranjo, L. G., Parker, T. A. & Wege, D. C. 1992. *Threatened birds of the Americas: the ICBP / IUCN Red Data book*. International Council for Bird Preservation, Cambridge, UK.
Collar, N. J., Crosby M. J. & Stattersfield, A. J. 1994. *Birds to watch 2: the world list of threatened birds*. BirdLife International, Cambridge, UK.
Elliot, D. G. 1878. Classification and synopsis of the Trochilidae. *Smiths. Contrib. Knowledge* 317. Smithsonian Institution, Washington DC.
Engleman, D. 1994. The field editor's report. *Toucan* 20: 4–5.
Griscom, L. 1935. Ornithology of the Republic of Panama. *Bull. Mus. Comp. Zool*. 78: 261–382.
McGuire, J. A., Witt, C. C., Remsen, J. V., Corl, A., Rabosky, D. L., Altshuler, D. L. & Dudley, R. 2014. Molecular phylogenetics and the diversification of hummingbirds. *Current Biol*. 24: 1–7.
Miller, M. J., Angehr, G. R., Ridgely, R. S., Klicka, J., López. C., O. G., Arauz, J., Campos C., E. & Buitrago-Rosas, D. 2015. Annotated checklist of the birds (Aves) of Cerro Hoya National Park, Azuero Peninsula, Panamá. *Check List* 11: 1–13.
Ridgely, R. S. & Gwynne, J. A. 1989. *A guide to the birds of Panama, with Costa Rica, Nicaragua, and Honduras*. Second edn. Princeton Univ. Press.
Ridgway, R. 1911. The birds of North and Middle America. *Bull. US Natl. Mus*. 50(5).
Salvin, O. 1870. On some collections of birds from Veragua. Pt. 2. *Proc. Zool. Soc. Lond*. 1870: 175–219.
Sharpe, R. B. 1887. *Supplement to Gould's monograph on the Trochilidae*. Taylor & Francis, London.
Siegel, D. & Olson, S. L. 2008. The birds of the Republic of Panamá, pt. 5. *Smiths. Misc. Coll*. 150.
Stiles, F. G. 1983. Systematics of the southern forms of *Selasphorus* (Trochilidae). *Auk* 100: 311–325.
Stiles, F. G. 1999. Glow-throated Hummingbird *Selasphorus ardens*. P. 679 *in* del Hoyo, J., Elliott, A. & Sargatal, J. (eds.) *Handbook of the birds of the world*, vol. 5. Lynx Edicions, Barcelona.
Warren, R. L. M. 1966. *Type-specimens of birds in the British Museum (Natural History)*, vol. 1. Trustees of the Brit. Mus. (Nat. Hist.), London.
Wetmore, A. 1968. The birds of the Republic of Panamá, Part 2. *Smiths. Misc. Coll*. 150.

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