

by the similarity in date and locality to van Heijst's specimen, I asked for particulars. Jhr van Heurn informed me that, indeed, the specimen was obtained during a visit of a few days to van Heijst, who was at that time engaged in clearing primary forest to make place for rubber plantations. During his stay, van Heurn shot a small number of birds, among which was the Leiden specimen of *C. finschii*. As this suggested that at that time the species was rather common, I contacted several other museums who might have material, and in that way built up the list of 13 specimens printed above, all of which I have examined. The Singapore specimens from Timbang-Serdang were without a collector's name, but it has now become clear that it must have been H. Bogaarts (cf. Van Marle & Voous 1988: 47, 115). Most surprising was the series of seven specimens in Amsterdam.

I wrote a note about the species, including the table here reproduced, and offered it for publication to "Limosa", as a courtesy to Jhr van Heurn, who was a former editor of "Limosa" and has always particularly encouraged publications on Indonesian birds. Unfortunately, the later editor returned my note: interest in Indonesian birds was at its nadir then, and a simple note on a bird that, after all, had already been recorded from Sumatra, was evidently regarded as too insignificant to justify publication. Thus, my note languished for over 30 years, so that the mistaken notion that the species was known from Sumatra from a single specimen, was perpetuated.

Address: 31 West Street, Busselton 6280, Western Australia.

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**On types of trochilids in the Natural History
Museum, Tring III. *Amazilia alfaroana*
Underwood (1896), with notes on biogeography
and geographical variation in the *Saucerottia*
saucerrottei superspecies**

by A.-A. Weller

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Based on biogeographical and morphological evidence, Weller (1999) suggested that the Neotropical hummingbird taxon *Saucerottia* (Bonaparte, 1850) should be separated from the genus *Amazilia* (Lesson, 1843). This classification had been already proposed by others (e.g. Hartert 1900, Simon 1921, Nicéforo Maria 1940) prior to Peters' (1945) check-list of the family Trochilidae. Berlioz (1933) suggested that *Saucerottia*, among other species, should comprise *S. cyanifrons*, *S. saucerrottei*, and *S. viridigaster*.

Among the former taxa of *Amazilia* nowadays regarded as members of *Saucerottia*, the unique type of *Amazilia alfaroana* has been the subject of controversial taxonomic discussion since the bird was collected at Volcan Miravalles, Costa Rica, and described by Underwood (1896). More recent reviewers have proposed that *alfaroana* is a subspecies of *Amazilia cyanifrons* (Bourcier, 1843) (e.g. Carriker 1910, Peters 1945, A.O.U. 1983, Sibley & Monroe 1990) whereas other authors cited the specimen in synonymy with the latter (Simon 1921, suggesting an aberrant trade skin from the so-called "Bogotá" collection) or neglected the bird completely (Berlioz 1933). Slud (1964) considered *alfaroana* as a subspecies of *S. cyanifrons*, pointing to possible sympatry with *S. saucerrottei* (race *hoffmanni*); in fact, this would represent an unique example of a bird occurring within Central America only in Costa Rica, but with its closest relatives found in South America (Walters, pers. comm). With regard to its unusual morphology and the fact that subsequent collectors failed to obtain further specimens or sight records, Stiles *et al.* (1989: 221) stated that this specimen represents "perhaps the foremost ornithological mystery of Costa Rica". Based on a detailed character analysis I present evidence that *alfaroana* should be considered as an extinct species of *Saucerottia*. Moreover, this study indicates that specimens known as *Eriocnemis incultus* (Elliot, 1889) probably represent aberrant melanistic forms of *S. cyanifrons*.

Material and methods

This study is based on data obtained from 59 specimens of *S. cyanifrons* (39 males, 20 females) and 121 specimens of *S. saucerrottei* (81 males, 40 females). The holotype of *S. alfaroana*, deposited in The Natural History Museum, Tring (BMNH 1898.3.12.13; Warren 1966), was compared directly with skins of both species. Moreover, five *Eriocnemis incultus* specimens were included in the analysis. Descriptions of iridescent colours typical of trochiline hummingbirds are given in general terms, while other colours (numbers, specific terms in brackets) refer to Smithe (1975). Plumage terminology follows Johnsgard (1997). Morphometric characters - bill length (from tip to proximal end of nostril), wing chord length (taken from unflattened wing due to properties of wing morphology and skins of trochilids), length of innermost (r1) and outermost rectrices (r5) - were measured with a digital caliper to the nearest 0.5 mm. Single morphometric characters of taxa (with $n \geq 4$ specimens) were compared with parametric test methods (with student's *t*-test, based on ANOVA; significance level $p < 0.05$). Coordinates of collecting sites in Colombia were taken from Paynter (1997), whereas Costa Rican localities (as included in Fig. 1) were either derived from Slud (1964) or various travel maps.

Results and discussion

Distribution of *Saucerottia cyanifrons*

The monotypic Indigo-capped Hummingbird *Saucerottia cyanifrons* has a scattered distribution in the central Andean valleys of Colombia (Fig. 1). It occurs mainly along

the western slope of the eastern Andes from Norte de Santander to the upper Magdalena valley, reaching the eastern slope of the Cordillera Central in Huila. In the Cauca valley, the taxon is apparently restricted to the uppermost region, possibly due to interspecific exclusion with *S. saucerrottei* from the mid and lower regions. *S. cyanifrons* has also been reported from the Atlantic lowlands of northwestern Colombia (Los Pendales, Atlantico, 20 m, 10°37'N, 75°13'W; NMNH # 350695-696, 352656), but since the majority of records are from the Andes, these specimens most likely represent stragglers. No geographical variation has been documented (Weller 1998).

S. cyanifrons ranges from 400 to 3,000 m, with the main concentration between 1,000 and 2,000 m. It inhabits edges of wet forest as well as drier, more open habitats with shrubs, plantations, and gardens (Hilty & Brown 1986) where it forages in vegetation at medium to higher level between 4-8 m (Schuchmann, pers. obs.). Otherwise, ecological requirements are poorly known (e.g. Munves 1975, Snow & Snow 1980).

Distribution and taxonomy of *Saucerottia saucerrottei*

S. saucerrottei (Delattre & Bourcier, 1846) occurs in several subspecies from northwestern South America to Central America (Fig. 1). Generally bound to drier

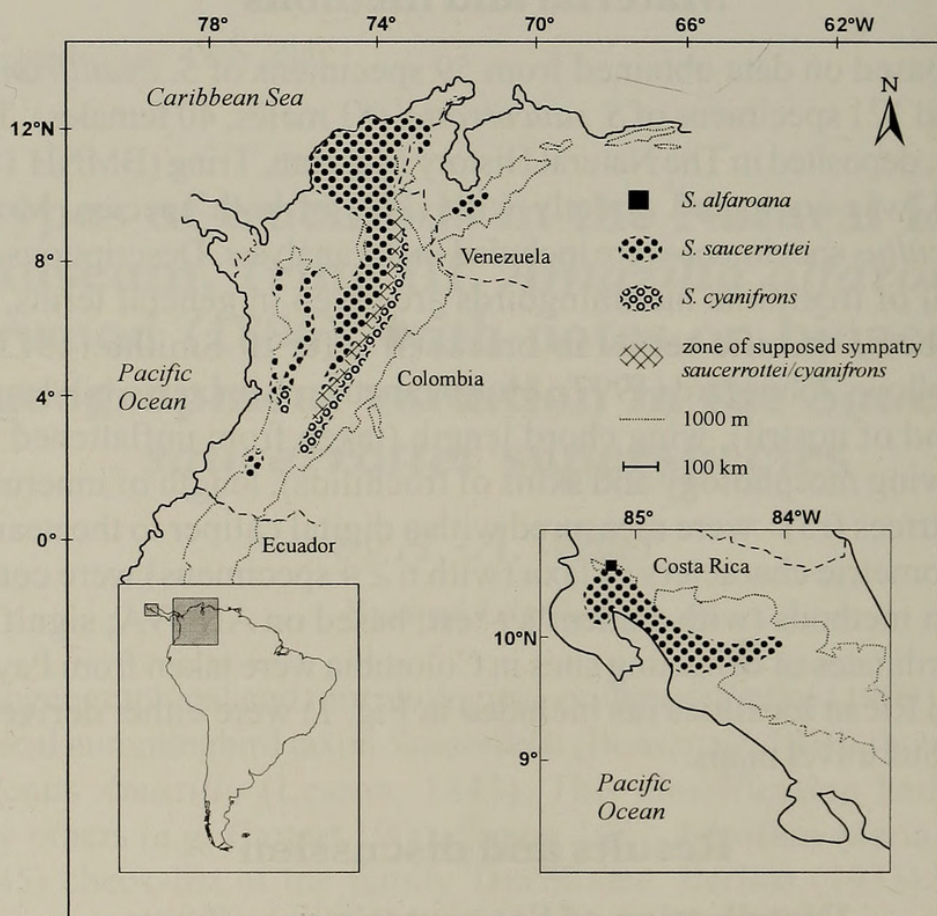


Fig. 1: Geographical distribution of *Saucerottia saucerrottei* (Colombia, Costa Rica) and *S. cyanifrons* (Colombia), and type locality of *S. alfaroana* (Costa Rica), based on examined skins.

habitats, it is found mainly in the lowlands and submontane zone. The distribution of the subspecies can be summarized as follows: *S. s. warscewicz* - N and N central Colombia; *S. s. braccata* - Andes of Merida, Venezuela; *S. s. saucerrottei* - Andean slopes and valleys of NW Colombia; *S. s. hoffmanni*: S Nicaragua to central Costa Rica. All races occupy well-defined geographical ranges, in particular the last form that is broadly isolated from the South American ones. *S. s. warscewicz* seems to occur regularly along the western slope of the Eastern Andes to the mid Magdalena valley where it is probably sympatric with *S. cyanifrons* in the vicinity of Ocaña, Norte de Santander (08°15'N, 73°20'W; Fig. 1). Another sight record of *S. saucerrottei* from the upper Magdalena valley (Hilty & Brown 1986) may also refer to this race, perhaps indicating seasonal sympatry with *S. cyanifrons*.

The status and taxonomy of *S. s. hoffmanni* (Cabanis & Heine, 1860) are controversial. Beginning with Gould (1861), several authors considered this taxon as a separate species and erroneously applied the name *Saucerottia* (or *Amazilia*) *sophiae* to it (e.g., Salvin 1892, Hartert 1900, Ridgway 1911). More recently, Stiles *et al.* (1989) regarded it an allospecies based on bioacoustic differences from *S. saucerrottei*. By contrast, the absence of significant habitat differences compared with the South American populations, as well as strong similarities in morphology (e.g., biometric data, see Table 1; tail colouration), may argue against specific distinctness.

Morphology of *Saucerottia cyanifrons* and *S. saucerrottei*

Like other members of the genus, *S. cyanifrons* and *S. saucerrottei* are medium-sized trochilids (c. 8-11 cm in length, 4-7 g) with relatively straight, blackish bills with

TABLE 1.

Biometric characters of *Saucerottia cyanifrons* and *S. v. viridigaster* compared with *Eriocnemis incultus*, based on examined skins; ranges (sample sizes), means, and standard deviations are given.

Taxon	Bill length (mm)	Wing length (mm)	Rectrix 1 length (mm)	Rectrix 5 length (mm)
<i>S. cyanifrons</i>	♂: 18.0-21.5 (39)	50.0-57.5 (35)	25.0-28.5 (39)	30.0-35.5 (39)
	19.7±0.8	53.9±1.5	26.7±0.8	32.4±1.3
	♀: 18.5-22.5 (20)	49.5-54.0 (17)	25.5-28.0 (19)	29.5-32.5(16)
	20.3±1.1	52.7±1.3	26.9±0.8	31.0±1.0
<i>E. incultus</i>	♂: 19.0 (1)	53.0-53.5 (2)	26.0-27.5 (2)	30.5-32.5 (2)
	♀: 20.0-20.5 (2)	51.5-54.0 (2)	26.0-28.0 (2)	28.5-29.5 (2)
<i>S. viridigaster</i>	♂: 18.0-21.0 (28)	48.5-56.5 (26)	24.5-28.5 (28)	26.0-33.5 (26)
	19.7±0.9	53.1±1.8	26.8±1.0	31.1±1.6
	♀: 17.0-21.0 (25)	49.0-54.5 (19)	23.0-28.5 (24)	27.5-32.5 (24)
	19.7±1.1	52.2±1.7	26.3±1.3	29.8±1.4

reddish at the base of the lower mandible, and a golden green basic plumage with a glittering crown and gorget. The tail is Blue Black (90) in both species or steel- to violet-blue (\sim Cyanine Blue, 74) in *S. saucerrottei* and slightly forked in each taxon. The discs of the undertail coverts either resemble in colouration the rectrices (*S. s.*) or vary from bluish to Olive-Brown (28, *S. c.*).

Males of *S. cyanifrons* are most readily distinguished from *S. saucerrottei* by their deep blue instead of golden green glittering crown that becomes more turquoise towards the hindneck. In females and immature males, the turquoise colouration also extends to the crown area. Unlike *S. saucerrottei*, the uppertail coverts of *S. cyanifrons* show golden green feather bases and the undertail coverts have pronounced greyish-brown margins.

Considering biometric characters (Fig. 2), I found no significant differences between the biogeographically closely related taxa *S. cyanifrons* and *S. s. saucerrottei* except in wing length ($p < 0.01$). *S. s. hoffmanni* differs strongly from the nominate race in several characters. Wings and innermost rectrices are significantly longer ($p < 0.001$) in *hoffmanni* whereas the bill is on average shorter ($p < 0.001$) than in *S. s. saucerrottei*.

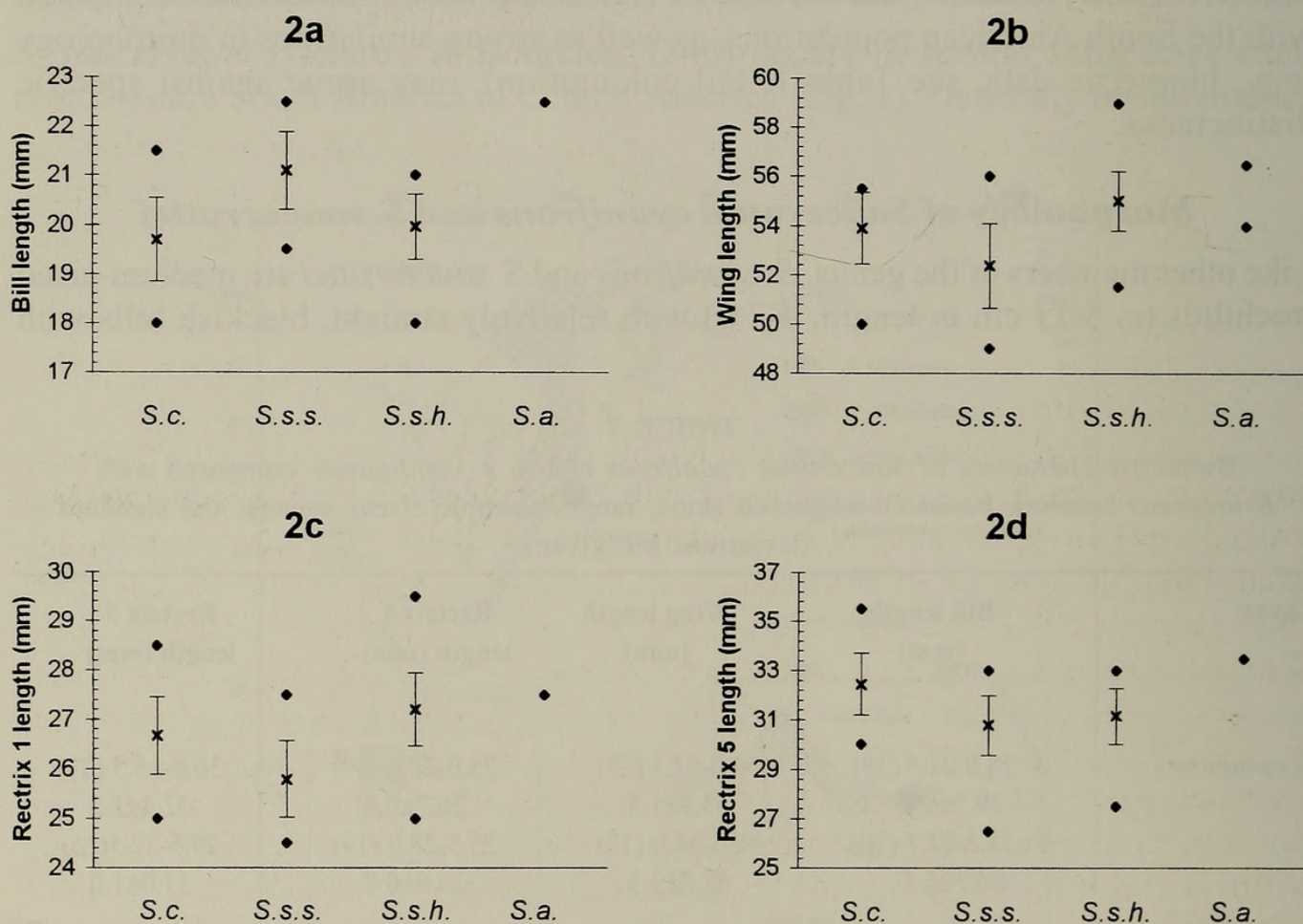


Fig. 2: Biometric characters of *Saucerottia cyanifrons* (*S. c.*, $n = 27$), *S. s. saucerrottei* (*S.s.s.*, $n = 45$), *S. saucerrottei hoffmanni* (*S.s.h.*, $n = 34$), and the type specimen of *S. alfaroana* (*S.a.*), based on examined skins; means, standard deviations and ranges are shown. Note that the two wing length measurements for *S. alfaroana* are due to different sizes of the left and right wing (see also text).

Distribution and morphology of *Saucerottia alfaroana*

The type locality and only collecting site of *S. alfaroana* is located at the southern slope of Volcan Miravalles in Cordillera de Guanacaste, northwestern Costa Rica, where the bird "was taken at a pretty high point" (Underwood 1896: 441; according to the author, altitude between c. 450-600 m: 432). Unfortunately, Underwood did not record the habitat, and therefore we have no information whether it was collected in forest or not.

AOU (1983) and Stiles *et al.* (1989) considered that *S. alfaroana* is unlikely to result from hybridization of any two local species occurring at Volcan Miravalles. Moreover, the type specimen exhibits certain plumage characters either typical of all taxa of *Saucerottia*, or at least found in several congeners. The underparts have a glittering dark golden green colouration. Tail and tail coverts differ strongly from dorsal and ventral plumage, respectively. The uppertail coverts are dark violet, thus contradicting Underwood (1896) who described this character as in *S. s. hoffmanni* (where the colouration is actually steel-blue). Likewise, the discs of undertail coverts have a violet-blue shine and whitish margins. The rectrices are shining deep steel-blue, a character also present in *S. cyanifrons* and some subspecies of *S. saucerrottei* (*S. s. braccata*, *S. s. hoffmanni*). The tail bifurcation (6 mm) is similar to that of male *S. cyanifrons*.

Nevertheless, *S. alfaroana* exhibits unique plumage features that are not referable to any other congener. The type has an iridescent turquoise-bluish cap, less well-defined than in *S. cyanifrons*, and a bluish-green back, the latter very different from other representatives of the genus which either show an inconspicuous greenish or a strongly bronzish to copperish back. For example, the latter colour pattern occurs in *S. saucerrottei hoffmanni* as well as in several races of *S. edward* (Panamá) and *S. cupreicauda* (Pantepui region of Venezuela, Guyana, Brazil).

S. alfaroana was initially sexed as a female (as indicated on the specimen label), most probably due to its crown colouration that resembles female *S. cyanifrons* (but here reduced). However, other plumage characters indicate that the type was wrongly sexed. First, the absence of conspicuous whitish subterminal bars in the chin and gorget (as present in females) is characteristic of males of all *Saucerottia* taxa. Second, biometric data of the wings and rectrices are referable to both male *S. cyanifrons* and *S. saucerrottei* although on average they are closer to those found in the latter species (Fig. 2). In particular, the length of wings (left one: 56.5 mm, right one: 54 mm; difference possibly due to preparation) and of the outermost rectrices (r5) in *alfaroana* almost matches the mean values found for *S. s. hoffmanni* (Fig. 2b-c). As an exception, the bill is longer than in males of *S. cyanifrons* and those of *S. s. hoffmanni* but falls just within the upper range of male *S. s. saucerrottei* (Fig. 2a).

Taxonomy and morphology of *Eriocnemis incultus*

The holotype of *E. incultus* (AMNH collection # 38888) was first described by Elliot (1889) and placed in the genus *Eriocnemis*, distant from *Saucerottia* species. Based

on colour differences from other *Eriocnemis* species, Salvin & Hartert (1895) doubted its generic position. Among subsequent taxonomists, Simon (1897, 1921), Hartert (1900), Peters (1945), and Greenway (1978) included *E. incultus* in the nominate race of *S. viridigaster*.

As indicated by Simon (1897), the subsequently described taxon *Saucerottia nunezi*, originating from Colombia (Boucard 1892), should be regarded as synonymous to *E. incultus*. Considering morphological aspects, the main character of *E. incultus* and *S. nunezi* is the dull body plumage which can be generally described as Sepia Brown (119), becoming slightly lighter towards the rump and belly (119A; c.f. Greenway 1978). Uppertail coverts and rectrices are Jet Black (89), the undertail coverts have brownish centres with greyish-white fringes. The bill is blackish with a paler base of the lower mandible, fairly straight, and medium-long (Table 1). Altogether, these characters indicate that *E. incultus* represents a melanistic form of a *Saucerottia* species (e.g., Simon 1897, 1921; Hartert 1900).

Contrary to previous classifications, this study suggests that *E. incultus* is probably a melanistic variation of *S. cyanifrons* rather than of *S. viridigaster*. All five *E. incultus* specimens examined are Bogotá trade skins and their collection site is unknown. As a result, conclusions on the taxonomic identity can be drawn only from details in colouration. Males and females show a very dull greenish-black cap, resembling in shape the dark violet blue one in *S. cyanifrons* (e.g., extending to the neck in male *incultus*). As typical for *Saucerottia*, females have also whitish to greyish subterminal bars in the gorget. Morphometrically, *E. incultus* is neither distinct from *S. cyanifrons* nor from *S. v. viridigaster* (Table 1).

Another aberrant specimen of *S. cyanifrons* (ZFMK # 7207), labeled as a melanistic variety, probably male, closely resembles in morphology *E. incultus* but reveals slight differences in detail. The wings are shorter than in males of the latter whereas the other mensural data almost agree with them (Table 1); the body plumage is Sepia coloured (119) with a deep Vinaceous (most similar to Color 4) shine on the gorget and lower throat, becoming very dark purplish towards the flanks and belly (see also Simon 1897); and the uppertail coverts and rectrices are purplish black. The undertail coverts show brownish centres, similar to *E. incultus*, thus differing from typical representatives of *S. cyanifrons*. Additionally, this bird has an almost blackish cap of a similar extension as in males of *S. cyanifrons* and *E. incultus*.

Speciation model in *Saucerottia*

The current distribution and plumage patterns of *S. cyanifrons* and *S. saucerrottei* suggest that both taxa are most likely derived from a common ancestor and differentiated northwest of the Andes, thus being of recent, probably Pleistocene origin (Weller 1998). Moreover, based on recent habitat preferences it is postulated that *S. saucerrottei* originated in the Caribbean lowland dry forest of present northwestern Colombia whereas *S. cyanifrons* evolved in the submontane, more humid forest zone, presumably along the eastern Andean slope of the Magdalena valley. Subsequently, populations of *S. saucerrottei* colonized not only central and

western Andean valleys (*S. s. saucerrottei*), the Andes of Mérida (*S. s. braccata*), and the Santa Marta region (*S. s. warszewiczi*) but also the Central American land-bridge where *S. s. hoffmanni* could establish along the volcanic belt raising from the Pacific lowlands of Costa Rica and Nicaragua. Similar to other submontane Andean forest birds (e.g., Haffer 1967, 1970), refuges may have played an important role effecting intrageneric speciation and subspeciation events in *Saucerottia*.

Based on plumage and morphometric patterns and biogeographical evidence, *S. alfaroana* most likely represents a separate species, with closer affinities to *S. saucerrottei* (Walters, pers. comm.). The former occurrence of *S. alfaroana* is most likely referable to the invasion of *S. saucerrottei* descendants than to any westward-directed spread of *S. cyanifrons*. Under the first assumption, it remains speculative whether isolation events or altitudinal segregation split the Costa Rican population of *S. saucerrottei* into the precursors of *S. s. hoffmanni* and *S. alfaroana*, or *alfaroana* originated subsequently from the *hoffmanni* population. Obviously, due to interspecific exclusion the once connected population of *S. cyanifrons* was disrupted by *S. saucerrottei* populations invading the central Andean valleys, leaving back an isolated subpopulation of the former taxon in the uppermost Cauca valley. Against this competitive background and in view of ecological adaptations, it is much less plausible that a hypothetical precursor of *S. alfaroana* derived from *S. cyanifrons* that once invaded the volcanic belt of Costa Rica across the Caribbean and Panamanian lowlands.

Considering morphological affinities, the similar crown colouration of *S. alfaroana* and *S. cyanifrons* could be interpreted as a "leapfrog" pattern (cf. Rensch 1929, Remsen 1984), interrupted by the less contrasted bronzy greenish crown of *S. saucerrottei*. Moreover, the latter species shares several phenotypic features with *S. cyanifrons* and the east Andean congeners *S. viridigaster* and *S. tobaci*, e.g., the dark bluish to violet tail and the darkish golden green, iridescent body plumage. In terms of phylogeny, both colour patterns can be considered as plesiomorphic intrageneric characters, indicating that the evolutionary centre of the genus was located in northwestern South America (Weller 2000). However, for biogeographical reasons the western Andean and the eastern Andean species group are considered to have evolved independently (Weller 1998). Therefore, each of them represents a superspecies, with the western one comprising *S. saucerrottei*, *S. cyanifrons*, and perhaps the extinct *S. alfaroana* (in view of previous allopatry or parapatry with *S. s. hoffmanni*), and the eastern one consisting of *S. viridigaster*, *S. cupreicauda*, and *S. tobaci* (Weller 2000). Due to their proposed common monophyletic origin, allopatric occurrence, and ecological replacement, both groups may form a second order superspecies *sensu* Haffer (1986).

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References:

- American Ornithologists' Union (AOU) 1983. *Check-list of North American birds*, 6th edition. Allen Press, Inc. Lawrence, Kansas.
- Berlioz, J. 1933. Révision critique des Trochilidés du genre *Saucerottia* (1) Bp. *Oiseau* 3 (n.s.): 793-807.
- Bonaparte, C. L. J. L. 1850. *Saucerottia*. *Compt. Rend. Acad. Sciences* 30: 381.
- Bourcier, J. 1843. Oiseaux-Mouches nouveaux. *Rev. Zool.* 6: 99-104.
- Boucard, A. 1892. Genera of humming birds. *Humming Bird* 2: 1-56.
- Cabanis, J. & Heyne, F. 1860. *Museum Ornithologicum Heineanum*, Theil 3. Halberstadt.
- Carriker, M. A., Jr. 1910. An annotated list of the birds of Costa Rica, including Cocos Island. *Ann. Carnegie Mus.* 6: 314-915.
- Delattre, A. & Bourcier, J. 1846. Oiseaux-Mouches nouveaux. *Rev. Zool.* 9: 305-311.
- Elliot, D. G. 1889. Descriptions of supposed new species of hummingbirds belonging to the genera *Amazilia* and *Eriocnemis*. *Auk* 6: 209-210.
- Gould, J. 1861. *An introduction to the Trochilidae, or family of humming-birds*. Taylor & Frances, London.
- Greenway, J. C., Jr. 1978. Type specimens of birds in the American Museum of Natural History. *Bull. Amer. Mus. Nat. Hist.* 161: 1-305.
- Haffer, J. 1967. Speciation in Colombian forest birds west of the Andes. *Amer. Mus. Novit.* 2294: 1-57.
- Haffer, J. 1970. Entstehung und Ausbreitung nord-andiner Bergvögel. *Zool. Jahrb. Syst.* 97: 301-337.
- Haffer, J. 1986. Superspecies and species limits in vertebrates. *Z. Zool. Syst. Evol. Forsch.* 24: 169-190.
- Hartert, E. 1900. Trochilidae. In: Reichenow, A. (ed.), *Das Tierreich*. 9. Lieferung. Deutsche Zoologische Gesellschaft, Berlin.
- Hilty, S. L. & Brown, W. L. 1986. *A guide to the birds of Colombia*. Princeton Univ. Press, Princeton, New Jersey.
- Lesson, R. P. 1843. *Écho du Monde Savant* 10, col. 757.
- Johnsgard, P. A. 1997. *The hummingbirds of North America*, 2nd edition. Christopher Helm, A & C Black. London.
- Munves, J. 1975. Birds of a highland clearing in Cundinamarca, Colombia. *Auk* 92: 307-321.
- Nicéforo Maria, H. 1940. Los Troquilidos del Museo del Instituto de La Salle. *Rev. Acad. Colomb. Cienc. Bogota* 3: 314-322.
- Paynter, R. A., Jr. 1997. *Ornithological gazetteer of Colombia*, 2nd edition. Museum of Comparative Zoology. Cambridge, Mass.
- Peters, J. L. 1945. *Check-list of birds of the world*, Vol. 5. Harvard Univ. Press. Cambridge, Mass.
- Remsen, J. V., Jr. 1984. High incidence of "leapfrog" patterns of geographical variation in Andean birds: implication for the speciation process. *Science* 224: 171-173.
- Rensch, B. 1929. *Das Prinzip der geographischen Rassenkreise und das Problem der Artbildung*. Bornträger. Berlin.
- Ridgway, R. 1911. The birds of North and Middle America, Vol. 5. - *Bull. U.S. Natl. Mus.* 50.

- Salvin, O. 1892. *Catalogue of the Picariæ in the collection of the British Museum*. Upupæ, Trochili. 1-433. Trustees of the British Museum (Natural History), London.
- Sibley, C. G. & Monroe, B. L., Jr. 1990. *Distribution and taxonomy of birds of the world*. Yale Univ. Press. New Haven.
- Simon, E. 1897. *Catalogue des espèces actuellement connues de la famille des Trochilides*, Vol. 8. Paris.
- Simon, E. 1921. *Histoire naturelle des Trochilidés (synopsis and catalogue)*. Encyclopédie Roret, L. Mulo. Paris.
- Slud, P. 1964. The birds of Costa Rica. Distribution and ecology. *Bull. Amer. Mus. Nat. Hist.* 128.
- Smithe, F. B. 1975. *Naturalist's color guide*. American Museum of Natural History. New York.
- Snow, D. W. & Snow, B. K. 1980. Relationships between hummingbirds and flowers in the Andes of Colombia. *Bull. Br. Mus. nat. Hist. (Zool.)* 38: 105-139.
- Stiles, F. G., Skutch, A. F. & Gardner, D. 1989. *A guide to the birds of Costa Rica*. Christopher Helm, Bromley. London.
- Underwood, C. F. 1896. A list of birds collected or observed on the lower, southern, and southern western slopes of the Volcano of Miravalles and on the lower lands extending to Bagaces in Costa Rica, with a few observations on their habits. *Ibis* 38: 431-451.
- Warren, R. L. M. 1966. *Type-specimens in the British Museum (Natural History)*, Vol. 1. *Non-Passerines*. Trustees of the British Museum (Natural History). London.
- Weller, A.-A. 1998. *Biogeographie, geographische Variation und Taxonomie der Gattung Amazilia (Aves, Trochilidae)*. Unpubl. Ph.D. thesis, Rhein. Friedrich-Wilhelms-Universität. Bonn.
- Weller, A.-A. 1999. Genus *Saucerottia*. 602-605. In: del Hoyo, J., A. Elliot & J. Sargatal (eds.), *Handbook of the birds of the world*, Vol. 5. Lynx Edicions. Barcelona.
- Weller, A.-A. 2000. A new hummingbird subspecies from southern Bolívar, Venezuela, with notes on biogeography and taxonomy of the *Saucerottia viridigaster-cupreicauda* species group. *Ornitol. Neotrop.* 11: 143-154.

Address: A.-A. Weller, Research Group "Biology and Phylogeny of Neotropical Birds", Ornithology, Alexander Koenig Research Institute and Museum of Zoology, Adenauerallee 160, 53113 Bonn, Germany.

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Brood hosts of Oriental Cuckoo *Cuculus saturatus* in Sabah, Malaysia

by Robert G. Moyle, Alim Biun, Benedict Butit & David Sumpngol

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Wells & Becking (1975) and Becking (1975) used several lines of evidence to examine the specific affinity of a race of *Cuculus* resident in Malaya, Sumatra, Java, and the Lesser Sundas. Plumage, bill and eggshell structure, vocalizations, and brood hosts indicated that this race (*lepidus*) was a subspecies of Oriental Cuckoo *Cuculus saturatus* and not a subspecies of Lesser Cuckoo *Cuculus poliocephalus*, as previously believed. Because of incomplete data, a Bornean form (*insulindae*) was



Weller,
Andre

-Alexander

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. 2001. "On types of trochilids in the Natural History Museum, Tring III. *Amazilia alfaroana* Underwood (1896), with notes on biogeography and geographical variation in the *Saucerottia saucerrottei* superspecies." *Bulletin of the British Ornithologists' Club* 121, 98–107.

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