Taxonomic identity of *Trochilus verticalis* Deppe, 1830

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The type series of *Trochilus verticalis* Deppe, 1830, deposited in the collections of the Museum für Naturkunde Berlin (ZMB) and the Naturhistorisches Museum Wien (NMW), consists of five specimens of different taxa and one specimen with aberrant characters. However, the original description of *verticalis* refers to *Agyrtria cyanocephala* (Lesson, 1829), to which only the two NMW specimens clearly correspond. Therefore NMW 2.670 (male, Perote) is designated as lectotype of *Trochilus verticalis* Deppe, 1830.

Introduction

Hinrich Carl Lichtenstein (1780-1857), director of the Zoological Museum of Berlin (ZMB) between 1813 and 1857, was not only well-known for his business sense concerning the expansion of the collections, but also for his 'unconventional' way of describing new taxa (Stresemann, 1960). He awarded new names to all specimens which seemed to be unknown to him and published them in one of his numerous sales catalogues. Since these very short descriptions hardly fulfilled even the demands of the contemporary taxonomy, the identification of such 'type' specimens still causes historical, nomenclatural and taxonomic problems, e.g. when dealing with type catalogues (Mauersberger, 1988). A good example is *Trochilus verticalis* "Lichtenstein" W. Deppe, 1830. This hummingbird was described on page 1 of the "Preis-Verzeichniß der Säugethiere, Vögel, Amphibien, Fische und Krebse, welche von den Herren Deppe und Schiede in Mexico gesammelt worden, und bei dem unterzeichneten Bevollmächtigen in Berlin gegen baare Zahlung in Preuß. Courant zu erhalten sind." (Deppe, 1830). This sales catalogue was published in 1830 and reprinted by J. Cabanis in 1863 ("Lichtenstein's Preis-Verzeichniss mexicanischer Vögel etc.," J. Ornithol. 11: 54-60):

"27. *Trochilus verticalis* Lichtenst. adult. Kopf glänzend blau, Rücken grün, Kehle und Bauch weiss. [head glossy blue, back green, throat and abdomen white].
"28. " " juv."

Although the catalogue has been considered as very rare or even lost (Mauersberger, 1988; Browning & Monroe, 1991), at least one original copy still exists in the ZMB (Deppe, 1830). It was signed and published by Wilhelm Deppe, an account in the museum's administration at this time. Due to his profession, Deppe dealt only with technical aspects of publications and sales and was not involved in taxonomic questions. Additionally, the form of the catalogue and descriptions and Cabanis' assignment indicate the authorship

of Lichtenstein rather than that of Deppe. Lichtenstein also published a second sales catalogue with the same wording six years later, containing the remaining, unsold material of Deppe and Schiede (Lichtenstein, 1836). However, since Lichtenstein's authorship is not evidenced in the first catalogue, W. Deppe has to be considered as the author of the new scientific names published therein (cf. ICZN, 1999, Art. 50.1.1.; see also Stresemann, 1954; Browning & Monroe, 1991).

Historical background

The "Preis-Verzeichniss mexicanischer Vögel" is based on zoological material collected by the Berlin botanists Ferdinand Deppe (1794-ca. 1860; W. Deppe's brother) and Wilhelm Schiede (1798-1836) in Mexico from 1828 till 1830.

F. Deppe had earlier joined an expedition through southern Mexico (Alvarado - Jalapa - Mexico City - Temascaltepec - Puebla - Tehuacan - Oaxaca - Tehuantepec - Alvarado) between 1824 and 1827, where he collected large numbers of birds, other animals and plants. All zoological material was bought by the Zoological Museum of Berlin. Thus, Deppe and Schiede expected to finance their future expeditions by selling zoological and botanical specimens to European natural history museums and dealers. They settled down in Jalapa and made collecting excursions to adjacent areas (from Veracruz to Cofre de Perote and Pico de Orizaba, Puebla). As a result, many specimens in the ZMB collection were only labelled "Xalapa", even if they originated from its surroundings. Despite the sale catalogue provided by W. Deppe, the sales stagnated subsequently and forced F. Deppe and Schiede to give up their business in late 1830 (Stresemann, 1954).

The majority of the zoological material of both expeditions is housed in the ZMB, but part of the specimens already brought to the Berlin museum attained to the Museum of Natural History, Vienna (Naturhistorisches Museum Wien, NMW) and other European collections (e.g. National Museum of Natural History, Leiden, RMNH). Schifter (1996) provided a critical revision of the NMW specimens collected by F. Deppe and Schiede. Private collectors obtained further specimens, but unfortunately such sales are hard to trace.

Type specimens

According to ICZN (1999), Art. 72.4.1.1., "any evidence, published or unpublished, may be taken into account to determine what specimens constitute the type series." A careful comparison between the material mentioned in Deppe's catalogue and the specimens still existing in the collection shows that not all of the newly named specimens were offered and sold, but instead some remained in the ZMB. Therefore the type series most likely contain more specimens than one would expect from the sales catalogues (for *verticalis*: one adult and one immature).

Furthermore, the type series of *verticalis* include not only specimens collected on the second expedition of F. Deppe, but also those of the first journey. Contrary to Stresemann's (1954: 91) remark "Type sold. Cotype, from 'Jalapa', 1828," neither Lichtenstein nor Deppe fixed a (holo-)type nor did Stresemann's comment designate a valid lectotype (ICZN, 1999, Art. 74.3.). Hence, all specimens represent syntypes.

A total of nine specimens of so-called *Trochilus verticalis* were obtained by the ZMB between 1826 and 1829 (acquisition register, Deppe, 1826-1829). Two of them were sold to the NMW where they are still present (NMW 2.670, Perote; NMW 2.671, Jalapa; cf. Schifter, 1996). Two further specimens were offered in the sales catalogue in 1830 (see above) and were presumably sold because they are not listed in the second catalogue (Lichtenstein, 1836). Four of the five remaining specimens were registered in the collection catalogue. Three of them still exist in the ZMB (8734, "Xalapa" [= Jalapa Enriquez]; 8735, "Oaxaca" [= Oaxaca de Juárez]; 8737, "Cuernavacca" [= Cuernavaca]; fig. 1), whereas one is apparently lost (8736, Cuernavaca; data according to the collection catalogue). Stresemann (1954) stated Veracruz as the type locality of *verticalis*.

Biogeography and taxonomy

Our study adopts the generic classification of amaziline trochilids provided by Weller (1998, 2000) and Schuchmann (1999), separating the morphologically and biogeographically distinctive white-bellied, mostly colourfully crowned taxa of *Agyrtria* (Reichenbach, 1854) from the more greenish-plumaged groups of *Amazilia* (Lesson, 1843), *Saucerottia* (Bonaparte, 1850) and *Polyerata* (Heine, 1863). Only two species of *Agyrtria* are found in the above described collecting range of Deppe and Schiede which correspond with Lichtenstein's description, the Azure-crowned Hummingbird *Agyrtria cyanocephala* (Lesson, 1829) and the Violet-fronted Hummingbird *A. violiceps* (Gould, 1859). *A. cyanocephala* is distributed with two subspecies from south-eastern Mexico through Guatemala and Honduras to north-eastern Nicaragua, whereas *A. violiceps*, polytypic as well, occurs from the extreme south-eastern USA through western Mexico to western Oaxaca (Binford, 1989; Howell & Webb, 1995; Schuchmann, 1999; fig. 1).

Cabanis & Heine (1860) and Gould (1861) applied *verticalis* to the populations of northern and north-western Mexico, nowadays regarded as *Agyrtria violiceps ellioti* (Berlepsch, 1889; Schuchmann, 1999). According to Salvin (1892), *verticalis* is characterized by a flesh-coloured bill with a black tip, a glittering blue crown, and whitish under parts and under tail coverts, thus being morphologically well separable from both *Cyanomyia violiceps* Gould, 1859 (= *A. v. violiceps*; crown) and from *Cyanomyia cyanocephala* Lesson, 1829 (= *A. c. cyanocephala*; bill, under parts) Nevertheless Salvin (op. cit.) also remarked that the classification of *verticalis* had not been entirely resolved at that time. Hartert (1900a) and Ridgway (1911) followed Salvin's opinion, but in view of new specimens from Volcano Orizaba, Hartert (1900b: 361) doubted its taxonomic identity "… because *verticalis* could also be applied to *violiceps*." However, he never studied the NMW specimens.

Hellmayr (1913), who first re-examined three original specimens in the Berlin and Vienna collections, concluded that they may belong to *cyanocephala*. Van Rossem (in Griscom, 1934: 378) doubted that all specimens in fact represent this taxon but that at least the "juvenile" bird - No. 28 of the catalogue (see above) - is *A. violiceps*. Meise (1949/51, in litt.) and Stresemann (1954) considered *verticalis* a synonym of *violiceps*. Within the subsequent taxonomical literature, solely the American Ornithologist's Union (AOU, 1957) retained *verticalis* but later substituted *violiceps* for it (AOU, 1983; 1998). In contrast, Phillips (1964), Howell & Webb (1995) and Schuchmann (1999) applied *verticalis* to *cyanocephala*.

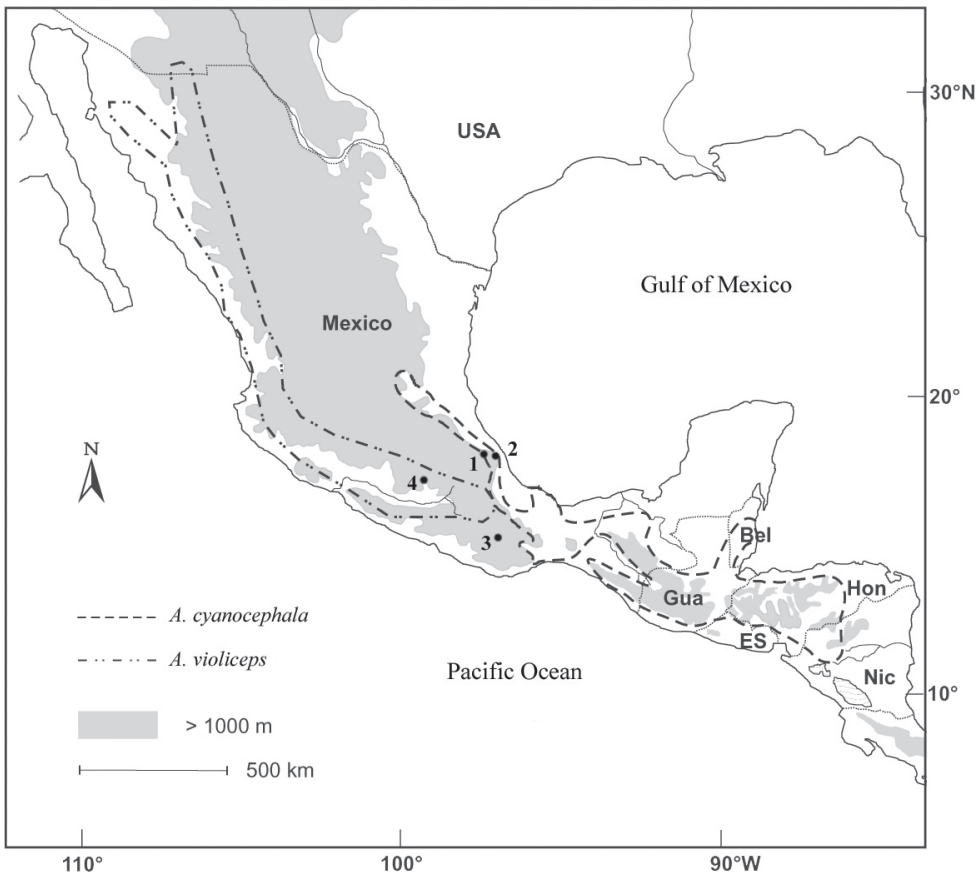

Figure 1. Distributional ranges of *Agyrtria cyanocephala* and *A. violiceps* and collecting localities of type specimens of *Trochilus verticalis*: **1** – Perote (19°36'N, 97°15'W) = NMW 2.670, *A. c. cyanocephala*; **2** – Jalapa Enriquez (19°34'N, 96°54'W) = NMW 2.671, *A. c. cyanocephala* and ZMB 8734, ? aberrant *A. c. cyanocephala*; **3** – Oaxaca de Juárez (17°05'N, 96°40'W) = ZMB 8735, *Cynanthus sordidus*; **4** – Cuernavaca (18°56'N, 99°11'W) = ZMB 8737, *A. v. violiceps*.

Morphological aspects and conclusions

A. cyanocephala and *A. violiceps* have similar morphometric characteristics (table 1; Weller, 1998) but distinct colour patterns. For geographic reasons, the following descriptions refer to the nominotypical forms. *A. c. cyanocephala* exhibits a glittering bluish-violet crown (more turquoise in female-type plumage), golden to bronze-green upper parts, a white throat and belly with golden green flanks and indicated breast band, olive-green centres of under tail coverts, and a golden green tail. *A. v. violiceps* shows a rather violet, weakly iridescent pileum, an olive-green dorsal side with pale cinnamon fringes on the lower back and rump, entirely white under parts and under tail coverts, and bronze-green to purplish shining rectrices. In general, the plumage of *cyanocephala* is more bronze than that of *violiceps*. Both taxa can be discriminated by bill coloration (most visible in birds alive): *cyanocephala* has a blackish upper mandible and a reddish

Table 1. Standard morphometric characteristics (mm) of study skins of *Agyrtria c. cyanocephala*, *A. v. violiceps*, and selected type specimens of *Trochilus verticalis* in the collections of the Zoological Museum, Berlin (ZMB) and the Natural History Museum, Vienna (NMW), including means ± s.d., specimen numbers (in parentheses), and value ranges for both sexes (after Weller, 1998). Ad. = adult, imm. = immature.

Taxon/specimen	Bill length	Wing length	Rectrix 1 length	Rectrix 5 length
A. c. cyanocephala				
males	21.9 ± 0.7 (35)	59.1± 1.2 (31)	30.8 ± 0.8 (33)	34.4 ± 1.1 (34)
	20.5 – 23.5	56.0 – 61.5	29.0 – 32.0	32.0 – 36.5
females	22.5 ± 0.8 (21)	57.1 ± 0.7 (20)	30.5 ± 1.0 (21)	32.5 ± 1.3 (21)
	21.0 – 23.5	55.5 – 58.5	28.5 – 32.5	31.0 – 35.0
A. v. violiceps				
males	23.5 ± 0.5 (22)	58.4 ± 1.3 (23)	30.3 ± 0.8 (24)	33.9 ± 1.2 (22)
	22.5 – 24.5	56.0 – 61.5	29.0 – 32.5	32.0 – 36.5
females	24.6 ± 1.1 (5)	56.3 ± 0.9 (4)	30.3 ± 1.3 (5)	32.1 ± 1.3 (4)
	23.5 – 26.5	55.0 – 57.0	28.5 – 32.0	31.0 – 34.0
NMW 2.670, ad. male *A. c. cyanocephala*	20.5	64.0	30.5	35.0
NMW 2.671, ad. male *A. c. cyanocephala*	21.0	61.0	29.8	35.0
ZMB 8734, ad. female ? *A. c. cyanocephala* ?	25.0	58.5	31.0	33.5
ZMB 8737, imm. *A. v. violiceps*	23.0	57.0	29.0	30.5

lower mandible with dark tip, whereas the bill of *violiceps* is fleshy red except for the dark tip. In female-type plumage of both *cyanocephala* and *violiceps*, the crown has more turquoise reflections and is duller than in adult males.

Both NMW specimens represent adults (male and female) of *cyanocephala* and seem to correspond best with the description provided in Deppe's catalogue. The ZMB syntype series comprises at least two taxa: *Agyrtria violiceps* (ZMB 8737, immature, Cuernavaca) and, surprisingly, *Cynanthus sordidus* (Gould, 1859) (ZMB 8735, adult, Oaxaca). Although this species was formerly merged into *Cyanomyia* (Bonaparte, 1854; today a synonym for *Agyrtria*, cf. Weller, 1998), the dark grey ventral plumage separates it well from taxa belonging to the white-bellied genus *Agyrtria*. The third specimen (ZMB 8734, Jalapa) can be easily identified as a species of *Agyrtria*. However, a thorough comparison with a good series of *cyanocephala* and *violiceps* in the collection of the Alexander Koenig Research Institute and Museum of Zoology (ZFMK), Bonn, revealed that it shows characteristics of both *violiceps* (bill morphology, pattern of upper tail coverts) and *cyanocephala* (coloration of crown and upper parts) as well as intermediate characters (ventral plumage, tail; for a detailed description, see footnote[1]). The indefinite crown coloration and the bill length

[1] Description of ZMB 8734: General plumage condition fairly poor, e.g. due to lacking head and dorsal (rump) feathers; bill horn-coloured with dark tip; frontlet with turquoise blue to bluish-violet reflections, becoming turquoise green towards hindneck; auricular feathers shining golden green; dorsum bronze-green, remaining rump feathers darker; upper tail coverts with coppery reflections; wings greyish-brown, coverts olive green; under parts whitish, weakly flanked bronze-green; rectrices shining bronze-green, with inner webs strongly copperish; under tail coverts with cream-coloured to pale drab centers and white margins; one covert tipped bronze-green.

(table 1) indicate that this specimen is likely a female. Altogether, morphological evidence suggests that it may be either an aberrant morph of one of these taxa or a hybrid of them.

Although hybridisation among hummingbirds is not a rare phenomenon and occurs on the intergeneric as well as on the intrageneric level, particularly throughout many trochiline clades (e.g. Graves, 1990; 1999; Weller & Schuchmann, 1997; Schuchmann, 1999), there has been no evidence of intrageneric hybrids of *Agyrtria* to date (Weller, 1998). However, on the intergeneric level the unique holotype of *Cyanomyia salvini* (Brewster, 1893) has been interpreted as a hybrid of *A. violiceps* × *Cynanthus latirostris* (Griscom, 1934; Phillips, 1964; Graves, 2003).

From a biogeographic point of view, *A. cyanocephala* and *A. violiceps* are parapatric only in southern central Mexico (W Puebla to NW Oaxaca; fig. 1). In contrast, the given collecting site Jalapa Enriquez, state of Veracruz, or even the possible collecting area of Deppe and Schiede between Veracruz, Cofre de Perote and Pico de Orizaba (see above) are situated within the range of *A. c. cyanocephala* on the Atlantic side of the Sierra Madre Oriental (Howell & Webb, 1995; Johnsgard, 1997; Weller, 1998), with a clear distance to the south-eastern range limits of *A. v. violiceps*. Although the possibility exists that *A. violiceps* may occur north-east of the southern residential range, there is no information on such movements (Johnsgard, 1997). Hence the distributional findings provide no support for a supposed hybrid origin *A. violiceps* × *A. cyanocephala* of this specimen. Hybridisation of *A. cyanocephala* with *A. candida* (Bourcier & Mulsant, 1846), a congener indigenous of north-eastern Mexico, can also be excluded because coloration (*candida*: e.g. crown dull bronze-green, greenish band on breast, rectrices grey- to bronze-green) and morphometrics (*candida*: bill and wings clearly shorter than in *cyanocephala*; Weller, 1998) of the ZMB syntype (see footnote 1) contradict a parental participation of this species.

Generally, morphological aberrations are unknown for both *A. cyanocephala* and *A. violiceps*. However, based on the current distributional data this specimen should be regarded as an aberrant individual of *A. cyanocephala* (cf. Griscom, 1934).

Lectotype designation of *Trochilus verticalis* Deppe, 1830

The composite nature of the type series of *Trochilus verticalis* makes it necessary to designate a lectotype in order to confirm the current nomenclature and priority of the names *Agyrtria violiceps* (Gould, 1859) and *Cynanthus sordidus* (Gould, 1959). The original description refers to *A. cyanocephala* (Lesson, 1829). Thus, only a syntype of the Vienna collection can be chosen as the lectotype.

According to ICZN (1999), Art. 74.7., we herein designate as the lectotype of *Trochilus verticalis* Deppe, 1830: NMW 2.670, male [ad.], Sept[ember] 1828, Perote, Mexico, leg. Deppe & Schiede, purchased 1829, former Cat. No. 1829.VII.8. In accordance with ICZN (1999), Art. 76.2., the type locality is Perote (19°36'N, 97°15'W; state of Veracruz, Mexico).

Following ICZN (1999), Art. 74.1.3., the specimens listed below (former syntypes) become paralectotypes:
ZMB 8734, male juv. [ad. ?], Xalapa, leg. Deppe [= ? aberrant *Agyrtria c. cyanocephala*];
ZMB 8735, juv., Oaxaca, leg. Deppe [= *Cynanthus sordidus*];

ZMB 8736, male, Cuernavaca, leg. Deppe, presumably lost, whereabouts unknown, data from ZMB catalogue;
ZMB 8737, [imm.], Cuernavaca, leg. Deppe [= *A. v. violiceps*]; and
NMW 2.671, female [ad.], VIII.1828, Jalapa, leg. Deppe & Schiede, purchased 1829, former Cat. No. 1829.VII.8a. [= *A. c. cyanocephala*].

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