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Source: Bulletin of the British Ornithologists' Club, 139(1) : 75-82

Published By: British Ornithologists' Club

URL: <https://doi.org/10.25226/bboc.v139i1.2019.a6>

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Species limits in the African Palm Swift *Cypsiurus parvus*

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Received 20 December 2018; revised 28 January 2019; published 15 March 2019

<http://zoobank.org/urn:lsid:zoobank.org:pub:A468F2C9-6BDB-4A35-8BB3-17979CCC77BA>

SUMMARY.—The Malagasy forms *gracilis* (Madagascar) and *griveaudi* (Comoro Islands) of African Palm Swift *Cypsiurus parvus* have very different vocalisations (short insect-like single buzzy notes and occasional drawn-out rising buzzes) from mainland African taxa (twitters and staccato notes, the former sometimes in longer series). They also have heavier dark markings on the throat and upper breast, paler bellies and distinctly shorter tail extensions. These characters in combination are here considered to demarcate the Malagasy forms as a species, Madagascar Palm Swift *C. gracilis*, separate from both the remaining taxa of *C. parvus* and Asian Palm Swift *C. balasiensis*.

African Palm Swift *Cypsiurus parvus* is distributed widely across sub-Saharan Africa, the Comoro Islands and Madagascar in eight subspecies: *C. p. parvus* from Senegambia east as far as south-west Arabia; *brachypterus* from Sierra Leone east to the Democratic Republic of Congo and Angola, plus the Gulf of Guinea islands; *C. p. myochrous* from South Sudan south to eastern Botswana and northern South Africa; *C. p. laemostigma* from Somalia to Mozambique; *C. p. hyphaenes* in northern Namibia and Botswana; *C. p. celer* in southern Mozambique and eastern South Africa; *C. p. griveaudi* in the Comoros; and *C. p. gracilis* in Madagascar (Fry 1988, Chantler 1999, Chantler & Driessens 2000, Dickinson & Remsen 2013, Safford 2013, del Hoyo & Collar 2014). Published diagnoses of these taxa (Brooke 1972, Clancey 1983, Fry 1988, Chantler & Driessens 2000) indicate that differences between the continental forms are relatively subtle, but that the insular forms in the Indian Ocean are collectively a little more distinctive.

On a visit to Madagascar in November 2017, MSLM noticed that the calls of the palm swifts were strikingly different from those with which he is familiar in mainland Africa. The possibility therefore emerged that the Malagasy taxa might merit further study, to reconsider their taxonomic status.

Methods

We assembled and analysed sound recordings of the calls of *C. parvus*, using all available online archives (Xeno-canto = 30 recordings, Macaulay Library = 3, and Avian Vocalizations Center = 3), a few commercial publications (Gibbon 1995, Chappuis 2000, Huguet & Chappuis 2003, Stjernstedt 2008) and four made in Madagascar by MSLM. This set of recordings provided a good geographical coverage, including all but one (*laemostigma*) of the eight races (see Appendix 1). For all of these we prepared sonograms and manually measured basic sound parameters using CoolEdit Pro.

We also examined and measured specimens in the American Museum of Natural History, New York, USA (AMNH), Muséum national d'Histoire naturelle, Paris, France (MNHN), Natural History Museum, Tring, UK (NHMUK) and Museum für Naturkunde, Berlin, Germany (ZMB). Mensural data (in mm) were taken from males using digital callipers accurate to two decimal places, for wing (curved) and tail (from point of insertion to the tip of the longer outermost rectrix, hereafter 'extension'). Birds without tail extensions

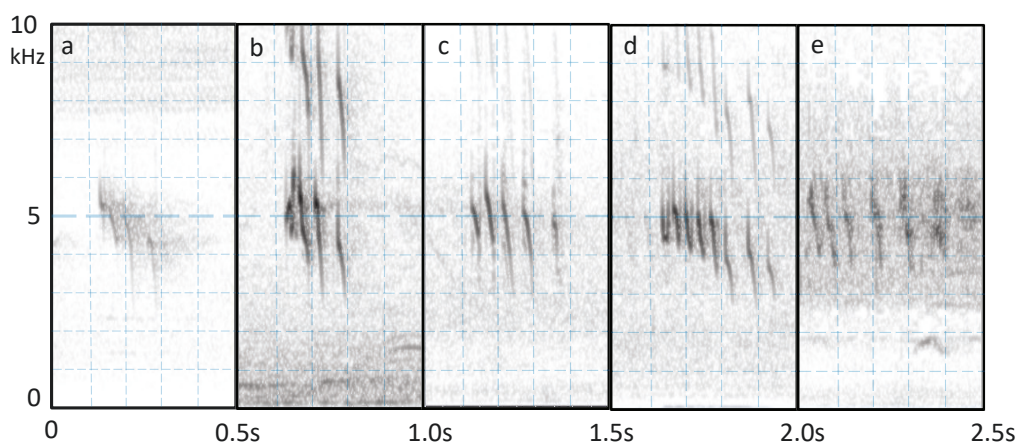


Figure 1. Examples of short calls uttered by single individuals, for mainland races of *Cypsiurus parvus*. From left to right (a–e): *parvus* (XC421450, B. Piot), *brachypterus* (XC348468, P. Verbelen), *myochrous* (XC280231, P. Boesman), *hyphaenes* (XC346765, P. Boesman) and *celer* (XC280232, P. Boesman).

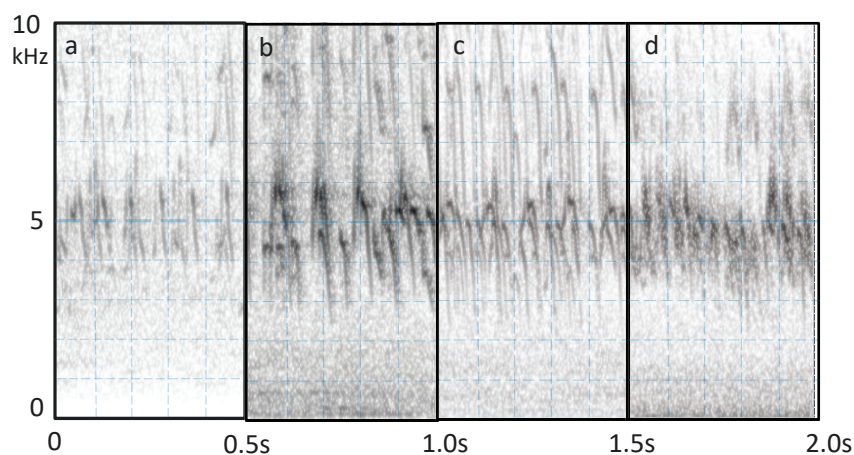


Figure 2. Examples of call series (extracts to illustrate note shapes) uttered by groups of birds, for mainland races of *Cypsiurus parvus*. From left to right (a–d): *parvus* (XC356729, B. Piot), *brachypterus* (XC348468, P. Verbelen), *myochrous* (XC396390, J. Bradley), *hyphaenes* (XC153527, R. de By).

were excluded, as were those showing signs of immaturity (scaly pattern on upperparts plus short tail extensions). Samples involved 27 *gracilis* (14 AMNH, 13 NHMUK), five *griveaudi* (three MNHN, two NHMUK), 14 *parvus* (all NHMUK), ten *brachypterus* (eight AMNH, two NHMUK), ten *myochrous* (one AMNH, nine NHMUK), one *hyphaenes* (in NHMUK), no *celer* and no *laemostigma*. The type of the last-named taxon, in ZMB, was examined and photographed (Fig. 6) but, lacking tail extensions, not measured. Four *laemostigma* in AMNH, three of them male, are immature or moulting, and otherwise neither this taxon nor *celer* could be found in several other European collections visited.

To gauge the degree of difference in voice, plumage and dimensions between Malagasy taxa and African mainland taxa, we used the scoring system proposed by Tobias *et al.* (2010), in which an exceptional character (radically different coloration, pattern, size or sound) scores four, a major character (pronounced difference in body part colour or pattern, measurement or vocalisation) three, medium character (clear difference, e.g. a distinct hue rather than different colour) two, and minor character (weak difference, e.g. a change in

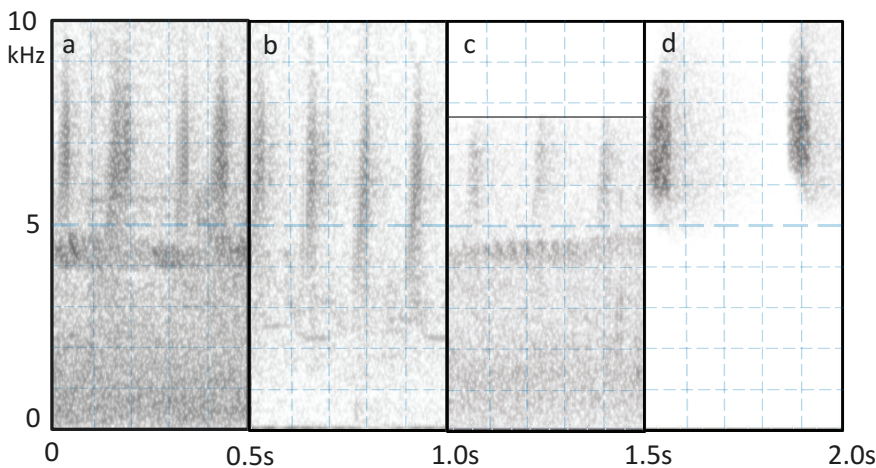


Figure 3. Examples of calls uttered by single individuals of Malagasy races of *Cypsiurus parvus*. From left to right: *gracilis* a: XC162876, M. Nelson; b: M. Mills; c: XC125058, A. Lastukhin (cut-off at 7.8 kHz) and *griveaudi* d: M. Herremans (heavily filtered).

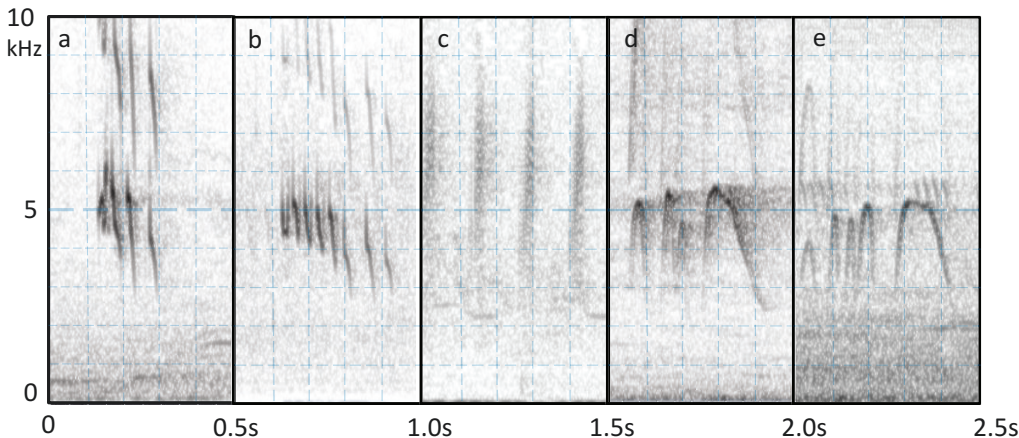


Figure 4. Examples of calls uttered by three vocal groups of *Cypsiurus parvus* ranked from west to east (and from left to right): *parvus* group a: XC348468, São Tomé, P. Verbelen; b: XC346765, Namibia, P. Boesman; *gracilis* group c: Madagascar, M. Mills; and *balasiensis* group d: XC286657, India, V. Puliyeri; e: XC362689, Thailand, A. Lastukhin.

shade) one; a threshold of seven is set to permit species status, which cannot be triggered by minor characters alone, and only three plumage characters, two vocal characters, two biometric characters (both vocal and mensural data assessed for effect size using Cohen’s *d* where 0.2–2.0 is minor, 2–5 medium and 5–10 major) and one behavioural or ecological character (allowed 1) may be counted.

Results

Vocally, Malagasy birds form a very distinct group from those of the African mainland. All mainland subspecies (also including birds from the Gulf of Guinea islands) make calls that consist of twitters (somewhat like Little Swift *Apus affinis*). Single birds typically utter salvos (‘short calls’) of 2–6 downslurred elements (Figs. 1, 4), but birds in loose flocks give longer call series incorporating similar elements, as well as rather staccato notes (note

TABLE 1
Means and standard deviations of length of wing and tail (see text) of taxa of African Palm Swift *Cypsiurus parvus* (males alone). * indicates Malagasy taxa.

taxon	sample	mean wing	S.D.	mean tail	S.D.
<i>parvus</i>	14	129.4	3.61	93.3	4.41
<i>brachypterus</i>	10	124	3.41	92.2	3.03
<i>myochrous</i>	10	126.5	4.04	94.1	4.86
<i>laemostigma</i>	—	—	—	—	—
<i>hyphaenes</i>	1	131	—	88	—
<i>celer</i>	—	—	—	—	—
* <i>griveaudi</i>	5	127	2.92	81.4	1.52
* <i>gracilis</i>	27	120.9	3.20	78.0	4.13

TABLE 2
Means and standard deviations of length of wing and tail of African and Malagasy taxa of African Palm Swift *Cypsiurus parvus* from Table 1.

	<i>n</i>	wing	tail
African <i>Cypsiurus</i>	35	127.1 ± 4.26	93.1 ± 4.21
Malagasy <i>Cypsiurus</i>	32	121.8 ± 3.85	78.5 ± 4.02

shapes are fairly constant over the entire range) (Fig. 2). In contrast, Malagasy birds give short, insect-like, single buzzy notes at irregular intervals (Figs. 3–4), and occasionally a drawn-out, somewhat rising buzz, with no resemblance to mainland birds (the single recording of *griveaudi* was supplemented by MSLM listening to—circumstances prevented recordings—birds during a visit to the Comoros in October 2018 to confirm their likeness to *gracilis*).

In plumage and measurements, Malagasy birds have heavier dark markings on the throat and upper breast than found in either nominate *parvus* or *laemostigma* (which have the heaviest streaking of the mainland taxa: Brooke 1972; pers. obs.). These markings extend as vague dark scaling onto the pale grey belly, whereas in African taxa they do not and the belly is uniform mid-grey (Figs. 5–6; also Chantler & Kirwan 2018). The undertail-coverts are a shade darker than the grey belly, forming a slight contrast, vs. none in mainland taxa; and the tail extensions are distinctly shorter (Tables 1–2). The form *griveaudi* was distinguished from *gracilis* for having the white of the chin to breast extending slightly further rearwards, and the scaling on the belly slightly more broadly tipped white, but it is ‘not very strongly differentiated’ (Benson 1960). We confirm these minor distinctions and add that it is clearly longer winged than *gracilis* (but indistinguishable from African taxa in this character; see Tables 1–2, Fig. 5) and slightly longer tailed (Table 1).

Quantification of vocal differences—although somewhat superfluous in this extreme case—here involves, first, max. pace of notes (= elements) in a single calling bird, which reach 18–30 notes per second in African mainland birds but just 3–10 notes in Malagasy birds (mean 23.1 ± 4.0 vs. 7.1 ± 2.1, effect size 5.02, Tobias score 3); and, second, frequency range (or bandwidth) of calls (twittering vs. buzz), registering as <1,000 Hz at any single point in recordings of African mainland populations, but 3,000–6,000 Hz in the Malagasy region (mean 325 ± 96 vs. 4,875 ± 854, effect size –7.49, Tobias score 3). In addition, the heavier breast markings of Malagasy birds are here scored 1 (minor difference), the dark scaling on pale grey (vs. no scaling on mid-grey) belly scores at least a further 1 (a minor but arguably stronger difference; see Figs. 5–6), the slightly darker undertail-coverts receive no



Figure 5. Examples in NHMUK of six taxa treated as races of African Palm Swift *Cypsiurus parvus*, left to right: *gracilis* and *griveaudi* (Malagasy taxa), *hyphaenes*, *myochrous*, *brachypterus* and *parvus* African taxa). Note the stronger-marked throat and breast markings and paler, scaled bellies of the Malagasy taxa, but the longer wings of *griveaudi* than *gracilis* (Nigel J. Collar, © Natural History Museum, London)

score but the shorter tail extensions (Table 1; effect size -3.54) score 2 (medium difference). When the mean and standard deviation of five *griveaudi* tail extensions (data in Table 1) are assessed against those of 35 from the African mainland (data in Table 2) the effect size is -3.69 .

In total, Malagasy birds score ten when the threshold for species rank is seven, and given such a high level of character divergence we consider it appropriate to propose that *C. p. gracilis* and *C. p. griveaudi* are better reclassified as Madagascar Palm Swift *Cypsiurus g. gracilis* (Madagascar) and *C. g. griveaudi* (Comoro Islands, including Mayotte).

Discussion

Swift vocalisations appear to be simple and largely invariable, so any distinct difference between populations is likely to have considerable taxonomic implications (Gahr 2000, Pellegrino *et al.* 2017). In the case of African Palm Swift this difference is so striking that reference to the scoring system of Tobias *et al.* (2010) seems supererogatory. The fact, however, that Malagasy birds also show a relatively high degree of morphological difference lends strong support to their discrimination as a separate species. Brooke (1972), who observed that *gracilis* ‘lays a clutch of three eggs, not two as in African *parvus*’ (a potential further point of divergence that requires confirmation by wider sampling), considered it ‘best treated as a race of *parvus*’ but accepted that it could be accorded species status because birds ‘differ from nominate *parvus* far more than any African race does’. This



Figure 6. Type of *Cypsiurus parvis laemostigma* (ZMB 49.338; above) compared to an example of *C. p. gracilis* (ZMB 36.546); note the plain grey breast and belly of the former (Nigel J. Collar)

possible alternative treatment was again considered by Brooke (1978), who mentioned that *gracilis* 'is clearly derived from the same stock as continental African birds and has nothing which suggests a closer relationship with *C. balasiensis*' (Asian Palm Swift—see below). It was repeated without comment by Chantler (1999) and Chantler & Driessens (2000), and consequently also by del Hoyo & Collar (2014) who, however, declared that 'NHMUK material suggests that morphological differences from African taxa are overstated in HBW [i.e. Chantler 1999] and based on average (rather than absolute) values'. This conclusion is now reversed on the basis of a closer examination of that material.

That the difference in voice between the two groups has not been noted before appears likely to reflect several factors. First, the study of birds of the two regions, African and Malagasy, has largely fallen to different groups of ornithologists whose familiarity has tended to remain with one or other but not both avifaunas. Second, vocalisations of swifts are rather poorly studied, as reflected in this case by the limited number of recordings available for a common, widespread species. Third, the calls certainly fall into the same class of high-pitched staccato sounds that only emerge as strikingly distinct once attention is concentrated on them. Nevertheless, the difference is well conveyed in the descriptions in the respective parts of *Birds of Africa*, with African mainland birds giving 'quiet, high-pitched sibilant chittering or twittering' (Fry 1988) and Malagasy birds uttering 'short vowel-less scratchy medium-pitched notes *tchh tchh tchh* repeated 1–10 times' (Safford 2013).

Brooke (1972) made the case, universally followed since, for regarding Asian Palm Swift *C. balasiensis* as a separate species from African, noting that adults lack the latter's streaked throat and elongated, emarginated extensions, and that juveniles lack a distinctive (lightly scaled) plumage. His measurements also showed that Asian is a markedly smaller bird even than the Malagasy taxa. To this we can add that the short call of Asian Palm Swift is a twittering quite different from African in having chatters of several fast notes consistently terminating in a longer emphasised note, *pi-ti-titrtrtr-TEEE* (Chantler & Boesman 2018; Fig.

4), thus typically ascending and increasing, whereas in African Palm Swift it is exactly the opposite; and obviously there is even less similarity with Malagasy birds.

Madagascar Palm Swift appears to be common across most of its range, except the far arid south (R. J. Safford *in litt.* 2019), frequently associated with cultivated coconut palms and almost invariably in areas of secondary vegetation in which palm trees are present (Benson 1960, Louette 1988, Safford 2013). Its conservation status on both Madagascar and the Comoros therefore appears secure.

Acknowledgements

We thank the many field workers who have made their recordings publicly available for study (Appendix 1), and the staff of AMNH (Paul Sweet, Tom Trombone), MNHN (Patrick Boussès, Jérôme Fuchs), NHMUK (Mark Adams, Hein van Grouw) and ZMB (Sylke Frahnert, Pascal Eckhoff) for access to specimen material and literature consulted in this research. MSLM's visits to Madagascar and the Comoro Islands were enabled by Birding Africa (www.birdingafrica.com). Bob Dowsett, Roger Safford and an anonymous reviewer were most helpful referees.

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Appendix 1: list of recordings accessed

All recordings were listened to as a means to check taxon-specific features, and a subset of these (of sufficient quality) was used to measure basic sound parameters. XC: Xeno-canto, ML: Macaulay Library, AV: Avian Vocalization Center.

C. p. parvus ($n = 4$ recordings): XC356729 and XC421450, Senegal, B. Piot; XC425455, Gambia, P. Boesman; XC115456, Burkina Faso, G. Boano; *C. p. brachypterus* ($n = 8$): Huguet II/88a, Ivory Coast, C. Chappuis; ML95202, Príncipe, L. Macaulay; XC132985, São Tomé, T. Mark; XC348468–470, Príncipe, P. Verbelen; XC98889, Cameroon, M. Nelson; XC417114, Uganda, M. Wadstein; *C. p. myochrous* ($n = 14$): ML137444–445, Tanzania, L. Macaulay; XC138031, Uganda, B. Piot; XC201373, Tanzania, T. Chansac; XC280231, South Africa, P. Boesman; XC37703, Malawi, B. Piot; XC396390, Kenya, J. Bradley; XC365294 and XC366448, Malawi, F. Lambert; XC429538–540, Tanzania, F. Lambert; XC92213, Zambia, R. Nefdt; *C. p. hyphaenes* ($n = 4$): XC153527, Namibia, R. de By; XC346765, Namibia, P. Boesman; AV11924 and AV12341, Botswana, P. Rasmussen; *C. p. celer* ($n = 2$): XC280232, South Africa, P. Boesman; XC335425, South Africa, L. Rudman; *C. p. griveaudi* ($n = 1$): Huguet II/88b, Comores, M. Herremans; *C. p. gracilis* ($n = 6$): unpublished, Madagascar, M. Mills; XC125055–058 and XC128340, Madagascar, A. Lastukhin; XC162876, Madagascar, M. Nelson.