Taxonomic rearrangements in the *Pampa curvipennis* complex

Description of the problem:

The *Pampa curvipennis* complex comprises three allotaxa found in eastern Mexico, Belize, and Guatemala. From north to south; *Pampa c. curvipennis* (Deppe, 1830) is found in the eastern cloud forests and adjacent foothills of the Sierra Madre Oriental from Tamaulipas to northern Oaxaca and southern Veracruz, *Pampa excellens* Wetmore, 1941 replaces *curvipennis* to the south in the Sierra de los Tuxtlas and the highlands of western Chiapas, and *Pampa c. pampa* (Lesson, 1832) is a lowland taxon widespread in the Yucatán Peninsula as far west as eastern Chiapas and Tabasco (Arizmendi et al. 2021).

The three were long considered subspecies (e.g. Cory 1918, Peters 1955, Ridgway 1911, Wetmore 1941) until Lowery and Dalquest (1951) showed skeletal differences between *excellens* and *curvipennis*, namely a decidedly larger skull in the former. This comparison, however, was based on a single specimen. Ridgway (1911) listed a single specimen from Apazote, Campeche (well within the distribution of *pampa*) as being intermediate between *pampa* and *curvipennis*, but nearer the latter. Based on this information, AOU (1983) split *excellens* with the following comment: "The morphologically distinct form from the Yucatan Peninsula and northern Central America has been treated as a separate species, *C. pampa* (Lesson, 1832) [WEDGE-TAILED SABREWING], although intergradation with *c. curvipennis* [CURVE-WINGED SABREWING] in Campeche has been reported. *C. curvipennis* and *C. excellens* are treated as conspecific by many authors; they constitute a superspecies. Further study of this complex is needed." This is the current treatment of the complex.

New information:

A more recent series of papers have addressed genetics, morphometrics, and song of the three taxa in the group (González and Ornelas 2005, González et al. 2011, González and Ornelas 2014, Cruz-Yepez et al. 2020). In particular, González et al. (2011) used two mitochondrial and ten microsatellite markers from 160 individuals of all taxa and showed that the primary genetic break in the group is between *pampa* and *curvipennis/excellens*. Notably, some analyses placed *excellens* as barely differentiated or embedded within *curvipennis*. Migration rates based on microsatellite data showed minimal ongoing gene flow between taxa, although somewhat higher between *excellens* and *curvipennis*. Using mitochondrial molecular clock rates of 2% and 5% per million years, the divergence of *pampa* dated to 1.47 Mya or 0.52 Mya, while the divergence of *excellens* and *curvipennis* dated to 614,000 or 202,000 years. Figures embedded below.

Morphometric data from wing chord, bill length, and tail length showed the relatively larger size of *excellens* in comparison to the other two taxa, but also found a relatively shorter bill length in male *pampa* in comparison to both *excellens* and *curvipennis* (González et al. 2011). Using a Jaccard similarity dendrogram, González et al. (2011) found that songs clustered by taxon, but also that there were differences between populations within *curvipennis*. This intra-subspecific song structure (within *curvipennis*) was investigated by González and Ornelas (2005, 2014), who attributed their findings to a combination of geographic isolation and vocal learning.

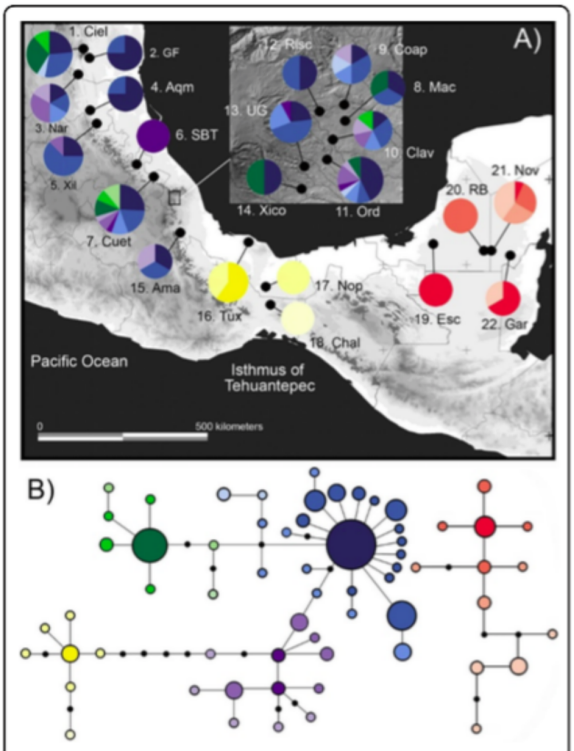

Figure 2 Sampling localities, geographic distribution, and genealogical relationships of mtDNA haplotypes. A. Pie charts indicate the frequency of occurrence of haplotypes in each population, and colors correspond to those shown in the haplotype network below. The current natural range of cloud forest (indicated by dark gray shading) is overlaid on a relief map of eastern Mexico. **B**. Statistical parsimony haplotype network derived from a combined matrix of mitochondrial genes (ATPase 6-8 and control region). Each circle represents a haplotype and its size is proportional to its frequency. Lines represent a single mutational change and black circles correspond to unsampled haplotypes.

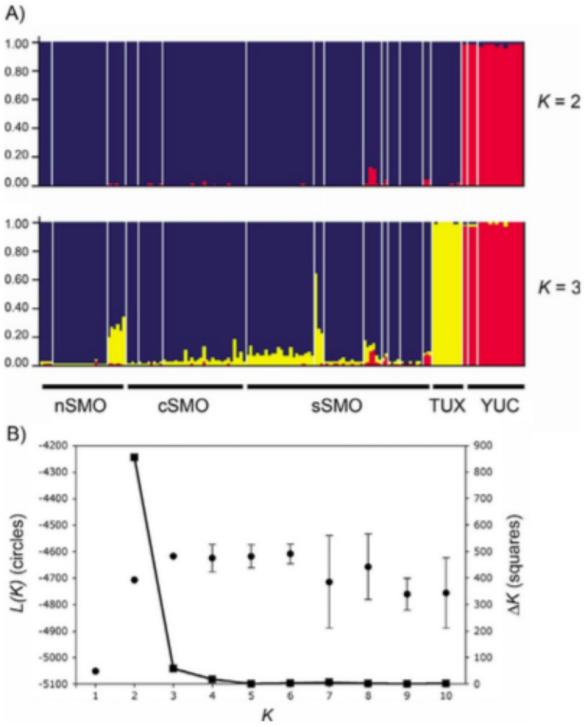

Figure 3 Spatial genetic structure determined by a Bayesian assignment analysis using STRUCTURE. A. Posterior assignment probabilities of 160 individuals of *Campylopterus curvipennis* to an optimal number of $K = 2$ and $K = 3$. Each individual is represented by a vertical line that is partitioned into K colored sections, with the length of each section proportional to the estimated membership coefficient. **B**. Mean log probability of the data ($L(K) \pm SD$) over 10 runs for each K value (left Y axis) and values of ΔK calculated according to Evanno *et al.* [90] (right Y axis).

Table 4 Estimates of M (mutational corrected migration) from the MIGRATE analysis of microsatellites among genetic groups

	SMO	TUX	YUC
SMO	-	1.48 (0.58 - 4.22)	0.58 (-0.1 - 1.56)
TUX	1.98 (0.54 - 3.81)	-	0.49 (-0.68 - 3.39)
YUC	0.91 (0.03 - 2.29)	0.63 (-0.25 - 1.58)	-

Donor populations are in the first column. Estimates given are followed by 95% confidence intervals and none of the comparisons was significantly greater than 1.

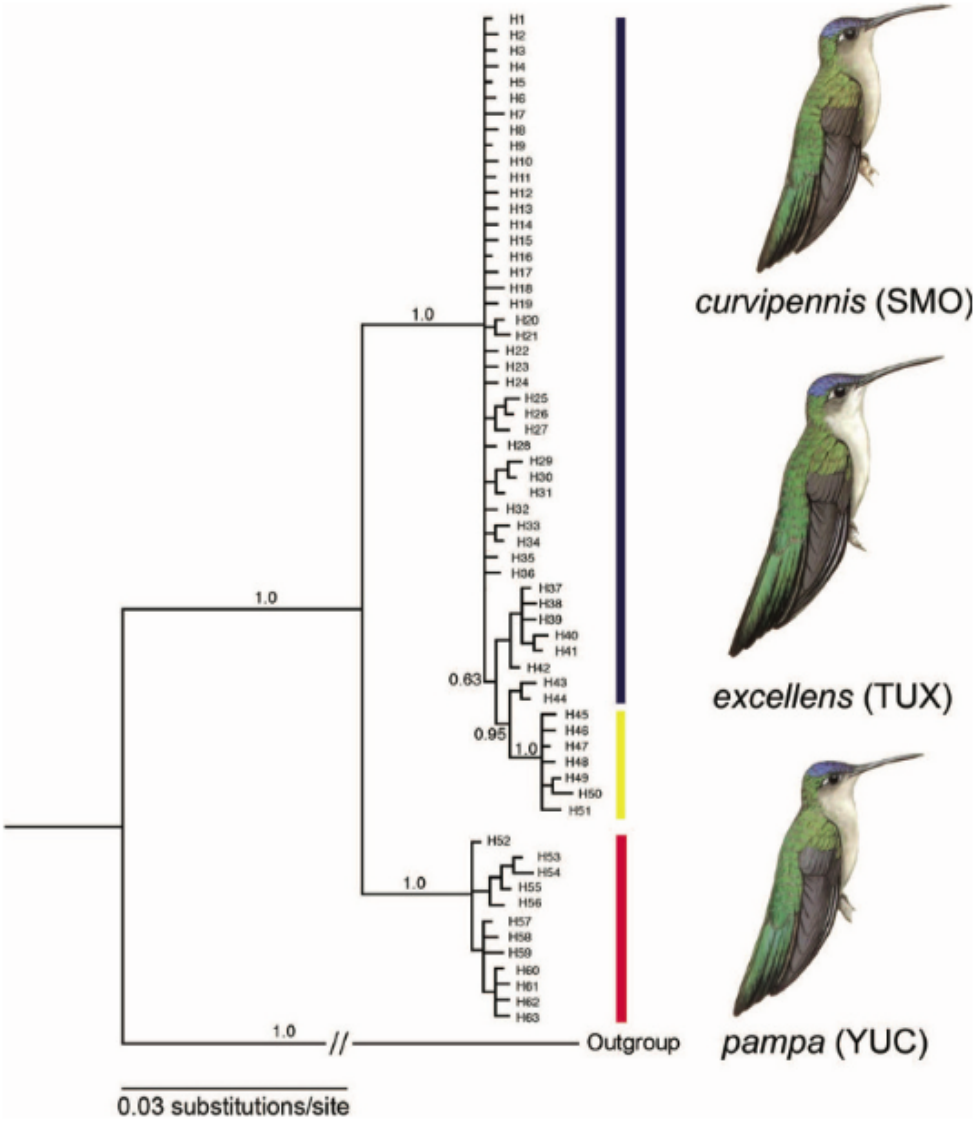

Figure 1 Phylogenetic relationships among mtDNA haplotypes based on Bayesian inference. Values above branches denote posterior probabilities, and numbers at the tip of the branches indicate distinct haplotypes. Outgroups were *Campylopterus rufus*, *C. hemileucurus*, and *C. largipennis*, and are shown collapsed into a single branch. Hummingbird illustrations were taken from color plates in the *Handbook of the Birds of the World* [32].

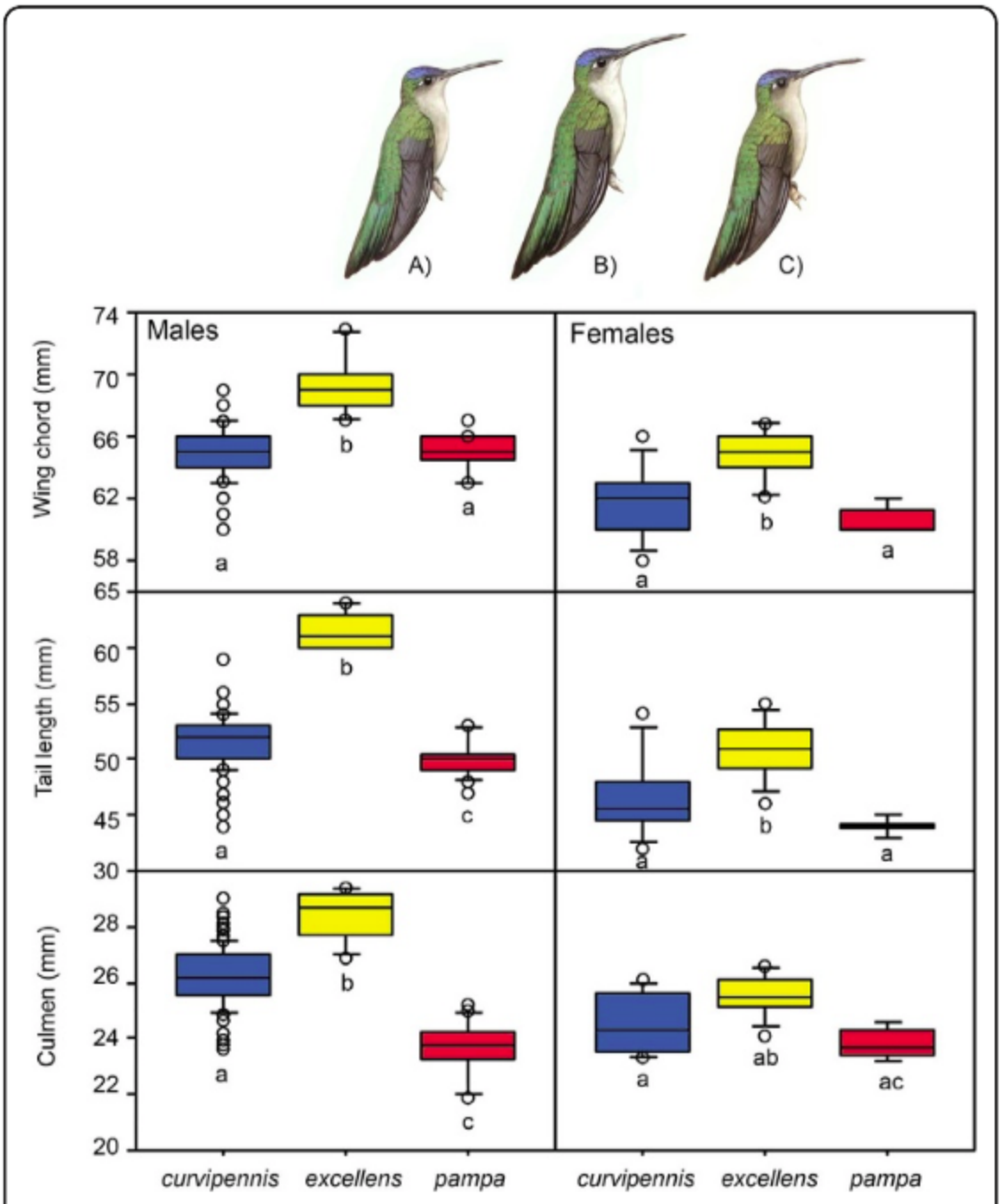

Figure 4 Morphological traits taken for males and females of *C. curvipennis* lineages. Boxplots show the 10th, 25th, 50th (median), 75th, and 90th percentiles. Values above the 90th and below the 10th percentile are plotted as open circles. Illustrations correspond to *C. c. curvipennis* (**A**), *C. c. excellens* (**B**) and *C. c. pampa* (**C**) taken from the *Handbook of the Birds of the World* [32].

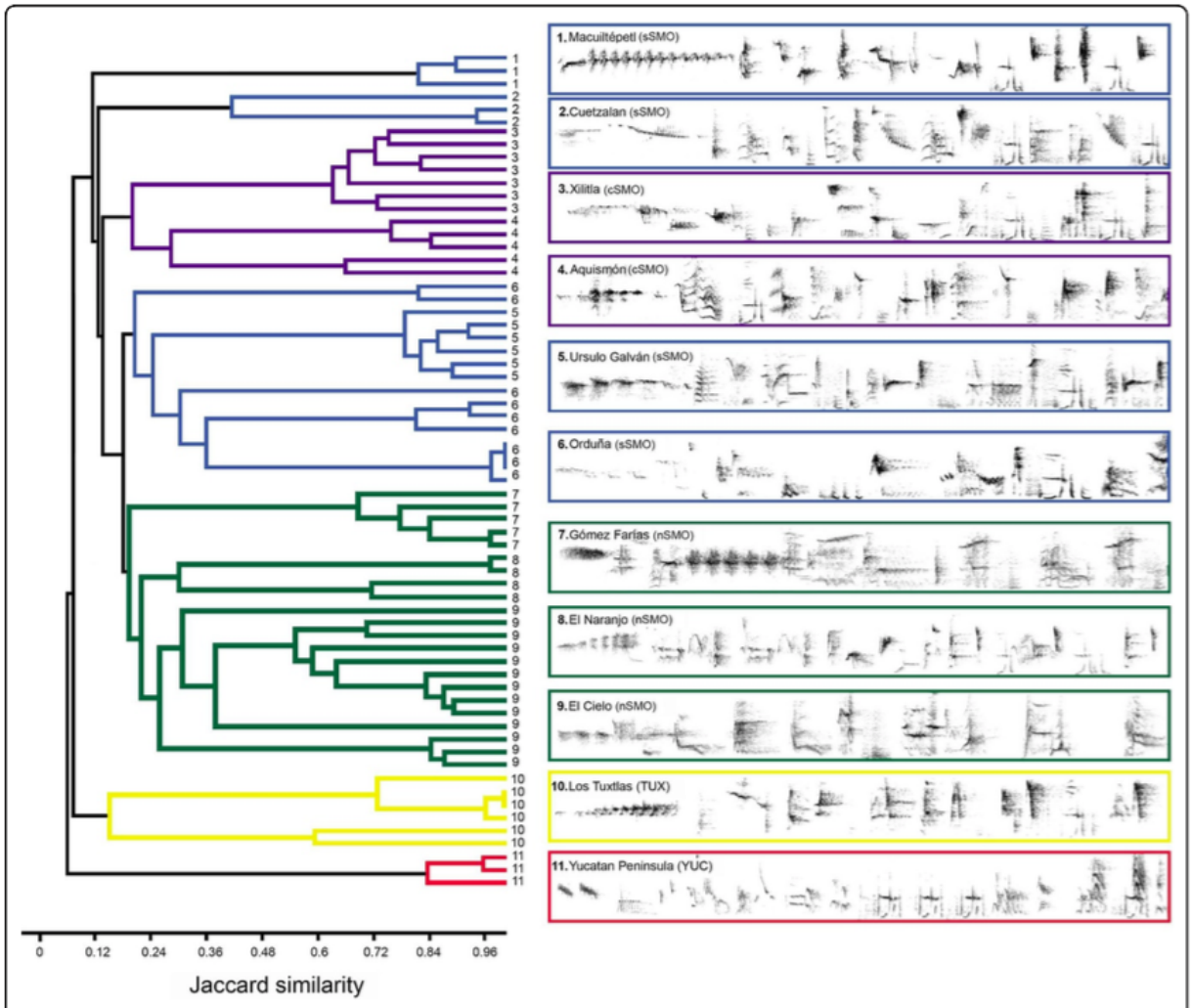

Figure 5 Dendrogram generated by cluster analysis of a presence/absence matrix of syllable types from recordings of individuals. Colored lines correspond to individuals recorded at different geographic locations: green, purple and blue correspond to sites located in the northern, central and southern parts of the Sierra Madre Oriental respectively (nSMO, cSMO, and sSMO) for the *C. c. curvipennis* lineage, yellow corresponds to the Tuxtlas region for the *C. c. excellens* lineage and red corresponds to the Yucatan Peninsula for the *C. c. pampa* lineage. Attached to the dendrogram fragments of vocalizations (4 sec) representing each sampled site are shown.

Song playback experiments focused on *P. c. curvipennis*, with no song playback experiments conducted on the other two taxa (Cruz-Yepez et al. 2020). However, those experiments showed that *curvipennis* responds equally to songs of *curvipennis* and *excellens*, but with lower response to songs of *pampa*, suggesting some degree of pre-mating isolation between *curvipennis* and *pampa*. However, the lower response to *pampa* is not very drastic, and confidence intervals overlap considerably. See figure from Cruz-Yepez et al. (2020) below.

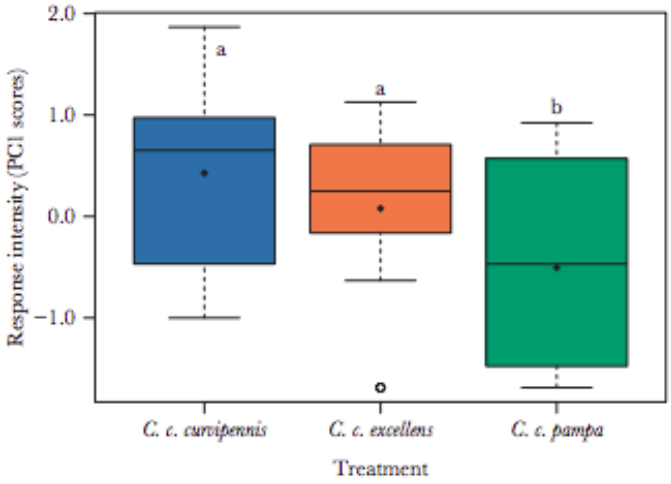

Figure 2
Response intensity (represented by PC1 scores) of *Campylopterus c. curvipennis* individuals exposed to songs of *C. c. curvipennis*, *C. c. excellens*, and *C. c. pampa*. Thick lines represent the median, and diamonds the mean. Letters indicate significant differences among treatments, result of Tukey post hoc tests.

Photos of males from the LSU collections are below. In each photo, the specimens left-to-right represent the taxa in a north-to-south order: 2 *curvipennis*, 2 *excellens* from the Chiapas highlands, 2 *excellens* from Sierra de los Tuxtlas, and 2 *pampa*. Note the browner under parts and paler upper parts of *curvipennis*, the large size and pale whitish under parts of *excellens,* and the small size and darker gray under parts of *pampa*. Of note is the two *excellens* from the Chiapas highlands, which were identified as *curvipennis* by Charles Ely, but this population is typically considered to be *excellens*. These two specimens are similar in size to *excellens* from the Tuxtlas and roughly the same color below, but have a bit more brownish wash on the flanks.


LA. STATE UNIV. 20560 MUSEUM OF ZOOLOGY
BR. Honduras: Orange Walk Dist., Gallon Jug
29 March 1955 Stephen M. Russell
LA. STATE UNIV. 21002 MUSEUM OF ZOOLOGY
BR. HONDURAS: Toledo Dist., 2 mi. W San Pedro
on Columbia River
13 MAY 1956 STEPHEN M. RUSSELL
LA. STATE UNIV. 28763 MUSEUM OF ZOOLOGY
Mexico: 4 m. ENE Tapalapax, Ver.
1 Sept. 1962 Robt. F. Andrle
LA. STATE UNIV. 28762 MUSEUM OF ZOOLOGY
Mexico: Volcán San Martín Tuxtla, Ver.
3400' a.s.l.
25 August 1962 Robt. F. Andrle
Testes 7x4 mm. Skull compl. ossified. No fat.
8.8 g. netted, moist evergreen forest.
Campylopterus curvipennis curvipennis
LSUMZ 168030
COLLECTION OF CHARLES A. ELY
MEXICO. Chiapas, Ocozocoautla, 26 Km N. (by road)
SEX— ♂
21 December 1970 COLLECTOR—CHARLES A. ELY
LA. STATE UNIV. 11066 MUSEUM OF ZOOLOGY
MEXICO: San Luis Potosí: XILITLA
SEX ♂
DATE February 10, 1947 MARCELLA NEWMAN
LA. STATE UNIV. 11077 MUSEUM OF ZOOLOGY
MEXICO: San Luis Potosí: XILITLA ROAD
at junction with Pan-Am. Hwy.
SEX ♂
DATE December 23, 1946 MARCELLA NEWMAN
CAE 44460


March 1955 Stephen M. Russell
336
Mexico: Volcán San Martín Tuxtla
3400' a.s.l.
25 August 1962 Robt. F. And
LSUMZ 168029
Ocozocoautla 26 Km
Sex-- ♂
Collector - Charles A.
curvipennis
pterus curvipennis

The primary issue here seems to be whether to place greater importance on the differentiation in song, plumage, or genetic data, as the patterns between taxa in each trait are different. In particular, *excellens* is different in morphometrics but not genetics, while *pampa* is different in genetics but to a lesser degree in morphometrics. Gene flow between all taxa appears to be low, although greater than zero. This is clearly a borderline case. All the differences between these taxa are small, and they are very closely related.

Effect on AOS-CLC area:

Lumping *excellens* with *curvipennis* would result in one less species for the AOS area. Splitting *pampa* from *curvipennis* would result in one additional species for the AOS area.

Please vote on the following two proposals:

1) Lump *excellens* with *curvipennis*

2) Split *pampa* from *curvipennis*

Recommendation:

We tentatively recommend a YES on lumping *excellens* with *curvipennis*, based on the molecular data, and additional studies needed in the possible contact area in northern Chiapas (playback experiments and expanded genetic sampling), but note that this is the most distinct taxon in morphometrics.

We tentatively recommend a YES on splitting *pampa* from *curvipennis* based on genetic differences and lower response to *pampa* song by *curvipennis*, despite the lack of playback experiments on *pampa*.

If *pampa* is split from *curvipennis*, the name Wedge-tailed Sabrewing has been used in the past and could apply here. However, as this is a split of allotaxa with approximately equivalent range sizes and Wedge-tailed has been used for the combined *curvipennis* and *pampa*, we suggest the English name of Yucatan Sabrewing for *pampa*. The English name of Curve-winged Sabrewing has been used for *curvipennis*, although this name highlights a trait shared by all sabrewings. So, while not ideal, it does have previous association with this taxon.

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