

Morphological and vocal divergences suggest a rearrangement in the taxonomy of eastern populations of *Cnemotriccus fuscatus* (Aves, Tyrannidae)

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INTRODUCTION & AIM

- ***Cnemotriccus fuscatus***: a complex of seven morphologically homogeneous subspecies.
- Suboscine species (Suborder Tyranni).
- Eastern South American subspecies: *C. f. fuscatus* (Wied 1831) and *C. f. bimaculatus* (D'Orbigny and Lafresnaye 1837).
- **AIM**: a morphological and vocal analysis of the eastern subspecies to assess their taxonomic status.



Figure 1. (A) *Cnemotriccus f. fuscatus* (WA4145396) from Mongaguá, São Paulo; (B) *C. f. bimaculatus* (WA3203992) from Botucatu, São Paulo.

METHOD

- **Vocal recordings' databases:**



- 51 loudsong recordings of *C. f. fuscatus* and 53 of *C. f. bimaculatus*.

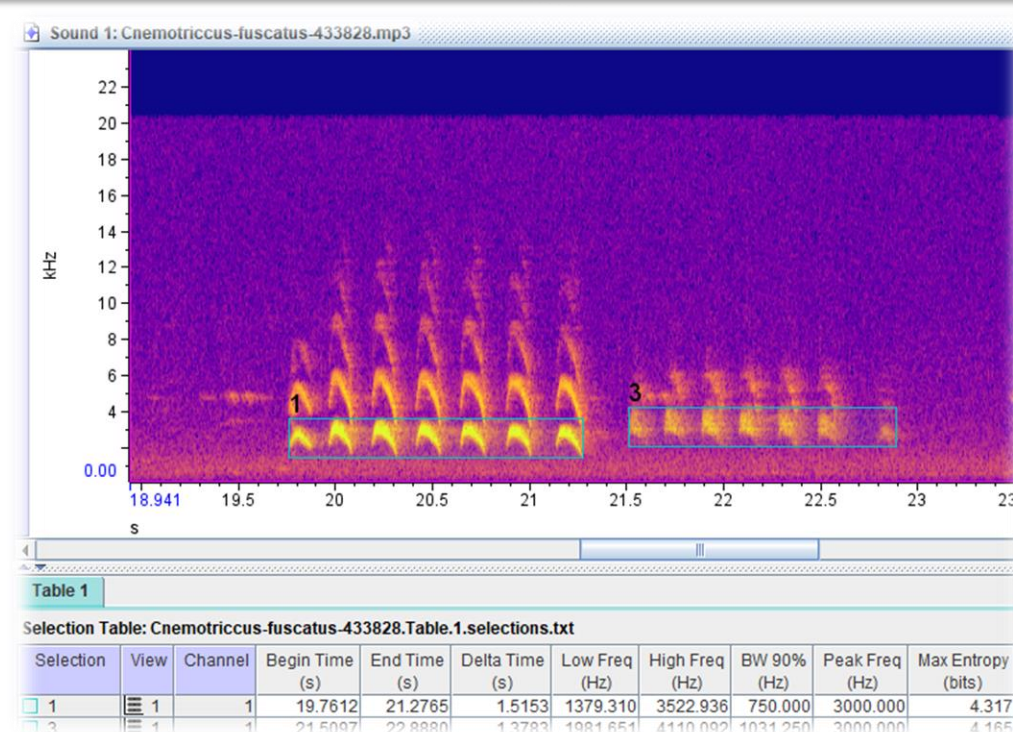


Figure 2. Loudsongs from two *C. f. bimaculatus* in Raven Pro.

- **Seven parameters**: loudsong duration, note number, frequency ranges, bandwidth 90%, and maximum entropy.

- **Specimens from:**



- 13 *C. f. fuscatus* and 23 *C. f. bimaculatus*.

- **Morphometrics measurements**: Wing chord, tail length, tarsus length, and bill dimensions.

- Measurements with digital caliper.

Figure 3. Munsell code catalogue and digital caliper.



- **Plumage coloration**: Specimens were color-coded using **Munsell code**.

- Recordings were analyzed using:

- Statistical analyses:

- Spearman correlation, Student's *t*-test and MANOVA.

- Conducted in:



RESULTS & DISCUSSION

- **Bioacoustic analysis**

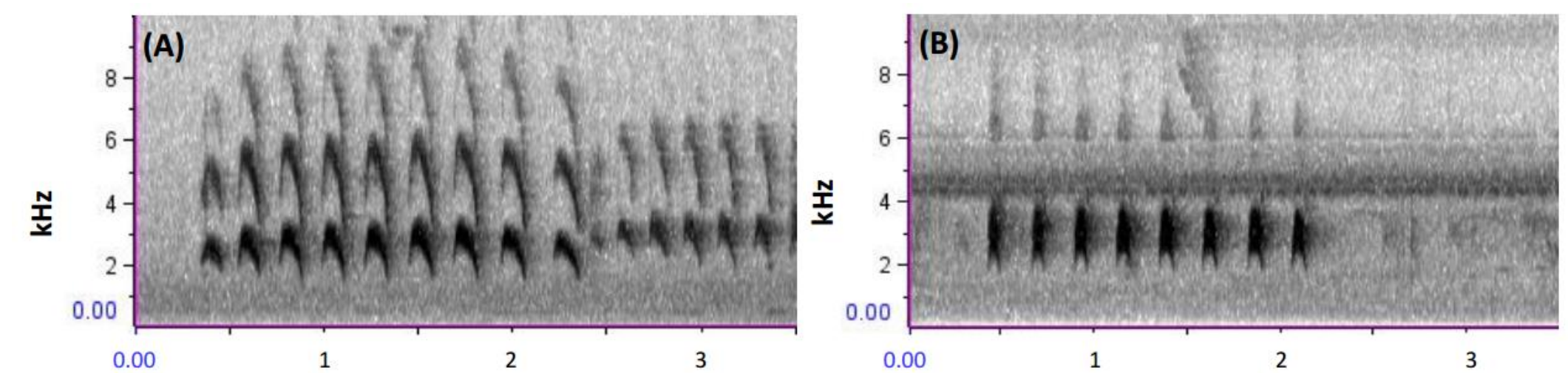


Figure 3. Spectrogram of *C. f. bimaculatus*' loudsong (A) and loudsong of *C. f. fuscatus*' loudsong (B).

- **MANOVA**: Bioacoustic divergence was highly significant ($F_{1,1} = 26.1$; $p < 0.001$).
- **Spearman correlation**: Three variables were correlated: duration, maximum frequency and maximum entropy ($\rho > 0.580$).
- **Student's *t*-test**: Significant differences for notes ($t = 2.8$; $p = 0.005$), pace ($t = 10.7$; $p < 0.001$) and bandwidth ($t = 3.3$; $p = 0.001$).
- ***C. f. fuscatus***: 6.8 ± 4.2 notes, pace of 3.8 ± 0.7 and bandwidth of 975.3 ± 162.4 .
- ***C. f. bimaculatus***: 9.6 ± 6.0 notes, 5.9 ± 1.1 and $1,149.5 \pm 339.6$, respectively.

- **Morphometrics and Morphology**

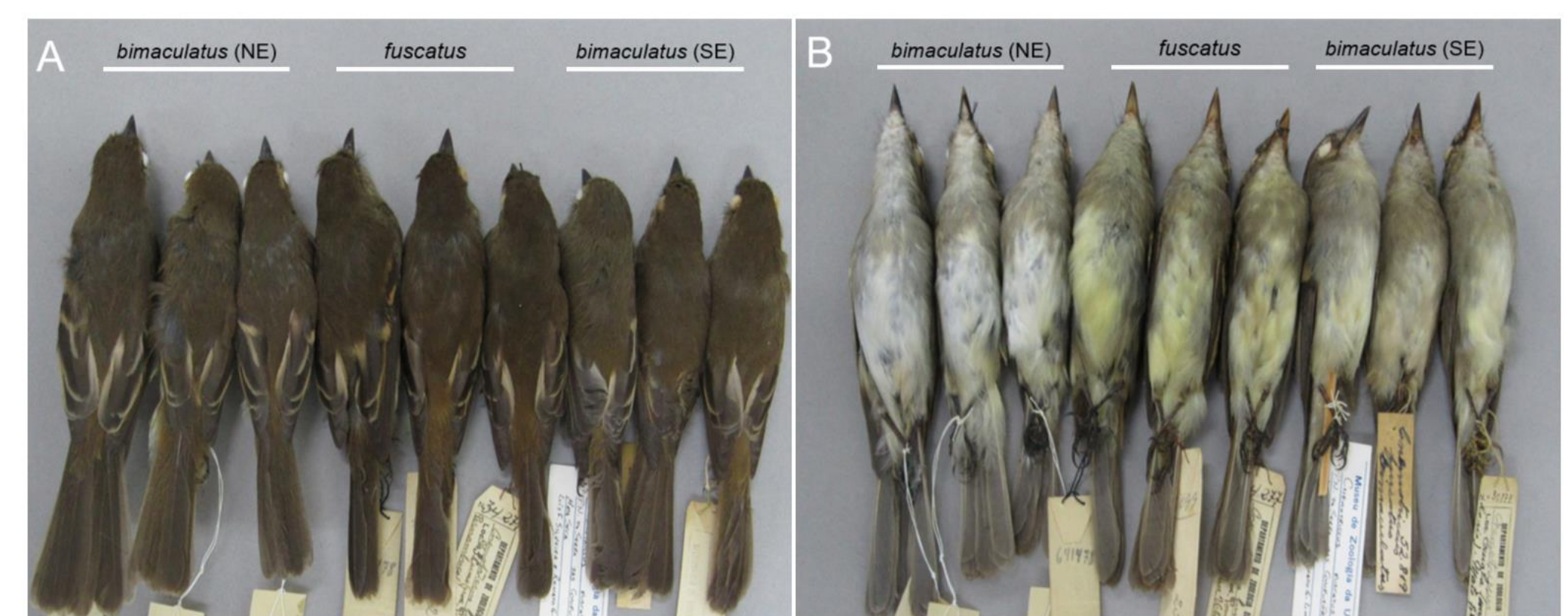


Figure 4. (A) Dorsal and (B) ventral views of *C. fuscatus*: *C. f. bimaculatus* (northeast), *C. f. fuscatus*, *C. f. bimaculatus* (southeast).

- No significant morphometric differences were found ($F_{1,1} = 0.7$; $p = 0.547$).
- Predominantly brownish plumage:
 - 10YR 3/4 for *C. f. bimaculatus*.
 - 2.5Y 3/3 for *C. f. fuscatus*.
- Yellowish-olive (5Y 8/6) belly for *C. f. fuscatus*.
- Buff (5Y 8/3) or whitish (8/N) underparts for *C. f. bimaculatus*.

CONCLUSION

Despite overlap in some variables, the vocal differences, alongside morphological analysis, strongly support elevating these taxa to full species.

FUTURE WORK / REFERENCES

- **Future work**:

- Analysis with Convolutional Neural Network to evaluate its use in taxonomic research.

- **References**:

