

# Phylogenomic data support a non-bifurcating speciation history within the *Paleosuchus palpebrosus* species complex (Alligatoridae: Caimaninae)

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**Abstract:** In our previous study we detected three Evolutionarily Significant Units and proposed that *P. palpebrosus* is a species complex. In the present study, we expanded our genomic sampling to 6,733 loci to delimit lineages, test monophyly and resolve phylogenetic relationships between lineages. Cluster analyzes were consistent in indicating four deeply divergent groups - “Amazon” (A), “Madeira” (M), “Bolivia” (B) and “Pantanal” (P). Species tree estimated with SNAPP (A,(M,(B,P))) was well supported and different from that estimated from the mitochondrial cytb gene (A,((M+B),P)). Supertree estimated in ASTRAL-III was consistent with the SNAPP results and confirmed the monophyly of A, P and B+P, although B and M were both not well supported as monophyletic. Additionally, the topology resulting from SNAPP was analyzed in G-PhoCS, which estimated three unidirectional migration bands: ancMBP→A, A→M and M→B. Delimitation of species using the Bayes Factor Delimitation method in SNAPP indicated the existence of four species, since models containing four species were more likely than models with three or less species. Although our results are robust in terms of the number of species in the complex, phylogenetic relationships among them are less certain. The non-monophyly of M and B in ASTRAL-III, the apparent inconsistency with the mitochondrial topology and the need to include gene-flow/hybridization to explain lineage divergence of this group indicates a more complex speciation history than explained by simple branching process. It is possible that the mtDNA phylogeny reflects the true sequence of divergences, and that subsequent introgressions made it difficult for analytical methods that account only for Incomplete Lineage Sorting to estimate the correct phylogenetic relationships. Although they appear inconsistent, the phylogenetic signs of the mitochondrial and nuclear markers are actually complementary and help us to delimit a small number of alternative hypotheses of diversification with reticulation and/or hybridization that can be explicitly tested.

**Keywords:** Dwarf caiman, Species complex, Species tree, Forensic genetics

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