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Phylogeny of *Epidrepanus* dung beetles inferred from morphological and biogeographical data (Coleoptera: Scarabaeidae, Oniticellini, Drepanocerina)

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Various drepanocerine specimens were collected during recent field surveys (2014-16) in Malawi and Kenya. These individuals are distinct from any known species, and should likely be ascribed to the Afrotropical genus *Epidrepanus* Roggero et al., 2015, which currently includes only 3 species: *Epidrepanus caelatus* (Gerstaecker, 1871), *E. pulvinarius* (Balthasar, 1963) and *E. schimperi* (Janssens, 1953). The morphological patterns of *Epidrepanus* and the other Drepanocerina genera were compared. The Drepanocerina phylogenetic relationships were lately assessed relying on qualitative morphological characters, such as the genitalia, generally crucial for taxonomic identification and phylogenetic interpretation of dung beetles, and thus widely employed in the Scarabaeidae systematics. Some morphological traits (i.e., the hindwing and epipharynx) were highlighted as particularly promising, and were studied here by applying mixed methods. The overall morphological variation was expressed by the landmarks configurations for both hindwing and epipharynx, and the patterns of shape variation were analyzed using both geometric morphometric methods and phylogenetic approaches. The PCA (Principal Component Analysis) plots and MST (Minimum Spanning Tree) clusters were employed to represent the overall shape variation within the Drepanocerina genera, and the PLS (Partial Least Squares) Analysis was used to account for the shape covariation between the hindwing and epipharynx. The combined phylogenetic analysis was then employed to analyze a matrix of both discrete and continuous characters as implemented in TNT (Tree New Technology) software. The outgroup method was chosen to root the trees, by employing the genus *Anoplodrepanus* Simonis, 1981. Relative nodal support values were determined as implemented in TNT using bootstrap, jackknife and symmetrical resampling with 1,000 iterations. The morphological patterns of hindwing and epipharynx discriminate among the studied Drepanocerina. The phylogenetic analysis confirmed that *Epidrepanus* constitutes a homogeneous monophyletic group, inward characterized by several distinct lineages. The *Epidrepanus* georeferenced distribution data were integrated with the phylogenetic results and processed by DIVA (Dispersal-Vicariance Analysis), as implemented in RASP (Reconstruct Ancestral State in Phylogenies). The mechanisms of speciation were highlighted by VIP (Vicariance Inference Program). The results of the biogeographical analysis confirmed that *Epidrepanus* ancestral range can be located into the Central Eastern African Region, and both dispersion ($N_d = 8$) and vicariance ($N_v = 1$) events would lead to the current distribution.

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