Species relationships in the genus Eumerus (Diptera: Syrphidae) based on morphological evidence

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Abstract

Within the family Syrphidae, quantitative phylogenetic methods have been used on both morphological and molecular data (Rotheray and Gilbert, 1999; Cheng et al, 2000; Ståhls et al, 2003; Hippa and Ståhls, 2005; Doczkal and Pape, 2009; Mengual et al, 2015), but most researchers have used non-numerical qualitative methods to assess morphological data. Here we present the first numerical analysis of systematic relationships of the genus *Eumerus* from Southeast Europe using a comprehensive morphological character matrix. We scored 189 adult morphological characters for 44 species recorded in South Europe.

Principal component analysis (PCA) identified 49 PC axes, of which 24 axes were selected based on the percentage of variability. The following morphological characters stood out as the most significant for *Eumerus* delimitation: (1) the arrangement of pilosity on the katepisternum, (2) uniformity of ventral pilosity on hind femur in male, (3) the arrangement of dusting on the katepisternum, (4) the shape of hamus, (5) the distance between the posterior ocellus and the eye margin in female, (6) furrowing of the female basoflagellomere and (7) the shape of cercus. Moreover, the species position in the space defined by morphological characters is depicted using PCA scatterplots. Finally, with cluster analysis based on Euclidean distances we provided (NJ) phenogram in order to test the efficiency of a set of morphological characters for systematics within the genus. The phenogram recognized the major three clusters: (1) outgroup (genera Merodon, Platynochetus and Megatrigon) clustered together with *tricolor* group species, (2) *ornatus* group and (3) all other species clustered together.

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