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The world's biogeographical regions revisited: global patterns of endemism in Tipulidae (Diptera)

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Abstract

This paper explores the distributional data of 4,224 Tipulidae (Insecta: Diptera) species to search for endemism patterns in a worldwide scale and to test the extent to which the global patterns of endemism of the group fit into previously proposed regionalization schemes, particularly Wallace's system and recent revisions of it. Large scale areas of endemism are assessed using the grid-based method implemented in VNDM. VNDM depends on the prior definition of the grid size for analysis, but a criterion for choosing beforehand a particular grid size is not clear. The same holds for the choice of the level of similarity in species composition selected for the calculation of consensus areas. In our study, we developed a methodological approach that helped defining objective criteria for choosing suitable values for these critical variables. Large-scale areas of endemism around the globe are identified and ranked according to endemicity levels: 1—West Palaearctic, 2—Nearctic, 3—East Palaearctic-Oriental, 4—West North America, 5—Australia, 6—Neotropical, 7—Sub-Saharan Africa, 8—Palaearctic, and 9—Middle East. Our main conclusion is that there are still some limitations in applying biogeographical classifications proposed mostly on the basis of vertebrate distribution to other taxonomic groups, such as the Tipulidae. While there is a general congruence of the broad-scale areas of endemism of tipulids with previously proposed regionalization schemes, for some areas, the sharpness of boundaries between traditional regions is not so acute, due to a great level of overlap of part of its biotic elements.

Key words: Areas of endemism, biogeography, VNDM, Tipulidae

Introduction

"*An important problem in Natural History, and one that has hitherto been too little agitated, is that of ascertaining the most natural primary divisions of the earth's surface, taking the amount of similarity or dissimilarity of organized life solely as our guide.*" Philip L. Sclater (1858, p. 130).

More than 150 years had passed since Sclater's early statement. Nowadays, there are numerous studies dealing with biogeographical regionalization, based on zoological and botanical evidences. Even before Sclater's attempt, authors such as Buffon and de Candolle proposed worldwide systems of biogeographical regions (Nelson 1978), but it was only with Wallace's (1876) work that a stable scheme of names for the regions was established and accepted by biogeographers ever since.

The regions recognized by Wallace were Neotropical (South America and Central America as far north as central Mexico), Ethiopian (Africa south of the Tropic of Cancer), Australian (including New Zealand, New Guinea and adjacent islands), Oriental (tropical Asia), Palaearctic (temperate Eurasia), and Nearctic (North America south to central Mexico). He also divided each of the six global regions into four distinct subregions.

In the last two decades, Wallace's scheme has been refined including analytical approaches such as cladistic

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