Abiotic drivers of bat community diversity in a savanna mosaic across the tropical/subtropical transition of South America

Robert D. Owen, Gloria González de Weston, Maria E. Torres, M. Belén Barreto Cáceres

Abstract

Paraguay lies in an area of transition between the tropics and subtropics, and encompasses the interface of six South American ecoregions. Because of its central location within the climatic and biotic schema of the South American continent, Paraguay is ideal for exploring a variety of biogeographic and ecological questions. Several studies have evaluated the taxonomic, biogeographic and migratory status of the 59 species of bats currently recognized in Paraguay, and other studies have evaluated aspects of population genetics and community ecology of frugivorous bats in eastern Paraguayan forests. However, no study has evaluated the environmental factors influencing bat community structure within the mosaic of savanna ecoregions which extend over a majority of the Paraguayan territory. Based on conservative selection criteria, six bat communities from the Cerrado, Humid Chaco and Dry Chaco were evaluated in this study. Climatic data included a suite of temperature and precipitation parameters for each site. Latitude and longitude were also included as factors potentially predicting bat community parameters. Gini-Simpson diversity indices were calculated for each site, separately for species diversity, taxonomic diversity and trophic diversity. Environmental variables were evaluated for their associations with each of the three diversity indices. Significant differences were found among the six sites based on each of the three diversity indices. In general, precipitation variables are more influential than temperature variables in determining bat community diversity levels in Paraguayan savanna ecosystems. Species diversity can best be predicted with a linear combination of mean annual precipitation and mean precipitation of the driest month. Taxonomic diversity is best predicted using mean annual precipitation alone. In contrast, best prediction of trophic diversity is with mean precipitation of driest month. Species and taxonomic diversity patterns were generally concordant for the Cerrado and Humid Chaco communities, whereas trophic diversity was inconsistent among the Humid Chaco communities. An analysis of variance combining the three diversity indices, showed three non-significantly different groups of communities: (1) the two Dry Chaco communities; (2) a Dry Chaco and a Humid Chaco community; and (3) the Cerrado and three Humid Chaco localities. These results should be considered in bat conservation management strategies, which should incorporate benchmarks not only of species diversity, but also of taxonomic and trophic diversity.