

Ricklefs, R. E. and I. J. Lovette. 1999. The roles of island area *per se* and habitat diversity in the species-area relationships of four Lesser Antillean faunal groups. *Journal of Animal Ecology*, 68, 1142-1160.

**Abstract:** 1. We analysed the relationships between species richness, island area, and habitat diversity for birds, bats, butterflies, and reptiles and amphibians on 19 islands in the Lesser Antilles. Habitat diversity was quantified by Simpson's index based on the total areas of five vegetation types on each island. Island area varied over two orders of magnitude (13-1510 km<sup>2</sup>) and habitat diversity varied between 1 and 3.7 equivalents of equally abundant habitat types. 2. Because the Lesser Antilles consist of an inner arc of high, volcanic islands and an outer arc of low-lying islands formed of uplifted marine sediments, correlations between area and elevation ( $r^2 = 0.32$ ) and between area and habitat diversity ( $r^2 = 0.40$ ) were weak. Habitat diversity was, however, strongly correlated with maximum island elevation ( $r^2 = 0.85$ ). 3. Simple correlations of species richness with island area were significant for all four faunal groups, and simple correlations of species richness with elevation and habitat were significant for all groups except bats. In multiple regressions of species richness on area and habitat diversity together, area was a significant effect for birds and bats, and habitat diversity was a significant effect for birds, butterflies, and reptiles and amphibians. 4. These results suggest that the four Lesser Antillean taxonomic groups differ in their responses to area and habitat diversity. For butterflies and for reptiles and amphibians, the relationship of species richness to area is probably a fortuitous consequence of a relationship between habitat diversity and area. Bird species richness responds independently to both habitat diversity and area, and bat species richness is influenced by area but not by habitat diversity. 5. We suggest that this variation is related to differences in several biological traits of the different faunal groups. Strong habitat-diversity effects are likely in taxa with high degrees of habitat specialization, populations large enough to have a low probability of stochastic extinction, life-cycles that include a resistant resting stage that reduces vulnerability to catastrophic extinction, or a combination of these traits. In contrast, strong area effects are likely in taxa with weak habitat specialization, low population density, or both. 6. At least in Lesser Antillean birds, it is unlikely that immigration depends on island size. Therefore, the species-area relationship for birds is probably generated by island-size-dependent extinction. Among the four taxonomic groups we studied, only butterflies are likely to show a 'rescue effect' stemming from frequent between-island movement of individuals, as only butterflies exhibited low levels of endemism and lacked a unique area effect for species richness. 7. Considered in concert, these taxon-specific differences demonstrate that both biological characteristics of organisms and geographical features of island groups mediate the relative contribution of island area and habitat diversity to variation in species richness.