
Island Life before Man

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Abstract

Island biodiversity is changing locally and globally, but at present we have insufficient knowledge of time-series data to assess the degree, nature and consequences of these changes. Nearly all our knowledge on insular biodiversity patterns is derived from studies of extant faunas, which are partly artefacts of ancient colonisations by humans and their commensals. The fossil record provides the necessary baseline to detect and evaluate change and test hypotheses. We tested three models of island biogeography theory: the island rule of body size evolution, the species-area relationship (SAR) and the species-isolation relationship (SIR). We assembled data on body mass and island characteristics, including time, for over 1800 populations of non-volant mammals (including 63 fossil endemic species and 56 introduced species) across 285 islands. We further compiled the number of mammalian species for 36 oceanic islands at colonisation, after speciation and after human arrival to assess the impact of speciation and humans on the native assemblages. The island rule is indeed a pervasive pattern in mammals, exhibited across a broad span of geographical regions, time periods and for introduced as well as native populations. Body size shifts are much more pronounced for populations with greater residence times on the islands. Body size of insular populations is negatively correlated with number of co-occurring mammalian species, confirming an ecological hypothesis of the island rule. We also found that biodiversity patterns for founder populations were consistent with both SAR and SIR, with biodiversity increasing with area and decreasing with isolation. However, resulting biodiversity, that is, after speciation took place, were anomalous, with steep log-log slopes of SAR, and no sign of SIR. Further, anthropogenic introductions have inflated species richness on many islands far above that predicted by SAR theories. We argue that models of island biogeography should include the effects of five processes: immigration, extinction, speciation, time and the impact of human activities.

Keywords: Pleistocene, mammals, fossil record, species, area relationship, island rule

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