

BIOGEOGRAPHY OF RECENT MARINE BIVALVE MOLLUSCS: IMPLICATIONS FOR THE GEOGRAPHY OF EXTINCTION

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The geographic distribution of taxa appears to affect their survivorship during both background and mass extinction. Direct paleontological evidence for this tendency is strong, but inevitably incomplete on a global scale due to extreme geographic variation in preservation and sampling. As a complementary approach to the relation between biogeography and extinction, we are modelling potential survivorship patterns using a global biogeographic database for Recent shallow (< 200 m) marine bivalve molluscs. To date, we have collected information on genera from 10 superfamilies: Arcacea, Limposacea, Mytilacea, Pinnacea, Pteriacea, Pectinacea, Carditacea, Cardiacea (including Tridacnacea), Tellinacea, and Veneracea. Although these superfamilies represent only one-fourth of all marine superfamilies, they include approximately 46 percent of the extant marine genera. We used species lists or monographs to disentangle many generic assignments, thus attaining uniformity of treatment at the generic level among 115 sites or regions. These faunas together represent all latitudinal zones, all oceans, and many oceanic islands and inland seas.

The expected latitudinal and inter-ocean diversity gradients are clearly seen in our data. Although high latitude faunas are consistently low in generic diversity, tropical bivalve faunas may have high, intermediate, or low generic diversities, mainly because of the relative impoverishment of Atlantic faunas and the low diversity of tropical island faunas relative to their continental shelf counterparts. Island faunas are dominated by cosmopolitans, underscoring the importance of dispersal in maintaining bivalve populations on oceanic islands.

We simulated extinction of bivalve faunas by "eliminating" genera restricted to particular latitudinal zones, oceans, continental shelves or oceanic islands. Because endemism at the generic level is low (despite today's high global thermal gradient and wide dispersal of continents), extinctions comparable to the K/T and P/Tr can be accomplished only through the annihilation of faunas in several latitudinal zones or oceans. Either today's fauna is more cosmopolitan than those of the past, or major mass extinctions required truly pervasive and profound environmental upheavals.