



The functional consequences of extinctions: from giant sharks to small mollusks

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The end of the Pliocene marked the beginning of a period of great climatic variability and sea-level oscillations. Although it has been proposed that these environmental changes triggered the extinction of benthic communities in the Caribbean, large marine vertebrates are usually assumed to have remained globally resistant. We overturn this assumption by reporting a previously unrecognized extinction event in the Pliocene, in which 36% of the marine megafauna genera were lost. We used a functional diversity approach to evaluate the potential impacts of this extinction for ecosystem functioning, and found that seven out of 49 (14%) functional groups (unique trait combinations) disappeared, along with 17% of functional richness (volume of the functional space). This contrasts with previous studies that have reported negligible functional changes after the extinction of marine invertebrates. We further compared the functional diversity loss after the newly reported marine megafauna extinction and the well-known Caribbean mollusks extinction. We found that small, speciose mollusks are functionally redundant (large number of taxa filling functional groups), and consequently resilient, whereas large megafaunal taxa are functionally unique and their communities highly vulnerable. Our results suggest that functional redundancy is a key determinant of the consequences of extinctions for marine ecosystems.