

Contributions of rare and common species to the functional diversity of basalt-hosted tubeworm bush communities from the Juan de Fuca Ridge

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The majority of species in a community are rare. Yet rare species, with small populations and restricted niches, are likely more vulnerable to extinction than common species. The effects of these species losses on community diversity, dynamics, and function are poorly characterized. A functional trait approach enables us to compare communities using species-level traits such as body size, mobility, and trophic level. In species-rich systems, such as tropical rainforests and coral reefs, rare species contribute more to functional diversity than common species, despite low abundances. Rare species in speciose ecosystems also offer redundant traits (traits shared among co-occurring species), which may insure community function against future environmental change. Using a globally unique dataset from NE Pacific Juan de Fuca Ridge vents, we assess the contributions to functional diversity by species with differing maximum relative abundances, occupancy, and geographic extents. We find that both rare and common species contribute functional uniqueness. In addition, functional redundancy in Juan de Fuca Ridge tubeworm bush communities is low. It is therefore both the rarest and most common species that support unique functions in these vent communities and, as these functions are not supported by multiple, co-occurring species (redundancy is low), they are poorly insured. Thus, we conclude that even the loss of a small number of species will have strong impacts on functional diversity in these hydrothermal vent ecosystems.