Population subdivision of hydrothermal vent polychaete Alvinella pompejana across equatorial and Easter Microplate boundaries

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The Equator and Easter Microplate regions of the eastern Pacific Ocean exhibit geomorphological and hydrological features that create barriers to dispersal for a number of animals associated with deep-sea hydrothermal vent habitats. This study examined effects of these boundaries on geographical subdivision of the vent polychaete Alvinella pompejana. DNA sequences from one mitochondrial and eleven nuclear genes were examined in samples collected from ten vent localities that comprise the species' known range from 23°N latitude on the East Pacific Rise to 38°S latitude on the Pacific Antarctic Ridge. Multi-locus genotypes inferred from these sequences clustered the individual worms into three metapopulation segments - the northern East Pacific Rise (NEPR), southern East Pacific Rise (SEPR), and northeastern Pacific Antarctic Ridge (PAR) - separated by the Equator and Easter Microplate boundaries. Application of the isolation-with-migration (IMa2) model provided information about divergence times and demographic parameters. The PAR and NEPR metapopulation segments were estimated to have split roughly 4.20 million years ago (Mya), followed by splitting of the SEPR and NEPR segments about 0.79 Mya. Estimates of gene flow between the neighboring regions were mostly low (2 Nm < 1). Estimates of effective population size decreased with southern latitudes: NEPR > SEPR > PAR. Highly effective dispersal capabilities allow A. pompejana to overcome the temporal instability and intermittent distribution of active hydrothermal vents in the eastern Pacific Ocean. As for many other vent taxa, this pioneering colonizer is similarly affected by local rates of habitat turnover and by major dispersal filters associated with the Equator and the Easter Microplate region.