Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Coalescent Theory Analysis of Population Collapse and Recovery in a Neutral Evolution Model[1] DAWN KING, SONYA BAHAR, University of Missouri at Saint Louis — As we move through the Anthropocene Epoch, human-driven climate change is predicted to accelerate extinction risk in the near future. Therefore, understanding basic underlying mechanisms of population loss and recovery could be paramount to saving key species in changing ecosystems. Here, we present an evolutionary model that investigates the dynamics of population collapse and recovery following a simulated mass extinction. Previously, we have shown that nonequilibrium, continuous phase transitions of the directed percolation universality class occur as a function of two different control parameters: the mutability, μ, which dictates how phenotypically different an offspring can be from its parent, and the death probability, δ, which probabilistically removes organisms within each generation. Here, we characterize the phylogenetic tree structures at two levels of biological organization—the organism and species level. Using methods from coalescent theory, we examine the phylogenetic tree structures at, and above, criticality, by considering common descent. The times to most recent common ancestor show phase transition behavior, as well as scale-free branching behavior at both levels of organization. We further examine these genealogical structures pre- and post-extinction.

[1]This research was supported by funding from the James S. McDonnell Foundation

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Date submitted: 06 Nov 2015 Electronic form version 1.4