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RESEARCH ARTICLE

Kin-Aggregations Explain Chaotic Genetic Patchiness, a Commonly Observed Genetic Pattern, in a Marine Fish

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Abstract

The phenomenon of chaotic genetic patchiness is a pattern commonly seen in marine organisms, particularly those with demersal adults and pelagic larvae. This pattern is usually associated with sweepstakes recruitment and variable reproductive success. Here we investigate the biological underpinnings of this pattern in a species of marine goby *Coryphopterus personatus*. We find that populations of this species show tell-tale signs of chaotic genetic patchiness including: small, but significant, differences in genetic structure over short distances; a non-equilibrium or "chaotic" pattern of differentiation among locations in space; and within locus, within population deviations from the expectations of Hardy-Weinberg equilibrium (HWE). We show that despite having a pelagic larval stage, and a wide distribution across Caribbean coral reefs, this species forms groups of highly related individuals at small spatial scales (<10 metres). These spatially clustered family groups cause the observed deviations from HWE and local population differentiation, a finding that is rarely demonstrated, but could be more common than previously thought.

Introduction

Marine organisms with dispersive pelagic larvae are expected to be characterized by little to no genetic differentiation among populations over large geographic areas due to high gene flow. However, many marine species exhibit slight, yet significant, levels of genetic heterogeneity over various local spatial scales [1,2] which may be temporally unstable. Typically in these situations, molecular markers deviate from the expectations of Hardy-Weinberg equilibrium (HWE) within some samples [3–5]. This complex pattern, termed chaotic genetic patchiness (CGP), has been attributed to non-equilibrium conditions caused by variation in reproductive success of breeding adults during larval recruitment [2,6]. By seeking to understand the biological mechanisms underlying these patterns we can deepen our understanding of the ecology and evolution of complex marine populations.