

Tropicalization of temperate reef fish communities depends on urchin herbivory and thermal response diversity

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October 5, 2020

Abstract

Global declines in structurally complex habitats are reshaping both land and seascapes in directions that may change how biological communities respond to warming. Here, we test whether the widespread loss of kelp habitats through overgrazing by sea urchins changes fish community structure in directions that systematically alter warming sensitivity. We use simulations and comparisons of communities from 5996 sites across 19 ecoregions to test for thermal diversity shifts related to habitat. We find that the realized thermal affinities and ranges of fishes from kelp and urchin barrens differ, but only in regions with high initial response diversity. Fish communities in warm-temperate barrens host relatively more warm-affinity species than neighbouring kelp beds, highlighting that urchin herbivory can exacerbate tropicalization processes. By contrast, relatively cool-affinity species colonize cool-temperate barrens and explain apparent lags with ocean warming in these locations. Evidently, urchins are agents of ecological change with implications for climate resilience.

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