Community-level responses of intertidal seaweeds to a marine heatwave in central British Columbia

Matthew Whalen1,2, Sam Starko2,3, Sandra Lindstrom2, Patrick T. Martone2

1Hakai Institute

2University of British Columbia

3University of Victoria

Among the most concerning recent news in marine science concerns population and ecosystem responses to acute increases in temperature, so-called marine heatwaves. Known impacts of marine heatwaves include population declines, range shifts, changes in size structure, and species replacements for one or a few species within an ecosystem, but we have yet to adequately explore how marine heatwaves affect entire communities. We utilize a nine-year time series of intertidal seaweed cover from Calvert Island, British Columbia, Canada, to explore the impacts of a recent heatwave – the ‘blob’ of 2013-2016 – on intertidal seaweed communities at three sites. We find that while local species richness remained relatively stable during and after the heatwave, total algal cover fluctuated greatly, decreasing during the heatwave at all sites and rebounding afterwards at most sites. Communities changed in a variety of ways, from largely oscillatory trajectories in low intertidal wave-exposed sites to more directional trajectories in some high intertidal wave-protected sites. Across >100 species of seaweed and invertebrates, we found several taxon-specific responses during the heatwave, with sessile invertebrates being more sensitive to winter temperature anomalies and seaweeds to summer anomalies. Our results confirm that ecological impacts of climate disruptions are dependent on existing spatial heterogeneity in the environment, and suggest that predictions around responses of ecological communities to abiotic stress may require updating. Our results provide some hope that diverse ecosystems are stable and robust in the face of acute but wide-ranging disturbances associated with extreme climate events.