Highlights/Pieces:

1. SST anomalies predicts 16-20% of variation in average algal cover within transects across years, but relatively little of alpha diversity (3%). This suggests that total abundance is decoupled from species richness and relative abundance within transects. Each anomaly degree for the previous winter and previous summer correspond to a reduction in cover of 4 and 20%, respectively, and to a reduction in alpha diversity of 0.02-0.04 species. Local diversity appears to be relatively stable, even in the face of a heatwave. Interestingly, the two exposed sites showed reductions in alpha diversity over time, whereas the protected cobble habitat showed a slight increase. These results differ when all space-occupying species are included (i.e., sessile invertebrates), with an overall reduction in explanatory power and an increase in the importance of winter anomalies relative to summer (winter being stronger). Thus, the relative abundances of invertebrates and algae respond to different dimensions of the heatwave, with potential consequences for competitive interactions.
2. Community trajectory analysis (look up Patrick’s paper on cod) shows directional change in communities in mid-intertidal shores. This is especially the case at the protected shores. Communities in the mid-shore have started resembling communities in the high-intertidal zone, and vice versa. This seems to be a result of a loss of cover over time without replenishment through recruitment or vegetative growth. Notably, this habitat is characterized by cobbles and boulders that are known to move in winter storms. While we cannot point to this form of disturbance as a mechanism (sensu Sousa 1979), it is unlikely that storms have increased during the observation period in the middle intertidal zone. All sites responded to the heatwave in one way or another, and have shifted in composition over the course of the study (centered PCoA). In particular, 2016 marked a collapse of the haploid vegetative stage of species in the genus Pyropia across all sites, which includes species of economic and cultural value to First Nations of the central British Columbia coast. 2016 also seemed to mark extreme community states for Calvert Island, after which communities began to recover or settle into a new phase. NOTE: PCoA shows that intertidal zone differences explain the majority of the community variation captured on the first axis, while site differences are captured on the second axis, but this axis does not discriminate the two exposed sites well.
3. To investigate how individual species within communities responded to the environment, we used HMSC, a hierarchical joint species distribution modeling approach. This approach allows us to estimate individual species responses and evaluate species association in a single Bayesian framework. Nearly all species showed very strong negative quadratic responses to tidal elevation measured at each quadrat, reflecting the distributions of species along intertidal gradients. Species showed variable responses to summer vs winter anomalies, with many species responding in opposite sign to seasonal anomalies. Most sessile invertebrates showed positive responses to summer SST anomalies and negative responses to winter temperature anomalies. On average, most seaweeds responded more strongly to summer SST anomalies than winter anomalies, consistent with our univariate analyses of total cover. Still trying to make heads or tails of this analysis, but if done right I think it could be pretty powerful.