Adaptive Physiology at a Local Scale: Implications for Species Distributions under Climate Change
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**Introduction**
- Physical and biological conditions on rocky shores vary over small spatial scales (~100s m)\textsuperscript{4}
- For gastropods, it can be difficult to disperse over these distances as adults, but highly likely during their planktonic phase\textsuperscript{5}
- Acclimation may occur over the lifetime of an organism
- Assessing physiological response to different levels of physical and biological stress provides a measure of within-lifetime response to local conditions
- Understanding plasticity and adaptability of marine organisms will refine predictions of how they will respond to climate change.

**Methods**
- Four sites were selected on Hong Kong Island (Figure 1)
- Simple, \textit{in situ} field measurements were taken to determine the physical and biological characteristics of these sites
- These included aspect, crevice and rockpool cover, number of grazers, number of habitat facilitators etc
- These measurements represented physical stress (temperature and desiccation) and biological stress (intra- and interspecific competition) which limpets were exposed to at each site
- Significantly different stress profiles were determined through a bootstrapped PCA process for each site \textsuperscript{6}
- To measure physiological adaptation, the detachment temperature of limpets (\textit{Cellana grata}) was measured for limpets collected from each site (in the lab, within 90 mins of collection)

**Results**
- Significant differences occurred between stress profiles at different sites (Figure 3).
- Detachment temperatures also differed significantly between different stress profiles (Figure 4).
- Those sites with higher proportions of physical stress had higher detachment temperatures.

**Discussion**
- \textit{Cellana grata} appears to adapt to localised conditions during its lifetime
- Uniform physiology across a range is unlikely to occur in many species which inhabit diverse ranges of habitats \textsuperscript{7}
- Understanding the interplay between stress levels and localised adaptation will allow predictions of ‘refuges’ for species under climate change
- Determining areas with the highest levels of physical stress at present may also allow insights into how species can or cannot adapt to future levels of stress more generally

**Notes and References**
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Background image – view from site 3. North facing with more crevices, lower wave action and higher number of competing grazers than indicated in Figure 2