Understanding impacts of environmental changes and anthropogenic activities on marine organisms

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Sessile marine organisms (*e.g.* corals, sponges) are subject to the environmental conditions that surround them; they must either be able to tolerate, or adapt to, any changes in these conditions if they are to survive and reproduce. In the 21st century, a number of global environmental influences (*e.g.* increasing CO_2 levels leading to ocean acidification, ocean warming) and local anthropogenic activities (*e.g.* nutrient runoff, sedimentation, dredging) are resulting in changes to marine environmental conditions that are occurring on sufficiently large scales and frequent time frames to cause concern. Whether occuring independently or concurrently, such environmental events potentially threaten the long-term survival of the flora and fauna that make up our important marine ecosystems.

However, the impact of these events remains an active debate and little is known about long-term effects on marine communities. This debate is confounded by the fact that the extent to which the change(s) impact upon sessile organisms may i) differ across life-cycle stages, physical morphologies, and different species; ii) depend upon the environmental variability that an organism already experiences locally, and/or iii) be affected by events occurring concurrently, either by acting together to produce cumulative effects or conversely, actually mitigating some of the potential impacts.

In this talk I will present data from two recently completed projects that have utilised correlative and/or quantitative microscopy and data analyses across both 2- and 3-dimensions to assess the impact of changes in environmental conditions on sessile marine organisms. Projects include i) the effects of temperature and pCO_2 on the growth and development of juvenile corals [1,2]; and ii) the effects of dredging activities (i.e. resulting suspended sediments) on sponge colonies [3]. Relevant techniques utilised include optical microscopy, Raman spectroscopy, scanning electron microscopy (SEM), and X-ray microscopy (microCT).

[1] Foster et al. (2016) *Science Advances*

[2] Foster T and Clode PL (2016). *Biogeosciences*

[3] Strehlow et al. (2017) *Peer J*