Ecosystem effects of ocean acidification

*Ben Harvey[1], Sylvain Agostini[1], Shigeki Wada[1], Koetsu Kon[1], Kazuo Inaba[1], Jason M Hall-Spencer[1,2]

1. Shimoda Marine Research Center, University of Tsukuba, 2. Marine Biology and Ecology Research Centre, University of Plymouth, UK

Our oceans cover 70% of the planet, provide 90% by volume of its biosphere, support 50% of global primary production and provide vital ecosystem services, including the recycling of nutrients, carbon sequestration and the provision of protein, on which large proportions of the global population rely. These marine systems are, however, now under threat from both climate (e.g. ocean acidification and global warming) and non-climate stressors (e.g. fishing pressure, invasive species) with negative impacts expected overall for biodiversity, ecosystem functioning, and the goods and services the world’ s oceans provide. While there is increasing evidence for the impacts of climate change at the individual level, much less is known about how species’ likely idiosyncratic responses may alter ecological interactions within a community. Given the importance of ecological interactions in structuring marine communities, future climate change is likely to have major consequences for community composition and the structure and function of ecosystems.

My research currently involves carrying out collaborative international research into CO_2 seeps located on Shikine-Jima (Izu Islands, Japan) as a first assessment of the likely ecosystem-level effects of ocean acidification in warm temperate waters –located at a biogeographic boundary where canopy-forming macroalgae and zooxanthellate scleractinian corals coexist. Areas with naturally high seawater pCO_2 can be used as natural laboratories for investigating such long-term (multi-generational) effects of ocean acidification on entire communities. To date, studies at CO_2 seeps have demonstrated a few positive species' responses whereby some organisms can adapt to long-term ocean acidification –some can build their skeletons even faster at higher CO_2 levels –and others have protective tissues that allow them to survive. However, in the majority of cases ocean acidification will reduce the overall biodiversity and the density of marine biogenic habitats and therefore negatively impact the structure and complexity of coastal marine ecosystems. Overall, it is anticipated that it will be a combination of direct effects and community-mediated indirect effects caused by ocean acidification that will drive ecosystem changes in future oceans.

Keywords: Ocean Acidification, CO2 Seeps, Marine Ecosystems, Ecological Interactions, Marine Food Webs

©2017. Japan Geoscience Union. All Right Reserved.