Are you interested in the effects of climate on sea urchins and would like to do a Masters project in South Africa?

Research Question: Does exposure to pH variability within coastal seascapes mediate the impacts of future ocean acidification on the Cape urchin (*Parechinus angulosus*)?

It is well established that calcifying organisms are vulnerable to the effects of low pH, particularly in their early life stages. For example the early life stages of many species of sea urchins face developmental delays and regression as a result of the physiological constraints associated with extreme low pH. Based on preliminary research, the endemic Cape urchin *Parechinus angulosus* appears to be similarly affected.

Coastal habitats are known for their variability in physico-chemical conditions, including pH which can vary by up to 1 pH unit in some habitats. This may be particularly apparent in vegetated habitats (macroalgae and seagrass) where pH increases during the day through photosynthesis. This exposes organisms utilising these habitats, often as nurseries and refuges, to high pH variability to which they become adapted and which can infer a degree of resilience to environmental change. For example, a recent study found that the embryos of giant purple sea urchins (*Strongylocentrotus purpuratus*) spawned from adults associated with giant kelp were more pH-resilient than embryos from adults outside of kelp forests.

This study will assess whether parental exposure (adult Cape urchin) to variable pH in macrophyte habitats where they naturally occur will influence the sensitivity of their larvae to low pH associated with future acidification. Adults will be collected from two contrasting coastal habitats, one where pH variability is naturally high (macrophyte beds) and another where pH conditions are more stable. The adults from each habitat will be artificially spawned to produce larvae which will be exposed to pH treatments associated with future ocean acidification in the laboratory using established experimental methods. Endpoints such as growth rates, development, survival, and metabolic rates will be compared in the larvae originating from either habitat. The study will also utilise autonomous sensors to continuously monitor pH over relevant temporal scales in these habitats to inform appropriate experimental treatment conditions.

The hypothesis for this study is that adult Cape urchins that are exposed to more variable pH conditions as adults may produce more resilient larvae. These findings will inform management of natural coastal ocean acidification refugia.

If you think this sounds like an exciting project, do not hesitate to contact charlotte.berkstrom@slu.se!

Photo: Fred Bavendam

https://www.mindenpictures.com/gallery/preview/1056/1315/632/0/purple-sea-urchin-strongylocentrotus-purpuratus-and-red-sea-urchin/0_00151848.html