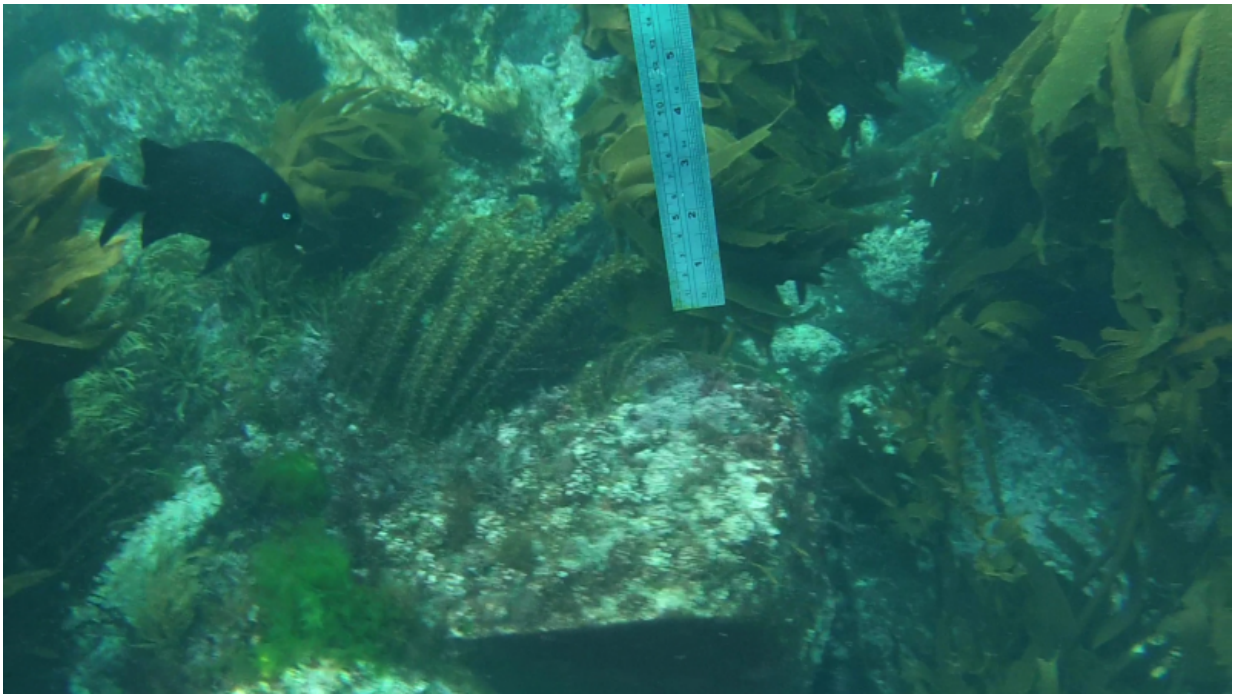
Volcanic vents preview future ocean habitats

August 10 2015



A healthy kelp forest in the present-day CO_2 levels. Credit: Ivan Nagalkerken, University of Adelaide

A world-first underwater study of fish in their natural environment by University of Adelaide marine ecologists has shown how predicted ocean acidification from climate change will devastate temperate marine habitats and biodiversity.

Published today in the journal *Nature Climate Change*, the researchers

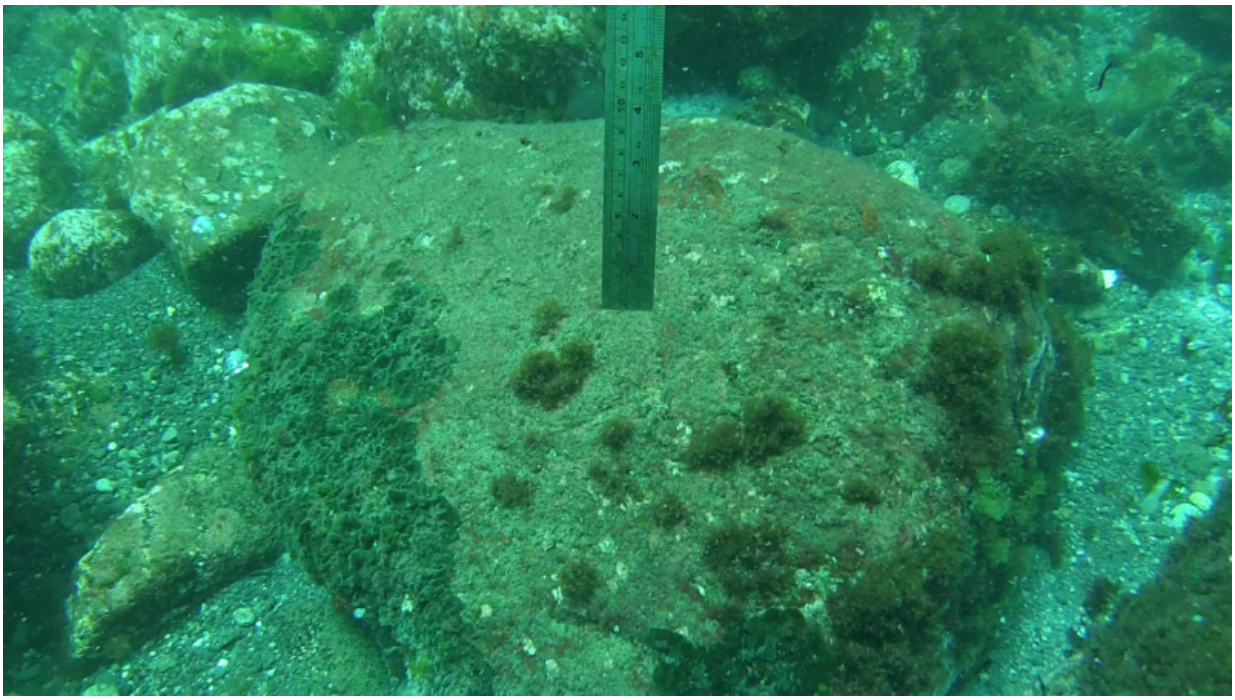
used natural CO2 underwater seeps to study how entire ecosystems have been impacted by the resulting acidification of the water.

They compared ecosystems in the high-CO2 levels found at volcanic vents in temperate waters in both the Northern and Southern hemispheres with adjacent ecosystems with present-day levels of CO2. These underwater vents have specific sites that release CO2 into the water at concentrations predicted for the end of the century.

"Human greenhouse gas emissions are rapidly acidifying our oceans," says project leader Associate Professor Ivan Nagelkerken, Australian Researcher Council (ARC) Future Fellow with the University's Environment Institute. "Using these CO2 seeps, we've been able to get a unique preview of what the future ocean will look like under current projections for the end of the century - and it's not good.

"Previous studies have largely looked at how single fish species are affected by acidification in laboratory experiments. But we used these 'natural laboratories' to see the effects on whole ecosystems, as well as how acidification affects the behaviour and physiology of individual species."

The study confirmed previous laboratory research which showed acidification of the water affects fish behaviour, for example, by reducing the escape response from predators.



Unhealthy kelp in the high-CO_2, acidified water. Credit: Ivan Nagelkerken, University of Adelaide

But there were some surprising results. When the fish were close to shelter in their natural environment, this negative effect of acidification disappeared.

"We also found that some species were more abundant in the acidified waters. But these were common or generalist species such as gobie and triplefin fishes which doubled or even tripled in number to the detriment of other species," Associate Professor Nagelkerken says.

The most dramatic finding was the marked habitat shift found in the high-CO2, acidified waters.

"As you swim from one area to the other you see a dramatic difference,"

says co-author Professor Sean Connell. "One minute you're in a kelp forest with one metre high kelp and lots of different fish. Then you move into the vent area where everything is barren with short turf algae, just a few centimetres high and devoid of the life and colour of the other areas.

"Ecosystems represent complex interactions between different species, and between species and their environment. Our research has given us a greater understanding of increasing CO2 emissions as a driver of ecological change and what this might mean for future marine biodiversity and fisheries production."

More information: Ocean acidification alters fish populations indirectly through habitat modification, *Nature Climate Change*, DOI: 10.1038/nclimate2757

Provided by University of Adelaide