Sponges erode coral reef under acidification scenarios

December 31 2013, by Chris Thomas

In order to breathe and eat, sponges filter water. Fluorescent dye shows Cliona orientalis exhales water after it was passing through its body. Orpheus Island. Credit: Max Wisshak

Ocean warming and acidification are leading to an increase in the rate of sponge biomass and bioerosion.

Combined German-Australian research, recently presented at the Ninth World Sponge Conference in Fremantle, used past, present and future climate scenarios to explore how changes are occurring.

The Australian Institute of Marine Science's Dr Christine Schönberg, based at UWA's Oceans Institute, planned and shared fieldwork and experiments with German bioerosion expert Dr Max Wisshak.

"For the past we had measured records; it was cooler and less acidic in the seas," Dr Schönberg says.

"For the future, we use models based on scientific evidence estimating what it may be like in 100 years.

"Adjusting temperature is easy—you insulate a volume of water and either cool or heat it and keep an eye on the temperature.

"With acidity, it's far more challenging. To mimic what's going on in the environment through climate change, induced by human activities, you don't simply add acid to the water.

"You have to dissolve carbon dioxide in it, which creates carbonic acid, which causes a drop in pH and thus 'ocean acidification'."

Values for bioerosion were measured from the water chemistry via alkalinity of the culture water or by weighing eroded substrates under water—a method called buoyant weight measurement. Through this, researchers found sponge bioerosion was stronger in more acidic water.

Bioerosion is the erosion of hard materials caused by living organisms (such as microbes, sponges, sea urchins, fish, snails, bivalves and worms), which have specific ways to attack a variety of materials.

"Some weaken materials by rasping or removing particles, which is mechanic bioerosion," Dr Schönberg says.

"But what's important in the context of climate change and ocean acidification is the so-called chemical bioerosion, an etching process often involving acid that dissolves the materials attacked.

"If the water becomes more acidic, the bioeroders spend less energy to

work against a chemical gradient and need to produce less acid to create the same effect."

Dr Schönberg says sponges are often the most important bioeroders in warm waters and can be dominant on coral reefs, especially if the reefs are stressed.

Very active sponge species can remove as much as 20kg calcium carbonate rock per square metre each year—rock that was slowly created by corals is now reduced to fine sediments by the sponges.

"Normal coral growth rates are usually less than 20kg per square metre a year so when these sponges become more active, they may erode the reef faster than it can grow," Dr Schönberg says.

Provided by Science Network WA