Acidification of the sea hampers reproduction of marine species

July 29 2008

Within 100 years, it is reckoned that the world's seas will be three times as acidic as they are now. The lower pH may strike a severe blow to the ability of marine species to reproduce, according to research on sea urchins at the University of Gothenburg. "Acidification may be the biggest threat to marine ecosystems for hundreds of thousands of years," says Jon Havenhand, a researcher at the department of marine ecology.

By absorbing carbon dioxide from the atmosphere, and from the human use of fossil fuels, the world's seas function as a giant buffer for the Earth's life support system. The chemical balance of the sea has long been regarded as immovable. Today, researchers know that the pH of the sea's surface water has gone down by 0.1, or 25 percent, just since the beginning of industrialisation just over a century ago.

Jon Havenhand and Michael Thorndyke, researchers at the University of Gothenburg, along with colleagues in Australia, have studied how this acidification process affects marine animal life.

As part of the study, which is one of the world's first on this subject, they have allowed sea urchins of the species Heliocidaris erythrogramma to fertilise themselves in water where the pH has been lowered from its normal 8.1 to a pH value of 7.7. This means an environment three times as acidic, and corresponds to the change expected by the year 2100. The results are alarming.

Like most invertebrates, the sea urchin multiplies by releasing its eggs to

be fertilised in the open water. However, in a more acidic marine environment, the sea urchin's ability to multiply goes down by 25 percent, as its sperm swim more slowly and move less effectively. If fertilisation is successful, their larval development is disturbed to the extent where only 75 percent of the eggs develop into healthy larvae.

"A 25 percent drop in fertility is the equivalent of a 25 percent drop in the reproductive population. It remains to be seen whether other species exhibit the same effect, but, translated to commercially and ecologically important species such as lobsters, crabs, mussels and fish, acidification would have far reaching consequences," says Jon Havenhand, a researcher from the Department of Marine Ecology working at the Sven Lovén Centre for Marine Sciences in Tjärnö.

The sea urchin studied by Jon Havenhand and Michael Thorndyke lives off the south coast of Australia. From a research point of view, the species is highly interesting, as its shell is made out of limestone, which is broken down in more acidic environments.

"Species with limestone skeletons or shells are hit particularly hard when the pH drops, through a drop in ability to grow and a rise in mortality. But, and it's a big but, we don't yet know enough about the effects of acidification in the sea, and I hope I'm wrong about the wider consequences of our results," says John Havenhand, who says that the need for more research on a global level is acute.

Source: Swedish Research Council