Rising acid in oceans is worsening industry toxins

February 12 2013, by Harriet Jarlett

Crustaceans like mussels may be harmed by several stress factors.

Acidification of UK waters may make industrially-contaminated sediments more toxic over time, say scientists.

The study looked at crustaceans that feed on the surface of sediments from dredged ports and estuaries.

It found that ocean acidification, caused by climate change, causes sediments contaminated with metal to become more toxic. This can result in significant DNA damage for the animals that graze on these sediments.

'The combined effect on these animals, of coping with adapting to climate change as well as increased toxin levels, could prove to be fatal,' says Dave Sheahan, from the Centre for Environment, Fisheries and

Aquaculture Science (Cefas), senior researcher on the study.

Cefas already monitors the sediments from industrialised estuaries, such as the Tees in northeast England, for poisonous metal particles. These areas must be regularly dredged to maintain harbour entrances, and the excess material has to be tested for its toxicity.

The scientists placed dredged material from one of these sites into laboratory tanks, then introduced burrowing crustaceans which normally graze on the sediment surface. Next, they exposed the creatures to water with levels of acid found in seawater today, as well as acid levels predicted for the next 50 and 100 years. Animals that survived ten days in these tanks were then tested to see if they incurred DNA damage.

The animals experienced significant DNA damage, which rose with acidification levels, suggesting that when acidification is combined with metal in sediments it can be more harmful.

But the study also showed that as toxicity of ingested metals rises, animals are sometimes able to adapt their behaviour to cope.

Dr Silvana Birchenough, senior benthic ecologist and co-author of the study, describes how 'initially you can see the distinct burrows they made, but after treatment there was less activity, some species were just sat on top without moving much. This shows us how some organisms, may be able to move more or less to regulate for these changes. So there will be some trade off in behaviour.'

Sheahan explained that scientists may now find a certain species tolerance is worse, and over time that species would be outcompeted by other groups. Although they expect some species to be able to survive better, or some genotypes within species better able to tolerate changes.

At the moment dredged sediments are monitored and if toxicity falls below a predetermined threshold they are considered safe to deposit in the sea. However, rising ocean acid levels may put more stress on the animals, on top of the metal toxicity, meaning current threshold values will need to be changed to make sure all marine animals, including crustaceans, are protected.

Some commercially important crustaceans, like lobsters and scallops, now need to be assessed to see if they are also exposed to contaminated sediments. Birchenough continued, 'there's a commercial importance on where we think major exposure routes are.'

'There are two aspects to our study here of interest; whether contaminated sediments and changes in ocean acidification will affect animals in the marine situation, and also whether we use these tests to make a judgement about sediments that we currently deem ok.' Sheahan concluded, 'We may need to think about moderating certain activities that currently we think acceptable.'

More information: Roberts, D. et al. (2013). Ocean acidification increases the toxicity of contaminated sediments. *Global Change Biology*, 19: 340-351. doi: 10.1111/gcb.12048

Provided by PlanetEarth Online