BRINGING OCEAN ACIDIFICATION INTO THE CLIMATE CHANGE NARRATIVE

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Atmospheric carbon dioxide concentrations are steadily increasing and some of this carbon dioxide dissolves in seawater to make carbonic acid – a process known as ocean acidification. Between pre-industrial times and the present day, seawater pH has decreased by 0.1 pH units, with predicted changes by the end of the current century of up to 0.5 pH units.

Ocean acidification reduces the availability of dissolved calcium carbonate used in the exoskeleton and shells of marine organisms such as corals and molluscs. This makes it harder for these organisms to build exoskeletons, slows larval settlement and weakens byssal attachment. Slower growing and hence weaker shells are vulnerable to storm damage with increasing storm frequency and severity also linked to increased carbon dioxide through climate change. Ocean acidification is already having ecological effects with evidence that the growth of some corals and molluscs is slowing. In polar regions and areas of upwelling water, ocean acidification is causing seawater to become undersaturated with calcium carbonate which can cause shells to dissolve.

Looking back in time over two time periods – 0.8 million years and 0.5 billion years can be helpful. During the last 0.8 million years carbon dioxide has fluctuated between 170 ppm and 300 ppm, but in the last few decades it has jumped to 415 ppm, basically showing what is now happening to atmospheric carbon dioxide due to human activities is anomalous. A 0.5-billion-year perspective shows that major mass extinction events are associated with peaks in carbon dioxide – the associated acidification caused oceanic ecological collapse, and this reminds us that future anthropogenic ocean acidification has the potential to trigger another mass extinction event.

Preventing ocean acidification requires greater public awareness. At present the majority of publicity about carbon dioxide is in a climate change rather that ocean acidification narrative. As ecologists and educators, we need to shift this debate to include ocean acidification and, if possible, explain the interplay between both processes as part of increasing the intellectual level of public debate from single environmental issues to multiple interacting issues.

Policy makers are well aware of the link between carbon dioxide and climate change, although maybe not so aware of the link with ocean acidification – or perhaps not so likely to discuss ocean acidification when interacting with the public. Carbon dioxide control is tricky for policy makers as they can get a career disadvantage by introducing measures to reduce carbon dioxide release, as quality of life, opportunity and status for many people who voted them into power is linked to burning more fossil fuels or deforestation and associated land use change.

We have been working on curbing the increase in atmospheric carbon dioxide for at least 30 years with a huge number of initiatives, but the inexorable increase in the Keeling Curve of atmospheric carbon dioxide measured for 63 years in Hawaii shows that these initiatives have not achieved anything on a scale that makes a material difference in carbon dioxide control.

We cannot go on failing to control atmospheric carbon dioxide concentrations as the resulting ocean acidification has put us on a direct path towards oceanic mass extinction, and importantly, the physiological and ecological harm of that mass extinction event has already started – it is not some hypothetical future event.

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