R. RODOLFO-METALPA

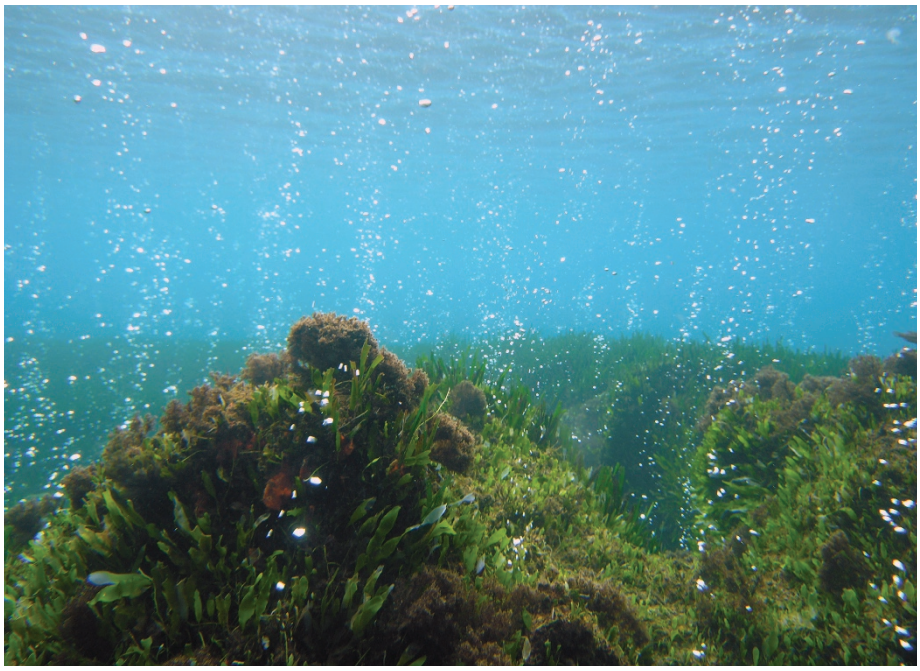

Figure 1 | Sparkling sea water. Venting of volcanic CO_2 at a Mediterranean site off the island of Ischia provides the opportunity to observe changes in the community structure of a rocky shore ecosystem along gradients of decreasing pH close to the vents. Groups such as sea urchins, coralline algae and stony corals decline in abundance or vanish completely with decreasing pH. Sea grasses and brown algae benefit from elevated CO_2 availability close to the vent by increasing their biomass. Similar high CO_2/low pH conditions are on the verge of progressively developing ocean-wide through the uptake of fossil-fuel CO_2 by the surface ocean.

This study[3] is a compelling demonstration of the usefulness of natural CO_2 venting sites in assessing the long-term effects of ocean acidification on sea-floor ecosystems, an approach that undoubtedly needs to be further explored. But there are considerable differences between such systems and the situation arising from global-scale ocean acidification caused by rising atmospheric CO_2. For example, temporal and spatial variability in CO_2 and pH perturbations, induced in part by changes in the direction and intensity of water currents, complicate the determination of a reliable dose–response relationship. Large but short-term variation in pH may itself be stressful to some organisms owing to the extra physiological burden of acclimating to ever-shifting conditions. In addition, mobile species and planktonic stages continually move or are carried into the venting area, providing a supply of organisms previously unexposed to high CO_2 and low pH. This further complicates the extrapolation of CO_2 effects from volcanic vents to global-scale ocean acidification. Invasion of non-adapted organisms may also cause short-term stress to those organisms, possibly amplifying the range of high-CO_2 responses.

In the case of unabated CO_2 emissions, ocean acidification may develop to pose an unprecedented threat to marine life. Our understanding of the processes that underlie its observed effects on ecosystems and biogeochemistry is still rudimentary, as is our ability to forecast its impacts. There is an urgent need to develop tools to assess and quantify such impacts across the entire range of biological responses, from subcellular regulation to ecosystem reorganization, and from short-term physiological acclimation to evolutionary adaptation.

Hall-Spencer *et al.*[3] provide independent support for conclusions, reached by experimental studies, that ocean acidification can cause a loss of biodiversity and trigger shifts in ecosystem structure and function[4–6]. They also demonstrate that, although natural CO_2 venting sites are not precise analogues of global-scale ocean acidification, they can provide essential information about high-CO_2 effects on spatial and temporal scales, which are otherwise difficult to address. Tackling this emerging threat to marine biota calls for a coordinated research effort and requires "a coherent global vision ... to better determine the impacts of climate change on marine systems"[7]. ■

Ulf Riebesell is at the Leibniz Institute of Marine Sciences (IFM-GEOMAR), 24105 Kiel , Germany.
e-mail: uriebesell@ifm-geomar.de

1. Sabine, C. L. *et al. Science* **305,** 367–371 (2004).
2. Orr, J. C. *et al. Nature* **437,** 681–686 (2005).
3. Hall-Spencer, J. M. *et al. Nature* **454,** 96–99 (2008).
4. Fabry, V. J., Seibel, B. A., Feely, R. A. & Orr, J. C. *ICES J. Mar. Sci.* **65,** 414–432 (2008).
5. Kleypas, J. A. *et al. Impacts of Ocean Acidification on Coral Reefs and Other Marine Calcifiers* workshop rep. 18–20 April 2005, St Petersburg, Florida, www.ucar.edu/communications/Final_acidification.pdf (2006).
6. Royal Society *Ocean Acidification Due to Increasing Atmospheric Carbon Dioxide* Policy Document 12/05 (Royal Society, London, 2005).
7. Richardson, A. J. & Poloczanska, E. S. *Science* **320,** 1294–1295 (2008).

See also page 16.

50 YEARS AGO

At a meeting of the Linnean Society on July 1, attended by members of the Darwin and Wallace families, representatives of other societies and institutions and members of the Linnean Society, the president, Dr. C. F. A. Pantin, unveiled a plaque in the meeting room commemorating the centenary of the reading before the Society on July 1, 1858, of the joint communication by Charles Darwin and Alfred Wallace on their theory of evolution by natural selection. At the meeting a hundred years ago neither Darwin nor Wallace was present: Darwin because of family bereavement and illness, and Wallace was still in Ternate. The papers were communicated by Sir Charles Lyell and Dr. (later Sir) J. D. Hooker ... Hooker, writing to Francis Darwin at a later date giving an account of the meeting, said " ... The interest excited was intense, but the subject too novel and too ominous for the old School to enter the lists before armouring. It was talked over after the meeting, 'with bated breath' ..."
From *Nature* 5 July 1958.

100 YEARS AGO

The list of honours issued on the occasion of His Majesty's birthday includes the name of a few men distinguished for their work in pure or applied science ... Some reference has been made in the daily papers to the ratio of honours awarded to naval and military men, the suggestion being that the Army receives an undue share of these distinctions. With the demands of the two services for recognition we are not concerned, but the question induces us to ask what ratio exists between the award of honours to men who devote their lives to work which promotes the scientific progress of the country and those who do not? ... Probably the reason is that ministers and officials who are chiefly concerned with the affairs of State and Court live in a world in which science and the results of science are almost unknown.
From *Nature* 2 July 1908.

50 & 100 YEARS AGO