Climate Change Makes for Lonelier Corals

Press release: November 2016

New research shows how deep-sea coral reefs in the cold waters of northern Europe could be threatened by a loss of connection between marine protected areas (MPAs) resulting from changes in wind patterns linked to climate change. Coral populations on mountains beneath the sea hold the key to maintaining these links.

Deep-sea coral populations are linked by tiny, fragile larvae - ten would fit comfortably on the head of a pin - that drift and swim on the ocean currents, travelling hundreds of miles between suitable habitats. Dr Alan Fox, lead author of the study and a Daphne Jackson Trust Fellow said, "We can't track these particles in the ocean, but the little we know of their behaviour allows us to use computer models to simulate their epic journeys, predicting which populations are connected and which are isolated. In less well-connected networks, populations become isolated and cannot support each other, making survival and recovery more difficult."

The vulnerable cold-water coral *Lophelia pertusa* creates reefs that are hotspots of biodiversity. Today, Scotland's MPA network for *Lophelia pertusa* appears to be weakly connected, held together by a population on Rosemary Bank seamount, an undersea mountain off the west coast of Scotland. In years where the winds from the west are weaker during winter, the coral sites become isolated, with fewer links. Years with stronger winter westerlies produce a generally more connected network. A shift in average winter conditions in western Europe, as has been predicted by climate change models, could profoundly change the MPA network.

Cold-water corals also thrive on oil and gas platforms in the northern North Sea and west of Shetland. Results suggest these new populations bridge a gap in the network between corals in the Atlantic and along the coast of Norway. Professor Murray Roberts, co-ordinator of the ATLAS project, at the University of Edinburgh (Scotland, UK) said, "This study shows the unique role Scotland's seabed plays as a stepping-stone for deep-sea Atlantic species. By teaming up with researchers in Canada and the USA we will expand this work right across the Atlantic Ocean."

The content of the publication has been generated through Heriot-Watt University funding of a Daphne Jackson Trust Fellowship. This work will be continued through the ATLAS and ANChor projects.

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Notes for Editors

Dr Alan Fox was funded by Heriot-Watt University (Scotland, UK) on a Daphne Jackson Trust Fellowship. The Daphne Jackson Trust enables men and women to return to the scientific and research world of work following a career break of two years or more by providing flexible and part time retraining fellowship schemes, held in conjunction with host organisations around the UK i.e. academic and research institutes.

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ATLAS is a research and innovation action funded under the European Union's Framework Programme for Research and Innovation, Horizon 2020, grant No. 678760. It is the largest integrated study of deep Atlantic ecosystems ever undertaken. The four-year project was launched in May 2016 and has a total budget of €9.1 million.

Led by the University of Edinburgh (Scotland, UK) **ATLAS** brings together 24 partners (and one linked third party) from 10 European countries, the USA and Canada. It consists of 12 universities, four national research institutes, five small and medium sized enterprises (SMEs) and four government agencies. AquaTT (Ireland) is the project dissemination partner.

Lophelia pertusa is a cold-water coral that grows in the deep waters throughout the North Atlantic Ocean. It can develop elaborate reef frameworks that are hotspots of biodiversity, home to a diverse community. While not currently threatened, they are vulnerable to damage by commercial trawling and slow to recover. This has resulted in calls for, and the implementation of, measures for their protection.

In 2010 a strategic plan was set out by the Convention on Biological Diversity, a global agreement, calling for well-connected systems of protected areas by 2020. Scotland has progressed towards this goal by the ongoing process of designating a suite of area-based protection measures including SACs (Special Areas of Conservation) and, in 2014, a network of 31, mostly inshore, MPAs (Marine Protected Areas).

Marine protected areas (MPAs) are areas of the ocean that are managed to achieve the long-term conservation of nature with associated ecosystem services and cultural values. In general, individual MPAs do not exist in isolation; these areas are connected in space and time by the movement of migratory species, larval life stages, or simply by the circulation of energy and elements.

Rosemary Bank seamount rises almost 2000m from its base to its summit 300m below the sea surface. It takes its romantic name from the vessel by which it was discovered in 1930, HMS Rosemary, a WWI minesweeper turned survey vessel built in 1915.

The dominant factor governing inter-annual variability in winter weather conditions is the North Atlantic Oscillation (NAO). The NAO index tracks the atmospheric pressure difference between Iceland and the Azores, and with it the strength of westerly winds across western Europe. The NAO varies with an irregular period of 5-10 years; climate models have predicted shifts in this cycle though currently with low certainty.

The ANChor project looks at the importance of North Sea oil and gas platforms to the wider North Sea ecosystem, and the biological communities that inhabit these massive hard man-made structures. ANCHor is funded by the INSITE programme.