News Release

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The Pace of Climate Change Predicts Rapid Changes in Marine Ecosystems

A new study in Science highlights how climate change is affecting marine life.

Petaluma, California, USA – To survive, many species respond to changes in climate by adapting - e.g. by altering their timing of breeding, spawning and migrating - or by relocating. A new study published today (4 November 2011) in the journal *Science* finds that life in the seas is likely to be affected by climate change as much or more than life on land. The study also provides evidence that some of the most diverse marine ecosystems may be particularly vulnerable to risks from ocean warming.

"With the support of experts from around the world, I wanted to find out how marine species may respond to changes in temperature and compare this with expectations for the much better studied land systems," explains lead-author Dr. Michael T. Burrows who heads the Department of Ecology at the Scottish Marine Institute.

Drawing on five decades of global temperature data from the UK's prestigious Hadley Centre, the team was able to track the pace of climate change using two key measures: a) geographical shifts in temperature bands and b) seasonal changes in temperature. The team found that while the land has warmed faster than the ocean over the past 50 years, the rates of temperature shifts in the sea are greater than on land. Thus, the effects of climate change on marine life are likely to be as great, or greater, than effects on terrestrial life.

Co-author Dr. William J. Sydeman of the Farallon Institute in Petaluma, California and member of the California Ocean Protection Council Science Advisory Team adds, "Geographic shifts in temperature bands, known as *isotherms*, in the sea have outpaced those observed on land. If ocean life is to survive, it must adapt rapidly to keep pace with big habitat changes in the ocean. Therefore, we should not be surprised when we see substantial change in the whereabouts of marine populations or changes in their timing of breeding or migration dates. Indeed, some species may not be able to cope with the velocity of change, but others will more easily adapt, or will be moved by ocean currents to new locations."

Recent increases in the abundance of tropical Humboldt squid and decreases in salmon abundance along the California coast are in keeping with these new findings. Changes in plankton populations may be another example.

In the Northeast Pacific Ocean there has been a lot of variation in the pace of climate change in the marine environment. Most of the Northeast Pacific has warmed by about 0.25^{o}C/decade over the past 50 years, but cooling has also been observed in some regions (off northern California and Oregon). For plants and animals to track these temperature changes might mean big shifts in some places, such as the Gulf of Alaska, but not as much in other areas (northern California).

This study is groundbreaking in that it offers a basis to make predictions about changes in marine populations and communities from regional to global scales. Such changes will have (or may be having) significant effects on society in the future.

Publication information: Michael T Burrows *et al.* (2011) 'The Pace of Shifting Climate in Marine and Terrestrial Ecosystems' *Science*.

Photographs to accompany this article may be downloaded from: https://picasaweb.google.com/MichaelTBurrows/Oceans?authuser=0&authkey=Gv1sRgCI3Ii8PXl5P7XQ&feat=directlink

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Additional Information

The *Farallon Institute for Advanced Ecosystem Research* is a non-profit scientific organization dedicated to the understanding and preservation of healthy marine ecosystems. Its research is designed to provide the scientific basis for ecosystem based management practices and policy reforms consistent with a productive marine world. The *Farallon Institute* emphasizes long term multi-species, multi-disciplinary research into the interdependent aspects of the marine environment, including the effects of natural and human-based climate change, and the broad implications and influences of ocean currents, weather patterns, fishing practices and coastal development on marine food webs and ecosystem processes.

The *California Ocean Protection Council Science Advisory Team (OPC-SAT)* is an advisory body to the State of California composed of 24 esteemed scientists from a range of independent research institutions along the U.S. west coast and beyond. The mission of the OPC-SAT is to ensure that ocean and coastal policy decisions in the state of California are based in the best available science. California Ocean Science Trust, an independent non-profit organization dedicated to connecting science to ocean policy and management, coordinates all aspects of the OPC-SAT. For more information, please visit http://calost.org/, or contact Emily Knight, Program Manager, Ocean Science Trust (510-251-8318 or emily.knight@calost.org).