

Thanks for the feedback! [Undo](#)
We'll use your feedback to review ads on this site.



Science News

from research organizations

Print Email Share

Coral reefs highlight the key role of existing biodiversity for climate change adaptation

Date: April 4, 2016

Source: University of Southampton

Summary: New research on coral reefs suggests that existing biodiversity will be essential for the successful adaptation of ecosystems to climate change.

Share: Facebook Twitter Google+ LinkedIn + Email

RELATED TOPICS

Plants & Animals

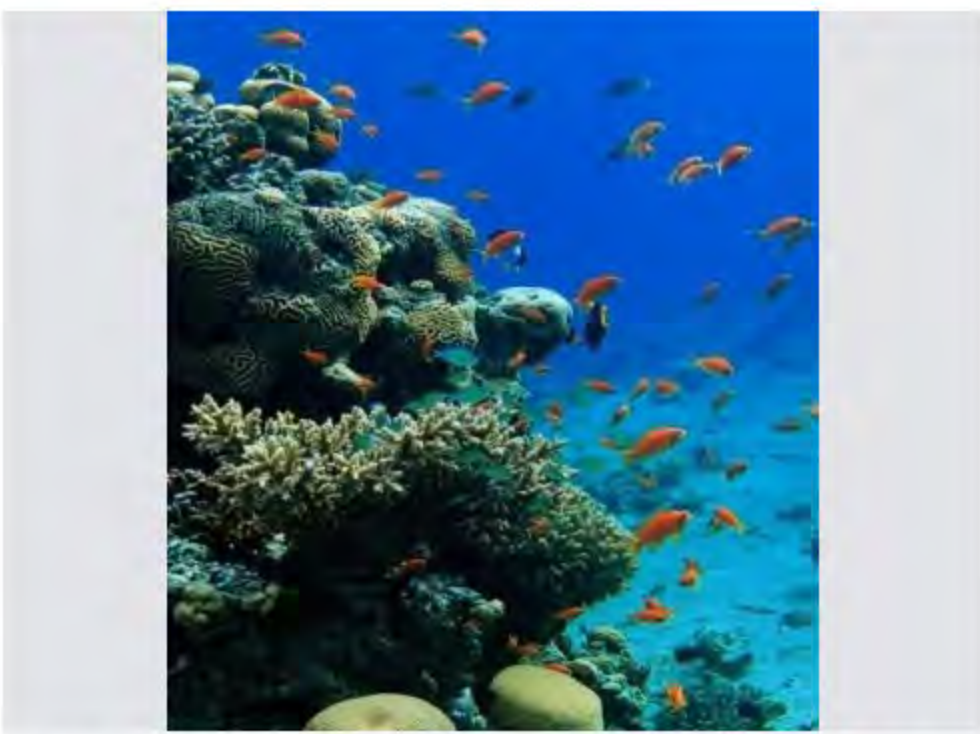
- > Ecology Research
- > Marine Biology
- > Extinction

Earth & Climate

- > Ecology
- > Coral Reefs
- > Environmental Awareness

RELATED TERMS

- > Southeast Asia coral reefs
- > Climate change mitigation
- > Eutrophication
- > Consensus of scientists regarding global warming
- > Artificial reef
- > Coral bleaching



Coral reefs show that hidden genetic diversity can prepare ecosystems for climate change.

Credit: Prof. J. Wiedenmann, University of Southampton, UK

New research on coral reefs led by the University of Southampton suggests that existing biodiversity will be essential for the successful adaptation of ecosystems to climate change.

About 25% of all marine biodiversity depends on coral reefs, the three-dimensional calcareous framework laid down by the coral animals together with their algal symbionts. Climate change, in particular increasing seawater temperatures, threatens to disrupt the functionality of this productive association with potentially devastating knock-on effects to ecosystem services that are provided by coral reefs including food supply, coastal protection, attraction of tourists and access to biopharmaceuticals.

Investigations of the symbiotic partnership between the coral host and their algal symbiont in the world's hottest coral reef environments -- the Persian/Arabian Gulf (PAG) and nearby seas -- lead an international consortium of scientists to conclude that natural selection of existing biodiversity is key to facilitating rapid adaptation of coral reef ecosystems to climate change.

The novel findings by the University of Southampton (UK), KAUST (Saudi Arabia), NYUAD (UAE) and Tel Aviv University /IUI (Israel) are published this week in the journal *Proceedings of the National Academy of Sciences*.

Professor Jörg Wiedenmann, head of the University of Southampton's Coral Reef Laboratory and principal investigator of the project explains: "Corals of the PAG can survive exceptionally high salinity levels and temperatures of up to 35 degrees Celsius -- conditions that would kill corals elsewhere. However, the historic climate change that created this extreme environment, left coral communities in the Middle Eastern region only less than 6000 years to adjust to the drastic changes. Therefore, these coral ecosystems are ideal model systems to understand how reefs may respond to present-day climate change."

Dr Benjamin Hume, Postdoctoral Research Fellow at the University of Southampton and lead author of the paper, elaborates: "Using advanced molecular biological approaches, we recently discovered that corals of the Southern PAG host almost exclusively a species of symbiotic algae, *Symbiodinium thermophilum*, that was new to science. This finding suggested that this algal species was essential for the survival of the PAG corals and the question arose whether *Symbiodinium thermophilum* was the product of rapid evolution catalysed by the challenging conditions of the PAG, or whether this symbiont originated elsewhere."

To answer this question, the scientific team analysed close to a thousand corals along 5000 km of coastline in the PAG and adjacent seas.

Professor Voolstra from the Red Sea Research Center at KAUST adds: "Next-generation sequencing technologies allowed us to analyse the DNA of the coral symbionts in unprecedented depth, a prerequisite to screen large numbers of samples for the genetic signature of *Symbiodinium thermophilum*."

While the unusual symbiont was prevalent within the PAG, it was also found in the Gulf of Oman and Red Sea, however, only at barely detectable levels. Analysing a suite of molecular markers, the researchers discovered a surprising genetic diversity among *S. thermophilum* from outside the PAG.

Dr Hume explains: "Our data suggest that this diversity resulted from a genetic radiation aged at approximately 13 million years ago. This is far earlier than the formation of the PAG that only occurred about 15 k years ago as a result of rising sea levels after the last ice age."

He adds: "Out of this diverse group only one genetic type dominates the PAG, suggesting that selection by the extreme conditions has favoured an existing variant that was best suited to promote coral growth in this environment."

Professor Wiedenmann continues: "Our example of the heat tolerant coral symbiont suggests that the genetic diversity that exists among populations can be key to survival if species are facing a rapid change in environmental conditions. These pre-adapted forms might exist only in low numbers among abundant, but more vulnerable individuals. Any loss of genetic material from coral reefs caused by habitat destruction, overfishing, nutrient enrichment and pollution could therefore reduce the capacity of species to adjust to a changing environment."

He concludes: "To save coral reefs for the future, we need to fight the rising levels of greenhouse gases which cause climate change. At the same time, we need to protect present-day biodiversity to facilitate adaptation to changing environmental conditions. This applies not only to coral reefs but to ecosystems in general."

Story Source:

The above post is reprinted from materials provided by **University of Southampton**. *Note: Materials may be edited for content and length.*

Journal Reference:

1. Benjamin C. C. Hume, Christian R. Voolstra, Chatchanit Arif, Cecilia D'Angelo, John A. Burt, Gal Eyal, Yossi Loya, and Jörg Wiedenmann. **Ancestral genetic diversity associated with the rapid spread of stress-tolerant coral symbionts in response to Holocene climate change.** *PNAS*, 2016 DOI: 10.1073/pnas.1601910113

Cite This Page:

MLA APA Chicago

University of Southampton. "Coral reefs highlight the key role of existing biodiversity for climate change adaptation." ScienceDaily. ScienceDaily, 4 April 2016. <www.sciencedaily.com/releases/2016/04/160404152918.htm>.

Share This Page:

Facebook Twitter Google+ LinkedIn + Email

Earth & Climate News

April 5, 2016



Earth's Internal Heat Drives Subglacial Melting



Vibrations Make Large Landslides Flow Like Fluid



Hybrid System Could Cut Coal-Plant Emissions



Shocking Collapse of Gorilla Subspecies

Latest Headlines

updated 12:56 pm ET



Increased Flooding, Accelerated Sea-Level Rise in Miami Over Last Decade, New Study Shows

Apr. 4, 2016 — Miami Beach flood events have significantly increased over the last decade due to an acceleration of sea-level rise in South ... [read more »](#)

- > Accelerated Sea-Level Rise in Miami Over Decade
- > Water Cycle Instability Here to Stay
- > El Nino's Impact On Ocean's Food Source
- > Fishing for the Future of Coral Reefs
- > Coral Reefs, Biodiversity and Climate Change
- > Common Pesticides Kill Amphibian Parasites
- > Western Lifestyle Spells End of Biodiversity
- > Climate Tipping Point: North Atlantic Pivotal
- > Acid Oceans from CO2: Severe Damage
- > Sex Reversal in Amphibians Due to the Pill

more stories >

Latest Videos

from news services



Mexico's Popocatepetl Volcano Bursts Into Life



Raw: Pakistani Floods Displace Thousands



Kenya Prepares for a Record-High Ivory Burn



Droughts Create Acute Severe Malnutrition in Southern Madagascar

more videos >

Thanks for the feedback! [Undo](#)

We'll use your feedback to review ads on this site.



Related Stories



Coral Symbionts Take to the Open Ocean

Dec. 21, 2015 — Symbiodinium is a unicellular alga that plays a major role in coral reefs by forming symbiotic partnerships with invertebrates, providing them with the ability to photosynthesize. For the first time, ... [read more »](#)



Predicting Coral Reef Futures Under Climate Change

Jan. 14, 2015 — Researchers examining the impact of climate change on coral reefs have found a way to predict which reefs are likely to recover following bleaching episodes and which won't. Coral bleaching is ... [read more »](#)



Overfishing of Sharks Is Harming Coral Reefs, Study Suggests

Sep. 18, 2013 — A team of scientists from Canada and Australia have discovered that the decline in shark populations is detrimental to coral reefs. Where shark numbers are reduced due to commercial fishing, there is ... [read more »](#)



Natural Climate Shifts Drove Coral Reefs to a Total Ecosystem Collapse Lasting 2,500 Years

July 5, 2012 — A new article shows how natural climatic shifts stopped reef growth in the eastern Pacific for 2,500 years. The reef shutdown, which began 4,000 years ago, corresponds to a period of dramatic swings ... [read more »](#)

See fewer ads and support this site.

Contributor works on millions of sites and all of your devices.

Contributor by Google

Strange & Offbeat

PLANTS & ANIMALS



Scientists Find Surprise Lurking in Crocodilian Jaw



Recent Evolutionary Change Allows a Fruit Fly to Dine on a Toxic Fruit



World's Smallest Diode Created



Programming Language for Novel Biological Circuits

EARTH & CLIMATE



Laser Cloaking Device Could Help Us Hide from Aliens



City Birds Are Smarter Than Country Birds



Could Ireland's Ecosystems Cope If We Introduced St. Patrick's Scaly Foes?

First Successful Extraction of Ancient DNA from a Southern African Mummy

FOSSILS & RUINS



Fossil of 'Early Spider' Discovered; 305 Million Years Old



A World Map of Neanderthal and Denisovan Ancestry in Modern Humans

Human Ancestors Explored 'out of Africa' Despite Impaired Nasal Faculties



More Ancient Viruses Lurk in Our DNA Than We Thought

See fewer ads and support this site.

Contributor works on millions of sites and all of your devices.

Contributor by Google

In Other News

from NewsDaily

SCIENCE

Orbital presses U.S. lawmakers to end ban on retired missiles

Bezos praises third Blue Origin launch-and-land rocket test as 'perfect'

Pentagon awards \$75 million for advanced textiles institute

Europe gives green light to first gene therapy for children

HEALTH

FDA staff finds Intercept's liver drug effective as monotherapy

Exclusive: Makers took big price increases on widely used U.S. drugs

India steps up fight against cigarette firms over health warnings

Europeans spend 24 billion euros on narcotics each year: report

ENVIRONMENT

Lead EU carbon policymaker calls for end to UK price floor to help steel

At least 55 killed in flash floods in northern Pakistan

U.S. judge approves BP settlement for 2010 Gulf of Mexico oil spill

Judge orders U.S. to address climate threat to wolverines

TECHNOLOGY

Twitter to stream Thursday night NFL games in 2016 season

China's ZTE names new management in wake of U.S. export restrictions

Chipmaker Marvell's CEO, president stepping down

Yen for animation inspired Hong Kong designer's robot

Print Email Share

Free Subscriptions

Get the latest science news with ScienceDaily's free email newsletters, updated daily and weekly. Or view hourly updated newsteeds in your RSS reader:

Email Newsletters RSS Feeds

Follow Us

Keep up to date with the latest news from ScienceDaily via social networks:

Facebook Twitter Google+ LinkedIn

Mobile Apps

Get the latest news from ScienceDaily via our free mobile apps, available for download on the following platforms:

iPhone/iPad Android

Have Feedback?

Tell us what you think of ScienceDaily -- we welcome both positive and negative comments. Have any problems using the site? Questions?

Leave Feedback Contact Us