Origins of 'The Hoff' crab revealed (w/ Video)

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Studio close-up of a 'Hoff' Yeti crab from vents in the Indian Ocean. A team led by Oxford University scientists has revealed the history of the Yeti crabs for the first time. Credit: David Shale

The history of a new type of crab, nicknamed 'The Hoff' because of its hairy chest, which lives around hydrothermal vents deep beneath the Southern Ocean and Indian Ocean, has been revealed for the first time.

A team led by Oxford University scientists has found that, far from being 'relics' marooned in their deep sea habitat Yeti crabs (Kiwaidae) are, in evolutionary terms, relative newcomers that diversified 40 million years ago. A report of this first genetic study into the evolution of Yeti crabs is published in this week's *Proceedings of the Royal Society B*.

The 'Hoff' crabs, which have yet to be scientifically described and are probably two separate species, split off from their hairy-clawed Yeti cousins and spread eastwards over undersea ridges from the Pacific, through the Drake Passage between South America and Antarctica, to reach vents in the Southern and Indian Oceans.

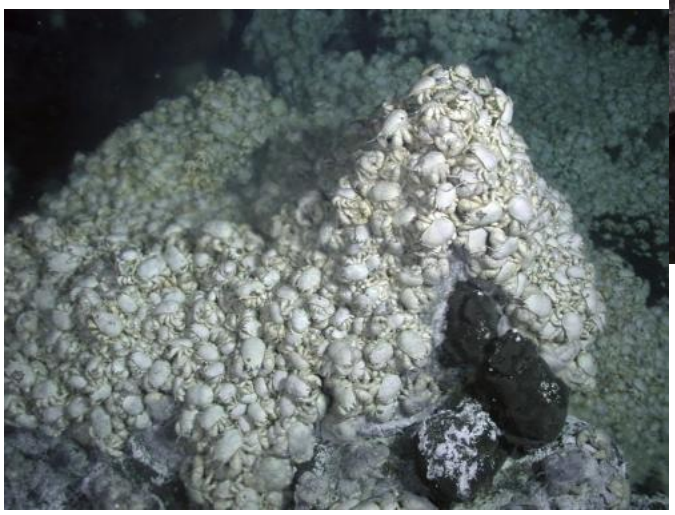
Hoff crabs live in one of the most extreme environments on the planet; over 2000 metres under the sea where volcanic vents superheat the water to c.380 degrees Celsius and belch out noxious chemicals, and there is no light and very little oxygen. They feed by effectively 'farming' bacteria on their hairy chests, then using special comb-like mouthparts to 'strain off' the bacteria so that they can eat them.

Yet, despite their hardiness, the new research by scientists from Oxford University, University of Southampton, and British Antarctic Survey shows that their precarious lifestyle could leave them particularly vulnerable to changes in the oxygen levels of the oceans caused by global warming.

'The life of these charismatic crustaceans is a delicate balancing act,' said Nicolai Roterman of Oxford University's Department of Zoology who led the research and gave the crabs the 'Hoff' nickname. 'They need oxygen to survive, in short supply around the vents, but the bacteria they 'farm' for food depend on chemicals only available near the vents. They exist in the narrow zone where the water from the vents and normal seawater mixes, their challenge is to position themselves close enough to the vents to thrive but not so close that they risk suffocating or getting cooked alive.'

It was once thought that (unlike land or shallow ocean dwellers) creatures living around deep-sea vents might be immune from the effects of extreme climate change, as the vent bacteria they feed on would be unaffected by surface weather patterns. However, a reappraisal of the ages of vent animals in another study suggests that, far from being ancient 'relics', most vent species diversified within the last 55 million years or so, with the previous

inhabitants having gone extinct. The reasons for this are unclear, but a period of intense global warming spanning several million years that started 55 million years ago and dramatically reduced deep-sea oxygen levels globally may be to blame.



'Hoff' Yeti crabs around vents on the East Scotia Ridge in the Southern Ocean photographed by the ROV ISIS. A team led by Oxford University scientists has revealed the history of Yeti crabs for the first time. Credit: CHESSO consortium

The relatively recent origins of the Yeti crabs adds them to the list of vent animals that diversified after this extended episode of global warming and this new research seems to confirm a picture in which the inhabitants of deep-sea vents may be periodically wiped out and vents only repopulated by a wave of new species once conditions become favourable again. During episodes of extreme global warming, circulation between the well oxygenated surface waters and deeper down is thought to decline, leading to the gradual depletion of oxygen in the deep sea.

'Hoff' Yeti crabs around vents on the East Scotia Ridge in the Southern Ocean photographed by the ROV ISIS. Credit: CHESSO consortium

'Yeti crabs and other such creatures may in fact be especially prone to extinction when there is less oxygen available in the deep ocean,' said Nicolai Roterman. 'This is because if deep-sea ocean oxygen levels fall, the amount of oxygen available to these animals, that already live in an oxygen-poor environment at the limits of their physiological tolerance, may drop below the minimum level at which they can survive. They would face the stark choice of 'suffocate or starve'.'

More information: The biogeography of the yeti crabs (Kiwaidae) with notes on the phylogeny of the Chirostyloidea (Decapoda: Anomura), rspb.royalsocietypublishing.or ... .1098/rspb.2013.0718

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