


**VENUS CRATER
DEBATE HEATS UP**

Questions raised over dramatic geological change.
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Cold blamed for Bolivia's mass fish deaths

With high Andean peaks and a humid tropical forest, Bolivia is a country of ecological extremes. But the unusually low winter temperatures experienced by the country's tropical region in July and August hit freshwater species hard, killing an estimated 6 million fish and thousands of alligators, turtles and river dolphins.

Scientists who have visited the affected rivers say the event is the biggest ecological disaster Bolivia has known. They are now scrambling to coordinate research into how it happened, and how quickly the ecosystem may recover.

"There's just a huge number of dead fish," says Michel Jégu, a researcher from the Institute for Developmental Research in Marseilles, France, who is currently working at the Noel Kempff Mercado Natural History Museum in Santa Cruz, Bolivia. "In the rivers near Santa Cruz there's about 1,000 dead fish for every 100 metres of river."

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Decomposing fish have polluted the waters of the Grande, Pirai and Ichilo rivers so badly that local authorities have had to provide alternative sources of drinking water for towns along the rivers' banks.

The blame lies with a mass of Antarctic air that settled over the Southern Cone of South America for most of July. Water temperatures in Bolivian rivers that normally register about 15°C during the day fell as low as 4°C.

"It is not unlikely that the extreme weather conditions in July might have been related to the El Niño–Southern Oscillation [ENSO]," says Fons Smolders, a fisheries scientist at Radboud University in Nijmegen, the Netherlands. "Although it is still debated whether ENSO is affected by climate change, it is generally accepted that climate change has the potential to increase the prevalence and severity of extremes such as heat waves, cold waves, storms, floods and droughts."

Cold weather can sometimes kill freshwater fish by reducing water mixing, starving the animals of oxygen, says Jégu. But Smolders, who has visited the affected area, suspects that additional factors may be involved. "Some of the fish that I saw had white spots that may indicate disease. The cold probably made them very susceptible to all kinds of infections," he says.

"When fish die, it's usually not a single stressor, but multiple stressors interacting," agrees Steven Cooke, an aquatic ecologist at Carleton University in Ottawa, Canada. "If cold shock or cooler temperatures are being implicated in mortality, there's probably something else going on as well."

Jégu and Smolders both plan to study the rivers and lakes affected, in part to assess whether controlled burning of farmland in the region raised pollution levels in the water. ■

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See go.nature.com/oA5JQ1 for a longer version of this story.