Bacteria left a methane mess after spill

Study contradicts notion that microbes consumed most of the gas after 2010 Deepwater Horizon spill.

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Tracking the oil and methane remnants from the 2010 BP spill has proven challenging for researchers.

When the blowout of the Deepwater Horizon oil well sent some 400,000 tonnes of methane into the Gulf of Mexico in April 2010, many scientists and others feared it would linger. So researchers were pleasantly surprised when studies suggested that methane-eating bacteria had consumed nearly all of it by August.

But new evidence suggests an alternate scenario. Research published today in *Nature Geoscience*[1] finds that although these bacteria consumed much of the gas, they slowed down considerably after a few months. In fact, bacteria only consumed roughly half of the methane, according to co-author author Samantha Joye, a microbial biogeochemist and oceanographer at the University of Georgia in Athens.

Feast or famine

The team analysed more than 1,000 water samples collected over more than 105,000 square kilometres during 10 expeditions to the gulf between March and December 2010.

The analysis finds that about two weeks after the blowout, methane oxidation rates – an indication of how much methane the bacteria were consuming – began rising, and increased steadily until early June. But later that month, the feeding frenzy had subsided, with rates tumbling from their peak by one or two orders of magnitude.

“We saw a boom and bust,” says Joye. That decline came, she says, despite ample remaining methane for the bacteria to nosh on.

The team suggests that the boom may have stemmed from super-fast oxidation by a type of bacteria that had been rare in pre-spill samples but proliferated after the spill. The bust, they speculate, may have been due to a crash in the population of methane-eating bacteria, whether, for example, resulting from consumption by other organisms or a need for these ‘super-oxidizers’ to thrive only in extremely high methane concentrations.

Joye says that earlier research[2] suggesting methane-eating bacteria had oxidized all the methane lacked sufficient data. “I don’t think

the researchers misinterpreted their data," she says. "It's just that they had an incomplete data set. Our paper underscores the absolute necessity of making long-term measurements."

Differing interpretations

But David Valentine, a microbial geochemist at the University of California in Santa Barbara, and one of the authors of the earlier work, is not convinced. Valentine still contends that bacteria consumed nearly all of the methane in the plumes. He speculates that the methane Joye's group found was part of a reported 1% of discharged methane that wound up in shallow water instead of in the plumes. "Elevated methane was reported at shallow depths during active discharge at concentrations similar to the ones reported in this work," he says .

Joye counters that any Deepwater Horizon methane found in surface water post-blowout would not have persisted for months; it would have escaped into the atmosphere.

John Kessler, a chemical oceanographer at the University of Rochester in New York, and a lead author of the earlier work, believes the new study doesn't capture the entire story. He notes that the methane plume was vast and heterogeneous. Methane oxidation rates would peak at different times in different places. The earlier findings[2, 3] – that oxidation occurred at unprecedented rates and depleted most of the methane – are based, he says, on a more integrated view of methane oxidation over the plume's entire volume.

But Joye says the conclusion of complete consumption is based on a model that incorporates data from late June showing sluggish methane oxidation, and data from August through September, when researchers found low oxidation rates and no elevated methane. Researchers inferred, therefore, that oxidation rates must have peaked from mid-July to late August. Joye's extensive data counters that model. "Our conclusions of incomplete consumption are based on direct rate measurements over a very large area," Joye says.

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References

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