Researchers find high numbers of heat-loving bacteria in cold Arctic Ocean

September 17 2009

At a latitude of 79 degrees North it is cold. Even during the short arctic summer the mountains stay covered with snow. Max Planck director Bo Barker Jørgensen on board the research vessel FARM. Image: Kristine Barker, Andrew Steen

A team of scientists led by U of C grad Casey Hubert has detected high numbers of heat loving, or thermophilic, bacteria in subzero sediments in the Arctic Ocean off the Norwegian island of Spitsbergen. The bacterial spores might provide a unique opportunity to trace seepages of fluids from hot sub-seafloor habitats, possibly pointing towards undiscovered offshore petroleum reservoirs.

These thermophiles exist in the Arctic Ocean sediment as spores — dormant forms that withstand adverse conditions for long periods, waiting for better times. Experimental incubations at 40 to 60 degrees Celsius revive the Arctic spores, which appear to have been transported from deeper hot spots.

"The genetic similarities to bacteria from hot offshore oil reservoirs are

striking," says Hubert. After completing his PhD in petroleum microbiology at University of Calgary, Hubert traveled to Bremen, Germany, with an NSERC post-doctoral fellowship to study the Arctic thermophiles at the renowned Max Planck Institute for Marine Microbiology. "We expect ongoing surveys will pin-point the source, or sources, of these misplaced microbes. This could have interesting applications if they are really coming up from leaky petroleum reservoirs."

Because these bacteria are anaerobic, their high abundance and steady supply into the sediments indicate they are coming from a huge oxygen-free habitat. Hubert says one source could be a deep pressurized oil reservoir from which upward-leaking hydrocarbons carry bacteria into overlying seawater. Another source could be related to fluid circulation through warm ocean crust at spreading ridges where "black smokers" and other hydrothermal vents are present. The thermophiles must be getting carried out of one of these abyssal hot spots and may be dispersed by ocean currents before ending up as hibernating spores in the cold sediments, where they were discovered.

"We hope further experiments and genetic forensics will reveal the warm source," adds Max Planck Director Prof. Bo Barker Jørgensen.

While the spores might provide an opportunity to track marine hot spots, they also offer fresh insight for understanding biodiversity and the "hidden rare biosphere." The dominant bacterial species in a given environment obscure many minor groups that don't seem to participate in ecosystem functioning. Dormant thermophiles in the cold ocean could be a useful model for understanding how biodiversity is maintained by the passive dispersal of small cells over great distances. "The Arctic thermophiles could hold important clues for solving broader riddles of bio-geography," says Hubert.

More information: A Constant Flux of Diverse Thermophilic Bacteria into the Cold Arctic Seabed by Casey Hubert, Alexander Loy, Maren Nickel, Carol Arnosti, Christian Baranyi, Volker Brüchert, Timothy Ferdelman, Kai Finster, Flemming Mønsted Christensen, Júlia Rosa de Rezende, Verona Vandieken, and Bo Barker Jørgensen, will be published in the journal *Science* on September 18, 2009.

Source: University of Calgary (news : web)