



## WATER RESOURCES RESEARCH GRANT PROPOSAL

**Project ID:** 2002AK7B

**Title:** Luminescent Bacteria: A New Water Quality Issue?

**Project Type:** Research

**Focus Categories:** Water Quality

**Keywords:** Luminescent, bacteria, salmon, freshwater, Yukon River, Alaska

**Start Date:** 03/01/2003

**End Date:** 02/28/2004

**Federal Funds:** \$13795.00

**Matching Funds:** \$27596.00

**Congressional District:** Alaska

**Principal Investigators:** Braddock, Joan F.

**Abstract:** Subsistence fishers from several native villages (e.g., Holy Cross) expressed concern in summer 2001 after observing fish on their drying racks “glowing in the dark.” The phenomenon is caused by growth of luminescent bacteria, common in the marine environment, but generally not found in freshwater. Luminescent bacteria are generally considered to be non-pathogenic. However, the widespread presence of these bacteria in summer 2001 indicates conditions favoring growth of these organisms and potentially other harmful bacteria. In general, it is likely prudent for fishers not to eat fish heavily contaminated with luminescent bacterial growth. In year one of this project we characterized several luminescent bacterial isolates collected from Yukon River salmon. We have used both traditional culturing techniques and molecular techniques to identify these isolates. All of the luminescent strains we have isolated so far are *Photobacterium phosphoreum*. This identification is based on their carbon substrate utilization patterns and on sequencing of the *luxA* and 16S rDNA genes. However, our isolates appear to be distinguishable from known strains of *P. phosphoreum* in that they have lower temperature optima (growing poorly or not at all at 20 °C) and different salt requirements than other identified strains. Previously described strains of *P. phosphoreum* have only been found in marine environments and are believed to be dependent on sodium in the medium. While our strains also appear to require sodium for growth and even viability, they grow at higher growth rates than reference strains in reduced salt

medium. So far our efforts to isolate the bacteria directly from river water have not been successful. In year two of this project we would like to continue sampling fish from the Yukon River, continue to determine where the bacteria naturally occur on this fish, and continue to pursue characterization of the unique temperature and salt requirements of our Alaskan isolates. This work will be included in the master's thesis of Kevin Budsberg who is expected to defend his thesis sometime in winter of 2003/2004. The results of this study are of basic scientific interest, as these bacteria have not previously been found in freshwater environments, and of applied interest to regulators responsible for providing advice to fishers.

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*[U.S. Department of the Interior, U.S. Geological Survey](#)*

*Maintain: [Schefter@usgs.gov](mailto:Schefter@usgs.gov)*

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