

## **Metacommunity dynamics of bacteria in an arctic lake: the impact of species sorting and mass effects on bacterial production and biogeography**

Heather E. Adams<sup>1</sup>, Byron C. Crump<sup>2\*</sup>, and George W. Kling<sup>1</sup>

<sup>1</sup>University of Michigan, Department of Ecology and Evolutionary Biology, Ann Arbor, MI, USA

<sup>2</sup>Oregon State University, College of Earth, Ocean and Atmospheric Science, Corvallis, OR, USA

**Supplemental Table 1.** DNA similarity (1.0 = identical) between sites during transplant experiments and the impact of location on community composition (average similarity of control compared to location treatment). Samples with slashes in the name have the community source environment before the slash and the incubation environment after the slash.

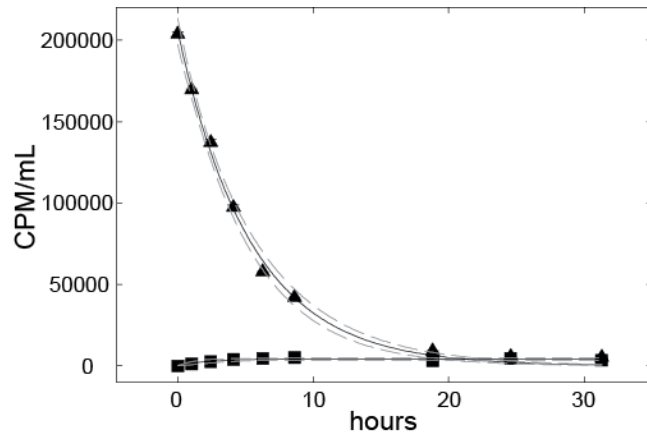
| Date            | Samples compared |              | Similarity |
|-----------------|------------------|--------------|------------|
| 18 July 2006    | I-8 inlet        | I-8 outlet   | 0.38       |
| 18–21 July 2006 | Inlet/inlet      | Inlet/outlet | 0.77       |
| 21 July 2006    | I-8 inlet        | I-8 outlet   | 0.56       |
| 1 Aug. 2006     | I-8 inlet        | I-8 outlet   | 0.51       |
| 1-3 Aug. 2006   | Inlet/inlet      | Inlet/outlet | 0.74       |
| 1-3 Aug. 2006   | Outlet/outlet    | Outlet/inlet | 0.90       |
| 3 Aug. 2006     | I-8 inlet        | I-8 outlet   | 0.55       |

**Supplemental Table 2.** Habitat characteristics during transplant experiments. Transplant experiment collected on 9 Jul 2005 was deployed 12 hours after conditions were measured on 5 Jul 2005.

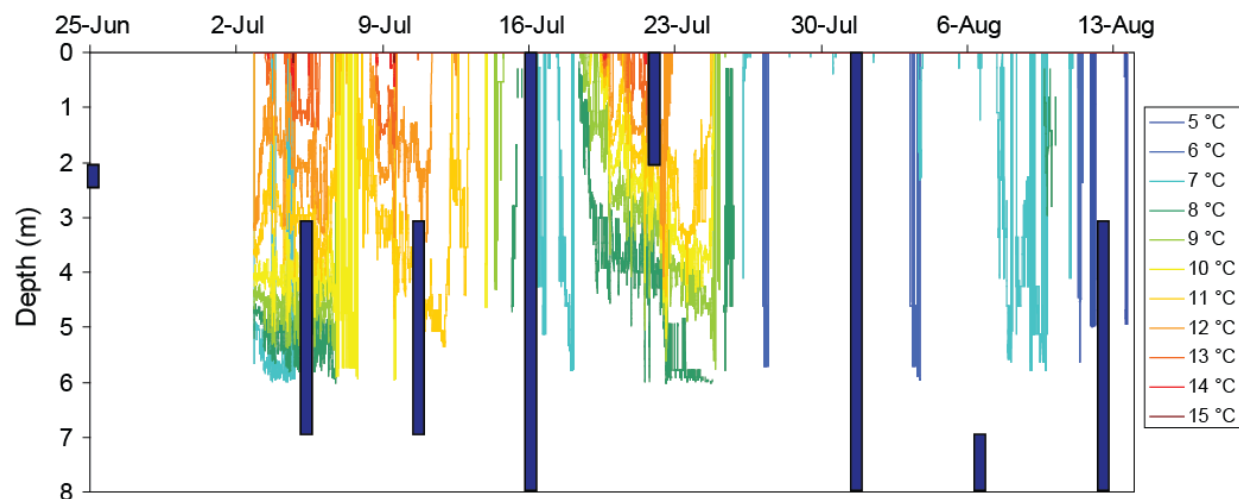
| <i>Date</i> | <i>Site</i> | <b>Temp</b><br>(°C) | <b>BP</b> ( $\mu\text{g}$<br>C/L/d) | <b>Cond</b><br>( $\mu\text{S/cm}$ ) | <b>pH</b> | <b>Chl <i>a</i></b><br>( $\mu\text{g/L}$ ) | <b>Protein</b><br>(mg/L) | <b>Phenolics</b><br>( $\mu\text{M}$ ) | <b>DOC</b><br>( $\mu\text{M}$ ) |
|-------------|-------------|---------------------|-------------------------------------|-------------------------------------|-----------|--|--------------------------|---------------------------------------|---------------------------------|
| 5 Jul 2005  | I-8 inlet   | 7                   | 1.25                                | 123.3                               | 7.28      | 0.21                                       | 0.16                     | 0.06                                  | 268                             |
| 5 Jul 2005  | I-8 outlet  | 12.3                | 7.19                                | 51.2                                | 6.99      | 0.39                                       | 0.29                     | 0.04                                  | 387                             |
| 9 Jul 2005  | I-8 inlet   | 7.2                 | 1.69                                | 62.0                                | 6.29      | 0.18                                       | 0.51                     | 0.81                                  | 615                             |
| 9 Jul 2005  | I-8 outlet  | 10.6                | 11.4                                | 62.2                                | 6.61      | 0.80                                       | 0.53                     | 0.99                                  | 457                             |
| 26 Jul 2005 | I-8 inlet   | 11.2                | 1.42                                | 117.2                               | 7.12      | 0.10                                       | 0.16                     | 0.29                                  | 354                             |
| 26 Jul 2005 | I-8 outlet  | 14.6                | 6.38                                | 67.9                                | 7.61      | 0.75                                       | 0.38                     | 0.78                                  | 527                             |
| 28 Jul 2005 | I-8 inlet   | 11                  | 1.79                                | 124.3                               | 7.66      | 0.90                                       | 0.16                     | 0.27                                  | 351                             |
| 28 Jul 2005 | I-8 outlet  | 14.4                | 10.6                                | 69.5                                | 7.54      | 0.97                                       | 0.34                     | 0.76                                  | 522                             |
| 18 Jul 2006 | I-8 inlet   | 10.1                | 0.85                                | 88.5                                | 8.14      | 0.41                                       | 0.30                     | 0.56                                  | 463                             |
| 18 Jul 2006 | I-8 outlet  | 12.4                | 2.39                                | 69.6                                | 7.65      | 2.10                                       | 0.59                     | 1.05                                  | 574                             |
| 21 Jul 2006 | I-8 inlet   | 8.3                 | 1.16                                | 77.7                                | 7.59      | 0.43                                       | 0.47                     | 0.73                                  | 528                             |
| 21 Jul 2006 | I-8 outlet  | 11.6                | 7.70                                | 72.5                                | 7.39      | 1.72                                       | 0.59                     | 0.95                                  | 564                             |
| 1 Aug 2006  | I-8 inlet   | 10.1                | 0.56                                | 95.9                                | 7.62      | 10.1                                       | 0.45                     | 0.43                                  | 476                             |
| 1 Aug 2006  | I-8 outlet  | 12.6                | 3.86                                | 75.4                                | 7.41      | 12.6                                       | 0.59                     | 0.87                                  | 592                             |
| 3 Aug 2006  | I-8 inlet   | 12.1                | 2.09                                | 100.4                               | 7.72      | 0.65                                       | 0.47                     | 0.48                                  | 457                             |
| 3 Aug 2006  | I-8 outlet  | 12.8                | 10.8                                | 78.4                                | 7.52      | 2.10                                       | 0.62                     | 0.81                                  | 576                             |
| 2 Jul 2007  | I-8 inlet   | 17.6                | 7.15                                | 152.2                               | 7.65      | 0.29                                       | 0.12                     | 0.68                                  | 402                             |
| 2 Jul 2007  | I-8 outlet  | 16.3                | 15.4                                | 79                                  | 7.47      | 0.48                                       | 0.19                     | 0.69                                  | 315                             |
| 4 Jul 2007  | I-8 inlet   | 13.9                | 2.69                                | 158                                 | 7.50      | 0.20                                       | 0.21                     | 0.23                                  | 363                             |
| 4 Jul 2007  | I-8 outlet  | 18.4                | 2.68                                | 74.2                                | 7.25      | 0.29                                       | 0.32                     | 0.03                                  | 427                             |

**Supplemental Table 3.** Limnological variables measured at Lake I-8 during the 4 Jul 2007 intensive spatial sampling (see Kling et al. 2000 for methodology).

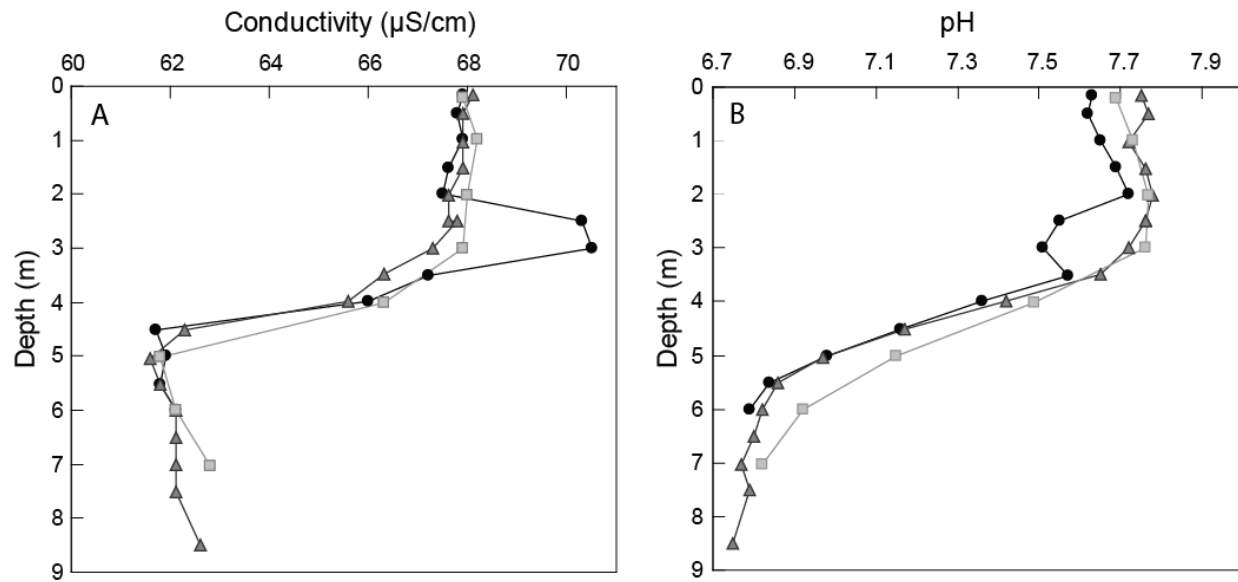
| Site               | Time  | Depth (m) | Temp °C | Cond µS/cm | pH   | Alk µeq/L | DOC µM | NH <sub>4</sub> µM | PO <sub>4</sub> µM | NO <sub>3</sub> µM | TDN µM | TDP µM | Ca µM | Mg µM | Na µM | K µM | Si µM | Oxygen mg/L | Chl <sub>a</sub> µg/L |
|--------------------|-------|-----------|---------|------------|------|-----------|--------|--------------------|--------------------|--------------------|--------|--------|-------|-------|-------|------|-------|-------------|-----------------------|
| I8 Inlet           | 9:55  | 0.01      | 13.9    | 158        | 7.5  | 1418      | 363.3  | 0.35               | 0.02               | 13.82              | 21.1   | 0.08   | 668   | 146   | 22.3  | 5.4  | 30.5  | .           | 0.23                  |
| I8 Inlet Northeast | 9:15  | 0.01      | 11.3    | 208        | 7.53 | 1898      | 427.3  | 0.57               | 0.06               | 18.70              | 24.7   | 0.06   | 917   | 176   | 30.8  | 5.7  | 41.2  | .           | 0.36                  |
| I8 Inlet South     | 14:10 | 0.01      | 16.3    | 143.3      | 6.93 | 1379      | 405.9  | 0.54               | 0.07               | 1.86               | 13.5   | 0.11   | 639   | 114   | 20.4  | 4.4  | 38.0  | .           | 0.41                  |
| I8 Lake Central    | 11:08 | 0.5       | 17.8    | 68.4       | 7.57 | 633.3     | 447.4  | 0.26               | 0.04               | 0.06               | 10.8   | 0.09   | 308   | 66.3  | 12.8  | 7.4  | 16.5  | 8.43        | 1.01                  |
| I8 Lake East       | 10:32 | 0.5       | 17.9    | 68.7       | 7.78 | 650.5     | 456.4  | 0.34               | 0.04               | 0.12               | 12.2   | 0.11   | 309   | 66.3  | 13.4  | 7.7  | 15.9  | 8.74        | 1.02                  |
| I8 Lake Northeast  | 10:15 | 0.5       | 18      | 68.8       | 7.85 | 645       | 444.1  | 0.48               | 0.03               | 0.21               | 12.1   | 0.11   | 312   | 67    | 13.2  | 7.8  | 15.8  | 8.78        | 0.94                  |
| I8 Lake Northwest  | 12:50 | 0.5       | 17.5    | 68.1       | 7.73 | 640.4     | 405.7  | 0.27               | 0.04               | 0.08               | 11.3   | 0.07   | 305   | 66.1  | 12.8  | 7.4  | 16.4  | 8.73        | 1.05                  |
| I8 Lake Southeast  | 10:44 | 0.5       | 18      | 69         | 7.8  | 634.3     | 429.3  | 0.44               | 0.07               | 0.20               | 12.5   | 0.10   | 311   | 67.5  | 27.8  | 9.2  | 19.1  | 8.80        | 0.65                  |
| I8 Lake Southwest  | 11:38 | 0.5       | 17.7    | 67.8       | 7.63 | 616.1     | 448    | 0.25               | 0.04               | 0.18               | 11.1   | 0.12   | 305   | 65.8  | 13.3  | 7.5  | 16.4  | 8.48        | 1.06                  |
| I8 Lake West       | 12:12 | 0.5       | 17.6    | 67.8       | 7.76 | 647.2     | 391.1  | 0.28               | 0.03               | 0.11               | 11.7   | 0.08   | 305   | 66.2  | 12.9  | 7.4  | 16.5  | 8.69        | 0.97                  |
| I8 Lake West       | 12:12 | 6         | 7.76    | 61.8       | 6.82 | 609.9     | 425.9  | 0.52               | 0.05               | 0.32               | 11.8   | 0.14   | 290   | 62.6  | 13.1  | 8.1  | 29.7  | 7.75        | 1.85                  |
| I8 Outlet          | 11:00 | 0.01      | 18.4    | 74.2       | 7.25 | 622.3     | 393.5  | 0.67               | 0.04               | 0.46               | 12.1   | 0.11   | 316   | 68.5  | 13.1  | 7.5  | 17.9  | .           | 0.34                  |



**Supplemental Figure 1.** Diffusion of  $^{14}\text{C}$ -leucine across dialysis bags. Upper line (triangles) is radioactivity of  $^{14}\text{C}$ -labeled leucine measured inside a dialysis bag (in scintillation counts per minute (CPM) per ml), while the lower line is radioactivity measured in the fluid exterior of the bag (squares). Black solid lines are fitted to the curves with exponential equations (decay and increase,  $R^2 = 0.997$  and  $0.84$ ), and gray dashed lines are 95% confidence intervals. Error bars on data points are standard error of the mean.



**Supplemental Figure 2.** Plot of isotherms in Lake I-8 from summer 2003. Bars indicate the depth range where the density of the inflow water from I-8 inlet is the same as the water within the lake (density calculated using measured temperature and salinity).



**Supplemental Figure 3.** Conductivity (left) and pH (right) depth profiles for the sampling transect in the western basin of Lake I-8 on 4 Jul 2007. I-8 southwest station (black circles) clearly shows the influence of the main inlet stream in higher conductivity and lower pH, compared to the west (light gray squares) and northwest (dark gray triangles) stations.