OCN750 – Microbial Biography
Fall 2007

Monday 9:00-10:00am, MSB306

http://www.soest.hawaii.edu/oceanography/zij

Instructor:
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Grading (1 unit):
100% class participation / attendance

Course Description:
The goal of this course is to read and discuss current and seminal papers in microbial biogeography. This course is open to graduate students in biological, chemical and physical oceanography as well as those in microbiology or others with interest in the subject. Students are encouraged to suggest papers for discussion or to solicit ideas from their major professors, but there is a list below to help get us started.

OBJECTIVES:
• To learn how different types of microbes are distributed in different marine environments

• To explore linkages between microbial diversity and ecosystem properties

• To examine potential physical, chemical (and biological) mechanisms responsible for these patterns

Readings:

August 21

Organization

August 27

Longhurst A. Ecological geography of the sea. 1-24. Academic Press. 1998

Hughes-Martiny et al. Microbial biogeography: putting microorganisms on the map. Nature Reviews Microbiology 4, 102-112. 2006

Ramette A. and Tiedje J. Biogeography: An Emerging Cornerstone for Understanding Prokaryotic Diversity, Ecology, and Evolution. Microbial Ecology 53, 197-207.

September 3: No Class (Labor Day)

September 10: Some observations

Bell, T. and others 2005. Larger islands house more bacterial taxa. Science **308:** 1884-1884.

Bowman, J.P., S.A. McCammon, J.A.E. Gibson, L. Robertson, and P.D. Nichols. 2003. Prokaryotic Metabolic Activity and Community Structure in Antarctic Continental Shelf Sediments. Applied and Environmental Microbiology 69: 2448-2462.

Cho, J.C. and J.M. Tiedje. 2000. Biogeography and degree of endemicity of fluorescent Pseudomonas strains in soil. Applied and Environmental Microbiology 66: 5448-5456.

Staley, J.T. and J.J. Gosink. 1999. Poles apart: Biodiversity and biogeography of sea ice bacteria. Annual Review of Microbiology 53: 189-215.

September 17: No Class

September 24: No Class

October 1: Fine scale patterns

Long, R.A. and F. Azam. 2001. Microscale patchiness of bacterioplankton assemblage richness in seawater. Aquatic Microbial Ecology 26: 103-113.

Seymour, J.R., L. Seuront, and J.G. Mitchell. 2005. Microscale and small-scale temporal dynamics of a coastal planktonic microbial community. Marine Ecology-Progress Series 300: 21-37.

October 8: Basin Scale Patterns

Bouman, H.A., O. Ulloa, D.J. Scanlan, K. Zwirglmaier, W.K.W. Li, T. Platt, V. Stuart, R. Barlow, O. Leth, L. Clementson et al. 2006. Oceanographic Basis of the Global Surface Distribution of Prochlorococcus Ecotypes. Science 312: 918-921.

Johnson, Z.I., E.R. Zinser, A. Coe, N.P. McNulty, M. Woodward, and S.W. Chisholm. 2006. Niche partitioning among Prochlorococcus ecotypes along ocean-scale environmental gradients. Science 311: 1737-1740.

Zwirglmaier, K., J.L. Heywood, K. Chamberlain, E.M.S. Woodward, M.V. Zubkov, and D.J. Scanlan. 2007. Basin-scale distribution patterns of picocyanobacterial lineages in the Atlantic Ocean. Environmental Microbiology 9: 1278-1290.

October 15: Virus Biogeography

Breitbart, M. and F. Rohwer. 2005. Here a virus, there a virus, everywhere the same virus? Trends in Microbiology 13: 278-284.

Silander, O.K., D.M. Weinreich, K.M. Wright, K.J. O'Keefe, C.U. Rang, P.E. Turner, and L. Chao. 2005. Widespread genetic exchange among terrestrial bacteriophages. PNAS 102: 19009-19014.

October 22: Metagenomic Patterns

DeLong, E.F., C.M. Preston, T. Mincer, V. Rich, S.J. Hallam, N.-U. Frigaard, A. Martinez, M.B. Sullivan, R. Edwards, B.R. Brito et al. 2006. Community Genomics Among Stratified Microbial Assemblages in the Ocean's Interior. Science 311: 496-503.

Rusch, D.B., A.L. Halpern, G. Sutton, K.B. Heidelberg, S. Williamson, S. Yooseph, D. Wu, J.A. Eisen, J.M. Hoffman, K. Remington et al. 2007. The Sorcerer II Global Ocean Sampling Expedition: Northwest Atlantic through Eastern Tropical Pacific, PLoS. e77.

October 29: Phylogeography

Cohan, F.M. 2002. What are bacterial species? Annual Review of Microbiology 56: 457-487.

Sogin, M.L., H.G. Morrison, J.A. Huber, D.M. Welch, S.M. Huse, P.R. Neal, J.M. Arrieta, and G.J. Herndl. 2006. Microbial diversity in the deep sea and the underexplored "rare biosphere". PNAS 103: 12115-12120.

Thompson, J.R., S. Pacocha, C. Pharino, V. Klepac-Ceraj, D.E. Hunt, J. Benoit, R. Sarma-Rupavtarm, D.L. Distel, and M.F. Polz. 2004. Genotypic diversity within a natural coastal bacterioplankton population. Science 307: 1311-1313.

November 5: Mechamisms

Green, J.L., A.J. Holmes, M. Westoby, I. Oliver, D. Briscoe, M. Dangerfield, M. Gillings, and A.J. Beattie. 2004. Spatial scaling of microbial eukaryote diversity. Nature 432: 747.

Horner-Devine, M.C., M. Lage, J.B. Hughes, and B.J.M. Bohannan. 2004. A taxa-area relationship for bacteria. Nature 432: 750.

November 12: No Class (Veteran's Day)

November 19: Ecological Theory

Hubbell, S.P. 2001. The unified neutral theory of biodiversity and biogeography . Princeton University Press, Princeton.

Whitaker, R.J., D.W. Grogan, and J.W. Taylor. 2003. Geographic barriers isolate endemic populations of hyperthermophilic archaea. Science 301: 976-978.

Finlay, B.J. 2002. Global dispersal of free-living microbial eukaryote species. Science 296: 1061-1063.

November 26: Modeling

Follows, M.J., S. Dutkiewicz, S. Grant, and S.W. Chisholm. 2007. Emergent Biogeography of Microbial Communities in a Model Ocean. Science 315: 1843-1846.

Hood, R., E. Laws, M.J. Follows, and D.A. Siegel. 2007. Modeling and prediction of marine microbial populations in the genomic era. Oceanography 20: 155-165.

December 3: Open