EBS/CMOP Undergraduate Intern Mentoring Opportunity

Project Title:

Dinoflagellate populations associated with *Myrionecta rubra* blooms in the Columbia River estuary

Context for Project:

Columbia River estuary (CRE) is characterized as a detritus-driven, net heterotrophic ecosystem. However, blooms of *Myrionecta rubra*, a planktonic ciliate, occur each year in late summer in the lower CRE. *Myrionecta rubra* harbors cryptophyte chloroplasts and can perform high rates of photosynthesis. Blooms of *M. rubra* have important biogeochemical impacts on the ecosystem. As *M. rubra* is known to be prey of toxic dinoflagellates (Dinophysis), the high biomass of *M. rubra* in the blooms may lead to significant changes of the dinoflagellate populations. So far, little is known about the population dynamics of the dinoflagellates during and after the *M. rubra* blooms. It is important to characterize the dinoflagellate population structure in the lower CRE when *M. rubra* blooms occur in late summer.

Brief description:

The goal of this study is to characterize the influence of the *M. rubra* blooms on the higher trophic levels of the ecosystem. The student's research will contribute to the CMOP initiative II (plankton blooms) and test the hypothesis: **The proliferation of the bloom-forming M. rubra variant promotes the propagation of organisms (Dinophysis) that prey on the ciliate in the estuary and/or the plume.**

The undergraduate intern will collect pre-bloom and bloom water samples within the estuary and post-bloom water samples from the plume during supervised cruises. The microorganism will be filtered onto sterivex filters, and the DNA from the organisms will be extracted. The small subunit, 18S rDNA will be amplified by PCR using oligonucleotide primers specific for dinoflagellates. The PCR fragments will be cloned into a TOPO vector for sequence analysis. The sequences thus obtained will undergo computer-aided phylogenetic analysis to identify dinoflagellate species. The population structure of dinoflagellates will be compared among the prebloom, bloom and post-bloom samples. If time allows, quantitative PCR primers and/or fluorescent in situ hybridization probes will be designed to further study the population dynamics of specific dinoflagellate species.

Proposed Outcomes/Broader Impact: This project will reveal the diversity of dinoflagellates associated with *M. rubra* blooms and probably contribute to a scientific publication.

Proposed timeline (within a 10 week span):

Week 1-6: Familiarize student with field work in CRE, microscopy of protists (crytophytes, ciliates, dinoflagelates) and molecular techniques. Travel to estuary to collect samples and establish 18S clone libraries.

Week 7-10: Analyze sequences data and build phylogenetic trees. Design primers and/ or probes for specific dinoflagellate species.

Intern academic experience and skill set should include:

Molecular lab experience would be great as well as a broad knowledge in microbial ecology or marine biology. Probably a more experienced candidate would be suitable.