Microzooplankton and Plankton Community Structure, Growth and Grazing Rates
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The main objective of this component of the RISE project is to determine and compare the growth and grazing mortality rates of phytoplankton and assess the community composition in the Columbia River plume, Washington and Oregon coasts. The results will help address our central hypotheses that the Washington coast is more productive than the Oregon coast due to the influence of the Columbia River Plume. We used the dilution method to experimentally determine the growth and grazing rates of the whole and size-fractionated phytoplankton community, as well as specific taxa. We used an imaging-in-flow cytometer (FlowCAM) as well as fixed samples, to follow the in situ spatial and temporal changes in the abundance of the major phytoplankton and microzooplankton taxa.

We performed 22 dilution experiments. Six were performed on the Grays Harbor (WA) line and Cape Meares (OR) lines, as well as seven others along the Washington and Oregon coasts. Nine experiments were run in or near the Columbia River Mouth, at different times of the tidal cycle and in "new" and "aged" plume waters. Dilution experiment locations, chlorophyll biomass as well as preliminary growth and grazing rates of the total, >5 um and <5um chlorophyll are shown in Figure X.

The FlowCAM was invaluable for providing near real-time assessments of plankton community composition, which helped guide our experimental planning. We processed over 700 samples during surveys, both from the CTD and Fe fish sampler, which will be used to quantify patterns in distribution of the major taxa of phytoplankton and heterotrophic protists. This will give us an unprecedented fine scale map of plankton taxa tied to concurrent chemical (macronutrients and micronutrients) and hydrographic information.

Some Preliminary Results:

- Large, healthy diatoms dominated the phytoplankton assemblage, but the specific composition varied with location in contrast to June 2005 where the community was quite similar throughout the cruise and generally less healthy.
- Growth rates and biomass were typically higher than in June 2005 on both the Washington and Oregon coasts.
- Phytoplankton growth rates and biomass were consistently higher on the Washington coast than the Oregon coast, with values for growth rates from the area of the Columbia River mouth falling in between.
- Phytoplankton growth rates were not nitrate-limited in plume waters with the exception of "aged" plume water (as tracked by drifter after 2 days).
- On the Washington and Oregon coasts, grazing rates were similar in magnitude. Grazing was lowest in the new plume waters, with values averaging ~0.1 d^{-1}

All chlorophyll analyses, nutrient analyses (Bruland group) and preliminary work-up of the dilution experiment data were done on board the ship. QA/QC of the dilution experiment results, analysis of FlowCAM records and microscopical analyses of plankton samples will be performed in the lab.