The influence of terrestrial subsidies in juvenile fish populations in streams of Glacier Bay, Alaska

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Introduction:

Ice recession within Glacier Bay National Park has opened up new watersheds. These are unique as natural laboratories, and can be used to examine primary succession and colonization by vegetation, invertebrates and fish.

New watersheds have no previous biological communities and therefore colonizers must come from other already colonized areas – this is primary succession. One aspect of our research focuses on fish colonization. Especially which species, their diet and nutrient contributions to the food webs by dead salmonids after spawning.

This research will help us understand the succession in aquatic ecosystems and the impact marine derived nutrients, especially nitrogen, on community assembly.

Study area:

Glacier Bay provides a range of different stream conditions and habitats suited for salmon colonization (Milner, 1994, Milner et al., 2000) yielding an almost unique opportunity to study streams with juvenile salmonid populations in watersheds with different successional stages of terrestrial vegetation. Six streams with different age since deglaciation will be studied during the summers of 2010, 2011 and 2012. The six study streams all possess the following characteristics: (1) gradient <5%, (2) age 35 to 220 years, (3) catchment area 10.0-40.0 km^2, (4) floodplain vegetation varying from negligible to spruce-hemlock forest.

Salmonids diet:

Juvenile salmonids (Coho salmon and Dolly Varden) are captured in minnow traps. The juveniles are sedated with clove oil and identified to species, and then weighed and measured to fork length. Their stomachs are then evacuated using water from a hypodermic syringe, and after some recovery time the fish are released. Stomach content are stored in ethanol and at the University laboratory the stomach dietary compositions are analyzed under a binocular microscope.

Terrestrial input:

Trays are used to capture terrestrial arthropods to assess the level of terrestrial input in streams of different age. When we compare these results with the benthic macroinvertebrate communities and the fish diets we get an idea of the importance of the terrestrial input in the diets of juvenile salmonids. These data are also required to assess potential influences of habitat variability upon juvenile salmonid populations.

Marine derived nitrogen:

Salmonid carcasses might be an important source of marine derived nitrogen (MDN), and are acquired during their feeding period in the ocean which then are left behind as die after spawning. The amount of MDN can be measured using δ15N a stable Nitrogen isotope. Biological samples from the streams are separated into primary producers (leaves), primary consumers (Trichoptera) and secondary consumers (juvenile fish) to measure the MDN incorporated into food webs compared to nitrogen from other sources. In some olders streams MDN can be up to 30% of the N in juvenile fish.

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