Spatial variability of stable isotopes and fossil pigments in surface sediments of Alaskan coastal lakes: Constraints on quantitative estimates of past salmon abundance

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Limnol. Oceanogr., 51(4), 2006, 1637-1647 | DOI: 10.4319/lo.2006.51.4.1637

ABSTRACT: We quantified spatial patterns of stable isotopes of N and C ($\delta^{15}N$, $\delta^{13}C$) and fossil pigment concentrations in the uppermost 10 mm of sediment (,10 yr) from 74 profundal locations and three spawning-stream discharge areas in Lake Nerka, southwest Alaska. Sediment $\delta^{15}N$ (4.3% $\pm$ 0.7%) and $\delta^{13}C$ (-26.3% $\pm$ 1.2%) varied directly ($\delta^{15}N$) or inversely ($\delta^{13}C$) with water column depth, whereas concentrations of most fossil pigments from algae were negatively correlated with depth. Sediment $\delta^{15}N$ and $\delta^{13}C$ were poorly correlated with either fossil pigment abundance or the local densities of spawning salmon. Instead, coastal nursery lakes appeared to integrate marine-derived nutrients rapidly into lakewide nutrient pools, suggesting that while individual cores may be used to reconstruct whole-lake salmon densities, habitat-specific variations of past fish populations cannot be quantified reliably from sedimentary analyses.