Continental-Scale Comparative Analyses of Feeding and Resource Ecology of Juvenile Chinook Salmon Along the Pacific Coast of North America

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During the last two to three decades, the adult return of Chinook salmon has been declining for several stocks, which might be linked to large-scale changes in ocean conditions associated with variability in temperature, nutrients, quantity and quality of habitat and food, and predator assemblages. Understanding and modeling the feeding and resource ecology of juvenile Chinook salmon on a continental scale have never been done because of the challenges in collecting and integrating samples and following consistent protocols. To achieve this scale of comparative analysis, we collected zooplankton, salmon, and forage fish from eight cruises along the coastal regions off northern California, Oregon/Washington, Vancouver Island, Southeast Alaska, eastern Bering Sea, and Chukchi Sea during August through October 2007. We examined stable isotope signatures of nitrogen and carbon and concentrations of mercury in the tissue and stomach contents to understand the continental-scale variability in foodweb dynamics, trophic interactions, and resource base of juvenile Chinook salmon. We found large gradients in the $\delta^{13}C$ signatures along a continental spatial scale that corresponded to regional variability in the diet. Juvenile Chinook salmon up to 200 mm in length showed an ontogenetic niche shift in most regions and then stabilized. Mercury concentrations in juvenile Chinook salmon tissue appear to be linked to growth patterns, not to large-scale loading or mobilization. Finally, we used the zooplankton and forage fish data from the different regions to estimate baseline isotope signatures to compare regional differences in trophic shifts as a function of body size.

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