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Life History Diversity and Energetic Tradeoffs of *Oncorhynchus mykiss* in the Utkholok River, Kamchatka

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Diversity is critical to population resilience over time. Among salmonids, *Oncorhynchus mykiss* have exceptionally diverse life histories, the full extent of which are expressed in the remote and largely untouched rivers of Kamchatka, Russia. In this study we investigate patterns in growth and lipid storage for anadromous and resident life histories of *O. mykiss* observed in the Utkholok River, a tundra-type river in western Kamchatka. The life histories feed across a range of environments that can be generally described as resource rich (ocean) to resource limited (freshwater). We hypothesized that both growth rates and lipid storage would be influenced by feeding environments with more growth and less compensatory lipid storage in the resource-rich environments. Field data were collected using a citizen-science program sponsored by The Conservation Angler. At least five different life history types were inferred from scale analysis and associated with freshwater (riverine), coastal (estuarine, riverine-estuarine), and ocean (typical anadromous, anadromous B) feeding environments. Stable isotopes differentiated the oceanic from the coastal and freshwater life histories but did not distinguish the coastal and freshwater fish from each other. Oceanic life histories grew to a larger body size than coastal and freshwater life histories. Initial growth rates varied with faster-growing life histories (typical anadromous, estuarine) maturing at younger ages than slower-growing life histories (anadromous B, riverine-estuarine, riverine). For females, lipid storage of oceanic fish was highest, coastal fish intermediate, and freshwater fish the lowest. For males, lipid storage of freshwater and coastal life histories was higher than freshwater life histories. For the slower-growing freshwater life history, small fish stored more lipids than large fish; however, lipid storage was not associated with body size in the faster-growing coastal and oceanic life histories. Our results demonstrate that *O. mykiss* life histories allocate energy based on their feeding environment and individual state. Life history diversity is therefore connected to suitability of conditions (e.g., food, temperature) that optimize energy allocations in freshwater, coastal, and oceanic environments.