Title:
Evaluation of energy expenditure in adult salmonids migrating upstream in the Columbia River basin: an assessment based on sequential proximate analysis

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Summary of Presentation:
The Pacific Northwest is currently in the midst of an unprecedented decline of many stocks of anadromous salmonids. One factor potentially limiting salmonid production in the Columbia River basin is an excessive use of energy by adults migrating upstream, yet this notion has received little attention. In 2002, we continued research to document the energy expenditure of upstream migrating adult salmonids in the Columbia and Snake rivers. In the past, this research used electromyogram (EMG) radio telemetry to assess the physiology, energetics, and behavior of fish in the wild. For this work, we assessed the energetics associated with migration, reproductive development, and spawning by conducting a sequential proximate analysis of Yakima River spring chinook salmon as they migrated upstream to their spawning tributary. To provide a baseline energy density estimate for this spring chinook salmon population, we sampled 50 fish at Bonneville Dam that had a PIT tag indicating they originated from the Yakima River. We also sampled fish at Roza Dam on the Yakima River and fish from the spawning grounds that either did or did not successfully spawn. From each fish, we collected a large blood sample and removed (1) the entire gonad, (2) the remaining viscera, and (3) a sample of muscle from just below the anterior portion of the dorsal fin for proximate analysis (i.e., percent fat, protein, ash, and water). In addition, small aliquots of samples (ca. 1 mg) were used for analysis of stable isotope ratios ($*^{13}C$ and $*^{15}N$) to explore this technique as a means to obtain nutritional information on fish without sacrificing them. Although data are still being analyzed, we will present information on: (1) the energy reserves of fish at Bonneville and Roza Dams; (2)the energy reserves of fish from the spawning grounds that either did or did not spawn successfully; and (3) the efficacy of stable isotope data to predict the nutritional status of fish.

Collectively, our results should provide an assessment of the influence of different migration histories on whole-body and tissue specific energy content and the potential for different migration histories (e.g., fish that fallback and delay often compared with those that do not) to leave fish with insufficient energy reserves to successfully reproduce.