Non-direct homing behaviours by adult Chinook salmon in a large, multi-stock river system

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Two non-direct homing behaviours, overshoot of natal tributaries and temporary non-natal tributary use, were evaluated for 5150 radio-tagged spring-summer Chinook salmon Oncorhynchus tshawytscha from 40 populations in the large Columbia River system. Over 7 years, 2–44% (mean = 15%) of individuals within each group temporarily entered presumed non-natal tributaries. In addition, many Chinook salmon from lower river tributaries initially travelled 3 to >250 km upstream in the main-stem river beyond confluences with presumed natal tributaries before returning to the natal sites (‘overshoot’). Both overshoot and temporary tributary use behaviours declined exponentially with increasing distance from the natal tributary. Non-direct homing also increased later in the season as water temperatures rose and was associated with hatchery origin in some cases. The behaviours may reflect a mix of active searching for olfactory cues from natal sites, behavioural thermoregulation and orientation challenges in a large-river migration corridor transformed by dams and reservoirs. While anadromous salmonid homing is generally accurate and precise, these results indicate that route finding can be non-direct, potentially increasing energetic costs and harvest risks during migration.

Key words: behavioural thermoregulation; Chinook salmon; homing; migration; Oncorhynchus; straying.

INTRODUCTION

Extensive migrations and precise homing to natal sites are fundamental to the life histories of anadromous salmonids (Oncorhynchus and Salmo species). Philopatry to natal river systems and even to specific spawning reaches (Quinn et al., 1999; Bentzen et al., 2001) is a distinctive trait that allows adaptation to local conditions and substantial phenotypic, genetic and behavioural variation within species (Quinn et al., 2000; Beacham et al., 2002; Hendry et al., 2002). Adult salmonid homing has been clearly linked to olfactory imprinting on