Long-distance downstream movements by homing adult chinook salmon

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Unusually long downstream movements totalling several hundred kilometres to >1100 km were observed during upstream homing migrations of radio-tagged spring chinook salmon Oncorhynchus tshawytscha in the Columbia and Snake Rivers, U.S.A. Downstream migrants, identified by their repeated ascension and fallback over a series of large hydroelectric dams within the migration corridor, were primarily hatchery-origin males.

Key words: chinook salmon; downstream migration; hatchery; Oncorhynchus; radiotelemetry.

The environmental, reproductive, and genetic cues affecting upstream migration timing and upstream migration rates of adult anadromous salmonids (Oncorhynchus and Salmo) have been well documented (Banks, 1969; Burger et al., 1985; Stewart et al., 2002; Quinn et al., 2002; Keefer et al., 2004a,b). Downstream movements also occur during salmonid homing migrations, and have been reported on a scale of metres to tens of kilometres following fish handling (Bernard et al., 1999; Mäkinen et al., 2000), near migration obstacles (Gowans et al., 1999) and on spawning grounds (Berman & Quinn, 1999; Økland et al., 2001). Relatively little is known, however, about the extent of downstream movements or about how such behaviours affect migration success. The behaviours and traits of a group of salmonids with exceptionally long downstream movements during upstream homing migration within a regulated river system were investigated in the present study.

Results from a large, multi-year radiotelemetry study of thousands of adult salmonid migrations in the Columbia River basin (U.S.A., 46° N; 124° W; Fig. 1) indicate that substantial downstream movements may be much more frequent than previously described. Boggs et al. (2004) described widespread downstream movement by these fishes past hydroelectric dams, a behaviour termed ‘fallback’. On average, 15–22% of the fishes from studied runs of chinook salmon Oncorhynchus tshawytscha (Walbaum) and steelhead

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