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CONSUMPTION OF JUVENILE SALMONIDS BY ADULT STEELHEAD IN THE COWLITZ RIVER, WASHINGTON

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On the Pacific coast of North America, adult hatchery steelhead, *Oncorhynchus mykiss*, commonly return to streams where wild salmonid juveniles also are present. These adult fish may prey on wild juveniles, possibly impairing already depressed populations. Groot and Margolis (1991) mention many instances where salmonids prey on juvenile Pacific salmon. Although some adult Pacific salmon, such as chum, *O. keta*, and pink salmon, *O. gorbuscha*, are thought not to feed in freshwater (Scott and Crossman 1973), others, such as sea-run cutthroat trout, *O. clarki*, do actively feed (Trotter 1997). In the only literature we found on adult steelhead feeding in freshwater, Burns (1974) reported that 95% of steelhead contained food items in Deer and Mill creeks, tributaries of the Sacramento River in California. The most prevalent food items were Trichoptera, followed by aquatic plants and eggs of chinook salmon, *O. tschawytscha*; no juvenile fish were reported. If such a high incidence of feeding involved juvenile salmonids, curtailment of hatchery steelhead programs in some streams might be warranted to protect juveniles of other species. Our study was conducted to add information to that known about the frequency of adult steelhead predation on juvenile salmonids.

The Cowlitz River, a tributary of the lower Columbia River at river kilometer (rkm) 108 (Fig. 1), was chosen as the study site because adult hatchery steelhead and juvenile salmonids were both abundant. From May through October 1994 and 1995, Cowlitz River recreational anglers harvested 12,540 and 7,664 adult summer steelhead, respectively (Washington Department of Fish and Wildlife [WDFW] punchcard data, Olympia, Washington). Summer, rather than winter, steelhead were chosen for this study because winter steelhead were thought to be less likely to prey on juvenile salmonids due to shorter freshwater residency prior to spawning, slower metabolism associated with cooler water temperatures in winter, and reduced abundance of juvenile salmonids in winter. Adult summer steelhead enter the Cowlitz River from May through August and spawn in December and January, whereas winter steelhead enter the river from November through April and typically spawn within a month of arrival. About 80% of Cowlitz River adult summer steelhead enter freshwater after 2 years of ocean residence and are about 62-70 cm fork length (Tipping[1] 1997). Angling regulations allow only the harvest of hatchery-origin fish, identified by the absence of the adipose fin, previously excised from juvenile fish before release.

From March through June 1994 and 1995, two hatcheries on the river released a

[1] Tipping, J.M. 1997. Cowlitz fish biologist annual report for 1996. Washington Department of Fish and Wildlife #H97-03, Olympia, Washington, USA.

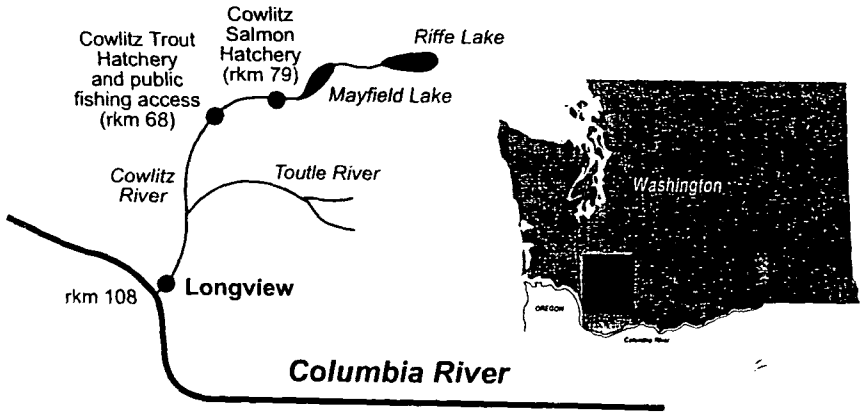

Figure 1. Map of the Cowlitz River with locations of hatcheries noted.

total of 25.4 million juvenile coho salmon, *O. kisutch*; chinook salmon; sea-run cutthroat trout; and steelhead (WDFW planting records, Olympia, Washington). Each year several hundred to thousands of adult fall chinook salmon, spring chinook salmon, coho salmon, and steelhead also spawn naturally in the river (WDFW spawning escapement records, Vancouver, Washington) and produce offspring that may be susceptible to predation by adult steelhead returning from May through October. Although many juvenile salmonids undoubtedly emigrate from the Cowlitz River to the ocean before June, about 6 million juvenile hatchery chinook salmon are liberated in June and some fish from prior liberations may be still present in the river. In addition, based on their extended freshwater life history, many naturally produced juvenile salmonids are present after June. The hatcheries are located and release fish at rkm 68 and rkm 79 (Fig. 1). Most natural spawning (WDFW spawning escapement records, Vancouver, Washington) and much of the recreational fishery occurs between the 2 hatcheries.

We collected stomachs from adult hatchery summer steelhead caught by anglers on the Cowlitz River from June through October 1994 and 1995. Most steelhead stomachs were obtained from anglers using a public access at rkm 68. Boat anglers, commonly fishing from 11 km above to 20 km below the access, caught most of the sampled fish. Collection dates of individual stomachs were not recorded, but most were gathered in July and August, a reflection of angler effort and fish abundance. Steelhead stomachs were injected with a small amount of 37% formalin and placed in 100% ethanol until dissection. During dissection, longitudinal cuts were made through the sides of the stomach. Contents were removed, placed in jars of ethanol, and identified with the unaided eye. Particular care was taken in looking for the remains of fish.

Of 1,041 stomachs examined (n = 232 in 1994, n = 809 in 1995), 116 (11%) contained food, including salmon roe and ghost shrimp, *Callianassa californiensis* (anglers' baits) (84 stomachs); insects (4 stomachs); and detritus (26 stomachs).