Effects of ventral fin and adipose fin clips on survival of coho and fall chinook salmon.

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Our goal was to evaluate how different fin clips affect the return rate of coho and fall chinook salmon. We had two hypotheses. First, survival of coded wire tagged (CWT) coho marked with left ventral clips (CWT +LV) or adipose clips (CWT+AD) was the same. Second, fall chinook marked with CWT only, CWT+AD, CWT+LV or CWT+AD+LV survive equally well.

Methods

We marked hatchery coho and fall chinook with combinations of fin clips and gave each group unique coded-wire tags (Table 1). We sampled returning adults for CWTs using electronic equipment. If we detected a CWT, we examined the fish and noted whether any fins were missing, and if so, the fin clip quality. Because fin clips might not be distinguishable, we used the CWT to assign each fish to the correct treatment.

Results

More coho marked with CWT+AD returned than coho marked with CWT+LV (Figure 1). This difference ranged from a 6% to a 56% decline in survival (Table 1). The effect was not significant ($F=6.19$, $p=0.055$). We estimated that the power of the ANOVA was less than 0.30; we therefore had a 70% chance of committing a Type II error.

Fall chinook returned in descending numbers by fin clip in the following order CWTonly, CWT+AD, CWT+LV, CWT+AD+LV (Fig. 2). Analysis of variance and multiple comparisons showed significantly more fish with CWTonly returned than fish with CWT+AD+LV ($F=7.12$, $p=0.02$). At $p=0.1$, fish marked with CWT+AD+LV also showed a significantly lower return rate than fish marked with CWT+LV or CWT+AD. Compared with fish with CWTonly, declines in returns averaged 8.1% for CWT+AD, 51% for fish marked with CWT+LV, and 63% for fish marked with CWT+AD+LV (Table 1).

Clip type did not affect the length at return in coho or chinook. In both coho and fall chinook, adipose marks were easily identified and most were classified as "good" clips. Left ventral clips had fewer "good" clips than adipose clips, and when combined (AD+LV) the quality generally dropped for both clips.

Discussion

We observed fewer coho with left ventral fin clips returning to hatcheries than coho with adipose clips. The difference was not significant, but because it was very close to significance and the power of the ANOVA was low, we recommend caution when selecting a ventral clip rather than an adipose clip. Our study supports the use of the adipose clip rather than a ventral clip for mass marking. For Washington's coho production of 45.7 million fish annually returning at 2.8%, the average 23% decline we observed by using a ventral clip compared with an adipose clip adds up to 294,000 fewer adults.

For conservative management of chinook, our study would recommend the adipose clip rather than a ventral clip. In Washington, 142.6 million chinook are released annually, and if the left ventral clip were used to mark all these fish rather than an adipose clip, we might expect 47% fewer adults returning. At a return rate of 0.06%, this would be about 40,000 fewer adults. Presumably, other sectors of the fishery would have an equal reduction. Once the decision has been made to release hatchery fish, the choice of mark is an important way that we can influence the number of fish available for harvest.

Table 1: Releases and recoveries of coho and fall chinook. For coho, "relative return as escapement" is relative to the corresponding CWT+AD and for chinook, it is relative to the corresponding CWTonly.

Hatchery	Brood Year	Relative Return Rate					
		CWT+AD	CWT+LV	CWT+AD+LV	CWTonly	CWT+VIF	CWT+VIE
COHO							
Voights Cr	1990	X	-6.0%				
Voights Cr	1991	X	-19.4%	-5.1%			
Soos Cr	1990	X	-17.7%				
Soos Cr	1991	X	-11.5%	-8.9%			
George Adams	1990	X	-55.7%				
Marblemount	1991	X	-31.5%	-24.8%	+3.6%	-58.4%	-16.7%
FALL CHINOOK							
Spring Creek NFH	1992	-23.0%	-65.5%	-80.8%	X		
Spring Creek NFH	1993	-8.1%	-48.9%	-63.5%	X		
Spring Creek NFH	1994	+6.1%	-38.8%	-45.2%	X		

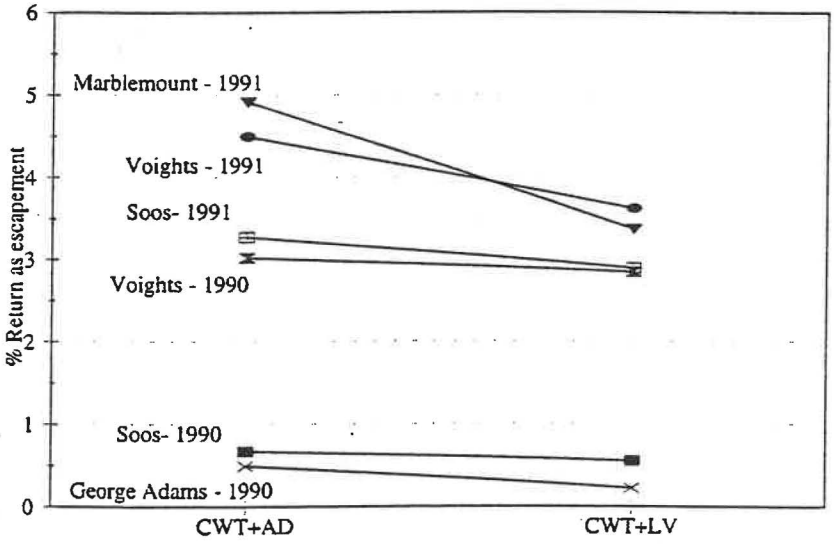

Figure 1: Coho percent return as escapement.

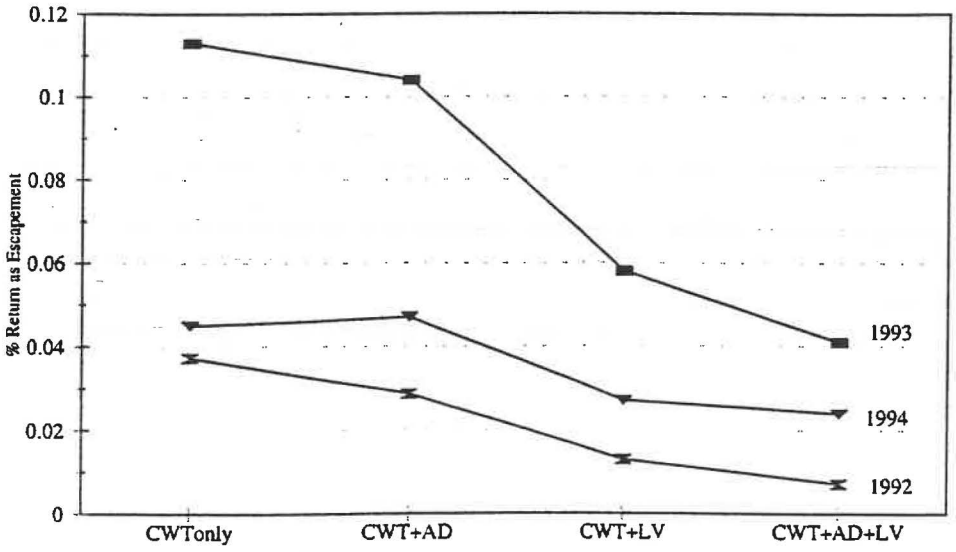

Figure 2: Percent return as escapement of fall chinook released from Spring Creek NFH.