Differential Survival of Ventral Fin and Adipose Fin Clips in fall chinook salmon (Oncorhynchus tshawytscha)

H. Lee Blankenship, Daniel A. Thompson and Steve Olhausen

The Washington Department of Fish and Wildlife (WDFW) and the United States Fish and Wildlife Service (USFWS) began conducting a study in March 1993 to determine the effect on survival of removing the adipose and ventral fin on fall chinook salmon (Oncorhynchus tshawytscha). The study was conducted at Spring Creek National Fish hatchery on the Columbia River for three consecutive brood years beginning with 1992 brood.

For each brood year four groups of chinook were marked and coded wire tagged (CWT) with distinct codes. The four groups included CWT only, CWT/adipose clip, CWT/left ventral clip, and CWT/adipose clip/left ventral clip. The chinook ranged in size from 4.0 g per fish (72 mm FL) for 1992 brood to 2.9 g per fish (65 mm FL) for 1993 and 1994 broods. The fish were reared in the same raceways until their release as 0 age chinook in April-June of each year. One exception to this occurred with the 1992 brood CWT/adipose clip group which was inadvertently released early. Consequently this group was dropped from the analysis.

Quality Control Checks

Quality control checks were performed for each group and brood year to determine CWT loss and poor fin marks. The quality control checks were performed between 18 and 33 days post tagging for the groups and the number of viable CWT's released were adjusted accordingly.

Adult Sampling

During the fall of 1995, '96 and '97 all chinook returning to the Spring Creek hatchery were electronically sampled for the presence of a CWT using a Northwest Marine Technology R-10 CWT detector. If a CWT was detected the chinook was examined to determine which fin(s)(if any) were removed and fin clip quality. Each fish was given an individual head label with the fin clip quality and fork-length recorded. The snout was then removed to retrieve the CWT. Once the CWT was decoded the fish was assigned to the proper treatment. Fin clip quality was defined as "Good" (none to 1/4 of the fin present), "Marginal" (1/4 to 1/2 of the fin present), "Bad" (more than 1/2 of the fin present), and "No Mark" (no apparent fin mark).

Results

The results presented in Table 1 show the number of returning adults by clip type and clip quality for 1992, 93, and 1994 brood years returning in 1995, '96, and 1997. A summary of the differential survival between fin clips for 1992, '93, and '94 brood years is presented in Table 2.

Table 1. Numbers of chinook returning to the Spring Creek hatchery in 1995 and 1996 by fin clip and fin clip quality. Fin clip quality was defined as "Good" (none to 1/4 fin present), "Marginal" (more than 1/4 to 1/2 fin present), "Bad" (greater than 1/2 fin present) and "No Mark" (no apparent fin mark).

1992 Brood Recoveries in 1995 and 1996

Fin Clip	# Recoveries	Survival to Rack	Average fork-length (1996)	Standard Deviation
Coded Wire Tag Only	74	0.037%	80.7 cm	5.8 cm
Left Ventral	26	0.013%	80.1 cm	5.6 cm
Adipose/ Left Ventral	18	0.009%	76.2 cm	6.2 cm

Difference in Survival

Left Ventral clips survived 64.9% less than Coded wire tag only

Left Ventral/Adipose clips survived 75.7% less than Coded wire tag only

Clip Quality

Adipose Clip		Left Ventral		Adipose/Left Ventral			
Good	= 96.4% (54)	Good	= 34.6% (9)	Good	= 77.8% (14)	Good	= 22.2% (4)
Marginal	= 1.8% (1)	Marginal	= 30.8% (8)	Marginal	= 11.1% (2)	Marginal	= 16.7% (3)
Bad	= 1.8% (1)	Bad	= 30.8% (8)	Bad	= 5.5% (1)	Bad	= 44.4% (8)
No Mark	= 0.0%	No Mark	= 3.8% (1)	No Mark	= 5.5% (1)	No Mark	= 16.7% (3)

1993 Brood Recoveries in 1995, '96, and '97

Fin Clip	# Recoveries	Survival to Rack	Average fork-length (1997)	Standard Deviation
Coded Wire Tag Only	220	0.11%	87.1 cm	6.2 cm
Adipose	195	0.10%	87.2 cm	7.9 cm
Left Ventral	112	0.05%	86.5 cm	6.4 cm
Adipose/ Left Ventral	88	0.04%	85.8 cm	7.7 cm

Difference in Survival

Coded wire tag only survived 9.1% higher than adipose clips

Coded wire tag only survived 54.6% higher than left ventral clips

Coded wire tag only survived 63.7% higher than left ventral/adipose clips

Clip Quality

Adipose Clip		Left Ventral		Adipose/Left Ventral			
Good	= 94.4%(184)	Good	= 59.8% (67)	Good	= 83.0% (73)	Good	= 65.9% (58)
Marginal	= 1.5% (3)	Marginal	= 24.1% (27)	Marginal	= 2.2% (2)	Marginal	= 25.9% (21)
Bad	= 3.1% (6)	Bad	= 16.1% (18)	Bad	= 8.0% (7)	Bad	= 6.8% (6)
No Mark	= 1.0% (2)	No Mark	= 0.0%	No Mark	= 6.8% (6)	No Mark	= 3.4% (3)

Table 1. cont.

1994 Brood Recoveries in 1996, and 1997

Fin Clip	# Recoveries	Survival to Rack	Average fork-length (1997)	Standard Deviation
Coded Wire Tag Only	76	0.038%	77.4 cm	6.2 cm
Adipose	76	0.039%	76.1 cm	6.3 cm
Left Ventral	46	0.023%	74.7 cm	6.1 cm
Adipose/ Left Ventral	44	0.022%	74.4 cm	5.4 cm

Difference in Survival

Coded wire tag only survived 2.6% lower than adipose clips

Adipose clips survived 41.1% higher than left ventral clips

Adipose clips survived 43.6% higher than adipose/left ventral clips

Clip Quality

Adipose Clip		Left Ventral		Adipose/Left Ventral			
Good	= 89.5% (68)	Good	= 56.5% (26)	Good	= 88.6% (39)	Good	= 54.5% (24)
Marginal	= 6.6% (5)	Marginal	= 17.4% (8)	Marginal	= 2.3% (1)	Marginal	= 18.2% (8)
Bad	= 3.9% (3)	Bad	= 23.9% (11)	Bad	= 6.8% (3)	Bad	= 18.2% (8)
No Mark	= 0.0%	No Mark	= 2.2% (1)	No Mark	= 2.3% (1)	No Mark	= 9.1% (4)

Table 2. Differential survival of fin clipped and coded-wire tagged fall chinook from Spring Creek hatchery

Brood Year	Mark Applied	# Marked	Rack Recoveries				Return to Escapement	Differential Survival
			Age 2	Age 3	Age 4	Total		Vs CWT Only
1992	CWT Only	198,823	Not Sampled	71	3	74	0.037%	
1992	CWT Ventral	194,496	Not Sampled	23	3	26	0.013%	- 64.9%
1992	CWT Ad/LV	195,497	Not Sampled	16	2	18	0.009%	- 75.7%
1993	CWT Only	194,489	27	133	60	220	0.11%	
1993	CWT Adipose	185,575	28	116	51	195	0.10%	- 9.1%
1993	CWT Ventral	193,745	16	56	40	112	0.05%	- 54.6%
1993	CWT Ad/LV	191,405	15	48	25	88	0.04%	- 63.7%
1994	CWT Only	197,347	12	64	--	76	0.038%	
1994	CWT Adipose	190,205	8	68	--	76	0.039%	+ 2.6%
1994	CWT Ventral	194,127	8	38	--	46	0.023%	- 39.5%
1994	CWT Ad/LV	196,529	3	41	--	44	0.022%	- 42.2%