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Thermal mark patterns Applied to Salmon from Alaska, Washington, Treaty Tribes and Other Northwest States for Brood Year 2000

Peter T. Hagen

J. Ryan Scott

Alaska Department of Fish and Game
P.O. Box 25526
Juneau, Alaska 99821-5526

Eric C. Volk

Jeff J. Grimm

Washington Dept of Fish and Wildlife
600 Capitol Way N.
Olympia, WA 98501

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Abstract

In Washington and Alaska, mass marking of salmon using otolith thermal marking is proving to be an effective research and management tool in a variety of situations. However the specific needs and applications for marking are not same in each state. This document contains a report of thermal mark patterns applied to salmon stocks from the 2000 brood year. It includes release numbers where known and mark patterns applied in Alaska, Washington, Oregon and by Treaty Tribes.

Summary of Alaska Thermal Marking Programs

In Alaska, the primary use of thermal marking is to provide information about the contribution of hatchery fish, primarily pink, chum and sockeye salmon, to commercial and cost-recovery fisheries during the summer fishing season. Several on-going programs use this information as an aid to the in-season management of mixed stock fisheries, and hatcheries use the information to evaluate the success of various release strategies. In research applications, thermal marks have been used to answer questions regarding lake survival and to provide information on straying rates of returning adults. In addition the presence of otolith thermal marks is being used to determine the origin of juvenile and immature salmon collected in the Gulf of Alaska surveys. In many instances, thermal marks, are being applied in hatcheries without a directed sampling program in place. This applies primarily to coho and chinook, but includes some sockeye releases as well. The reasons for this vary, but it is primarily done in situations where the marks cost little to apply and there is an anticipation that a sampling program may be put together by the time the fish return.

Thermal mark patterns are assigned annually by the Alaska Department of Fish and Game with consideration based on the constraints of the hatchery, management needs to identify those stocks and presence of a funded program to recover the thermal patterns. Thermal marking is expected to expand in the next couple of years, and there are increasing difficulties in applying unique thermal patterns.

A list of thermal marks applied to hatchery reared salmon in brood year 2000 is shown in Table 1. The release numbers have not been reported by all the hatchery operations as of this date, but there were a total of 56 different mark groups, and similar to previous years the number is expected to be over 900 million. Strontium marking continued for the second year at Gulkana Hatchery on sockeye and a new program was initiated to thermal mark coho in the SouthCentral region. This new program will include chinook salmon in brood year 2001 and is being conducted to monitor hatchery contributions to recreational fisheries.

The otolith pattern is presented both as the RBr notation (Munk and Geiger 1998) with slight modifications by Hagen (1999) as well as the equivalent Hatch Notation. The Hatch Notation is similar to the RBr code in that thermal rings are considered to be grouped into bands of rings that are evenly spaced. The primary difference is that the hatch event is denoted with an ‘H’, and the position of the ‘H’ in the code indicates what

rings are formed pre or post hatch. Both notations are shown in the tables as well as graphic representation of the mark.

Information regarding thermal marked patterns and numbers of released fish in Alaska is available from the Alaska Deptartment of Fish and Game's Mark, Tag and Age Laboratory database.

For the marks applied to the 2001 brood stock, the intention in Alaska is to apply similar patterns as in previous years. There is a light increase in the number of hatcheries applying thermal marks, though at this point the pattern that will be laid down by all facilities have not been evaluated. Effort is being made to avoid duplicate marks where possible.

Summary of Otolith Thermal Marking Projects by Washington State Department of Fish and Wildlife (WDF&W), Northwest Treaty Tribes and other Western States

In Washington State, mass-marking of hatchery salmon with thermally-induced otolith marks (Volk et al., 1999) is primarily used as an evaluation and research tool where identification of hatchery fish at various life history stages is important. Projects range widely in scope and magnitude, including evaluation of supplementation efforts for stock recovery, assessment of survival rates for different hatchery release strategies, determination of hatchery stray rates and evaluating impacts of hatchery programs on wild stocks. On a more limited scale, thermal marking is also used as an aid to pre-season and in-season management of near-terminal fisheries. WDF&W often acts as a consultant to other western U.S. fisheries agencies using otolith thermal marking. Where information is available, these projects are included in this summary.

A summary of otolith thermal marks applied to brood year 2000 salmon in Washington (WDF&W and State treaty tribes), Oregon and other Western states is presented in Table 2. A total of 23 initiatives are summarized where approximately 35 million juvenile salmon were mass-marked with thermally-induced patterns. Because the majority of these projects are focused upon evaluation or research objectives, it is typical to have unique identifiers for many groups within a single stock. Similarly, because marks in these studies are typically recovered in juveniles or adults from terminal or near-terminal areas, duplicate marks between stocks are not a large problem and redundancy of marks between stocks often occurs. Nearly all thermal-marking efforts are conducted by chilling ambient incubation water, and patterns are typically created using a modified bar code symbology (Volk et al., 1994). In Table 2, the mark patterns are represented as a schematic of thermal events. The Hatch code notation is shown as well which summarizes some of the pattern variation in the marks. For consistency, these patterns could be described according to the RBr coding scheme with some modifications (Hagen 1999) but that was not done here.

We expect that thermal marking efforts will continue at a similar or slightly increased level next year.

References

Munk K.M. and Geiger, H.J. 1998. Thermal Marking of Otoliths: the "RBr" Coding Structure of Thermal Marks (NPAFC Doc. 367). 19 p. Alaska Dept.of Fish and Game, Juneau Alaska

Hagen, P. 1999. A modeling approach to address the underlying structure and constraints of thermal mark codes and code notation. (NPAFC Doc. 395). 12p. Alaska Dept. Fish and Game, Juneau Alaska.

Hagen, P., H.J. Geiger, E.C. Volk, and J.J. Grimm. 1999. Releases of Thermally Marked Salmon from Alaska and Washington in 1999. (NPAFC Doc. 445). 6 p. Alaska Dept. Fish and Game, Juneau Alaska.

Table 1. Summary of thermal mark codes applied to Alaska hatchery salmon in brood year 2000.

SPECIES: SOCKEYE

ID#	MARK TYPE	BROOD YEAR	RELEASE YEAR	DATE LAST RELEASED[1]	SPECIES	STATE/PROVINCE	REGION RELEASE	AGENCY	FACILITY	STOCK
AK00-39	TM	2000	2001		SOCKEYE	AK	Southcentral - II	CIAA	Trail Lakes	Big LK 247-50
AK00-40	TM	2000	2001		SOCKEYE	AK	Southcentral - II	CIAA	Trail Lakes	Hidden LK 244-30
AK00-41	TM	2000	2001		SOCKEYE	AK	Southcentral - II	CIAA	Trail Lakes	Bear LK 231-30
AK00-42	TM	2000	2001		SOCKEYE	AK	Southcentral - II	CIAA	Trail Lakes	Bear LK 231-30
AK00-43	TM	2000	2001		SOCKEYE	AK	Southcentral - II	CIAA	Trail Lakes	Tustumena LK 244-30
AK00-44	TM	2000	2002		SOCKEYE	AK	Southeast - I	DIPAC	Snettisham CIF	Snettisham
AK00-45	TM	2000	2002		SOCKEYE	AK	Southeast - I	DIPAC	Snettisham CIF	Snettisham
AK00-46	TM	2000	2002		SOCKEYE	AK	Southeast - I	DIPAC	Snettisham CIF	Snettisham
AK00-47	TM	2000	2002		SOCKEYE	AK	Southeast - I	DIPAC	Snettisham CIF	Snettisham
AK00-48	TM	2000	2001		SOCKEYE	AK	Southeast - I	DIPAC	Snettisham CIF	Snettisham
AK00-49	TM	2000	2001		SOCKEYE	AK	Southeast - I	DIPAC	Snettisham CIF	Chilkat LK 115-32
AK00-50	TM	2000	2001		SOCKEYE	AK	Southeast - I	DIPAC	Snettisham CIF	S-Tatsemenie LK
AK00-51	TM	2000	2001		SOCKEYE	AK	Southeast - I	DIPAC	Snettisham CIF	S-Tatsemenie LK
AK00-52	TM	2000	2001		SOCKEYE	AK	Southeast - I	DIPAC	Snettisham CIF	S-Tahltan LK
AK00-53	TM	2000	2001		SOCKEYE	AK	Southcentral - II	Port Graham	Port Graham	English Bay
AK00-54	TM	2000	2001		SOCKEYE	AK	Southeast - I	POWHA	Prince of Whales Hatchery	Klawock LK 103-60
AK00-55	TM	2000	2002		SOCKEYE	AK	Southcentral - II	PWSAC	Main Bay Hatchery	Main Bay
AK00-56	TM	2000	2002		SOCKEYE	AK	Southcentral - II	PWSAC	Main Bay Hatchery	Main Bay
AK00-57	TM	2000	2001		SOCKEYE	AK	Southcentral - II	PWSAC	Main Bay Hatchery	Main Bay
AK00-58	TM	2000	2002		SOCKEYE	AK	Southeast - I	SSRAA	Brunett Inlet	McDonald LK 101-80
AK00-59	TM	2000	2001		SOCKEYE	AK	Southeast - I	SSRAA	Brunett Inlet	Hugh Smith LK 101-30
AK00-60	TM	2000	2001		SOCKEYE	AK	Southeast - I	SSRAA	Brunett Inlet	Hugh Smith LK 101-30
AK00-61	SM	2000	2001		SOCKEYE	AK	Southcentral - II	PWSAC	Gulkana Hathcery	Gulkana

ID#	MARK NAME	STAGE	WEIGHT[1]	LENGTH[1]	ESTIMATED RELEASE[1]	RBr CODE	HATCH CODE	PRE-HATCH GRAPHIC	POST-HATCH GRAPHIC	COMMENT
AK00-39	TrailLake00sock	Fry				1:1.3,2.2	3,2H	III II		High IHN Mortality
AK00-40	TrailLake00sock	Fry				1:1.4,2.2	4,2H	IIII II		High IHN Mortality
AK00-41	TrailLake00sock	Fry				1:1.6	6H	IIIIII		High IHN Mortality
AK00-42	TrailLake00sock	Pre-smolt				1:1.6,2.3	6,3H	IIIIII III		High IHN Mortality
AK00-43	TrailLake00sock	Fry				2:1.3,2.3	H3,3		III III	High IHN Mortality
AK00-44	Snett00E/Lsock	Smolt				1:1.3,2.3n+3.3	3,3nH3	III IIII	III	Early-Large
AK00-45	Snett00L/Lsock	Smolt				1:1.3,2.4	3,4H	III IIII		Late-Large
AK00-46	Snett00L/Ssock	Smolt				1:1.4,2.3	4,3H	IIII III		Late-Small
AK00-47	Snett00E/Ssock	Smolt				1:1.4,2.4n	4,4nH	IIII IIII		Early-Small
AK00-48	SWT00sock	Fry				1:1.5,2.3	5,3H	IIIII III		
AK00-49	Chilkat00sock	Fry				1:1.5,2.5n	5,5nH	IIIII IIIII		Anticipated TM 1:1.5+2.4n
AK00-50	Tats00Latesock	Fry				1:1.5+2.3	5H3	IIIII	III	Late-Fed
AK00-51	Tats00Earlysock	Fry				1:1.5	5H	IIIII		Early-Fed
AK00-52	Tahltan00sock	Fry				1:1.7	7H	IIIIIII		Anticipated TM 1:1.7+2.4
AK00-53	PtGraham00sock					1:1.5,2.2	5,2H	IIIII II		
AK00-54	Klawock00sock	Fed Fry				1:1.3,2.2	3,2H	III II		
AK00-55	MainBay00sock	Smolt				1:1.3,2.2+3.2	3,2H2	III II	II	
AK00-56	Coghill00sock	Smolt				1:1.3,2.3+3.2	3,3H2	III III	II	
AK00-57	Solf00sock	Fed Fry				1:1.3,2.4+3.2	3,4H2	III IIII	II	
AK00-58	NeckCr00sock	Smolt				1:1.2,2.5n	2,5n	II IIIII		Released into Neck Creek
AK00-59	HughSmith00sock	Fry				1:1.2,2.3n,3.2	2,3n,2H	II III II		
AK00-60	HughSmith00sock	Fry				1:1.2,2.3n,3.3	2,3n3H	II III III		
AK00-61	Gulkana00sock	Fry	-------	-------	-------	-------	-------	-------	-------	Strotium Chloride Marked

[1]Missing and estimated data due to continued 2001 hatchery production reporting.

Table 1 (continued). Summary of thermal mark codes applied to Alaska hatchery salmon in brood year 2000.

SPECIES: PINK

ID#	MARK TYPE	BROOD YEAR	RELEASE YEAR	DATE LAST RELEASED[1]	SPECIES	STATE/PROVINCE	REGION RELEASE	AGENCY	FACILITY	STOCK
AK00-24	TM	2000	2001		PINK	AK	Southeast - I	Armstrong-Keta	Port Armstrong	Port Armstrong
AK00-25	TM	2000	2001		PINK	AK	Southeast - I	Armstrong-Keta	Port Armstrong	Port Armstrong
AK00-26	TM	2000	2001		PINK	AK	Southeast - I	Armstrong-Keta	Port Armstrong	Port Armstrong
AK00-27	TM	2000	2001		PINK	AK	Southeast - I	DIPAC	Gastineau Hatchery	Gastineau
AK00-28	TM	2000	2001		PINK	AK	Southcentral - II	Port Graham	Port Graham	Port Graham
AK00-29	TM	2000	2001		PINK	AK	Southcentral - II	PWSAC	Cannery Creek Hatchery	Cannery Creek
AK00-30	TM	2000	2001		PINK	AK	Southcentral - II	PWSAC	Cannery Creek Hatchery	Cannery Creek
AK00-31	TM	2000	2001		PINK	AK	Southcentral - II	PWSAC	Cannery Creek Hatchery	Cannery Creek
AK00-32	TM	2000	2001		PINK	AK	Southcentral - II	PWSAC	Armin F. Koernig Hatchery	A F Koernig
AK00-33	TM	2000	2001		PINK	AK	Southcentral - II	PWSAC	Armin F. Koernig Hatchery	A F Koernig
AK00-34	TM	2000	2001		PINK	AK	Southcentral - II	PWSAC	Armin F. Koernig Hatchery	A F Koernig
AK00-35	TM	2000	2001		PINK	AK	Southcentral - II	PWSAC	Wally H.Noerenberg Hatchery	Wally Noerenberg
AK00-36	TM	2000	2001		PINK	AK	Southcentral - II	PWSAC	Wally H.Noerenberg Hatchery	Wally Noerenberg
AK00-37	TM	2000	2001		PINK	AK	Southcentral - II	PWSAC	Wally H.Noerenberg Hatchery	Wally Noerenberg
AK00-38	TM	2000	2001		PINK	AK	Southcentral - II	VFDA	Solomon Gulch Hatchery	Solomon Gulch

ID#	MARK NAME	RELEASE STAGE	WEIGHT[1]	LENGTH[1]	ESTIMATED RELEASE[1]	RBr CODE	HATCH CODE	PRE-HATCH GRAPHIC	POST-HATCH GRAPHIC	COMMENT
AK00-24	PtArm00pink	Fed Fry				1:1.3	3H	I I I		
AK00-25	PtArm00pink	Fed Fry				1:1.3+2.3	3H3	I I I	I I I	
AK00-26	PtArm00pink	Fed Fry				1:1.3+2.4	3H4	I I I	I I I I	
AK00-27	Dipac00pink	Fed Fry			1,500,000	2:1.4	H4		I I I I	Mark appears to be H5
AK00-28	PtGraham00pink	Fed Fry				1:1.4,2.2	4,2H	I I I I I I		
AK00-29	CCH00pink	Fed Fry				1:1.3,2.3	3,3H	I I I I I I		
AK00-30	CCH00pink	Fed Fry				1:1.3,2.3+3.3	3,3H3	I I I I I I	I I I	
AK00-31	CCH00pink	Fed Fry				1:1.3,2.3+3.4	3,3H4	I I I I I I	I I I I	
AK00-32	AFK00pink	Fed Fry				1:1.4	4H	I I I I		
AK00-33	AFK00pink	Fed Fry				1:1.4+2.3	4H3	I I I I	I I I	
AK00-34	AFK00pink	Fed Fry				1:1.4+2.4	4H4	I I I I	I I I I	
AK00-35	WHN00pink	Fed Fry				1:1.8	8H	I I I I I I I I		
AK00-36	WHN00pink	Fed Fry				1:1.8+2.3	8H3	I I I I I I I I	I I I	
AK00-37	WHN00pink	Fed Fry				1:1.8+2.4	8H4	I I I I I I I I	I I I I	
AK00-38	SGH00pink	Fed Fry				1:1.6	6H	I I I I I I		Some lots have 5H pattern

[1]Missing and estimated data due to continued 2001 hatchery production reporting.

Table 1 (continued). Summary of thermal mark codes applied to Alaska hatchery salmon in brood year 2000.

SPECIES: CHINOOK, CHUM, COHO

ID#	MARK TYPE	BROOD YEAR	RELEASE YEAR	DATE LAST RELEASED[1]	SPECIES	STATE/PROVINCE	REGION RELEASE	AGENCY	FACILITY	STOCK
AK00-01	AD+CWT+TM	2000	2002		CHINOOK	AK	Southeast - I	DIPAC	Gastineau	Gastineau
AK00-02	AD+CWT+TM	2000	2002		CHINOOK	AK	Southeast - I	NSRAA	Medvejie	Medvejie
AK00-03	AD+CWT+TM	2000	2002		CHINOOK	AK	Southeast - I	NSRAA	Medvejie	Medvejie
AK00-04	AD+CWT+TM	2000	2002		CHINOOK	AK	Southeast - I	NSRAA	Hidden Falls CIF	Hidden Falls
AK00-05	TM	2000	2001		CHUM	AK	Southeast - I	DIPAC	Gastineau Hatchery	Gastineau
AK00-06	TM	2000	2001		CHUM	AK	Southeast - I	DIPAC	Gastineau Hatchery	Gastineau
AK00-07	TM	2000	2001		CHUM	AK	Southeast - I	DIPAC	Gastineau Hatchery	Gastineau
AK00-08	TM	2000	2001		CHUM	AK	Southeast - I	DIPAC	Gastineau Hatchery	Gastineau
AK00-09	TM	2000	2001		CHUM	AK	Southeast - I	DIPAC	Gastineau Hatchery	Gastineau
AK00-10	TM	2000	2001		CHUM	AK	Southeast - I	NSRAA	Hidden Falls CIF	Hidden Falls
AK00-11	TM	2000	2001		CHUM	AK	Southeast - I	NSRAA	Hidden Falls CIF	Hidden Falls
AK00-12	TM	2000	2001		CHUM	AK	Southeast - I	NSRAA	Medvejie	Hidden Falls
AK00-13	TM	2000	2001		CHUM	AK	Southcentral - II	PWSAC	Wally H.Noerenberg Hatchery	Wally Noerenberg
AK00-14	TM	2000	2001		CHUM	AK	Southcentral - II	PWSAC	Wally H.Noerenberg Hatchery	Wally Noerenberg
AK00-15	AD+CWT+TM	2000	2002		COHO	AK	Southcentral - II	ADFG	Fort Richardson Hatchery	Ship CR 247-50, Jim CR 247-50 , Bear LK 231-30
AK00-16	TM	2000	2002		COHO	AK	Southcentral - II	ADFG	Fort Richardson Hatchery	Bear Lake 231-30
AK00-17	AD+CWT+TM	2000	2002		COHO	AK	Southeast - I	Armstrong-Keta	Port Armstrong	Post Armstrong
AK00-18	TM	2000	2001		COHO	AK	Southcentral - II	CIAA	Trail Lakes	Bear Lake 231-30
AK00-20	TM	2000	2002		COHO	AK	Southcentral - II	CIAA	Trail Lakes	Bear Lake 231-30
AK00-21	AD+CWT+TM	2000	2002		COHO	AK	Southeast - I	DIPAC	Gastineau	Gastineau
AK00-22	TM	2000	2002		COHO	AK	Southcentral - II	PWSAC	Wally H.Noerenberg Hatchery	Wally Noerenberg
AK00-23	TM	2000	2002		COHO	AK	Southcentral - II	VFDA	Solomon Gulch Hatchery	Solomon Gulch

ID#	MARK NAME	RELEASE STAGE	WEIGHT[1]	LENGTH[1]	ESTIMATED RELEASE[1]	RBr CODE	HATCH CODE	PRE-HATCH GRAPHIC	POST-HATCH GRAPHIC	COMMENT
AK00-01	Dipac00chin	Smolt			600,000	1:1.5	5H	I I I I I		
AK00-02	Medvejie00chin	Smolt				1:1.4, 2.3	4,3H	I I I I I I I		
AK00-03	Greenlk00chin	Smolt				1:1.3,2.3	3,3H	I I I I I I		
AK00-04	HF00chin	Smolt				1:1.4,2.2	4,2H	I I I I I I		
AK00-05	Amalga00chum	Fed Fry			40,000,000	1:1.5	5H	I I I I I		
AK00-06	Dipac00chum	Fed Fry			24,000,000	1:1.5+2.3	5H3	I I I I I	I I I	
AK00-07	BoatHbr00chum	Fed Fry			15,000,000	1:1.5+2.4	5H4	I I I I I	I I I I	
AK00-08	Limestone00chum	Fed Fry			15,000,000	1:1.5+2.5	5H5	I I I I I	I I I I I	
AK00-09	AmalgaL/L00chum	Fed Fry			8,000,000	1:1.5+2.6	5H6	I I I I I	I I I I I I	Late-Large Release
AK00-10	HF00chum	Fed Fry	2.15		38,918,758	1:1.3,2.3	3,3H	I I I I I I		
AK00-11	Takatz00chum	Fed Fry	1.85		41,925,954,	1:1.3,2.2	3,2H	I I I I I		
AK00-12	DeepInlet00chum	Fed Fry			14,000,000	1:1.4,2.3	4,3H	I I I I I I I		
AK00-13	PtChalmers00chum	Fed Fry				1:1.3	3H	I I I		
AK00-14	WHN00chum	Fed Fry				1:1.5,2.2	5,2H	I I I I I I I		
AK00-15	FtRich00coho	Smolt				1:1.5	5H	I I I I I		
AK00-16	FtRich00coho	Smolt				1:1.4	4H	I I I I		
AK00-17	PtArm00coho	Smolt				1:1.3	3H	I I I		
AK00-18	TrailLake00coho	Fry			450,000	1:1.3,2.3	3,3H	I I I I I I		
AK00-20	TrailLake00coho	Smolt			150,000	1:1.3,2.3+3.1	3,3H1	I I I I I I	I	Vouchers on Slides
AK00-21	Dipac00coho	Smolt			800,000	1:1.5	5H	I I I I I		
AK00-22	WHN00coho	Smolt				1:1.3	3H	I I I		
AK00-23	SGH00coho	Smolt				1:1.6	6H	I I I I I I		

[1]Missing and estimated data due to continued 2001 hatchery production reporting.

Table 2. Summary of thermal mark codes applied to hatchery salmon in Washington and other states in brood year 2000.

SPECIES: CHINOOK

ID #	Mark Type	Year Brood	Year Released	Date Last Released	Species	State/ Province	Region Released	Agency	Facility	Stock
W00-01	TM	2000	2001		CHINOOK	WASHINGTON	NW	TULALIP TRIBE	BERNIE KAI-KAI GOBIN	SNOHOMISH RIVER
W00-02	TM	2000	2001		CHINOOK	WASHINGTON	NW	TULALIP TRIBE	BERNIE KAI-KAI GOBIN	SNOHOMISH RIVER
W00-03	TM	2000	2001		CHINOOK	WASHINGTON	NW	TULALIP TRIBE	BERNIE KAI-KAI GOBIN	SNOHOMISH RIVER
W00-04	TM	2000	2001		CHINOOK	WASHINGTON	NW	TULALIP TRIBE	BERNIE KAI-KAI GOBIN	SNOHOMISH RIVER
W00-05	Ad+CWT+TM	2000	2001		SUMMER CHINOOK	WASHINGTON	NW	TULALIP TRIBE	BERNIE KAI-KAI GOBIN	SNOHOMISH RIVER
W00-06	TM	2000	2001		CHINOOK	WASHINGTON	NW	TULALIP TRIBE	BERNIE KAI-KAI GOBIN	SNOHOMISH RIVER
W00-23	TM	2000	2001		CHINOOK	WASHINGTON	NW	WDFW	KENDALL CREEK	SPRING
W00-24	TM	2000	2001		CHINOOK	WASHINGTON	NW	WDFW	KENDALL CREEK	SPRING
W00-25	TM	2000	2001		CHINOOK	WASHINGTON	NW	WDFW	KENDALL CREEK	SPRING
W00-26	TM	2000	2001		CHINOOK	WASHINGTON	NW	WDFW	KENDALL CREEK	SPRING
W00-27	TM	2000	2001		CHINOOK	WASHINGTON	NW	WDFW	KENDALL CREEK	SPRING
W00-28	TM	2000	2001		CHINOOK	WASHINGTON	NW	WDFW	KENDALL CREEK	SPRING
W00-29	TM	2000	2001		CHINOOK	WASHINGTON	NW	WDFW	KENDALL CREEK	SPRING
W00-30	TM	2000	2001		CHINOOK	WASHINGTON	NW	WDFW	KENDALL CREEK	SPRING
W00-31	TM	2000	2000-01		CHINOOK	WASHINGTON	NW	WDFW	KENDALL CREEK	SPRING
W00-32	TM	2000	2000-01		CHINOOK	WASHINGTON	NW	WDFW	KENDALL CREEK	SPRING
W00-33	TM	2000	2001		CHINOOK	WASHINGTON	NW	WDFW	KENDALL CREEK	SPRING
W00-34	TM	2000	2001		CHINOOK	WASHINGTON	NW	WDFW	KENDALL CREEK	SPRING
W00-35	TM	2000	2001		CHINOOK	WASHINGTON	NW	WDFW	KENDALL CREEK	SPRING
W00-36	TM	2000	2001		CHINOOK	WASHINGTON	NW	WDFW	KENDALL CREEK	SPRING
W00-45	TM	2000	2001		CHINOOK	WASHINGTON	NW	WDFW	DUNGENESS	SPRING
W00-46	TM	2000	2001		CHINOOK	WASHINGTON	NW	WDFW	DUNGENESS	SPRING
W00-67	TM	2000	2001		CHINOOK	WASHINGTON	NW	LONG LIVE THE KINGS	LILLIWAUP	DUCKABUSH RIVER FALL
W00-68	TM	2000	2001		CHINOOK	WASHINGTON	NW	LONG LIVE THE KINGS	HAMMA HAMMA RSI	HAMMA HAMMA FALL
W00-69	TM	2000	2001		CHINOOK	WASHINGTON	NW	LONG LIVE THE KINGS	HAMMA HAMMA	HAMMA HAMMA FALL
W00-72	TM	2000	2001		CHINOOK	WASHINGTON	SW	USFWS	SPRING CREEK	COLUMBIA RIVER TULE

ID #	Release Site	Stage	Total Released	Hatch code	Prehatch graphic	Posthatch graphic	Temp shift direction	comments
W00-01	TULALIP CREEK	FINGERLING	500,000	2,2H4,4,1	‖ ‖	‖‖‖ ‖‖‖ ‖	chill	
W00-02	TULALIP CREEK	FINGERLING	200,000	2,2H6,2,1	‖ ‖	‖‖‖‖‖ ‖‖ ‖	chill	
W00-03	TULALIP CREEK	FINGERLING	600,000	2,2H3,3,2	‖ ‖	‖‖ ‖‖ ‖‖	chill	
W00-04	TULALIP CREEK	FINGERLING	200,000	1,2H3,5	‖	‖‖	‖‖ ‖‖‖‖	chill
W00-05	TULALIP CREEK	FINGERLING	200,000	1,1,2H1,1,4	‖	‖ ‖‖	‖ ‖‖‖‖	chill
W00-06	TULALIP CREEK	FINGERLING	100,000	1,2,2H3,3,2	‖ ‖‖ ‖‖	‖‖‖ ‖‖‖ ‖‖	chill	
W00-23	ON-SITE	FED FRY	200,000	1,3H2,2	‖ ‖‖	‖ ‖ ‖‖	chill	
W00-24	DEADHORSE CREEK 1 (acclimation)	FED FRY	200,000	1,3H3,1,1	‖ ‖‖	‖‖‖ ‖ ‖	chill	
W00-25	EXCELSIOR CREEK SIDE CHANNEL	FED FRY	200,000	1,3H1,1,2,1	‖ ‖‖	‖ ‖ ‖‖ ‖	chill	
W00-26	DEADHORSE CREEK 2 (acclimation)	FED FRY	200,000	1,3H2,1,2	‖ ‖‖	‖‖ ‖ ‖‖	chill	
W00-27	KIDNEY CREEK	FED FRY	200,000	1,3H1,2,1	‖ ‖‖	‖ ‖‖ ‖	chill	
W00-28	EXCELSIOR CREEK TRIBUTARY	FED FRY	200,000	1,3H3,2,1	‖ ‖‖	‖‖‖ ‖‖ ‖	chill	
W00-29	ON-SITE JUNE RELEASE	FED FRY	200,000	1,3H5	‖ ‖‖	‖‖‖‖	chill	
W00-30	ON-SITE JUNE RELEASE	FED FRY	200,000	1,3H1,1,1,2	‖ ‖‖	‖ ‖ ‖ ‖‖	chill	
W00-31	MAPLE FALLS - CW SPRINGS	FED FRY		1,1,1,1,1H	‖ ‖ ‖ ‖ ‖		chill	
W00-32	SMITH SITE	FED FRY		1,1,3H	‖ ‖ ‖‖		chill	
W00-33	MAPLE FALLS - GLEN	FED FRY		1,1,1H	‖ ‖ ‖		chill	
W00-34	BOULDER CREEK	FED FRY		1,3H4,1	‖ ‖‖	‖‖‖ ‖	chill	
W00-35	HEDRICK SPRING	UNFED FRY		1,3H1,3	‖ ‖‖	‖ ‖‖	chill	
W00-36	HEDRICK SPRING - RSI	EGG		1,3H	‖ ‖‖		chill	
W00-45	DUNGENESS RIVER (acclimation pond)		420,000	1,1H2,2	‖ ‖	‖ ‖ ‖‖	heated	
W00-46	DUNGENESS RIVER		420,000	1,1,1H3,3	‖ ‖ ‖	‖ ‖ ‖ ‖ ‖ ‖	heated	
W00-67		EGG	30,000	1,2,1H	‖ ‖‖ ‖		chill	
W00-68		EGG	45,000	1,3H	‖ ‖‖		chill	
W00-69		EGG	30,000	H1,3		‖ ‖‖	ice	
W00-72	COLUMBIA RIVER	UNFED FRY		4H4,5	‖‖‖	‖‖‖ ‖‖‖‖	chill	

Table 2. (continued) Summary of thermal mark codes applied to hatchery salmon in Washington and other states in brood year 2000.

SPECIES: CHUM & COHO

ID #	Mark Type	Year Brood	Year Released	Date Last Released	Species	State/ Province	Region Released	Agency	Facility	Stock
W00-37	TM	2000	2001		CHUM	WASHINGTON	NW	WDFW	BIG BEEF CREEK	SUMMER
W00-38	TM	2000	2001		CHUM	WASHINGTON	NW	WDFW	BIG BEEF CREEK	SUMMER
W00-39	TM	2000	2001		CHUM	WASHINGTON	NW	WDFW	BIG BEEF CREEK	SUMMER
W00-40	TM	2000	2001		CHUM	WASHINGTON	WEST CENTRAL	WDFW	BINGHAM CREEK	SATSOP SPRINGS REGULAR RUN
W00-47	TM	2000	2001		CHUM	WASHINGTON	NW	WDFW	DUNGENESS	SUMMER
W00-48	TM	2000	2001		CHUM	WASHINGTON	NW	WDFW	DUNGENESS	SUMMER
W00-49	TM	2000	2001		CHUM	WASHINGTON	NW	WDFW	DUNGENESS	SUMMER
W00-50	TM	2000	2001		CHUM	WASHINGTON	WEST CENTRAL	WDFW	GEORGE ADAMS	UNION RIVER SUMMER
W00-51	TM	2000	2001		CHUM	WASHINGTON	WEST CENTRAL	WDFW	GEORGE ADAMS	UNION RIVER SUMMER
W00-53	TM	2000	2001		CHUM	WASHINGTON	SW	WDFW	GRAYS RIVER	REGULAR RUN
W00-54	TM	2000	2001		CHUM	WASHINGTON	SW	WDFW	GRAYS RIVER	REGULAR RUN
W00-55	TM	2000	2001		CHUM	WASHINGTON	NW	WDFW	LILLIWAUP	HAMMA HAMMA
W00-56	TM	2000	2001		CHUM	WASHINGTON	NW	WDFW	LILLIWAUP	HAMMA HAMMA
W00-61	TM	2000	2001		CHUM	WASHINGTON	NW	WDFW	HURD CREEK	JIMMYCOMELATELY CREEK
W00-62	TM	2000	2001		CHUM	WASHINGTON	NW	WDFW	HURD CREEK	JIMMYCOMELATELY CREEK
W00-66	TM	2000	2001		CHUM	WASHINGTON	NW	WDFW	LILLIWAUP	LILLIWAUP RIVER
W00-52	TM	2000	2001		COHO	WASHINGTON	WEST CENTRAL	WDFW	GRAYS RIVER	FORKS CREEK
W00-57	TM	2000	2001		COHO	WASHINGTON	NW	WDFW	HURD CREEK	DUNGENESS
W00-58	TM	2000	2001		COHO	WASHINGTON	NW	WDFW	HURD CREEK	CROCKER LAKE
W00-59	TM	2000	2001		COHO	WASHINGTON	NW	WDFW	HURD CREEK	CROCKER LAKE
W00-60	TM	2000	2001		COHO	WASHINGTON	NW	WDFW	HURD CREEK	CROCKER LAKE

ID #	Release Site	Stage	Total Released	Hatch code	Prehatch graphic	Posthatch graphic	Temp shift direction	comments
W00-37	BIG BEEF CREEK	FED FRY	50,000	1,3H2,3	I III	II III	chill	
W00-38	BIG BEEF CREEK	FED FRY	16,000	1,3H4,1	I III	IIII I	chill	
W00-39	BIG BEEF CREEK	FED FRY	26,000	1,3H1,5	I III	I IIIII	chill	
W00-40	SATSOP SPRINGS	EGG	125,000	1,3H	I III		chill	
W00-47	CHIMACUM CREEK ESTUARY		40,000	1,3H	I III		heated	
W00-48	CHIMACUM CREEK NET PENS		40,000	3,1H	III I		heated	
W00-49	SALMON CREEK		100,000	2,2H	II II		heated	
W00-50	UNION RIVER	EGG	40,000	2,2H	II II		chill	
W00-51	UNION RIVER	FRY	40,000	2,2H2,2	II II	II II	chill	
W00-53	GRAYS RIVER	FED FRY	200,000	2,2H2,2,2	II II	II II II	chill	
W00-54	CHINOOK RIVER	FED FRY	100,000	1,1,2H1,2,1,2	I I II	I II I II	chill	
W00-55	HAMMA HAMMA RIVER	EGG	30,000	1,2,1H	I II I		chill	
W00-56	HAMMA HAMMA RIVER	FRY	40,000	1,2,1H1,2,1	I II I	I II I	chill	
W00-61	JIMMYCOMELATELY CREEK	EGG	16,000	2,2H	II II		chill	
W00-62	JIMMYCOMELATELY CREEK	UNFED FRY	16,000	2,2H2,2	II II	II II	chill	
W00-66	LILLIWAUP RIVER	FRY	19,000	2,2H2,2	II II	II II	chill	
W00-52	FORKS CREEK	EGG	300,000	1,2,1H	I II I		chill	
W00-57	DUNGENESS RIVER	EGG	50,000	2,1,2H	II I II		chill	
W00-58	ANDREWS CREEK	EGG	13,000	2,3H	II III		chill	
W00-59	SNOW CREEK	EGG	13,000	1,1,1H	I I I		chill	
W00-60	CROCKER LAKE	EGG	18,000	3,3H	III III		chill	

Table 2. (continued) Summary of thermal mark codes applied to hatchery salmon in Washington and other states in brood year 2000.

SPECIES: SOCKEYE, KOKANEE, CUTTHROAT

ID #	Mark Type	Year Brood	Year Released	Date Last Released	Species	State/ Province	Region Released	Agency	Facility	Stock
W00-07	TM	2000	2001		SOCKEYE	WASHINGTON	NW	WDFW	LANDSBURG	CEDAR RIVER
W00-08	TM	2000	2001		SOCKEYE	WASHINGTON	NW	WDFW	LANDSBURG	CEDAR RIVER
W00-09	TM	2000	2001		SOCKEYE	WASHINGTON	NW	WDFW	LANDSBURG	CEDAR RIVER
W00-10	TM	2000	2001		SOCKEYE	WASHINGTON	NW	WDFW	LANDSBURG	CEDAR RIVER
W00-11	TM	2000	2001		SOCKEYE	WASHINGTON	NW	WDFW	LANDSBURG	CEDAR RIVER
W00-12	TM	2000	2001		SOCKEYE	WASHINGTON	NW	WDFW	LANDSBURG	CEDAR RIVER
W00-13	TM	2000	2001		SOCKEYE	WASHINGTON	NW	WDFW	LANDSBURG	CEDAR RIVER
W00-14	TM	2000	2001		SOCKEYE	WASHINGTON	NW	WDFW	LANDSBURG	CEDAR RIVER
W00-15	TM	2000	2001		SOCKEYE	WASHINGTON	NW	WDFW	LANDSBURG	CEDAR RIVER
W00-16	TM	2000	2001		SOCKEYE	WASHINGTON	NW	WDFW	LANDSBURG	CEDAR RIVER
W00-17	TM	2000	2001		SOCKEYE	WASHINGTON	NW	WDFW	LANDSBURG	CEDAR RIVER
W00-18	TM	2000	2001		SOCKEYE	WASHINGTON	NW	WDFW	LANDSBURG	CEDAR RIVER
W00-19	TM	2000	2001		SOCKEYE	WASHINGTON	NW	WDFW	LANDSBURG	CEDAR RIVER
W00-20	TM	2000	2001		SOCKEYE	WASHINGTON	NW	WDFW	LANDSBURG	CEDAR RIVER
W00-21	TM	2000	2001		SOCKEYE	WASHINGTON	NW	WDFW	LANDSBURG	CEDAR RIVER
W00-22	TM	2000	2001		SOCKEYE	WASHINGTON	NW	WDFW	LANDSBURG	CEDAR RIVER
W00-63	TM	2000	2001		SOCKEYE	WASHINGTON	WEST COAST	MAKAH TRIBE	HOKO	LAKE OZETTE
W00-64	TM	2000	2001		SOCKEYE	WASHINGTON	WEST COAST	MAKAH TRIBE	HOKO	LAKE OZETTE
W00-65	TM	2000	2001		SOCKEYE	WASHINGTON	WEST COAST	MAKAH TRIBE	HOKO	LAKE OZETTE
W00-41	TM	2000	2001		KOKANEE	IDAHO	N	IDFG	CABINET GORGE	LAKE PEND OREILLE
W00-71	TM	2000	2001		KOKANEE	COLORADO		CDOW	ROARING JUDY	GUNNISON RIVER
W00-42	TM	2000	2001		CUTTHROAT	WASHINGTON	NE	WDFW	COLVILLE	GRAHAM LAKE
W00-43	TM	2000	2001		CUTTHROAT	WASHINGTON	NE	WDFW	COLVILLE	GRAHAM LAKE
W00-44	TM	2000	2002		CUTTHROAT	WASHINGTON	NE	WDFW	COLVILLE	GRAHAM LAKE
W00-70	TM	2000	2001		CUTTHROAT	MONTANA	SW	MDFWP	ANACONDA	YOUNG CREEK WESTSLOPE

ID #	Release Site	Stage	Total Released	Hatch code	Prehatch graphic	Posthatch graphic	Temp shift direction	comments
W00-07	CEDAR RIVER	UNFED FRY	294,500	2,1,3,1H2	II I III I	I I	chill	
W00-08	CEDAR RIVER	UNFED FRY	905,600	7H	IIIIIII		chill	
W00-09	CEDAR RIVER	UNFED FRY	322,400	2,1,3H	II I III		chill	
W00-10	CEDAR RIVER	UNFED FRY	2,240, 000	4H	IIII		chill	
W00-11	CEDAR RIVER	UNFED FRY	2,700,000	4H2,2	IIII	II II	chill	
W00-12	CEDAR RIVER	UNFED FRY	3,000,000	4H1,1,3	IIII	I I III	chill	
W00-13	CEDAR RIVER	UNFED FRY	2,100,000	2,2H1,1,3	II II	I I III	chill	
W00-14	CEDAR RIVER	UNFED FRY	304,000	5H4	IIIII	IIII	chill	
W00-15	CEDAR RIVER	UNFED FRY	99,200	3,3H	III III		chill	
W00-16	CEDAR RIVER	UNFED FRY	84,800	5H	IIIII		chill	
W00-17	CEDAR RIVER	UNFED FRY	559,000	1,3,1H1,3	I III I	I III	chill	
W00-18	CEDAR RIVER	UNFED FRY	210,000	1,2,1H	I II I		chill	
W00-19	CEDAR RIVER	UNFED FRY	200,000	2,1,2H2,2	II I II	II II	chill	
W00-20	CEDAR RIVER	UNFED FRY	608,000	1,4H4	I IIII	IIII	chill	
W00-21	CEDAR RIVER	UNFED FRY	281,600	1,1,2H2,2	I I II	II II	chill	
W00-22	CEDAR RIVER	FED FRY	288,000	1,1,2H7	I I II	IIIIIII	chill	
W00-63		EGG	84,000	3,1,1H	III I I		heated	
W00-64		EGG	63,000	2,1,2H	II I II		heated	
W00-65		EGG	63,000	1,1,3H	I I III		heated	
W00-41	LAKE PEND OREILLE	FED FRY	13,500,000	H1,2,1		I II I	chill	
W00-71		EGG	3,000,000	3H3	III	III	chill	
W00-42	GRAHAM LAKE	EGG	4,000	1,2,1H	I II I		chill	
W00-43	GRAHAM LAKE	FRY	4,000	1,2,1H1,1,3	I II I	I I III	chill	
W00-44	GRAHAM LAKE	YEARLING	4,000	1,2,1H4,1	I II I	IIII I	chill	
W00-70	YOUNG CREEK	EGG	140,000	1,3H	I III		heated	