

**Proposed Thermal Marks for Brood Year 2004 Salmon in Alaska**

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Submitted to the

**NORTH PACIFIC ANADROMOUS FISH COMMISSION**

By

United States of America

May 2004

**This paper may be cited in the following manner:**

Agler, B.A., D.S. Oxman, and R. Josephson. 2004. Proposed thermal marks for brood year 2004 salmon in Alaska. (NPAFC Doc. 757Rev.1) 7 p. Alaska Dept. Fish and Game, Juneau, Alaska. 99801

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### **Abstract**

In Alaska, mass-marking of salmon using otolith thermal marking is an effective research and management tool applicable to a variety of situations. For Brood Year 2004, we plan to mark approximately 31.2 million sockeye, 6.6 million chinook, 448 million chum, 6.7 million coho, and 695 million pink salmon. Salmon will be marked at 16 different hatcheries using 77 thermal marks.

### **Introduction**

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 mark-recovery information as an aid to the in-season management of mixed stock fisheries, and hatcheries use the information to evaluate the success of various rearing and release strategies. In addition, thermal marks are being used to determine the origin of juvenile and immature salmon collected during biotic surveys in the Gulf of Alaska by the National Marine Fisheries Service and as part of the Bering Sea and Aleutian Island Salmon Investigative Study (BASIS) program.

### **Plan for 2004 brood year stocks**

The proposed thermal marks for brood year 2004 salmon are listed in Table 1. We plan to mark approximately 31.2 million sockeye, 6.6 million chinook, 448 million chum, 6.7 million coho, and 695 million pink salmon. Salmon will be marked at 16 different hatcheries using 77 thermal mark patterns. The proposed otolith plan shows how some marks are scheduled to change in future years. Some marks are on an every other year cycle, while others rotate on a three-year cycle. Thermal mark patterns are presented in both the RBr notation (Munk and Geiger 1998), with the modification by Hagen (1999) to include narrow ring bands, as well as in the Hatch Code notation.

## References

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

Table 1. Summary of thermal mark codes to be applied to Alaska hatchery salmon in brood year 2004.

SPECIES: CHINOOK

ID#	MARK TYPE	BROOD YEAR	RELEASE YEAR	DATE LAST RELEASED	SPECIES	STATE/ PROVINCE	REGION RELEASE	AGENCY	FACILITY	STOCK
AK04-01	TM	2004	2006		CHINOOK	Alaska	Southcentral	ADFG	Fort Richardson Hatchery	Cook Inlet
AK04-02	TM	2004	2005		CHINOOK	Alaska	Southcentral	ADFG	Elmendorf Hatchery	Cook Inlet
AK04-03	TM	2004	2006		CHINOOK	Alaska	Southcentral	ADFG	Fort Richardson Hatchery	Crooked Creek
AK04-04	TM	2004	2005		CHINOOK	Alaska	Southcentral	ADFG	Elmendorf Hatchery	Crooked Creek
AK04-05	TM	2004	2006		CHINOOK	Alaska	Southcentral	ADFG	Fort Richardson Hatchery	Ressurrection Bay
AK04-06	TM	2004	2005		CHINOOK	Alaska	Southcentral	ADFG	Elmendorf Hatchery	Ressurrection Bay
AK04-07	TM	2004	2006		CHINOOK	Alaska	Southeast	NSRAA	Medvejie Hatchery	Medvejie
AK04-08	TM	2004	2006		CHINOOK	Alaska	Southeast	NSRAA	Hidden Falls Hatchery	Hidden Falls
AK04-09	TM	2004	2006		CHINOOK	Alaska	Southeast	NSRAA	Medvejie Hatchery	Medvejie
AK04-10	TM	2004	2006		CHINOOK	Alaska	Southeast	DIPAC	Macaulay Hatchery	Macaulay
AK04-11	TM	2004	2005		CHINOOK	Alaska	Southcentral	ADFG	Elmendorf Hatchery	Ressurrection Bay

ID#	MARK NAME	STAGE	WEIGHT	LENGTH	ESIMATED RELEASE	RBr CODE	HATCH CODE	Pre-Hatch Graphic	Post-Hatch Graphic	COMMENTS
AK04-01	COOKINLET04CHIN				1,085,000	1:1.2,2.3	2,3H			Repeat s each year
AK04-02	COOKINLET04CHINZ				315,000	1:1.2,2.3	2,3H			Repeat s each year
AK04-03	PWS04CHIN				315,000	1:1.2,2.4	2,4H			Repeat s each year
AK04-04	PWS04CHINZ				105,000	1:1.2,2.4	2,4H			Repeat s each year
AK04-05	RESURRECTION04CHIN				210,000	1:1.2,2.5	2,5H			Repeat s each year
AK04-06	RESURRECTION04CHINZ				105,000	1:1.2,2.5	2,5H			Repeat s each year
AK04-07	GREENLAKE04CHIN				1,000,000	1:1.3,2.3	3,3H			Repeat s each year
AK04-08	HIDDENFALLS04CHIN				1,500,000	1:1.4,2.2	4,2H			Repeat s each year
AK04-09	MEDVEJIE04				1,300,000	1:1.4,2.3	4,3H			Repeat s each year
AK04-10	DIPAC04CHIN				600,000	2:1.4	H4			Al t er nat es each year
AK04-11	RESURRECTION04CHINZ				105,000	1:1.2,2.6	2,6H			Repeat s each year

SPECIES: COHO

ID#	MARK TYPE	BROOD YEAR	RELEASE YEAR	DATE LAST RELEASED	SPECIES	STATE/ PROVINCE	REGION RELEASE	AGENCY	FACILITY	STOCK
AK04-38	TM	2004	2005		COHO	Alaska	Southcentral	CIAA	Trail Lakes Hatchery	Bear Lake
AK04-39	TM	2004	2005		COHO	Alaska	Southcentral	CIAA	Trail Lakes Hatchery	Bear Lake
AK04-40	TM	2004	2006		COHO	Alaska	Southcentral	PWSAC	Wally H.Noerenberg Hatchery	Wally H.Noerenberg
AK04-41	TM	2004	2006		COHO	Alaska	Southeast	NSRAA	Medvejie Hatchery	Medvejie
AK04-42	TM	2004	2005		COHO	Alaska	Southcentral	ADFG	Fort Richardson Hatchery	Bear Lake
AK04-43	TM	2004	2006		COHO	Alaska	Southeast	DIPAC	Macaulay Hatchery	Macaulay
AK04-44	TM	2004	2006		COHO	Alaska	Southeast	AKI	Port Armstrong Hatchery	Port Armstrong
AK04-45	TM	2004	2005		COHO	Alaska	Southcentral	ADFG	Fort Richardson Hatchery	Ship & Jim Creek

ID#	MARK NAME	STAGE	WEIGHT	LENGTH	ESIMATED RELEASE	RBr CODE	HATCH CODE	Pre-Hatch Graphic	Post-Hatch Graphic	COMMENTS
AK04-38	TRAILLAKES04SMCOHO				450,000	1:1.3,2.3	3,3H			Repeat s each year
AK04-39	TRAILLAKES04LGCOHO				150,000	1:1.3,2.3+3.2	3,3H2			Repeat s each year
AK04-40	WHN04COHO				300,000	1:1.3	3H			Repeat s each year
AK04-41	MEDVEJIE04COHO				2,500,000	1:1.4,2.2	4,2H			Repeat s each year
AK04-42	RESURRECTION04COHO				240,000	1:1.4	4H			Repeat s each year
AK04-43	DIPAC04COHO				800,000	1:1.4	4H			Al t er nat es each year
AK04-44	PORTARMSTRONG04COHO				1,600,000	1:1.5	5H			
AK04-45	COOKINLET04COHO				640,000	1:1.5	5H			Repeat s each year

Table 1 (continued). Summary of thermal mark codes to be applied to Alaska hatchery salmon in brood year 2004.

SPECIES: CHUM

ID#	MARK TYPE	BROOD YEAR	RELEASE YEAR	DATE LAST RELEASED	SPECIES	STATE/ PROVINCE	REGION RELEASE	AGENCY	FACILITY	STOCK
AK04-12	TM	2004	2005		CHUM	Alaska	Southeast	SSRAA	Neets Bay Hatchery	Neets Bay
AK04-13	TM	2004	2005		CHUM	Alaska	Southeast	SSRAA	Neets Bay Hatchery	Neets Bay
AK04-14	TM	2004	2005		CHUM	Alaska	Southeast	SSRAA	Neets Bay Hatchery	Neets Bay
AK04-15	TM	2004	2005		CHUM	Alaska	Southeast	NSRAA	Hidden Falls Hatchery	Hidden Falls
AK04-16	TM	2004	2005		CHUM	Alaska	Southeast	NSRAA	Herman Creek	Chilkat
AK04-17	TM	2004	2005		CHUM	Alaska	Southeast	SSRAA	Neets Bay Hatchery	Neets Bay
AK04-18	TM	2004	2005		CHUM	Alaska	Southeast	NSRAA	Hidden Falls Hatchery	Hidden Falls
AK04-19	TM	2004	2005		CHUM	Alaska	Southeast	NSRAA	Hidden Falls Hatchery	Hidden Falls
AK04-20	TM	2004	2005		CHUM	Alaska	Southeast	NSRAA	Hidden Falls Hatchery	Hidden Falls
AK04-21	TM	2004	2005		CHUM	Alaska	Southcentral	PWSAC	Wally H.Noerenberg Hatchery	Wally H.Noerenberg
AK04-22	TM	2004	2005		CHUM	Alaska	AYK		Nome	
AK04-23	TM	2004	2005		CHUM	Alaska	Southeast	NSRAA	Hidden Falls Hatchery	Hidden Falls
AK04-24	TM	2004	2005		CHUM	Alaska	Southeast	SSRAA	Neets Bay Hatchery	Neets Bay
AK04-25	TM	2004	2005		CHUM	Alaska	Southcentral	PWSAC	Wally H.Noerenberg Hatchery	Wally H.Noerenberg
AK04-26	TM	2004	2005		CHUM	Alaska	Southeast	DIPAC	Macaulay Hatchery	Macaulay
AK04-27	TM	2004	2005		CHUM	Alaska	Southeast	DIPAC	Macaulay Hatchery	Macaulay
AK04-28	TM	2004	2005		CHUM	Alaska	Southeast	DIPAC	Macaulay Hatchery	Macaulay
AK04-29	TM	2004	2005		CHUM	Alaska	Southeast	DIPAC	Macaulay Hatchery	Macaulay
AK04-30	TM	2004	2005		CHUM	Alaska	Southeast	DIPAC	Macaulay Hatchery	Macaulay
AK04-31	TM	2004	2005		CHUM	Alaska	Southeast	DIPAC	Macaulay Hatchery	Macaulay
AK04-32	TM	2004	2005		CHUM	Alaska	Southeast	SSRAA	Neets Bay Hatchery	Neets Bay
AK04-33	TM	2004	2005		CHUM	Alaska	Southeast	NSRAA	Medvejie Hatchery	Medvejie
AK04-34	TM	2004	2005		CHUM	Alaska	Southcentral	PWSAC	Wally H.Noerenberg Hatchery	Wally H.Noerenberg

ID#	MARK NAME	STAGE	WEIGHT	LENGTH	ESIMATED RELEASE	RBr CODE	HATCH CODE	Pre-Hatch Graphic	Post-Hatch Graphic	COMMENTS
AK04-12	ANITABAY04				14,000,000	1:1.1,2.3n,3.2n	1,3n,2nH			
AK04-13	NAKATINLET04FALL	Fall			8,000,000	1:1.1,2.4n,3.2	1,4n,2H			
AK04-14	NEETS BAY04SUM	Summer			47,000,000	1:1.1,2.5n,3.2n	1,5n,2nH			
AK04-15	HIDDENFALLS04				38,000,000	1:1.3,2.2,3.2	3,2,2H			<i>Repeats each year</i>
AK04-16	CHILKAT04					1:1.3,2.2	3,2H			
AK04-17	NAKATINLET04SUM	Summer			8,000,000	1:1.3,2.2n,3.2n	3,2n,2nH			
AK04-18	DEEPINLETHF04				14,000,000	1:1.3,2.3	3,3H			
AK04-19	DEEPINLETHF04LL	Late Large				1:1.3,2.4	3,4H			
AK04-20	HIDDENFALLS04LL	Late Large				1:1.3,2.5	3,5H			
AK04-21	PORTCHALMERS04				25,000,000	1:1.3	3H			
AK04-22	NOME04				25,000,000	1:1.3	3H			
AK04-23	TAKATZ04				42,000,000	1:1.3+2.4	3H4			
AK04-24	KENDRICKBAY04				18,000,000	1:1.3n,2.1n,3.2n	3n,1n,2nH			
AK04-25	WHN04A				75,000,000	1:1.4,2.3	4,3H			
AK04-26	AMALGA04A				40,000,000	1:1.4	4H			<i>three year rotation</i>
AK04-27	GASTINEAU04A				20,000,000	1:1.4+2.3	4H3			<i>three year rotation</i>
AK04-28	GASTINEAU04B				7,000,000	1:1.4+2.3,3.3	4H3,3			<i>three year rotation</i>
AK04-29	BOATHARBOR04				15,000,000	1:1.4+2.4	4H4			<i>three year rotation</i>
AK04-30	LIMESTONE04				15,000,000	1:1.4+2.5	4H5			<i>three year rotation</i>
AK04-31	AMALGA04B				8,000,000	1:1.4+2.6	4H6			<i>three year rotation</i>
AK04-32	NEETS BAY04FALL	Fall			20,000,000	1:1.4n,2.2,3.2n	4n,2,2nH			
AK04-33	DEEPINLETMJ04LL	Late Large			9,000,000	1:1.5	5H			
AK04-34	WHN04B					1:1.6	6H			

Table 1 (continued). Summary of thermal mark codes to be applied to Alaska hatchery salmon in brood year 2004.

SPECIES: SOCKEYE

ID#	MARK TYPE	BROOD YEAR	RELEASE YEAR	DATE LAST RELEASED	SPECIES	STATE/ PROVINCE	REGION RELEASE	AGENCY	FACILITY	STOCK
AK04-57	TM	2004	2005		SOCKEYE	Alaska	Southcentral	CIAA	Trail Lakes Hatchery	Tutsumena Lake
AK04-58	TM	2004	2005		SOCKEYE	Alaska	Southeast	POWHA	Klawock River Hatchery	Klawock Lake
AK04-59	TM	2004	2005		SOCKEYE	Alaska	Southcentral	CIAA	Trail Lakes Hatchery	Bear Lake
AK04-60	TM	2004	2005		SOCKEYE	Alaska	Southeast	SSRAA	Burnett Inlet Hatchery	McDonald Lake
AK04-61	TM	2004	2005		SOCKEYE	Alaska	Southcentral	PWSAC	Main Bay Hatchery	Main Bay
AK04-62	TM	2004	2006		SOCKEYE	Alaska	Southcentral	CIAA	Trail Lakes Hatchery	Bear Lake
AK04-63	TM	2004	2006		SOCKEYE	Alaska	Southeast	DIPAC	Snettisham Hatchery	Snettisham
AK04-64	TM	2004	2006		SOCKEYE	Alaska	Southeast	DIPAC	Snettisham Hatchery	Snettisham
AK04-65	TM	2004	2005		SOCKEYE	Alaska	Southcentral	CIAA	Trail Lakes Hatchery	Hidden Lake
AK04-66	TM	2004	2006		SOCKEYE	Alaska	Southeast	DIPAC	Snettisham Hatchery	Snettisham
AK04-67	TM	2004	2006		SOCKEYE	Alaska	Southeast	DIPAC	Snettisham Hatchery	Snettisham
AK04-68	TM	2004	2005		SOCKEYE	Alaska	Southeast	DIPAC	Snettisham Hatchery	Tatsamenie Lake
AK04-69	TM	2004	2005		SOCKEYE	Alaska	Southeast	DIPAC	Snettisham Hatchery	Tahltan Lake
AK04-70	TM	2004	2005		SOCKEYE	Alaska	Southeast	DIPAC	Snettisham Hatchery	Tatsamenie Lake
AK04-71	TM	2004	2005		SOCKEYE	Alaska	Southeast	DIPAC	Snettisham Hatchery	Snettisham
AK04-72	TM	2004	2005		SOCKEYE	Alaska	Southeast	SSRAA	Burnett Inlet Hatchery	McDonald Lake
AK04-73	TM	2004	2005		SOCKEYE	Alaska	Southeast	DIPAC	Snettisham Hatchery	Tahltan Lake
AK04-74	TM	2004	2005		SOCKEYE	Alaska	Southcentral	CIAA	Trail Lakes Hatchery	Bear Lake
AK04-75	TM	2004	2005		SOCKEYE	Alaska	Southcentral	CIAA	Trail Lakes Hatchery	Big Lake
AK04-76	TM	2004	2005		SOCKEYE	Alaska	Southeast	SSRAA	Burnett Inlet Hatchery	Hugh Smith Lake
AK04-77	TM	2004	2005		SOCKEYE	Alaska	Southeast	SSRAA	Burnett Inlet Hatchery	Hugh Smith Lake

ID#	MARK NAME	STAGE	WEIGHT	LENGTH	ESIMATED RELEASE	RBr CODE	HATCH CODE	Pre-Hatch Graphic	Post-Hatch Graphic	COMMENTS
AK04-57	TUTSUMENA04				6,000,000	1:1.2,2.2	2,2H			
AK04-58	KLAWOCK04				365,000	1:1.2,2.3	2,3H			
AK04-59	BEARLAKE04A				700,000	1:1.2,2.4	2,4H			
AK04-60	BURNETTINLET04	Smolts			40,000	1:1.2,2.5n	2,5nH			
AK04-61	MAINBAY04				8,000,000	1:1.3,2.2	3,2H			Al ternates each year
AK04-62	BEARLAKE04C				250,000	1:1.3,2.3+3.3	3,3H3			
AK04-63	SPEELARM04E/LG	EL			1,500,000	1:1.3,2.3n	3,3nH			
AK04-64	SPEELARM04L/LG	LL			1,500,000	1:1.3,2.4	3,4H			
AK04-65	HIDDENLAKE04				1,100,000	1:1.4,2.2	4,2H			
AK04-66	SPEELARM04L/SM	LS			1,500,000	1:1.4,2.3	4,3H			
AK04-67	SPEELARM04E/SM	ES			1,500,000	1:1.4,2.4n	4,4nH			
AK04-68	TATSAMENIE04A					1:1.4+2.3,3.3	4H3,3			
AK04-69	TUYA04				2,250,000	1:1.4+2.4	4H4			
AK04-70	TATSAMENIE04B				1,000,000	1:1.4+2.5n	4H5n			
AK04-71	SWEETHEART04				526,000	1:1.5,2.3n	5,3nH			
AK04-72	NECKCREEK04				500,000	1:1.2,2.5n+3.4	2,5nH4			
AK04-73	TAHLTAN04				1,500,000	1:1.6+2.4	6H4			
AK04-74	BEARLAKE04B				1,000,000	2:1.4	H4			
AK04-75	BIGLAKE04				1,500,000	2:1.5	H5			
AK04-76	HUGHSMITH04LG	L/L			225,000	1:1.2,2.3,3.2	no release			
AK04-77	HUGHSMITH04SM	E/S			225,000	1:1.2,2.3,3.3	no release			

Table 1 (continued). Summary of thermal mark codes to be applied to Alaska hatchery salmon in brood year 2004.

SPECIES: PINK

ID#	MARK TYPE	BROOD YEAR	RELEASE YEAR	DATE LAST RELEASED	SPECIES	STATE/ PROVINCE	REGION RELEASE	AGENCY	FACILITY	STOCK
AK04-46	TM	2004	2005		PINK	Alaska	Southcentral	PWSAC	Cannery Creek Hatchery	Cannery Creek
AK04-47	TM	2004	2005		PINK	Alaska	Southeast	AKI	Port Armstrong Hatchery	Port Armstrong
AK04-48	TM	2004	2005		PINK	Alaska	Southeast	AKI	Port Armstrong Hatchery	Port Armstrong
AK04-49	TM	2004	2005		PINK	Alaska	Southeast	AKI	Port Armstrong Hatchery	Port Armstrong
AK04-50	TM	2004	2005		PINK	Alaska	Southcentral	PWSAC	Armin F. Koernig Hatchery	Armin F. Koernig
AK04-51	TM	2004	2005		PINK	Alaska	Southcentral	PWSAC	Armin F. Koernig Hatchery	Armin F. Koernig
AK04-52	TM	2004	2005		PINK	Alaska	Southcentral	PWSAC	Armin F. Koernig Hatchery	Armin F. Koernig
AK04-53	TM	2004	2005		PINK	Alaska	Southcentral	VFDA	Solomon Gulch Hatchery	Solomon Gulch
AK04-54	TM	2004	2005		PINK	Alaska	Southcentral	PWSAC	Wally H.Noerenberg Hatchery	Wally H.Noerenberg
AK04-55	TM	2004	2005		PINK	Alaska	Southcentral	PWSAC	Wally H.Noerenberg Hatchery	Wally H.Noerenberg
AK04-56	TM	2004	2005		PINK	Alaska	Southcentral	PWSAC	Wally H.Noerenberg Hatchery	Wally H.Noerenberg

ID#	MARK NAME	STAGE	WEIGHT	LENGTH	ESIMATED RELEASE	RBr CODE	HATCH CODE	Pre-Hatch Graphic	Post-Hatch Graphic	COMMENTS
AK04-46	CCH04				140,000,000	1:1.3,2.3	3,3H			Repeat s each year
AK04-47	PORTARMSTRONG04E	E			35,000,000	1:1.3	3H			Repeat s each year
AK04-48	PORTARMSTRONG04M	M			35,000,000	1:1.3+2.3	3H3			Repeat s each year
AK04-49	PORTARMSTRONG04L	L			15,000,000	1:1.3+2.4	3H4			Repeat s each year
AK04-50	AFK04E				50,000,000	1:1.4	4H			Repeat s each year
AK04-51	AFK04L1				50,000,000	1:1.4+2.3	4H3			Repeat s each year
AK04-52	AFK04L2				50,000,000	1:1.4+2.5	4H5			Repeat s each year
AK04-53	SGH04				200,000,000	1:1.6	6H			Repeat s each year
AK04-54	WHN04EPINK				40,000,000	1:1.8	8H			Repeat s each year
AK04-55	WHN04L1PINK				40,000,000	1:1.8+2.3	8H3			Repeat s each year
AK04-56	WHN0L2PINK				40,000,000	1:1.8+2.5	8H5			Repeat s each year