NPAFC
Doc. 587
Rev. 1
Rev. Date: 2002-Sep-05

Proposed Thermal Marks for Brood Year 2002 Salmon in Japan

by

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Submitted to the

NORTH PACIFIC ANADROMOUS FISH COMMISSION

by

JAPAN

October 2002

This paper may be cited in the following manner:
Kawana, M., S. Urawa, and H. Adachi. 2002. Proposed thermal marks for brood year 2002 salmon in Japan. (NPAFC Doc. 587 rev.1) 4 p. National Salmon Resources Center, Toyohira-ku, Sapporo 062-0922, Japan.

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Abstract

Brood year 2002 salmon (approximately 72 million chum, 1.8 million pink, and 1.8 million masu salmon) will be marked at nine hatcheries with 25 discrete patterns. We plan to mark chum salmon at the Shari, Tsurui, and Yakumo hatcheries in Hokkaido and the Omine Hatchery in northeast Honshu for the first time. In addition, we plan to mark masu salmon at the Shari and Yakumo hatcheries. To distinguish spawning time, three or four discrete marking patterns are planned at the Chitose, Tokushibetsu, Ichani, and Shizunai hatcheries.

Introduction

The aim of thermal mark programs is to provide information for the ocean migration and survival of each regional salmon stocks in Japan (Urawa et al. 2000). Thermal marks are used for juvenile migration, growth, survival, and feeding surveys, and for offshore migration surveys in the Sea of Okhotsk, North Pacific Ocean, and Bering Sea. In addition, we will determine hatchery origins of returning adults using thermal marks. The present report proposes thermal otolith marks applied to brood year 2002 salmon in Japan.

Plan for 2002 brood year stocks

The proposed thermal marks for the 2002 brood year salmon is shown in Tables 1 and 2. We plan to mark brood year 2002 salmon (approximately 72 million chum, 1.8 million pink, and 1.8 million masu salmon) at nine hatcheries with 25 discrete patterns. All chum salmon released from the Shizunai Hatchery will be marked. The differences between the 2002 and 2001 brood

year programs are as follows. We plan to mark chum salmon at the Shari, Tsurui, and Yakumo hatcheries in Hokkaido and the Omine Hatchery in northeast Honshu for the first time. In addition, we plan to mark masu salmon at the Shari and Yakumo hatcheries. To distinguish spawning time, three or four discrete marking patterns are planned at the Chitose, Tokushibetsu, Ichani, and Shizunai hatcheries.

The marking pattern is presented as the RBr notation (Munk and Geiger 1998; Hagen 1999) and Hatch code notation (Hagen et al. 2000). As base mark two rings in the first band have been adopted to distinguish Japanese chum and pink salmon from other stocks since 1999 brood year stocks (Kawana et al. 2000; Urawa et al. 2000). Thermal rings are induced by cooler temperature exposures except for a chum salmon stock at the Shizunai Hatchery (Shizunai02chum-tr).

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Table1. Proposed thermal mark releases from Japan for 2002 brood year stocks of chum and pink salmon.

No	BROOD YEAR	YEAR OF RELEASE	SPECIES	COUNTRY	STATE/ PROVINCE	REGION	AGENCY	FACILITY	STOCK	FINAL RELEASE SITE
J02-1	2002	2003	CHUM	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Chitose Hatchery	Chitose River	Chitose River
J02-2	2002	2003	CHUM	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Chitose Hatchery	Chitose River	Chitose River
J02-3	2002	2003	CHUM	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Chitose Hatchery	Chitose River	Chitose River
J02-4	2002	2003	CHUM	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Chitose Hatchery	Chitose River	Chitose River
J02-5	2002	2003	CHUM	JAPAN	HOKKAIDO	Okhotsk Sea coast	NASREC	Tokushibetsu Hatchery	Tokushibetsu River	Tokushibetsu River
J02-6	2002	2003	CHUM	JAPAN	HOKKAIDO	Okhotsk Sea coast	NASREC	Tokushibetsu Hatchery	Tokushibetsu River	Tokushibetsu River
J02-7	2002	2003	CHUM	JAPAN	HOKKAIDO	Okhotsk Sea coast	NASREC	Tokushibetsu Hatchery	Tokushibetsu River	Tokushibetsu River
J02-8	2002	2003	CHUM	JAPAN	HOKKAIDO	Okhotsk Sea coast	NASREC	Shari Hatchery	Shari River	Shari River
J02-9	2002	2003	CHUM	JAPAN	HOKKAIDO	Nemuro Strait coast	NASREC	Ichani Hatchery	Ichani River	Ichani River
J02-10	2002	2003	CHUM	JAPAN	HOKKAIDO	Nemuro Strait coast	NASREC	Ichani Hatchery	Ichani River	Ichani River
J02-11	2002	2003	CHUM	JAPAN	HOKKAIDO	Nemuro Strait coast	NASREC	Ichani Hatchery	Ichani River	Ichani River
J02-12	2002	2003	CHUM	JAPAN	HOKKAIDO	East Pacific coast	NASREC	Tsurui Hatchery	Kushiro River	Kushiro River
J02-13	2002	2003	CHUM	JAPAN	HOKKAIDO	West Pacific coast	NASREC	Shizunai Hatchery	Shizunai River	Shizunai River
J02-14	2002	2003	CHUM	JAPAN	HOKKAIDO	West Pacific coast	NASREC	Shizunai Hatchery	Shizunai River	Shizunai River
J02-15	2002	2003	CHUM	JAPAN	HOKKAIDO	West Pacific coast	NASREC	Shizunai Hatchery	Shizunai River	Shizunai River
J02-16	2002	2003	CHUM	JAPAN	HOKKAIDO	West Pacific coast	NASREC	Shizunai Hatchery	Shizunai River	Shizunai River
J02-17	2002	2003	CHUM	JAPAN	HOKKAIDO	West Pacific coast	NASREC	Yakumo Hatchery	Yurappu River	Yurappu River
J02-18	2002	2003	CHUM	JAPAN	HONSHU	Pacific coast	NASREC	Katagishi Hatchery	Katagishi River	Katagishi River
J02-19	2002	2003	CHUM	JAPAN	HONSHU	Pacific coast	NASREC	Omine Hatchery	Kitakami River	Kitakami River
J02-20	2002	2003	PINK	JAPAN	HOKKAIDO	Okhotsk Sea coast	NASREC	Tokushibetsu Hatchery	Tokushibetsu River	Tokushibetsu River
J02-21	2002	2003	PINK	JAPAN	HOKKAIDO	Nemuro Strait coast	NASREC	Ichani Hatchery	Ichani River	Ichani River

No	REARING TREATMENT	STAGE	PRELIMINARY NUMBER OF TM RELEASED	OM ID	RBr CODE	HATCH CODE	GRAPHIC IMAGE PREHATCH	GRAPHIC IMAGE POSTHATCH	MARKING SYSTEM
J02-1	fed	fry	2,570,000	Chitose02chum-early	1:1.2,2.3-3.2	2,3-2H			CHILLER
J02-2	fed	fry	1,290,000	Chitose02chum-t	1:1.2,2.3-3.2-4.2	2,3-2-2H			CHILLER
J02-3	fed	fry	18,850,000	Chitose02chum-mid	1:1.2,2.3-3.4	2,3-4H			CHILLER
J02-4	fed	fry	6,000,000	Chitose02chum-late	1:1.2,2.3-3.6	2,3-6H			CHILLER
J02-5	fed	fry	700,000	Tokushibetsu02chum-1	1:1.2,2.1n-3.3n	2,1n-3nH			CHILLER
J02-6	fed	fry	700,000	Tokushibetsu02chum-2	1:1.2,2.3n-3.3n	2,3n-3nH			CHILLER
J02-7	fed	fry	700,000	Tokushibetsu02chum-3	1:1.2,2.3n	2,3nH			CHILLER
J02-8	fed	fry	11,600,000	Shari02chum	1:1.2,2.3n-3.5n	2,3n-5nH			CHILLER
J02-9	fed	fry	1,700,000	Ichani02chum-early	1:1.2,2.9n	2,9nH			CHILLER
J02-10	fed	fry	1,700,000	Ichani02chum-mid	1:1.2,2.7n	2,7nH			CHILLER
J02-11	fed	fry	1,700,000	Ichani02chum-late	1:1.2-2.8n	2-8nH			CHILLER
J02-12	fed	fry	9,100,000	Kushiro02chum	1:1.2,2.4n-3.4n	2,4n-4nH			CHILLER
J02-13	fed	fry	330,000	Shizunai02chum-early	1:1.2,2.2n,3.4n	2,2n,4nH			CHILLER
J02-14	fed	fry	330,000	Shizunai02chum-tr	1:1.2-2.3	2-3H			CHILLER
J02-15	fed	fry	2,650,000	Shizunai02chum-mid	1:1.2,2.6n	2,6nH			CHILLER
J02-16	fed	fry	2,730,000	Shizunai02chum-late	1:1.2,2.1n-3.5n	2,1n-5nH			CHILLER
J02-17	fed	fry	7,500,000	Yurappu02chum	1:1.2,2.2n-3.2n	2,2n-2nH			CHILLER
J02-18	fed	fry	4,000,000	Katagishi02chum	1:1.2,2.4	2,4H			CHILLER
J02-19	fed	fry	1,500,000	Omine02chum	1:1.2,2.2	2,2H			CHILLER
J02-20	fed	fry	800,000	Tokushibetsu02pink	1:1.2-2.3	2-3H			CHILLER
J02-21	fed	fry	1,000,000	Ichani02pink	1:1.2,2.5	2,5H			CHILLER

No	OTOLITH MARK SCHEDULE	TEMP SHIFT DIRECTION	COMMENTS
J02-1	(1X)12C:12H,(1X)12C:24H,(2X)12C:12H,(1X)12C:36H,(2X)12C:12H	down (8-4°C)	spawning date: early and middle September
J02-2	(1X)12C:12H,(1X)12C:24H,(2X)12C:12H,(1X)12C:36H,(1X)12C:12H,(1X)12C:36H,(2X)12C:12H	down (8-4°C)	spawning date: late September
J02-3	(1X)12C:12H,(1X)12C:24H,(2X)12C:12H,(1X)12C:36H,(4X)12C:12H	down (8-4°C)	spawning date: October
J02-4	(1X)12C:12H,(1X)12C:24H,(2X)12C:12H,(1X)12C:36H,(6X)12C:12H	down (8-4°C)	spawning date: November and December
J02-5	(1X)24C:24H,(1X)24C:48H,(1X)12C:36H,(3X)12C:12H	down (8-5°C)	
J02-6	(1X)24C:24H,(1X)24C:48H,(2X)12C:12H,(1X)12C:36H,(3X)12C:12H	down (8-5°C)	
J02-7	(1X)24C:24H,(1X)24C:48H,(3X)12C:12H	down (8-5°C)	
J02-8	(1X)24C:24H,(1X)24C:48H,(2X)12C:12H,(1X)12C:36H,(5X)12C:12H	down (8-4°C)	
J02-9	(1X)24C:24H,(1X)24C:48H,(9X)12C:12H	down (8-4°C)	spawning date: early October
J02-10	(1X)24C:24H,(1X)24C:48H,(7X)12C:12H	down (8-4°C)	spawning date: late October
J02-11	(1X)24C:24H,(1X)24C:72H,(8X)12C:12H	down (8-4°C)	spawning date: middle November
J02-12	(1X)24C:24H,(1X)24C:48H,(3X)12C:12H,(1X)12C:36H,(4X)12C:12H	down (8-4°C)	
J02-13	(1X)24C:24H,(1X)24C:48H,(1X)12C:12H,(1X)12C:36H,(4X)12C:12H	down (10-6°C)	spawning date: early October
J02-14	(2X)24H:24C,(1X)72H:24C,(2X)24H:24C	up (6-10°C)	spawning date: early October
J02-15	(1X)24C:24H,(1X)24C:48H,(6X)12C:12H	down (10-6°C)	spawning date: late October and early November
J02-16	(1X)24C:24H,(1X)24C:48H,(1X)12C:36H,(5X)12C:12H	down (10-6°C)	spawning date: middle November and December
J02-17	(1X)24C:24H,(1X)24C:48H,(1X)12C:12H,(1X)12C:36H,(2X)12C:12H	down (8-4°C)	
J02-18	(1X)12C:12H,(1X),12C:24H,(4X)12C:12H	down (12-8°C)	
J02-19	(1X)24C:24H,(1X)24C:48H,(2X)24C:24H	down (8-4°C)	
J02-20	(1X)24C:24H,(1X)24C:72H,(3X)24C:24H	down (7-4°C)	
J02-21	(1X)24C:24H,(1X)24C:48H,(5X)24C:24H	down (8-4°C)	

Table2. Proposed thermal mark releases from Japan for 2002 brood year stocks of masu salmon.

No	BROOD YEAR	YEAR OF RELEASE	SPECIES	COUNTRY	STATE/ PROVINCE	REGION	AGENCY	FACILITY	STOCK	FINAL RELEASE SITE
J02-22	2002	2003	MASU	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Yakumo Hatchery	Shiribetsu River	Shubuto River
J02-23	2002	2003	MASU	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Yakumo Hatchery	Shiribetsu River	Shiribetsu River
J02-24	2002	2003	MASU	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Chitose Hatchery	Shiribetsu River	Shiribetsu River
J02-25	2002	2003	MASU	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Chitose Hatchery	Chitose River	Chitose River
J02-26	2002	2003	MASU	JAPAN	HOKKAIDO	Okhotsk Sea Coast	NASREC	Shari Hatchery	Shari River	Shari River
J02-27	2002	2003	MASU	JAPAN	HOKKAIDO	Okhotsk Sea Coast	NASREC	Shari Hatchery	Shari River	Shari River
J02-28	2002	2003	MASU	JAPAN	HOKKAIDO	West Pacific coast	NASREC	Yakumo Hatchery	Yurappu River	Yurappu River
J02-29	2002	2004	MASU	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Yakumo Hatchery	Shiribetsu River	Shiribetsu River
J02-30	2002	2004	MASU	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Chitose Hatchery	Shiribetsu River	Shiribetsu River
J02-31	2002	2004	MASU	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Chitose Hatchery	Chitose River	Chitose River
J02-32	2002	2004	MASU	JAPAN	HOKKAIDO	Okhotsk Sea Coast	NASREC	Shari Hatchery	Shari River	Shari River
J02-33	2002	2004	MASU	JAPAN	HOKKAIDO	West Pacific coast	NASREC	Chitose Hatchery	Shizunai River	Shizunai River
J02-34	2002	2004	MASU	JAPAN	HOKKAIDO	West Pacific coast	NASREC	Yakumo Hatchery	Yurappu River	Yurappu River

No	REARING TREATMENT	STAGE	PRELIMINARY NUMBER OF TM RELEASED	OM ID	RBr CODE	HATCH CODE	GRAPHIC IMAGE PREHATCH	GRAPHIC IMAGE POSTHATCH	MARKING SYSTEM
J02-22	fed	fry	580,000	Shubuto02masu-f	1:1.2,2.2n-3.2n	2,2n-2nH	I I II		CHILLER
J02-23	fed	fry / juvenile	165,000 / 60,000	Shiribetsu02masu-y-fj	1:1.2,2.2n-3.2n	2,2n-2nH	I I II		CHILLER
J02-24	fed	juvenile	40,000	Shiribetsu02masu-c-j	1:1.3,2.3n	3,3nH	I I I III		CHILLER
J02-25	fed	fry / juvenile	30,000 / 40,000	Chitose02masu-fj	1:1.3,2.3n	3,3nH	I I I III		CHILLER
J02-26	fed	fry / juvenile	400,000 / 100,000	Shari02masu-fj	1:1.6	6H	I I I I I I		CHILLER
J02-27	unfed	egg	-	Shari02masu-e	1:1.4	4H	I I I I		CHILLER
J02-28	fed	fry / juvenile	100,000 / 60,000	Yurappu02masu-fj	1:1.2,2.2n-3.2n	2,2n-2nH	I I II		CHILLER
J02-29	fed	smolt	40,000	Shiribetsu02masu-y-s	1:1.2,2.2n-3.2n	2,2n-2nH	I I II		CHILLER
J02-30	fed	smolt	40,000	Shiribetsu02masu-c-s	1:1.3,2.3n	3,3nH	I I I III		CHILLER
J02-31	fed	smolt	30,000	Chitose02masu-fj	1:1.3,2.3n	3,3nH	I I I III		CHILLER
J02-32	fed	smolt	100,000	Shari02masu-s	1:1.6	6H	I I I I I I		CHILLER
J02-33	fed	smolt	10,000	Shizunai02masu-s	1:1.3,2.3n	3,3nH	I I I III		CHILLER
J02-34	fed	smolt	30,000	Yurappu02masu-s	1:1.2,2.2n-3.2n	2,2n-2nH	I I II		CHILLER

No	OTOLITH MARK SCHEDULE	TEMP SHIFT DIRECTION	COMMENTS
J02-22	(1X)24C:24H,(1X)24C:48H,(1X)12C:12H,(1X)12C:36H,(2X)12C:12H	down (8-4°C)	
J02-23	(1X)24C:24H,(1X)24C:48H,(1X)12C:12H,(1X)12C:36H,(2X)12C:12H	down (8-4°C)	
J02-24	(2X)24C:24H,(1X)24C:48H,(3X)12C:12H	down (8-4°C)	
J02-25	(2X)24C:24H,(1X)24C:48H,(3X)12C:12H	down (8-4°C)	
J02-26	(6X)24C:24H	down (8-4°C)	
J02-27	(4X)24C:24H	down (8-4°C)	
J02-28	(1X)24C:24H,(1X)24C:48H,(1X)12C:12H,(1X)12C:36H,(2X)12C:12H	down (8-4°C)	
J02-29	(1X)24C:24H,(1X)24C:48H,(1X)12C:12H,(1X)12C:36H,(2X)12C:12H	down (8-4°C)	include TM + Finclips
J02-30	(2X)24C:24H,(1X)24C:48H,(3X)12C:12H	down (8-4°C)	include TM + Finclips
J02-31	(2X)24C:24H,(1X)24C:48H,(3X)12C:12H	down (8-4°C)	include TM + Finclips
J02-32	(6X)24C:24H	down (8-4°C)	include TM + Finclips
J02-33	(2X)24C:24H,(1X)24C:48H,(3X)12C:12H	down (8-4°C)	TM + Ribbon Tag
J02-34	(1X)24C:24H,(1X)24C:48H,(1X)12C:12H,(1X)12C:36H,(2X)12C:12H	down (8-4°C)	include TM + Finclips