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Proposed Thermal Marks for Brood Year 2004 Salmon in Japan

by

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Abstract

Brood year 2004 salmon (approximately 129 million chum, 6.2 million pink, and 3.6 million masu salmon) reared at 12 hatcheries will be marked with 44 discrete patterns in Japan. The proposed marking patterns are similar with the patterns for the brood year 2003 stocks except for five patterns for chum salmon at the Tokachi Hatchery and masu salmon at the Tokushibetsu and Nemuro Hatcheries in Hokkaido.

Introduction

Thermal otolith marks of salmon are used for migration, growth, survival, and feeding surveys in the early ocean life, and for offshore migration surveys in the Okhotsk Sea, 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 2004 salmon in Japan.

Plan for 2004 brood year stocks

The proposed thermal marks for the 2004 brood year salmon is shown in Tables 1 and 2. We plan to mark brood year 2004 salmon (approximately 129 million chum, 6.2 million pink, and 3.6 million masu salmon) at 12 hatcheries with 44 discrete patterns. The proposed markings have the same patterns as for the brood year 2003 stocks (Kawana et al. 2003) except for five patterns for chum or masu salmon at three hatcheries, where otolith marking system is newly introduced in 2004. We plan to mark chum salmon at the Tokachi Hatchery and masu salmon at the Tokushibetsu and Nemuro Hatcheries in Hokkaido for the first time.

The marking pattern is presented as the RBr notation (Munk and Geiger 1998; Hagen 1999) and Hatch code notation (Hagen et al. 2000). We extended the RBr and Hatchcode notation to

describe a wide spaced band, which are opposite to a narrow spaced band (Kawana et al. 2003). The letter ‘w’ following a ring number is used to indicate a wide spaced band. 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, 2001, 2002; Urawa et al. 2000). Thermal rings are induced by cooler temperature exposures except for a chum salmon stock at the Shizunai Hatchery (Shizunai04chum-tr) and all masu salmon stocks at the Shiribetsu Hatchery.

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Table1. Proposed thermal mark releases from Japan for 2004 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
J04-1	2004	2005	CHUM	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Chitose Hatchery	Chitose River	Chitose River
J04-2	2004	2005	CHUM	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Chitose Hatchery	Chitose River	Chitose River
J04-3	2004	2005	CHUM	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Chitose Hatchery	Chitose River	Chitose River
J04-4	2004	2005	CHUM	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Chitose Hatchery	Chitose River	Chitose River
J04-5	2004	2005	CHUM	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Chitose Hatchery	Chitose River	Chitose River
J04-6	2004	2005	CHUM	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Chitose Hatchery	Chitose River	Chitose River
J04-7	2004	2005	CHUM	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Chitose Hatchery	Chitose River	Chitose River
J04-8	2004	2005	CHUM	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Chitose Hatchery	Chitose River	Chitose River
J04-9	2004	2005	CHUM	JAPAN	HOKKAIDO	Okhotsk Sea coast	NASREC	Tokushibetsu Hatchery	Tokushibetsu River	Tokushibetsu River
J04-10	2004	2005	CHUM	JAPAN	HOKKAIDO	Okhotsk Sea coast	NASREC	Tokushibetsu Hatchery	Tokushibetsu River	Tokushibetsu River
J04-11	2004	2005	CHUM	JAPAN	HOKKAIDO	Okhotsk Sea coast	NASREC	Tokushibetsu Hatchery	Tokushibetsu River	Tokushibetsu River
J04-12	2004	2005	CHUM	JAPAN	HOKKAIDO	Okhotsk Sea coast	NASREC	Shari Hatchery	Shari River	Shari River
J04-13	2004	2005	CHUM	JAPAN	HOKKAIDO	Okhotsk Sea coast	NASREC	Shari Hatchery	Shari River	Shari River
J04-14	2004	2005	CHUM	JAPAN	HOKKAIDO	Okhotsk Sea coast	NASREC	Shari Hatchery	Shari River	Shari River
J04-15	2004	2005	CHUM	JAPAN	HOKKAIDO	Nemuro Strait coast	NASREC	Ichani Hatchery	Ichani River	Ichani River
J04-16	2004	2005	CHUM	JAPAN	HOKKAIDO	Nemuro Strait coast	NASREC	Ichani Hatchery	Ichani River	Ichani River
J04-17	2004	2005	CHUM	JAPAN	HOKKAIDO	Nemuro Strait coast	NASREC	Ichani Hatchery	Ichani River	Ichani River
J04-18	2004	2005	CHUM	JAPAN	HOKKAIDO	Nemuro Strait coast	NASREC	Nijibetsu Hatchery	Nijibetsu River	Nijibetsu River
J04-19	2004	2005	CHUM	JAPAN	HOKKAIDO	East Pacific coast	NASREC	Tsurui Hatchery	Kushiro River	Kushiro River

No	REARING TREATMENT	STAGE	PRELIMINARY NUMBER OF TM RELEASED	OM ID	RBr CODE	HATCH CODE	GRAPHIC IMAGE PREHATCH	GRAPHIC IMAGE POSTHATCH	MARKING SYSTEM
J04-1	fed	fry	3,750,000	Chitose04chum-1	1:1.2,2.3-3.2	2,3-2H	I I I I I I		CHILLER
J04-2	fed	fry	3,750,000	Chitose04chum-2	1:1.2,2.3-3.3	2,3-3H	I I I I I I I		CHILLER
J04-3	fed	fry	3,750,000	Chitose04chum-3	1:1.2,2.3-3.4	2,3-4H	I I I I I I I I		CHILLER
J04-4	fed	fry	3,750,000	Chitose04chum-4	1:1.2,2.3-3.5	2,3-5H	I I I I I I I I I		CHILLER
J04-5	fed	fry	3,750,000	Chitose04chum-5	1:1.2,2.3-3.2-4.2	2,3-2-2H	I I I I I I I I I		CHILLER
J04-6	fed	fry	3,750,000	Chitose04chum-6	1:1.2,2.3-3.6	2,3-6H	I I I I I I I I I I I		CHILLER
J04-7	fed	fry	3,750,000	Chitose04chum-7	1:1.2,2.3-3.2-4.3	2,3-2-3H	I I I I I I I I I I I		CHILLER
J04-8	fed	fry	3,750,000	Chitose04chum-8	1:1.2,2.3-3.3.-4.2	2,3-3-2H	I I I I I I I I I I I		CHILLER
J04-9	fed	fry	3,700,000	Tokushibetsu04chum-1	1:1.2,2.1n-3.3n	2,1n-3nH	I I I III		CHILLER
J04-10	fed	fry	3,700,000	Tokushibetsu04chum-2	1:1.2,2.3n-3.3n	2,3n-3nH	I I III III		CHILLER
J04-11	fed	fry	3,700,000	Tokushibetsu04chum-3	1:1.2,2.3n	2,3nH	I I III		CHILLER
J04-12	fed	fry	3,860,000	Shari04chum-1	1:1.2/2.2w-3.3	2/2w-3H	I I I I I I I		CHILLER
J04-13	fed	fry	3,860,000	Shari04chum-2	1:1.2/2.2w,3.2-4.2	2/2w,2-2H	I I I I I I I I		CHILLER
J04-14	fed	fry	3,860,000	Shari04chum-3	1:1.2/2.2w-3.4	2/2w-4H	I I I I I I I I I		CHILLER
J04-15	fed	fry	2,660,000	Ichani04chum-1	1:1.2,2.9n	2,9nH	I I IIIIIIIII		CHILLER
J04-16	fed	fry	2,660,000	Ichani04chum-2	1:1.2,2.7n	2,7nH	I I IIIIIII		CHILLER
J04-17	fed	fry	2,660,000	Ichani04chum-3	1:1.2-2.8n	2-8nH	I I IIIIIIII		CHILLER
J04-18	fed	fry	25,000,000	Nijibetsu04chum	1:1.2,2.5n	2,5nH	I I IIIII		CHILLER
J04-19	fed	fry	3,030,000	Kushiro04chum-1	1:1.2,2.5-3.2	2,5-2H	I I I I I I I I		CHILLER

No	OTOLITH MARK SCHEDULE	TEMP SHIFT DIRECTION	COMMENTS
J04-1	(1X)12C:12H,(1X)12C:24H,(2X)12C:12H,(1X)12C:36H,(2X)12C:12H	down (8-4°C)	
J04-2	(1X)12C:12H,(1X)12C:24H,(2X)12C:12H,(1X)12C:36H,(3X)12C:12H	down (8-4°C)	
J04-3	(1X)12C:12H,(1X)12C:24H,(2X)12C:12H,(1X)12C:36H,(4X)12C:12H	down (8-4°C)	
J04-4	(1X)12C:12H,(1X)12C:24H,(2X)12C:12H,(1X)12C:36H,(5X)12C:12H	down (8-4°C)	
J04-5	(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)	
J04-6	(1X)12C:12H,(1X)12C:24H,(2X)12C:12H,(1X)12C:36H,(6X)12C:12H	down (8-4°C)	
J04-7	(1X)12C:12H,(1X)12C:24H,(2X)12C:12H,(1X)12C:36H,(1X)12C:12H,(1X)12C:36H,(3X)12C:12H	down (8-4°C)	
J04-8	(1X)12C:12H,(1X)12C:24H,(2X)12C:12H,(1X)12C:36H,(2X)12C:12H,(1X)12C:36H,(2X)12C:12H	down (8-4°C)	
J04-9	(1X)24C:24H,(1X)24C:48H,(1X)12C:36H,(3X)12C:12H	down (8-5°C)	
J04-10	(1X)24C:24H,(1X)24C:48H,(2X)12C:12H,(1X)12C:36H,(3X)12C:12H	down (8-5°C)	
J04-11	(1X)24C:24H,(1X)24C:48H,(3X)12C:12H	down (8-5°C)	
J04-12	(1X)12C:12H,(1X)12C:48H,(1X)24C:24H,(1X)24C:72H,(3X)12C:12H	down (8-4°C)	
J04-13	(1X)12C:12H,(1X)12C:48H,(1X)24C:24H,(1X)24C:48H,(1X)12C:12H,(1X)12C:36H,(2X)12C:12H	down (8-4°C)	
J04-14	(1X)12C:12H,(1X)12C:48H,(1X)24C:24H,(1X)24C:72H,(4X)12C:12H	down (8-4°C)	
J04-15	(1X)24C:24H,(1X)24C:48H,(9X)12C:12H	down (9-5°C)	
J04-16	(1X)24C:24H,(1X)24C:48H,(7X)12C:12H	down (8-4°C)	
J04-17	(1X)24C:24H,(1X)24C:72H,(8X)12C:12H	down (8-4°C)	
J04-18	(1X)24C:24H,(1X)24C:48H,(5X)12C:12H	down (8-4°C)	
J04-19	(1X)12C:12H,(1X)12C:36H,(4X)12C:12H,(1X)12C:36H,(2X)12C:12H	down (8-4°C)	

Table1. Continued.

No	BROOD YEAR	YEAR OF RELEASE	SPECIES	COUNTRY	STATE/ PROVINCE	REGION	AGENCY	FACILITY	STOCK	FINAL RELEASE SITE
J04-20	2004	2005	CHUM	JAPAN	HOKKAIDO	East Pacific coast	NASREC	Tsurui Hatchery	Kushiro River	Kushiro River
J04-21	2004	2005	CHUM	JAPAN	HOKKAIDO	East Pacific coast	NASREC	Tsurui Hatchery	Kushiro River	Kushiro River
J04-22	2004	2005	CHUM	JAPAN	HOKKAIDO	East Pacific coast	NASREC	Tokachi Hatchery	Tokachi River	Sarubetu River
J04-23	2004	2005	CHUM	JAPAN	HOKKAIDO	East Pacific coast	NASREC	Tokachi Hatchery	Tokachi River	Sarubetu River
J04-24	2004	2005	CHUM	JAPAN	HOKKAIDO	East Pacific coast	NASREC	Tokachi Hatchery	Tokachi River	Sarubetu River
J04-25	2004	2005	CHUM	JAPAN	HOKKAIDO	West Pacific coast	NASREC	Shizunai Hatchery	Shizunai River	Shizunai River
J04-26	2004	2005	CHUM	JAPAN	HOKKAIDO	West Pacific coast	NASREC	Shizunai Hatchery	Shizunai River	Shizunai River
J04-27	2004	2005	CHUM	JAPAN	HOKKAIDO	West Pacific coast	NASREC	Shizunai Hatchery	Shizunai River	Shizunai River
J04-28	2004	2005	CHUM	JAPAN	HOKKAIDO	West Pacific coast	NASREC	Shizunai Hatchery	Shizunai River	Shizunai River
J04-29	2004	2005	CHUM	JAPAN	HOKKAIDO	West Pacific coast	NASREC	Yakumo Hatchery	Yurappu River	Yurappu River
J04-30	2004	2005	CHUM	JAPAN	HOKKAIDO	West Pacific coast	NASREC	Yakumo Hatchery	Yurappu River	Yurappu River
J04-31	2004	2005	CHUM	JAPAN	HOKKAIDO	West Pacific coast	NASREC	Yakumo Hatchery	Yurappu River	Yurappu River
J04-32	2004	2005	CHUM	JAPAN	HONSHU	Pacific coast	NASREC	Katagishi Hatchery	Katagishi River	Katagishi River
J04-33	2004	2005	CHUM	JAPAN	HONSHU	Pacific coast	NASREC	Katagishi Hatchery	Katagishi River	Katagishi River
J04-34	2004	2005	CHUM	JAPAN	HONSHU	Pacific coast	NASREC	Katagishi Hatchery	Katagishi River	Katagishi River
J04-35	2004	2005	CHUM	JAPAN	HONSHU	Pacific coast	NASREC	Katagishi Hatchery	Katagishi River	Katagishi River
J04-36	2004	2005	PINK	JAPAN	HOKKAIDO	Okhotsk Sea coast	NASREC	Tokushibetsu Hatchery	Tokushibetsu River	Tokushibetsu River
J04-37	2004	2005	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		MARKING SYSTEM
							PREHATCH	POSTHATCH	
J04-20	fed	fry	3,030,000	Kushiro04chum-2	1:1.2,2.5-3.3	2,5-3H	I I IIIII III		CHILLER
J04-21	fed	fry	3,030,000	Kushiro04chum-3	1:1.2,2.5-3.4	2,5-4H	I I IIIII IIII		CHILLER
J04-22	fed	fry	5,100,000	Tokachi04chum-1	1:1.2,2.4n	2,4nH	I I IIII		CHILLER
J04-23	fed	fry	5,100,000	Tokachi04chum-2	1:1.2,2.4n-3.2n	2,4n-2nH	I I IIII II		CHILLER
J04-24	fed	fry	5,100,000	Tokachi04chum-3	1:1.2,2.4n-3.3n	2,4n-3nH	I I IIII III		CHILLER
J04-25	fed	fry	330,000	Shizunai04chum-early	1:1.2,2.2n,3.4n	2,2n,4nH	I I II IIII		CHILLER
J04-26	fed	fry	330,000	Shizunai04chum-tr	1:1.2-2.3	2-3H	I I III		CHILLER
J04-27	fed	fry	2,870,000	Shizunai04chum-mid	1:1.2,2.6n	2,6nH	I I IIIIII		CHILLER
J04-28	fed	fry	2,870,000	Shizunai04chum-late	1:1.2,2.1n-3.5n	2,1n-5nH	I I I IIIII		CHILLER
J04-29	fed	fry	2,500,000	Yurappu04chum-1	1:1.2,2.2w	2,2wH	I I I I		CHILLER
J04-30	fed	fry	2,500,000	Yurappu04chum-2	1:1.2,2.2w-3.2	2,3w-2H	I I I I II		CHILLER
J04-31	fed	fry	2,500,000	Yurappu04chum-3	1:1.2,2.2w-3.3	2,3w-3H	I I I I III		CHILLER
J04-32	fed	fry	2,000,000	Katagishi04chum-1	1:1.2,2.4	2,4H	I I IIII		CHILLER
J04-33	fed	fry	1,000,000	Katagishi04chum-2	1:1.2-2.2,3.2	2-2,2H	I I II II		CHILLER
J04-34	fed	fry	1,000,000	Katagishi04chum-3	1:1.2,2.2,3.3	2,2,3H	I I II III		CHILLER
J04-35	fed	fry	1,000,000	Katagishi04chum-4	1:1.2,2.2	2,2H	I I II		CHILLER
J04-36	fed	fry	1,700,000	Tokushibetsu04pink	1:1.2-2.3	2-3H	I I III		CHILLER
J04-37	fed	fry	4,500,000	Ichani04pink	1:1.2,2.5	2,5H	I I IIIII		CHILLER

No	OTOLITH MARK SCHEDULE	TEMP SHIFT DIRECTION	COMMENTS
J04-20	(1X)12C:12H,(1X)12C:36H,(4X)12C:12H,(1X)12C:36H,(3X)12C:12H	down (8-4°C)	
J04-21	(1X)12C:12H,(1X)12C:36H,(4X)12C:12H,(1X)12C:36H,(4X)12C:12H	down (8-4°C)	
J04-22	(1X)24C:24H,(1X)24C:48H,(4X)12C:12H	down (9-5°C)	
J04-23	(1X)24C:24H,(1X)24C:48H,(3X)12C:12H,(1X)12C:36H,(2X)12C:12H	down (9-5°C)	
J04-24	(1X)24C:24H,(1X)24C:48H,(3X)12C:12H,(1X)12C:36H,(3X)12C:12H	down (9-5°C)	
J04-25	(1X)24C:24H,(1X)24C:48H,(1X)12C:12H,(1X)12C:36H,(4X)12C:12H	down (10-6°C)	spawning date: early October
J04-26	(2X)24H:24C,(1X)72H:24C,(2X)24H:24C	up (6-10°C)	spawning date: early October
J04-27	(1X)24C:24H,(1X)24C:48H,(6X)12C:12H	down (10-6°C)	spawning date: late October and early November
J04-28	(1X)24C:24H,(1X)24C:48H,(1X)12C:36H,(5X)12C:12H	down (10-6°C)	spawning date: middle November and December
J04-29	(1X)12C:12H,(1X)12C:24H,(2X)24C:24H	down (8-4°C)	
J04-30	(1X)12C:12H,(1X)12C:24H,(1X)24C:24H,(1X)24C:48H,(2X)12C:12H	down (8-4°C)	
J04-31	(1X)12C:12H,(1X)12C:24H,(1X)24C:24H,(1X)24C:48H,(3X)12C:12H	down (8-4°C)	
J04-32	(1X)12C:12H,(1X),12C:24H,(4X)12C:12H	down (12-8°C)	
J04-33	(1X)12C:12H,(1X)12C:36H,(1X)12C:12H,(1X)12C:36H,(2X)12C:12H	down (12-8°C)	
J04-34	(1X)12C:12H,(1X)12C:24H,(1X)12C:12H,(1X)12C:24H,(3X)12C:12H	down (12-8°C)	
J04-35	(1X)12C:12H,(1X)12C:24H,(2X)12C:12H	down (12-8°C)	
J04-36	(1X)24C:24H,(1X)24C:72H,(3X)24C:24H	down (7-4°C)	
J04-37	(1X)24C:24H,(1X)24C:48H,(5X)24C:24H	down (8-4°C)	

Table2. Proposed thermal mark releases from Japan for 2004 brood year stocks of masu salmon.

No	BROOD YEAR	YEAR OF RELEASE	SPECIES	COUNTRY	STATE/ PROVINCE	REGION	AGENCY	FACILITY	STOCK	FINAL RELEASE SITE
J04-38	2004	2005	MASU	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Shiribetsu Hatchery	Shiribetsu River	Shubuto River
J04-39	2004	2005	MASU	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Shiribetsu Hatchery	Shiribetsu River	Shiribetsu River
J04-40	2004	2006	MASU	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Shiribetsu Hatchery	Shiribetsu River	Shiribetsu River
J04-41	2004	2005	MASU	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Yakumo Hatchery	Shiribetsu River	Shiribetsu River
J04-42	2004	2006	MASU	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Yakumo Hatchery	Shiribetsu River	Shiribetsu River
J04-43	2004	2005	MASU	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Chitose Hatchery	Shiribetsu River	Shiribetsu River
J04-44	2004	2006	MASU	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Chitose Hatchery	Shiribetsu River	Shiribetsu River
J04-45	2004	2005	MASU	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Chitose Hatchery	Chitose River	Chitose River
J04-46	2004	2005	MASU	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Chitose Hatchery	Chitose River	Chitose River
J04-47	2004	2006	MASU	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Chitose Hatchery	Chitose River	Chitose River
J04-48	2004	2005	MASU	JAPAN	HOKKAIDO	Okhotsk Sea Coast	NASREC	Tokushibetsu Hatchery	Tokushibetsu River	Tokushibetsu River
J04-49	2004	2005	MASU	JAPAN	HOKKAIDO	Okhotsk Sea Coast	NASREC	Tokushibetsu Hatchery	Tokushibetsu River	Tokushibetsu River
J04-50	2004	2005	MASU	JAPAN	HOKKAIDO	Okhotsk Sea Coast	NASREC	Shari Hatchery	Shari River	Shari River
J04-51	2004	2005	MASU	JAPAN	HOKKAIDO	Okhotsk Sea Coast	NASREC	Shari Hatchery	Shari River	Shari River
J04-52	2004	2005	MASU	JAPAN	HOKKAIDO	Okhotsk Sea Coast	NASREC	Shari Hatchery	Shari River	Shari River
J04-53	2004	2006	MASU	JAPAN	HOKKAIDO	Okhotsk Sea Coast	NASREC	Shari Hatchery	Shari River	Shari River
J04-54	2004	2005	MASU	JAPAN	HOKKAIDO	Nemuro strait coast	NASREC	Nemuro Hatchery	Shibetsu River	Shibetsu River
J04-55	2004	2005	MASU	JAPAN	HOKKAIDO	Nemuro strait coast	NASREC	Nemuro Hatchery	Shibetsu River	Shibetsu River
J04-56	2004	2006	MASU	JAPAN	HOKKAIDO	Nemuro strait coast	NASREC	Nemuro Hatchery	Shibetsu River	Shibetsu River
J04-57	2004	2005	MASU	JAPAN	HOKKAIDO	West Pacific coast	NASREC	Yakumo Hatchery	Yurappu River	Yurappu River
J04-58	2004	2006	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
J04-38	fed	fry	580,000	Shubuto04masu-f	1:1.2,2,2	2,2H	I I I I		CHILLER
J04-39	fed	fry	690,000	Shiribetsu04masu-r-f	1:1.2,2,2	2,2H	I I I I		CHILLER
J04-40	fed	smolt	160,000	Shiribetsu04masu-r-s	1:1.2,2,2	2,2H	I I I I		CHILLER
J04-41	fed	juvenile	180,000	Shiribetsu04masu-y-j	1:1.5	5H	I I I I I		CHILLER
J04-42	fed	smolt	20,000	Shiribetsu04masu-y-s	1:1.5	5H	I I I I I		CHILLER
J04-43	fed	juvenile	40,000	Shiribetsu04masu-c-j	1:1.3,2.3n	3,3nH	I I I III		CHILLER
J04-44	fed	smolt	40,000	Shiribetsu04masu-c-s	1:1.3,2.3n	3,3nH	I I I III		CHILLER
J04-45	fed	fry	30,000	Chitose04masu-f	1:1.3,2.3n	3,3nH	I I I III		CHILLER
J04-46	fed	juvenile	40,000	Chitose04masu-j	1:1.3,2.3n	3,3nH	I I I III		CHILLER
J04-47	fed	smolt	30,000	Chitose04masu-s	1:1.3,2.3n	3,3nH	I I I III		CHILLER
J04-48	fed	fry	400,000	Tokushibetsu04masu-f	1:1.5-2.3w	5-3wH	I I I I I I I I I		CHILLER
J04-49	fed	juvenile	100,000	Tokushibetsu04masu-j	1:1.5-2.3w	5-3wH	I I I I I I I I I		CHILLER
J04-50	fed	fry	400,000	Shari04masu-f	1:1.6	6H	I I I I I I		CHILLER
J04-51	unfed	egg	-	Shari04masu-e	1:1.4	4H	I I I I		CHILLER
J04-52	fed	juvenile	100,000	Shari04masu-j	1:1.6	6H	I I I I I I		CHILLER
J04-53	fed	smolt	100,000	Shari04masu-s	1:1.6	6H	I I I I I I		CHILLER
J04-54	fed	fry	100,000	Shibetsu04masu-f	1:1.2,2.4	2,4H	I I I I I		CHILLER
J04-55	fed	juvenile	340,000	Shibetsu04masu-j	1:1.2,2.4	2,4H	I I I I I		CHILLER
J04-56	fed	smolt	60,000	Shibetsu04masu-s	1:1.2,2.4	2,4H	I I I I I		CHILLER
J04-57	fed	fry	130,000	Yurappu04masu-f	1:1.5	5H	I I I I I		CHILLER
J04-58	fed	smolt	60,000	Yurappu04masu-s	1:1.5	5H	I I I I I		CHILLER

No	OTOLITH MARK SCHEDULE	TEMP SHIFT DIRECTION	COMMENTS
J04-38	(1X)24H:24C,(1X)24H:48C,(2X)24H:24C	up (6-10°C)	
J04-39	(1X)24H:24C,(1X)24H:48C,(2X)24H:24C	up (6-10°C)	
J04-40	(1X)24H:24C,(1X)24H:48C,(2X)24H:24C	up (6-10°C)	TM + Finclips
J04-41	(5X)24C:24H	down (8-4°C)	include TM + Finclips (100,000)
J04-42	(5X)24C:24H	down (8-4°C)	TM + Finclips
J04-43	(2X)24C:24H,(1X)24C:48H,(3X)12C:12H	down (8-4°C)	TM + Finclips
J04-44	(2X)24C:24H,(1X)24C:48H,(3X)12C:12H	down (8-4°C)	TM + Finclips
J04-45	(2X)24C:24H,(1X)24C:48H,(3X)12C:12H	down (8-4°C)	
J04-46	(2X)24C:24H,(1X)24C:48H,(3X)12C:12H	down (8-4°C)	TM + Finclips
J04-47	(2X)24C:24H,(1X)24C:48H,(3X)12C:12H	down (8-4°C)	TM + Finclips
J04-48	(4X)12C:12H,(1X)12C:36H,(3X)24C:24H	down (8-4°C)	
J04-49	(4X)12C:12H,(1X)12C:36H,(3X)24C:24H	down (8-4°C)	TM + Finclips
J04-50	(6X)24C:24H	down (8-4°C)	
J04-51	(4X)24C:24H	down (8-4°C)	
J04-52	(6X)24C:24H	down (8-4°C)	TM + Finclips
J04-53	(6X)24C:24H	down (8-4°C)	TM + Finclips
J04-54	(1X)24C:24H,(1X)24C:48H,(4X)24C:24H	down (8-4°C)	
J04-55	(1X)24C:24H,(1X)24C:48H,(4X)24C:24H	down (8-4°C)	include TM + Finclips (100,000)
J04-56	(1X)24C:24H,(1X)24C:48H,(4X)24C:24H	down (8-4°C)	TM + Finclips
J04-57	(5X)24C:24H	down (8-4°C)	
J04-58	(5X)24C:24H	down (8-4°C)	TM + Finclips