

## **Proposed Otolith Marks for Brood Year 2014 Salmon in Japan**

by

Yasuo Tomida, Tsutomu Ohnuki, and Shigehiko Urawa

*Hokkaido National Fisheries Research Institute, Fisheries Research Agency  
2-2 Nakanoshima, Toyohira-ku, Sapporo 062-0922, Japan*

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*Hokkaido National Fisheries Research Institute, Fisheries Research Agency  
2-2 Nakanoshima, Toyohira-ku, Sapporo 062-0922, Japan*

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## Abstract

Japan plans to mark approximately 256 million salmon of the 2014 brood year (227 million chum, 24.5 million pink, 4.2 million masu, and 150 thousand sockeye salmon) using 95 discrete thermal patterns and two ALC (alizarin complexone) patterns at 46 hatcheries. Two rings in the first band are adopted as the base mark to distinguish Japanese chum and pink salmon from other stocks.

## Background

In Japan, thermal otolith marks have been used for migration, growth and survival surveys of juvenile salmon in the coastal waters, and for offshore migration surveys in the Okhotsk Sea, North Pacific Ocean and Bering Sea (Kawana et al. 1999; Urawa et al. 2000a, 2004, 2006, 2009; Sato et al. 2009). In addition, otolith marking is expected as a tool to evaluate accuracy of homing migration and abundance of hatchery and natural spawning stocks.

## Mark Plan

The proposed otolith marks for the 2014 brood year salmon include 95 discrete thermal patterns and two ALC (alizarin complexone) patterns (Table 1). We plan to mark approximately 227 million chum, 24.5 million pink, 4.2 million masu, and 150 thousand sockeye salmon at 46 hatcheries (Fig. 1).

The thermal marking pattern is presented as the hatch code notation (Hagen et al. 2000; Josephson et al. 2006). As the 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 stock (Urawa et al. 2000b). All thermal rings are induced by cooler temperature exposures.

ALC marks are used for chum, pink and masu salmon surveys by Hokkaido Research Organization (HOKK), Hokkaido Aquaculture Promotion Corporation (HAPC), and Yamagata Prefectural Inland Water Fisheries Experimental Station (YIE).

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**Table 1. Proposed otolith mark releases from Japan for 2014 brood year stocks of chum, pink, masu and sockeye salmon.** TM; otolith thermal marking, ALC; alizarin complexone, FRA; Fisheries Research Agency, HOKK; Hokkaido Research Organization, HAPC; Hokkaido Aquaculture Promotion Corporation, YIE; Yamagata Prefectural Inland Water Fisheries Experimental Station, YFPF; Yamagata Fisheries Promotion Foundation, IFTC; Iwate Fisheries Technology center, AITC; Aomori Prefectural Industrial Technology Research Center, HSPA; Hidaka Salmon Propagation Association, SSM; Sapporo Salmon Museum, NPH; non-profit private hatchery. **Red characters indicate items updated on August 25, 2014.**

No	Mark Type	Year of Release	Species	Country	Prefecture	Region	Agency	Facility	Final Release Site	Stage	Preliminary Number of OM Released	Hatch Code	Otolith Mark Schedule	Temp Shift Direction
JP14-01	TM	2015	CHUM	JAPAN	HOKKAIDO	Okhotsk Sea coast	NPH	Horonai Hatchery	Horonai River	fry	3,600,000	2,5nH	(1X)24C:24H,(1X)24C:48H,(5X)12C:12H	Down
JP14-02	TM	2015	CHUM	JAPAN	HOKKAIDO	Okhotsk Sea coast	FRA	Shari Hatchery	Shari River	fry	11,600,000	2-2-2-2H	(1X)12C:12H,(1X)12C:36H,(1X)12C:12H,(1X)12C:36H,(1X)12C:12H,(1X)12C:36H,(2X)12C:12H	Down
JP14-03	TM	2015	CHUM	JAPAN	HOKKAIDO	Okhotsk Sea coast	FRA	Tokushibetsu Hatchery	Tokushibetsu River	fry	600,000	2-2,2,3H	(1X)12C:12H,(1X)12C:48H,(1X)12C:12H,(1X)12C:24H,(1X)12C:12H,(1X)12C:24H,(3X)12C:12H	Down
JP14-04	TM	2015	CHUM	JAPAN	HOKKAIDO	Okhotsk Sea coast	FRA	Tokushibetsu Hatchery	Tokushibetsu River	fry	10,500,000	2,2,2,3H	(1X)12C:12H,(1X)12C:24H,(1X)12C:12H,(1X)12C:24H,(1X)12C:12H,(1X)12C:24H,(3X)12C:12H	Down
JP14-05	TM	2015	CHUM	JAPAN	HOKKAIDO	Okhotsk Sea coast	NPH	Shintonbetsu Hatchery	Tonbetsu River	fry	3,600,000	2-2-1-3H	(1X)12C:12H,(1X)12C:36H,(1X)12C:12H,(2X)12C:36H,(3X)12C:12H	Down
JP14-06	TM	2015	CHUM	JAPAN	HOKKAIDO	Nemuro Strait coast	FRA	Ichani Hatchery	Ichani River	fry	8,000,000	2-4-2H	(1X)12C:12H,(1X)12C:36H,(3X)12C:12H,(1X)12C:36H,(2X)12C:12H	Down
JP14-07	TM	2015	CHUM	JAPAN	HOKKAIDO	Nemuro Strait coast	FRA	Nijibetsu Hatchery	Nishibetsu River	fry	5,000,000	2,1n,5nH	(1X)24C:24H,(1X)24C:48H,(1X)12C:24H,(5X)12C:12H	Down
JP14-08	TM	2015	CHUM	JAPAN	HOKKAIDO	Nemuro Strait coast	FRA	Nijibetsu Hatchery	Nishibetsu River	fry	10,200,000	2,1n,4nH	(1X)24C:24H,(1X)24C:48H,(1X)12C:24H,(4X)12C:12H	Down
JP14-09	TM	2015	CHUM	JAPAN	HOKKAIDO	Nemuro Strait coast	FRA	Nijibetsu Hatchery	Nishibetsu River	fry	9,800,000	2,1n,3nH	(1X)24C:24H,(1X)24C:48H,(1X)12C:24H,(3X)12C:12H	Down
JP14-10	TM	2015	CHUM	JAPAN	HOKKAIDO	Nemuro Strait coast	NPH	Shibetsu Hatchery	Shibetsu River etc	fry	3,600,000	2,3,4H	(1X)12H:12C,(1X)12H:24C,(2X)12H:12C,(1X)12H:24C,(4X)12H:12C	Up
JP14-11	TM	2015	CHUM	JAPAN	HOKKAIDO	East Pacific coast	HSPA	Saruru Hatchery	Erimo misaki Fish Port	fry	2,000,000	2-3,1,2H	(1X)12C:12H,(1X)12C:48H,(2X)12C:12H,(2X)12C:24H,(2X)12C:12H	Down
JP14-12	TM	2015	CHUM	JAPAN	HOKKAIDO	East Pacific coast	NPH	Hiroo Hatchery	Hiroo River	fry	3,200,000	2n-4H	(1X)12C:12H,(1X)12C:36H,(4X)24C:24H	Down
JP14-13	TM	2015	CHUM	JAPAN	HOKKAIDO	East Pacific coast	FRA	Tsurui Hatchery	Kushiro River	fry	1,200,000	2-9H	(1X)12C:12H,(1X)12C:48H,(9X)12C:12H	Down
JP14-14	TM	2015	CHUM	JAPAN	HOKKAIDO	East Pacific coast	FRA	Tsurui Hatchery	Kushiro River	fry	1,700,000	2-2-3-3H	(1X)12C:12H,(1X)12C:36H,(1X)12C:12H,(1X)12C:36H,(2X)12C:12H,(1X)12C:36H,(3X)12C:12H	Down
JP14-15	TM	2015	CHUM	JAPAN	HOKKAIDO	East Pacific coast	FRA	Tsurui Hatchery	Kushiro River	fry	3,000,000	2-8H	(1X)12C:12H,(1X)12C:48H,(8X)12C:12H	Down
JP14-16	TM	2015	CHUM	JAPAN	HOKKAIDO	East Pacific coast	FRA	Tsurui Hatchery	Kushiro River	fry	3,200,000	2-10H	(1X)12C:12H,(1X)12C:48H,(10X)12C:12H	Down
JP14-17	TM	2015	CHUM	JAPAN	HOKKAIDO	East Pacific coast	NPH	Ashibetsu Hatchery	Kushiro River	fry	1,750,000	2n,2n-2H	(1X)12C:12H,(1X)12C:24H,(1X)12C:12H,(1X)12C:48H,(2X)24C:24H	Down
JP14-18	TM	2015	CHUM	JAPAN	HOKKAIDO	East Pacific coast	NPH	Ashibetsu Hatchery	Kushiro River	fry	1,750,000	2n-2n,2H	(1X)12C:12H,(1X)12C:48H,(1X)12C:12H,(1X)12C:24H,(2X)24C:24H	Down
JP14-19	TM	2015	CHUM	JAPAN	HOKKAIDO	East Pacific coast	FRA	Tokachi Hatchery	Tokachi River	fry	2,400,000	2-5-3H	(1X)12C:12H,(1X)12C:48H,(4X)12C:12H,(1X)12C:48H,(3X)12C:12H	Down
JP14-20	TM	2015	CHUM	JAPAN	HOKKAIDO	East Pacific coast	FRA	Tokachi Hatchery	Tokachi River	fry	1,450,000	2-5,3H	(1X)12C:12H,(1X)12C:48H,(4X)12C:12H,(1X)12C:24H,(3X)12C:12H	Down

**Table1. Continued.**

No	Mark Type	Year of Release	Species	Country	Prefecture	Region	Agency	Facility	Final Release Site	Stage	Preliminary Number of OM Released	Hatch Code	Otolith Mark Schedule	Temp Shift Direction
JP14-21	TM	2015	CHUM	JAPAN	HOKKAIDO	East Pacific coast	FRA	Tokachi Hatchery	Tokachi River	fry	1,450,000	2,5-3H	(1X)12C:12H,(1X)12C:24H,(4X)12C:12H,(1X)12C:48H,(3X)12C:12H	Down
JP14-22	TM	2015	CHUM	JAPAN	HOKKAIDO	East Pacific coast	FRA	Tokachi Hatchery	Tokachi River	fry	1,400,000	2,5,2H	(1X)12C:12H,(1X)12C:24H,(4X)12C:12H,(1X)12C:24H,(2X)12C:12H	Down
JP14-23	TM	2015	CHUM	JAPAN	HOKKAIDO	East Pacific coast	FRA	Tokachi Hatchery	Tokachi River	fry	2,900,000	2-5-2H	(1X)12C:12H,(1X)12C:48H,(4X)12C:12H,(1X)12C:48H,(2X)12C:12H	Down
JP14-24	TM	2015	CHUM	JAPAN	HOKKAIDO	East Pacific coast	FRA	Tokachi Hatchery	Tokachi River	fry	2,800,000	2-5,2H	(1X)12C:12H,(1X)12C:48H,(4X)12C:12H,(1X)12C:24H,(2X)12C:12H	Down
JP14-25	TM	2015	CHUM	JAPAN	HOKKAIDO	East Pacific coast	FRA	Tokachi Hatchery	Tokachi River	fry	2,900,000	2,5-2H	(1X)12C:12H,(1X)12C:24H,(4X)12C:12H,(1X)12C:48H,(2X)12C:12H	Down
JP14-26	TM	2015	CHUM	JAPAN	HOKKAIDO	Japan Sea coast	FRA	Chitose Hatchery	Ishikari River	fry	1,400,000	2,2n-3H	(1X)12C:12H,(1X)12C:24H,(1X)3C:9H,(1X)3C:21H,(3X)12C:12H	Down
JP14-27	TM	2015	CHUM	JAPAN	HOKKAIDO	Japan Sea coast	FRA	Chitose Hatchery	Ishikari River	fry	1,400,000	2,4n-3H	(1X)12C:12H,(1X)12C:24H,(3X)3C:9H,(1X)3C:21H,(3X)12C:12H	Down
JP14-28	TM	2015	CHUM	JAPAN	HOKKAIDO	Japan Sea coast	FRA	Chitose Hatchery	Ishikari River	fry	2,800,000	2,6n-3H	(1X)12C:12H,(1X)12C:24H,(5X)3C:9H,(1X)3C:21H,(3X)12C:12H	Down
JP14-29	TM	2015	CHUM	JAPAN	HOKKAIDO	Japan Sea coast	FRA	Chitose Hatchery	Ishikari River	fry	24,400,000	2,3-3H	(1X)12C:12H,(1X)12C:24H,(2X)12C:12H,(1X)12C:36H,(3X)12C:12H	Down
JP14-30	TM	2015	CHUM	JAPAN	HOKKAIDO	Japan Sea coast	SSM	Sapporo Salmon Museum	Ishikari River	fry	70,000	2-2H	(1X)24C:24H,(1X)24C:72H,(2X)24C:24H	Down
JP14-31	TM	2015	CHUM	JAPAN	HOKKAIDO	Japan Sea coast	NPH	Teshio Hatchery	Shokanbetsu River etc	fry	3,600,000	2-5H	(1X)12C:12H,(1X)12C:48H,(5X)12C:12H	Down
JP14-32	TM	2015	CHUM	JAPAN	HOKKAIDO	Japan Sea coast	FRA	Teshio Hatchery	Teshio River	fry	5,000,000	2n-3H	(1X)12C:12H,(1X)12C:36H,(3X)24C:24H	Down
JP14-33	TM	2015	CHUM	JAPAN	HOKKAIDO	West Pacific coast	NPH	Fukushima Hatchery	Fukushima River etc	fry	3,200,000	2-1-2-3H	(1X)12C:12H,(2X)12C:36H,(1X)12C:12H,(1X)12C:36H,(3X)12C:12H	Down
JP14-34	TM	2015	CHUM	JAPAN	HOKKAIDO	West Pacific coast	NPH	Hidakahorobetsu Hatchery	Hidakahorobetsu River	fry	3,200,000	2n-2,2nH	(1X)12C:12H,(1X)12C:36H,(1X)24C:24H,(1X)24C:48H,(2X)12C:12H	Down
JP14-35	TM	2015	CHUM	JAPAN	HOKKAIDO	West Pacific coast	NPH	Shikiu Hatchery	Shiraoi River etc	fry	3,600,000	2,2n-2nH	(1X)24C:24H,(1X)24C:48H,(1X)12C:12H,(1X)12C:36H,(2X)12C:12H	Down
JP14-36	TM	2015	CHUM	JAPAN	HOKKAIDO	West Pacific coast	NPH	Yakumo Hatchery	Shiribeshitoshibetsu River	fry	4,800,000	2-1-2-2H	(1X)12C:12H,(2X)12C:36H,(1X)12C:12H,(1X)12C:36H,(2X)12C:12H	Down
JP14-37	TM	2015	CHUM	JAPAN	HOKKAIDO	West Pacific coast	NPH	Shiriuchi Hatchery	Shiriuchi River	fry	850,000	2,3-2H	(1X)12C:12H,(1X)12C:24H,(2X)12C:12H,(1X)12C:48H,(2X)12C:12H	Down
JP14-38	TM	2015	CHUM	JAPAN	HOKKAIDO	West Pacific coast	NPH	Shiriuchi Hatchery	Shiriuchi River	fry	850,000	2-2,3H	(1X)12H:12C,(1X)12H:48C,(1X)12H:12C,(1X)12H:24C,(3X)12H:12C	Up
JP14-39	TM	2015	CHUM	JAPAN	HOKKAIDO	West Pacific coast	NPH	Shiriuchi Hatchery	Shiriuchi River	fry	800,000	2-3,2H	(1X)12H:12C,(1X)12H:48C,(2X)12H:12C,(1X)12H:24C,(2X)12H:12C	Down
JP14-40	TM	2015	CHUM	JAPAN	HOKKAIDO	West Pacific coast	FRA	Shizunai Hatchery	Shizunai River	fry	700,000	2,2,5H	(1X)12C:12H,(1X)12C:24H,(1X)12C:12H,(1X)12C:24H,(5X)12C:12H	Down

**Table1. Continued.**

No	Mark Type	Year of Release	Species	Country	Prefecture	Region	Agency	Facility	Final Release Site	Stage	Preliminary Number of OM Released	Hatch Code	Otolith Mark Schedule	Temp Shift Direction	Comments
JP14-41	TM	2015	CHUM	JAPAN	HOKKAIDO	West Pacific coast	FRA	Shizunai Hatchery	Shizunai River	fry	600,000	2,2,6H	(1X)12C:12H,(1X)12C:24H,(1X)12C:12H,(1X)12C:24H,(6X)12C:12H	Down	
JP14-42	TM	2015	CHUM	JAPAN	HOKKAIDO	West Pacific coast	FRA	Shizunai Hatchery	Shizunai River	fry	600,000	2,2-4H	(1X)12C:12H,(1X)12C:24H,(1X)12C:12H,(1X)12C:48H,(4X)12C:12H	Down	
JP14-43	TM	2015	CHUM	JAPAN	HOKKAIDO	West Pacific coast	FRA	Shizunai Hatchery	Shizunai River	fry	2,900,000	2,2-5H	(1X)12C:12H,(1X)12C:24H,(1X)12C:12H,(1X)12C:48H,(5X)12C:12H	Down	
JP14-44	TM	2015	CHUM	JAPAN	HOKKAIDO	West Pacific coast	FRA	Shizunai Hatchery	Shizunai River	fry	800,000	2-2,4H	(1X)12C:12H,(1X)12C:48H,(1X)12C:12H,(1X)12C:24H,(4X)12C:12H	Down	
JP14-45	TM	2015	CHUM	JAPAN	HOKKAIDO	West Pacific coast	FRA	Shizunai Hatchery	Shizunai River	fry	800,000	2-2,5H	(1X)12C:12H,(1X)12C:48H,(1X)12C:12H,(1X)12C:24H,(5X)12C:12H	Down	
JP14-46	TM	2015	CHUM	JAPAN	HOKKAIDO	West Pacific coast	NPH	Toyohata Hatchery	Shizunai River	fry	900,000	2,3,1,2H	(1X)12C:12H,(1X)12C:24H,(2X)12C:12H,(2X)12C:24H,(2X)12C:12H	Down	
JP14-47	TM	2015	CHUM	JAPAN	HOKKAIDO	West Pacific coast	NPH	Toyohata Hatchery	Shizunai River	fry	900,000	2,3,1,3H	(1X)12C:12H,(1X)12C:24H,(2X)12C:12H,(2X)12C:24H,(3X)12C:12H	Down	
JP14-48	TM	2015	CHUM	JAPAN	HOKKAIDO	West Pacific coast	NPH	Toyohata Hatchery	Shizunai River	fry	800,000	2,3,1,4H	(1X)12C:12H,(1X)12C:24H,(2X)12C:12H,(2X)12C:24H,(4X)12C:12H	Down	
JP14-49	TM	2015	CHUM	JAPAN	HOKKAIDO	West Pacific coast	FRA	Yakumo Hatchery	Yurappu River	fry	650,000	2,1n-2nH	(1X)24C:24H,(1X)24C:48H,(1X)12C:48H,(2X)12C:12H	Down	
JP14-50	TM	2015	CHUM	JAPAN	HOKKAIDO	West Pacific coast	FRA	Yakumo Hatchery	Yurappu River	fry	850,000	2,1n-3nH	(1X)24C:24H,(1X)24C:48H,(1X)12C:48H,(3X)12C:12H	Down	
JP14-51	TM	2015	CHUM	JAPAN	HOKKAIDO	West Pacific coast	FRA	Yakumo Hatchery	Yurappu River	fry	1,000,000	2,1n-4nH	(1X)24C:24H,(1X)24C:48H,(1X)12C:48H,(4X)12C:12H	Down	
JP14-52	TM	2015	CHUM	JAPAN	HOKKAIDO	West Pacific coast	FRA	Yakumo Hatchery	Yurappu River	fry	1,000,000	2,1n-5nH	(1X)24C:24H,(1X)24C:48H,(1X)12C:48H,(5X)12C:12H	Down	
JP14-53	TM	2015	CHUM	JAPAN	HOKKAIDO	West Pacific coast	FRA	Yakumo Hatchery	Yurappu River	fry	1,000,000	2,1n-6nH	(1X)24C:24H,(1X)24C:48H,(1X)12C:48H,(6X)12C:12H	Down	
JP14-54	TM	2015	CHUM	JAPAN	HOKKAIDO	West Pacific coast	FRA	Yakumo Hatchery	Yurappu River	fry	1,000,000	2,2n,4nH	(1X)24C:24H,(1X)24C:48H,(1X)12C:12H,(1X)12C:24H,(4X)12C:12H	Down	
JP14-55	TM	2015	CHUM	JAPAN	HOKKAIDO	West Pacific coast	FRA	Yakumo Hatchery	Yurappu River	fry	1,000,000	2,2n,5nH	(1X)24C:24H,(1X)24C:48H,(1X)12C:12H,(1X)12C:24H,(5X)12C:12H	Down	
JP14-56	TM	2015	CHUM	JAPAN	HOKKAIDO	West Pacific coast	FRA	Yakumo Hatchery	Yurappu River	fry	1,000,000	2,2n,6nH	(1X)24C:24H,(1X)24C:48H,(1X)12C:12H,(1X)12C:24H,(6X)12C:12H	Down	
JP14-57	TM	2015	CHUM	JAPAN	HONSHU	Japan Sea coast	NPH	Masukawa Hatchery	Gakkou River	fry	3,000,000	2,3nH	(1X)24C:24H,(1X)24C:48H,(3X)12C:12H	Down	
JP14-58	ALC	2015	CHUM	JAPAN	HONSHU	Japan Sea coast	YIE	Minowa Hatchery	Gakkou River	fry	100,000	A1H			partial finclips (adipose fin: 15000)
JP14-59	TM	2015	CHUM	JAPAN	HONSHU	Japan Sea coast	NPH	Kawabukuro Hatchery	Kawabukuro River	fry	3,800,000	2,1,4H	(1X)12C:12H,(2X)12C:24H,(4X)12C:12H	Down	
JP14-60	TM	2015	CHUM	JAPAN	HONSHU	Japan Sea coast	NPH	Miomote #3 Hatchery	Miomote River	fry	3,800,000	2,1,2H	(1X)12C:12H,(2X)12C:24H,(2X)12C:12H	Down	

**Table1. Continued.**

No	Mark Type	Year of Release	Species	Country	Prefecture	Region	Agency	Facility	Final Release Site	Stage	Preliminary Number of OM Released	Hatch Code	Otolith Mark Schedule	Temp Shift Direction
JP14-61	TM	2015	CHUM	JAPAN	HONSHU	Japan Sea coast	NPH	Oirase Hatchery (Jpn sea)	Oirase River (Jpn Sea)	fry	1,400,000	2,3,2H	(1X)12C:12H,(1X)12C:24H,(2X)12C:12H,(1X)12C:24H,(2X)12C:12H	Down
JP14-62	TM	2015	CHUM	JAPAN	HONSHU	Japan Sea coast	AITC	Oirase Hatchery (Jpn sea)	Oirase/Akaishi/Sasanai River (Jpn Sea)	fry	1,500,000	2,3n-2H	(1X)12C:12H,(1X)12C:24H,(2X)3C:9H,(1X)3C:21H,(2X)12C:12H	Down
JP14-63	TM	2015	CHUM	JAPAN	HONSHU	Japan Sea coast	NPH	Shougawa Hatchery	Shou River	fry	2,500,000	2,2n-3nH	(1X)12C:12H,(1X)12C:24H,(1X)3C:9H,(1X)3C:21H,(3X)3C:9H	Down
JP14-64	TM	2015	CHUM	JAPAN	HONSHU	Pacific coast	NPH	Shimoakka Hatchery	Akka River	fry	8,500,000	2,6H	(1X)12C:12H,(1X)12C:24H,(6X)12C:12H	Down
JP14-65	TM	2015	CHUM	JAPAN	HONSHU	Pacific coast	NPH	Shimoakka Hatchery	Akka River	fry	1,500,000	2-3H	(1X)12C:12H,(1X)12C:48H,(3X)12C:12H	Down
JP14-66	TM	2015	CHUM	JAPAN	HONSHU	Pacific coast	NPH	Eai Hatchery	Eai River	fry	2,500,000	2,3H	(1X)12C:12H,(1X)12C:24H,(3X)12C:12H	Down
JP14-67	TM	2015	CHUM	JAPAN	HONSHU	Pacific coast	IFTC	Kasshi Hatchery	Kasshi River	fry	1,600,000	2,4,3H3	(1X)12C:12H,(1X)12C:24H,(3X)12C:12H,(1X)12C:24H,(3X)12C:12H,HATCH,(3X)12C:12H	Down
JP14-68	TM	2015	CHUM	JAPAN	HONSHU	Pacific coast	IFTC	Kasshi Hatchery	Kasshi River	fry	400,000	2,4H3	(1X)12C:12H,(1X)12C:24H,(4X)12C:12H,HATCH,(3X)12C:12H	Down
JP14-69	TM	2015	CHUM	JAPAN	HONSHU	Pacific coast	IFTC	Kasshi Hatchery	Kasshi River	fry	1,600,000	2,2,3,2H3	(1X)12C:12H,(1X)12C:24H,(1X)12C:12H,(1X)12C:24H,(2X)12C:12H,(1X)12C:24H,(2X)12C:12H,HATCH,(3X)12C:12H	Down
JP14-70	TM	2015	CHUM	JAPAN	HONSHU	Pacific coast	IFTC	Kasshi Hatchery	Kasshi River	fry	400,000	2,2,4H3	(1X)12C:12H,(1X)12C:24H,(1X)12C:12H,(1X)12C:24H,(4X)12C:12H,HATCH,(3X)12C:12H	Down
JP14-71	TM	2015	CHUM	JAPAN	HONSHU	Pacific coast	IFTC	Kumano Hatchery	Kumano River	fry	30,000	2,4,3H2	(1X)12C:12H,(1X)12C:24H,(3X)12C:12H,(1X)12C:24H,(3X)12C:12H,HATCH,(2X)12C:12H	Down
JP14-72	TM	2015	CHUM	JAPAN	HONSHU	Pacific coast	IFTC	Kumano Hatchery	Kumano River	fry	30,000	2,2,3,2H2	(1X)12C:12H,(1X)12C:24H,(1X)12C:12H,(1X)12C:24H,(2X)12C:12H,(1X)12C:24H,(2X)12C:12H,HATCH,(2X)12C:12H	Down
JP14-73	TM	2015	CHUM	JAPAN	HONSHU	Pacific coast	IFTC	Kumano Hatchery	Kumano River	fry	200,000	2,2,3,2H	(1X)12C:12H,(1X)12C:24H,(1X)12C:12H,(1X)12C:24H,(2X)12C:12H,(1X)12C:24H,(2X)12C:12H	Down
JP14-74	TM	2015	CHUM	JAPAN	HONSHU	Pacific coast	IFTC	Kumano Hatchery	Kumano River	fry	200,000	2,4,3H	(1X)12C:12H,(1X)12C:24H,(3X)12C:12H,(1X)12C:24H,(3X)12C:12H	Down
JP14-75	TM	2015	CHUM	JAPAN	HONSHU	Pacific coast	IFTC	Kumano Hatchery	Kumano River	fry	100,000	2,4H	(1X)12C:12H,(1X)12C:24H,(4X)12C:12H	Down
JP14-76	TM	2015	CHUM	JAPAN	HONSHU	Pacific coast	IFTC	Kumano Hatchery	Kumano River	fry	300,000	2,2,4H	(1X)12C:12H,(1X)12C:24H,(1X)12C:12H,(1X)12C:24H,(4X)12C:12H	Down
JP14-77	TM	2015	CHUM	JAPAN	HONSHU	Pacific coast	IFTC	Kumano Hatchery	Kumano River	fry	100,000	2,4H2	(1X)12C:12H,(1X)12C:24H,(4X)12C:12H,HATCH,(2X)12C:12H	Down
JP14-78	TM	2015	CHUM	JAPAN	HONSHU	Pacific coast	IFTC	Kumano Hatchery	Kumano River	fry	300,000	2,2,4H2	(1X)12C:12H,(1X)12C:24H,(1X)12C:12H,(1X)12C:24H,(4X)12C:12H,HATCH,(2X)12C:12H	Down
JP14-79	TM	2015	CHUM	JAPAN	HONSHU	Pacific coast	NPH	Eai Hatchery	Kuji River	fry	500,000	2,2H	(1X)12C:12H,(1X)12C:24H,(2X)12C:12H	Down
JP14-80	TM	2015	CHUM	JAPAN	HONSHU	Pacific coast	NPH	Ohtsuchi Hatchery	Ohtsuchi River	fry	1,000,000	2,4nH	(1X)24C:24H,(1X)24C:48H,(4X)12C:12H	Down

**Table1. Continued.**

No	Mark Type	Year of Release	Species	Country	Prefecture	Region	Agency	Facility	Final Release Site	Stage	Preliminary Number of OM Released	Hatch Code	Otolith Mark Schedule	Temp Shift Direction	Comments
JP14-81	TM	2015	CHUM	JAPAN	HONSHU	Pacific coast	NPH	Oirase Hatchery (Pacific)	Oirase River (Pacific)	fry	5,500,000	2,2,3H	(1X)12C:12H,(1X)12C:24H,(1X)12C:12H,(1X)12C:24H,(3X)12C:12H	Down	
JP14-82	TM	2015	CHUM	JAPAN	HONSHU	Pacific coast	NPH	Orikasa Hatchery	Orikasa River	fry	1,000,000	2,1,5H	(1X)12C:12H,(2X)12C:24H,(5X)12C:12H	Down	
JP14-83	TM	2015	CHUM	JAPAN	HONSHU	Pacific coast	FRA	Orikasa Hatchery	Orikasa River	fry	400,000	2n-2H	(1X)12C:12H,(1X)12C:36H,(2X)24C:24H	Down	
JP14-84	TM	2015	CHUM	JAPAN	HONSHU	Pacific coast	FRA	Orikasa Hatchery	Orikasa River	eyed egg	100,000	2,5H	(1X)12C:12H,(1X)12C:24H,(5X)12C:12H	Down	
JP14-85	TM	2015	CHUM	JAPAN	HONSHU	Pacific coast	FRA	Orikasa Hatchery	Yamada Bay	fry	400,000	2,2nH	(1X)24C:24H,(1X)24C:48H,(2X)12C:12H	Down	
JP14-86	TM	2015	CHUM	JAPAN	HONSHU	Pacific coast	FRA	Orikasa Hatchery	Yamada Bay	fry	400,000	2-2,2H	(1X)12C:12H,(1X)12C:36H,(1X)12C:12H,(1X)12C:24H,(2X)12C:12H	Down	
JP14-87	TM	2015	CHUM	JAPAN	HONSHU	Pacific coast	NPH	Sakari Hatchery	Sakari River	fry	1,000,000	2,1,3H	(1X)12C:12H,(2X)12C:24H,(3X)12C:12H	Down	
JP14-88	TM	2015	CHUM	JAPAN	HONSHU	Pacific coast	NPH	Tarou Hatchery	Tarou River	fry	2,000,000	2-1,2H	(1X)12C:12H,(1X)12C:48H,(1X)12C:24H,(2X)12C:12H	Down	
JP14-89	TM	2015	CHUM	JAPAN	HONSHU	Pacific coast	NPH	Tsugaruishi Hatchery	Tsugaruishi River	fry	4,800,000	2-6H	(1X)12C:12H,(1X)12C:48H,(6X)12C:12H	Down	
JP14-90	TM	2015	CHUM	JAPAN	HONSHU	Pacific coast	NPH	Tsugaruishi Hatchery	Tsugaruishi River	fry	3,000,000	2-4H	(1X)12C:12H,(1X)12C:48H,(4X)12C:12H	Down	
JP14-91	TM	2015	CHUM	JAPAN	HONSHU	Pacific coast	NPH	Tsugaruishi Hatchery	Tsugaruishi River	fry	1,000,000	2,7H	(1X)12C:12H,(1X)12C:24H,(7X)12C:12H	Down	
JP14-92	ALC	2015	PINK	JAPAN	HOKKAIDO	Okhotsk Sea coast	HOKK	Aioi Hatchery	Abashiri River	fry	2,000,000	A2H			small ring double
JP14-93	TM	2015	PINK	JAPAN	HOKKAIDO	Okhotsk Sea coast	NPH	Tokushibetsu Hatchery	Kitamihorobetsu River	fry	1,300,000	2n-3H	(1X)12C:12H,(1X)12C:36H,(3X)24C:24H	Down	
JP14-94	TM	2015	PINK	JAPAN	HOKKAIDO	Okhotsk Sea coast	NPH	Shari Hatchery	Shari River	fry	4,700,000	2,3nH	(1X)24C:24H,(1X)24C:48H,(3X)12C:12H	Down	
JP14-95	TM	2015	PINK	JAPAN	HOKKAIDO	Okhotsk Sea coast	FRA	Shari Hatchery	Tokoro River	fry	1,000,000	2,3n-2nH	(1X)24C:24H,(1X)24C:48H,(2X)12C:12H,(1X)12C:36H,(2X)12C:12H	Down	
JP14-96	ALC	2015	PINK	JAPAN	HOKKAIDO	Okhotsk Sea coast	HOKK	Oketo Hatchery	Tokoro River	fry	2,000,000	A1H			small ring
JP14-97	TM	2015	PINK	JAPAN	HOKKAIDO	Okhotsk Sea coast	FRA	Tokushibetsu Hatchery	Tokushibetsu River	fry	1,700,000	2-3H	(1X)24C:24H,(1X)24C:72H,(3X)24C:24H	Down	
JP14-98	TM	2015	PINK	JAPAN	HOKKAIDO	Nemuro Strait coast	FRA	Ichani Hatchery	Ichani River	fry	1,500,000	2,4H	(1X)24C:24H,(1X)24C:48H,(4X)24C:24H	Down	
JP14-99	TM	2015	PINK	JAPAN	HOKKAIDO	Nemuro Strait coast	FRA	Ichani Hatchery	Ichani River	fry	1,500,000	2-2,4H	(1X)12C:12H,(1X)12C:36H,(1X)12C:12H,(1X)12C:36H,(4X)12C:12H	Down	
JP14-100	TM	2015	PINK	JAPAN	HOKKAIDO	Nemuro Strait coast	FRA	Ichani Hatchery	Ichani River	fry	1,500,000	2-5H	(1X)12C:12H,(1X)12C:36H,(5X)12C:12H	Down	

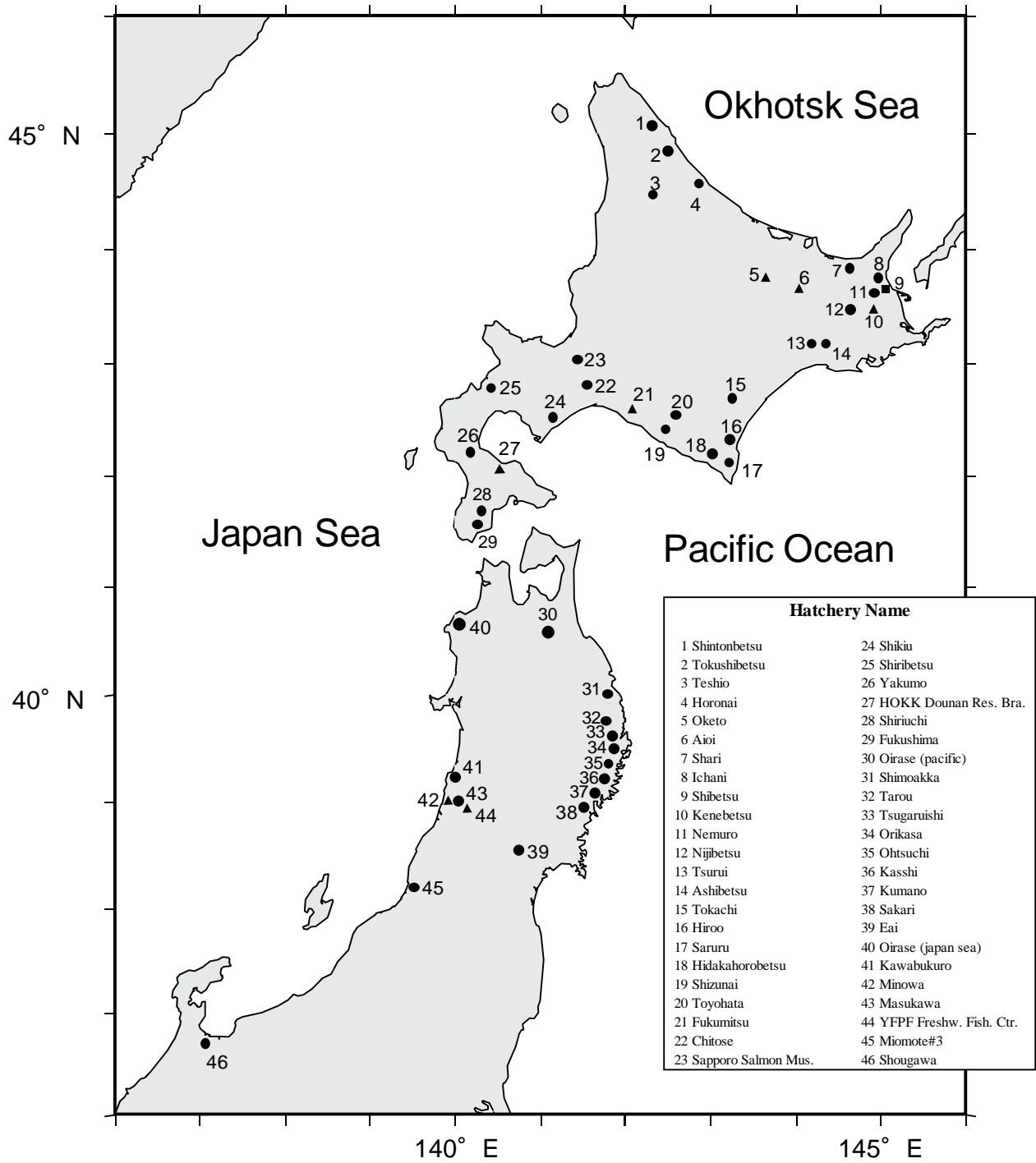


**Table1. Continued.**

No	Mark Type	Year of Release	Species	Country	Prefecture	Region	Agency	Facility	Final Release Site	Stage	Preliminary Number of OM Released	Hatch Code	Otolith Mark Schedule	Temp Shift Direction	Comments
JP14-101	TM	2015	PINK	JAPAN	HOKKAIDO	Nemuro Strait coast	NPH	Nijibetsu Hatchery	Shibetsu River etc	fry	5,300,000	2,4nH	(1X)24C:24H,(1X)24C:48H,(4X)12C:12H	Down	
JP14-102	ALC	2015	PINK	JAPAN	HOKKAIDO	Nemuro Strait coast	HOKK	Shibetsu Hatchery	Shibetsu River	emergent fry	1,000,000	A1H			large ring
JP14-103	ALC	2015	PINK	JAPAN	HOKKAIDO	Nemuro Strait coast	HOKK	Kenebetsu Hatchery	Touhoro River	emergent fry	1,000,000	A2H			large ring double
JP14-104	TM	2015	MASU	JAPAN	HOKKAIDO	Okhotsk Sea coast	FRA	Shari Hatchery	Shari River	fry	500,000	4H	(4X)24C:24H	Down	
JP14-105	TM	2015	MASU	JAPAN	HOKKAIDO	Okhotsk Sea coast	FRA	Shari Hatchery	Shari River	juvenile	50,000	4H	(4X)24C:24H	Down	
JP14-106	TM	2016	MASU	JAPAN	HOKKAIDO	Okhotsk Sea coast	FRA	Shari Hatchery	Shari River	smolt	50,000	4H	(4X)24C:24H	Down	
JP14-107	TM	2015	MASU	JAPAN	HOKKAIDO	Okhotsk Sea coast	FRA	Tokushibetsu Hatchery	Tokushibetsu River	fry	500,000	2,3nH	(1X)24C:24H,(1X)24C:48H,(3X)12C:12H	Down	
JP14-108	TM	2015	MASU	JAPAN	HOKKAIDO	Nemuro Strait coast	FRA	Nemuro Hatchery	Ichani River	fry	80,000	2,5H	(1X)24C:24H,(1X)24C:48H,(5X)24C:24H	Down	
JP14-109	TM	2016	MASU	JAPAN	HOKKAIDO	Nemuro Strait coast	FRA	Nemuro Hatchery	Ichani River	smolt	20,000	2,5H	(1X)24C:24H,(1X)24C:48H,(5X)24C:24H	Down	
JP14-110	TM	2015	MASU	JAPAN	HOKKAIDO	Nemuro Strait coast	FRA	Nemuro Hatchery	Shibetsu River	fry	120,000	2,4H	(1X)24C:24H,(1X)24C:48H,(4X)24C:24H	Down	
JP14-111	TM	2015	MASU	JAPAN	HOKKAIDO	Nemuro Strait coast	FRA	Nemuro Hatchery	Shibetsu River	juvenile	60,000	2,4H	(1X)24C:24H,(1X)24C:48H,(4X)24C:24H	Down	
JP14-112	TM	2016	MASU	JAPAN	HOKKAIDO	Nemuro Strait coast	FRA	Nemuro Hatchery	Shibetsu River	smolt	20,000	2,4H	(1X)24C:24H,(1X)24C:48H,(4X)24C:24H	Down	
JP14-113	TM	2015	MASU	JAPAN	HOKKAIDO	Japan Sea coast	FRA	Chitose Hatchery	Ishikari River	fry	30,000	2,3H	(1X)24C:24H,(1X)24C:48H,(3X)24C:24H	Down	
JP14-114	TM	2015	MASU	JAPAN	HOKKAIDO	Japan Sea coast	FRA	Chitose Hatchery	Ishikari River	juvenile	40,000	2,3H	(1X)24C:24H,(1X)24C:48H,(3X)24C:24H	Down	finclips (left ventral fin)
JP14-115	TM	2016	MASU	JAPAN	HOKKAIDO	Japan Sea coast	FRA	Chitose Hatchery	Ishikari River	smolt	30,000	2,3H	(1X)24C:24H,(1X)24C:48H,(3X)24C:24H	Down	finclips (right ventral fin)
JP14-116	ALC	2015	MASU	JAPAN	HOKKAIDO	Japan Sea coast	HOKK	HOKK Dounan Res. Branch	Furu River	fry	180,000	A1H			small ring
JP14-117	ALC	2015	MASU	JAPAN	HOKKAIDO	Japan Sea coast	HOKK	HOKK Dounan Res. Branch	Chihase River	fry	125,000	A1H			small ring
JP14-118	ALC	2016	MASU	JAPAN	HOKKAIDO	Japan Sea coast	HOKK	HOKK Dounan Res. Branch	Chihase River	smolt	150,000	A1H			small ring
JP14-119	ALC	2015	MASU	JAPAN	HOKKAIDO	Japan Sea coast	HOKK	HOKK Dounan Res. Branch	Kenichi River	fry	20,000	A1H			large ring, finclips (adipose fin)
JP14-120	ALC	2016	MASU	JAPAN	HOKKAIDO	Japan Sea coast	HOKK	HOKK Dounan Res. Branch	Kenichi River	smolt	210,000	A1H			large ring

**Table1. Continued.**

No	Mark Type	Year of Release	Species	Country	Prefecture	Region	Agency	Facility	Final Release Site	Stage	Preliminary Number of OM Released	Hatch Code	Otolith Mark Schedule	Temp Shift Direction	Comments
JP14-121	ALC	2016	MASU	JAPAN	HOKKAIDO	Japan Sea coast	HOKK	HOKK Dounan Res. Branch	Sannai River	smolt	50,000	A1H			small ring
JP14-122	TM	2015	MASU	JAPAN	HOKKAIDO	Japan Sea coast	FRA	Shiribetsu Hatchery	Shiribetsu River	fry	760,000	5H	(5X)24C:24H	Down	
JP14-123	TM	2015	MASU	JAPAN	HOKKAIDO	Japan Sea coast	FRA	Shiribetsu Hatchery	Shiribetsu River	juvenile	220,000	5H	(5X)24C:24H	Down	finclips (left ventral fin)
JP14-124	TM	2016	MASU	JAPAN	HOKKAIDO	Japan Sea coast	FRA	Shiribetsu Hatchery	Shiribetsu River	smolt	220,000	5H	(5X)24C:24H	Down	finclips (right ventral fin)
JP14-125	TM	2015	MASU	JAPAN	HOKKAIDO	Japan Sea coast	FRA	Shiribetsu Hatchery	Shubuto River	fry	500,000	3H	(3X)24C:24H	Down	
JP14-126	ALC	2015	MASU	JAPAN	HOKKAIDO	Japan Sea coast	HOKK	HOKK Dounan Res. Branch	Toppu River	fry	20,000	A1H			large ring, finclips (adipose fin)
JP14-127	ALC	2016	MASU	JAPAN	HOKKAIDO	Japan Sea coast	HOKK	HOKK Dounan Res. Branch	Toppu River	smolt	210,000	A1H			large ring
JP14-128	ALC	2016	MASU	JAPAN	HOKKAIDO	West Pacific coast	HAPC	Fukumitsu Hatchery	Saru River	smolt	10,000	A1H			green ribbon tag (SK)
JP14-129	ALC	2014	MASU	JAPAN	HONSHU	Japan Sea coast	YIE	YFPF Freshw. Fish. Ctr.	Ira River	eyed egg	30,000	A1H			
JP14-130	TM	2015	SOCKEYE	JAPAN	HOKKAIDO	East Pacific coast	FRA	Shizunai Hatchery	Kushiro River	fry	50,000	2,3H	(1X)24C:24H,(1X)24C:48H,(3X)24C:24H	Down	
JP14-131	TM	2016	SOCKEYE	JAPAN	HOKKAIDO	West Pacific coast	FRA	Chitose Hatchery	Abira River	smolt	50,000	2,7H	(1X)24C:24H,(1X)24C:48H,(7X)24C:24H	Down	
JP14-132	TM	2016	SOCKEYE	JAPAN	HOKKAIDO	West Pacific coast	FRA	Chitose Hatchery	Shizunai River	smolt	50,000	2,7H	(1X)24C:24H,(1X)24C:48H,(7X)24C:24H	Down	



**Fig. 1.** Locations of hatcheries where brood year 2014 salmon will be otolith-marked. Thirty-eight (closed circles) and seven (closed triangles) hatcheries continue otolith thermal marking and ALC marking, respectively. One hatchery (closed rectangle) plans to mark using both thermal and ALC marking methods.