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Proposed Otolith Marks for Brood Year 2011 Salmon in Japan

by

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In Japan, 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, hatchery origins of maturing adults are determined using otolith marks to evaluate their homing migrations and abundance.

The proposed otolith marks for the 2011 brood year salmon include 46 discrete thermal patterns and one ALC (alizarin complexone) patterns (Table 1). We plan to mark approximately 241 million chum, 27.7 million pink, 3.4 million masu, and 18 thousand sockeye salmon at 38 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 and pink salmon surveys by Hokkaido Salmon and Freshwater Fisheries Research Institute, Hokkaido Research Organization.

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Table 1. Proposed otolith mark releases from Japan for 2011 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; NPH, non-profit private hatchery. Revised marking plans and additional marking plans are indicated by red and blue characters, respectively.

No	Mark Type	Brood Year	Year of Release	Species	Country	Prefecture	Region	Agency	Facility	Stock	Final Release Site
JP11-01	TM	2011	2012	CHUM	JAPAN	Hokkaido	Japan Sea coast	FRA	Chitose Hatchery	Ishikari River	Ishikari River
JP11-02	TM	2011	2012	CHUM	JAPAN	Hokkaido	Japan Sea coast	FRA	Chitose Hatchery	Ishikari River	Ishikari River
JP11-03	TM	2011	2012	CHUM	JAPAN	Hokkaido	Japan Sea coast	FRA	Chitose Hatchery	Ishikari River	Ishikari River
JP11-04	TM	2011	2012	CHUM	JAPAN	Hokkaido	Japan Sea coast	FRA	Chitose Hatchery	Ishikari River	Ishikari River
JP11-05	TM	2011	2012	CHUM	JAPAN	Hokkaido	Japan Sea coast	FRA	Teshio Hatchery	Teshio River	Teshio River
JP11-06	TM	2011	2012	CHUM	JAPAN	Hokkaido	Japan Sea coast	NPH	Teshio Hatchery	Shokanbetsu River	Shokanbetsu River
JP11-07	TM	2011	2012	CHUM	JAPAN	Hokkaido	Okhotsk Sea coast	NPH	Shintonbetsu Hatchery	Tonbetsu River	Tonbetsu River
JP11-08	TM	2011	2012	CHUM	JAPAN	Hokkaido	Okhotsk Sea coast	FRA	Tokushibetsu Hatchery	Tokushibetsu River	Tokushibetsu River
JP11-09	TM	2011	2012	CHUM	JAPAN	Hokkaido	Okhotsk Sea coast	NPH	Horonai Hatchery	Horonai Hatchery	Horonai Hatchery
JP11-10	TM	2011	2012	CHUM	JAPAN	Hokkaido	Okhotsk Sea coast	FRA	Shari Hatchery	Shari River	Shari River
JP11-11	TM	2011	2012	CHUM	JAPAN	Hokkaido	Nemuro Strait coast	FRA	Ichani Hatchery	Ichani River	Ichani River
JP11-12	ALC	2011	2012	CHUM	JAPAN	Hokkaido	Nemuro Strait coast	HOKK	Uebetsu/Shibetsu Hatchery	Shibetsu River	Uebetsu River
JP11-13	TM	2011	2012	CHUM	JAPAN	Hokkaido	Nemuro Strait coast	NPH	Shibetsu Hatchery	Shibetsu River	Shibetsu River
JP11-14	TM	2011	2012	CHUM	JAPAN	Hokkaido	Nemuro Strait coast	FRA	Nijibetsu Hatchery	Nishibetsu River	Nishibetsu River
JP11-15	TM	2011	2012	CHUM	JAPAN	Hokkaido	Nemuro Strait coast	FRA	Nijibetsu Hatchery	Nishibetsu River	Nishibetsu River
JP11-16	TM	2011	2012	CHUM	JAPAN	Hokkaido	Nemuro Strait coast	FRA	Nijibetsu Hatchery	Nishibetsu River	Nishibetsu River
JP11-17	TM	2011	2012	CHUM	JAPAN	Hokkaido	East Pacific coast	FRA	Tsurui Hatchery	Kushiro River	Kushiro River
JP11-18	TM	2011	2012	CHUM	JAPAN	Hokkaido	East Pacific coast	FRA	Tokachi Hatchery	Tokachi River	Tokachi River
JP11-19	TM	2011	2012	CHUM	JAPAN	Hokkaido	East Pacific coast	NPH	Hiroo Hatchery	Hiroo River	Hiroo River
JP11-20	TM	2011	2012	CHUM	JAPAN	Hokkaido	West Pacific coast	NPH	Hidakahorobetsu Hatchery	Hidakahorobetsu River	Hidakahorobetsu River

No	Rearing Treatment	Stage	Preliminary Number of OM Released	OM ID	Hatch Code	Prehatch Graphic Image	Posthatch Graphic Image	Marking System
JP11-01	fed	fry	3,000,000	Ishikari1chum-1	2,3-2-2H			CHILLER
JP11-02	fed	fry	3,000,000	Ishikari11chum-2	2,3-2-3H			CHILLER
JP11-03	fed	fry	3,000,000	Ishikari11chum-3	2,3-5H			CHILLER
JP11-04	fed	fry	21,000,000	Ishikari11chum-4	2,3-3H			CHILLER
JP11-05	fed	fry	5,000,000	Teshio11chum	2n-3H			CHILLER
JP11-06	fed	fry	4,800,000	Shokanbetsu11chum	2-5-2H			CHILLER
JP11-07	fed	fry	4,800,000	Tonbetsu11chum	2-2-1-3H			CHILLER
JP11-08	fed	fry	11,100,000	Tokushibetsu11chum	2,4nH			CHILLER
JP11-09	fed	fry	4,600,000	Horonai11chum	2,5nH			CHILLER
JP11-10	fed	fry	11,600,000	Shari11chum	2-2-2-2H			CHILLER
JP11-11	fed	fry	8,000,000	Ichani11chum	2-4-2H			CHILLER
JP11-12	fed	fry	3,000,000	Uebetsu11chum-alc	A1H			
JP11-13	fed	fry	4,600,000	Shibetsu11chum	2,3,4H			CHILLER
JP11-14	fed	fry	5,000,000	Nishibetsu11chum-1	2,6nH			CHILLER
JP11-15	fed	fry	10,200,000	Nishibetsu11chum-2	2-7H			CHILLER
JP11-16	fed	fry	9,800,000	Nishibetsu11chum-3	2-8H			CHILLER
JP11-17	fed	fry	9,100,000	Kushiro11chum	2-2-3-3H			CHILLER
JP11-18	fed	fry	15,300,000	Tokachi11chum	2-5-3H			CHILLER
JP11-19	fed	fry	4,600,000	Hiroo11chum	2n-4H			CHILLER
JP11-20	fed	fry	4,800,000	Hidakahorobetsu11chum	2n-2,2nH			CHILLER

No	Otolith Mark Schedule	Temp Shift Direction	Comments
JP11-01	(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)	
JP11-02	(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)	
JP11-03	(1X)12C:12H,(1X)12C:24H,(2X)12C:12H,(1X)12C:36H,(5X)12C:12H	down(8-4°C)	
JP11-04	(1X)12C:12H,(1X)12C:24H,(2X)12C:12H,(1X)12C:36H,(3X)12C:12H	down(8-4°C)	
JP11-05	(1X)12C:12H,(1X)12C:36H,(3X)24C:24H	down(12-8°C)	
JP11-06	(1X)12C:12H,(1X)12C:36H,(4X)12C:12H,(1X)12C:36H,(2X)12C:12H	down(8-4°C)	
JP11-07	(1X)12C:12H,(1X)12C:36H,(1X)12C:12H,(1X)12C:36H,(1X)12C:36H,(3X)12C:12H	down(8-4°C)	
JP11-08	(1X)24C:24H,(1X)24C:48H,(4X)12C:12H	down(8-4°C)	
JP11-09	(1X)24C:24H,(1X)24C:48H,(5X)12C:12H	down(8-4°C)	
JP11-10	(1X)12C:12H,(1X)12C:36H,(1X)12C:12H,(1X)12C:36H,(1X)12C:12H,(1X)12C:36H,(2X)12C:12H	down(8-4°C)	
JP11-11	(1X)12C:12H,(1X)12C:36H,(3X)12C:12H,(1X)12C:36H,(2X)12C:12H	down(8-4°C)	
JP11-12			
JP11-13	(1X)12C:12H,(1X)12C:24H,(2X)12C:12H,(1X)12C:24H,(4X)12C:12H	down(8-4°C)	
JP11-14	(1X)24C:24H,(1X)24C:48H,(6X)12C:12H	down(9-5°C)	
JP11-15	(1X)12C:12H,(1X)12C:36H,(7X)12C:12H	down(9-5°C)	
JP11-16	(1X)12C:12H,(1X)12C:36H,(8X)12C:12H	down(9-5°C)	
JP11-17	(1X)12C:12H,(1X)12C:36H,(1X)12C:12H,(1X)12C:36H,(2X)12C:12H,(1X)12C:36H,(3X)12C:12H	down(8-4°C)	
JP11-18	(1X)12C:12H,(1X)12C:36H,(4X)12C:12H,(1X)12C:36H,(3X)12C:12H	down(8-4°C)	
JP11-19	(1X)12C:12H,(1X)12C:36H,(4X)24C:24H	down(8-4°C)	
JP11-20	(1X)12C:12H,(1X)12C:36H,(1X)24C:24H,(1X)24C:48H,(2X)12C:12H	down(8-4°C)	

Table 1. Continued.

No	Mark Type	Brood Year	Year of Release	Species	Country	Prefecture	Region	Agency	Facility	Stock	Final Release Site
JP11-21	TM	2011	2012	CHUM	JAPAN	Hokkaido	West Pacific coast	FRA	Shizunai Hatchery	Shizunai River	Shizunai River
JP11-22	TM	2011	2012	CHUM	JAPAN	Hokkaido	West Pacific coast	NPH	Shikiu Hatchery	Shiraai River	Shiraai River
JP11-23	TM	2011	2012	CHUM	JAPAN	Hokkaido	West Pacific coast	NPH	Yakumo Hatchery	Shiribeshitoshibetsu River	Shiribeshitoshibetsu River
JP11-24	TM	2011	2012	CHUM	JAPAN	Hokkaido	West Pacific coast	FRA	Yakumo Hatchery	Yurappu River	Yurappu River
JP11-25	TM	2011	2012	CHUM	JAPAN	Hokkaido	West Pacific coast	NPH	Fukushima Hatchery	Fukushima River	Fukushima River
JP11-26	TM	2011	2012	CHUM	JAPAN	Aomori	Pacific coast	NPH	Oirase Hatchery (Pacific)	Oirase River (Pacific)	Oirase River (Pacific)
JP11-27	TM	2011	2012	CHUM	JAPAN	Iwate	Pacific coast	FRA	Katagishi Hatchery	Katagishi River	Katagishi River
JP11-28	TM	2011	2012	CHUM	JAPAN	Iwate	Pacific coast	FRA	Katagishi Hatchery	Katagishi River	Katagishi River
JP11-29	TM	2011	2012	CHUM	JAPAN	Iwate	Pacific coast	FRA	Katagishi Hatchery	Katagishi River	Katagishi River
JP11-30	TM	2011	2012	CHUM	JAPAN	Iwate	Pacific coast	FRA	Orikasa Hatchery	Orikasa River	Orikasa River
JP11-31	TM	2011	2012	CHUM	JAPAN	Iwate	Pacific coast	FRA	Orikasa Hatchery	Orikasa River	Yamada Bay
JP11-32	TM	2011	2012	CHUM	JAPAN	Iwate	Pacific coast	FRA	Orikasa Hatchery	Orikasa River	Yamada Bay
JP11-33	TM	2011	2012	CHUM	JAPAN	Iwate	Pacific coast	NPH	Shimoakka Hatchery	Akka River	Akka River
JP11-34	TM	2011	2012	CHUM	JAPAN	Iwate	Pacific coast	NPH	Tarou Hatchery	Tarou River	Tarou River
JP11-35	TM	2011	2012	CHUM	JAPAN	Iwate	Pacific coast	NPH	Tsugaruishi Hatchery	Tsugaruishi River	Tsugaruishi River
JP11-36	TM	2011	2012	CHUM	JAPAN	Iwate	Pacific coast	NPH	Orikasa Hatchery	Orikasa River	Orikasa River
JP11-37	TM	2011	2012	CHUM	JAPAN	Iwate	Pacific coast	NPH	Ohtsuchi Hatchery	Ohtsuchi River	Ohtsuchi River
JP11-38	TM	2011	2012	CHUM	JAPAN	Iwate	Pacific coast	NPH	Sakari Hatchery	Sakari River	Sakari River
JP11-39	TM	2011	2012	CHUM	JAPAN	Miyagi	Pacific coast	NPH	Eai Hatchery	Eai River	Eai River
JP11-40	TM	2011	2012	CHUM	JAPAN	Ibaraki	Pacific coast	NPH	TBA	TBA	Kuji River

No	Rearing Treatment	Stage	Preliminary Number of OM Released	OM ID	Hatch Code	Prehatch Graphic Image	Posthatch Graphic Image	Marking System
JP11-21	fed	fry	6,400,000	Shizunai1chum	2,2n-3nH			CHILLER
JP11-22	fed	fry	4,800,000	Shikiu11chum	2,2n-2nH			CHILLER
JP11-23	fed	fry	4,800,000	Shiribeshitoshibetsu11chum	2-1-2-2H			CHILLER
JP11-24	fed	fry	7,500,000	Yurappu11chum	2-2-3H			CHILLER
JP11-25	fed	fry	4,800,000	Fukushima11chum	2-1-2-3H			CHILLER
JP11-26	fed	fry	6,400,000	Oirase-P11chum	2,2,3H			CHILLER
JP11-27	fed	fry	2,000,000	Katagishi11chum-1	2,4H			CHILLER
JP11-28	fed	fry	2,000,000	Katagishi11chum-2	2,5H			CHILLER
JP11-29	fed	fry	2,000,000	Katagishi11chum-3	2-2,2H			CHILLER
JP11-30	fed	fry	1,000,000	Orikasa11chum-1	2,3H			CHILLER
JP11-31	fed	fry	1,000,000	Orikasa11chum-2	2,2nH			CHILLER
JP11-32	fed	fry	1,000,000	Orikasa11chum-3	2n-2H			CHILLER
JP11-33	fed	fry	10,000,000	Akka11chum	2,6H			CHILLER
JP11-34	fed	fry	4,000,000	Tarou11chum	2,6H			CHILLER
JP11-35	fed	fry	8,000,000	Tsugaruishi11chum	2,6H			CHILLER
JP11-36	fed	fry	2,000,000	Orikasa11chum	2,6H			CHILLER
JP11-37	fed	fry	2,000,000	Ohtsuchi11chum	2,6H			CHILLER
JP11-38	fed	fry	2,000,000	Sakari11chum	2,6H			CHILLER
JP11-39	fed	fry	3,400,000	Eai11chum	2,2H			CHILLER
JP11-40	fed	fry	1,000,000	Kuji11chum	2,2-2H			CHILLER

No	Otolith Mark Schedule	Temp Shift Direction	Comments
JP11-21	(1X)24C:24H,(1X)24C:48H,(1X)12C:12H,(1X)12C:36H,(3X)12C:12H	down(10-6°C)	
JP11-22	(1X)24C:24H,(1X)24C:48H,(1X)12C:12H,(1X)12C:36H,(2X)12C:12H	down(8-4°C)	
JP11-23	(1X)12C:12H,(1X)12C:36H,(1X)12C:36H,(1X)12C:12H,(1X)12C:36H,(2X)12C:12H	down(8-4°C)	
JP11-24	(1X)12C:12H,(1X)12C:36H,(1X)12C:12H,(1X)12C:36H,(3X)12C:12H	down(8-4°C)	
JP11-25	(1X)12C:12H,(1X)12C:36H,(1X)12C:36H,(1X)12C:12H,(1X)12C:36H,(3X)12C:12H	down(8-4°C)	
JP11-26	(1X)12C:12H,(1X)12C:24H,(1X)12C:12H,(1X)12C:24H,(3X)12C:12H	down(8-4°C)	
JP11-27	(1X)12C:12H,(1X)12C:24H,(4X)12C:12H	down(12-8°C)	
JP11-28	(1X)12C:12H,(1X)12C:24H,(5X)12C:12H	down(12-8°C)	
JP11-29	(1X)12C:12H,(1X)12C:36H,(1X)12C:12H,(1X)12C:24H,(2X)12C:12H	down(12-8°C)	
JP11-30	(1X)12C:12H,(1X)12C:24H,(3X)12C:12H	down(12-8°C)	
JP11-31	(1X)24C:24H,(1X)24C:48H,(2X)12C:12H	down(12-8°C)	
JP11-32	(1X)12C:12H,(1X)12C:36H,(2X)24C:24H	down(12-8°C)	
JP11-33	(1X)12C:12H,(1X)12C:24H,(6X)12C:12H	down(8-4°C)	
JP11-34	(1X)12C:12H,(1X)12C:24H,(6X)12C:12H	down(8-4°C)	
JP11-35	(1X)12C:12H,(1X)12C:24H,(6X)12C:12H	down(8-4°C)	
JP11-36	(1X)12C:12H,(1X)12C:24H,(6X)12C:12H	down(8-4°C)	
JP11-37	(1X)12C:12H,(1X)12C:24H,(6X)12C:12H	down(8-4°C)	
JP11-38	(1X)12C:12H,(1X)12C:24H,(6X)12C:12H	down(8-4°C)	
JP11-39	(1X)12C:12H,(1X)12C:24H,(2X)12C:12H	down(8-4°C)	
JP11-40	(1X)12C:12H,(1X)12C:24H,(1X)12C:12H,(1X)12C:36H,(2X)12C:12H	down(8-4°C)	

Table 1. Continued.

No	Mark Type	Brood Year	Year of Release	Species	Country	Prefecture	Region	Agency	Facility	Stock	Final Release Site
JP11-41	TM	2011	2012	CHUM	JAPAN	Aomori	Japan Sea coast	NPH	Oirase Hatchery (Japan sea)	Oirase River (Japan Sea)	Oirase River (Japan Sea)
JP11-42	TM	2011	2012	CHUM	JAPAN	Akita	Japan Sea coast	NPH	Kawabukuro Hatchery	Kawabukuro River	Kawabukuro River
JP11-43	TM	2011	2012	CHUM	JAPAN	Yamagata	Japan Sea coast	NPH	Masukawa Hatchery	Gakkou River	Gakkou River
JP11-44	TM	2011	2012	CHUM	JAPAN	Niigata	Japan Sea coast	NPH	Miomote3 Hatchery	Miomote River	Miomote River
JP11-45	TM	2011	2012	CHUM	JAPAN	Niigata	Japan Sea coast	NPH	Himekawa Hatchery	Himekawa River	Himekawa River
JP11-46	TM	2011	2012	CHUM	JAPAN	Toyama	Japan Sea coast	NPH	Shougawa Hatchery	Shougawa River	Shougawa River
JP11-47	TM	2011	2012	PINK	JAPAN	Hokkaido	Okhotsk Sea coast	FRA	Tokushibetsu Hatchery	Tokushibetsu River	Tokushibetsu River
JP11-48	TM	2011	2012	PINK	JAPAN	Hokkaido	Okhotsk Sea coast	FRA	Tokushibetsu Hatchery	Tokushibetsu River	Kitamihorobetsu River
JP11-49	TM	2011	2012	PINK	JAPAN	Hokkaido	Okhotsk Sea coast	FRA	Shari Hatchery	Shari River	Shari River
JP11-50	TM	2011	2012	PINK	JAPAN	Hokkaido	Okhotsk Sea coast	FRA	Kitami Hatchery	Tokoro River	Tokoro River
JP11-51	TM	2011	2012	PINK	JAPAN	Hokkaido	Nemuro Strait coast	FRA	Nijibetsu Hatchery	Sashirui River	Shibetsu River
JP11-52	ALC	2011	2012	PINK	JAPAN	Hokkaido	Nemuro Strait coast	HOKK	Shunkarikotan Hatchery	Shibetsu River	Shibetsu River
JP11-53	TM	2011	2012	PINK	JAPAN	Hokkaido	Nemuro Strait coast	FRA	Ichani Hatchery	Ichani River	Ichani River
JP11-54	TM	2011	2012	PINK	JAPAN	Hokkaido	Nemuro Strait coast	FRA	Ichani Hatchery	Ichani River	Ichani River
JP11-55	ALC	2011	2012	PINK	JAPAN	Hokkaido	Nemuro Strait coast	HOKK	Kenebetsu Hatchery	Touhoro River	Touhoro River
JP11-56	TM	2011	2012	PINK	JAPAN	Hokkaido	East Pacific coast	FRA	Tsurui Hatchery	Kushiro River	Kushiro River
JP11-57	TM	2011	2012	MASU	JAPAN	Hokkaido	Japan Sea coast	FRA	Shiribetsu Hatchery	Shiribetsu River	Shubuto River
JP11-58	TM	2011	2012	MASU	JAPAN	Hokkaido	Japan Sea coast	FRA	Shiribetsu Hatchery	Shiribetsu River	Shiribetsu River
JP11-59	TM	2011	2012	MASU	JAPAN	Hokkaido	Japan Sea coast	FRA	Shiribetsu Hatchery	Shiribetsu River	Shiribetsu River
JP11-60	TM	2011	2013	MASU	JAPAN	Hokkaido	Japan Sea coast	FRA	Shiribetsu Hatchery	Shiribetsu River	Shiribetsu River

No	Rearing Treatment	Stage	Preliminary Number of OM Released	OM ID	Hatch Code	Prehatch Graphic Image	Posthatch Graphic Image	Marking System
JP11-41	fed	fry	1,800,000	Oirase-J11chum	2,3,2H			CHILLER
JP11-42	fed	fry	4,300,000	Kawabukuro11chum	2,1,4H			CHILLER
JP11-43	fed	fry	4,200,000	Gakkoku11chum	2,3nH			CHILLER
JP11-44	fed	fry	3,800,000	Miomote11chum	2,1,2H			CHILLER
JP11-45	fed	fry	1,300,000	Himekawa11chum	2,1,2H			CHILLER
JP11-46	fed	fry	3,285,000	Shougawa11chum	2,1,3H			CHILLER
JP11-47	fed	fry	1,700,000	Tokushibetsu11pink	2-3H			CHILLER
JP11-48	fed	fry	1,500,000	Kitamihorobetsu11pink	2n-2H			CHILLER
JP11-49	fed	fry	5,000,000	Shari11pink	2,3nH			CHILLER
JP11-50	fed	fry	1,000,000	Tokoro11pink	2,3n-2nH			CHILLER
JP11-51	fed	fry	5,500,000	Shibetsu11pink	2,2nH			CHILLER
JP11-52	fed	fry	2,000,000	Shibetsu11pink-alc	A1H			CHILLER
JP11-53	fed	fry	2,600,000	Ichani11pink-1	2,4H			CHILLER
JP11-54	fed	fry	1,900,000	Ichani11pink-2	2-2-4H			CHILLER
JP11-55	fed	fry	2,000,000	Touhoro11pink-alc	A1H			CHILLER
JP11-56	fed	fry	4,500,000	Kushiro11pink	2-5H			CHILLER
JP11-57	fed	fry	500,000	Shubuto11masu	3H			CHILLER
JP11-58	fed	fry	860,000	Shiribetsu11masu-f	2,2H			CHILLER
JP11-59	fed	juvenile	220,000	Shiribetsu11masu-j	2,2H			CHILLER
JP11-60	fed	smolt	220,000	Shiribetsu11masu-s	2,2H			CHILLER

No	Otolith Mark Schedule	Temp Shift Direction	Comments
JP11-41	(1X)12C:12H,(1X)12C:24H,(2X)12C:12H,(1X)12C:24H,(2X)12C:12H	down(8-4°C)	
JP11-42	(1X)12C:12H,(2X)12C:24H,(4X)12C:12H	down(8-4°C)	
JP11-43	(1X)24C:24H,(1X)24C:48H,(3X)12C:12H	down(8-4°C)	
JP11-44	(1X)12C:12H,(2X)12C:24H,(2X)12C:12H	down(8-4°C)	
JP11-45	(1X)12C:12H,(2X)12C:24H,(2X)12C:12H	down(8-4°C)	
JP11-46	(1X)12C:12H,(2X)12C:24H,(3X)12C:12H	down(8-4°C)	
JP11-47	(1X)24C:24H,(1X)24C:72H,(3X)24C:24H	down(8-4°C)	
JP11-48	(1X)12C:12H,(1X)12C:36H,(2X)24C:24H	down(8-4°C)	
JP11-49	(1X)24C:24H,(1X)24C:48H,(3X)12C:12H	down(8-4°C)	
JP11-50	(1X)24C:24H,(1X)24C:48H,(2X)12C:12H,(1X)12C:36H,(2X)12C:12H	down(12-8°C)	
JP11-51	(1X)24C:24H,(1X)24C:48H,(2X)12C:12H	down(9-5°C)	
JP11-52			
JP11-53	(1X)24C:24H,(1X)24C:48H,(4X)24C:24H	down(8-4°C)	
JP11-54	(1X)12C:12H,(1X)12C:36H,(1X)12C:12H,(1X)12C:36H,(4X)12C:12H	down(8-4°C)	
JP11-55			
JP11-56	(1X)12C:12H,(1X)12C:36H,(5X)12C:12H	down(8-4°C)	
JP11-57	(3X)24C:24H	down(10-6°C)	
JP11-58	(1X)24C:24H,(1X)24C:48H,(2X)24C:24H	down(10-6°C)	
JP11-59	(1X)24C:24H,(1X)24C:48H,(2X)24C:24H	down(10-6°C)	TM + Finclips
JP11-60	(1X)24C:24H,(1X)24C:48H,(2X)24C:24H	down(10-6°C)	TM + Finclips

Table 1. Continued.

No	Mark Type	Brood Year	Year of Release	Species	Country	Prefecture	Region	Agency	Facility	Stock	Final Release Site
JP11-61	TM	2011	2012	MASU	JAPAN	Hokkaido	Japan Sea coast	FRA	Chitose Hatchery	Ishikari River	Ishikari River
JP11-62	TM	2011	2012	MASU	JAPAN	Hokkaido	Japan Sea coast	FRA	Chitose Hatchery	Ishikari River	Ishikari River
JP11-63	TM	2011	2013	MASU	JAPAN	Hokkaido	Japan Sea coast	FRA	Chitose Hatchery	Ishikari River	Ishikari River
JP11-64	TM	2011	2012	MASU	JAPAN	Hokkaido	Okhotsk Sea coast	FRA	Tokushibetsu Hatchery	Tokushibetsu River	Tokushibetsu River
JP11-65	TM	2011	2012	MASU	JAPAN	Hokkaido	Okhotsk Sea coast	FRA	Shari Hatchery	Shari River	Shari River
JP11-66	TM	2011	2012	MASU	JAPAN	Hokkaido	Okhotsk Sea coast	FRA	Shari Hatchery	Shari River	Shari River
JP11-67	TM	2011	2013	MASU	JAPAN	Hokkaido	Okhotsk Sea coast	FRA	Shari Hatchery	Shari River	Shari River
JP11-68	TM	2011	2012	MASU	JAPAN	Hokkaido	Nemuro Strait coast	FRA	Nemuro Hatchery	Ichani River	Ichani River
JP11-69	TM	2011	2012	MASU	JAPAN	Hokkaido	Nemuro Strait coast	FRA	Nemuro Hatchery	Ichani River	Ichani River
JP11-70	TM	2011	2013	MASU	JAPAN	Hokkaido	Nemuro Strait coast	FRA	Nemuro Hatchery	Ichani River	Ichani River
JP11-71	TM	2011	2012	MASU	JAPAN	Hokkaido	Nemuro Strait coast	FRA	Nemuro Hatchery	Shibetsu River	Shibetsu River
JP11-72	TM	2011	2012	MASU	JAPAN	Hokkaido	Nemuro Strait coast	FRA	Nemuro Hatchery	Shibetsu River	Shibetsu River
JP11-73	TM	2011	2013	MASU	JAPAN	Hokkaido	Nemuro Strait coast	FRA	Nemuro Hatchery	Shibetsu River	Shibetsu River
JP11-74	TM	2011	2013	SOCKEYE	JAPAN	Hokkaido	East Pacific coast	FRA	Tsurui Hatchery	Kushiro River	Kushiro River
JP11-75	TM	2011	2012	SOCKEYE	JAPAN	Hokkaido	West Pacific coast	FRA	Shizunai Hatchery	Shizunai River	Abira River
JP11-76	TM	2011	2013	SOCKEYE	JAPAN	Hokkaido	West Pacific coast	FRA	Shizunai Hatchery	Shizunai River	Shizunai River
JP11-77	TM	2011	2013	SOCKEYE	JAPAN	Hokkaido	West Pacific coast	FRA	Chitose Hatchery	Abira River	Abira River

No	Rearing Treatment	Stage	Preliminary Number of OM Released	OM ID	Hatch Code	Prehatch Graphic Image	Posthatch Graphic Image	Marking System
JP11-61	fed	fry	30,000	Ishikari11masu-f	2,3H			CHILLER
JP11-62	fed	juvenile	40,000	Ishikari11masu-j	2,3H			CHILLER
JP11-63	fed	smolt	30,000	Ishikari11masu-s	2,3H			CHILLER
JP11-64	fed	fry	500,000	Tokushibetsu11masu	2,3nH			CHILLER
JP11-65	fed	fry	400,000	Shari11masu-f	6H			CHILLER
JP11-66	fed	juvenile	100,000	Shari11masu-j	6H			CHILLER
JP11-67	fed	smolt	100,000	Shari11masu-s	6H			CHILLER
JP11-68	fed	fry	100,000	Ichani11masu-f	2,5H			CHILLER
JP11-69	fed	juvenile	30,000	Ichani11masu-j	2,5H			CHILLER
JP11-70	fed	smolt	30,000	Ichani11masu-s	2,5H			CHILLER
JP11-71	fed	fry	200,000	Shibetsu11masu-f	2,4H			CHILLER
JP11-72	fed	juvenile	60,000	Shibetsu11masu-j	2,4H			CHILLER
JP11-73	fed	smolt	30,000	Shibetsu11masu-s	2,4H			CHILLER
JP11-74	fed	smolt	50,000	Kushiro11sockeye	2,3H			CHILLER
JP11-75	fed	fry	30,000	Abira10sockeye-f	2,6H			CHILLER
JP11-76	fed	smolt	50,000	Shizunai11sockeye	2,6H			CHILLER
JP11-77	fed	smolt	50,000	Abira10sockeye-s	2,6H			CHILLER

No	Otolith Mark Schedule	Temp Shift Direction	Comments
JP11-61	(1X)24C:24H,(1X)24C:48H,(3X)24C:24H	down(8-4°C)	
JP11-62	(1X)24C:24H,(1X)24C:48H,(3X)24C:24H	down(8-4°C)	TM + Finclips
JP11-63	(1X)24C:24H,(1X)24C:48H,(3X)24C:24H	down(8-4°C)	TM + Finclips
JP11-64	(1X)24C:24H,(1X)24C:48H,(3X)12C:12H	down(8-4°C)	
JP11-65	(6X)24C:24H	down(8-4°C)	
JP11-66	(6X)24C:24H	down(8-4°C)	TM + Finclips
JP11-67	(6X)24C:24H	down(8-4°C)	TM + Finclips
JP11-68	(1X)24C:24H,(1X)24C:48H,(5X)24C:24H	down(8-4°C)	
JP11-69	(1X)24C:24H,(1X)24C:48H,(5X)24C:24H	down(8-4°C)	
JP11-70	(1X)24C:24H,(1X)24C:48H,(5X)24C:24H	down(8-4°C)	
JP11-71	(1X)24C:24H,(1X)24C:48H,(4X)24C:24H	down(8-4°C)	
JP11-72	(1X)24C:24H,(1X)24C:48H,(4X)24C:24H	down(8-4°C)	
JP11-73	(1X)24C:24H,(1X)24C:48H,(4X)24C:24H	down(8-4°C)	
JP11-74	(1X)24C:24H,(1X)24C:48H,(3X)24C:24H	down(8-4°C)	
JP11-75	(1X)24C:24H,(1X)24C:48H,(6X)24C:24H	down(10-6°C)	
JP11-76	(1X)24C:24H,(1X)24C:48H,(6X)24C:24H	down(10-6°C)	
JP11-77	(1X)24C:24H,(1X)24C:48H,(6X)24C:24H	down(8-4°C)	

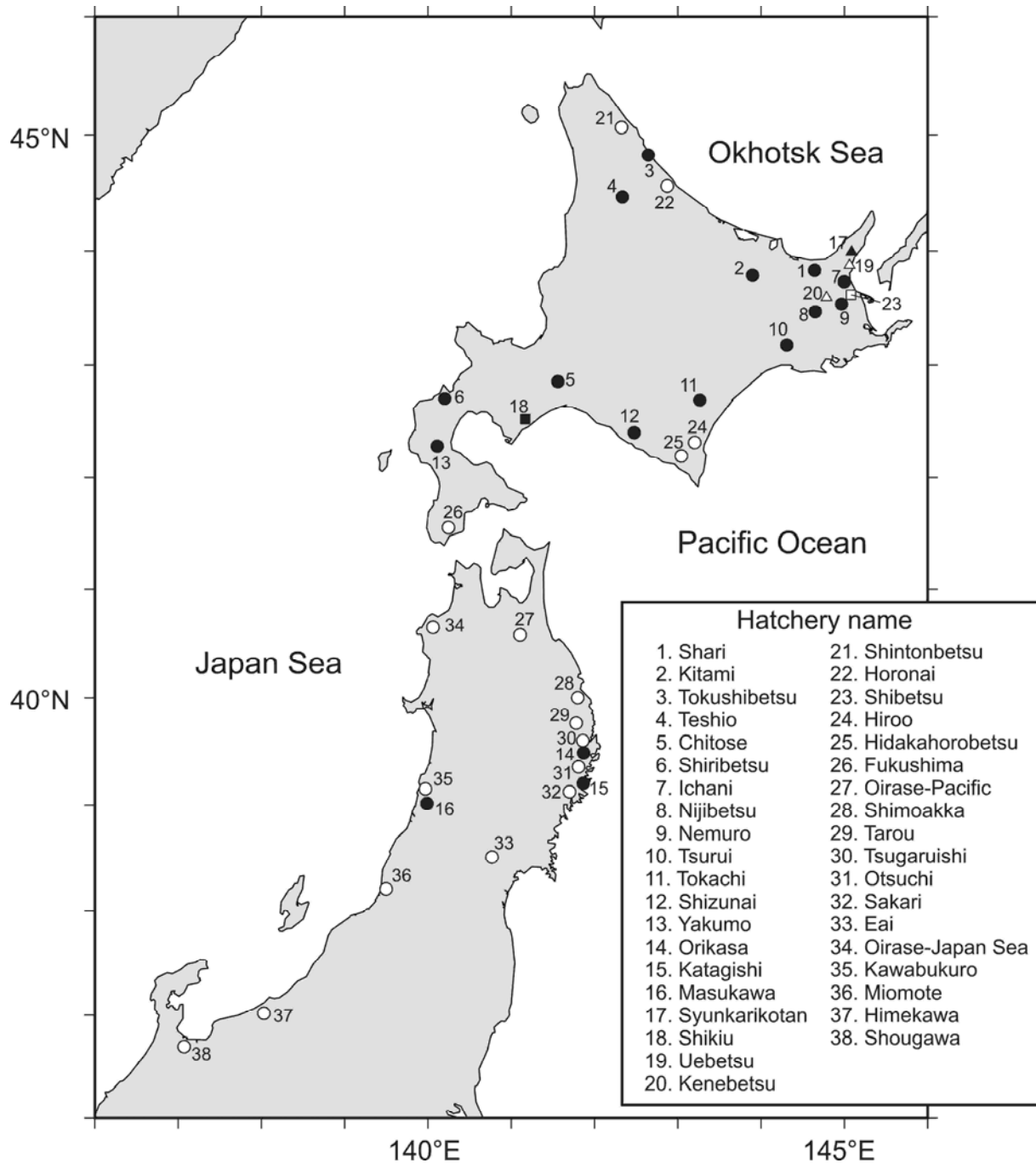


Fig. 1. Locations of hatcheries where brood year 2011 salmon will be otolith-marked. Sixteen (closed circles) and one (triangles) hatchery continue otolith thermal marking and ALC marking, respectively. Additional 17 hatcheries (open circles) and two hatcheries (open triangles) will initiate otolith thermal marking and ALC marking, respectively. Two hatcheries (open and closed rectangles) plan to mark using both thermal and ALC marking methods.