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Proposed Otolith Marks for Brood Year 2009 Salmon in Japan

by

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

The proposed otolith marks for the 2009 brood year salmon include 53 discrete thermal patterns and two ALC (alizarin complexone) patterns (Table. 1). We plan to mark approximately 155 million chum, 31.7 million pink, 3.2 million masu, and 30 thousand sockeye salmon at 19 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. 2000). All thermal rings are induced by cooler temperature exposures.

The ALC marks will be used for chum salmon surveys by Hokkaido Fish Hatchery.

References

- Hagen, P., H.J. Geiger, E.C. Volk, and J.J. Grimm. 2000. Thermal mark patterns applied to salmon from Alaska, Washington and Oregon for brood year 1999 and some proposed marks for brood year 2000. (NPAFC Doc. 463 rev.1). 8p. Alaska Dept. Fish and Game, Juneau Alaska 99801-5526, USA.
- Josephson, R., B.A. Agler, K.F. Van Kirk, and D.S. Oxman 2006. A proposal to simplify the thermal mark code notation. (NPAFC Doc. 944). 4p. Alaska Dept. Fish and Game, Juneau Alaska. 99801-5526, USA.
- Urawa, S., M. Kawana, and T. Ishiguro. 2000. Releases of thermally marked salmon from Japan in 1999 and 2000 with a thermal mark plan for 2000 brood year stocks. (NPAFC Doc. 461) 7 p. National Salmon Resources Center, Fisheries Agency of Japan, Sapporo 062-0922, Japan.

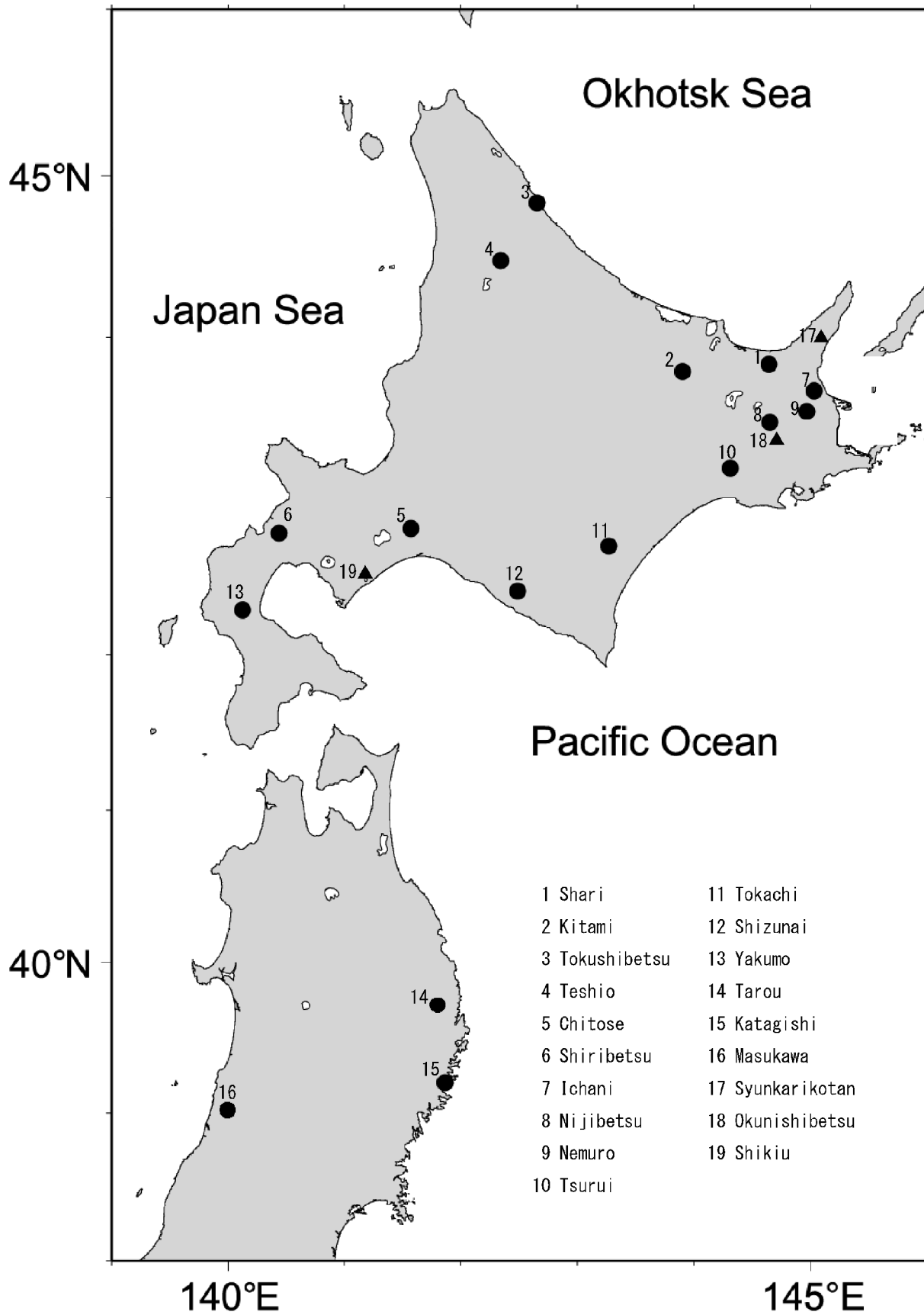


Fig. 1. Locations of hatcheries where brood year 2009 salmon will be thermally marked (closed circles) or marked with ALC (closed triangles).

Table 1. Proposed otolith mark releases from Japan for 2009 brood year stocks of chum, pink, masu and sockeye salmon.

No	Mark Type	Brood Year	Year of Release	Species	Country	State/Province	Region	Agency	Facility	Stock	Final Release Site
JP09-01	TM	2009	2010	CHUM	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Chitose Hatchery	Ishikari River	Ishikari River
JP09-02	TM	2009	2010	CHUM	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Chitose Hatchery	Ishikari River	Ishikari River
JP09-03	TM	2009	2010	CHUM	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Chitose Hatchery	Ishikari River	Ishikari River
JP09-04	TM	2009	2010	CHUM	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Chitose Hatchery	Ishikari River	Ishikari River
JP09-05	TM	2009	2010	CHUM	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Chitose Hatchery	Ishikari River	Ishikari River
JP09-06	TM	2009	2010	CHUM	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Teshio Hatchery	Teshio River	Teshio River
JP09-07	TM	2009	2010	CHUM	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Teshio Hatchery	Teshio River	Teshio River
JP09-08	TM	2009	2010	CHUM	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Teshio Hatchery	Teshio River	Teshio River
JP09-09	TM	2009	2010	CHUM	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Teshio Hatchery	Teshio River	Teshio River
JP09-10	TM	2009	2010	CHUM	JAPAN	HOKKAIDO	Okhotsk Sea coast	NASREC	Tokushibetsu Hatchery	Tokushibetsu River	Tokushibetsu River
JP09-11	TM	2009	2010	CHUM	JAPAN	HOKKAIDO	Okhotsk Sea coast	NASREC	Shari Hatchery	Shari River	Shari River
JP09-12	TM	2009	2010	CHUM	JAPAN	HOKKAIDO	Okhotsk Sea coast	NASREC	Shari Hatchery	Shari River	Shari River
JP09-13	TM	2009	2010	CHUM	JAPAN	HOKKAIDO	Okhotsk Sea coast	NASREC	Shari Hatchery	Shari River	Shari River
JP09-14	TM	2009	2010	CHUM	JAPAN	HOKKAIDO	Okhotsk Sea coast	NASREC	Shari Hatchery	Shari River	Shari River
JP09-15	TM	2009	2010	CHUM	JAPAN	HOKKAIDO	Okhotsk Sea coast	NASREC	Shari Hatchery	Shari River	Shari River
JP09-16	TM	2009	2010	CHUM	JAPAN	HOKKAIDO	Okhotsk Sea coast	NASREC	Shari Hatchery	Shari River	Shari River
JP09-17	TM	2009	2010	CHUM	JAPAN	HOKKAIDO	Okhotsk Sea coast	NASREC	Shari Hatchery	Shari River	Shari River
JP09-18	TM	2009	2010	CHUM	JAPAN	HOKKAIDO	Nemuro Strait coast	NASREC	Ichani Hatchery	Ichani River	Ichani River
JP09-19	TM	2009	2010	CHUM	JAPAN	HOKKAIDO	Nemuro Strait coast	NASREC	Ichani Hatchery	Ichani River	Ichani River
JP09-20	TM	2009	2010	CHUM	JAPAN	HOKKAIDO	Nemuro Strait coast	NASREC	Ichani Hatchery	Ichani River	Ichani River

No	Rearing Treatment	Stage	Preliminary Number of OM Released	OM ID	Hatch Code	Prehatch Graphic Image	Posthatch Graphic Image	Marking System
JP09-01	fed	fry	20,000,000	Ishikari09chum-1	2,3-2-2H			CHILLER
JP09-02	fed	fry	2,400,000	Ishikari09chum-2	2,3-2-3H			CHILLER
JP09-03	fed	fry	2,500,000	Ishikari09chum-3	2,3-5H			CHILLER
JP09-04	fed	fry	1,500,000	Ishikari09chum-4	2,3-6H			CHILLER
JP09-05	fed	fry	3,000,000	Ishikari09chum-5	2,2n-3nH			CHILLER
JP09-06	fed	fry	2,900,000	Teshio09chum-1	2,2H			CHILLER
JP09-07	fed	fry	700,000	Teshio09chum-2	2,3nH			CHILLER
JP09-08	fed	fry	700,000	Teshio09chum-3	2n-3H			CHILLER
JP09-09	fed	fry	700,000	Teshio09chum-4	2n-4H			CHILLER
JP09-10	fed	fry	11,100,000	Tokushibetsu09chum	2,4nH			CHILLER
JP09-11	fed	fry	2,000,000	Shari09chum-1	2-2-2-2H			CHILLER
JP09-12	fed	fry	1,300,000	Shari09chum-2	2-2-2-3H			CHILLER
JP09-13	fed	fry	2,600,000	Shari09chum-3	2-2-2-4H			CHILLER
JP09-14	fed	fry	1,300,000	Shari09chum-4	2-6H			CHILLER
JP09-15	fed	fry	1,800,000	Shari09chum-5	2-6-2H			CHILLER
JP09-16	fed	fry	1,800,000	Shari09chum-6	2-6-3H			CHILLER
JP09-17	fed	fry	800,000	Shari09chum-7	2-2-3-2H			CHILLER
JP09-18	fed	fry	600,000	Ichani09chum-1	2-7H			CHILLER
JP09-19	fed	fry	1,300,000	Ichani09chum-2	2-8H			CHILLER
JP09-20	fed	fry	600,000	Ichani09chum-3	2-9H			CHILLER

No	Otolith Mark Schedule	Temp Shift Direction	Comments
JP09-01	(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)	
JP09-02	(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)	
JP09-03	(1X)12C:12H,(1X)12C:24H,(2X)12C:12H,(1X)12C:36H,(6X)12C:12H	down(8-4°C)	
JP09-04	(1X)12C:12H,(1X)12C:24H,(2X)12C:12H,(1X)12C:36H,(6X)12C:12H	down(8-4°C)	
JP09-05	(1X)24C:24H,(1X)24C:48H,(1X)12C:12H,(1X)12C:36H,(3X)12C:12H	down(8-4°C)	
JP09-06	(1X)24C:24H,(1X)24C:48H,(2X)24C:24H	down(12-8°C)	
JP09-07	(1X)24C:24H,(1X)24C:48H,(3X)12C:12H	down(12-8°C)	
JP09-08	(1X)12C:12H,(1X)12C:36H,(3X)24C:24H	down(12-8°C)	
JP09-09	(1X)12C:12H,(1X)12C:36H,(4X)24C:24H	down(12-8°C)	
JP09-10	(1X)24C:24H,(1X)24C:48H,(4X)12C:12H	down(8-5°C)	
JP09-11	(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)	
JP09-12	(1X)12C:12H,(1X)12C:36H,(1X)12C:12H,(1X)12C:36H,(1X)12C:12H,(1X)12C:36H,(3X)12C:12H	down(8-4°C)	
JP09-13	(1X)12C:12H,(1X)12C:36H,(1X)12C:12H,(1X)12C:36H,(1X)12C:12H,(1X)12C:36H,(4X)12C:12H	down(8-4°C)	
JP09-14	(1X)12C:12H,(1X)12C:36H,(6X)12C:12H	down(8-4°C)	
JP09-15	(1X)12C:12H,(1X)12C:36H,(5X)12C:12H,(1X)12C:36H,(2X)12C:12H	down(8-4°C)	
JP09-16	(1X)12C:12H,(1X)12C:36H,(5X)12C:12H,(1X)12C:36H,(3X)12C:12H	down(8-4°C)	
JP09-17	(1X)12C:12H,(1X)12C:36H,(1X)12C:12H,(1X)12C:36H,(2X)12C:12H,(1X)12C:36H,(2X)12C:12H	down(8-4°C)	
JP09-18	(1X)12C:12H,(1X)12C:36H,(7X)12C:12H	down(8-4°C)	
JP09-19	(1X)12C:12H,(1X)12C:36H,(8X)12C:12H	down(8-4°C)	
JP09-20	(1X)12C:12H,(1X)12C:36H,(9X)12C:12H	down(8-4°C)	

Table 1. Continued.

No	Mark Type	Brood Year	Year of Release	Species	Country	State/Province	Region	Agency	Facility	Stock	Final Release Site
JP09-21	TM	2009	2010	CHUM	JAPAN	HOKKAIDO	Nemuro Strait coast	NASREC	Ichani Hatchery	Ichani River	Ichani River
JP09-22	TM	2009	2010	CHUM	JAPAN	HOKKAIDO	Nemuro Strait coast	NASREC	Ichani Hatchery	Ichani River	Ichani River
JP09-23	TM	2009	2010	CHUM	JAPAN	HOKKAIDO	Nemuro Strait coast	NASREC	Ichani Hatchery	Ichani River	Ichani River
JP09-24	TM	2009	2010	CHUM	JAPAN	HOKKAIDO	Nemuro Strait coast	NASREC	Ichani Hatchery	Ichani River	Ichani River
JP09-25	TM	2009	2010	CHUM	JAPAN	HOKKAIDO	Nemuro Strait coast	NASREC	Nijibetsu Hatchery	Nishibetsu River	Nishibetsu River
JP09-26	ALC	2009	2010	CHUM	JAPAN	HOKKAIDO	Nemuro Strait coast	HFH	Okunishibetsu Hatchery	Nishibetsu River	Nishibetsu River
JP09-27	ALC	2009	2010	CHUM	JAPAN	HOKKAIDO	Nemuro Strait coast	HFH	Okunishibetsu Hatchery	Nishibetsu River	Nishibetsu River
JP09-28	TM	2009	2010	CHUM	JAPAN	HOKKAIDO	East Pacific coast	NASREC	Tsurui Hatchery	Kushiro River	Kushiro River
JP09-29	TM	2009	2010	CHUM	JAPAN	HOKKAIDO	East Pacific coast	NASREC	Tokachi Hatchery	Tokachi River	Tokachi River
JP09-30	TM	2009	2010	CHUM	JAPAN	HOKKAIDO	East Pacific coast	NASREC	Tokachi Hatchery	Tokachi River	Tokachi River
JP09-31	TM	2009	2010	CHUM	JAPAN	HOKKAIDO	West Pacific coast	NASREC	Shizunai Hatchery	Shizunai River	Shizunai River
JP09-32	TM	2009	2010	CHUM	JAPAN	HOKKAIDO	West Pacific coast	NASREC	Shizunai Hatchery	Shizunai River	Shizunai River
JP09-33	TM	2009	2010	CHUM	JAPAN	HOKKAIDO	West Pacific coast	NASREC	Shizunai Hatchery	Shizunai River	Shizunai River
JP09-34	ALC	2009	2010	CHUM	JAPAN	HOKKAIDO	West Pacific coast	HFH	Shikiu Hatchery	Shikiu River	Shikiu River
JP09-35	ALC	2009	2010	CHUM	JAPAN	HOKKAIDO	West Pacific coast	HFH	Shikiu Hatchery	Shikiu River	Shikiu River
JP09-36	TM	2009	2010	CHUM	JAPAN	HOKKAIDO	West Pacific coast	NASREC	Yakumo Hatchery	Yurappu River	Yurappu River
JP09-37	TM	2009	2010	CHUM	JAPAN	HOKKAIDO	West Pacific coast	NASREC	Yakumo Hatchery	Yurappu River	Yurappu River
JP09-38	TM	2009	2010	CHUM	JAPAN	HOKKAIDO	West Pacific coast	NASREC	Yakumo Hatchery	Yurappu River	Yurappu River
JP09-39	TM	2009	2010	CHUM	JAPAN	HONSHU	Pacific coast	NASREC	Katagishi Hatchery	Katagishi River	Katagishi River
JP09-40	TM	2009	2010	CHUM	JAPAN	HONSHU	Pacific coast	NASREC	Katagishi Hatchery	Katagishi River	Katagishi River

No	Rearing Treatment	Stage	Preliminary Number of OM Released	OM ID	Hatch Code	Prehatch Graphic Image	Posthatch Graphic Image	Marking System
JP09-21	fed	fry	1,800,000	Ichani09chum-4	2-4-2H			CHILLER
JP09-22	fed	fry	1,200,000	Ichani09chum-5	2-4-3H			CHILLER
JP09-23	fed	fry	1,300,000	Ichani09chum-6	2-4-4H			CHILLER
JP09-24	fed	fry	1,200,000	Ichani09chum-7	2-5-2H			CHILLER
JP09-25	fed	fry	25,000,000	Nishibetsu09chum	2,6nH			CHILLER
JP09-26	fed	fry	2,000,000	Nishibetsu09chum-alc-s	A1H			
JP09-27	fed	fry	1,000,000	Nishibetsu09chum-alc-d	A2H			
JP09-28	fed	fry	9,100,000	Kushiro09chum	2-2-3-3H			CHILLER
JP09-29	fed	fry	12,400,000	Tokachi09chum-1	2-5-3H			CHILLER
JP09-30	fed	fry	2,900,000	Tokachi09chum-2	2-5-4H			CHILLER
JP09-31	fed	fry	670,000	Shizunai09chum-1	2-3-2H			CHILLER
JP09-32	fed	fry	2,870,000	Shizunai09chum-2	2-3-3H			CHILLER
JP09-33	fed	fry	2,860,000	Shizunai09chum-3	2-3-4H			CHILLER
JP09-34	fed	fry	1,600,000	Shikiu09chum-alc-s	A1H			
JP09-35	fed	fry	800,000	Shikiu09chum-alc-d	A2H			
JP09-36	fed	fry	6,500,000	Yurappu09chum-1	2-2-3H			CHILLER
JP09-37	fed	fry	500,000	Yurappu09chum-2	2-2-4H			CHILLER
JP09-38	fed	fry	500,000	Yurappu09chum-3	2-2-5H			CHILLER
JP09-39	fed	fry	2,000,000	Katagishi09chum-1	2,3H			CHILLER
JP09-40	fed	fry	1,000,000	Katagishi09chum-2	2,4H			CHILLER

No	Otolith Mark Schedule	Temp Shift Direction	Comments
JP09-21	(1X)12C:12H,(1X)12C:36H,(3X)12C:12H,(1X)12C:36H,(2X)12C:12H	down(8-4°C)	
JP09-22	(1X)12C:12H,(1X)12C:36H,(3X)12C:12H,(1X)12C:36H,(3X)12C:12H	down(8-4°C)	
JP09-23	(1X)12C:12H,(1X)12C:36H,(3X)12C:12H,(1X)12C:36H,(4X)12C:12H	down(8-4°C)	
JP09-24	(1X)12C:12H,(1X)12C:36H,(4X)12C:12H,(1X)12C:36H,(2X)12C:12H	down(8-4°C)	
JP09-25	(1X)24C:24H,(1X)24C:48H,(6X)12C:12H	down(9-5°C)	
JP09-26			
JP09-27			
JP09-28	(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)	
JP09-29	(1X)12C:12H,(1X)12C:36H,(4X)12C:12H,(1X)12C:36H,(3X)12C:12H	down(9-5°C)	
JP09-30	(1X)12C:12H,(1X)12C:36H,(4X)12C:12H,(1X)12C:36H,(4X)12C:12H	down(9-5°C)	
JP09-31	(1X)12C:12H,(1X)12C:36H,(2X)12C:12H,(1X)12C:36H,(2X)12C:12H	down(10-6°C)	
JP09-32	(1X)12C:12H,(1X)12C:36H,(2X)12C:12H,(1X)12C:36H,(3X)12C:12H	down(10-6°C)	
JP09-33	(1X)12C:12H,(1X)12C:36H,(2X)12C:12H,(1X)12C:36H,(4X)12C:12H	down(10-6°C)	
JP09-34			
JP09-35			
JP09-36	(1X)12C:12H,(1X)12C:36H,(1X)12C:12H,(1X)12C:36H,(3X)12C:12H	down(8-4°C)	
JP09-37	(1X)12C:12H,(1X)12C:36H,(1X)12C:12H,(1X)12C:36H,(4X)12C:12H	down(8-4°C)	
JP09-38	(1X)12C:12H,(1X)12C:36H,(1X)12C:12H,(1X)12C:36H,(5X)12C:12H	down(8-4°C)	
JP09-39	(1X)12C:12H,(1X)12C:24H,(3X)12C:12H	down(12-8°C)	
JP09-40	(1X)12C:12H,(1X)12C:24H,(4X)12C:12H	down(12-8°C)	

Table 1. Continued.

No	Mark Type	Brood Year	Year of Release	Species	Country	State/Province	Region	Agency	Facility	Stock	Final Release Site
JP09-41	TM	2009	2010	CHUM	JAPAN	HONSHU	Pacific coast	NASREC	Katagishi Hatchery	Katagishi River	Katagishi River
JP09-42	TM	2009	2010	CHUM	JAPAN	HONSHU	Pacific coast	NASREC	Katagishi Hatchery	Katagishi River	Katagishi River
JP09-43	TM	2009	2010	CHUM	JAPAN	HONSHU	Pacific coast	NASREC	Tarou Hatchery	Tarou River	Tarou River
JP09-44	TM	2009	2010	CHUM	JAPAN	HONSHU	Pacific coast	NASREC	Tarou Hatchery	Tarou River	Tarou River
JP09-45	TM	2009	2010	CHUM	JAPAN	HONSHU	Japan Sea coast	NASREC	Masukawa Hatchery	Gakkou River	Gakkou River
JP09-46	TM	2009	2010	CHUM	JAPAN	HONSHU	Japan Sea coast	NASREC	Masukawa Hatchery	Gakkou River	Gakkou River
JP09-47	TM	2009	2010	CHUM	JAPAN	HONSHU	Japan Sea coast	NASREC	Masukawa Hatchery	Gakkou River	Gakkou River
JP09-48	TM	2009	2010	CHUM	JAPAN	HONSHU	Japan Sea coast	NASREC	Masukawa Hatchery	Gakkou River	Gakkou River
JP09-49	TM	2009	2010	PINK	JAPAN	HOKKAIDO	Okhotsk Sea coast	NASREC	Tokushibetsu Hatchery	Tokushibetsu River	Tokushibetsu River
JP09-50	TM	2009	2010	PINK	JAPAN	HOKKAIDO	Okhotsk Sea coast	NASREC	Tokushibetsu Hatchery	Tokushibetsu River	Kitamihorobetsu River
JP09-51	TM	2009	2010	PINK	JAPAN	HOKKAIDO	Okhotsk Sea coast	NASREC	Shari Hatchery	Shari River	Shari River
JP09-52	TM	2009	2010	PINK	JAPAN	HOKKAIDO	Okhotsk Sea coast	NASREC	Kitami Hatchery	Tokoro River	Tokoro River
JP09-53	TM	2009	2010	PINK	JAPAN	HOKKAIDO	Nemuro Strait coast	NASREC	Nijibetsu Hatchery	Shunkarikotan River	Shunkarikotan River
JP09-54	ALC	2009	2010	PINK	JAPAN	HOKKAIDO	Nemuro Strait coast	HFH	Shunkarikotan Hatchery	Shunkarikotan River	Shunkarikotan River
JP09-55	TM	2009	2010	PINK	JAPAN	HOKKAIDO	Nemuro Strait coast	NASREC	Ichani Hatchery	Ichani River	Ichani River
JP09-56	TM	2009	2010	PINK	JAPAN	HOKKAIDO	Nemuro Strait coast	NASREC	Ichani Hatchery	Ichani River	Ichani River
JP09-57	ALC	2009	2010	PINK	JAPAN	HOKKAIDO	Nemuro Strait coast	HFH	Okunishibetsu Hatchery	Nishibetsu River	Nishibetsu River
JP09-58	ALC	2009	2010	PINK	JAPAN	HOKKAIDO	Nemuro Strait coast	HFH	Okunishibetsu Hatchery	Bettoga River	Bettoga River
JP09-59	TM	2009	2010	PINK	JAPAN	HOKKAIDO	East Pacific coast	NASREC	Tsurui Hatchery	Kushiro River	Kushiro River
JP09-60	TM	2009	2010	MASU	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Shiribetsu Hatchery	Shiribetsu River	Shubuto River

No	Rearing Treatment	Stage	Preliminary Number of OM Released	OM ID	Hatch Code	Prehatch Graphic Image	Posthatch Graphic Image	Marking System
JP09-41	fed	fry	1,000,000	Katagishi09chum-3	2,5H			CHILLER
JP09-42	fed	fry	1,000,000	Katagishi09chum-4	2-2,2H			CHILLER
JP09-43	fed	fry	2,000,000	Tarou09chum-1	2,2nH			CHILLER
JP09-44	fed	fry	2,000,000	Tarou09chum-2	2n-2H			CHILLER
JP09-45	fed	fry	4,000,000	Gakkou09chum-1	2-1-2H			CHILLER
JP09-46	fed	fry	1,000,000	Gakkou09chum-2	2-1-3H			CHILLER
JP09-47	fed	fry	3,000,000	Gakkou09chum-3	2-1-4H			CHILLER
JP09-48	fed	fry	4,000,000	Gakkou09chum-4	2-1-5H			CHILLER
JP09-49	fed	fry	1,700,000	Tokushibetsu09pink	2-3H			CHILLER
JP09-50	fed	fry	1,500,000	Kitamihorobetsu09pink	2n-2H			CHILLER
JP09-51	fed	fry	7,300,000	Shari09pink	2,3nH			CHILLER
JP09-52	fed	fry	1,000,000	Tokoro09pink	2,3n-2nH			CHILLER
JP09-53	fed	fry	7,700,000	Shunkarikotan09pink	2,2nH			CHILLER
JP09-54	fed	fry	1,000,000	Shunkarikotan09pink-alc	A2H			
JP09-55	fed	fry	2,500,000	Ichani09pink-1	2,4H			CHILLER
JP09-56	fed	fry	2,000,000	Ichani09pink-2	2-2-4H			CHILLER
JP09-57	fed	fry	1,000,000	Nishibetsu09pink-alc	A1H			
JP09-58	fed	fry	1,000,000	Bettoga09pink-alc	A1H			
JP09-59	fed	fry	5,000,000	Kushiro09pink	2,3nH			CHILLER
JP09-60	unfed	fry	500,000	Shubuto09masu-f	3H			CHILLER

No	Otolith Mark Schedule	Temp Shift Direction	Comments
JP09-41	(1X)12C:12H,(1X)12C:24H,(5X)12C:12H	down(12-8°C)	
JP09-42	(1X)12C:12H,(1X)12C:36H,(1X)12C:12H,(1X)12C:24H,(2X)12C:12H	down(12-8°C)	
JP09-43	(1X)24C:24H,(1X)24C:48H,(2X)12C:12H	down(12-8°C)	
JP09-44	(1X)12C:12H,(1X)12C:36H,(2X)24C:24H	down(12-8°C)	
JP09-45	(1X)12C:12H,(2X)12C:36H,(2X)12C:12H	down(9-5°C)	
JP09-46	(1X)12C:12H,(2X)12C:36H,(3X)12C:12H	down(9-5°C)	
JP09-47	(1X)12C:12H,(2X)12C:36H,(4X)12C:12H	down(9-5°C)	
JP09-48	(1X)12C:12H,(2X)12C:36H,(5X)12C:12H	down(9-5°C)	
JP09-49	(1X)24C:24H,(1X)924C:72H,(3X)24C:24H	down(7-4°C)	
JP09-50	(1X)12C:12H,(1X)12C:36H,(2X)24C:24H	down(7-4°C)	
JP09-51	(1X)24C:24H,(1X)24C:48H,(3X)12C:12H,(1X)12C:36H,(2X)12C:12H	down(8-4°C)	
JP09-52	(1X)24C:24H,(1X)24C:48H,(2X)12C:12H	down(12-8°C)	
JP09-53	(1X)24C:24H,(1X)24C:48H,(2X)12C:12H	down(9-5°C)	
JP09-54			
JP09-55	(1X)24C:24H,(1X)24C:48H,(4X)24C:24H	down(8-4°C)	
JP09-56	(1X)12C:12H,(1X)12C:36H,(1X)12C:12H,(1X)12C:36H,(4X)12C:12H	down(8-4°C)	
JP09-57			
JP09-58			
JP09-59	(1X)24C:24H,(1X)24C:48H,(3X)12C:12H,(1X)12C:36H,(2X)12C:12H	down(8-4°C)	
JP09-60	(3X)24C:24H	down(10-6°C)	

Table 1. Continued.

No	Mark Type	Brood Year	Year of Release	Species	Country	State/Province	Region	Agency	Facility	Stock	Final Release Site
JP09-61	TM	2009	2010	MASU	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Shiribetsu Hatchery	Shiribetsu River	Shiribetsu River
JP09-62	TM	2009	2010	MASU	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Yakumo Hatchery	Shiribetsu River	Shiribetsu River
JP09-63	TM	2009	2010	MASU	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Chitose Hatchery	Ishikari River	Ishikari River
JP09-64	TM	2009	2010	MASU	JAPAN	HOKKAIDO	Okhotsk Sea coast	NASREC	Tokushibetsu Hatchery	Tokushibetsu River	Tokushibetsu River
JP09-65	TM	2009	2010	MASU	JAPAN	HOKKAIDO	Okhotsk Sea coast	NASREC	Shari Hatchery	Shari River	Shari River
JP09-66	TM	2009	2010	MASU	JAPAN	HOKKAIDO	Okhotsk Sea coast	NASREC	Shari Hatchery	Shari River	Shari River
JP09-67	TM	2009	2010	MASU	JAPAN	HOKKAIDO	Okhotsk Sea coast	NASREC	Shari Hatchery	Shari River	Shari River
JP09-68	TM	2009	2010	MASU	JAPAN	HOKKAIDO	Nemuro Strait coast	NASREC	Nemuro Hatchery	Ichani River	Ichani River
JP09-69	TM	2009	2010	MASU	JAPAN	HOKKAIDO	Nemuro Strait coast	NASREC	Nemuro Hatchery	Shibetsu River	Shibetsu River
JP09-70	TM	2009	2010	MASU	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Shiribetsu Hatchery	Shiribetsu River	Shiribetsu River
JP09-71	TM	2009	2011	MASU	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Shiribetsu Hatchery	Shiribetsu River	Shiribetsu River
JP09-72	TM	2009	2010	MASU	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Yakumo Hatchery	Shiribetsu River	Shiribetsu River
JP09-73	TM	2009	2011	MASU	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Yakumo Hatchery	Shiribetsu River	Shiribetsu River
JP09-74	TM	2009	2010	MASU	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Chitose Hatchery	Ishikari River	Ishikari River
JP09-75	TM	2009	2011	MASU	JAPAN	HOKKAIDO	Japan Sea coast	NASREC	Chitose Hatchery	Ishikari River	Ishikari River
JP09-76	TM	2009	2010	MASU	JAPAN	HOKKAIDO	Okhotsk Sea coast	NASREC	Tokushibetsu Hatchery	Tokushibetsu River	Tokushibetsu River
JP09-77	TM	2009	2010	MASU	JAPAN	HOKKAIDO	Okhotsk Sea coast	NASREC	Shari Hatchery	Shari River	Shari River
JP09-78	TM	2009	2011	MASU	JAPAN	HOKKAIDO	Okhotsk Sea coast	NASREC	Shari Hatchery	Shari River	Shari River
JP09-79	TM	2009	2010	MASU	JAPAN	HOKKAIDO	Nemuro Strait coast	NASREC	Nemuro Hatchery	Ichani River	Ichani River
JP09-80	TM	2009	2011	MASU	JAPAN	HOKKAIDO	Nemuro Strait coast	NASREC	Nemuro Hatchery	Ichani River	Ichani River

No	Rearing Treatment	Stage	Preliminary Number of OM Released	OM ID	Hatch Code	Prehatch Graphic Image	Posthatch Graphic Image	Marking System
JP09-61	fed	fry	640,000	Shiribetsu09masu-r-f	2,2H			CHILLER
JP09-62	fed	fry	120,000	Shiribetsu09masu-y-f	2,2H			CHILLER
JP09-63	fed	fry	30,000	Chitose09masu-f	2,3H			CHILLER
JP09-64	fed	fry	400,000	Tokushibetsu09masu-f	2,3nH			CHILLER
JP09-65	fed	fry	400,000	Shari09masu-f	6H			CHILLER
JP09-66	unfed	egg	-	Shari09masu-e-1	4H			CHILLER
JP09-67	unfed	egg	-	Shari09masu-e-2	3,2nH			CHILLER
JP09-68	fed	fry	40,000	Ichani09masu-f	2,5H			CHILLER
JP09-69	fed	fry	110,000	Shibetsu09masu-f	2,4H			CHILLER
JP09-70	fed	juvenile	110,000	Shiribetsu09masu-r-j	2,2H			CHILLER
JP09-71	fed	smolt	110,000	Shiribetsu09masu-r-s	2,2H			CHILLER
JP09-72	fed	juvenile	110,000	Shiribetsu09masu-y-j	2,2H			CHILLER
JP09-73	fed	smolt	110,000	Shiribetsu09masu-y-s	2,2H			CHILLER
JP09-74	fed	juvenile	40,000	Chitose09masu-j	2,3H			CHILLER
JP09-75	fed	smolt	30,000	Chitose09masu-s	2,3H			CHILLER
JP09-76	fed	juvenile	100,000	Tokushibetsu09masu-j	2,3nH			CHILLER
JP09-77	fed	juvenile	100,000	Shari09masu-j	6H			CHILLER
JP09-78	fed	smolt	100,000	Shari09masu-s	6H			CHILLER
JP09-79	fed	juvenile	30,000	Ichani09masu-j	2,5H			CHILLER
JP09-80	fed	smolt	30,000	Ichani09masu-s	2,5H			CHILLER

No	Otolith Mark Schedule	Temp Shift Direction	Comments
JP09-61	(1X)24C:24H,(1X)24C:48H,(2X)24C:24H	down(10-6°C)	
JP09-62	(1X)24C:24H,(1X)24C:48H,(2X)24C:24H	down(8-4°C)	
JP09-63	(1X)24C:24H,(1X)24C:48H,(3X)24C:24H	down(8-4°C)	
JP09-64	(1X)24C:24H,(1X)24C:48H,(3X)12C:12H	down(8-4°C)	
JP09-65	(6X)24C:24H	down(8-4°C)	
JP09-66	(4X)24C:24H	down(8-4°C)	
JP09-67	(2X)24C:24H,(1X)24C:48H,(2X)12C:12H	down(8-4°C)	
JP09-68	(1X)24C:24H,(1X)24C:48H,(5X)24C:24H	down(8-4°C)	
JP09-69	(1X)24C:24H,(1X)24C:48H,(4X)24C:24H	down(8-4°C)	
JP09-70	(1X)24C:24H,(1X)24C:48H,(2X)24C:24H	down(10-6°C)	TM + Finclips
JP09-71	(1X)24C:24H,(1X)24C:48H,(2X)24C:24H	down(10-6°C)	TM + Finclips
JP09-72	(1X)24C:24H,(1X)24C:48H,(2X)24C:24H	down(8-4°C)	TM + Finclips
JP09-73	(1X)24C:24H,(1X)24C:48H,(2X)24C:24H	down(8-4°C)	TM + Finclips
JP09-74	(1X)24C:24H,(1X)24C:48H,(3X)24C:24H	down(8-4°C)	TM + Finclips
JP09-75	(1X)24C:24H,(1X)24C:48H,(3X)24C:24H	down(8-4°C)	TM + Finclips
JP09-76	(1X)24C:24H,(1X)24C:48H,(3X)12C:12H	down(8-4°C)	TM + Finclips
JP09-77	(6X)24C:24H	down(8-4°C)	TM + Finclips
JP09-78	(6X)24C:24H	down(8-4°C)	TM + Finclips
JP09-79	(1X)24C:24H,(1X)24C:48H,(5X)24C:24H	down(8-4°C)	TM + Finclips
JP09-80	(1X)24C:24H,(1X)24C:48H,(5X)24C:24H	down(8-4°C)	TM + Finclips

Table 1. Continued.

No	Mark Type	Brood Year	Year of Release	Species	Country	State/Province	Region	Agency	Facility	Stock	Final Release Site
JP09-81	TM	2009	2010	MASU	JAPAN	HOKKAIDO	Nemuro Strait coast	NASREC	Nemuro Hatchery	Shibetsu River	Shibetsu River
JP09-82	TM	2009	2011	MASU	JAPAN	HOKKAIDO	Nemuro Strait coast	NASREC	Nemuro Hatchery	Shibetsu River	Shibetsu River
JP09-83	TM	2009	2010	SOCKEYE	JAPAN	HOKKAIDO	West Pacific coast	NASREC	Tsurui Hatchery	Kushiro River	Kushiro River
JP09-84	TM	2009	2010	SOCKEYE	JAPAN	HOKKAIDO	West Pacific coast	NASREC	Shizunai Hatchery	Shizunai River	Shizunai River
JP09-85	TM	2009	2010	SOCKEYE	JAPAN	HOKKAIDO	West Pacific coast	NASREC	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
JP09-81	fed	juvenile	60,000	Shibetsu09masu-j	2,4H			CHILLER
JP09-82	fed	smolt	30,000	Shibetsu09masu-s	2,4H			CHILLER
JP09-83	fed	smolt	10,000	Kushiro09sockeye	2,9H			CHILLER
JP09-84	fed	smolt	10,000	Shizunai09sockeye	2,7H			CHILLER
JP09-85	fed	smolt	10,000	Abira09sockeye	2,6H			CHILLER

No	Otolith Mark Schedule	Temp Shift Direction	Comments
JP09-81	(1X)24C:24H,(1X)24C:48H,(4X)24C:24H	down(8-4°C)	TM + Finclips
JP09-82	(1X)24C:24H,(1X)24C:48H,(4X)24C:24H	down(8-4°C)	TM + Finclips
JP09-83	(1X)24C:24H,(1X)24C:48H,(9X)24C:24H	down(10-6°C)	
JP09-84	(1X)24C:24H,(1X)24C:48H,(7X)24C:24H	down(10-6°C)	
JP09-85	(1X)24C:24H,(1X)24C:48H,(6X)24C:24H	down(10-6°C)	