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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.

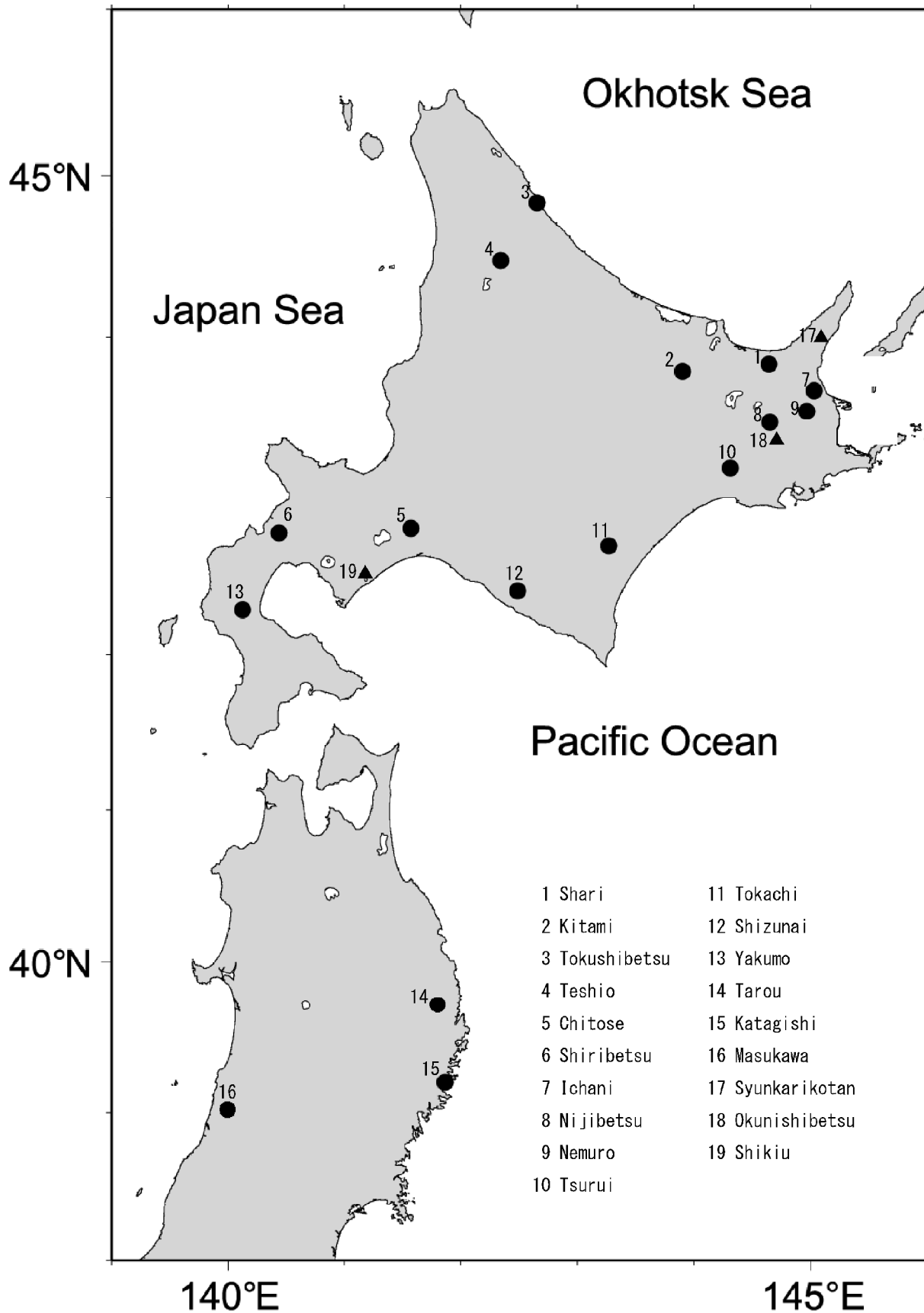


Fig. 1. Locations of hatcheries where brood year 2009 salmon will be thermally marked (closed circles) or marked with ALC (closed triangles).

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) | |