

# **Releases of Thermally Marked Salmon from Japan in 2001**

by

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## **Abstract**

From February to June 2001, approximately 19.0 million chum and 2.8 million pink salmon (2000 brood year) with one of fourteen thermal mark patterns were released from five hatcheries in Hokkaido. All chum salmon released from Shizunai Hatchery were thermally marked. The initial aim of thermal mark programs is to provide information for the ocean migration and survival of each regional salmon stock in Japan. Computer-based water temperature control systems were used to produce thermal marks in the otoliths of chum and pink salmon. Two rings as base mark were adopted to distinguish Japanese salmon from other stocks except for two marking groups by power failure. To increase available thermal mark patterns, we employed narrow rings, which were formed at 12 h intervals. To establish the international database of thermal mark releases, this document provided information of Japanese thermal marks releases, including release site, date, number, and mark patterns with images.

## **Introduction**

Mass marking of hatchery salmon using otolith thermal marks is an effective tool for stock identification of salmon in high seas (Ignell et al., 1997; Kawana et al., 1999; Urawa et al., 1999) and coastal waters (Hagen et al., 1995; Farley and Munk, 1997; Farley et al., 1999).

In Japan, the initial aim of thermal mark programs is to provide information for the ocean migration and survival of each regional salmon stocks, combining with coastal and high-seas salmon researches. Thus we are planning to increase the number of thermal mark releases from hatcheries (Urawa et al., 2000).

## Methods

Computer-based water temperature control systems were used to produce thermal marks in the otoliths of chum and pink salmon. The systems were installed at Chitose, Shizunai, Ichani, and Tokushibetsu Hatchery. Shikiu River stocks were marked at Chitose Hatchery.

Few mark patterns are available when ring number is limited (Hagen, 1999). To increase available patterns, we employ narrow ring spacing, which is formed at 12 h intervals by computer-based water temperature control systems. The RBr and Hatch code notation is used to describe thermal patterns (Munk and Geiger, 1998; Hagen et al., 2000). Two rings as base mark were adopted to distinguish Japanese salmon from other stocks.

### Releases of 2000 Brood Year Stocks

From February to June 2001, approximately 19.0 million chum and 2.8 million pink salmon (2000 brood year) with one of fourteen thermal mark patterns were released from five hatcheries in Hokkaido (Table 1). All chum salmon released from Shizunai Hatchery were thermally marked. The qualities of these thermal marks were good except for four poor marks: Shizunai00chum-tr, Shizunai00chum-v, Shikiu00chum-s, and Tokushibetsu00pink.

Shizunai00chum-tr and Shizunai00chum-v were marked at the same time by the same water temperature control system. After the marking of first thermal ring, power failure was occurred and programmed schedule was stopped automatically. Because of the next marking groups were standing by, enough spacing was not applied between base mark and second band. These marks could not be decoded in RBr or Hatch code notation.

Shikiu00chum-s included only first four rings of planned eight rings (Shikiu00chum). We stopped marking because of outbreak of soft shell egg disease.

Tokushibetsu00pink had insufficient patterns in 12 h narrow ring band. Third ring of second band was faint. Although water temperature was changed same as planned schedule and qualities of four kind of chum salmon marks employed by the same controller were good. Thus we changed thermal mark plan for brood year 2001 pink salmon at Tokushibetsu Hatchery to 24 h marking (Kawana et al., 2001).

## Acknowledgments

We thank Peter Hagen and Kristen Munk of ADFG Coded Wire Tag and Otolith Processing Laboratory for their technical supports to our thermal mark programs.

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in 1999 and 2000 with a thermal mark plan for 2000 brood year stocks. (NPAFC Doc. 461)  
National Salmon Resources Center, Fisheries Agency of Japan, Sapporo 062-0922, Japan. 7  
p.

**Table 1.** Otolith thermal mark releases of chum and pink salmon from Japan in 2001.

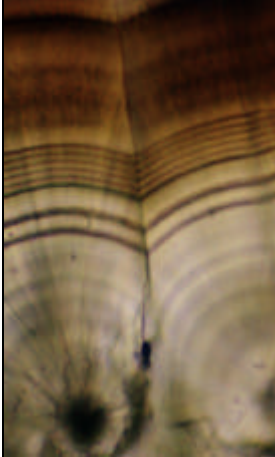
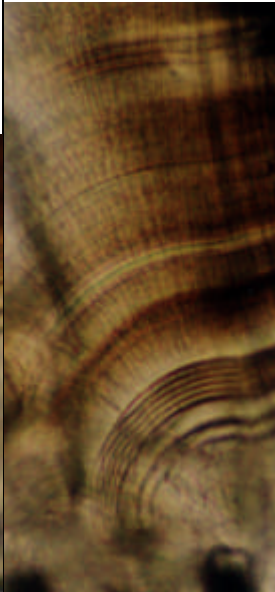
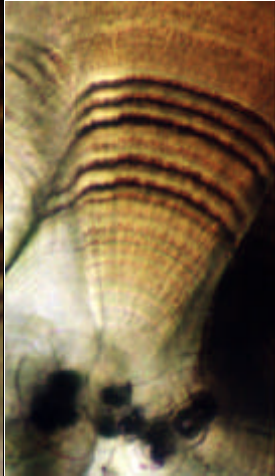
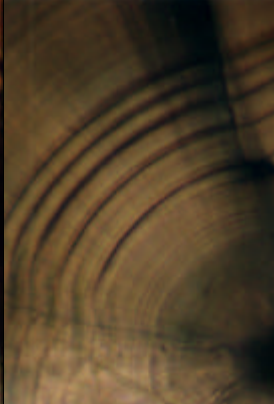

No	J00-01	J00-02	J00-03	J00-04	J00-05
<b>BROOD YEAR</b>	2000	2000	2000	2000	2000
<b>DATE OF RELEASE</b>	2/9/01-4/20/01	3/8/01	3/13/01-5/31/01	5/22/01	3/13/01-4/13/01
<b>SPECIES</b>	CHUM	CHUM	CHUM	CHUM	CHUM
<b>COUNTRY</b>	JAPAN	JAPAN	JAPAN	JAPAN	JAPAN
<b>STATE/PROVINCE</b>	HOKKAIDO	HOKKAIDO	HOKKAIDO	HOKKAIDO	HOKKAIDO
<b>REGION</b>	Japan Sea coast	Japan Sea coast	West Pacific coast	West Pacific coast	West Pacific coast
<b>AGENCY</b>	NASREC	NASREC	NASREC	NASREC	NASREC
<b>FACILITY</b>	Chitose Hatchery	Chitose Hatchery	Shizunai Hatchery	Shizunai Hatchery	Shizunai Hatchery
<b>STOCK</b>	Ishikari River	Ishikari River	Shizunai River	Shizunai River	Shizunai River
<b>FINAL RELEASE SITE</b>	Ishikari River	Ishikari River	Shizunai River	Shizunai River	Shizunai River
<b>OM ID</b>	Chitose00chum	Chitose00chum-hp	Shizunai00chum	Shizunai00chum-tr	Shizunai00chum-v
<b>RB<sub>r</sub></b>	1:1,2,2,6n	1:1,2,2,6n+3,3	1:1,2-2,3	n.a.(1:5rings)	n.a.(1:5rings)
<b>Hatch Code</b>	2,6nH	2,6nH3	2-3H	n.a.(5ringsH)	n.a.(5ringsH)
<b>PREHATCH GRAPHIC</b>	IIIII	IIIII			
<b>POSTHATCH GRAFIC</b>					
<b>OTOLITH MARK SCHEDULE</b>	(1X)24C:24H,(1X)24C:48H,(6X)12C:12H	(1X)24C:24H,(1X)24C:48H,(5X)12C:12H ,(1X)12C:828H,(3X)24C:24H	(1X)24C:24H,(1X)24C:72H,(3X)24C:24H	(1X)24H:24C,(1X)53H:24C,(1X)43H:24C ,(2X)24H:24C	(1X)24C:53H,(1X)24C:43H,(3X)24C:24H
<b>MARKING SYSTEM</b>	CHILLER	CHILLER	CHILLER	CHILLER	CHILLER
<b>TEMP SHIFT DIRECTION</b>	down (8-4C)	down (8-4C)	down (10-6C)	up (7-11C)	down (11-7C)
<b>REARING TREATMENT</b>	fed	fed	fed	fed	fed
<b>STAGE</b>	fry	fry	fry	fry	fry
<b>MEAN SIZE AT RELEASE (mm)</b>	43	40	62	63	58
<b>MEAN SIZE AT RELEASE (g)</b>	0.66	0.45	1.99	1.97	1.69
<b>ACTUAL NUMBER OF OM RELEASED</b>	4,153,000	7,500	4,950,000	315,000	1,127,000
<b>MARK QUALITY</b>	good	good	good	poor	poor
<b>COMMENTS</b>	include TM+Finclips (146 thousand)	hatch pipe		power failure, looks like WWNN	variation of J00-03 power failure, looks like WWNN
<b>DIGITAL PHOTO IMAGE</b>					



Table 1. Continued.

No	J00-06	J00-07	J00-08	J00-09	J00-10
<b>BROOD YEAR</b>	2000	2000	2000	2000	2000
<b>DATE OF RELEASE</b>	6/1/01	6/1/01	5/7/01-5/31/01	5/15/01	5/31/01
<b>SPECIES</b>	CHUM	CHUM	CHUM	CHUM	CHUM
<b>COUNTRY</b>	JAPAN	JAPAN	JAPAN	JAPAN	JAPAN
<b>STATE/PROVINCE</b>	HOKKAIDO	HOKKAIDO	HOKKAIDO	HOKKAIDO	HOKKAIDO
<b>REGION</b>	West Pacific coast	West Pacific coast	Nemuro Strait coast	Okhotsk Sea coast	Okhotsk Sea coast
<b>AGENCY</b>	NASREC	NASREC	NASREC	NASREC	NASREC
<b>FACILITY</b>	Shikiu Hatchery	Shikiu Hatchery	Ichani Hatchery	Tokushibetsu Hatchery	Tokushibetsu Hatchery
<b>STOCK</b>	Shikiu River	Shikiu River	Ichani River	Tokushibetsu River	Tokushibetsu River
<b>FINAL RELEASE SITE</b>	Shikiu River	Shikiu River	Ichani River	Tokushibetsu River	Tokushibetsu River
<b>OM ID</b>	Shikiu00chum	Shikiu00chum-s	Ichani00chum	Tokushibetsu00chum (early)	Tokushibetsu00chum (mid)
<b>RB#</b>	1:1.2.2.3n-3.3n	1:1.2.2.2n	1:1.2.2.8n	1:1.2.2.1n-3.4n	1:1.2.2.2n-3.3n
<b>Hatch Code</b>	2,3n-3nH	2,2nH	2,8nH	2,1n-4nH	2,2n-3nH
<b>PREHATCH GRAPHIC</b>	11 III III	11 II	11 IIIIII	11 I IIII	11 II III
<b>POSTHATCH GRAFIC</b>					
<b>OTOLITH MARK SCHEDULE</b>	(1X)24C:24H,(1X)24C:48H,(2X)12C:12H ,(1X)12C:36H,(3X)12C:12H	(1X)24C:24H,(1X)24C:48H,(2X)12C:12H	(1X)24C:24H,(1X)24C:48H,(8X)12C:12H	(1X)24C:24H,(1X)24C:48H,(1X)12C:36H ,(4X)12C:12H	(1X)24C:24H,(1X)24C:48H,(1X)12C:12H ,(1X)12C:36H,(3X)12C:12H
<b>MARKING SYSTEM</b>	CHILLER	CHILLER	CHILLER	CHILLER	CHILLER
<b>TEMP SHIFT DIRECTION</b>	down (8-4C)	down (8-4C)	down (8-4C)	down (9-5C)	down (9-5C)
<b>REARING TREATMENT</b>	fed	fed	fed	fed	fed
<b>STAGE</b>	fry	fry	fry	fry	fry
<b>MEAN SIZE AT RELEASE (mm)</b>	60	60	56	52	53
<b>MEAN SIZE AT RELEASE (g)</b>	1.69	1.87	1.28	1.17	1.23
<b>ACTUAL NUMBER OF OM RELEASED</b>	447,000	412,000	5,027,000	628,000	651,000
<b>MARK QUALITY</b>	good	poor	good	good	good
<b>COMMENTS</b>		stopped planed pattern by outbreak of soft shell egg diseases			
<b>DIGITAL PHOTO IMAGE</b>					

Table 1. Continued.

No	J00-11	J00-12	J00-13	J00-14
<b>BROOD YEAR</b>	2000	2000	2000	2000
<b>DATE OF RELEASE</b>	5/31/01	4/27/01	4/27/01	4/27/01
<b>SPECIES</b>	CHUM	CHUM	PINK	PINK
<b>COUNTRY</b>	JAPAN	JAPAN	JAPAN	JAPAN
<b>STATE/PROVINCE</b>	HOKKAIDO	HOKKAIDO	HOKKAIDO	HOKKAIDO
<b>REGION</b>	Okhotsk Sea coast	Okhotsk Sea coast	Nemuro Strait coast	Okhotsk Sea coast
<b>AGENCY</b>	NASREC	NASREC	NASREC	NASREC
<b>FACILITY</b>	Tokushibetsu Hatchery	Tokushibetsu Hatchery	Ichani Hatchery	Tokushibetsu Hatchery
<b>STOCK</b>	Tokushibetsu River	Tokushibetsu River	Ichani River	Tokushibetsu River
<b>FINAL RELEASE SITE</b>	Tokushibetsu River	Tokushibetsu River	Ichani River	Tokushibetsu River
<b>OM ID</b>	Tokushibetsu00chum (late)	Tokushibetsu00chum (late-tr)	Ichani00pink	Tokushibetsu00pink
<b>RB<sub>r</sub></b>	1:1.2.2.3n	1:1.2.2.3n-3.2n	1:1.2.2.6n	1:1.2.2.4n
<b>Hatch Code</b>	2,3nH	2,3n-2nH	2,6nH	2,4nH (2,2n,1nH)
<b>PREHATCH GRAPHIC</b>	I I III	I I III II	I I IIIIII	I I III (I I II I)
<b>POSTHATCH GRAFIC</b>				
<b>OTOLITH MARK SCHEDULE</b>	(1X)24C:24H,(1X)24C:48H,(3X)12C:12H	(1X)24C:24H,(1X)24C:48H,(2X)12C:12H ,(1X)12C:36H,(2X)12C:12H	(1X)24C:24H,(1X)24C:48H,(6X)12C:12H	(1X)24C:24H,(1X)24C:48H,(4X)12C:12H
<b>MARKING SYSTEM</b>	CHILLER	CHILLER	CHILLER	CHILLER
<b>TEMP SHIFT DIRECTION</b>	down (9-5C)	down (9-5C)	down (8-4C)	down (10-6C)
<b>REARING TREATMENT</b>	fed	fed	fed	fed
<b>STAGE</b>	fry	fry	fry	fry
<b>MEAN SIZE AT RELEASE (mm)</b>	53	49	52	41
<b>MEAN SIZE AT RELEASE (g)</b>	1.23	0.90	0.82	0.48
<b>ACTUAL NUMBER OF OM RELEASED</b>	653,000	659,000	2,066,000	754,000
<b>MARK QUALITY</b>	good	good	good	poor
<b>COMMENTS</b>			include TM+Finclips (164 thousand)	3rd ring of band 2 is faint (I I II I)
<b>DIGITAL PHOTO IMAGE</b>				