

Releases of Thermally Marked Salmon from Japan in 2004

by

Morihiko Kawana, Shigehiko Urawa, and Hiroyasu Adachi

National Salmon Resources Center

2-2 Nakanoshima, Toyohira-ku, Sapporo 062-0922, Japan

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Abstract

From January to June 2004, approximately 78.8 million chum, 1.4 million pink, and 2.2 million masu salmon fry (2003 brood year) with thermal mark patterns were released from 11 hatcheries in Japan. In addition, 74 thousand masu salmon smolts (2002 brood year) were released after thermally marked. All chum salmon released from the Chitose, Shari, Shizunai, and Omine Hatcheries had thermal otolith marks. Two rings as base mark were adopted to distinguish Japanese salmon from other stocks. 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 mark 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 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 for salmon. The systems were installed at the Shiribetsu, Chitose, Tokushibetsu, Shari, Ichani, Nijibetsu, Tsurui, Shizunai, Yakumo, Katagishi, and Omine Hatcheries (Fig. 1). Masu salmon were marked by transferring eggs between original and chilled water alternately by hand at the 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. At the Chitose, Kushiro, and Katagishi Hatcheries, all thermal rings on chum, salmon are formed at 12 h intervals. The RBr and Hatch code notation is used to describe thermal patterns (Munk and Geiger, 1998; Hagen et al., 2000). We extend the RBr and Hatch code notation to describe a wide spaced band, which are opposite to a narrow spaced band. The letter 'w' following a ring number is used to indicate a wide spaced band. Two rings as base mark were adopted to distinguish Japanese salmon from other stocks.

Releases of 2003 Brood Year Stocks

From January to June 2004, approximately 78.8 million chum, 1.4 million pink, and 2.2 million masu salmon fry (2003 brood year) with thermal mark patterns were released from 11 hatcheries in Japan (Table 1, Fig. 1). All chum salmon released from Chitose, Shari, Shizunai, and Omine Hatcheries were thermally marked. The qualities of these thermal marks were good except for two poor marks: Tokushibetsu03chum and Shizunai03chum-tr. Some of the two marking groups contained similar dark rings before the first thermal ring.

Releases of 2002 Brood Year Stocks

In April 2004, approximately 74 thousand masu salmon smolts (2002 brood year) with a thermal mark pattern were released from two hatcheries in Japan (Table 1). The mark pattern of Chitose02masu was same as fry released in 2003 (Kawana et al., 2003).

References

- Farley, E. V., and K. Munk. 1997. Incidence of thermally marked pink and chum salmon in the coastal waters of the Gulf of Alaska. *Alaska Fish. Res. Bull.*, 4: 181-187.
- Farley, E. V., K. Munk, and P. T. Hagen. 1999. Incidence of thermally marked pink, chum, and sockeye salmon in the coastal waters of the Gulf of Alaska, 1998. (NPAFC Doc. 446) Auke Bay Laboratory, Alaska Fisheries Science Center, NMFS, NOAA, Juneau, Alaska, USA. 24 p.
- Hagen, P. 1999. A modeling approach to address the underlying structure and constraints of thermal mark codes and code notation. (NPAFC Doc. 395). Alaska Department of Fish and Game, Juneau, Alaska 99801-5526, USA. 12 p.
- Hagen, P., H. J. Geiger, E. Volk, and 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) Alaska Department of Fish and Game, Juneau, Alaska 99801-5526, USA. 8 p.
- Hagen, P., K. Munk, B. VanAlen, and B. White. 1995. Thermal mark technology for inseason fisheries management: a case study. *Alaska Fish. Res. Bull.*, 2: 143-155.
- Ignell, S. E., C. M. Guthrie III, J. H. Helle, and K. Munk. 1997. Incidence of the thermally-marked chum salmon in the 1994-96 Bering Sea pollack B-season trawl fishery. (NPAFC Doc. 246) Auke Bay Laboratory, Alaska Fisheries Science Center, NMFS, NOAA, Juneau, Alaska, USA. 16 p.

- Kawana, M., S. Urawa, G. Anma, Y. Kamei, T. Shoji, M. Fukuwaka, K. Munk, K. W. Myers, and E. V. Farley. 1999. Recoveries of thermally marked maturing pink salmon in the Gulf of Alaska in the summer of 1998. *Bull. National Salmon Resources Center*, 2:1-8.
- Kawana, M., S. Urawa, and H. Adachi. 2003. Releases of thermally marked salmon from Japan in 2003. (NPAFC Doc. 613) 8 p. National Salmon Resources Center, Toyohira-ku, Sapporo 062-0922, Japan.
- Munk, K. M., and H. J. Geiger. 1998. Thermal marking of otoliths: the "RBr" coding structure of thermal marks. (NPAFC Doc. 367) CWT & Otolith Processing Lab., Alaska Department of Fish and Game, Juneau, Alaska, USA. 19 p.
- Urawa, S., M. Kawana, G. Anma, Y. Kamei, T. Shoji, M. Fukuwaka, K. Munk, K. W. Myers, and E. V. Farley. 1999. Stock origin of chum salmon caught in offshore waters of the Gulf of Alaska during the summer of 1998. (NPAFC Doc. 420) National Salmon Resources Center, Fisheries Agency of Japan, Sapporo 062-0922, Japan. 16 p.
- 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) National Salmon Resources Center, Fisheries Agency of Japan, Sapporo 062-0922, Japan. 7 p.

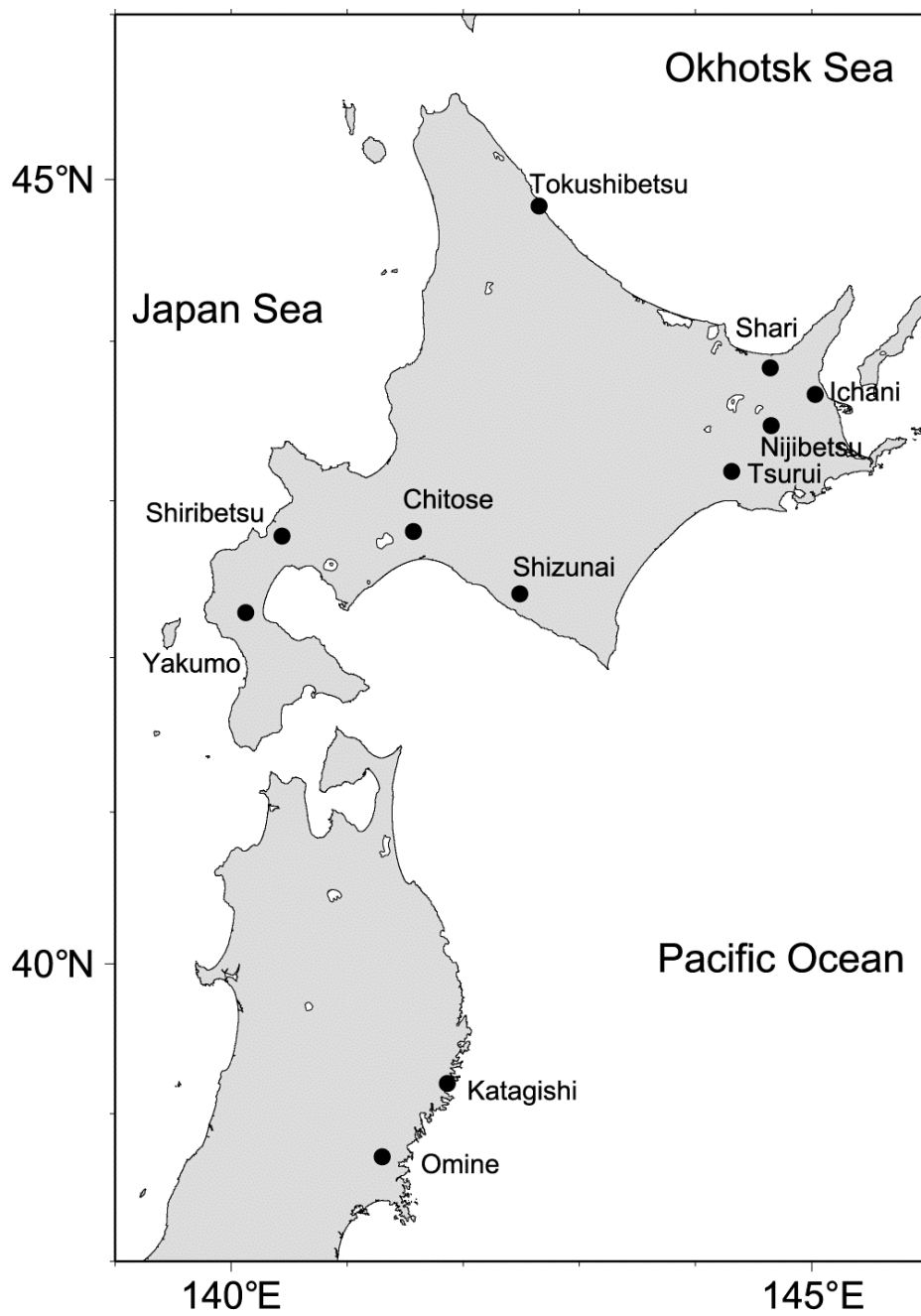


Fig. 1. Locations of hatcheries, which released otolith marked juvenile salmon in 2004.

Table 1. Otolith thermal mark releases of chum, pink, and masu salmon from Japan in 2004.

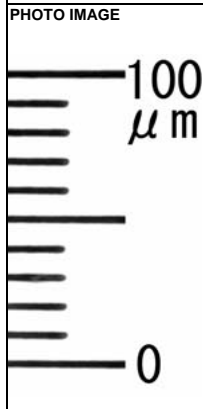
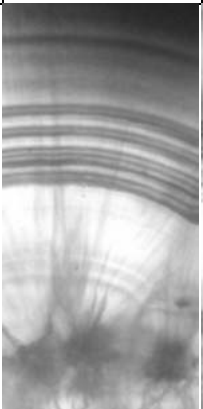
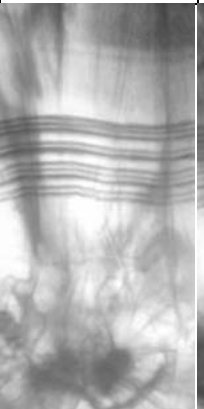
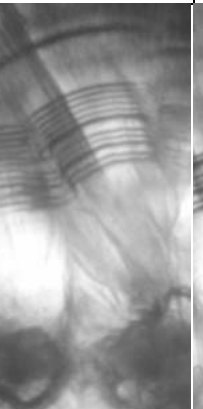
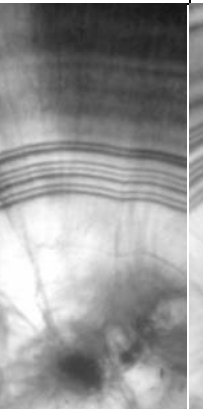
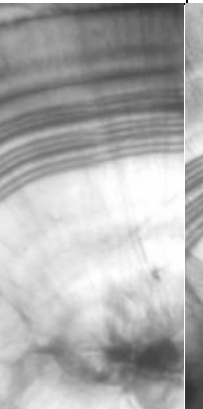
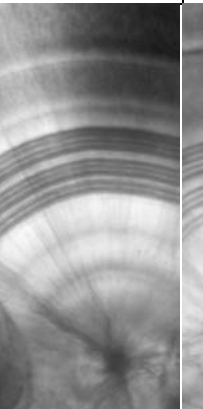
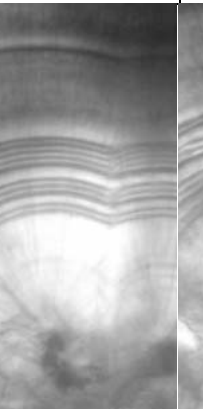
No	J03-1	J03-2	J03-3	J03-4	J03-5	J03-6	J03-7	J03-8
BROOD YEAR	2003	2003	2003	2003	2003	2003	2003	2003
SPECIES	CHUM	CHUM	CHUM	CHUM	CHUM	CHUM	CHUM	CHUM
STATE/PROVINCE	HOKKAIDO	HOKKAIDO	HOKKAIDO	HOKKAIDO	HOKKAIDO	HOKKAIDO	HOKKAIDO	HOKKAIDO
REGION	Japan Sea coast	Japan Sea coast	Japan Sea coast	Japan Sea coast	Japan Sea coast	Japan Sea coast	Japan Sea coast	Japan Sea coast
FACILITY	Chitose Hatchery	Chitose Hatchery	Chitose Hatchery	Chitose Hatchery	Chitose Hatchery	Chitose Hatchery	Chitose Hatchery	Chitose Hatchery
STOCK	Chitose River	Chitose River	Chitose River	Chitose River	Chitose River	Chitose River	Chitose River	Chitose River
FINAL RELEASE SITE	Chitose River	Chitose River	Chitose River	Chitose River	Chitose River	Chitose River	Chitose River	Chitose River
SPAWNING DATE	03/09/05-03/09/16	03/09/22-03/09/26	03/09/22-03/09/26	03/10/01-03/10/10	03/10/15-03/10/20	03/10/22-03/10/29	03/11/05-03/11/10	03/11/14-03/12/03
DATE OF RELEASE	04/01/16-04/4/15	04/01/26-04/4/15	04/01/26-04/4/15	04/02/16-04/04/21	04/02/16-04/04/21	04/02/26-04/04/21	04/03/17-04/04/21	04/03/25-04/04/21
OM ID	Chitose03chum-1	Chitose03chum-2t	Chitose03chum-3c	Chitose03chum-4	Chitose03chum-5	Chitose03chum-6	Chitose03chum-7	Chitose03chum-8
RBr CODE	1:1.2.2.3-3.2-4.2	1:1.2.2.3.3-2-4.3	1:1.2.2.3-3.6	1:1.2.2.3-3.2	1:1.2.2.3-3.3	1:1.2.2.3-3.4	1:1.2.2.3-3.5	1:1.2.2.3.3.-4.2
HATCH CODE	2,3-2-2H	2,3-2-3H	2,3-6H	2,3-2H	2,3-3H	2,3-4H	2,3-5H	2,3-3-2H
PREHATCH GRAPHIC								
POSTHATCH GRAPHIC								
MARKING SYSTEM	CHILLER	CHILLER	CHILLER	CHILLER	CHILLER	CHILLER	CHILLER	CHILLER
OTOLITH MARK SCHEDULE	(1X)12C:12H,(1X)12C:24H, (2X)12C:12H,(1X)12C:36H, (1X)12C:12H,(1X)12C:36H, (2X)12C:12H	(1X)12C:12H,(1X)12C:24H, (2X)12C:12H,(1X)12C:36H, (1X)12C:12H,(1X)12C:36H, (3X)12C:12H	(1X)12C:12H,(1X)12C:24H, (2X)12C:12H,(1X)12C:36H, (6X)12C:12H	(1X)12C:12H,(1X)12C:24H, (2X)12C:12H,(1X)12C:36H, (2X)12C:12H	(1X)12C:12H,(1X)12C:24H, (2X)12C:12H,(1X)12C:36H, (3X)12C:12H	(1X)12C:12H,(1X)12C:24H, (2X)12C:12H,(1X)12C:36H, (4X)12C:12H	(1X)12C:12H,(1X)12C:24H, (2X)12C:12H,(1X)12C:36H, (5X)12C:12H	(1X)12C:12H,(1X)12C:24H, (2X)12C:12H,(1X)12C:36H, (2X)12C:12H
TEMP SHIFT DIRECTION	down (8-4°C)	down (8-4°C)	down (8-4°C)	down (8-4°C)	down (8-4°C)	down (8-4°C)	down (8-4°C)	down (8-4°C)
REARING TREATMENT	fed	fed	fed	fed	fed	fed	fed	fed
STAGE	fry	fry	fry	fry	fry	fry	fry	fry
MEAN SIZE AT RELEASE (mm)	-	48	49	-	-	-	-	-
MEAN SIZE AT RELEASE (g)	0.60	0.91	0.99	0.67	0.61	0.64	0.55	0.56
ACTUAL NUMBER OF OM RELEASED (thousand)	2,581	1,171	1,175	6,457	6,381	6,301	3,532	1,377
MARK QUALITY	ok	good	good	good	good	good	good	good
COMMENTS	spawning date: early and middle September	spawning date: late September	spawning date: late September	spawning date: early October	spawning date: middle October	spawning date: late October	spawning date: early November	spawning date: after middle November
PHOTO IMAGE								

Table 1. Continued.

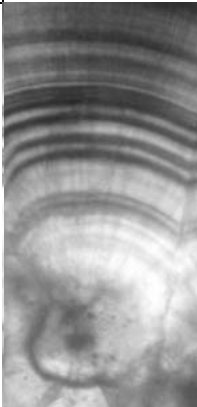
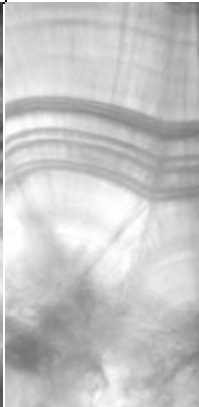
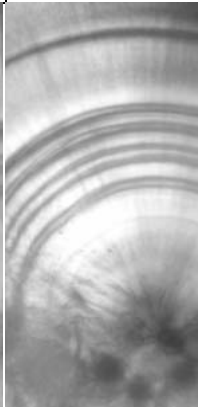
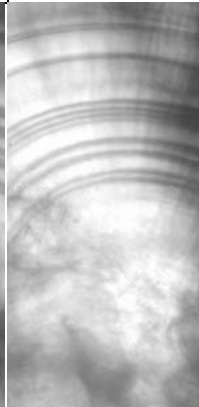
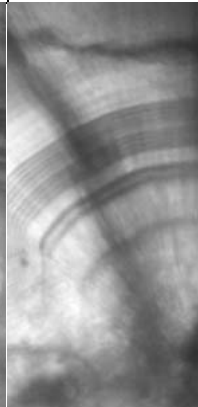
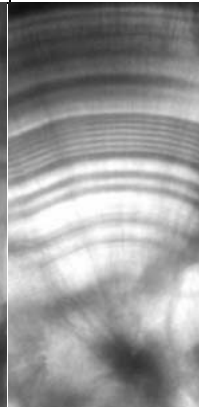
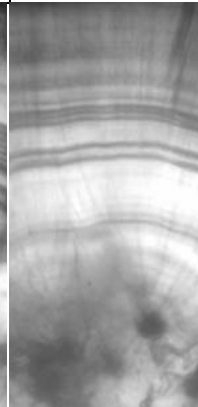
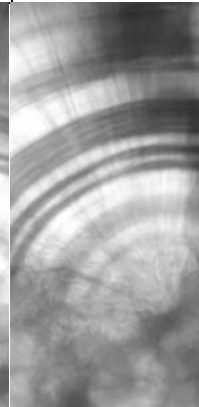
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BROOD YEAR	2003	2003	2003	2003	2003	2003	2003	2003
SPECIES	CHUM	CHUM	CHUM	CHUM	CHUM	CHUM	CHUM	CHUM
STATE/PROVINCE	HOKKAIDO	HOKKAIDO	HOKKAIDO	HOKKAIDO	HOKKAIDO	HOKKAIDO	HOKKAIDO	HOKKAIDO
REGION	Okhotsk Sea coast	Okhotsk Sea coast	Okhotsk Sea coast	Okhotsk Sea coast	Nemuro Strait coast	Nemuro Strait coast	Nemuro Strait coast	Nemuro Strait coast
FACILITY	Tokushibetsu Hatchery	Shari Hatchery	Shari Hatchery	Shari Hatchery	Ichani Hatchery	Ichani Hatchery	Ichani Hatchery	Nijibetsu Hatchery
STOCK	Tokushibetsu River	Shari River	Shari River	Shari River	Ichani River	Ichani River	Ichani River	Nijibetsu River
FINAL RELEASE SITE	Tokushibetsu River	Shari River	Shari River	Shari River	Ichani River	Ichani River	Ichani River	Nijibetsu River
SPAWNING DATE	03/10/07-03/11/14	03/10/17	03/11/08	03/11/20-03/12/04	03/10/07	03/10/24	03/11/14	03/11/14-03/11/21
DATE OF RELEASE	04/05/01-04-06/08	04/5/11	04/5/11	04/5/26	04/04/26-04/05/17	04/05/10-04/05/24	04/05/28-04/06/04	04/05/12-04/05/21
OM ID	Tokushibetsu03chum	Shari03chum-1	Shari03chum-2	Shari03chum-3	Ichani03chum-early	Ichani03chum-mid	Ichani03chum-late	Nijibetsu03chum
RBr CODE	1:1.2,2.1n-3.3n	1:1.2/2.2w-3.3	1:1.2/2.2w,3.2-4.2	1:1.2/2.2w-3.4	1:1.2,2.9n	1:1.2,2.7n	1:1.2,2.3n	1:1.2,2.5n
HATCH CODE	2,1n-3nH	2/2w-3H	2/2w,2-2H	2/2w-4H	2,9nH	2,7nH	2-3nH	2,5nH
PREHATCH GRAPHIC	III							
POSTHATCH GRAPHIC								
MARKING SYSTEM	CHILLER	CHILLER	CHILLER	CHILLER	CHILLER	CHILLER	CHILLER	CHILLER
OTOLITH MARK SCHEDULE	(1X)24C:24H,(1X)24C:48H, (1X)12C:36H,(3X)12C:12H	(1X)12C:12H,(1X)12C:48H, (1X)24C:24H,(1X)24C:72H, (3X)12C:12H	(1X)12C:12H,(1X)12C:48H, (1X)24C:24H,(1X)24C:48H, (1X)12C:12H,(1X)12C:36H, (2X)12C:12H	(1X)12C:12H,(1X)12C:48H, (1X)24C:24H,(1X)24C:72H, (4X)12C:12H	(1X)24C:24H,(1X)24C:48H, (9X)12C:12H	(1X)24C:24H,(1X)24C:48H, (7X)12C:12H	(1X)24C:24H,(1X)24C:72H, (3X)12C:12H	(1X)24C:24H,(1X)24C:48H, (5X)12C:12H
TEMP SHIFT DIRECTION	down (8-5°C)	down (8-4°C)	down (8-4°C)	down (8-4°C)	down (9-5°C)	down (8-4°C)	down (8-4°C)	down (8-4°C)
REARING TREATMENT	fed	fed	fed	fed	fed	fed	fed	fed
STAGE	fry	fry	fry	fry	fry	fry	fry	fry
MEAN SIZE AT RELEASE (mm)	50	65	60	57	59	59	58	59
MEAN SIZE AT RELEASE (g)	0.88	2.26	1.66	1.47	1.59	1.52	1.56	1.58
ACTUAL NUMBER OF OM RELEASED (thousand)	4,444	1,596	3,117	6,717	1,199	1,791	1,119	3,612
MARK QUALITY	poor	good	good	ok	ok	ok	ok	ok
COMMENTS	Some otoliths contained similar dark rings before the first thermal ring.				spawning date: early October	spawning date: late October	spawning date: middle November Planned schedule (2-8nH) was stopped because the egg condition was not good.	
PHOTO IMAGE								

Table 1. Continued.

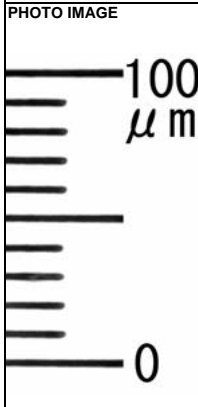
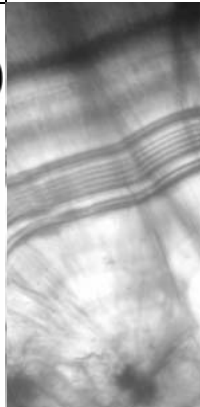
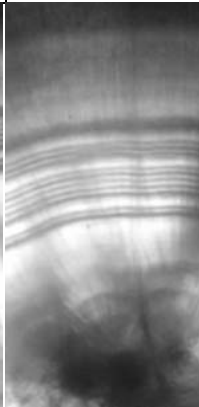
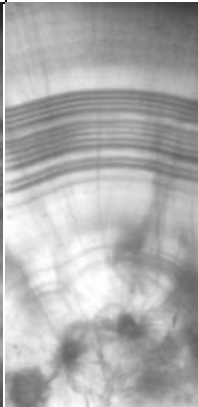
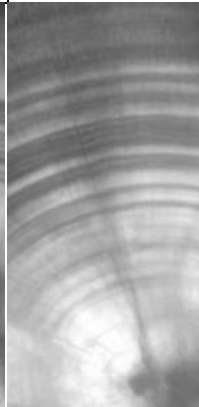
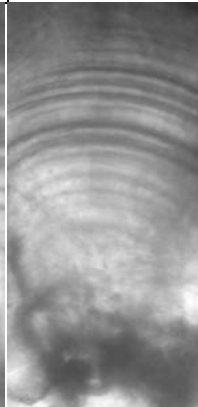
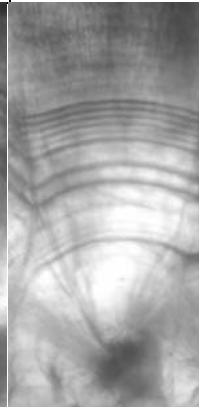
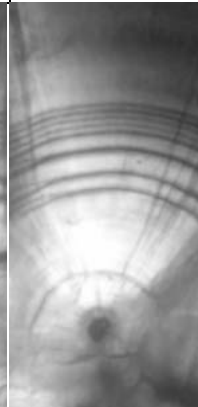
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BROOD YEAR	2003	2003	2003	2003	2003	2003	2003	2003
SPECIES	CHUM	CHUM	CHUM	CHUM	CHUM	CHUM	CHUM	CHUM
STATE/PROVINCE	HOKKAIDO	HOKKAIDO	HOKKAIDO	HOKKAIDO	HOKKAIDO	HOKKAIDO	HOKKAIDO	HOKKAIDO
REGION	East Pacific coast	East Pacific coast	East Pacific coast	West Pacific coast	West Pacific coast	West Pacific coast	West Pacific coast	West Pacific coast
FACILITY	Tsurui / Ashibetsu Hatchery	Tsurui Hatchery	Tsurui Hatchery	Shizunai Hatchery	Shizunai Hatchery	Shizunai Hatchery	Shizunai Hatchery	Yakumo Hatchery
STOCK	Kushiro River	Kushiro River	Kushiro River	Shizunai River	Shizunai River	Shizunai River	Shizunai River	Yurappu River
FINAL RELEASE SITE	Kushiro River	Kushiro River	Kushiro River	Shizunai River	Shizunai River	Shizunai River	Shizunai River	Yurappu River
SPAWNING DATE	03/10/02-03/10/15	03/10/29	03/11/20-03/11/21	03/10/06	03/10/06	03/10/22-03/11/04	03/11/12-03/12/09	03/09/24-03/10/10
DATE OF RELEASE	04/004/29-04/05/21	04/04/22-04/05/21	04/05/11-04/05/28	04/03/12	04/03/12	04/03/22-04/04/06	04/04/26-04/06/01	04/02/26-04/03/19
OM ID	Kushiro03chum-1	Kushiro03chum-2	Kushiro03chum-3	Shizunai03chum-early	Shizunai03chum-tr	Shizunai03chum-mid	Shizunai03chum-late	Yurappu03chum-1
RBr CODE	1:1.2.2.5-3.2	1:1.2.2.5-3.3	1:1.2.2.5-3.4	1:1.2.2.2n,3.4n	1:1.2-2.3	1:1.2.2.6n	1:1.2.2.1n-3.5n	1:1.2.2.2w-3.3
HATCH CODE	2.5-2H	2.5-3H	2.5-4H	2.2n,4nH	2-3H	2.6nH	2.1n-5nH	2.2w-3H
PREHATCH GRAPHIC								
POSTHATCH GRAPHIC								
MARKING SYSTEM	CHILLER	CHILLER	CHILLER	CHILLER	CHILLER	CHILLER	CHILLER	CHILLER
OTOLITH MARK SCHEDULE	(1X)12C:12H,(1X)12C:36H, (4X)12C:12H,(1X)12C:36H, (2X)12C:12H	(1X)12C:12H,(1X)12C:36H, (4X)12C:12H,(1X)12C:36H, (3X)12C:12H	(1X)12C:12H,(1X)12C:36H, (4X)12C:12H,(1X)12C:36H, (4X)12C:12H	(1X)24C:24H,(1X)24C:48H, (1X)12C:12H,(1X)12C:36H, (4X)12C:12H	(2X)24H:24C,(1X)72H:24C, (2X)24H:24C	(1X)24C:24H,(1X)24C:48H, (6X)12C:12H	(1X)24C:24H,(1X)24C:48H, (1X)12C:36H,(5X)12C:12H	(1X)12C:12H,(1X)12C:24H, (1X)24C:24H,(1X)24C:48H, (3X)12C:12H
TEMP SHIFT DIRECTION	down (8-4°C)	down (8-4°C)	down (8-4°C)	down (10-6°C)	up (6-10°C)	down (10-6°C)	down (10-6°C)	down (8-4°C)
REARING TREATMENT	fed	fed	fed	fed	fed	fed	fed	fed
STAGE	fry	fry	fry	fry	fry	fry	fry	fry
MEAN SIZE AT RELEASE (mm)	69	49	54	65	46	66	72	46
MEAN SIZE AT RELEASE (g)	2.24	0.97	1.34	2.31	0.79	2.08	2.53	0.85
ACTUAL NUMBER OF OM RELEASED (thousand)	2,833	2,777	3,091	346	155	2,975	3,096	1,179
MARK QUALITY	good	good	good	ok	poor	ok	ok	good
COMMENTS				spawning date: early October	spawning date: early October Some otoliths contained similar dark rings before the first thermal ring.	spawning date: late October and early November	spawning date: middle November and December	
PHOTO IMAGE								

Table 1. Continued.

No	J03-25	J03-26	J03-27	J03-28	J03-29	J03-30	J03-31	J03-32
BROOD YEAR	2003	2003	2003	2003	2003	2003	2003	2003
SPECIES	CHUM	CHUM	CHUM	CHUM	CHUM	PINK	MASU	MASU
STATE/PROVINCE	HOKKAIDO	HOKKAIDO	HONSHU	HONSHU	HONSHU	HOKKAIDO	HOKKAIDO	HOKKAIDO
REGION	West Pacific coast	West Pacific coast	Pacific coast	Pacific coast	Pacific coast	Nemuro Strait coast	Japan Sea coast	Japan Sea coast
FACILITY	Yakumo Hatchery	Yakumo Hatchery	Katagishi Hatchery	Katagishi Hatchery	Omine Hatchery	Ichani Hatchery	Shiribetsu Hatchery	Shiribetsu Hatchery
STOCK	Yurappu River	Yurappu River	Katagishi River	Katagishi River	Kitakami River	Ichani River	Shiribetsu River	Shiribetsu River
FINAL RELEASE SITE	Yurappu River	Yurappu River	Katagishi River	Katagishi River	Kitakami River	Ichani River	Shubuto River	Shiribetsu River
SPAWNING DATE	03/09/29-03/10/24	2003/11/12	03/10/11	03/10/29-03/11/06	03/10/27-03/11/22	03/09/17	03/09/17	03/09/17
DATE OF RELEASE	04/02/26-04/05/01	04/04/02-04/05/01	04/03/11	04/03/11-04/04/15	04/01/26-04/03/02	04/03/31-04/04/21	04/04/07	04/05/25-04/05/26
OM ID	Yurappu03chum-2	Yurappu03chum-3	Katagishi03chum-1	Katagishi03chum-2	Omine03chum	Ichani03pink	Shubuto03masu-f	Shiribetsu03masu-s-f
RBr CODE	1:1.2.2.2w-3.2	1:1.2.2.2w	1:1.2.2.2	1:1.2.2.4	1:1.2	1:1.2.2.5	1:1.2.2.2	1:1.2.2.2
HATCH CODE	2.2w-2H	2.2wH	2.2H	2.4H	2H	2.5H	2.2H	2.2H
PREHATCH GRAPHIC								
POSTHATCH GRAPHIC								
MARKING SYSTEM	CHILLER	CHILLER	CHILLER	CHILLER	CHILLER	CHILLER	CHILLER	CHILLER
OTOLITH MARK SCHEDULE	(1X)12C:12H,(1X)12C:24H, (1X)24C:24H,(1X)24C:48H, (2X)12C:12H	(1X)12C:12H,(1X)12C:24H, (2X)24C:24H	(1X)12C:12H,(1X)12C:24H, (2X)12C:12H	(1X)12C:12H,(1X)12C:24H, (4X)12C:12H	(2X)24C:24H	(1X)24C:24H,(1X)24C:48H, (5X)24C:24H	(1X)24H:24C,(1X)24H:48C, (2X)24H:24C	(1X)24H:24C,(1X)24H:48C, (2X)24H:24C
TEMP SHIFT DIRECTION	down (8-4°C)	down (8-4°C)	down (12-8°C)	down (12-8°C)	down (8-4°C)	down (8-4°C)	up (6-10°C)	up (6-10°C)
REARING TREATMENT	fed	fed	fed	fed	fed	fed	fed	fed
STAGE	fry	fry	fry	fry	fry	fry	fry	fry
MEAN SIZE AT RELEASE (mm)	50	50	59	59	-	43	35	47
MEAN SIZE AT RELEASE (g)	1.10	1.04	1.36	1.37	0.91	0.49	0.30	0.99
ACTUAL NUMBER OF OM RELEASED (thousand)	1,418	890	681	2,879	3,879	1,373	563	586
MARK QUALITY	good	good	good	good	good	ok	ok	ok
COMMENTS								
PHOTO IMAGE								

Table 1. Continued.

No	J03-34	J03-35	J03-36	J02-29	J02-28
BROOD YEAR	2003	2003	2003	2002	2002
SPECIES	MASU	MASU	MASU	2004	2004
STATE/PROVINCE	HOKKAIDO	HOKKAIDO	HOKKAIDO	MASU	MASU
REGION	Japan Sea coast	Okhotsk Sea Coast	Okhotsk Sea Coast	Japan Sea coast	Japan Sea coast
FACILITY	Chitose Hatchery	Shari Hatchery	Shari Hatchery	Chitose Hatchery	Chitose Hatchery
STOCK	Chitose River	Shari River	Shari River	Shiribetsu River	Chitose River
FINAL RELEASE SITE	Chitose River	Shari River	Shari River	Shiribetsu River	Chitose River
SPAWNING DATE	03/09/29-03/10/15	03/08/29-03/09/04	03/08/29-03/09/04	02/09/20	02/09/17-02/09/24
DATE OF RELEASE	04/06/17	04/04/15-04/06/12	03/10/20-03/10/21	04/04/26	04/04/23
OM ID	Chitose03masu-f	Shari03masu-f	Shari03masu-e	Shiribetsu02masu-c-s	Chitose02masu-fj
RBr CODE	1:1.3.2.3n	1:1.6	1:1.4	1:1.3.2.3n	1:1.3.2.3n
HATCH CODE	3,3nH	6H	4H	3,3nH	3,3nH
PREHATCH GRAPHIC					
POSTHATCH GRAPHIC					
MARKING SYSTEM	CHILLER	CHILLER	CHILLER	CHILLER	CHILLER
OTOLITH MARK SCHEDULE	(2X)24C:24H,(1X)24C:48H, (3X)12C:12H	(6X)24C:24H	(4X)24C:24H	(2X)24C:24H,(1X)24C:48H, (3X)12C:12H	(2X)24C:24H,(1X)24C:48H, (3X)12C:12H
TEMP SHIFT DIRECTION	down (8-4°C)	down (8-4°C)	down (8-4°C)	down (8-4°C)	down (8-4°C)
REARING TREATMENT	fed	fed	unfed	fed	fed
STAGE	fry	fry	egg	smolt	smolt
MEAN SIZE AT RELEASE (mm)	51	62	-	120	125
MEAN SIZE AT RELEASE (g)	1.31	2.44	-	19.07	21.97
ACTUAL NUMBER OF OM RELEASED (thousand)	30	388	670	44	31
MARK QUALITY	good	ok	ok	ok	ok
COMMENTS				Some otoliths contained similar faint ring before the first thermal ring.	9 thousand: Ribbon tag (red)+Finclip (RV) 22 thousand: Finclip (RV)
PHOTO IMAGE					