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## Otolith marks for brood year 2002 salmon in Russia

by

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### Abstract

Program for marking 2002 brood year pacific salmon had been implemented in Magadan, Kamchatka and Sakhalin regions of Russia. Thermal and dry methods had been applied to introduce marks in otolith structure. Volume of marking remained the same as last year. Previously proposed marking plan for brood year 2002 salmon underwent substantial corrections due to reconstruction conducted at Magadan Hatchery.

### Introduction

Mass marking of salmon using otolith marking with subsequent identification of marked fish allows to determine foraging areas and migration routes for separate stock during sealife. Marking has been conducted in Russia since 1994. In 2001-2002 we received first data on identification of salmon of the Russian and Japanese origin during pre-spawning migrations. Increase in quantity of released marked fry will allow to study relative abundance of salmon belonging to separate stocks in different periods of life. Today, total marking in Russia can be conducted only at hatcheries of Kamchatka. Some experimental work on marking of otoliths is being conducted in Sakhalin, where most of the hatcheries are located. Parameters of fry released in 2003 from Russian hatcheries are represented in Table 1. Description of mark samples is represented in RBr (Munk and Geiger 1998; Hagen 1999) and Hatch Code (Hagen et al. 2000) formats.

### Release of brood year 2002 fry.

Marking of brood year 2002 pacific salmon in Russia was conducted at 14 hatcheries located in 3 regions – Kamchatka, Magadan Region and Sakhalin Island. 18 different types of marks had been used. Main target for marking was chum salmon – about 47 million individuals. We also released 9 million individuals of sockeye, 3 million coho, 0.5 million Chinook and 0.3 million individuals of pink salmon. The number of marked and released fry in 2003 totaled 61 million.

As in previous years, geographic origin of salmon was coded in the first block of marks: 3 rings were used by Kamchatka hatcheries, 4 rings by Sakhalin hatcheries, 5 and more rings by hatcheries of Magadan.

The marking in Kamchatka and Sakhalin was conducted according to marking plan. Marking plan for Magadan Hatchery underwent substantial corrections due to its partial reconstruction. (Table 1). Anyway, occurrence of abnormal conditions while marking certain portion of fry at Tauí Hatchery (Table 1, ID# R02-8) resulted in distortion of expected mark. About 0.9 million of Magadan fry bore a mark with 4 rings in the first block (typical for Kamchatka hatcheries). In general, rings in marks of brood year 2002 chum salmon, formed by 12 after 12 hours method at Tauí Hatchery, were distinct but too close to each other. Marks were easy to find, however, their identification required high magnification. In order to get short-cycle, high quality marks by applying dry marking at Magadan hatcheries the incubation temperature should be higher than that at Tauí Hatchery (3.4°C).

Lack of equipment at hatcheries of Sakhalin (no possibility to cool water neither for leveling of ambient temperature nor for marking) does not allow to intensify thermal marking in that region. Sakhalin salmon hatcheries function mainly upon river and ground waters. Water temperature during incubation period (early fall, when embryonic marking can be conducted) is characterized by abrupt fluctuations caused by weather changes. This results in natural formation of a large number of rings with various brightness. Rings of artificial mark get distorted or lost among them. Apart from that, the influence of higher water temperature during marking results in accelerated embryonic development which does not always

correspond with plans of fish-breeders. Quality of marks obtained by dry marking during incubator draining directly depends on daily air temperature dynamics at unheated incubation facilities. So far, 4 years of experimenting did not result in possibility of applying total marking, since optimal marking methods should first be selected for each hatchery allowing for various conditions.

### References

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**Table1.Otolith marks released from Russia for 2002 brood year stocks of salmon.**

ID#	MARK	BROOD	YEAR OF	SPECIES	COUNTRY	STATE/	AGENCY	FACILITY	FINAL	REARING	STAGE	NUMBER OF
	TYPE	YEAR	RELEASE			PROVINCE			RELEASE SITE	TREATMENT		RELEASED
1	2	3	4	5	6	7	8	9	10	10	11	12
R02-1	DM	2002	2003	coho	Russia	Magadan	OhotskRV	Armanskiy	Tauy Bay	fed	fry	929 000
R02-2	TM	2002	2003	chum	Russia	Magadan	OhotskRV	Olskiy	Tauy Bay	fed	fry	5 630 000
R01-5	TM	2002	2003	coho	Russia	Magadan	OhotskRV	Olskiy	Tauy Bay	fed	1+	5 600
R01-6	TM	2002	2003	sockeye	Russia	Magadan	OhotskRV	Olskiy	Tauy Bay	fed	1+	3 914
R02-3	DM	2002	2003	chum	Russia	Magadan	OhotskRV	Tauyskiy	Tauy Bay	fed	fry	1 055 400
R02-4	DM	2002	2003	chum	Russia	Magadan	OhotskRV	Tauyskiy	Tauy Bay	fed	fry	2 407 600
R02-5	DM	2002	2003	chum	Russia	Magadan	OhotskRV	Tauyskiy	Tauy Bay	fed	fry	908 800
R02-6	DM	2002	2003	coho	Russia	Magadan	OhotskRV	Tauyskiy	не выпускали	fed	fry	563 800
R02-7	DM	2002	2003	chum	Russia	Magadan	MagadanNIRO	Olskiy	Tauy Bay	fed	fry	230 000
R01-2	DM	2002	2003	coho	Russia	Magadan	MagadanNIRO	Yanskiy	Tauy Bay	fed	1+	1 625 000
R02-8	DM	2002	2003	coho	Russia	Magadan	MagadanNIRO	Yanskiy	не выпускали	fed	fry	478 600
R02-11	TM	2002	2003	chinook	Russia	Kamchatka	KamchatRV	Malkinskiy	West Kam	fed	fry	524 207
R02-12	DM	2002	2003	sockeye	Russia	Kamchatka	KamchatRV	Malkinskiy	West Kam	fed	fry	741 146
R02-13	DM	2002	2003	chum	Russia	Kamchatka	KamchatRV	Ketkinskiy	East Kam	fed	fry	7 210 435
R02-14	DM	2002	2003	chum	Russia	Kamchatka	KamchatRV	Ozerki	West Kam	fed	fry	4 550 980
R02-15	DM	2002	2003	sockeye	Russia	Kamchatka	KamchatRV	Ozerki	West Kam	fed	fry	8 000 000
R02-16	DM	2002	2003	chum	Russia	Kamchatka	KamchatRV	Paratunskiy	East Kam	fed	fry	19 039 200
R02-17	DM	2002	2003	chum	Russia	Kamchatka	KamchatRV	Viluyskiy	East Kam	fed	fry	706 805
R02-18	DM	2002	2003	coho	Russia	Kamchatka	KamchatRV	Viluyskiy	East Kam	fed	fry	100 000
R02-19	TM	2002	2003	Pink	Russia	Sahalin	SakhRV	Taranayskiy	Sahalin	fed	fry	90 000
R02-20	TM	2002	2003	Pink	Russia	Sahalin	SakhRV	Taranayskiy	Sahalin	fed	fry	91 000
R02-21	DM	2002	2003	Pink	Russia	Sahalin	SakhRV	Taranayskiy	Sahalin	fed	fry	90 050
R02-22	TM	2002	2003	Chum	Russia	Sahalin	SakhRV	Bereznykovsky	Sahalin	fed	fry	92 800

**Table1. (continued). Otolith marks released from Russia for 2002 brood year stocks of salmon.**

ID#	MARK	BROOD		YEAR OF	SPECIES	COUNTRY	STATE/	AGENCY	FACILITY	FINAL	REARING	STAGE	NUMBER OF
R02-23	TM	2002	2003		Chum	Russia	Sahalin	SakhRV	Berezhnykovsky	Sahalin	fed	fry	91 050
R02-24	DM	2002	2003		Chum	Russia	Sahalin	SakhRV	Berezhnykovsky	Sahalin	fed	fry	587 000
R02-25	TM	2002	2003		Chum	Russia	Sahalin	SakhRV	Ado-Tymovskiy	Sahalin	fed	fry	492 000
R02-26	TM	2002	2003		Chum	Russia	Sahalin	SakhRV	Ado-Tymovskiy	Sahalin	fed	fry	497 000
R02-27	DM	2002	2003		Chum	Russia	Sahalin	SakhRV	Ado-Tymovskiy	Sahalin	fed	fry	495 000
R02-28	TM	2002	2003		Chum	Russia	Sahalin	SakhRV	Bujuklovskiy	Sahalin	fed	fry	495 000
R02-29	TM	2002	2003		Chum	Russia	Sahalin	SakhRV	Bujuklovskiy	Sahalin	fed	fry	490 000
R02-30	DM	2002	2003		Chum	Russia	Sahalin	SakhRV	Bujuklovskiy	Sahalin	fed	fry	400 000
R02-31	TM	2002	2003		Chum	Russia	Sahalin	SakhRV	Pobedinskiy	Sahalin	fed	fry	494 000
R02-32	TM	2002	2003		Chum	Russia	Sahalin	SakhRV	Pobedinskiy	Sahalin	fed	fry	495 000
R02-33	DM	2002	2003		Chum	Russia	Sahalin	SakhRV	Pobedinskiy	Sahalin	fed	fry	495 000

**Table1.(continued). Otolith marks released from Russia for 2002 brood year stocks of salmon.**

ID#	RBr	HATCH CODE	GRAPHIC IMAGE		MARK SCHEDULE	QUALITY	COMMEENTS
			PREHATCH	POSTHATCH			
1	13	14	15	16	17	18	19
R02-1		5H			(5X)24D:24W	good	
R02-2	2:1.8	H8			(8X)24H:24C	good	
R01-5	1:1.5-2.2	5-2H			(4X)24D:24W,(1X)24D:72W,(2X)24D:24W	good	
R01-6	1:1.5-2.2	5-2H			(4X)24H:24C,(1X)24H:72C,(2X)24H:24C	good	
R02-3	1:1.8	8H			(8X)24H:24C	good	
R02-4	1:1.8n	8nH			(8X)12H:12C	good	ring are too close
R02-5	1:1.4,2.4n	4,4nH			(4X)24H:24C,(4X)12H:12C	50% bad	substandard mark
R02-6	1:1.4n	4nH			(4X)12D:12W	good	ring are too close
R02-7	1:1.5	5H			(5X)24D:24W	good	
R01-2	1:1.6	6H			(6X) 24D:24W	good	
R02-8	1:1.7	7H			(7X) 24D:24W	good	
		7					
R02-11	2:1.3	H3			(3X)24H:24C	good	
R02-12	1:1.3,2.1-3.1	3,2-1H			(2X)24D:24W,(1X)24D:48W,(1X)24D:72W,(1X)24D:24W	good	
R02-13	1:1.3,2.4	3,4H			(2X)24D:24W,(1X)24D:48W,(4X)24D:24W	good	
R02-14	1:1.3,2.1,3.2	3,1,2H			(2X)24D:24W,(1X)24D:48W,(1X)24D:48W,(2X)24D:24W	good	
R02-15	1:1.3,2.1,3.2	3,1,2H			(2X)24D:24W,(1X)24D:48W,(1X)24D:48W,(2X)24D:24W	good	
R02-16	1:1.3	3H			(3X)24D:24W	good	
R02-17	1:1.3,2.1-3.1	3,2-1H			(2X)24D:24W,(1X)24D:48W,(1X)24D:72W,(1X)24D:24W	good	
R02-18	1:1.3	3H			(3X)24D:24W	good	
		5					
R02-19	1:1.3-2.3	3-3H			(2X)24H:24C,(1X)24H:72C,(3X)24H:24C	50% bad	substandard mark
R02-20	1:1.3-2.3	3-3H			(2X)24H:24C,(1X)24H:72C,(3X)24H:24C	50% bad	substandard mark

**Table1.(continued). Otolith marks released from Russia for 2002 brood year stocks of salmon.**

ID#	RBr	HATCH CODE	GRAPHIC IMAGE	MARK SCHEDULE	QUALITY	COMMEENTS
R02-21	1:1.3-2.3	3-3H		(2X)24H:24C,(1X)24H:72C,(3X)24H:24C	50% bad	substandard mark
R02-22	1:1.4-2.4	4-4H		(3X)24H:24C,(1X)24H:72C,(4X)24H:24C	50% bad	substandard mark
R02-23	1:1.4-2.4	4-4H		(3X)24H:24C,(1X)24H:72C,(4X)24H:24C	50% bad	substandard mark
R02-24	1:1.4-2.4	4-4H		(3X)24H:24C,(1X)24H:72C,(4X)24H:24C	50% bad	substandard mark
R02-25	1:1.4-2.3	4-3H		(3X)24H:24C,(1X)24H:72C,(3X)24H:24C	50% bad	substandard mark
R02-26	1:1.4-2.3	4-3H		(3X)24H:24C,(1X)24H:72C,(3X)24H:24C	50% bad	substandard mark
R02-27	1:1.4-2.3	4-3H		(3X)24H:24C,(1X)24H:72C,(3X)24H:24C	50% bad	substandard mark
R02-28	1:1.4-2.2,3.1	4-2,1H		(3X)24H:24C,(1X)24H:72C,(1X)24H:24C,(1X)24H:48C,(1X)24H:24C	50% bad	substandard mark
R02-29	1:1.4-2.2,3.1	4-2,1H		(3X)24H:24C,(1X)24H:72C,(1X)24H:24C,(1X)24H:48C,(1X)24H:24C	50% bad	substandard mark
R02-30	1:1.4-2.2,3.1	4-2,1H		(3X)24H:24C,(1X)24H:72C,(1X)24H:24C,(1X)24H:48C,(1X)24H:24C	50% bad	substandard mark
R02-31	1:1.4-2.2	4-2H		(3X)24H:24C,(1X)24H:72C,(2X)24H:24C	50% bad	substandard mark
R02-32	1:1.4-2.2	4-2H		(3X)24H:24C,(1X)24H:72C,(2X)24H:24C	50% bad	substandard mark
R02-33	1:1.4-2.2	4-2H		(3X)24H:24C,(1X)24H:72C,(2X)24H:24C	50% bad	substandard mark