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**Thermal marks on chinook and chum salmon  
released from B.C. hatcheries for brood years 1992-1998.**

by

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## Abstract

Large-scale thermal marking of hatchery chinook salmon started with the 1992 brood year at the Robertson Cr. and Nitinat hatcheries. Mean annual releases of thermally marked chinook at Robertson Cr. are 8.0 million, at Nitinat 5.2 million, at Sarita R. 163 thousand, at Conuma R. 434 thousand, at Chilliwack 1.6 million, and at Quinsam R. 3.2 million. Chum salmon were thermally marked at the Nitinat hatchery beginning with the 1993 brood year. The average number of thermally marked chum salmon released from the Nitinat hatchery is 30.1 million. The thermal patterns for each release are reported.

## Introduction

This summary report was developed at the request of the NPAFC *ad hoc* "working group on thermal marking". The objective of this report is to provide information on releases of thermally marked salmon in recent years. Large-scale thermal marking of hatchery chinook salmon in Canada started with the 1992 brood year at the Robertson Cr. and Nitinat hatcheries on the west coast of Vancouver Island. Beginning with the 1993 brood year, chum salmon were thermally marked at the Nitinat hatchery.

## Methods and data

The thermal marks are characterized by the '**RBr**' format, developed by the Alaska Department of Fish and Game where:

**R** is the region in otolith where mark occurs

1 = pre-hatch

2 = post-hatch

3 = basemark may appear in either region

**B** is the band number

A band consists of evenly spaced thermal rings

Bands are separated by a space of at least two cycle intervals

**r** is the number of rings in the associated band

For example, a post-hatch thermal mark consisting of three bands of two rings each, and each band is separated by at least two cycle-intervals would be represented:

2: [ 1.2+2.2+3.2 ]

R: [ B.r +B.r + B.r ]

This 'mark code,' along with all measurements and comments, is recorded on the Thermal Mark Reference Sheet.

## Results

Mean annual releases of thermally marked chinook at Robertson Cr. are 8.0 million, at Nitinat - 5.2 million, at Sarita R. - 163 thousand, at Conuma R. - 434 thousand, at Chilliwack - 1.6 million, and at Quinsam R. - 3.2 million (Table 1). Chum salmon were thermally marked at the Nitinat hatchery beginning with the 1993 brood year (Table 1). The average number of thermally marked chum salmon released from the Nitinat hatchery is 30.1 million. The thermal patterns for each release are reported in Table 2: chinook, and Table 3 (chum).

Table 1. Numbers for thermally marked salmon released from major facilities.**Chinook**

<u>broodyear</u>	<u>Robertson Cr</u>	<u>Nitinat R</u>	<u>Sarita R</u>	<u>Conuma R</u>	<u>Chilliwack R</u>	<u>Quinsam R</u>
1992	8,400,429	500,000	156,632			
1993	6,939,205	6,195,122	210,776			
1994	7,272,539	6,353,525	237,979	663,691		
1995	8,273,553	4,073,259	7,086	390,040	813,089	
1996	8,451,699	7,474,233	58,469	507,047	2,055,821	3,628,008
1997	8,927,415	6,341,195	307,914	176,496	1,921,522	2,712,900

**Chum**broodyear

1993	28,363,894
1994	30,831,080
1995	24,649,925
1996	31,941,437
1997	34,830,668

Table 2. Thermal marks on chinook salmon released from B.C. hatcheries

**PACIFIC BIOLOGICAL STATION  
Fisheries and Oceans Canada  
THERMAL OTOLITH MARK RECORD**

**CHINOOK**

NOTE:  
Portion of thermal mark RBr code enclosed  
in square brackets indicates the base mark;  
e.g.) Region:[base mark] . accessory mark

BROOD YEAR	RELEASE SITE and FACILITY WHERE MARKING OCCURRED					
	Robertson Creek Robertson Creek Hatchery	Nitinat River Nitinat Hatchery	Sarita River Nitinat Hatchery	Conuma River Conuma Hatchery	Chilliwack River Chilliwack Hatchery	Quinsam River Quinsam Hatchery
	0104	0114	1388	0117	0107	0106
1992	1 : 1.4 IIII (41-70,16-25) and 1 : [1.4] , 2.4 IIII IIII (access @ 165-190)	2 : 1.4 IIII uneven spacing no ref. samples Parker Creek release	1 : [1.3 + 2.3] IIII III no ref. samples -80% marked	no mark	no mark	no mark
1993	1 : 1.5 IIII (50-61,27-38) edge effect r4-5 narrow	2 : 1.4 IIII (138-196,16-22)	2 : [1.2 + 2.2] IIII (117-143,30-33)	no mark	no mark	no mark
1994	1 : 1.4 IIII (25-70,12-15)	2 : [1.3 + 2.3] IIII III (140-210,36-40)	2 : [1.2 + 2.2 + 3.2] IIII II (160-180,44-47)	2 : 1.3 IIII (150-200,10-12)	no mark	no mark
1995	1 : [1.2 + 2.2] IIII (38-75,26-32)	2 : [1.2 + 2.3 + 3.2] IIII III (120-200,33-40) and 2 : [1.2 + 2.2 + 3.2] IIII II (120-148,33-39)	2 : [1.3 + 2.2 + 3.3] IIII II III (145-160,41-47)	2 : 1.5 IIII (150-188,18-22)	2 : 1.7 IIIIII (130-188,25-30)	no mark
1996	1 : 1.4 IIII (25-51,15-23) doublets @ 60-75	2 : [1.3 + 2.3] IIII III (188-233,29-32)	2 : [1.2 + 2.2] IIII II (158-190,18-20)	2 : [1.2+2.3] II III (180-225,22-26)	2 : [1.4 + 2.4] IIII IIII (135-190,35-43)	2 : [1.3 + 2.2] IIII II (130-170,20-26)
1997	1 : [1.2 + 2.2] IIII (48-73,23-28)	2 : [1.3 + 2.3] IIII III (156-190,32-43)	2 : [1.2 + 2.2 + 3.2] IIII II II (135-205,40-51)	2 : 1.6 IIIIII (135-160,23-26) some edge effect r3 not visible in some	2 : [1.5 + 2.3] IIII III (150-175,32-39)	2 : [1.3 + 2.4] IIII IIII (140-170,35-40)
1998	1 : [1.2 + 2.2] IIII	2 : [1.3 + 2.3] IIII III	2 : [1.2 + 2.2 + 3.2] IIII II II	2 : 1.6 IIIIII	2 : [1.5 + 2.3] IIII III	2 : [1.3 + 2.4] IIII IIII
	PROPOSED	PROPOSED	PROPOSED	PROPOSED	PROPOSED	PROPOSED

Table 3. Thermal marks on chum salmon released from Nitinat hatchery.

<b>PACIFIC BIOLOGICAL STATION</b> <b>Fisheries and Oceans Canada</b> <b>THERMAL OTOLITH MARK RECORD</b>		<b>CHUM</b>		<b>NOTE:</b> Portion of thermal mark RBr code enclosed in square brackets indicates the base mark; e.g.) Region:[base mark], accessory mark			
<b>BROOD YEAR</b>	<b>RELEASE SITE and FACILITY WHERE MARKING OCCURRED</b>						
	Nitinat River (early release) Nitinat Hatchery	Nitinat River (late release) Nitinat Hatchery					
	0114	0114					
1993	1 : 1.4 IIII (44-56,17-20) and 1 : [1.4], 2.4 III IIII (access. @ -180)	1 : 1.1, [2.4] I IIII (41-54,24-26)					
1994	1 : [1.2 + 2.2] II II (51-70,20-23)	1 : [1.2 + 2.2] II II (51-77,27)					
1995	2 : 1.3 III (180-210,5-7)	1 : 1.3 III (45-55,15) and 1 : [1.3], 2.3 III III (110-140,9-11)					
1996	1 : 1.4 IIII (32-60,14-19)	1 : 1.4 IIII (25-51,14-19) some poor marks marked into hatch					
1997	1 : [1.2 + 2.2] II II and 1 : [1.3 + 2.2] III II (28-63,18-32) r3 inconsistent	1 : [1.2 + 2.2] II II (32-65,28-37) many with extra ring between r1 & r2					
1998	1 : [1.2 + 2.2] II II PROPOSED	1 : [1.2 + 2.2] II II PROPOSED					