

**Chum Stock Identification Assessment for
Canadian Area 3 Commercial Fishery
Otoliths 2016**

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ABSTRACT

Jakubowski, M. 2017. Chum Stock Identification Assessment for Canadian Area 3 Commercial Fishery Otoliths 2016. Unpublished report for the Pacific Salmon Commission Northern Boundary and Transboundary Rivers Restoration and Enhancement Fund 2016. File NF-2016-I-8A.

Otoliths were collected from Chum salmon (*Oncorhynchus keta*) caught in Canadian Area 3 commercial fisheries in 2016 to identify the component of hatchery stocks with thermal marks. A total of 1,208 Chum were sampled in Area 3 between the dates of June 20 and August 5 2016. Nine specific sub areas of Area 3 were sampled during 5 gillnet and 7 seine commercial fishing openings.

INTRODUCTION

Funding for this project was provided by the Northern Boundary and Transboundary Rivers Restoration and Enhancement Fund (Northern Fund) to estimate hatchery contributions to Chum salmon (*Oncorhynchus keta*) fisheries in Area 3. The project sampled otoliths from chum salmon caught in Canadian commercial seine and gillnet fisheries in Area 3. The purpose of this project was to determine weekly Alaskan Chum proportion in four subareas of Area 3 in commercial fisheries by examining otoliths for the presence or absence of hatchery thermal markings. The goal of this project was to use hatchery proportion data to identify chum retention opportunities for the Area 3 commercial fishing fleet while minimizing wild stock chum impacts.

Access to sockeye and pink stocks in Area 3 commercial fisheries are limited by concerns for Canadian Area 3 and 4 chum stocks. Time and area closures as well as non-retention of chum salmon are used extensively to limit impacts. Fisheries may be redesigned to provide the highest ratio of sockeye and pink relative to the wild chum, bycatch, and allow for some chum retention. The information from this project has resulted in increased opportunities for Canadian Area 3 fisheries, while reaffirming the management plan restrictions to limit impacts on Canadian wild chum stocks. Continuing this study will provide stock composition information that will further define the time and area relative abundance of otolith marked chum in the Canadian fishery.

The program was initially requested by DFO fish management in response to direct requests for this information from commercial fishermen. Advice and consultation occurred between Canadian and US technical representatives including a visit to the US otolith lab in 2012 to observe the methods, and to meet and discuss the project with local staff. The project and the potential uses of the data will be of great interest to the commercial and Environmental Non-Government Organizations (ENGO's) with a vested interest in rebuilding chum stocks while supporting harvest opportunities.

The sample objectives were reduced from a total of 4200 samples to 2100 samples based on the nature of the fisheries and the sampling success in previous years. The target number of chum salmon samples was 100 chum salmon samples from up to four fishing locations per gear type per week from June 20 to August 13 in 2016. Chum salmon abundance early, a limited number of fishing opportunities, the number of participating vessels and weather patterns were factors which determined the number of samples actually collected. During the peak of Area 3 chum salmon abundance (midway through the program) sample targets are obtainable. During the tails of this program acquiring the desirable sampling targets was a challenge. 2100 samples represented the maximum that could be obtained. The sampling start date was moved to June 20 in 2016 from July 1 based on better than anticipated landed catches of commercial chum, and discussions with Canadian commercial fishermen.

The project continued to use ADF&G otolith labs to determine the presence or absence of thermal marks. This was to ensure accurate results, and to be cost efficient. Data were analyzed and reported by DFO North Coast Stock Assessment.

METHODS

The sample collection approach was to coordinate the chum sampling effort with the existing sockeye stock id sampling program. This program was conducted by on-water sampling crews that sample directly as fish were landed on gillnet and seine vessels. Both gillnet and seine components were completed by the DFO sockeye sampling crew.

All samples were obtained from commercial fishing boats in Area 3. Seine or gillnet fishers were approached on the fishing grounds by DFO samplers in two 5.4 meter rigid-hulled inflatable boats (RHIB's) and a sampler would request to board the fishing vessel. During fisheries where chum salmon retention was prohibited samplers would be present while incidental chum were brought on board and recover the fish before they were released. These salmon had their otoliths removed on the fishing grounds if the weather allowed. In situations where weather conditions made Otolith removal unsafe, fish were taken back to Prince Rupert and sampled there.

During retention fisheries it was necessary to allow the chum salmon to be delivered to the processing plant. This presented problems tracking the origin of each sample. To resolve this problem colored zap straps were attached under the operculum and through the mouth of each chum salmon encountered on the fishing grounds. Different colors were used for different areas and in the case of a mixed gillnet and seine fishery in the same area, gillnets would have one strap while seines would be given two straps per fish. Different colored tags allowed samplers to identify the exact location of origin. Once the fish were delivered, DFO staff would go to the processors and retrieve the heads with the color coded straps attached. Chum heads occasionally had to be frozen as samplers were required to be out on the water obtaining more samples as samples from previous days were still arriving at processors. Organization was required to ensure the timely recovery of heads arriving at various processors located throughout the Prince Rupert/Port Edward area.

Once the chum salmon heads were obtained, otolith removal was achieved simply by cutting the head with a knife from the back of the head to just behind the eye (Shaw, 1998, p. 79). Otoliths were then removed with forceps, cleaned and placed in numbered trays for shipment to Alaska. In Alaska the Otoliths will be checked for thermal marks and the results documented. Data collected was entered into an excel spreadsheet (Table 1 and Table 2)

RESULTS

Standards that are fundamental to the success of this program were indicated in the proposal as;

- 1) To meet the sampling objectives of the project design (2100 max).
 - 1208 Chum were sampled in Area 3 between the dates of June 20 and August 5 2016. Nine specific sub areas of Area 3 were sampled during 5 gillnet and 7 seine commercial fishing openings.
- 2) To digitize all chum biological sampling information collected
 - Chum biological information is available in Table 1 and Table 2
- 3) To prepare otoliths for lab analysis
 - A total of 1208 chum were sampled resulting in 1151 pairs and 57 single otoliths available for analyses by the ADF&G otolith lab in 2016/17.
- 4) To obtain sample specific hatchery thermal marking information
 - The results from 2016 otolith samples have been received with 1190 out of the 1208 otoliths providing results. Throughout the sampling 70.4% of Otoliths showed thermal marking while 29.6% did not.
- 5) To analyze and report spatial-temporal Area 3 chum mark rates and biological characteristics.
 - The specific area and stat week collection of samples was carried out as available. Data was recorded in Table 1 in this report and Table 2 as an electronic attachment.

DISCUSSION

This project is in line with the mandate of the Northern fund, “ to assist stocks and fisheries covered under the Pacific salmon Treaty” and contribute to all of the Northern fund committee objectives outlined in Chapter 2 part 5 of the Pacific salmon Treaty:

- A) Evaluate the effectiveness of management actions;
- B) Identify and review the status of pink, chum, sockeye and coho stocks;
- C) Present the most current information on harvest rates and patterns on these stocks and develop a joint data base for assessments;

- D) Collate available information on the productivity of stocks in order to identify escapements which produce maximum sustainable harvests and allowable harvest rates;
- E) Present historical catch data, associated fishing regimes and information on stock composition in fisheries harvesting this stock;
- F) Devise analytical methods for the development of alternative regulatory and production strategies;
- G) Identify information and research needs, including future monitoring programs for stock assessments; and
- H) For each season make stock and fishery assessments and recommend to the Northern Panel conservation measures consistent with the principals of the Treaty

Chum abundance, number of fishing opportunities, number of participating vessels and weather patterns are some of the factors which will determine the number of samples actually collected. During the peak of Area 3 chum abundance (midway through the program) sample target should remain obtainable. During the early and late portion of this program acquiring the desirable sampling targets will remain a challenge. If all of the conditions are met, a maximum of 2100 samples would be collected.

The use of otolith marks is a well-established technology. The DFO interest in using the ADF&G lab for analysis recognizes the established expertise and removes a potential source of error. The Canadian fishing areas and effort patterns are well understood, and the design samples gillnet and seine from different subareas over the span of the fishery. The intent of the program is to better understand the wild chum abundance changes over time and among areas and gear. DFO observers are experienced in sampling as part of the sockeye sampling program. DFO attempted to take samples opportunistically during the sockeye sampling program, but found that a dedicated program is required to execute the extensive sampling regime.

ACKNOWLEDGEMENTS

We thank the DFO Stock Assessment Division sampling crew for their effort in field sampling and data entry. Thanks to the ADF&G thermal mark lab for the timely shipping of sampling equipment and for otolith reading and interpretation. Thanks in 2016 to Andrea Reid and Katrina Crook for their additional area 3 seine caught samples. We also thank Canada's gillnet and seine fishing fleets in Area 3 for their cooperation and understanding during sampling.

REFERENCES

- Pacific Salmon Commission. 2000. Pacific Salmon Treaty, 1999 Revised Annexes, Memorandum of Understanding (1985), Exchanges of Notes.
- W. Shaw. 1994. Biological Sampling Manual for Salmonids- A Standardized Approach for the Pacific Region 1998. Can. Tech Rep of Fish and Aquatic Science No. 1998. 167 p

TABLES

Table 1. Chum sampling results 2016.

Stat week (CDN/AK)	Gear	Area	Area Description	Date	# of Samples	Box #	Read	UnRead.	Marked	UnMarked	% Marked	% Unmarked
64/26	GN	3B	Tracy Bay	20&21/06/2016	21	114	20	1	15	5	75.0%	25.0%
64/26	GN	3B	Boston Rocks	20&21/06/2016	59	116	58	1	45	13	77.6%	22.4%
64/26	GN	3C	Elliot Point	20/06/2016	61	113	60	1	46	14	76.7%	23.3%
64/26	GN	3C	Hogan island	20&21/06/2016	79	115	79	0	60	19	75.9%	24.1%
71/27	GN	3B	Boston Rocks	28/06/2016	96	119	96	0	83	13	86.5%	13.5%
71/27	GN	3B	Boston Rocks	28/06/2016	18	120	18	0	17	1	94.4%	5.6%
71/27	GN	3C	Elliot Point	27/06/2016	30	118	30	0	24	6	80.0%	20.0%
71/27	GN	3C	Hogan island	27/06/2016	42	117	41	1	28	13	68.3%	31.7%
72/28	GN	3C	Hogan island	04/07/2016	11	128	11	0	7	4	63.6%	36.4%
72/28	SN	3B	Boston Rocks	04/07/2016	28	127	28	0	17	11	60.7%	39.3%
73/29	SN	3B	Boston Rocks	11/07/2016	26	138	25	1	19	6	76.0%	24.0%
73/29	SN	3B	Tracy Bay	11/07/2016	43	140	40	3	32	8	80.0%	20.0%
73/29	SN	3C	Elliot Point	11/07/2016	19	139	17	2	12	5	70.6%	29.4%
73/29	SN	3B	Boston Rocks	15/07/2016	96	129	96	0	76	20	79.2%	20.8%
73/29	SN	3B	Boston Rocks	15/07/2016	21	130	20	1	15	5	75.0%	25.0%
73/29	SN	3B	Tracy Bay	15/07/2016	52	131	51	1	30	21	58.8%	41.2%
73/29	SN	3C	Elliot Point	15/07/2016	11	132	11	0	5	6	45.5%	54.5%
74/30	SN	3B	Boston Rocks	19/07/2016	73	133	73	0	50	23	68.5%	31.5%
74/30	SN	3B	Tracy Bay	19/07/2016	96	134	94	2	58	36	61.7%	38.3%
74/30	SN	3B	Tracy Bay	19/07/2016	47	135	46	1	28	18	60.9%	39.1%
74/30	SN	3C	Hogan island	18/07/2016	69	136	68	1	37	31	54.4%	45.6%
74/30	SN	3C	Emma Pass	18/07/2016	63	423	63	0	43	20	68.3%	31.7%
74/30	SN	3C	Steamers Pass	18/07/2016	49	422	48	1	26	22	54.2%	45.8%
74/30	SN	3D	Pirate Point	23/07/2016	1	424	1	0	0	1	0.0%	100.0%
75/31	SN	3C	Emma Pass	24/07/2016	10	417	10	0	6	4	60.0%	40.0%
75/31	SN	3C	Steamers Pass	24/07/2016	12	418	11	1	7	4	63.6%	36.4%
75/31	SN	3C	Elliot Point	24/07/2016	11	419	11	0	8	3	72.7%	27.3%
75/31	SN	3B	Tracy Bay	24/07/2016	44	420	44	0	33	11	75.0%	25.0%
75/31	SN	3B	Boston Rocks	24/07/2016	17	421	17	0	11	6	64.7%	35.3%
75/31	SN	3D	Cedar	24/07/2016	1	424	1	0	0	1	0.0%	100.0%
81/32	SN	3D	North Somerville	05/08/2016	2	424	2	0	0	2	0.0%	100.0%
Total Chum sampled					1208		1190	18	838	352	70.4%	29.6%
							98.5%	1.5%	70.4%	29.6%		

Attachment. 2016 Chum samples by location, gear type and date as a excel file.

FIGURES

Figure 1. Location of Area 3 in northern British Columbia.

