



Possibilities for Chinook Mark- Selective Fisheries

Sport Fishing Institute
Conference 2020 – Webinar
Series

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November 13, 2020

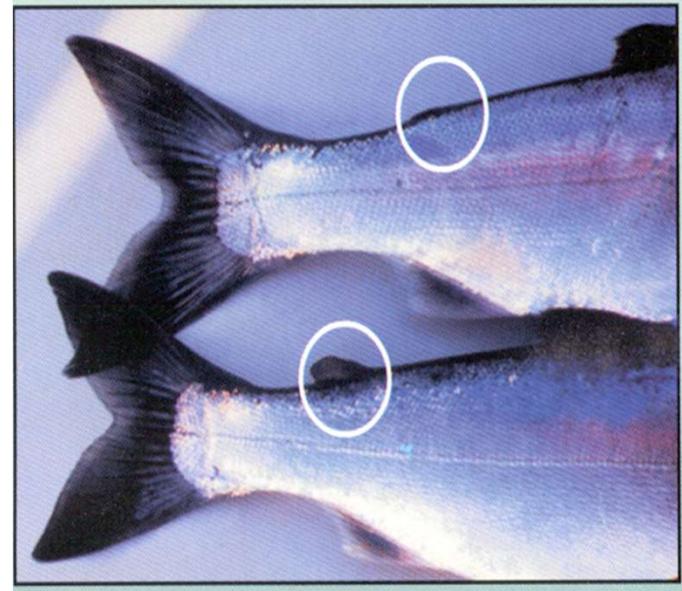


Purpose

- To provide an update on internal DFO work related to Chinook mark selective fisheries opportunities in B.C. in the short-term

Definitions

- **Mass marking (MM)** – the application of an adipose-fin-clip (AFC) to all or a high proportion of hatchery fish that do not carry a coded-wire tag (CWT).
- **Mark-Selective Fishery (MSF)** - any fishery in which retention possibilities for marked hatchery fish are greater than for unmarked wild fish.



Context

- Most southern BC Chinook populations have been/will be assessed as at risk by COSEWIC requiring SARA listing process.
- Implementation of the new Fish Stock Provisions under the new *Fisheries Act* underway; some Chinook stocks will be prescribed
- Need to limit fishery exploitation on Fraser stocks of concern - measures to protect stocks in 2018-2020; increase SRKW prey availability
- Active work underway to identify opportunities for MSF based on current information on benefits/risks and challenges with implementation

Potential Benefits of MSF

- Maintain or increase opportunities to harvest marked hatchery production while reducing exploitation rates on unmarked wild fish
 - Increasing spawning escapements
- May support Chinook stock rebuilding in select locations
 - Strong policy (WSP) and legislative framework (SARA, Fish Stock Provisions)
 - US Hatchery Reform group approach
 - Proportion Natural Influence goals

Risks

- Fishery impacts on Fraser River Chinook stocks
 - Need for area-time closures
 - Increased mortality through time because fishing activity and opportunity has grown – requires additional measures
- Implementation of MSF may not be feasible everywhere
- Mark rate \gg incidental mortality (e.g., release mortality). Encounters of hatchery fish are greater than released catch that dies as a result of being caught

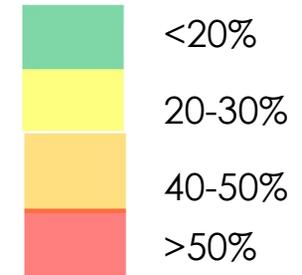
Feasibility of MSF

Two criteria:

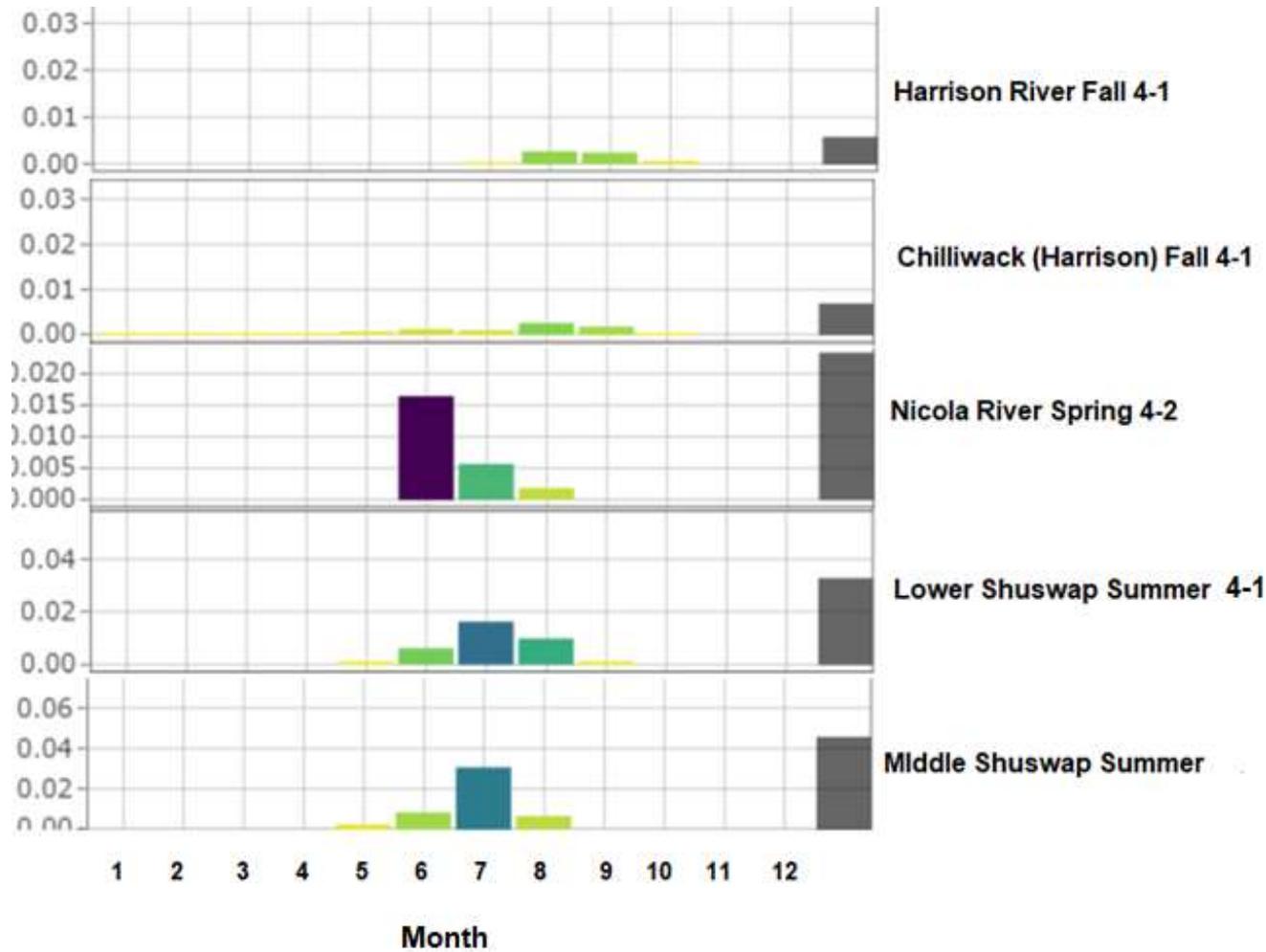
1. Observed mark rate $\geq 50\%$ (WA – 40-60%)
2. Minimize fishery impacts on stocks of concern (Fraser Chinook)
 - Expected reduction in exploitation of co-migrating Fraser stocks (work underway to estimate)
 - Avoid areas-times in which co-migrating Fraser stocks are found
- Consultation not considered, but outcomes will influence implementation decisions

Current Mark Rates

		Initial Mark Rate - Calculated from Creel Survey Data										
		Averages by month and PFMA for 2015 to 2018										
		PFMA	2	3	4	5	6	7	8	9	10	AvgOfMark Rate
Johnstone Strait	PFMA 11						5.4%	5.4%	4.8%			5.2%
	PFMA 111						5.1%					5.1%
	PFMA 12					11.4%	13.1%	9.5%	7.7%	5.0%		9.9%
Northern Strait of Georgia	PFMA 13	15.5%	0.0%			8.8%	12.0%	9.0%	6.0%	10.3%	44.7%	10.6%
	PFMA 14	30.0%	7.1%			13.4%	12.2%	20.3%	14.0%	13.2%	41.9%	16.1%
	PFMA 15					4.7%	9.3%	8.4%	8.5%	38.9%		9.9%
	PFMA 16					15.6%	22.0%	21.0%	29.7%	23.1%		21.9%
Southern Strait of Georgia	PFMA 17		61.5%			25.3%	22.0%	38.0%	25.8%	20.2%		28.3%
	PFMA 18		58.3%			35.3%	65.1%	58.7%	44.1%	48.9%		50.9%
	PFMA 28		47.8%			19.4%	25.7%	29.2%	4.9%	19.0%		23.7%
	PFMA 29		62.9%			23.9%	19.0%	37.2%	7.9%	15.5%		22.3%
Juan de Fuca Strait	PFMA 19	75.9%	68.5%	81.2%	62.1%	60.0%	52.2%	20.7%	19.1%	79.0%		55.2%
	PFMA 20	77.4%	83.9%	66.4%	70.5%	40.1%	37.0%	19.7%	31.8%	62.0%		52.7%
Southwest Vancouver Island inshore	PFMA 21					64.7%	58.3%	41.2%	21.0%	3.1%		38.6%
	PFMA 23					62.0%	37.8%	31.0%	10.7%	5.5%		27.7%
	PFMA 24					49.2%	44.5%	42.1%	19.7%	22.8%		34.1%
Northwest Vancouver Island Inshore	PFMA 25					29.8%	36.1%	6.3%	3.0%	41.3%		21.1%
	PFMA 26					26.3%	11.2%	7.8%	8.2%			10.4%
	PFMA 27					32.6%	15.2%	11.0%	8.9%	3.0%		12.6%
Offshore - West Coast Vancouver Island	PFMA 121					77.8%	55.9%	56.4%	54.1%	16.7%		51.8%
	PFMA 123					52.8%	50.1%	44.1%	32.8%	11.9%		37.6%
	PFMA 124					47.7%	46.4%	43.3%	43.0%	43.1%		44.5%
	PFMA 125					12.5%	36.8%	20.3%	18.5%			23.2%
	PFMA 126						18.1%	16.2%	16.3%			16.9%
	PFMA 127						19.0%	12.9%	9.4%			13.8%

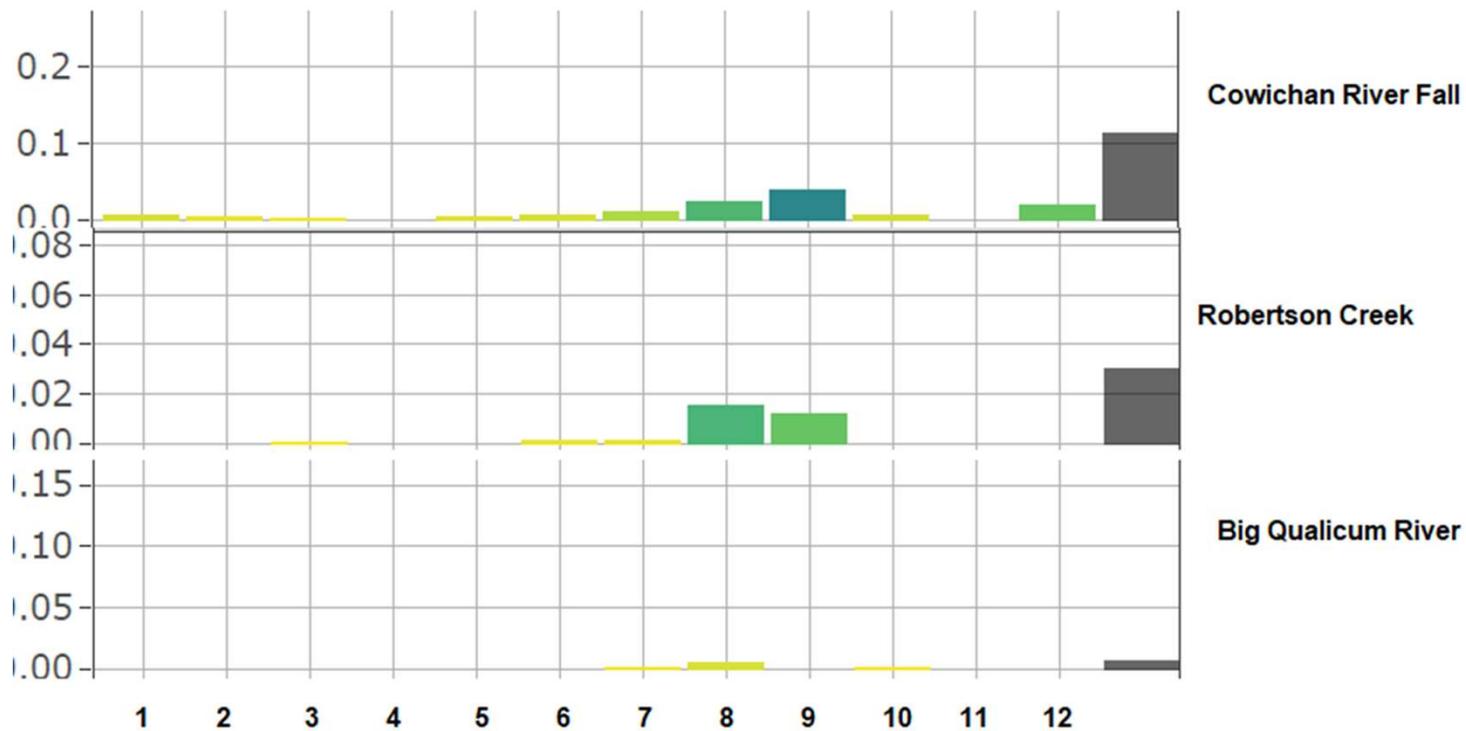


Fishery Data: Juan de Fuca Strait Example



Average (2009-2017) calendar-year exploitation rates (CYER) of Fraser Chinook stocks in Juan de Fuca Strait sport fishery

Fishery Data: Juan de Fuca Strait Example



- Average (2009-2017) calendar-year exploitation rates (CYER) of other Chinook stocks in Juan de Fuca Strait sport fishery

Can We Increase Mark Rates?

- Estimated mark rate expanded to represent total hatchery production
- Some additional areas/times have mark rates $\geq 50\%$
- Time-area closures and other measures need to be applied to protect Fraser Chinook
- Work underway to look at impact of strategic mass marking (e.g., WCVI)

		Adjusted Mark Rate - Expanded for Total Hatchery Production										
		If all hatchery production was marked. Averages by month and PFMA for 2015 to 2018										
	PFMA	2	3	4	5	6	7	8	9	10	11	12
Johnstone Strait	PFMA 11					30.3%	25.5%	39.6%				31.8%
	PFMA 111					99.9%						99.9%
	PFMA 12				37.6%	44.3%	36.6%	39.2%	86.5%			42.8%
Northern Strait of Georgia	PFMA 13	41.9%	0.0%		40.3%	39.2%	26.7%	19.8%	39.8%	87.8%		34.5%
	PFMA 14	36.7%	7.1%		33.5%	28.7%	55.0%	63.8%	39.8%	41.9%		42.1%
	PFMA 15				14.9%	38.2%	34.1%	18.8%	99.9%			31.8%
	PFMA 16				26.9%	37.8%	37.6%	52.1%	77.3%			44.7%
Southern Strait of Georgia	PFMA 17		61.5%		48.6%	53.5%	73.5%	65.3%	53.2%			59.2%
	PFMA 18		58.3%		35.3%	65.1%	66.9%	44.7%	53.6%			53.7%
	PFMA 28		47.8%		54.5%	40.5%	45.0%	4.9%	99.9%			48.5%
	PFMA 29		70.1%		49.5%	28.1%	64.5%	12.9%	26.9%			37.2%
Juan de Fuca Strait	PFMA 19	75.9%	69.3%	81.2%	64.9%	60.0%	60.6%	37.7%	54.9%	79.0%		63.3%
	PFMA 20	77.4%	87.6%	66.4%	82.8%	51.7%	51.6%	48.8%	94.8%	69.6%		69.7%
Southwest Vancouver Island inshore	PFMA 21				64.7%	58.6%	57.8%	46.9%	3.1%			49.3%
	PFMA 23				63.9%	45.9%	64.0%	93.1%	78.9%			69.4%
	PFMA 24				49.2%	49.0%	52.1%	34.1%	40.4%			44.5%
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Offshore - West Coast Vancouver Island	PFMA 121				77.8%	58.7%	58.1%	57.2%	16.7%			53.8%
	PFMA 123				56.0%	71.2%	58.0%	73.5%	97.1%			71.9%
	PFMA 124				47.7%	46.4%	56.2%	71.2%	70.4%			58.9%
	PFMA 125				12.5%	55.1%	54.0%	60.1%				52.9%
	PFMA 126					27.4%	32.6%	39.2%				33.1%
	PFMA 127					57.2%	68.8%	80.3%				68.8%

Potential for MSF

- Based on an analysis of current mark-rates and other fishery data, there are potential areas where MSF **opportunities could be implemented** without additional marking of Canadian hatchery Chinook.
- These areas include:
 - SOG south of Nanaimo
 - additional work to understand location; Harrison & Chilliwack fish present
 - Juan de Fuca Strait in winter-early spring
 - US stocks present; ER caps on these stocks;
 - Relatively small impact on CDN stocks; Nicola and Harrison
 - Inshore southwest Vancouver Island
 - Overwintering US fish in spring
 - Robertson Creek CWT Indicator stock

Sampling and Monitoring

- If these areas were open to MSF opportunities, then sampling and monitoring programs would need to be expanded to account for the wild release component in double-index tagging:
 - Creel survey interviews
 - Dockside monitoring to recover CWTs, otolith for aging, etc.
 - Test fishing to establish stock composition, size, mark rate
- Expansion would be based on risk evaluation (i.e., identification of areas and period of most concern due to high releases, uncertainty, etc.)
- Requires resources (budget, people) and time to implement

Limited Potential for MSF

- Based on current information, there are areas where the **opportunity** for MSF implementation is limited in the short-term.
- These areas include:
 - Northern Strait of Georgia
 - Johnstone Strait
 - Inshore northwest Vancouver Island (except 25)
- Other fishery management measures including retention limits, size limits or combinations could be explored for potential to provide fishery opportunities

Mass Marking and Mark Selective Fisheries

Management Option	Hatchery Production	Mass Marking Strategy	Fishery Benefit	Conservation Benefit
Option 1. Status Quo – no mass marking and limited MSF				
1a. Status Quo.	Maintain current CN production levels	No mass marking (i.e. AFC Indicator stock CWT fish only)	Status Quo. Limited MSF opportunities. Highly restricted fisheries to limit ER on stocks of concern.	PNI not managed, hatchery spawning and straying impacting genetics
1b. Status Quo with limited MSF opportunities	Maintain current CN production levels	No mass marking (i.e. AFC Indicator stock CWT fish only)	MSF – selectively harvest hatchery fish (where, when mark rate permits). Some additional opportunity in around southern Vancouver Island, with marginal reduction in ER. Significant restrictions still likely.	PNI not managed, hatchery spawning and straying impacting genetics
Option 2. Move forward with mass marking and MSF				
2a. Targeted mark enhancement	Maintain current CN production levels	Tactical mass marking of stocks to increase mark rates in key areas	MSF in key areas – selectively harvest hatchery fish (where, when mark rate permits).	Improved PNI and wild genetic diversity in some systems with mass marking
2b. Current Production and Mass Marking	Maintain current CN production levels	Mass mark all harvest production	MSF more broadly implemented – selectively harvest hatchery fish (where, when mark rate permits).	Improved PNI and wild genetic diversity in broad areas
2c. Expanded Production and Mass Marking	Increase CN production levels	Mass mark all harvest production	Higher catch than 2b and limited ER on stocks of concern. MSF – selectively harvest hatchery fish (where, when mark rate permits)	Improved PNI and wild genetic diversity in broad areas
Option 3. Reduce Hatchery Production				
3. Reduce Hatchery Production	Reduce CN production levels	No mass marking (i.e. AFC Indicator stock CWT fish only)	Decrease catch and increase restrictions throughout to limit ER. Limited MSF in times/areas where US fish most prevalent.	Improved PNI and wild genetic diversity

MSF Implementation Challenge - CWT Indicator Stocks

- We need to assess fishery impacts on wild fish. We do this with hatchery coded-wire tag (CWT) indicator stocks; these fish are injected with a CWT in the snout and are marked to indicate they have a tag
- CWT indicator stocks are representative of a broader group of wild stocks because they exhibit similar life history and migration patterns and are therefore exposed to the same fisheries as the wild fish they represent.
- By design, MSF will increase the exploitation rate on hatchery coded-wire tag indicator stocks so they are no longer representative of wild fish.
- We still need to assess fishery impacts on wild fish
 - Double-index tagging (DIT)
 - Parentage-based tagging (PBT) and enhanced sampling for GSI (long-term approach)

MSF Implementation Challenge

- Released fish – do not have good information on what is released (stock composition, size) nor mortality
- fishery-related incidental mortality - FRIM
 - Both short-term and long-term components
 - Have some estimates of short-term mortality (e.g., release mortality) that are at least 30 years old
- Will need to partner with angler groups to collect data and evaluate

Next Steps

- Internal work is underway to develop a framework describing technical feasibility (benefits, risks, implementation challenges, key gaps, mitigation)
- Analysis
 - Expected reductions in exploitation rate on wild stocks
 - Analysis of the impact of MSF on Fraser stocks after several years of non-retention
 - Model effect of increased marking of US fish on observed mark rates
- Options for discussion during upcoming IFMP process

Concluding Remarks

- No one size fits all approach for MSF
- There are potential areas where MSF opportunities could be implemented without additional marking of Canadian hatchery Chinook(targeted MSF; e.g., around southern Vancouver Island)
- Targeted mass marking may be desirable in some areas to provide additional harvest opportunities (e.g., WCVI)
- Analysis is underway to support discussion on options during IFMP consultation
- If MSF are implemented, then we need to expand existing sampling and monitoring programs to ensure that wild stocks can be assessed
- Partner with angler groups to improve angler reporting and fishery-related incidental mortality estimates

QUESTIONS?