Science and Salmon Education Outreach Series (CC-04-12), Final Report to the Yukon River Panel

by

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Alaska Department of Fish and Game **Divisions of Sport Fish and Commercial Fisheries**

Symbols and Abbreviations

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Weights and measures (metric)	
centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)	
cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature	
day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry	
all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General	
Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Mathematics, statistics	
all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	*e*
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	*E*
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	log_2, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

SCIENCE AND SALMON EDUCATION OUTREACH SERIES

FINAL REPORT TO THE YUKON RIVER PANEL

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ABSTRACT

Creating a more knowledgeable public enables and engages stakeholders in discussions about environmental and resource issues. However, there is a challenge in communicating often complex scientific topics to community members with little science background in an accessible and easily understood way. This project sought to develop a science education outreach program for K-12 groups in the Alaska portion of the Yukon River. This workshop built on a previous workshop to Yukon River fishermen, covering factors that impact different life history stages of Pacific salmon. Due to time constraints and a changeover in staff (departure of the lead PI), the workshop was presented only once at a Palmer homeschool program facilitated through Alaska Pacific University. The participants ranged from age 8 through 12 and were very engaged in the workshop discussion. Students were quite knowledgeable of salmon issues in Alaska, including factors that impact the various life cycle stages of salmon. The success of the workshop was likely a result of the small classroom size (8 students) and the quality of education the students were receiving through this homeschool coop program. Future efforts have been suspended until staff positions are filled again and will include travel to more schools throughout the Alaska portion of the Yukon River drainage.

Key words: Yukon River, Chinook salmon, salmon, education, outreach, salmon biology

INTRODUCTION

A more informed and engaged public can more effectively communicate with each other and managers to share ideas and concerns. Improving dialogue among diverse stakeholder groups empowers participants by increasing confidence and building a shared commitment to resource management and conservation. The Yukon River fishery spans two countries and thousands of miles of spawning and rearing habitat, supporting nearly 12,000 native and non-native Alaskans (Yukon River Salmon Agreement Handbook, 2005). While fishermen along the Yukon have a lot of local and traditional knowledge regarding Yukon salmon, knowledge about salmon during their marine or spawning life stages ranges widely. As a result, misconceptions about factors causing salmon population declines can hinder management objectives. This misinformation can create conflicting viewpoints among communities throughout the drainage and with federal and state management agencies. However, there is a challenge in communicating often complex scientific topics to community members with limited science background in an accessible and easily understood way.

The goal of this project was to expand of previous workshop efforts and to take the workshop in to the K-12 curriculum in schools on the Yukon River. Engaging and informing youth on these topics would help promote awareness among the future generation of Yukon fishermen.

OBJECTIVES

Specific objectives of the project included:

1) Develop two K-12 workshops to present lessons on salmon biology/life history in the a) marine environment and b) freshwater evironment.
2) Implement workshops at three Yukon River community K-12 schools.

METHODS

WORKSHOP DEVELOPMENT

In spring of 2012, we developed a workshop for Yukon River fisherman in consultation with staff, both within Commercial Fisheries Division and Subsistence Division, at Alaska Department of Fish and Game knowledgeable and experienced in Yukon River fisheries, resource-use issues in Alaska, and traditional knowledge. We took care to develop a workshop that was interactive to facilitate knowledge sharing among participants and workshop leaders. With declines in Yukon River salmon runs, specifically Chinook salmon, we wanted to provide a forum for sharing relevant scientific and traditional knowledge to form hypotheses that might explain the declines. Typically, stakeholder discussions regarding declining salmon populations have focused primarily on bycatch from the pollock fishery and quality of escapement as contributing factors. We developed a workshop that would explore a wide range of potential factors across all life history stages of salmon to highlight the complexity of the issue and help stakeholders understand the difficult task managers face in rehabilitating the population.

In the fall of 2012, we retooled the workshop on life history stages of salmon and declining Chinook salmon populations for a K-12 curriculum.

WORKSHOP DESCRIPTION AND IMPLEMENTATION

The workshop focused on five life history stages of Pacific salmon: eggs, fry, age 2, age 5 (adults about to return), and spawners (adults that actually make it to the spawning grounds). To illustrate rates of mortality at each life history stage, we used jars of M&M's that represented numbers of individuals at each stage (Figure 1). For example, the first jar of M&M's was full and represented about 4,000 eggs – typical of an average-sized female; while the final spawner jar had just a sliver of an M&M to represent the single individual from those 4,000 eggs that makes it to the spawning grounds. Approximate rates of mortality for each life history stage were taken from Groot and Margolis (1991) and the final life history stage was modified to reflect current estimated production rates in the Yukon River (JTC, 2012). We also had a Pacific salmon life cycle poster available for students to take home.

We described what the jars of M&M's represented and framed the discussion in the context of "What is happening at each life history stage that is causing us to go from approximately 4,000 eggs to just one individual surviving to the spawning grounds?" To facilitate and record the discussion, we had large poster paper on the wall for each life history stage. We went through each life history stage individually and simply asked students to reflect and describe all potential factors that impact salmon at that stage, creating an exhaustive list that was recorded on the poster paper. This allowed students to see common factors across life history stages. After going through each stage, we highlighted those common factors, identified what were potentially the most important factors, and discussed which of them we have control. At the conclusion of the discussion, we emphasized the myriad of issues impacting salmon at all life history stages and stressed the complexity of the issue for scientists, managers, and fishermen alike.

The second component of the K-12 workshop involved breaking the students in to groups to represent a "working group" of diverse stakeholders tasked with managing Chinook salmon. The "working group" was made up of a subsistence fisherman, a commercial fisherman, a biologist, a fisheries manager, and a politician. The students were assigned one of these roles and provided a description of their interests and priorities in that role. In their "working group" each student (in their respective role) discussed how they would proceed with managing a low return of Chinook salmon. The "working group" was tasked with coming to an agreement on how the Chinook salmon run should be managed. Each "working group" presented their management proposal to the whole class. The objective of this activity was to get students to understand how different interests are balanced in managing the fishery; but in the end, coming to a decision that they could all support was important.

Unfortunately, due to schedule conflicts and staffing changes, the workshop was implemented only once at a Palmer home-school program through Alaska Pacific University.

RESULTS

Workshop Discussion

The workshop discussion created a comprehensive list of factors impacting salmon across life history stages. Students were very knowledgeable of the salmon life history and were very engaged in the activity. Common factors across life history stages included food, temperature, oxygen, habitat, and disease.

The "working group" discussion was an interesting exercise for the students. They struggled with wanting to play their role appropriately (as tasked), but also wanted to appease everyone in the group. In the end, the students were much more sympathetic to subsistence fishermen interests than other stakeholders' interests.

DISCUSSION

Workshop Performance

The workshop was an excellent opportunity to engage students in the complexities of fisheries management and understanding the problem of declining Chinook populations. Along the lines of our first objective, we modified the format of the workshop to look at the entire life history of salmon and included an additional component of how to manage a complex fishery. We found the life cycle format to be productive with our adult Yukon River stakeholders and therefore continued with that format in the K-12 curriculum. The M&M jar demonstration and ensuing discussion format transferred easily over to the K-12 curriculum. Adding the second component of the "working group" provided insight to students on who is all involved in the fishery and how it is difficult to come to an agreement among diverse stakeholders. While we originally intended to teach up to two topics at three different schools, we believe the modified workshop structure was successful at exploring a wide range of topics (*Objective 2*). Future workshops at Yukon River community schools may require more explicit facilitation, but may also reveal some interesting insights in to students' traditional knowledge and ideas on how fisheries are managed. Scheduling conflicts and staffing changes (departure of Leba from Fish and Game) restricted the number of meetings we were able to attend. Based on conversations with the students and the teacher, the workshop appears to have been successful at educating students about issues affecting salmon populations in the Yukon River.

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TABLES AND FIGURES

Figure 1. Workshop visual aid of life history stages for Pacific salmon