

A Study to Evaluate Sampling and Tagging Methods for Estimating Survival of Adult Chinook Salmon through the estuary and lower Columbia River

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Estimates of adult salmon survival from the mouth of the Columbia River upstream 234 km to Bonneville Dam have never been developed.

Contemporary smolt-to-adult return rates for upriver stocks are based on returns to Bonneville Dam. As such, any 'natural mortality' (e.g. any mortality not due to fishing) that might have occurred in the estuary or lower river gets attributed to the ocean phase of the salmonid life history.

Why is incorrectly assigning lower river mortality to the ocean such a big deal?

- mask important stressors that adults may encounter in the estuary and lower river
- underestimates the true benefits of conservation measures implemented at earlier life history stages
- may effect predictions of run size

What makes us think that lower river mortality may be significant?



Photos by Ben Sanford, NOAA NWFSC

Since Passage of the Marine Mammal Protection Act in 1972, the Columbia River pinniped population has increased steadily. As many as 7,000 pinnipeds now reside in the lower Columbia River for all or part of the year, including 3,000 California and Stellar sea lions and 4,000 harbor seals.

Efforts to document predation have been ongoing in the immediate vicinity of Bonneville Dam since 2002. However >90% of the pinniped population resides in the lower river and estuary



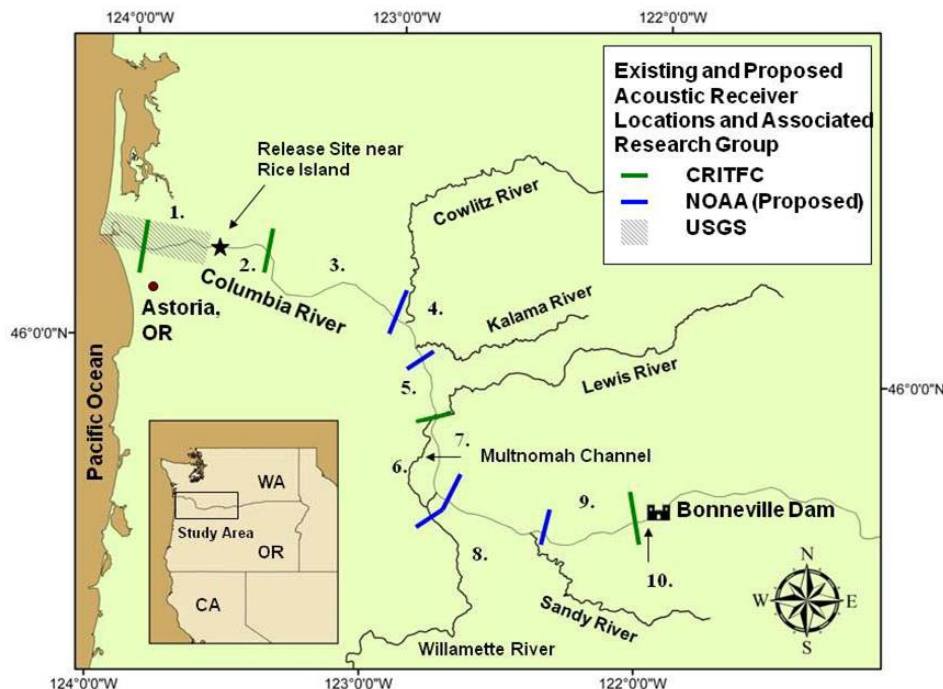
We utilized our best information (visual observations and bio-energetics) to estimate how much the population as a whole would potentially consume in a year, and this totaled **10-24%** of the adult spring/summer Chinook salmon return in 2008 (~**22,500-57,000 fish**).

Physical evidence of harbor seal attacks have also been on the rise since the early 1990's

- From 1990 to 1993, Harmon et al. (1994) reported tooth and claw abrasions from harbor seal attacks averaged **14.0-19.2%** on adult spring/summer Chinook salmon sampled at Lower Granite Dam.
- These reports of abrasions increased to **27.3** and **24.8%** during 2007 and 2008
- Of roughly 5,500 adult Chinook sampled in the spring of 2010, **29%** were reported as having abrasions (22% superficial, and 7% deeper flesh wounds)



Map of Study Area



Study Design: a two-tiered mark/recapture study, wherein a portion of returning adults will be implanted with passive integrated transponder (PIT) tags, and a second portion with both PIT tags and acoustic transmitters (AT).

Pilot Study Objectives:

- Establish protocols and equipment/boat/crew needs for handling and tagging significant numbers of fish (e.g., up to 100 fish per sampling day)
- Establish protocols for restraining fish to facilitate 'best practice' AT (both gastric and surgical methods) and PIT tagging
- Provide a cursory evaluation of the effects of tagging on adult fish
- Obtain estimates of PIT and AT tag retention for migrating fish over a period of 2 weeks or longer
- Obtain preliminary estimates of survival to Bonneville Dam for adult spring Chinook salmon to aid in sample size selection for expanded survival studies of this nature

Tagged in 2010

File_Date	PIT_Only	AT_surgery	AT_gastric	Total
4/14/2010	39	6	6	51
4/16/2010	46	6	6	58
4/20/2010	20	4	4	28
4/21/2010	10	3	3	16
4/22/2010	13	3	3	19
4/23/2010	21	3	3	27
4/24/2010	17	3	3	23
4/25/2010	5	3	3	11
4/28/2010	15	3	3	21
4/30/2010	35	4	4	43
5/10/2010	5	4	4	13
5/11/2010	7	3	3	13
5/18/2010	0	1	2	3
6/5/2010	0	4	3	7
Totals	233	50	50	333

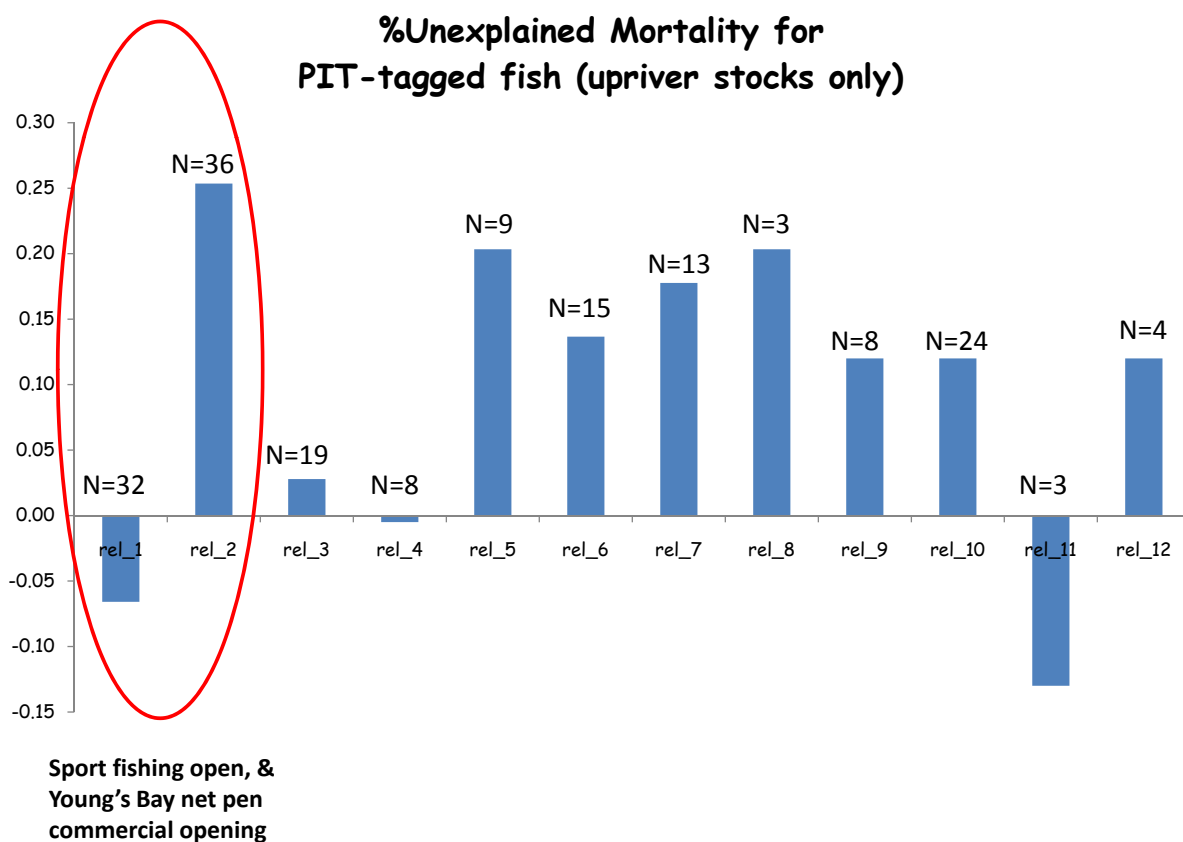
GSI determined that we had PIT-tagged **174** adult Chinook Salmon destined for tributaries above Bonneville Dam (MCR/UCR & SR)

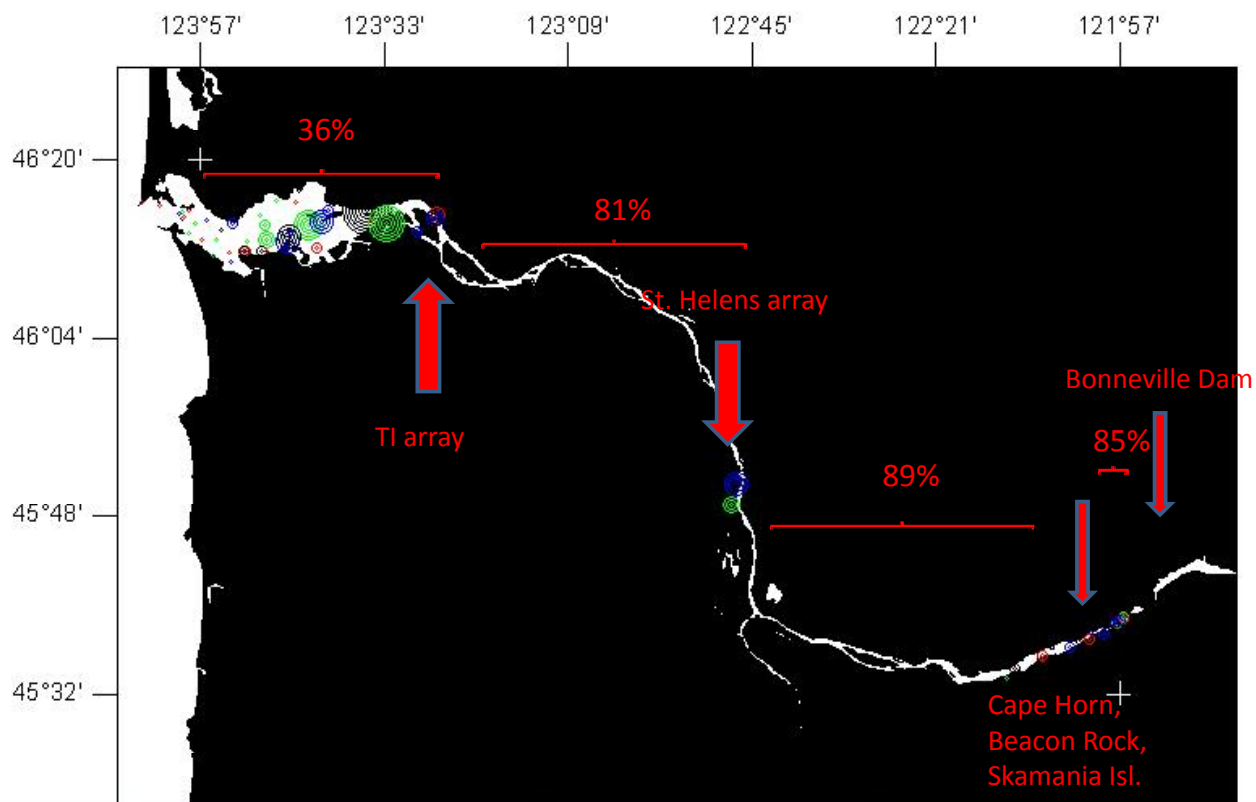
Survival to Bonneville for these fish was **74%** (56-100% per replicate).

The percent of 'unexplained' mortality for these fish was determined after accounting for:

- gear associated mortality (13% for all releases)
- mortality due to harvest (7% for releases 1 and 2)

'Unexplained mortality' was **10%** (-13 to +25% per replicate)





Immediate Goals:

- Repeat pilot work and tag more representative portion of the run over time
- Continue to validate/study acoustic tagging methods
 - utilize temperature sensitive transmitters
 - incorporate 'dummy' acoustic transmitters
- Captive stress study to validate handling methods

Future Goals:

- Expand the acoustic infrastructure
- Incorporate a gear comparison component
- Investigate lower river mortality in fall Chinook and Coho

