



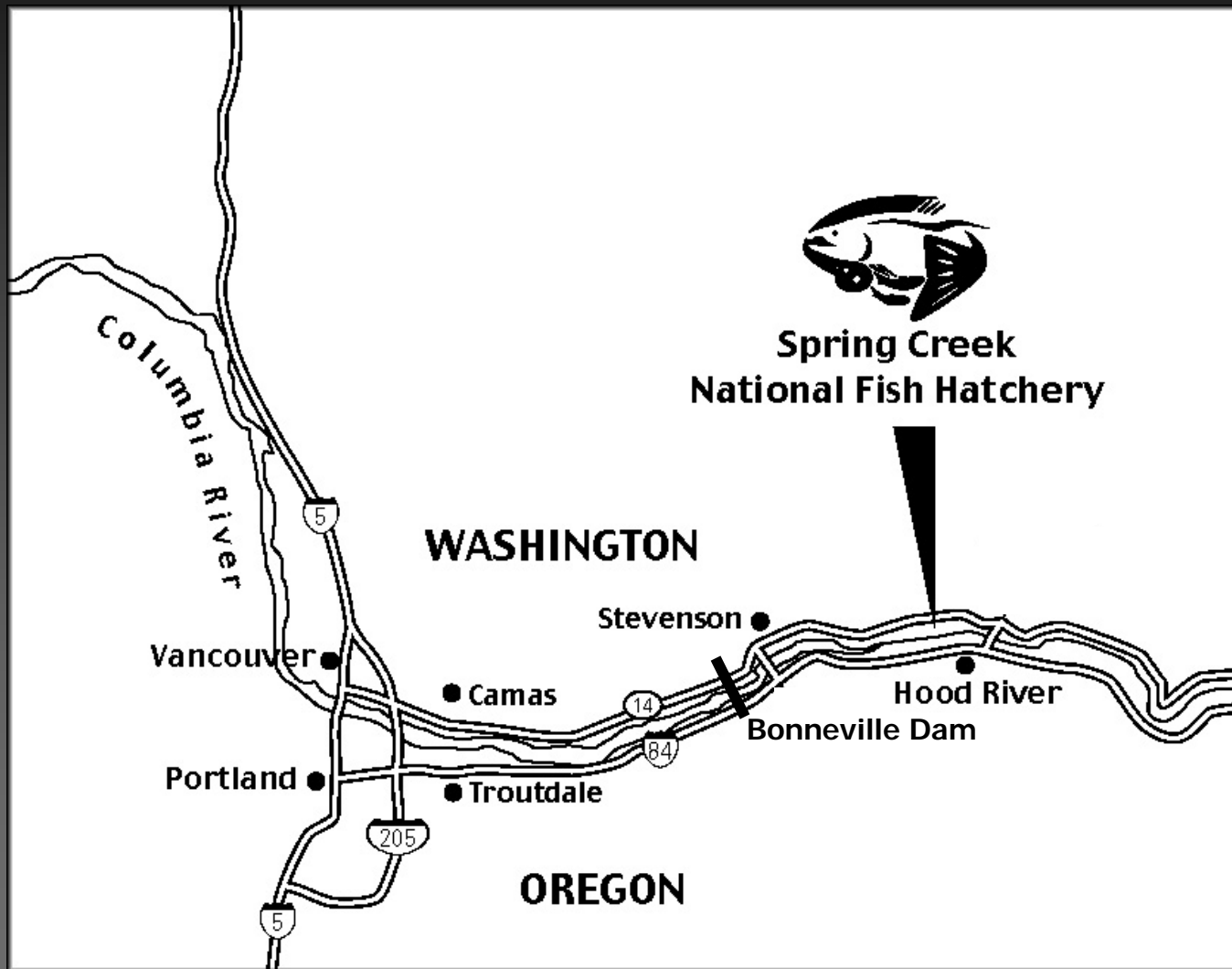
# Anti-Pathogenic Flowthrough Treatment with Iodophor in Large-Scale Salmon Egg Incubation



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*Spring Creek NFH*

# Introduction



# Introduction

Tule Fall Chinook

10.5 M sub-yearling smolts

John Day Lock and Dam Mitigation

Mitchell Act



# Introduction

Iodophor

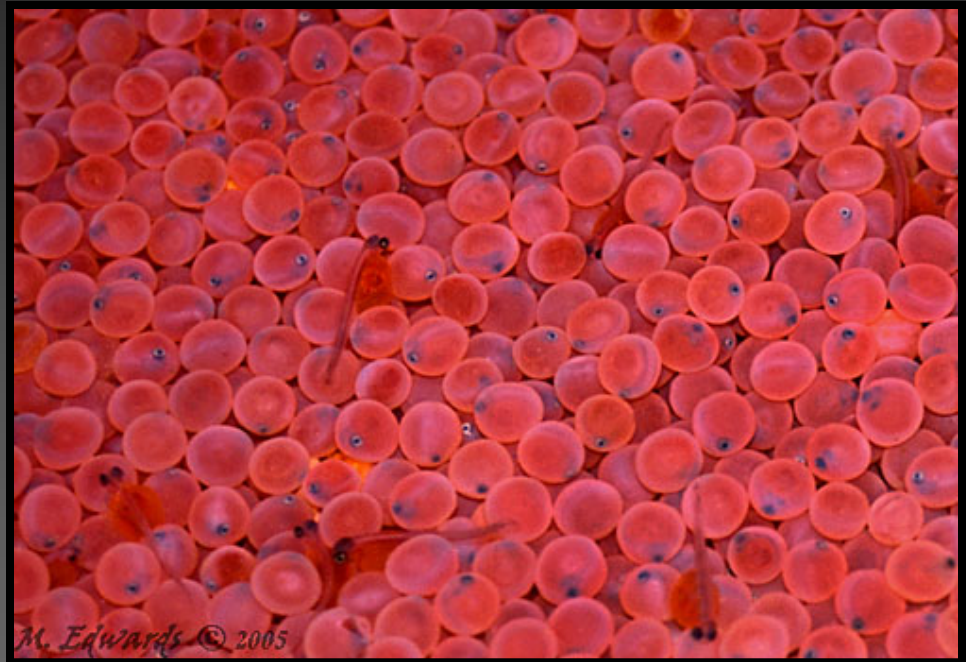
Water hardening

Prophylactic (3x per week)

Bacteria

Viruses

Fungus





# Introduction

## Iodophor

Since 1990

Valid anti-microbial treatment

Common in salmonid culture

“low regulatory priority” by EPA

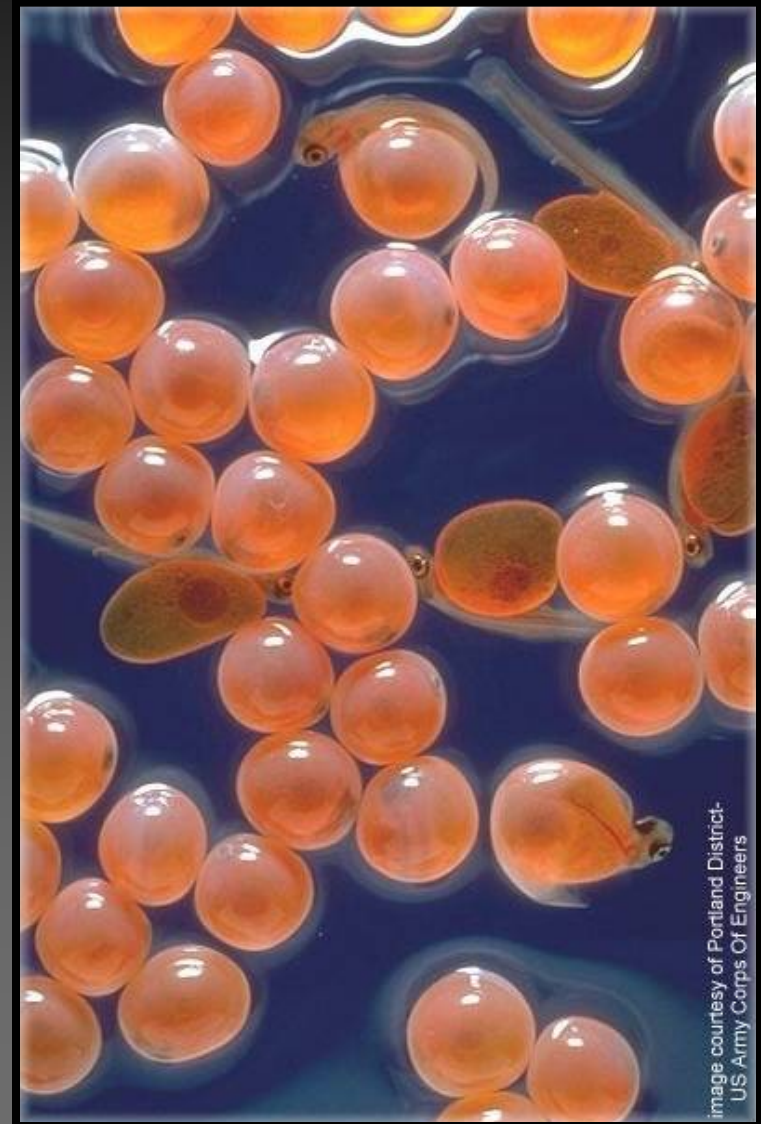


image courtesy of Portland District-  
US Army Corps Of Engineers

# Introduction

## Water sources

Spring (46°F)

Well (47-52°F)

Since 1991

Decrease incubation time

Sulfur content ( $H_2S$ )





# Introduction

Incubation Re-evaluation

Change in EPA guidelines

Sulfer

Anti-bacterial benefits

Adequate prophylactic/fungal treatment



# Objectives

Examine any measureable effect that may occur as a benefit of

Receiving incubation water with sulfur ( $\text{H}_2\text{S}$ )

Receiving prophylactic treatments with iodophor





# Methods

## Egg Collection

2008 & 2009

180 females

Control (spring + well + iodophor)

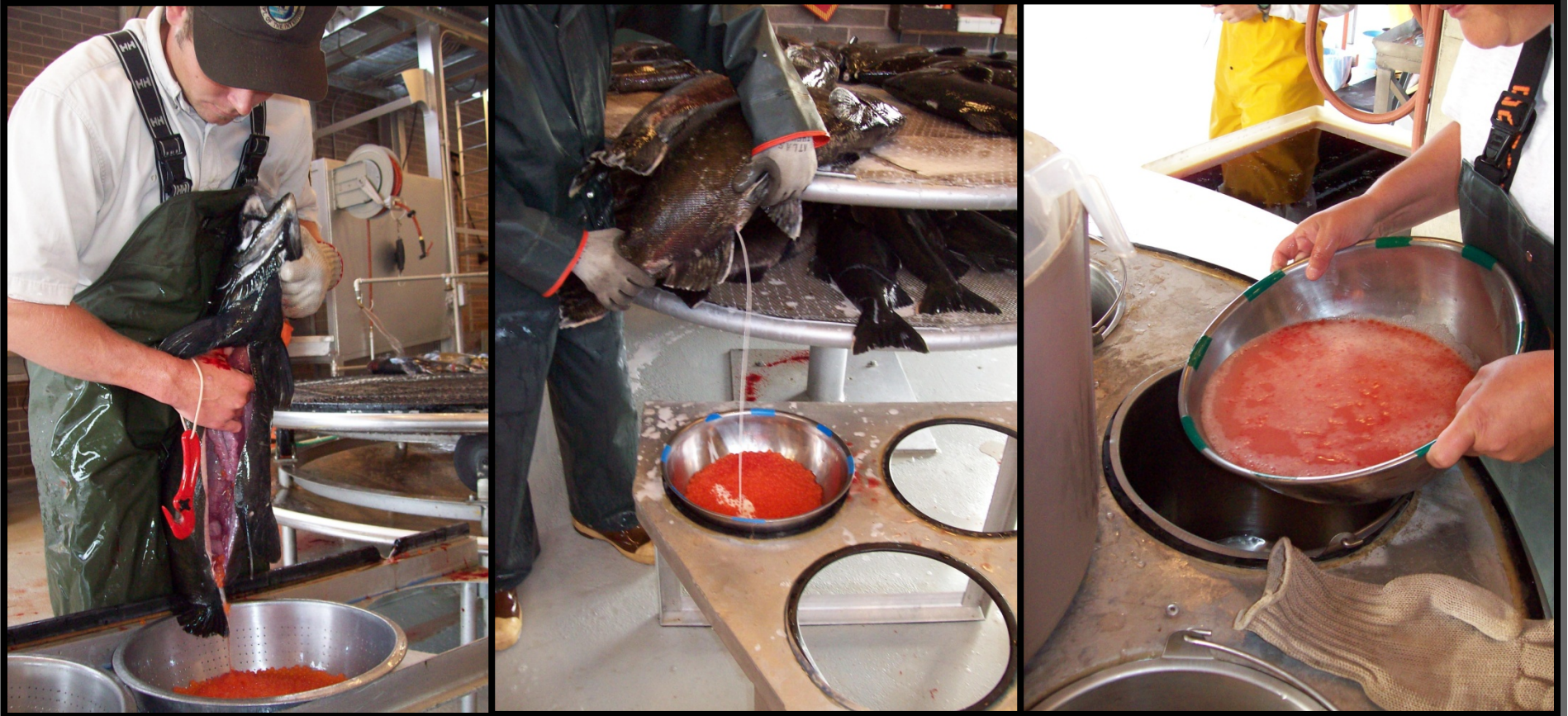
Treatment 1 (spring + iodophor)

Treatment 2 (spring + well)



# Methods

## Egg Collection...





# Methods

## Egg Collection...





# Methods

Egg Collection...





# Methods

Comparison between groups

2008

Survival to eye-up stage (%)

General observations

2009

Survival to eye-up stage (%)

Soft shell disease (ranking)

Bacterial and fungal culture

Water chemistry



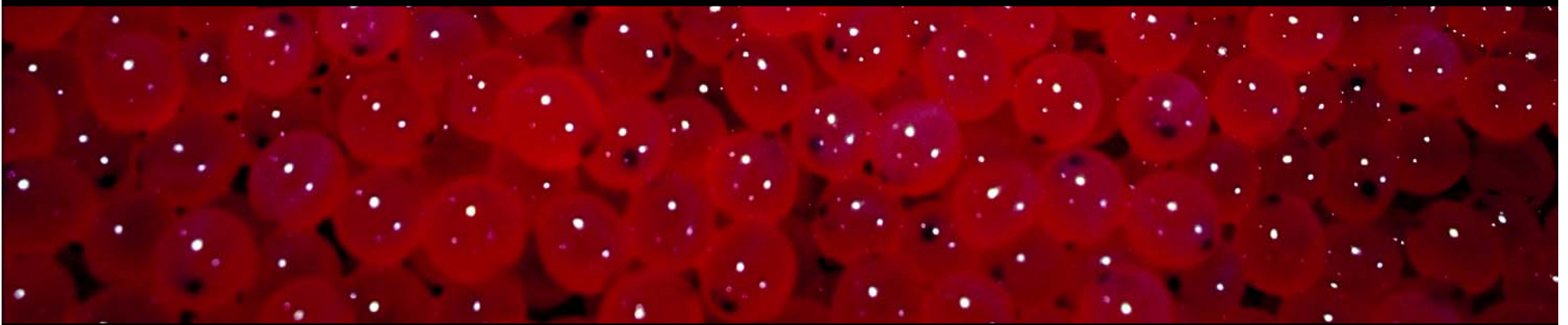
# Methods

## Soft shell disease

### Ranking system

- 1 – no soft shell disease observed
- 2 – Soft shell disease is present but its effects are low
- 3 – Soft shell disease is noticeably present
- 4 – Soft shell disease is present and causing additional loss
- 5 – Soft shell disease is present and causing significant loss

### Anecdotal data





# Methods

## Bacterial and Fungal Culture

Presence and prevalence

Trypticase soy agar (TSA)

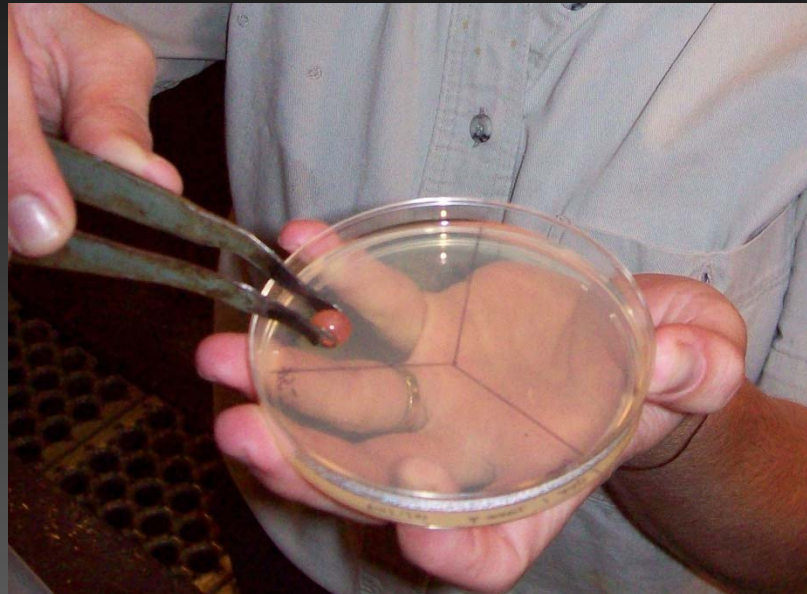
Tryptone yeast extract salts (TYES)

Before and after introduction of well



# Methods

## Bacterial and Fungal Culture...



# Methods

## Water Chemistry

Temperature (°F)

pH

Dissolved Oxygen

Ammonia ( $\text{NH}_4$ )

Nitrate ( $\text{NO}_3$ )

Nitrite ( $\text{NO}_2$ )

Hydrogen Sulfide ( $\text{H}_2\text{S}$ )





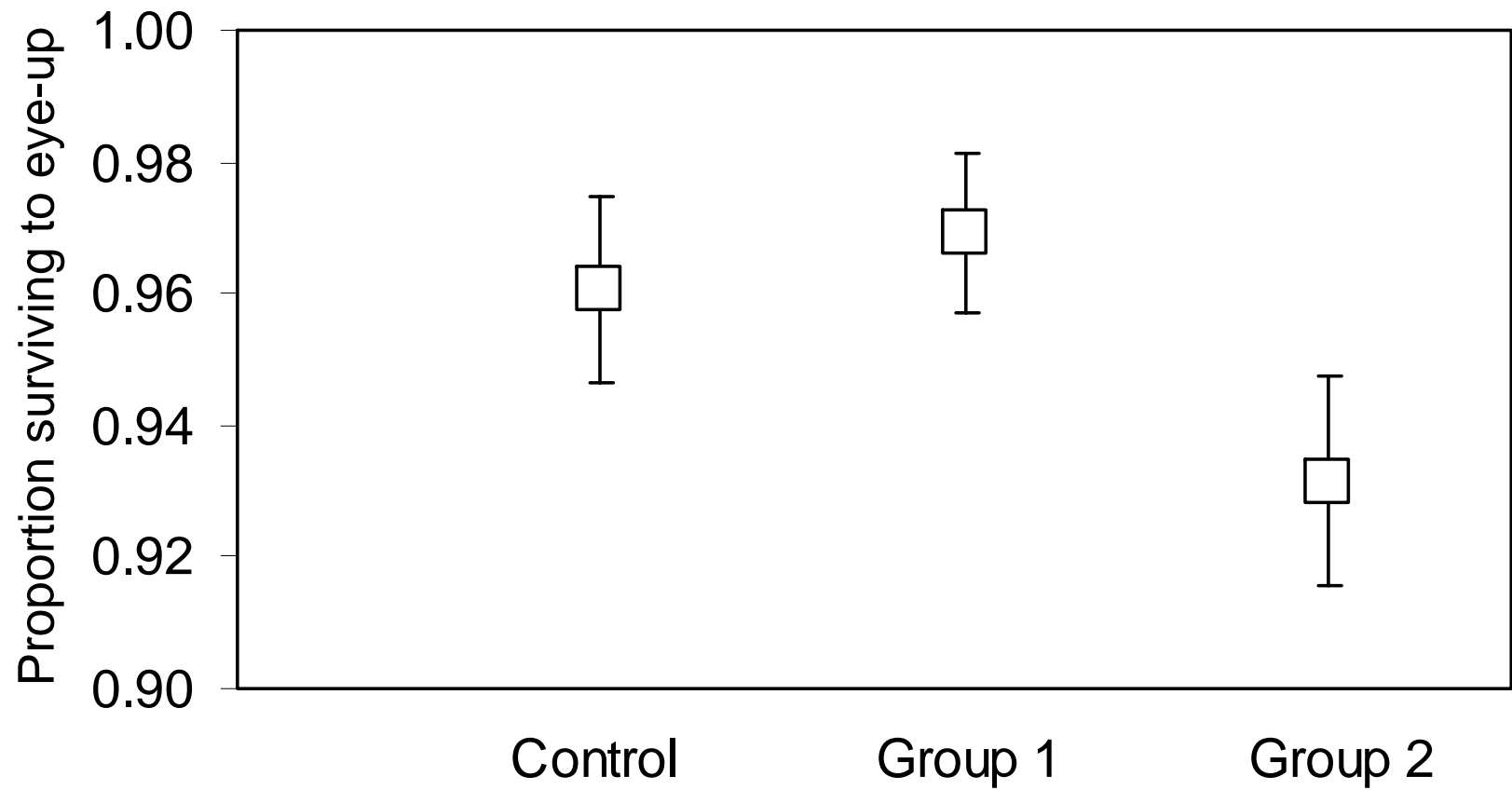
# Results

## Egg collection, loss, and survival rates

Year	Take	Control			Treatment Group 1			Treatment Group 2		
		Total Eggs	Salt Loss	Survival Rate	Total Eggs	Salt Loss	Survival Rate	Total Eggs	Salt Loss	Survival Rate
2008	3	99365	4675	0.95	97263	3213	0.97	95953	7057	0.93
	6	95072	2210	0.98	100108	1793	0.98	100833	5109	0.95
	10	105428	5086	0.95	98047	4086	0.96	102427	8344	0.92
	Total	299865	11971	0.96	295418	9092	0.97	299213	20510	0.93
2009	2	110134	3257	0.97	102167	6697	0.93*	105439	6942	0.93
	7	110175	5726	0.95	107367	5851	0.95	109664	9560	0.91
	11									
	Total	220309	8983	0.96	209534	12548	0.94	215103	16502	0.92

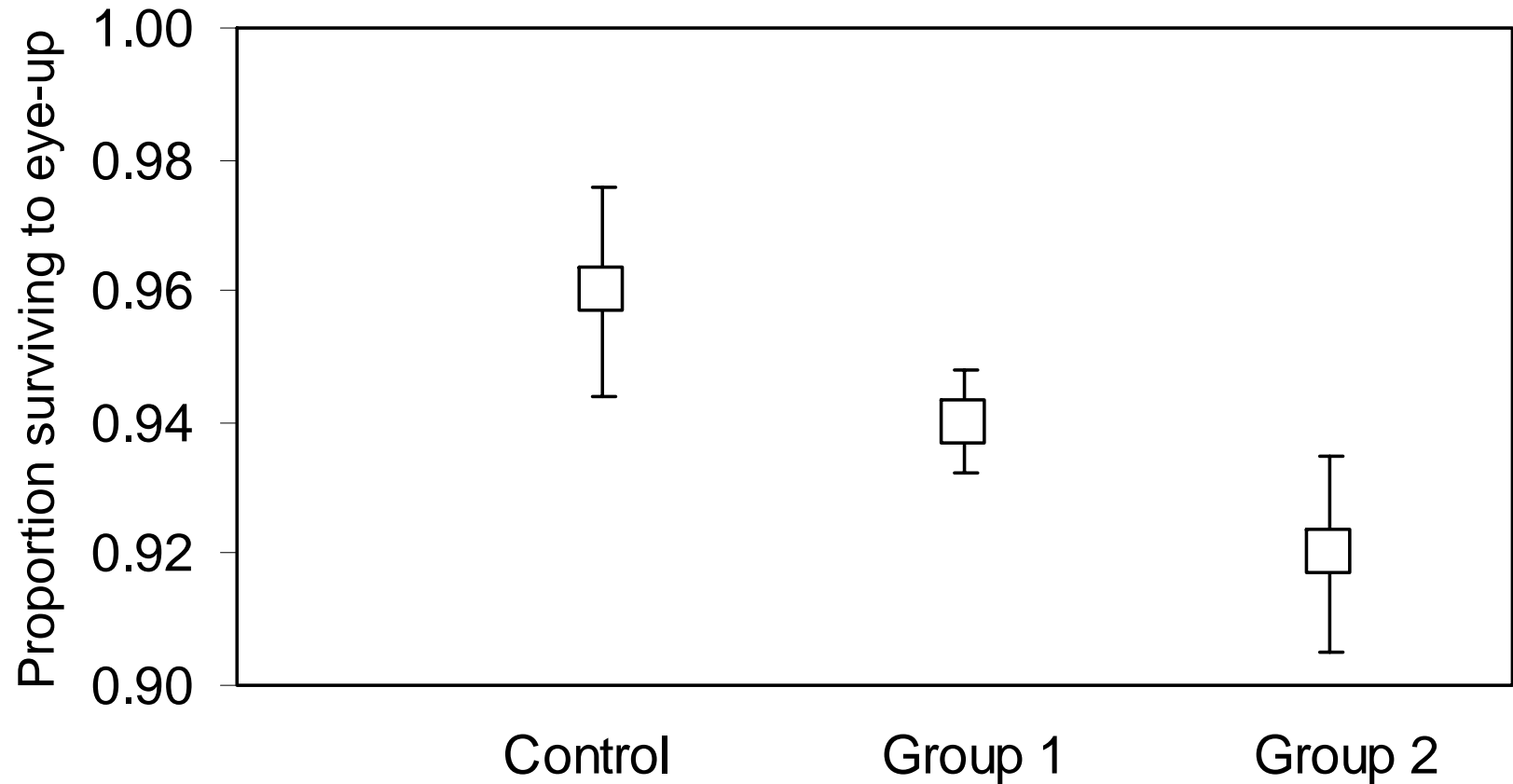
# Results

## Survival to eye-up



# Results

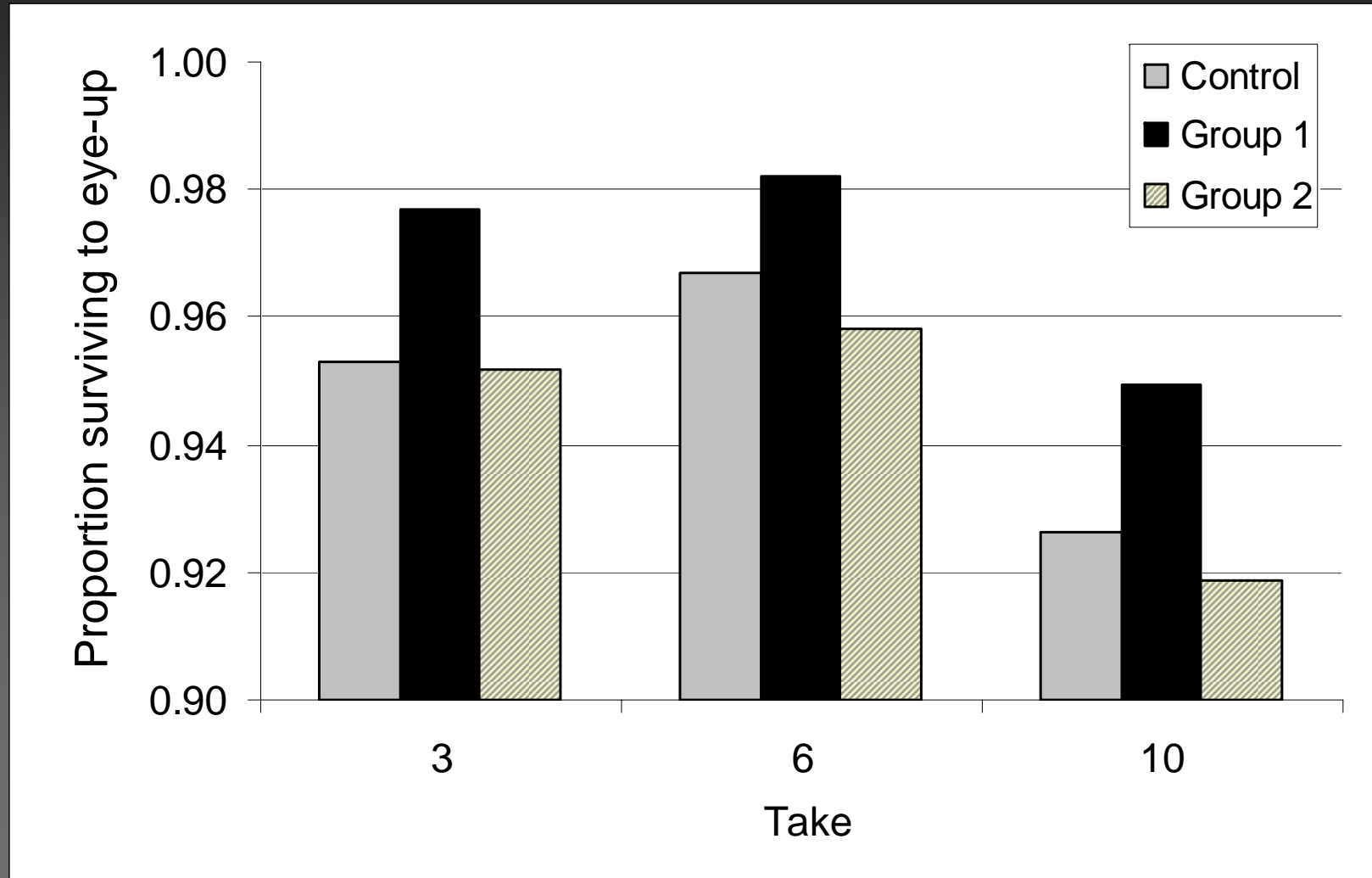
## Survival to eye-up





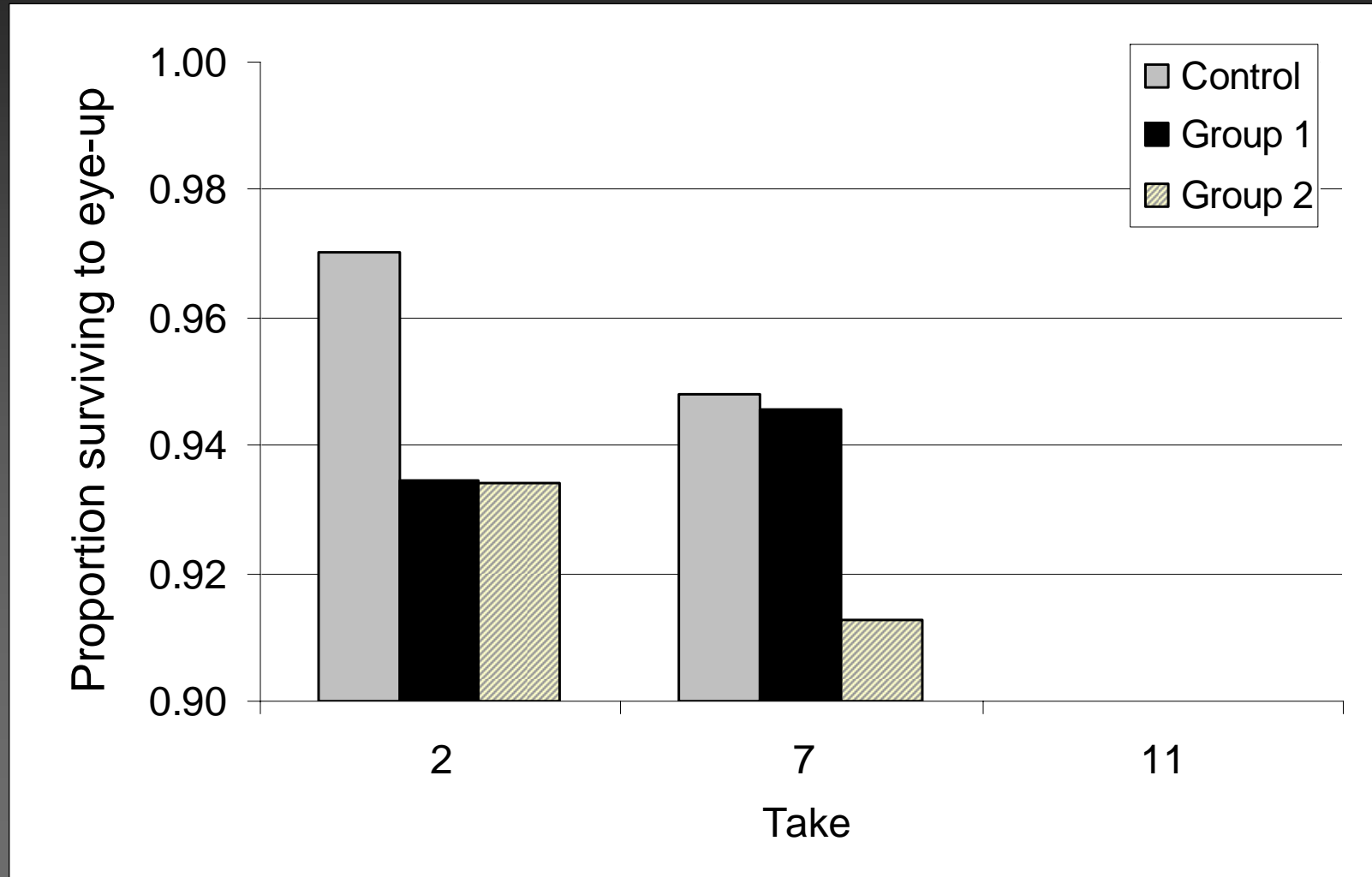
# Results

## Survival to eye-up



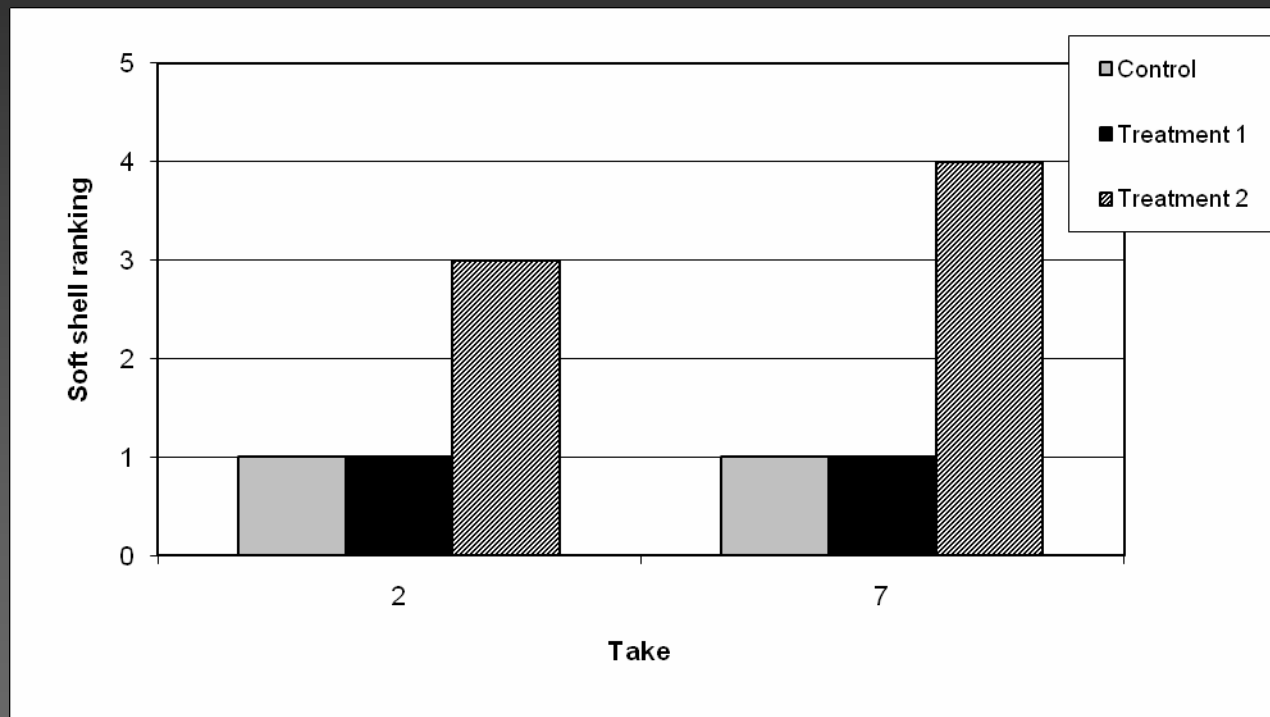
# Results

## Survival to eye-up



# Results

## Soft shell disease



# Results

## Soft shell disease



# Results

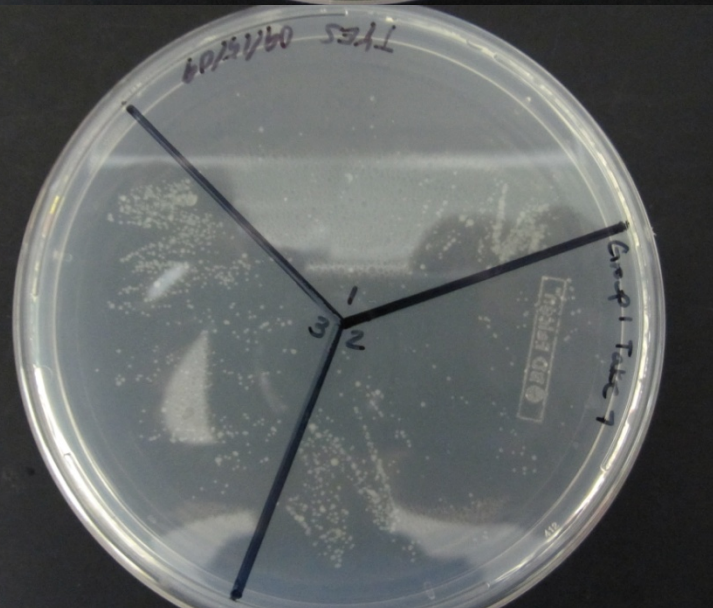
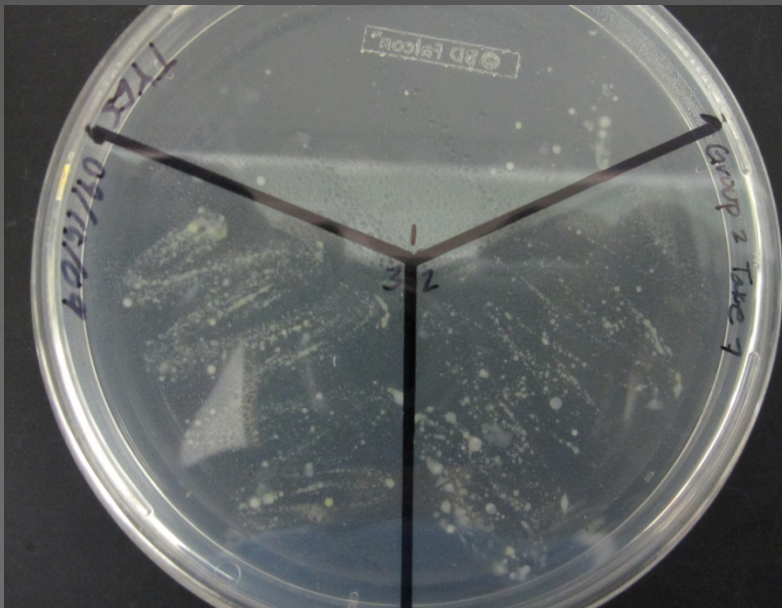
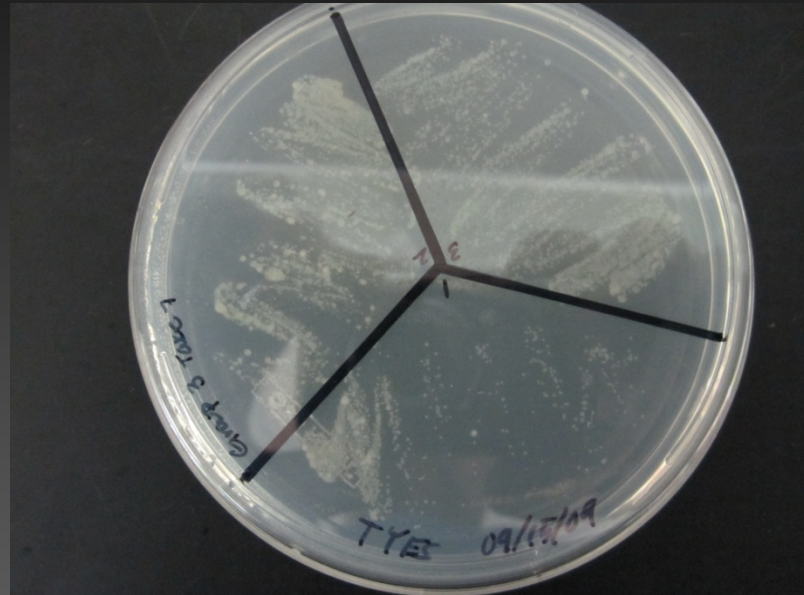
## Bacteriology

3 tests spring only

3 tests spring + well

Data yet to be analyzed

CFU range 1 to >1000





# Results

## Water Chemistry

Source	Temp (°C)	D. O. (ppm)	pH	NH <sub>4</sub> (ppm)	NO <sub>2</sub> (ppm)	NO <sub>3</sub> (ppm)	H <sub>2</sub> S (ppm)
Spring	8.0	9.0	7.6	0.00	0.004	2.6	0.000
Well	15.0	12.0	7.5	0.09	0.006	1.2	0.076
Spring + Well	10.0	12.0	7.6	0.02	0.004	1.7	0.000
Standard	0.0 - 15.0	>7.0	6.5 - 8.0	<0.0125	<0.1	<1.0	<0.003

# Discussion

Sulfur content did not provide significant anti-pathogenic benefits

Detrimental to fish

Increased stress levels (Wedemeyer 1996)

Decreased growth rates (Adelman & Smith 1970)

Increased malformations (Adelman & Smith 1970)

Significant effects on feeding fry

Prevent upstream movement of adult (Dare et al. 2001)

Temperature and pH dependent (Wedemeyer 1996)



# Discussion

Iodophor

Effective prophylactic treatment

Increased survival rates

Formalin, hydrogen peroxide, and sodium chloride (Waterstrat & Marking  
1995; Wagner et al. 2008)

Control soft shell disease





# Conclusion

Sulfur ( $\text{H}_2\text{S}$ ) does not provide sufficient anti-pathogenic benefits that would substantiate the discontinued use of iodophor as a prophylactic treatment.

Iodophor use should continue at SCNFH to control soft shell disease and maximize survival to the eye-up stage.



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**Thank You**

