

Does the use of Electronarcosis on adult coho salmon prior to spawning affect mortality and fry growth?

J. Michael Hudson¹, Maureen Kavanagh^{1*}, Shawna Castle², Brook Silver¹

¹*U.S. Fish and Wildlife Service – Columbia River Fisheries Program Office, Vancouver, WA*

²*U.S. Bureau of Reclamation- Boise, ID*



U.S. Fish and Wildlife Service

Columbia River Fisheries Program Office



Conserving America's Fisheries



Introduction

Electronarcosis

- use of electricity to elicit a state of narcosis, or deep sleep, using low voltage, non-pulsed DC power



Electrotetany

- immobilization by electricity, commonly involves the use of AC or pulsed DC power
- *(both found to have more negative impacts on adult salmon than non-pulsed DC)*



U.S. Fish and Wildlife Service

Columbia River Fisheries Program Office

CONSERVING
AMERICA'S
Fisheries

Conserving America's Fisheries



History

- Used to tag Atlantic salmon in the mid-60's (*Hartley 1967*)
- First used in U.S. on rainbow trout in the mid-70's (*Kynard and Lonsdale 1975, Curry and Kynard 1978*) and Pacific salmon in the mid- 80's (*Gunstrom and Bethers 1985*)
- It has since been used on channel catfish, striped bass, sturgeon, and many South American fish species for handling and researching effects on behavior



U.S. Fish and Wildlife Service

Columbia River Fisheries Program Office

CONSERVING
AMERICA'S
Fisheries

Conserving America's Fisheries



Applications

- Biological Sampling
 - Length, Scales, Genetic samples
- Tagging
 - Floy, PIT, Elastomer
- Surgery
 - Radiotags, PIT



U.S. Fish and Wildlife Service

Columbia River Fisheries Program Office

CONSERVING
AMERICA'S
Fisheries

Conserving America's Fisheries



Theory

- Requires a voltage gradient of approx. 0.25 to 0.5V/cm and a power density around $30\mu\text{V}/\text{cm}^3$
- Physiologically, during electronarcosis, no cerebral messages reach the motor paths
- The result is that the fish is limp and motionless as long as it remains in the water



U.S. Fish and Wildlife Service

Columbia River Fisheries Program Office

CONSERVING
AMERICA'S
Fisheries

Conserving America's Fisheries



Objectives

- Determine if there is a difference in egg mortality from spawning pairs of coho salmon subjected to electronarcosis vs. MS-222, and electronarcosis vs. no treatment prior to spawning.
- Determine if there is a difference in fry growth from spawning pairs of coho salmon subjected to electronarcosis vs. MS-222, and electronarcosis vs. no treatment prior to spawning.

If there is no difference between MS-222 and electronarcosis, and no difference between electronarcosis and the control, then it would indicate electronarcosis has no negative impacts on survival and reproductive potential.



U.S. Fish and Wildlife Service

Columbia River Fisheries Program Office

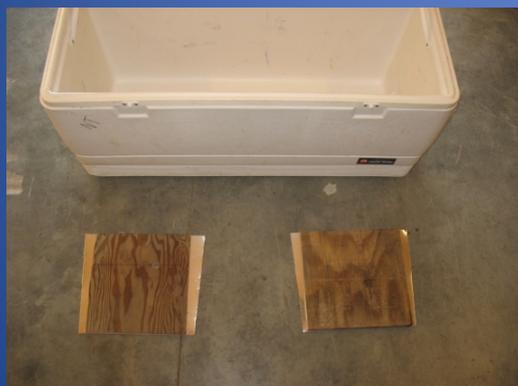


Conserving America's Fisheries



Construction

- 162 qt marine cooler
- Electrodes constructed from aluminum and mounted on plywood



U.S. Fish and Wildlife Service

Columbia River Fisheries Program Office

Conserving America's Fisheries



Power Connection

Power Supply



Electrode
(cathode)

Electrode
(anode)



U.S. Fish and Wildlife Service
Columbia River Fisheries Program Office

Conserving America's Fisheries

Conserving America's Fisheries





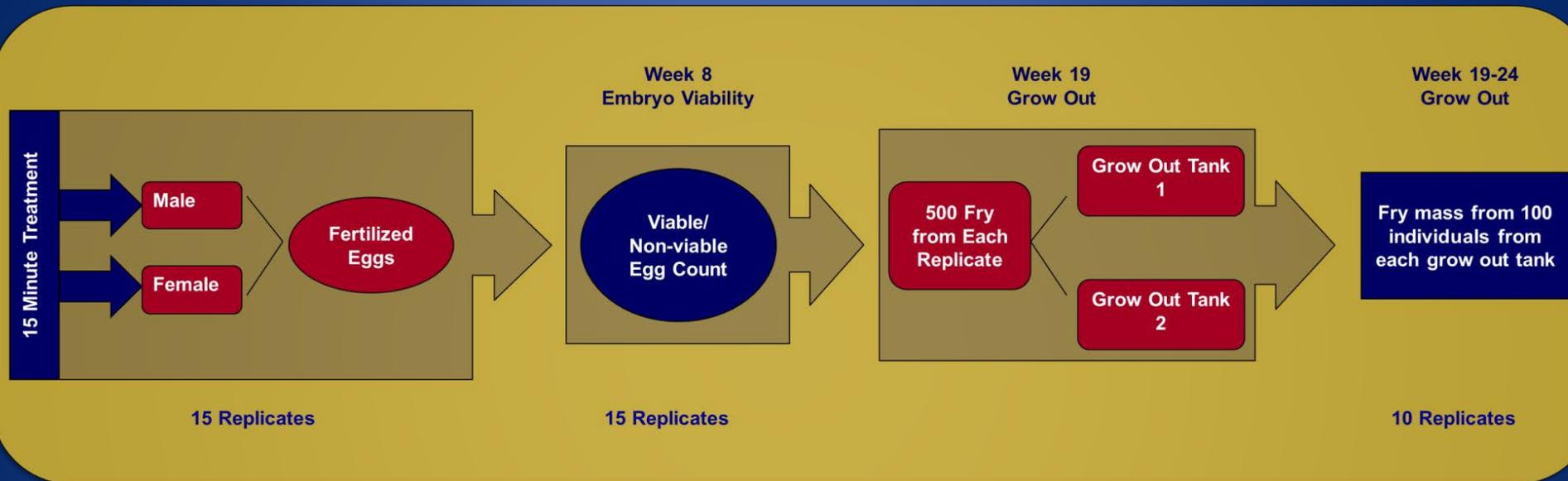
U.S. Fish and Wildlife Service
Columbia River Fisheries Program Office



Conserving America's Fisheries



Methods



- Electronarcosis: non-pulsed DC (40 volts at 0.01-0.03 amps)
- MS-222: 60mg/L
- Control: no sedation (physically euthanized)



U.S. Fish and Wildlife Service

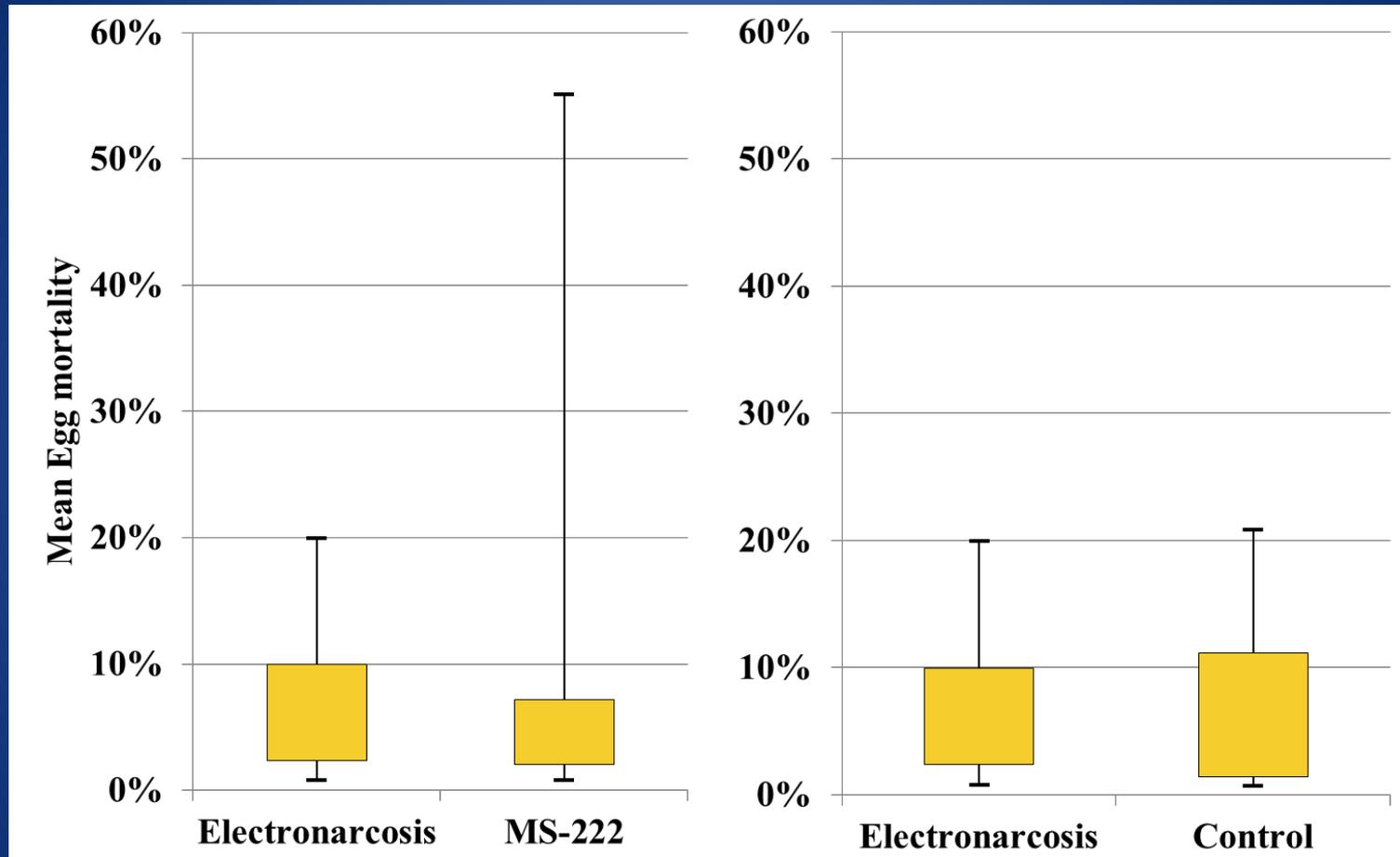
Columbia River Fisheries Program Office

CONSERVING AMERICA'S Fisheries

Conserving America's Fisheries



Embryo Viability



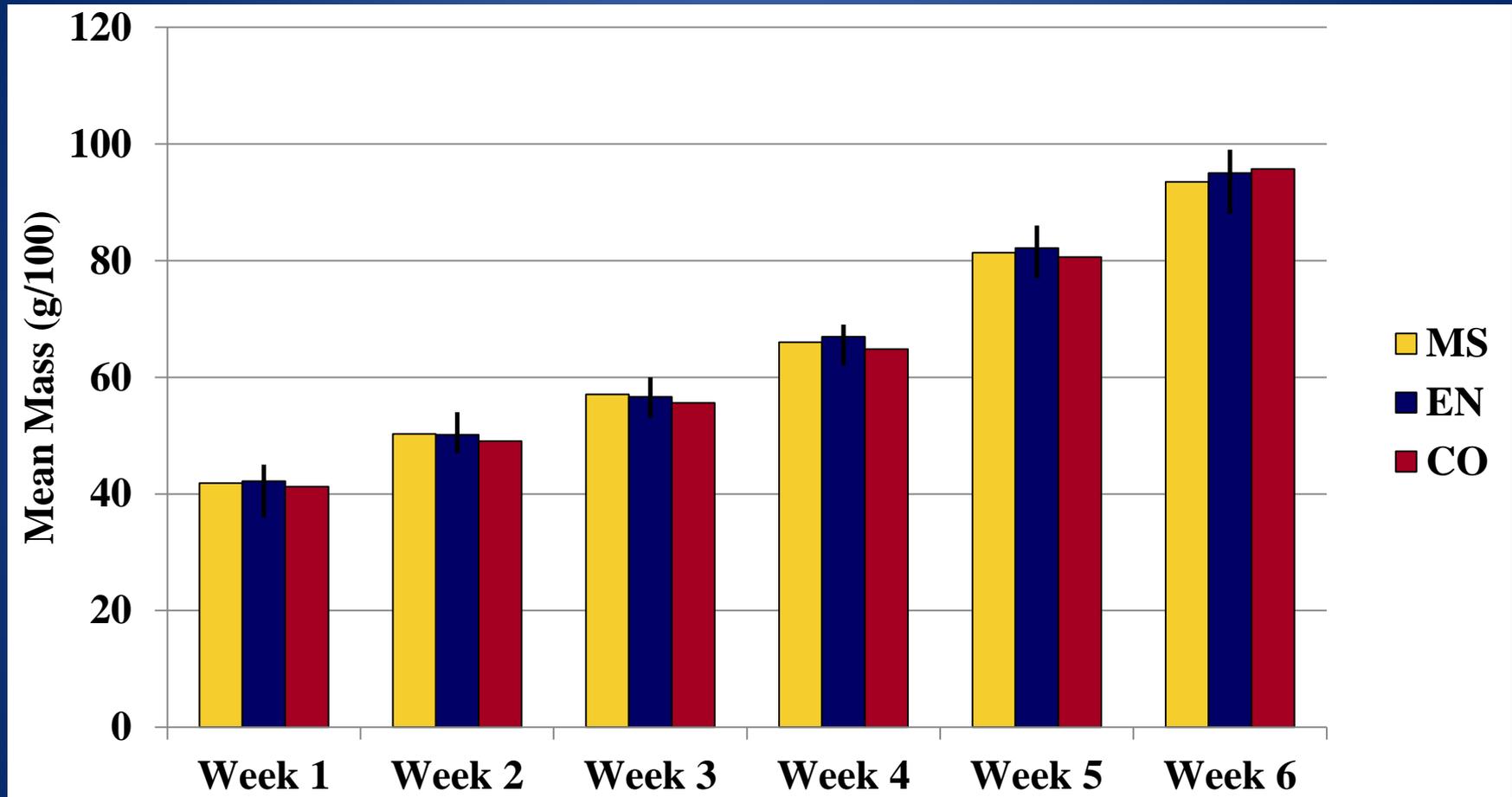
U.S. Fish and Wildlife Service

Columbia River Fisheries Program Office

Conserving America's Fisheries



Average weekly mass of coho Fry



U.S. Fish and Wildlife Service

Columbia River Fisheries Program Office



Conserving America's Fisheries



Conclusions

- Electronarcosis does not negatively impact coho embryo viability or fry growth rates
- Electronarcosis may be used as an alternative to MS-222 for both hatchery and wild salmonid populations
- Physical and physiological response of adult fish and their progeny to electronarcosis needs to be further researched



U.S. Fish and Wildlife Service

Columbia River Fisheries Program Office

CONSERVING
AMERICA'S
Fisheries

Conserving America's Fisheries



Electronarcosis



Zzzap!



U.S. Fish and Wildlife Service
Columbia River Fisheries Program Office

Conserving America's Fisheries

