

Electric Fish Handling Gloves:

New technology for immobilizing & handling fish

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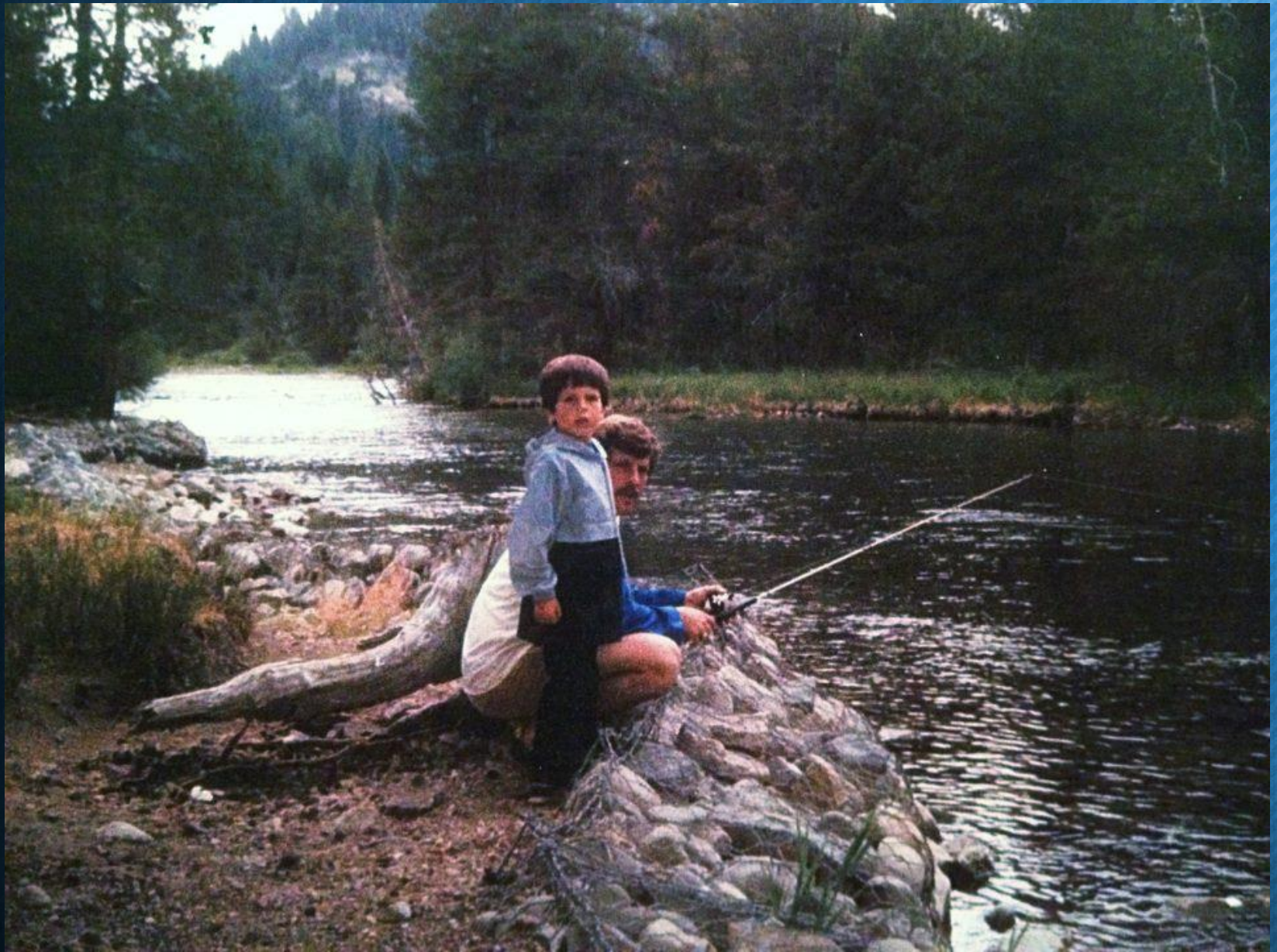
Patrick Cooney
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U.S. DEPARTMENT OF
ENERGY











Fish Handling



- Tag
- Move
- Sort
- Spawn
- Euthanize
- Inspect
- Weigh
- Measure
- Grade
- Transport
- Vaccinate
- Implant
- and more...

Fish Handling

Non-immobilized (Mobilized)

-Optimal for:

- Short handling duration
- Quick assessments

-Benefits include:

- Immediate recovery of fish
- No permits needed
- No withdrawal times
- Minimal cost
- No chemical disposal issues

-Drawbacks include:

- Potential injury risk for handler and fish
- Long duration handling is not optimal























Fish Handling

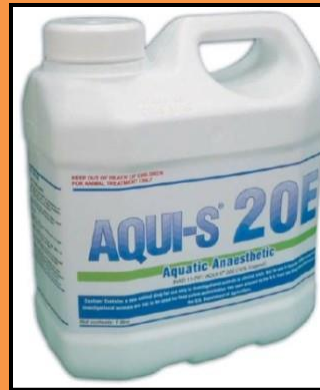


We all know the feeling.

Immobilization

Typical Methods:

- Carbon Dioxide
- Tricaine methane-sulfonate (MS-222)
- Benzocaine
- Clove Oil (Aqui-S)
- Electricity



Fish Handling

Immobilized

-Optimal for:

- Extended handling duration
- Spawning
- Invasive procedures

-Benefits include:

- Stops fish from moving
- Ease of handling
- Minimizes injury to handler and fish

-Drawbacks include:

- Potential permitting restrictions
- Long induction and recovery times
- Immediate release restrictions
- Chemical disposal



Tricaine methane-sulfonate (MS-222)



U.S. Food and Drug Administration
Protecting and Promoting Your Health



U.S. Department of Health & Human Services

FDA Center for Veterinary Medicine |

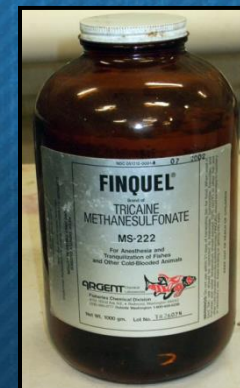
FDA Approved Animal Drug Products

Animal Drugs @ FDA

For fish:

- Not to be used within 21 days of harvesting fish for food
- Restricted to Ictaluridae, Salmonidae, Esocidae, and Percidae
- For water temps exceeding 10 degrees C (50 degrees F)

<http://www.accessdata.fda.gov/scripts/AnimalDrugsAtFDA/details.cfm?dn=200-226>



Comparison of Methods

Chemical and Electrical Approaches to Sedation of Cobia: Induction, Recovery, and Physiological Responses

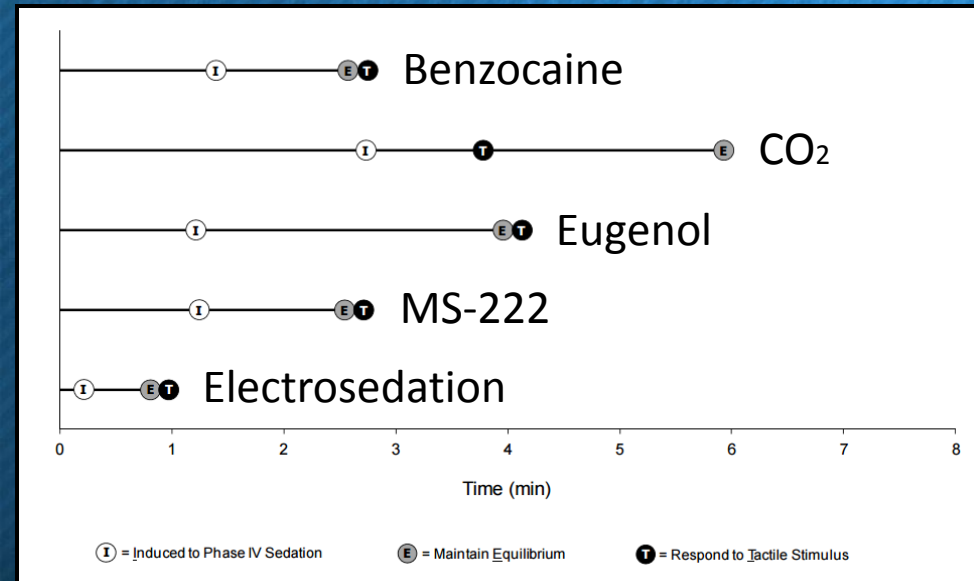
Jesse Trushenski
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U.S. Fish and Wildlife Service

Michael H. Schwarz
Virginia Polytechnical Institute and State University

2012



Comparison of Methods

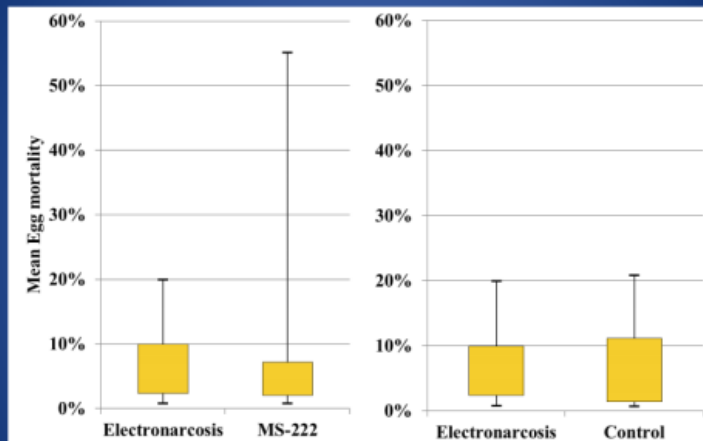
Lack of Effect on Embryo Mortality and Fry Growth from Adult Coho Salmon Subjected to Electronarcosis Prior to Spawning

DOI: 10.1080/15222055.2014.920750

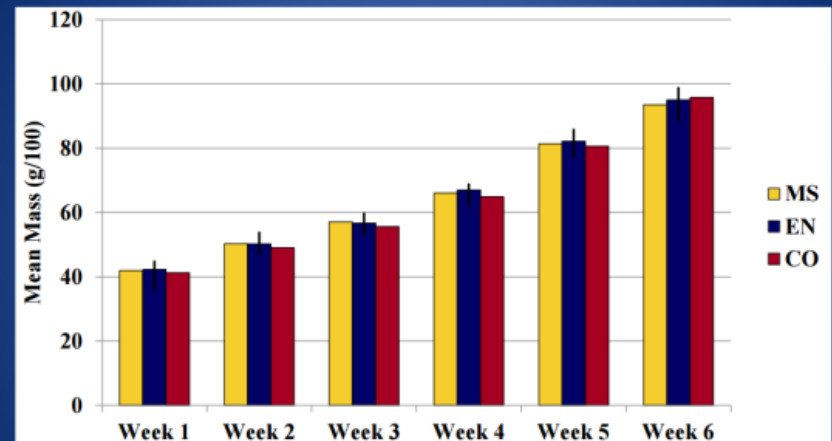
J. Michael Hudson^{a*}, Maureen Kavanagh^a, Shawna Castle^b & Brook Silver^a
pages 346-350

2014

Embryo Viability



Average weekly mass of coho Fry



Calls and Requests

We want to handle and immobilize fish using electricity to perform these **tasks**.

Can Smith-Root develop a product to do this?

- Tag
- Move
- Sort
- Spawn
- Euthanize
- Inspect
- Weigh
- Measure
- Grade
- Transport
- Vaccinate
- Implant
- and more...

Challenge

-Develop a tool that is optimal for:

- Multitude of **tasks**
- Wide range of handling times
- Fish out of water or partially submerged

-Key factors:

- Portable
- Stop fish from moving
- Minimize health risk
- No chemicals
- Short induction and recovery times
- No permits
- No disposal issues
- Simple to use
- Waterproof

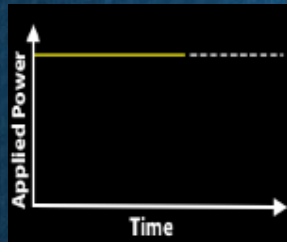
- **Tag**
- **Move**
- **Sort**
- **Spawn**
- **Euthanize**
- **Inspect**
- **Weigh**
- **Measure**
- **Grade**
- **Transport**
- **Vaccinate**
- **Implant**
- **and more...**

Electric Fish Handling Gloves



Electric Fish Handling Gloves

Direct
Current



-Low power and current

- 0.004, 0.0063, 0.01, 0.016, and 0.025 Amps



Waterproof
Housing

Switch

Harness



Wiring
Harness

2 Pairs of Gloves

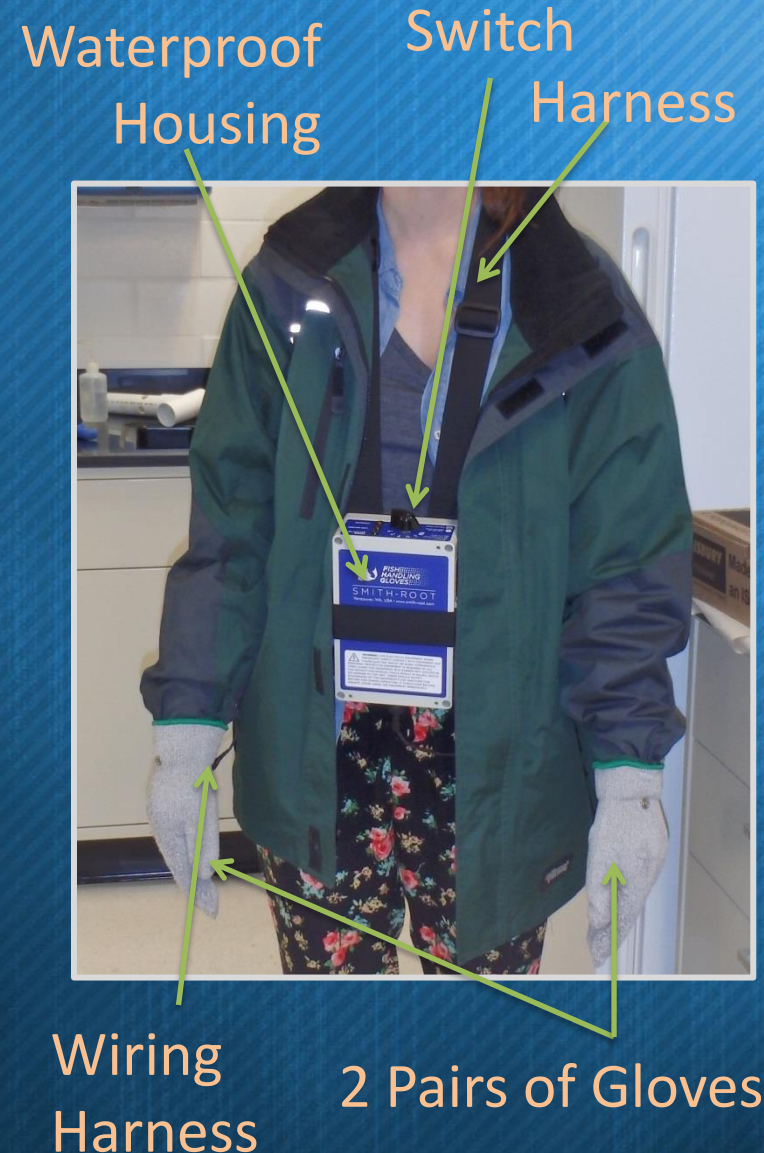
Electric Fish Handling Gloves

-Portable

- Rechargeable Lithium batteries

-Safety

- Rubber gloves insulate user
- Both hands must touch object
- Other folks can go glove free when touching immobilized fish because fish offers path of least resistance



Field Testing



Outside Testing



Outside Testing



Outside Testing

ALDEN
Solving flow problems since 1894



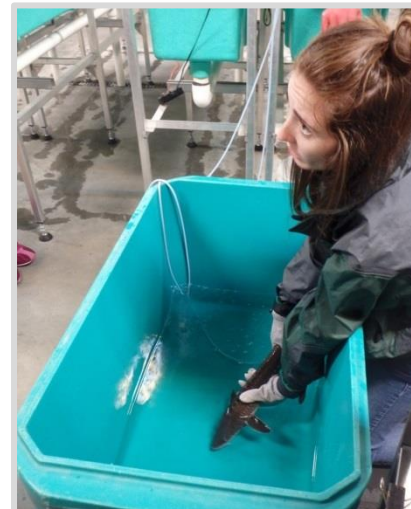
Outside Testing



Outside Testing



Outside Testing



Electric Fish Handling Gloves: Evaluation on three freshwater species

Elizabeth Cipriani

Science Undergraduate Laboratory Internship

Study

-Three species

- White sturgeon (n=60)
- Rainbow trout (n=30)
- Pacific lamprey (n=83)

-Design

- PIT tag all fish
- Handled for 2, 4, or 6 minutes
- Compare to control, MS-222, and Aqui-S (clove oil)

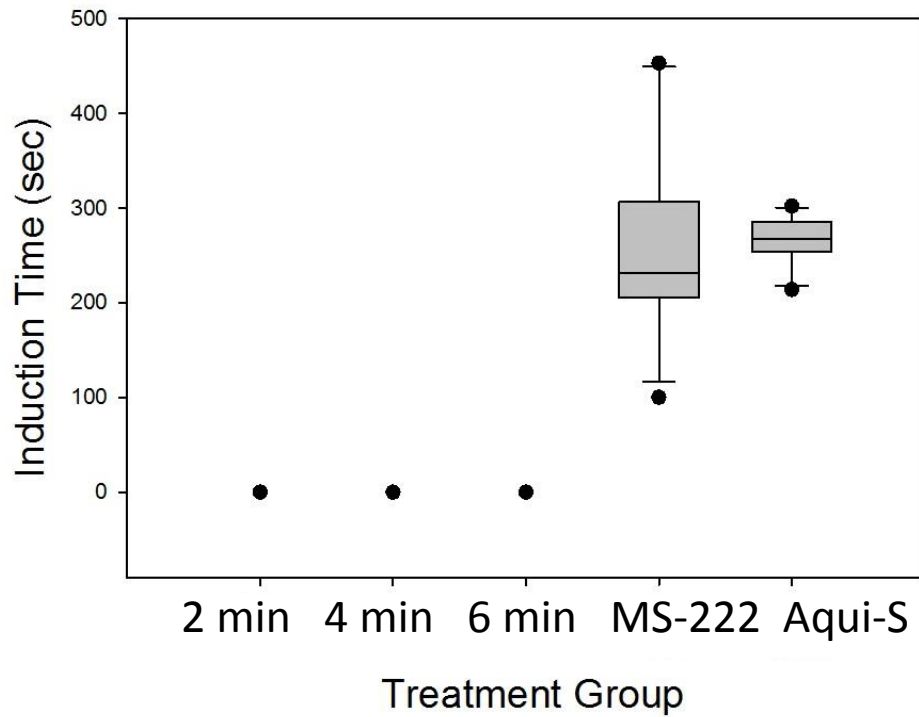
-Variables

- Induction and recovery times
- Survival
- Injury
- Gear limitations

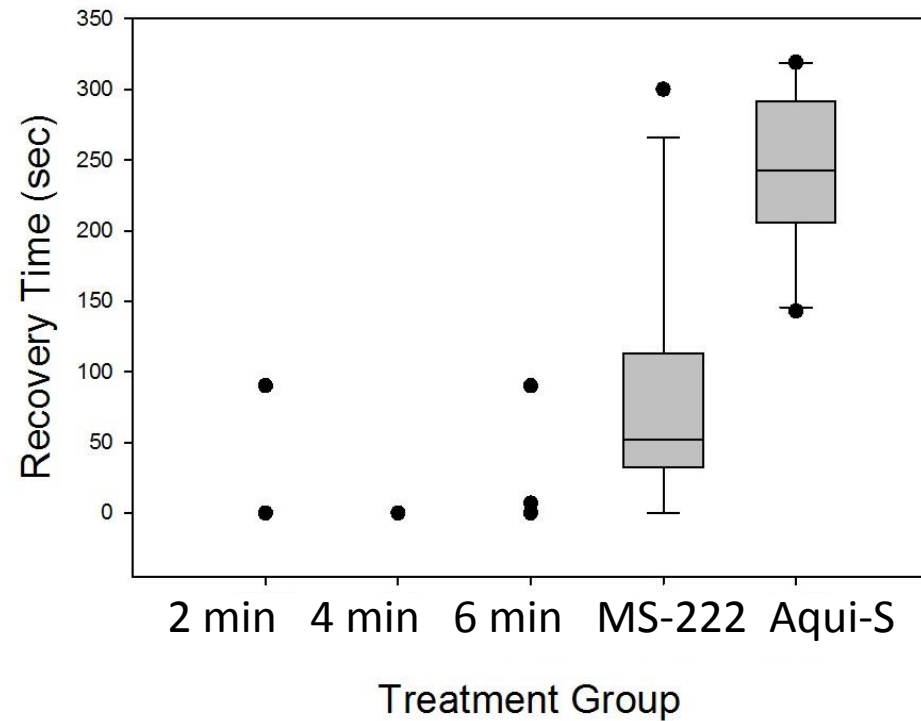


Results

Induction



Recovery



Results

Held for 2, 4, or 6 minutes, then monitored for 21 days.

| | Survival | Injury |
|--------------------|----------|--------|
| ○ Rainbow trout*: | 100% | 0% |
| ○ White sturgeon: | 100% | 0% |
| ○ Pacific lamprey: | 97.6% | 24% |



*1 rainbow trout from control group died

Cast of Characters

- **Salmon**
 - Atlantic, Chinook, Coho, Chum, Sockeye
- **Trout**
 - Steelhead, Rainbow, Brown, Brook, Lake
- **Lamprey**
 - Brook, Pacific, River
- **Bass**
 - Smallmouth, Largemouth
- **Catfish**
 - Flathead, Channel
- **White sturgeon**
- **Common carp**
- **Crappie**
 - Black, White
- **American eel**
- **Black sea bass**
- **Lingcod**
- **Albacore Tuna**
- **Blue shark**
- **Muskellunge**
- **Walleye**
- **Yellow perch**
- **Bluegill**
- **Pongee**

Additional Tool in the Box



Electric Fish Handling Gloves

Final Thought



