Guiding sea lamprey with pulsed direct current

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Presenter Information
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Guiding sea lamprey with pulsed direct current

Nick Johnson, Scott Miehls, Alex Haro: U.S. Geological Survey
Lisa O’Connor and Gale Bravener: Fisheries and Oceans Canada
Jessica Barber: U.S. Fish and Wildlife Service
Sea Lamprey Spread
Dates First Observed

- Lake Superior: 1938
- Lake Huron: 1937
- Lake Michigan: 1936
- Lake Erie: 1921
- Lake Ontario: 1800s
Existing Control Tools
Portable, Graduated, Pulsed Direct Current

Marker

Bouy

Steel Pipe electrode
NEMO – Portable Graduated Pulsed DC
Electrical guidance research for adult sea lamprey

Stage 1 – Pilot (2011)

Stage 2 – Define electric field parameters across a range of stream conditions (2012)

Stage 3 – Controlled field deployment (2013)

Stage 4 – Management-scale deployment & evaluation (2014-2015)
Blocking and guiding adult sea lamprey with pulsed direct current from vertical electrodes

Nicholas S. Johnson *, Henry T. Thompson, Christopher Holbrook, John A. Tix

USGS, Great Lakes Science Center, Hammond Bay Biological Station, 11188 Ray Road, Millersburg, MI 49759, USA
• Operated independent of a barrier
• Operated 7 hours a day (2200 to 0500)
• Minimal non-target effects
  – 7 dead fish observed over two years
  – Large catches of non-target species upstream (thousands)
• Annual cost: $5,800 USD
Tools Under Development
GUIDING OUT-MIGRATING JUVENILE SEA LAMPREY (*PETROMYZON MARINUS*) WITH PULSED DIRECT CURRENT

N. S. JOHNSON* AND S. MIEHLS

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Rainbow Trout

Off

On
Critical Knowledge Gap
Electric Guidance System for Outmigrating Juvenile Sea Lamprey

Stage 1 – Pilot (Successful)

Stage 2 – Define electric field parameters across a range of stream conditions

Stage 3 – Controlled field deployment

Stage 4 – Management-scale deployment & evaluation
STAGE 2 – CONTE LAB

Scott Miehls
Nicholas Johnson
Alex Haro

USGS
science for a changing world
Study Location
USGS, S. O. Conte Anadromous Fish Research Laboratory
Connecticut River, Turners Falls, Massachusetts
Electrical Guidance Efficiency of Downstream-Migrating Juvenile Sea Lampreys Decreases with Increasing Water Velocity

Scott M. Miehls, Nicholas S. Johnson & Alex Haro

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Final Thoughts

• Fishes often respond to low voltage electric fields.
• Those fields can be used to guide and block fish with minimal injury.
• Designing and deploying the electric field is the most difficult aspect of the work.
• Partner buy in is important and can be challenging.
USGS, Hammond Bay Biological Station
Sea lamprey research in partnership with the Great Lakes Fishery Commission

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