Effects of Electrofishing on Fish Health and Survival

by

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Outline

- ***Electrofishing background information***
- Implications for populations
- Implications for endangered fish
- Electrofishing effects on survival for…
  - Embryos
  - Juveniles
  - Adults
- Future research needs

Electrofishing:
Definition and Uses

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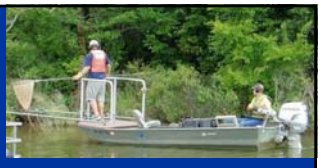

- Use of waterborne electric fields to capture fish
- Used in most freshwater habitats
- Often considered an essential technique by fisheries managers

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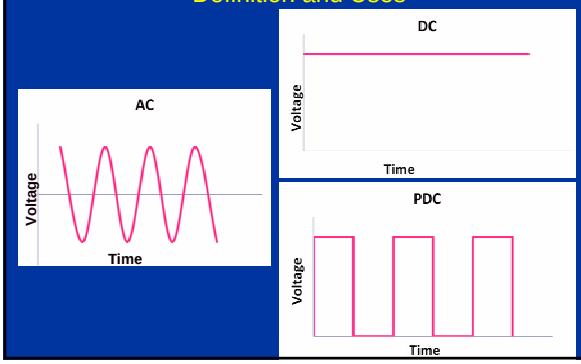
Electrofishing:
Definition and Uses

- Equipment:
  - Either boat or backpack electroshockers
    - Generator (or battery), voltage control, and electrodes
- Electric output:
  - Voltage controlled by operator
  - Electric waveform
    - Alternating Current (AC)
    - Direct Current (DC)
    - Pulsed Direct Current (PDC)

Electrofishing:
Definition and Uses



Electrofishing:
Definition and Uses

- Environmental factors impacting waterborne electric field intensity
  - Conductivity
- Choosing voltage
  - Waveform
  - Conductivity
  - Target species

Electrofishing for Brook Trout in GSMNP

Conductivity = ~20 µS/cm
Voltage selection = ~600-700 V
Waveform = AC

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Implications for Populations

- McMichael et al. (1998):
  - Frequency of injury decreases with increasing spatial scale (sample, reach, stream scales)
  - Insignificant proportion of the population will be impacted when viewed at the stream scale.

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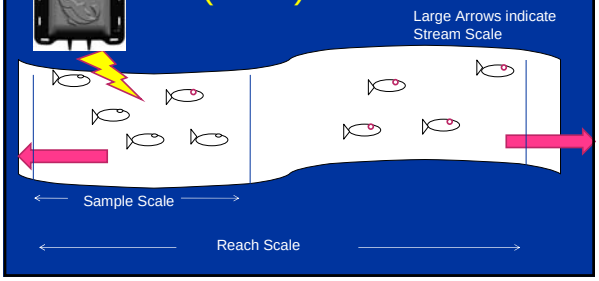
Illustration of McMichael et al. (1998)



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Implications for Endangered Fish

- Nielsen (1998):
  - Loss of even one individual is unacceptable and considered “take” under ESA
- If a small isolated population of fish is exposed, high mortality could have devastating effects on the population


During spawning season, multiple life history stages can be exposed to electric fields


Fish that aggregate to spawn would be particularly susceptible


Potential population level effects if the electric field is lethal

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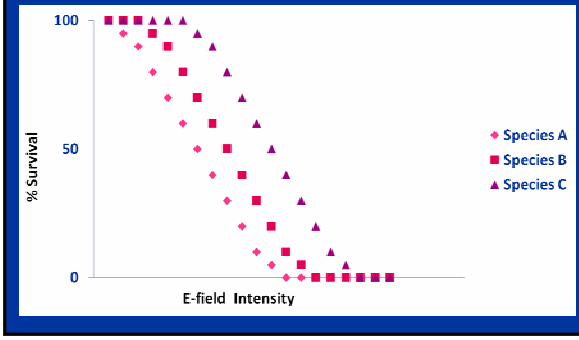
Effects of Electrofishing on Fish Survival

- All life history stages:
  - Mortality increases with electric field intensity (Dolan et al. 2002, Henry et al. 2003)
  - Differences in susceptibility exist between species (Meismer 1999, Henry et al. 2004, Henry and Grizzle 2004)

Effects of Electrofishing on Fish Survival



Effects of Electrofishing on Embryo Survival

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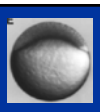
- Certain developmental stages are more susceptible than others (Dwyer et al. 1993, Henry and Grizzle 2004)
- DC is more lethal than PDC (Henry and Grizzle 2004)
- Embryos shocked at later developmental stages can hatch prematurely (Henry and Grizzle 2004)

Effects of Electrofishing on Embryos



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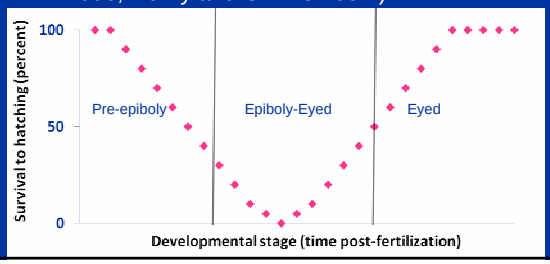
- Early developmental stages particularly susceptible to electroshock (Dwyer et al. 1993, Henry and Grizzle 2004)



Effects of Electrofishing on Embryos

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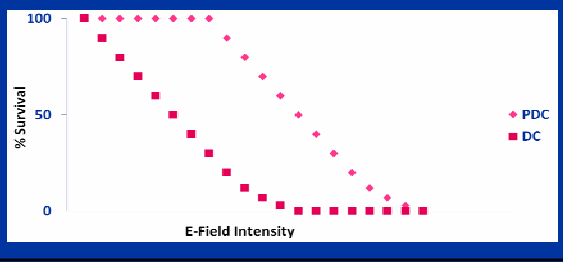
- DC is more lethal than PDC (Henry and Grizzle 2004)



Effects of Electrofishing on Larvae/Juveniles

– Newly transformed juveniles are more susceptible than larvae and older juveniles (Henry et al. 2003)

– PDC can cause mortality in larvae and juveniles (Henry et al. 2004)

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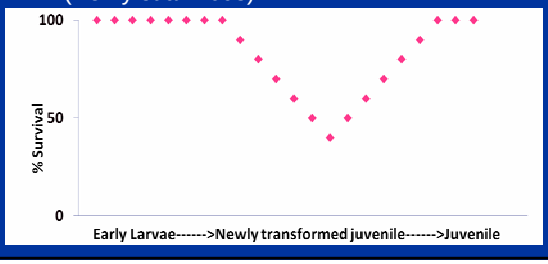


Effects of Electrofishing on Adults

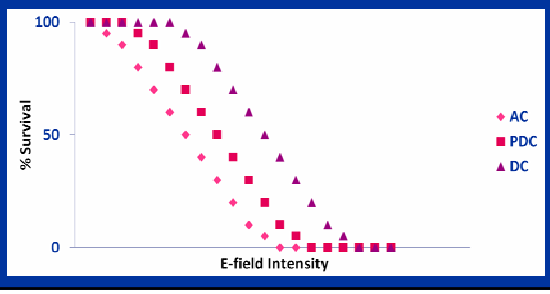
– AC is more lethal than PDC or DC (Pratt 1955, Taylor et al. 1957)

– Larger fish are more vulnerable to electroshock-induced mortality?

Greater size = More responsive to electroshockshock = More injury = More mortality?

Effects of Electrofishing on Adults

-AC is more lethal than PDC or DC (Pratt 1955, Taylor et al. 1957)



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Future Research Needs

- Investigate the impact of size on injury and mortality
- Examine why embryos are susceptible to DC while adults are more vulnerable to AC and PDC
- Find the most harmful waveform to larvae/juveniles
- Compare AC/DC/PDC vulnerability in one study

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Questions/Comments