

# Investigating novel uses of electricity in freshwater ecosystems

Jack Daniels, Professor Paul Kemp and Professor Suleiman Sharkh  
j.a.daniels@soton.ac.uk

Faculty of Engineering and Physical Sciences, University of Southampton, SO17 1BJ

## Background

River ecosystems are currently facing a loss in biodiversity and functionality due to a variety of factors, including invasive species (Gallardo and Aldridge 2013) and river infrastructure (see Kemp and O'Hanley 2010).

Electrical technology is currently being used in a variety of ways to reduce the impacts of these factors, but there is still significant opportunity for improvement.

## Fish Barriers

### Current Uses

Electric barriers are currently being used to restrict movement of rainbow trout (Layhee *et al.* 2016) and common carp (Kim and Mandrak 2017), as well as several other species.

Bajer *et al.* (2018) developed an electric guidance system which guided fish into traps.

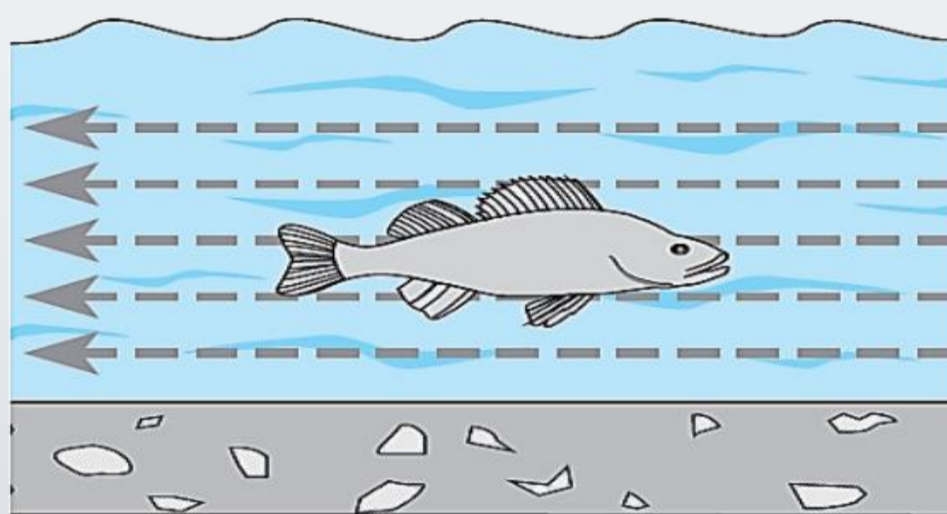


Figure 1 – Traditional fish barriers aim to create an electrical field (dashed arrows) that affects the fish from head to tail. This administers maximum electrical power, and often incapacitates the fish. From Yalçinkaya *et al.* (2017).

### Future Questions

Can we create species-specific electric barriers to reduce effects on non-target species?

Can electrical guidance systems be used to guide target species around harmful infrastructure?

How do electrical fish barriers impact other animal and plant groups?

## Limitation of Invasive Crayfish

### Current Uses

Benejam *et al.* (2015) successfully used an electric barrier to block movement of white-clawed crayfish and reduce incidence of crayfish plague.

Peay *et al.* (2015) achieved 97% mortality of signal crayfish using settings of 1600V and 7Hz applied for 308 minutes over four days.

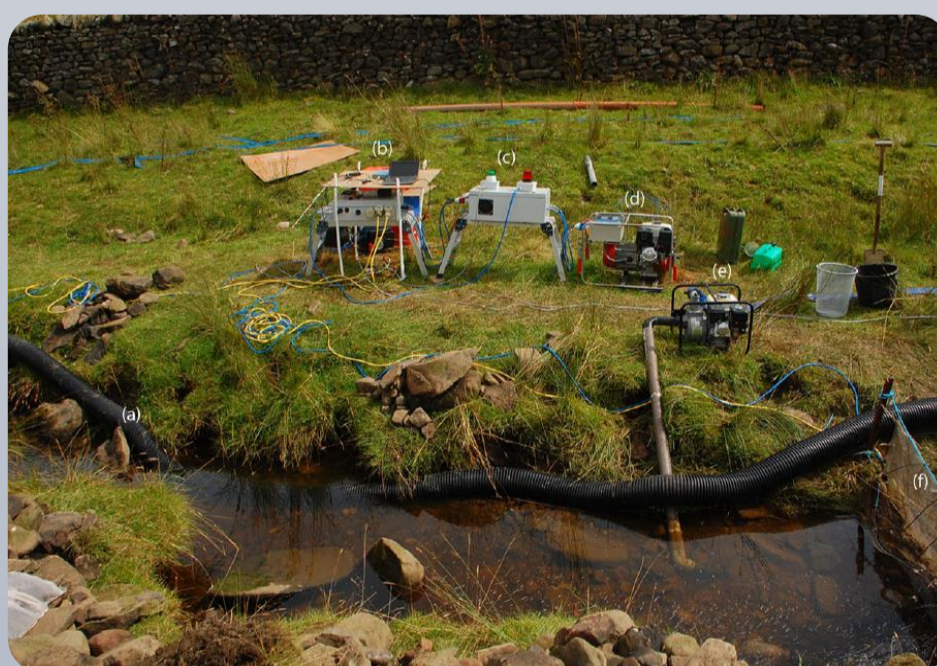


Figure 2 – The equipment used by Peay *et al.* (2015) to kill signal crayfish (*Pacifastacus leniusculus*). The image shows (a) flume pipe for flow bypass, (b) pulse unit, (c) capacitor unit, (d) 5kW generator, (e) dewatering pump, and (f) stop net.

### Future Questions

Is it possible to use electricity to create crayfish-specific barriers?

Could electricity be used to guide crayfish into traps (as done with carp by Bajer *et al.* 2018)?

Is it possible to expand knowledge of crayfish barriers to prevent spread of other invasive species?

## References

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