Monitoring and surveillance: UK examples for freshwater fish

Ian J. Winfield

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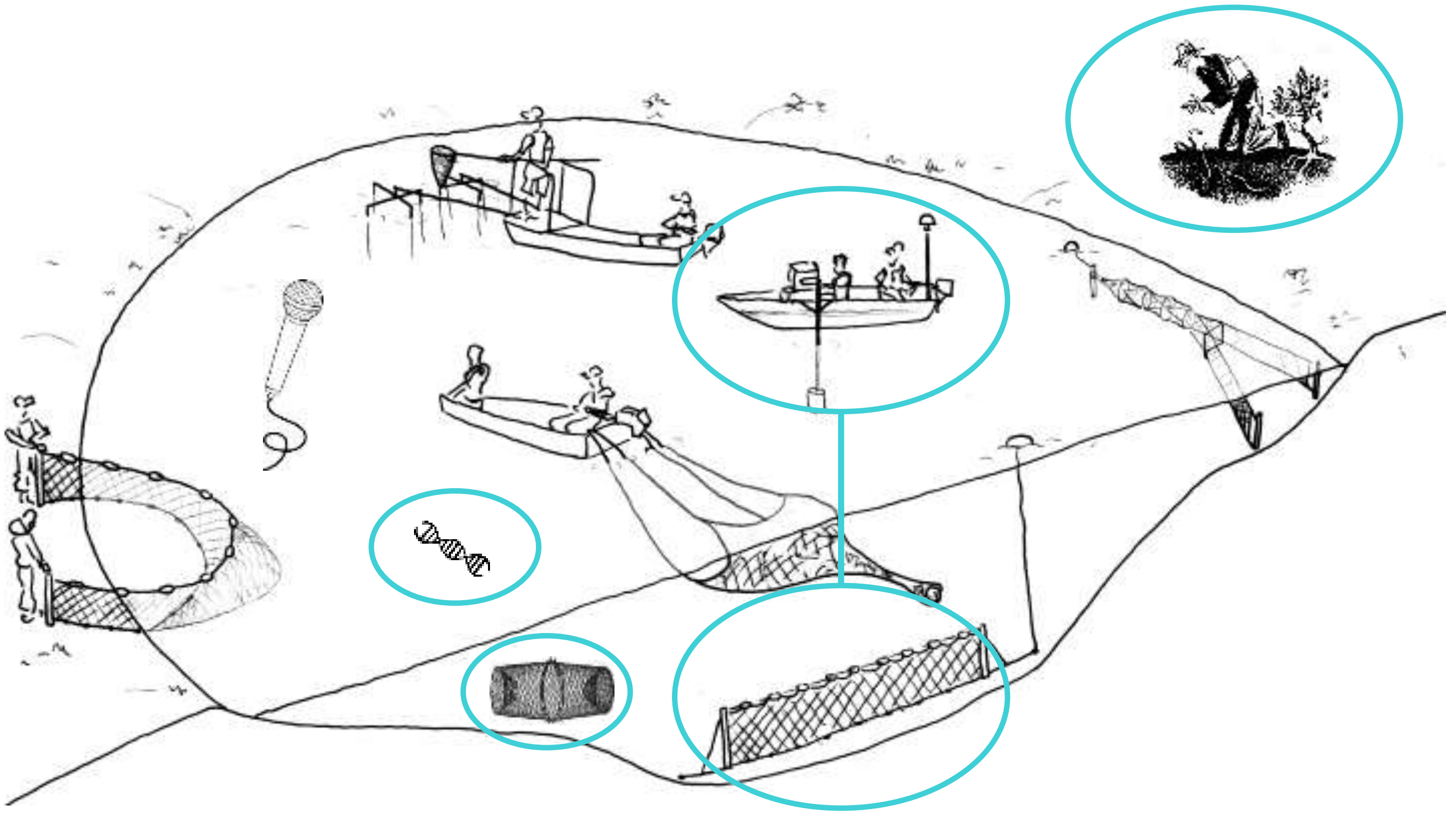
Structure of presentation

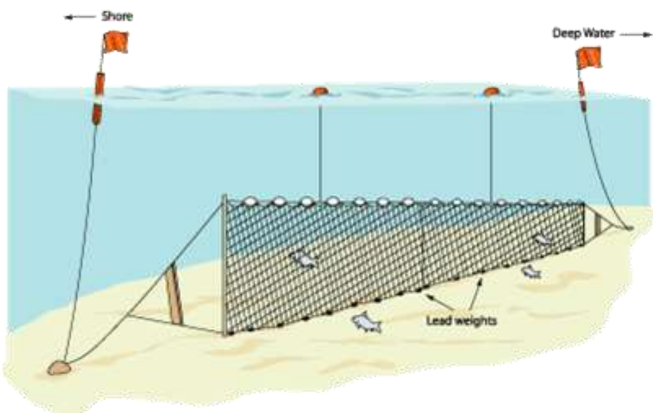
- Introduction
- Gill netting and hydroacoustics
- Environmental DNA (eDNA)
- Trapping
- Recording Apps
- Summary

Introduction



Gill netting and hydroacoustics

- Established and standardised
- Detailed and quantitative
- Laborious and destructive



Bassenthwaite Lake

(1995+)

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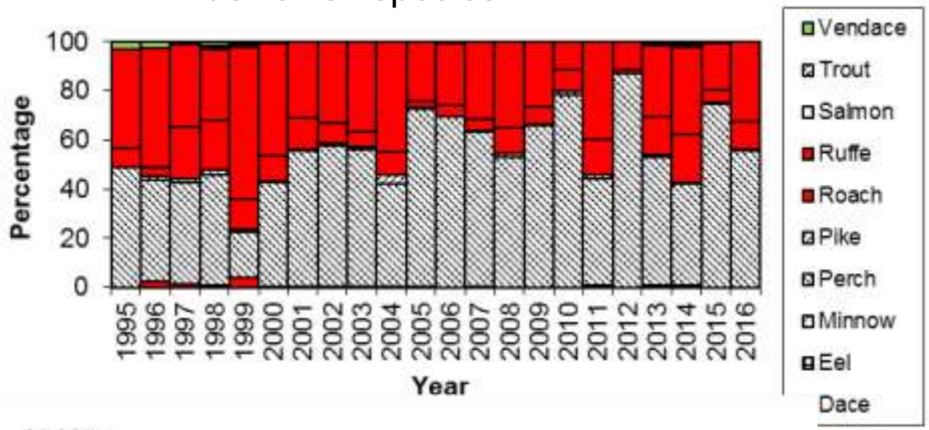
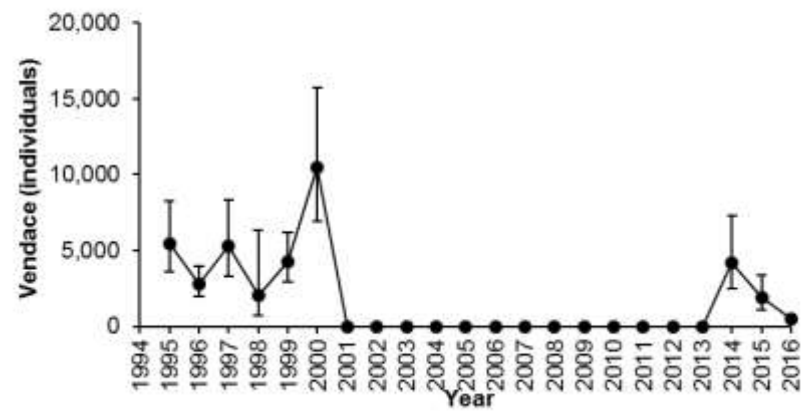
Vendace (*Coregonus albula*)

Rare native fish species in GREEN
Invasive fish species in RED





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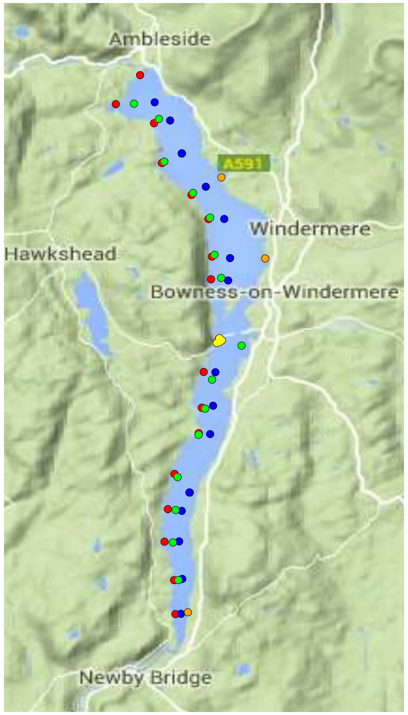
Environmental DNA (eDNA)

- Developing and unstandardised
- Semi-detailed and semi-quantitative
- Fast and non-destructive
- Led by Bernd Hänfling and Lori Lawson Handley (University of Hull)



Windermere

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EVO Hull

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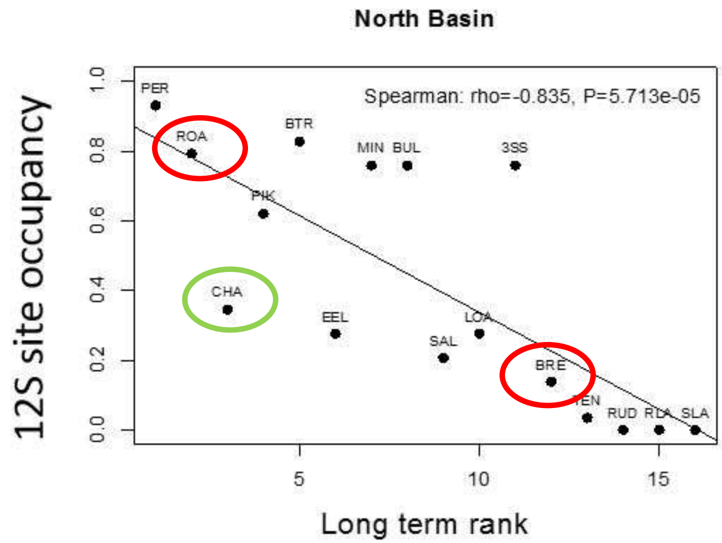

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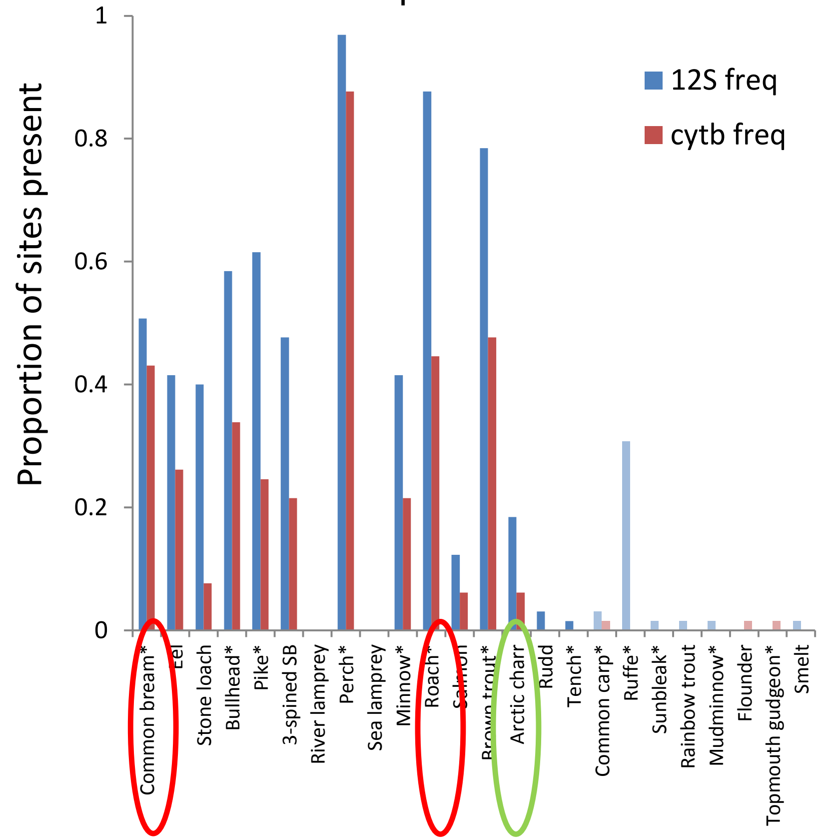
Invasive fish species in RED



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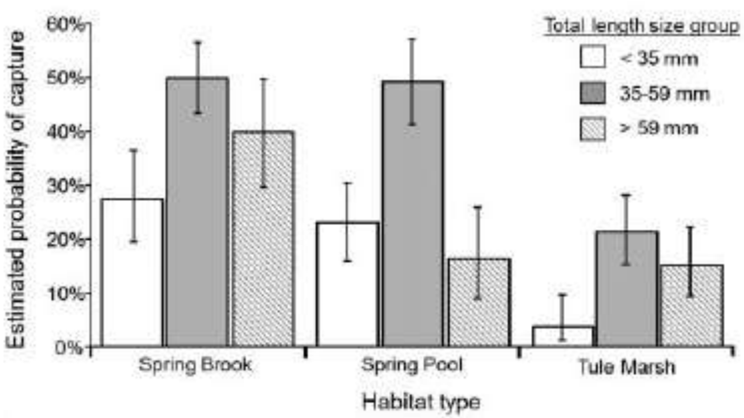

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ARTICLE

An Evaluation of the Efficiency of Minnow Traps for Estimating the Abundance of Minnows in Desert Spring Systems

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Abstract
Desert springs are sensitive aquatic ecosystems that pose unique challenges to natural resource managers and researchers. Among the most important of these is the need to accurately quantify population parameters for resident fish, particularly when the species are of special conservation concern. We evaluated the efficiency of baited minnow traps for estimating the abundance of two at-risk species, Foskett Speckled Dace *Rhinichthys osculus* ssp. and Borax Lake Chub *Gila boraxobius*, in desert spring systems in southeastern Oregon. We evaluated alternative sample designs using simulation and found that capture–recapture designs with four capture occasions would maximize the accuracy of estimates and minimize fish handling. We implemented the design and estimated capture and recapture probabilities using the Huggins closed-capture estimator. Trap capture probabilities averaged 23% and 26% for Foskett Speckled Dace and Borax Lake Chub, respectively, but differed substantially among sample locations, through time, and nonlinearly with fish body size. Recapture probabilities for Foskett Speckled Dace were, on average, 1.6 times greater than (first) capture probabilities, suggesting "trap-happy" behavior. Comparison of population estimates from the Huggins model with the commonly used Lincoln–Petersen estimator indicated that the latter underestimated Foskett Speckled Dace and Borax Lake Chub population size by 48% and by 20%, respectively. These biases were due to variability in capture and recapture probabilities. Simulation of fish monitoring that included the range of capture and recapture probabilities observed indicated that variability in capture and recapture probabilities in time negatively affected the ability to detect annual decreases by up to 20% in fish population size. Failure to account for variability in capture and recapture probabilities can lead to poor quality data and study inferences. Therefore, we recommend that fishery researchers and managers employ sample designs and estimators that can account for this variability.

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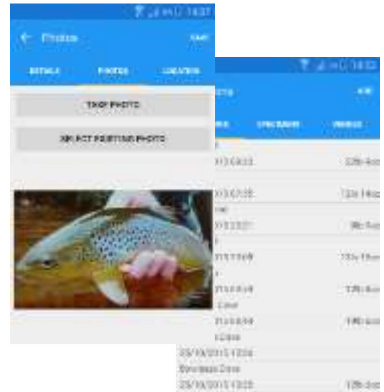

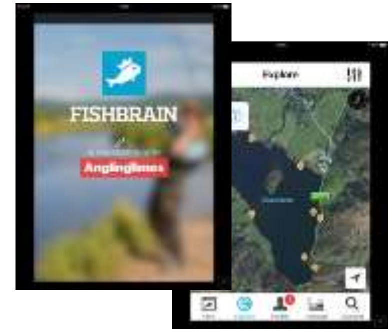

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Summary

- Long history of freshwater fish monitoring and surveillance in UK
- Established and standardised methods
- Development of new methods
- Trapping particularly relevant to Cyprus
- Recording Apps now realising their potential for freshwater fish