

Development of Best Practice for Agency Electric Fishing Operations

In 1999, the Environment Agency's Electric Fishing working group identified a need to develop best practice for electric fishing operations, in respect of choice of equipment and output characteristics needed to achieve good fish capture efficiency and minimum incidence and severity of fish damage at all times. Aspects in need of investigation were:

1. Output type and waveform
2. Frequency and power output
3. Anode size and shape, cathode size and shape
4. Choice of options available regarding gear configuration (single anode, multi-anode, boom-mounted etc)
5. Post-capture fish care

A collaborative project with the Centre for Ecology and Hydrology was undertaken which embodied four main elements -

- Collate existing published information regarding optimal equipment settings
- Determine from Agency staff the pool of knowledge that exists regarding practical equipment usage
- Determine from empirical experimentation and published literature the most appropriate combinations of electric fishing equipment and output settings for use under the range of conditions likely to be encountered in the UK
- Promote the best practice in electric fishing with the currently available equipment

The project revealed that much of literature on electric fishing, especially in respect of harmful effects on fish, is contradictory, and there is a paucity of literature on electric fishing of common UK species other than salmonids.

The survey of current electric fishing practices within the Agency revealed great diversity of practice within Agency, and a lack of consistency in approach to choice of equipment and settings, and varying levels of understanding of the basic principles of electric fishing.

Bench-testing of outputs from electric fishing generators and control boxes in general use indicated significant variations between different brands and models.

Notwithstanding the inconsistencies in the published literature and in the experience of practitioners, it was possible to derive general principles for achieving optimum voltage gradients/current densities.

An alternative approach to electric fishing is suggested which aims to use the most benign, rather than the most effective, electric fields in order to capture fish.

The following broad recommendations were drawn up:

- **Where possible fishing should be carried out using direct current (dc) fields.**

- **Where it is not possible to use dc, pulsed direct current (pdc) fields should be used.**
- **Pulse frequencies should be kept as low as possible**
- **Alternating current (ac) fields should not be used for fishing unless warranted by specific circumstances**
- **All fields should be adjusted to the minimum voltage gradient and current density concomitant with efficient fish capture.**
- **Equipment for measuring conductivity and field strength (voltage gradients) in the water should be available on each electric fishing trip to monitor equipment operation and adjust settings and electrodes for the desired size and intensity of the field.**
- **Comprehensive records should be kept of every electric fishing session.**
- **The anode head size should be as large as possible.**
- **The cathode should be as large as possible.**
- **Fishing technique using dc and pdc.**
 - The success of dc fishing depends upon it being conducted in a discontinuous fashion, in order to use the element of surprise, to improve capture efficiency and in order not to herd or drive the fish
 - When using pdc, care needs to be taken that the anode is not so close to the fish that the fish is instantly in the tetanising zone of the field or that the fish is tetanised whilst still outside the catching zone.
- **In general one anode for every 5 metres of river width has been found to be effective for quantitative electric fishing surveys of whole rivers.**
- **Fish should be removed from the electrical field as quickly as possible.**
 - length of exposure to the electric increases stress levels.
 - Repeated immersion of fish into an electric field has been shown to increase blood lactate levels.
- **Electric fishing should be avoided in extremes of temperature.**
 - A temperature range of 10-20°C is preferred for coarse fish and 10-15°C for salmonid species.
 - if fishing has to be carried out at low temperatures due to logistics (e.g. low growth in winter so better between site growth comparisons) increasing pulse width or voltage gradient may improve efficiency.

Recommendations were also made in respect of post capture fish care:

- **Temperature of water is the main criteria determining measures to maximise fish welfare.**
- **The use of floating mesh cages was considered to be a particularly effective way of keeping the fish in good condition.**
- **In fish holding bins, a 50% stocking density (45 litres of water: 20 kg (° 20 litres) fish) should be regarded as maximal.**

Recommendations for further research included:

- **Anode design:** Investigation of the ease of use and fields produced by large (>40 cm) electrodes needs to be carried out.
- **Electrical characteristics:** Work should be undertaken to obtain definitive data regarding the minimum voltage gradients required for a range of UK fish species. These gradients should be for attraction and tetany.
- **The role of pulse width:** Further research is urgently required on the role of pulse width in causing fish reaction to electric fishing..

- **Fish conductivity:** The lack of knowledge regarding fish conductivity needs urgently addressing.

This R&D Technical Summary relates to information from Project W2-054 contained in the following output:

R&D Technical Report W2-054/TR: Guidelines for Electric Fishing Best Practice
(ISBN: 1 85705 636 1)

Internal: Released to Regions
External: Public Domain

Research Contractor: Centre for Ecology & Hydrology
Project Manager: Dr Graeme Peirson, National Coarse Fisheries Centre, Midlands
Region

Copies of this R&D Technical Report are available internally on loan from Regional Information Centres. Further copies of the R&D Technical Report may be purchased from the Environment Agency R&D Dissemination Centre, c/o WRc, Frankland Road, Blagrove, Swindon, Wiltshire, SN5 8YF. Telephone: 01793 865012; Fax: 01793 514562; www.publications@wrcplc.co.uk

© Environment Agency 2001
Environment Agency
Rio House
Waterside Drive
Aztec West
Almondsbury
Bristol BS32 4UD

Tel: 01454 624400
Fax: 01454 624409