

Introduction

The Farm Animal Welfare Council's (1996) Report on the Welfare of Farmed Fish suggested that commercial trout farms routinely operate at stocking densities that compromise fish welfare. Their findings indicated that current stocking densities were too high causing stress, injury and mortality. The report acknowledged the complexity of the issue and highlighted a need for new methods to quantify fish welfare and called for research to be carried out to determine acceptable maximum stocking densities.

Objectives for 2000 to 2003

1. Review stocking density practices

- Review the existing scientific evidence on effects of stocking density on trout welfare
- Questionnaire survey to assess current UK practices

The questionnaire is currently being defined in consultation with the BTA and MAFF to assess the diversity of working practices in relation to stocking density. Factors such as system type, fish size, water flow rates, feeding methods, aeration/oxygenation systems, growth rate, mortality levels, fish quality and disease incidence will be addressed. The questionnaire will be distributed to British Trout Association registered farms in the UK by the BTA this Autumn. The returned data will be collated and analysed in confidence by the BTA Technical Advisor (Niall Bromage) and the IoA Scientist employed on the project (Ben North).

2. Develop a non-invasive assay for measuring trout stress levels

3. Experimentally examine the effects of stocking density on trout welfare

- Apply the stress assay in laboratory experiments to examine the effects of stocking density
- Apply the stress assay on farms to examine trout welfare under commercial conditions
- Determine the effects of stocking density on trout behaviour in laboratory experiments

The non-invasive assay for measuring trout stress levels

Stress levels in trout are usually measured by collection of blood samples and analysis of the blood plasma for levels of cortisol, the classic stress hormone. However, as the processes of capture and blood sampling are inherently stressful, we are developing a novel non-invasive method based upon testing tank water (Fig 1).

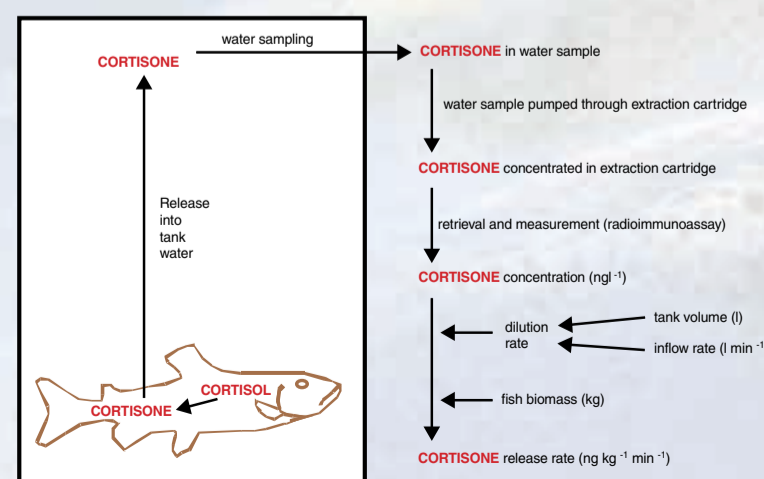


Figure 1. A non-invasive stress assay for trout

So far we have shown that:

1. Cortisone is the major breakdown product of cortisol released into the water by trout
2. Water cortisone levels are associated with acute stress and related to the degree of stress (Fig 2)
3. Under normal conditions cortisone release is constant (Fig 2).

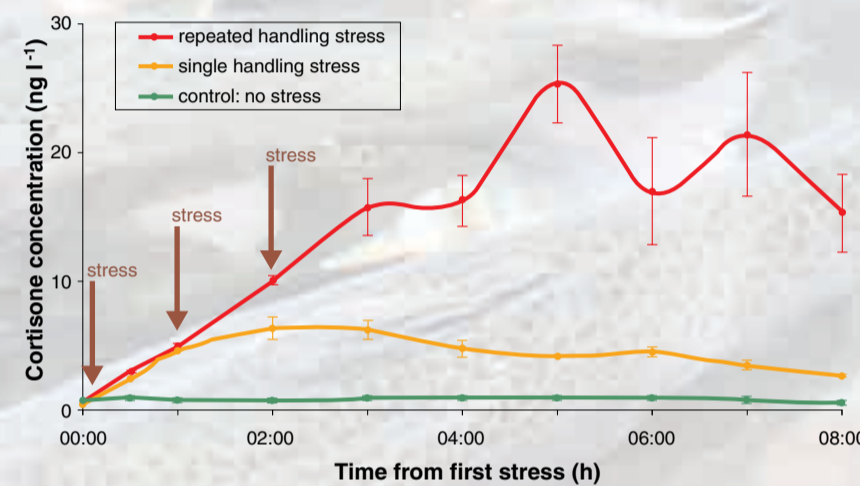


Figure 2. Release of cortisone by rainbow trout following acute handling stress.

4. Cortisone released by trout is stable and so is not broken down during freeze storage of water samples and extraction cartridges (Fig 3).

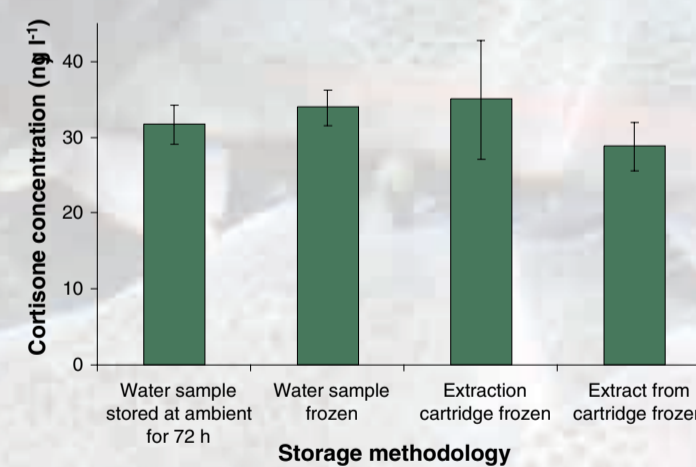


Figure 3. No effect of sample storage methodology on cortisone recovery.

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5. Water inflow dilutes the cortisone in tank water in a predictable manner (Fig 4).

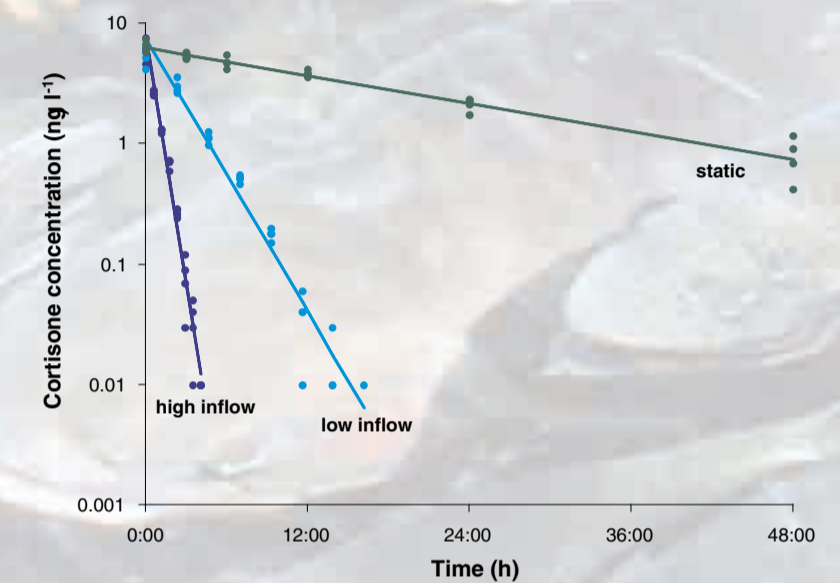


Figure 4. Decrease in added cortisone due to dilution.

Once fully developed, the assay will provide a powerful tool to determine the effect of a wide variety of husbandry practices on fish stress. The potential advantages of this revolutionary technique are that:

- repeated sampling is possible without disturbing or handling the fish
- it is suitable for quantifying stress from a variety of causes
- it provides a measure of welfare at a single point in time
- it is transferable from the laboratory to the farm environment
- it can be used with a range of fish sizes
- it is suitable for a variety of species.

Summary

- Significant progress has been made towards the development of a new method to assess fish welfare.
- The issue of stocking density and fish welfare is both complex and controversial. However, the new methodology, the collaboration of commercial farms, and the participation of the BTA will enable a balanced approach.

Acknowledgements

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