CHAPTER 1
Introduction

Over the past 100 years, electricity, or he use of electrical theory, has become a vital tool for fishery research and management. It is used to divert fish from hazards, capture them for research or husbandry, count them as they migrate within rivers and anaesthetise/sedate them for easier handling or tagging. Due to the potential hazards associated with using 'free' electricity in an aquatic environment (to both operators and fish), there is a continuing need to develop and promote Best Practice Guidelines for its use. Also, recent advances in electronics have resulted in new equipment that allows far greater control and selection of the output from the equipment. This new availability of output settings makes the need for improved understanding and guidance on how the method works and suitable output settings even more necessary. Probably the commonest use for electricity in fish research and management is for capturing them; this is called **electric fishing** (or **electrofishing**). Even for this methodology, books about the method tend to be either too simplistic or collations of scientific papers. The aim of this book is to give comprehensive information about the technical and theoretical aspects of using electricity but in easily understood language and format. In addition, practical guidance gained from over 40 years of experience of using electricity for a variety of uses in a wide range of locations and conditions is also given. The book will concentrate on electric fishing but in doing so will explain the fundamental concepts that govern other uses of electricity in fish research and management.

There has recently been a greater awareness and concern for fish welfare while electric fishing, and this book emphasises the concept of promoting fish welfare above fish capture. Information on basic electric circuit theory, choice of equipment, output characteristics and use should enable adequate fish capture efficiency with minimum incidence and severity of fish damage. Information and guidance that enable users to have a good understanding of the factors that influence efficient equipment set-up and benign fish capture are fundamental to achieving these goals. The work presented in this document is intended to give the above guidance and is based on an earlier document on Best Practice

Electricity in Fish Research and Management: Theory and Practice, Second Edition. W.R.C. Beaumont.

Guidelines for electric fishing (Beaumont *et al.* 2002) prepared for the UK Environment Agency. When Beaumont *et al.* (2002) was being written, it was hoped that it would be possible to lay down definitive rules and settings for use under a standard set of conditions and equipment specifications. Unfortunately, due to the wide variety of gears in use, water bodies in which they are used and range of operational requirements, it is not easy to categorically state what to use and where. Instead, it was decided that operators should have a good understanding of equipment and of the basic theory behind technique; this would allow them to set gear and output according to circumstances. This book is yet a further step along that road.

Overviews of electric fish screens, fish counters and the use of electricity to anaesthetise and sedate fish are also given.

The book is aimed at all who undertake sampling using electric fishing: professional practitioners such as government research scientists, under and post-graduate students and lay operators (water keepers etc.). Contrary to the comments of Smolian (1944) that 'at all costs electrofishing should not be allowed to develop into a method that allows any errand boy to be a fisherman', I hope that all who read this book will gain an understanding of at least the basic principles.

Recommendations from this work will include guidance on:

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

Only core health and safety issues specifically associated with electric fishing will be addressed, as national, regional or local Codes of Practice or guidelines should deal with issues such as lifting and working near water, and so on.

Whilst this book is based on equipment and practice commonly used in Europe, the electrical principles described are universal and will apply to whatever type of equipment is being used.