Living Resources Committee

ICES CM 1998/G:16

REPORT OF THE

STOCK IDENTIFICATION METHODS WORKING GROUP

By Correspondence

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1 MAIN TASKS AND PARTICIPANTS

At its 1997 Annual Science Conference, ICES resolved (C.Res.1997/2:55) that a Working Group on Stock Identification Methods will meet by correspondence under the chairmanship of Dr K. Friedland (USA). The Study Group would continue to develop the Stock Identification Methodology and advise on future meetings of the Working Group (Appendix 1).

The Working Group participants in 1997–1998 were as follows, with addresses given in Appendix 2.

1.1 Participants

G. Begg	USA
S. Campana	Canada
M. Fabrizio	USA
K. Friedland (Chairman)	USA
J. Hare	USA
R. Phillips	USA
S. Saila	USA
J. Waldman	USA

2 STOCK IDENTIFICATION METHODOLOGY

The Working Group considered five contributions to the Stock Identification Methodology (see Appendix 3). Section 110 on elemental composition of otoliths has been completed from the abstract submitted in 1994. Likewise, Section 112 on chromosome morphology follows a first draft started last year. Section 303 on life history parameters is a broad scope treatment of the subject intended to complement Section 301 on the distribution of early life stages. Section 504 on neural networks is an in depth examination of this emerging approach of classifying specimens to stock origin. Finally, the Working Group received its first contribution to Section 6 of the Methodology on stock identification data requirements in quantitative assessments (Section 603). In addition, the Table of Contents of the Methodology has been modified to reflect the addition of new Sections and some minor reorganisation.

The Working Group desires the widest possible participation in this effort and encourages experts to contact the Chairman if they can make a contribution, provide critical review of an existing section, or have suggestions of new sections that may be appropriate for inclusion in this compendium.

3 FUTURE MEETING

The Working Group did not identify the need for a meeting at this time, but would recommend that the subject remain on the terms of reference for future consideration.

4 RECOMMENDATIONS

The Working Group recommends:

The Stock Identification Methods Working Group work by correspondence in 1998–1999 under the chairmanship of Dr K.D. Friedland (USA) to:

a) continue development of the Stock Identification Methodology;
b) advise on future meetings of the Working Group.

The Working Group will report to the Living Resources Committee at the 1999 Annual Science Conference.

APPENDIX 1

Terms of Reference

C.Res.1997/

2:55 The **Stock Identification Methods Working Group** [SIMWG] (Chairman: Dr K.D. Friedland, USA) will work by correspondence in 1998 to:

a) continue development of the **Stock Identification Methodology** begun by the Study Group on Stock Identification Protocols for Finfish and Shellfish Stocks;

b) advise on future meetings of the Working Group.

SIMWG will report on progress to the Living Resources Committee at the 1998 Annual Science Conference.

APPENDIX 2

LIST OF PARTICIPANTS

Name	Address	Phone	Fax	e-mail
Kevin Friedland	UMass/NOAA CMER Program Blaisdell House University of Massachusetts Amherst, MA 01003–0040 USA	413–545–2842	413–545–2304	friedlandk@forwild.umass.edu
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Steve Campana	Marine Fish Division Bedford Institute of Oceanography PO Box 1006 Dartmouth, NS B2Y 4A2 USA	902–426–3233		s_campana@bionet.bio.dfo.ca
Mary Fabrizio	USGS, Biological Resources Division Great Lakes Science Center 1451 Green Road Ann Arbor, MI, 48105, USA	313–994–3331		Mary_fabrizio@usgs.gov
Jonathan A. Hare	National Marine Fisheries Service Beaufort Laboratory 101 Pivers Island Road Beaufort, NC 28516 USA	919–728–8732	919–728–8784	Jhare@hatteras.bea.nmfs.gov
Ruth B. Phillips	University of Wisconsin at Milwaukee Milwaukee, WI 53201 USA	414–229–4909		Rp@csd.uwm.edu
Saul Saila	Graduate School of Oceanography University of Rhode Island Narragansett, RI 02882 USA	401–874–6222		
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APPENDIX 3

STOCK IDENTIFICATION METHODOLOGY

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2 Introduction *(1st Draft, August 1993)*

3 Organisation of the Report *(1st Draft, August 1993)*

4 Section Authorship *(1st Draft, August 1993)*

5 Preparation of Text *(1st Draft, August 1993)*

6 Preparation of Tables *(1st Draft, August 1993)*

7 Preparation of Figures *(1st Draft, August 1993)*

8 Participation by Correspondence *(1st Draft, August 1993)*

9 Guidance to Authors on Section Content *(1st Draft, August 1993)*

100 NATURAL MARKS FOR STOCK IDENTIFICATION

101 Analyses of Calcified Structures-Fourier Shape Analysis *(1st Draft, K. Friedland, August 1993)*

102 Analyses of Calcified Structures-Truss Analysis

103 Analyses of Calcified Structures-Texture and Spacing Patterns *(1st Draft, K. Friedland, August 1994)*

104 Analyses of Calcified Structures-Morphometrics

105 Shape Analysis of Body Forms-Truss Analysis

106 Shape Analysis of Body Forms-Fourier Shape Analysis

107 Shape Analysis of Body Forms-Morphometrics *(1st Draft, S. Cadrin, Spring 1997)*

108 Meristics *(1st Draft, J. Waldman, November 1995)*

109 Parasites as Biological Tags *(2st Draft, K. MacKenzie and P. Abaunza,November 1995)*

110 Otolith Elemental Composition as a Natural Marker of Fish Stocks *(2 nd Draft, S. Campana, Spring 1998)*

111 Fatty Acid Profiles *(1st Draft, O. Grahl-Nielsen, Spring 1997)*

112 Genetic Analyses-Chromosome Morphology *(2 nd Draft, R. Phillips, Spring 1998)*

113 Genetic Analyses-Allozymes *(1st Draft, M-L. Koljonen, August 1994)*

114 Genetic Analyses-Mitochondrial DNA *(1st Draft, A. Magoulas, November 1995)*

115 Genetic Analyses-Single Copy, Coding; Single Copy Noncoding: and Repetitive Nuclear DNA *(1st Draft, I. Wirgin and J. Waldman, November 1995)*

116 Genetic Analyses-Random Amplified Polymorphic DNA (RAPD) *(2st Draft, P. Smith, November 1995)*

117 Environmental versus Genetic Influence on Identification Characters*(1st Draft, D.Swain, Spring 1997)*

118 Signal Processing of Optical Profiles of Fish Scales for Stock Identification *(1st Draft, T. Ong and S. Saila, November 1995)*

119 Stock Identification Using Complex Fourier Shape Features of Scales *(1st Draft, T. Ong and S. Saila, November 1995)*

200 APPLIED MARKS FOR STOCK IDENTIFICATION

201 External Synthetic Tags

202 Internal Synthetic Tags

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204 Otolith Thermal Marking *(1st Draft, E. Volk, S. Schroder, and J. Grimm, November 1995)*

205 Reward Systems

206 Reporting Rates for Tags

207 Finclipping

208 Pigments, Dyes, and Brands*(1st Draft, S. Schroder and C. Knudsen, Spring 1997)*

300 LIFE HISTORY TRAITS AS INDICATORS OF STOCK SEPARATION

301 Distribution of Early Life Stages *(1st Draft, J. Hare, Spring 1997)*

302 Growth and Reproductive Characteristics

303 The Role of Life History Parameters in Fish Stock Identification *(1st draft, G. Begg and J. Hare, Spring 1998)*

400 VARIABLE SELECTION IN STOCK IDENTIFICATION MODELS

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403 Multivariate Statistics and the Identification of Classification Variables

404 Outlier Rejection in Stock Identification Problems

500 STOCK IDENTIFICATION CLASSIFICATION MODELS

501 Statistical Algorithms for Stock Composition Analysis *(1st Draft, M. Prager, August 1994)*

502 Using Discriminant Function Analysis in Stock Identification

503 Characterising Estimates Variability of Discriminant Function Results

504 Neural Networks in Classifying Biological Populations *(1st draft, S. Saila, Spring 1998)*

505 Maximum Likelihood Estimators of Stock Composition *(1st Draft, J. Brodziak, November 1995)*

506 Non-parametric Methods of Estimating Classification Variability

507 Tests To Evaluate Feature Separation in Stock Identification Models

600 APPLICATION OF STOCK IDENTIFICATION DATA IN RESOURCE MANAGEMENT

601 Principles Used to Establish Management Units, Stock Units, and Populations

602 The Role of Stock Identification Data in Formulating Fishery Management Advice

603 Stock Identification Data Requirements in Quantitative Assessments *(1st Draft, M. Fabrizio, Spring 1998)*

604 Real Time Application of Stock Identification Information

605 Application of Stock Identification Data in Resource Management

606 Identifying Fish Farm Escapees

2 Introduction

There have been many excellent reviews of marking techniques and stock identification (Kumpf *et al.*, 1985; Parker *et al.*, 1990; Anon., 1993), but what is still unavailable to fisheries scientists is a synthetic overview of these subjects with a bent towards application. Many of the reports on stock identification are result-oriented case studies that are too narrowly focused or, conversely, overview perspectives lacking the detail needed to guide researchers. The Working Group will over the course of its meetings, assemble a series of reports organised around the central theme of defining methods for doing stock identification research. The authors of these methods reviews will attempt to explain the application of the methodology as currently accepted by the scientific community while providing worked examples as appropriate and a listing of the important literature references.

When the Working Group has completed its work, recipients of the reports will have a compendium of reviews that will hopefully serve as a valuable source document on stock identification for a number of years. If the Working Group has worked productively, it may be possible to have the series published in some other media such as a Cooperative Research Report or by an outside publisher. In any event, what should be encouraged is widespread participation and aggressive review and revision of these reports.

References

Anon. 1993. Biogeographical identification of English Channel fish and shellfish stocks. Report by IMFREMER Centres and MAFF Directorate to the EC Commission DG XIV, March 1993, 191 pp.

Kumpf, H.E., R.N. Vaught, C.B. Grimes, A.G. Johnson, and E.L. Nakamura. 1985. Proceedings of the Stock Identification Workshop. NOAA Tech. Mem. NMFS-SEFC-199, Panama City, Florida.

Parker, N.C., A.E. Giorgi, R.C. Heidinger, D.B. Jester, E.D. Prince, and G.A. Winans. 1990. Fish-Marking Techniques. American Fisheries Society Symposium 7, Bethesda, Maryland.

3 Organisation of the Report

This report will be organised in an open format. The format is intended to invite and facilitate additions and revisions over time. Part of this open format will require that each section has its own numbering sequence so that new sections can be added in the future without renumbering following sections. Because this is a "source of information" document, it is important to attract the broadest range of expertise available for input on specific sections. This may be best accomplished by correspondence in some cases. At the same time, those of us most involved in the Working Group can greatly facilitate the effectiveness of this project by distributing information about the protocols manual to potential contributors.

It is important to remember that sections of the Methodology are part of the Working Group report and subject to review and revision at the discretion of the Working Group. Section authors do not have special controls over these sections and must be prepared to defer to the consensus view of the Working Group.

Each section should be a stand-alone source of information including all the text, tables, figures and references for that section. Each section should begin with a chronology of revisions, and if appropriate, include an explanation of the revision changes.

The Working Group expects that there will be revisions made to the Table of Contents and does not suggest that the topic subheadings are an exhaustive list. The topics included are intended to express the range of topics the Working Group would hope to cover during its tenure. The Working Group is open to suggestions for additional topics and modification of existing topics.

4 Section Authorship

Each section should have a listing of the contributor(s) for each version or revision. It is suggested that these contributor lists form the basis of authorship if the report is developed into a Cooperative Research Report or book. Authorship should first depend on substantive contribution to the development and writing of the section. The order of authorship should depend on commonly recognised criteria; for example, those that do the most work are usually higher in the authorship order. Obviously, for sections authored by an individual or only a few people, authors will probably find it easier to form a consensus on authorship. A number of sections may undergo revision over time as new information relevant to the section becomes available. Some sections may, therefore, have a number of different authors with differing views on their relative

contribution. If a group of authors fails to find a consensus on authorship order, they may consider alphabetical ordering or a random draw.

5 Preparation of Text

The ICES Secretariat currently uses MS Word as its word processing system. It would be desirable for contributions to the methods protocol to be submitted in hard copy and as Word files. This does not prevent contributors from using other software systems as long as their text can be translated into an electronic format that can be imported by Word. Text formatting should be kept as simple as possible to avoid problems when submissions are reformatted as part of the report.

6 Preparation of Tables

Tables intended for inclusion in methods protocol sections can be prepared as text tables directly included in the text. Tables should be provided in MS Word format or in their native format if they can be translated into Word.

7 Preparation of Figures

Figures can be an effective way of expressing ideas and concepts. The generous use of figures is enthusiastically encouraged.

Figures intended for inclusion in the methods protocol sections can be submitted as original hardcopy or as picture in MS Word files. Other electronic formats that can be easily imported into Word are acceptable as well such as metafiles (.WMF) or bitmaps (.BMP).

8 Participation by Correspondence

The Working Group encourages the widest possible participation of experts in stock identification. Recognising that not all potential contributors will be able to, or desire to, participate in Working Group meetings, contribution by correspondence is encouraged. Contribution by correspondence can be contributions to section content or review comments on sections already developed. Corresponding participants will be afforded the same authorship considerations as those that have participated directly in Working Group meetings.

The current Working Group chairman is Dr Kevin Friedland and he can be contacted at the address below:

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9 Guidance to Authors on Section Content

Sections are intended to be focused explanations of the salient features of selected topics related to stock identification methodology. The target audience is expected to have a basic understanding of fishery and resources management science, but it should be assumed that the audience is new to the specific topic addressed in the section. The sections should be written in sufficient detail for a scientific investigator to use the information as a point of departure on the use of the method. However, the sections are not intended to be in such detail that they would be used as an exact guide to the implementation of the technique or method. The sections should also serve as a source of reference for those interested in evaluating the application of stock identification data. For example, members of ACFM or other assessment oversight committees would hopefully find the reviews presented here useful in technical evaluations of a range of different stock assessments.