ICES MGWG REPORT 2017

Interim Report of the Methods Working Group (MGWG)

13–17 November 2017

Woods Hole, USA

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Recommended format for purposes of citation:

ICES. 2018. Interim Report of the Methods Working Group (MGWG), 13–17 November 2017, Woods Hole, USA. ICES CM 2017/SSGEPI:18. 9 pp.

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Executive summary

The ICES Methods Working Group (MGWG) met in Woods Hole, USA, on 13–17 November 2017, after a hiatus during 2014–2016. The objectives of this meeting were to lay out potential research topics, select an appropriate number of research topics to pursue, form subgroups, and draft project plans with tentative manuscript titles. The group se-lected four research topics, under the following working titles:

1) State-space vs. traditional stock assessment models;

2) Estimating stock-recruitment curves inside vs. outside an assessment model;

3) Appropriate level of stock assessment model complexity;

4) Evaluating the consequences of alternative age selection in cod fisheries.

Subgroups were formed around these topics, with most participants joining two subgroups. The four projects are organized on the group GitHub site (https://github.com/ices-eg/mgwg), where each project was assigned two or more team coordinators. The road ahead was laid out for each project, and work was started by uploading and presenting stock assessment datasets and initial analysis.

As expected, the projects vary in terms of team size, the nature of the work involved, and the tangible progress so far. Overall, the objectives of the meeting were achieved, and the working group participants are enthusiastic to pursue the research topics that they selected.

This first meeting of the working group (after the hiatus) was of an exploratory manner. The scientists are trusted to identify research topics that are of general relevance and high impact in stock assessment methods research. The projects can be expected to continue to develop, and are to some extent influenced by the background and interest of the participating scientists. All projects have in common that they are on the frontier of current stock assessment research, and all efforts by the group are oriented to fit in the format of multi-authored journal papers.

1   Administrative details

Working Group name
Methods Working Group (MGWG)
Year of Appointment within current cycle
2017
Reporting year within current cycle (1, 2 or 3)
1
Chair(s)
Arni Magnusson, ICES Secretariat
Meeting dates
13–17 November 2017
Meeting venue
Woods Hole, USA

2   Terms of Reference

a) Development of new assessment models;

b) Improving existing assessment models;

c) Organise a collection of datasets;

d) Test performance of existing and new models;

e) Develop, improve and test assessment-related techniques

3   Summary of Work plan

Year 1: Prepare for the first meeting, invite people, and organize a discussion on topics of interest. Form sub-groups, identify topics and tentative manuscript titles.

Year 2: Continue working on all ToRs. Finalise ToR c).

Year 3: Finalise manuscripts. Reporting to parent organisations. Plan for continuation of the EG.

4   List of Outcomes and Achievements of the WG in this delivery period

Groupwide outcomes

- **Initial collection of 20 potential research topics**
  Before the meeting, the group created a collection of potential research topics to consider. These were submitted by the working group members, as well as other fisheries scientists across Europe and North America. The topics were:
  (1) Collinear surveys, (2) Model complexity, (3) Data imputation, (4) Data limited assmt, (5) Data uncertainty, (6) High resolution assmt, (7) Fitting to length data, (8) Time-varying M, (9) Analyzing MPAs, (10) Mgmt strategy evaluation, (11) Online assmt environments, (12) Profile and likelihood, (13) Retrospective patterns, (14) Selectivity in cod fisheries, (15) Spatial assmt, (16) Spatial smoothing of survey data, (17) Stock-recruitment estimation, (18) Recruitment of small pelagics, (19) State-space vs traditional models, (20) Analyzing and reporting types of uncertainty.

- **Present and evaluate 20 potential research topics**
  On the first day of the meeting, the group went through all 20 topics, evaluating them in terms of general importance, current gaps in the literature, whether another international group was already working on it, whether it would fit well as a collaborative project and a multiauthored journal paper, and whether the working group had a suitable number of participants that would like to analyze and write about that topic.

- **Recast and select 4 topics to pursue**
  After a first round of elimination based on voting, 10 topics remained, and some of those were later recast and partially combined. The final 4 topics that the working group selected are listed below.

- **Video conferences to invite remote participation**
  Two video conferences were held, to have more scientists from Europe and North America participate in the discussion and join project subgroups.

Project 1: State-space vs. traditional stock assessment models

- **Team coordinators and participants**
  Coordinators: Miller and Nielsen.
  Others participants: Stordal, Magnusson, Berg, Legault, Monnahan, Marsh, Kasper, Trijoulet, Johnson, Deroba, Hintzen, Cadigan, Jardim, Hennen

- **Research question**
  Do state-space assessment models tend to have better retrospective patterns than other models?

- **Project plan**

  Part I: Work with stocks that have shown bad retrospective patterns in the past, from North America and Europe. Apply a variety of models to these datasets, both state-space and traditional models. Evaluate whether the state-space models tend to have a better retrospective pattern.

  Part II: Simulation study designed to analyze in detail the findings and initial conclusions from Part I.

- **Initial analysis**

  A collection of 14 datasets have been uploaded to the GitHub site. Most of them have been analyzed tentatively with one model, but the first part of the project plan calls for analysis of each dataset with several models.

Project 2: Estimating stock–recruitment curves inside vs. outside an assessment model

- **Team coordinators and participants**

  Coordinators: Deroba and Cadigan

  Other participants: Berg, Legault, Marsh, Hart, Jardim, Deroba, Brooks, Miller, Trijoulet

- **Research question**

  What are the main pitfalls when fitting curves to stock-recruitment scatter that is model output rather than data?

- **Project plan**

  This project is based on earlier analysis of the Methods Working Group, last presented at the 2013 meeting. It will also follow up from recent papers such as Brooks and Deroba (2015).

- **Initial analysis**

  Two test stock assessment datasets have been uploaded.

Project 3: Appropriate level of stock assessment model complexity

- **Team coordinators and participants**

  Coordinators: Brooks and Hart

  Other participants: Yanez, Chasco, Hart, Storvik, Takade-Heumacher, Lynch, Jardim

- **Research question, project plan, and initial analysis**

  Still at an early stage. This topic could be taken in different directions, e.g. a review paper and/or guidelines of best practices and/or a simulation study.

Project 4: Evaluating the consequences of alternative age selection in cod fisheries

- **Team coordinators and participants**

  Coordinators: Magnusson, Kasper, and Korsbrekke
  Other participants: Yanez, Schirripa, Earl

- **Research question**

  Some fisheries mainly catch cod at a young age (2–4 yrs), is this a form of underutilization or risking stock collapse?

- **Project plan**

  Part I: Gather data for as many Atlantic cod stocks as possible.
  Part II: Within each stock, calculate recent selectivity and compare to optimal selectivity given life history
  Part III: Compare stocks by applying selectivity A to stock B, and vice versa

- **Initial analysis**

  Data from 3 stocks have been uploaded to the GitHub site, along with initial analysis of the same stocks.

5   Progress report on ToRs and workplan

The work conducted at the first meeting followed the original work plan and reached the objectives (define research topics to pursue, form subgroups, draft project plans).

Now that the research topics have been defined by the working group, this may be a good time to revisit the ToRs and consider how, and to what extent, the research topics relate to the original ToRs a–e:

a) Development of new assessment models

One of the most important developments in stock assessment methods in recent years is the increasing use of state-space models. Project 1 focuses on comparing state-space and traditional models, and has team members that have been particularly active in the development of various state-space assessment models.

b) Improving existing assessment models

Earlier work by the working group has focused on the practice of treating stock and recruitment estimates from assessment model output as data in subsequent modelling efforts. Project 2 focuses on how the methodology of doing so can be improved, to avoid pitfalls and get unbiased estimates that lead to sound inference.

c) Organise a collection of datasets

Open and organized data archives are valuable to evaluate and compare the performance of assessment models. All projects of this working group will make the corresponding data available on the GitHub working group site. This will support open and reproducible research, and enable follow-up studies in the future.

d) Test performance of existing and new models

A common trend among most new models in stock assessment is an increasing level of complexity. Project 3 focuses on comparing the performance of simple and complex

models. The choice of an appropriate model will always depend on which scientific question is being asked, the availability of data, etc. Some guidelines in model choice would be well received by the scientific community, especially when such guidelines are backed up by results from analysis.

e) Develop, improve and test assessment-related techniques

Estimation of age selection (selectivity) in a fishery is a technique that is often a part of age-based stock assessment models. The estimated selectivity is usually seen as more of a by-product in the analysis, rather than the main result. Project 4 focuses on how the estimated selectivity can be presented as a key result of stock assessment-related analysis, to be used as a basis for management advice and management decisions.

In reality, it is not the case that each research project addresses one of the original ToRs. Project 1, for example, is likely to address all ToRs in the end. Before the ICES Methods Working Group convened in 2017, the ToRs were used to frame the scope of potential topics to choose from: strategic goals for the group to keep in mind when selecting and defining the specific research projects.

The suggested way to track progress of this working group is to follow the path of each research project through milestones towards peer-reviewed publications. See table in next section.

6   Revisions to the work plan and justification

The milestones for each project towards peer-reviewed publication include: (1) define research topic, (2) form subgroup, (3) draft project plan, (4) prepare data and analysis, (5) conduct the analysis, (6) draft manuscript, (7) complete manuscript, (8) submit manuscript, (9) follow up with editor and reviewers.

All four research projects are in the early stages of these milestones:

	State space	Stock recruitment	Model complexity	Selectivity
1 Define topic	X	x	x	X
2 Form group	X	X	X	X
3 Plan	X	x	-	X
4 Early analysis	x	-	-	x
5 Complete analysis				
6 Draft manuscript				
7 Complete manuscript				
8 Submit manuscript				
9 Follow up with reviewers				

- not started
x started
X done

7   Next meetings

The 2018 meeting is planned to be held in Italy in September 2018, details TBD.

The 2019 meeting might take place in Seattle, USA.

Annex 1: List of participants

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