Marine Ecosystems Research Programme

Report from combined MERP Module 3 & Module 4 workshop on model ensemble analysis and synthesis

2 March 2016

Attendance:

Hayley Bannister (Sheffield)
Paul Blackwell (Sheffield)
Michael Heath (Strath)
Sheila Heymans (SAMS)
Axel Rossberg (Cefas/QMUL)
Sevrine Sailley (PML)
Natali Serpetti (SAMS)
Douglas Speirs (Strath)
Michael Spence (Sheffield)
Johan van der Molen (Cefas)

<u>**Agenda:**</u>

1. Welcome
2. Results from ensemble modelling so far
3. Linking simulated size-spectrum elasticities to data
4. Differential analysis of driving mechanisms in models
5. Quantifying relaxation time scales and uncertainty for Defra
6. Issues arising
7. Closing

<u>**Minutes:**</u>

1. The meeting was co-chaired by AR and PB. The chairs welcomed the participants, thankful that all contributors to the MERP Model Ensemble were able to join. HB observed the workshop for her interest in model uncertainty and its communication.

2. Participants discussed the outcomes of the first round of MERP Ensemble modelling. With respect to bottom-up effects, models were found to exhibit trophic amplification coefficients between 0.0 and 0.3. It was found that, due to the complex structure of top-down cascades, a corresponding univariate quantification is more difficult for these. Yet, the ensemble delivered an important first outcome: for all ensemble members that span a sufficiently large range of species body-sizes (EwE, SSSM, PDMM, StrathE2E) top-down cascades were strongly attenuating: overexploitation of large fish (> 1 kg maturation size) did not lead to practically measurable effects on zooplankton or phytoplankton abundance. This result was one of several examples of policy-relevant MERP outputs discussed in a recent (23 Feb 2016) meeting among representative of MERP and Defra in London.

3. Different routes to obtaining reliable empirical values for trophic amplification coefficients within MERP were discussed. The workshop agreed that archive data obtained through Module 1, spanning large spatial and temporal scales, appear promising in conjunction with ongoing measurements within Module 2.

4. Participants agreed to postpone work to analyse the mechanisms causing discrepancies in trophic amplification coefficients among models to after empirical data for these coefficients was available, do avoid empirically unfounded deterioration of diversity amongst models in this process.

5. At the recent MERP/Defra meeting in London, Dominic Pattinson (Defra) pointed out the policy need for estimates of the time it takes to reach new, improved environmental states as a result of reduce fishing effort under the revised Common Fisheries Policy, and of current scientific uncertainty of this time. The information will be needed for indicator assessments to be drafted by the end of the year. The workshop decided to address this question using the MERP Model Ensemble. Outlines of a common protocol for interrogating ensemble members were developed by the workshop. The workshop's choice of the protocol was determined by the need for a simple set of rules applicable to all models, while maintaining sufficient realism to generate the policy-relevant information to the required accuracy. Outlining the protocol in brief, models will be run with fixed fishing mortalities representative of the period 1985-1999 until they reach a dynamic attractor or fixed point. Then all fishing mortalities are then reduced by a fixed proportion, chosen to be representative of the relative changes in fishing mortalities between 1985-1999 and ICES proposal for FMSY published in 2015, for stocks where this data is available. Model simulations are then continued and values of approximations of UK MSFD indicators (e.g. LFI) in the models tracked throughout the simulations. The times are recorded when these reach values close to, e.g. within 10% of, the new equilibrium values. The outputs for these relaxation times are integrated using dedicated statistical methods developed within Module 4. A detailed protocol will be prepared by AR and circulated among model operators for comments.

6. The question arose for which UK MSFD indicators next to LFI it could be interesting to determine their relaxation times. The workshop obtained a recent list of UK MSFD indicators and identified among these those which one or more MERP model can represent to some approximation (irrespective of the question whether they are affected by changes in fishing mortality rates).

These where

- Marine bird abundance
- Seal abundance
- Cetacean abundance
- Lifeform indicator
- Zooplankton biomass
- Fish abundance and biomass
- Proportion of large fish (LFI)
- Size composition of fish community (Typical Length, replacing LFI)
- Physical damage to benthos
- Winter nutrient concentration
- Chlorophyll concentration
- Water column turbidity

7. The workshop agreed to continue work in Modules 3 and 4 through correspondence.