

## Working Group on Integrative, Physical-biological, and Ecosystem Modelling (WGIPEM)

2018/MA2/IEASG04 The Working Group on Integrative, Physical-biological, and Ecosystem Modelling (WGIPEM), chaired by Marie Maar, Denmark, Solfrid Sætre Hjøllo\*, Norway, and Sonja van Leeuwen\*, Netherlands, will work on ToRs and generate deliverables as listed in the Table below.

	Meeting dates	Venue	Reporting details	Comments (change in Chair, etc.)
Year 2019	25-29 March	Bergen, Norway	Interim report by 3 May 2019 to IEASG	
Year 2020	16-20 March	Brussels, Belgium	Interim report by 17 April 2020 to IEASG	Marie Maar will stop end 2020 and a new chair will take over during 2020
Year 2021	March/April	Copenhagen, Denmark	Final report by 7 May 2021 to IEASG	

### ToR descriptors

ToR	Description	Background	Science Plan codes	Duration	Expected Deliverables
<b>a</b>	<p>Improve model interactions between trophic levels by:</p> <ul style="list-style-type: none"> <li>-investigating the importance of spatio-temporal scales for trophic match-mismatch</li> <li>-assessing human activities effects on ecosystems, including cumulative impacts</li> </ul>	<p>Fundamental science lying behind the structural and parametric needs for these type of models.</p> <p>Important for IEA groups and WKEWIEA.</p> <p>Linked to Marine Ecosystem Research Program</p>	2.2, 2.5	Annually	<p>Report or paper on how human activities affecting marine ecosystems can be described in the models</p> <p>Report on knowledge gaps related to improving lower-to-higher trophic level models couplings</p> <p>Seek to establish contact to the social science EGs</p> <p>Where appropriate peer reviewed publications are envisioned</p>
<b>b</b>	<p>Improve lower trophic level models by investigating:</p> <ul style="list-style-type: none"> <li>- parametrization of functional diversity (community structure, traits) and adaptations</li> </ul>	<p>More research is needed to improve model description of diversity, adaptation and traits in lower trophic level models.</p> <p>The benthic-pelagic coupling are important</p>	1.3, 1.9	Annually	<p>Collaborative paper on productivity and drivers across models and ecosystems</p> <p>Where appropriate peer reviewed</p>

	<p>- patterns and drivers of plankton phenology and productivity across models and ecosystems</p> <p>- benthic-pelagic coupling in models</p>	<p>for nutrient and energy fluxes and should be better described in the models</p> <p>IEA groups, WGZE and BEWG.</p>			<p>publications are envisioned</p>
c	<p>Improve higher trophic level models by investigating:</p> <p>-effects of connectivity, climate and habitat on emerging species distribution, to support management and fisheries</p> <p>- key process formulation (mortality, physiological rates...)</p> <p>-movement algorithms</p>	<p>Understanding the connectivity between networks of MPA under influence of climate change is vital. Connectivity is also essential to defining the spatial structure of stocks and better understanding of the recruitment process.</p> <p>Fundamental research is needed to improve the description of key physiological processes in models</p> <p>Important for IEA EGs, spatial planning EG, BEWG, WGBIOP, and for advise.</p> <p>In E2E models, movement are essential, and there is a need to assess the characteristics and impacts of each algorithm in different environments (theoretical and/or realistic)</p>	1.3, 1.4	Annually	<p>Collaborative report or paper on the influence of climate on connectivity</p> <p>Collaborative report or paper on movement algorithms used in modelling</p> <p>Appropriate peer reviewed publications are envisioned</p>
d	<p>Assessment of model skill evaluation methods by:</p> <p>-Comparison of existing "guidelines" and metrics of skill assessment using existing examples and applying these methods to models used by the group to conclude on the feasibility of the currently existing</p>	<p>The lack of systematic evaluation of ecosystem model performance and sensitivity currently limits their use in an operational and management context.</p> <p>Evaluation is challenged by the complexity of the models themselves, as well as model vs. sparse datasets comparisons, where characterizing different types of</p>	1.3, 5.3	Annually	<p>Review paper on model skill assessments methods together with WGSAM</p> <p>Appropriate peer reviewed publications are envisioned</p>

approaches and identify possible weakness	variability (mean or trend; interannual or seasonal; rare or extreme events etc.) are needed.
- investigate uncertainty analysis (structural, parameters, scenarios) including model ensemble	Links to all EG using multispecies and Ecosystem modelling (e.g. WGSAM, WGIMM, Working Groups on Integrated Assessment).

### Summary of the Work Plan

<b>Year 1</b>	Annual meeting to report on the state-of-the-art of the topics in ToRa-d, planning of joint papers and specific workshops on selected topics.
<b>Year 2</b>	Annual meeting to report on the state-of-the-art of the topics in ToRa-d and joint meeting with other expert groups. Specific workshop on some of the identified topics.
<b>Year 3</b>	Annual meeting and final report on the state-of-the-art of the topics in ToRa-d, and joint meeting with other expert groups.

### Supporting information

<b>Priority</b>	This group's activities will support the ecosystem approach to fisheries science by combining knowledge of physical and biological processes, and modelling expertise that is required to strengthen our understanding of ecosystem functioning. The group will foster the development of and report on the application of "end-to-end" modelling tools (e.g. Atlantis, Osmose, EwE, size-based model). The activities of the group will foster international collaboration and networking among established and young scientists in a rapidly evolving science field, and should be given high priority.
<b>Resource requirements</b>	The research programmes which provide the main input to this group are already underway, and resources are already committed. The additional resource required to undertake additional activities in the framework of this group is negligible.
<b>Participants</b>	It is envisioned that this group will attract a large community of biologists / experimentalists, and modellers – with an annual meeting attended by some 15–25 members and guests.
<b>Secretariat facilities</b>	None.
<b>Financial</b>	No financial implications.
<b>Linkages to ACOM and groups under ACOM</b>	There are no obvious direct linkages, but discussion and/or workshop with other groups are envisioned.
<b>Linkages to other committees or groups</b>	There is a very close working relationship with all the groups of IEASG. It is also very relevant to WGSAM, WGBE, WGS2D.
<b>Linkages to other organizations</b>	There are natural linkages to PICES Working Group 40: Climate and Ecosystem Predictability, and Joint IMBeR/Future Earth Coasts Continental Margins Working Group (CMWG), and the group will seek to establish communication with these organizations.