Marine ecosystem modeling: using an end-to-end model to test ecosystem models

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Abstract: Knowledge about ecosystem dynamics, species interactions and human influences is essential before implementing ecosystem approach to fisheries management. One way to try to understand such a complex ecosystem is to build an end-to-end model that integrates physical, chemical, ecological and anthropogenic processes. This has been done for the marine ecosystem around Iceland using the Atlantis modeling framework. The model is in three dimensional layout and covers an area of 1,600,000 km^2 that has been divided into 36 active boxes and each box can have up to seven layers including a sediment layer. This model was used as an operating model to test the performance of a simpler ecosystem models, Ecopath with Ecosim (EwE) and Gadget. A methodology was developed to extract data from Atlantis and take into EwE. Balancing and fitting routines were written to make the modeling process more automatic and less subjective. Data rich and data poor scenarios were tested and compared. The Atlantis model offers an opportunity to investigate the performance of other, simpler, ecosystem models by knowing the true Atlantis ecosystem. This is not possible with a real ecosystem as the underlying truth is never really known but only the data from those systems. This study gives an insight into what can go wrong when data with high uncertainty is used in ecosystem models.