Communicating Science of the IiF Model Baseline

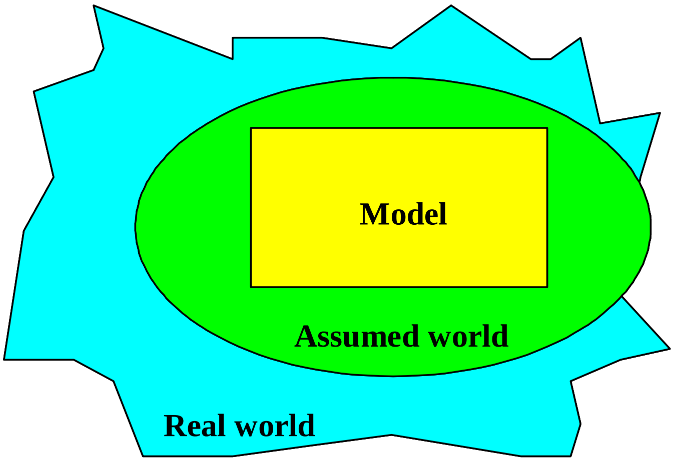
The communication of science to stakeholders is not trivial. Concepts and ways of doing things that are taken for granted by scientists are not always immediately obvious or even acceptable to those who are not familiar with the field of study. Often scientific approaches undertaken are state-of-the-art and in many cases have been built over decades of research. For example, in Europe, fish stock assessment takes place at ICES (International Council for the Exploration of the Sea) Working Group meetings. This collaboration incorporates the data and expertise of scientists throughout Europe.

It is useful to imagine a field of research as an iceberg that scientists are slowly chipping away at. However, to know where 'best' knowledge stands requires an awareness of those chippings. As a result, it is often the case that the 'word' of scientists is accepted without too much question assuming the peer-review process is well-founded. Even so, this does not mean that stakeholders do not have valid questions regarding the technical nature of science. Some of these are discussed in this section, including:

- simple versus complex models;
- short-term versus long-term analysis of results;
- uncertainty regarding model results (often presented as point-estimates);
- the ethics of scientists regarding the evaluation of specific 'what-if' scenarios (or options) – how does this interfere with the philosophy of a stakeholder driven project;
- using the model for induction versus deduction (i.e. indicative results versus predictive results);
- presenting results of options relative to some baseline; and
- the presentation of large sets of mathematical equations. This is 'difficult' for multi-disciplinary groups. In most cases this can be overcome through descriptive presentation rather than using any unfamiliar notation.

It is important to note that throughout the IiFSW model development, details of the model have been presented and feedback from Stakeholders and the Advisory Panel has been sought. For example, catches for fleets have been checked against fishermens knowledge as well as logbook data, and descriptions of fishing activities (i.e. metiers) have resulted in revisions being made to descriptions and parameters. This is in addition to the above points being addressed with stakeholders.

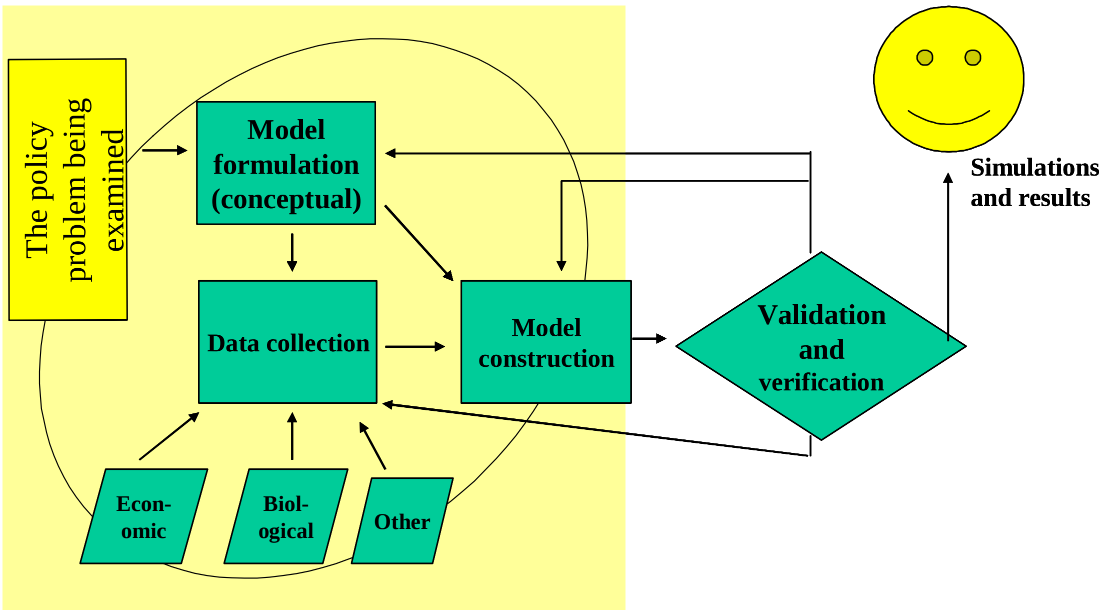
Figure 1 – Representation of the Role of the Bio-Economic Model



Firstly, the concept of the 'model' must be conveyed. Figure 1 shows that in essence, it is a simplified representation of the real world and has significant worth when experimentation in the real world is not practical.

From this, model development goes through a number of stages. Figure 2 shows this process with specific relevance to that undertaken for IiFSW.

Figure 2 – Representation of the Modelling Process

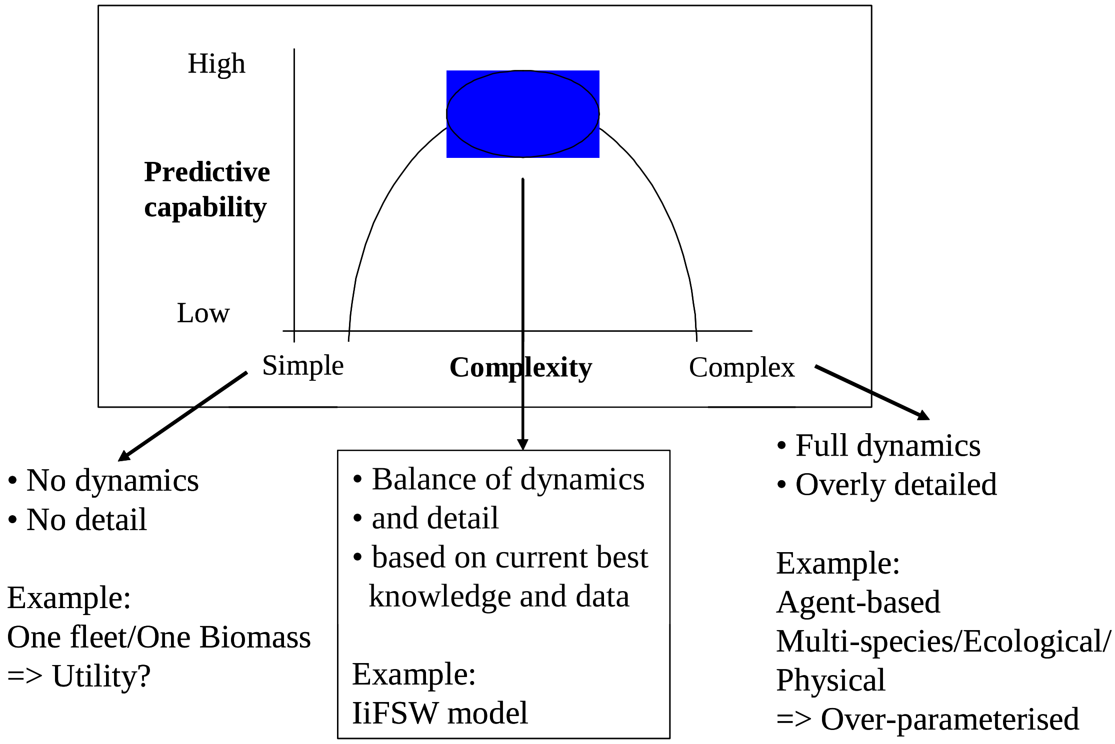


The simple versus complex model debate

Naturally, there are two extremes to the detail included in a model: the simple case where there is minimal detail; and the complex case where there is maximum detail. Both extremes can be useful or not. In the simple case the model will exhibit a low level of realism with few parameters and too many assumptions. In the complex case there are incredibly high data needs with so many parameters and huge amounts of uncertainty given the complex interactions involved. Somewhere in between there is an optimum level of model complexity that is of relevance to the situation being modelled. It will not be the same in every case.

A schematic view of this complexity is presented in the figure below. Somewhere in the middle is where the IiFSW bio-economic model should be and is. In this area, it has a balance of dynamics and detail as well as being based on the current best knowledge and data.

Figure 3 – Representation of Simple v Complex Modelling



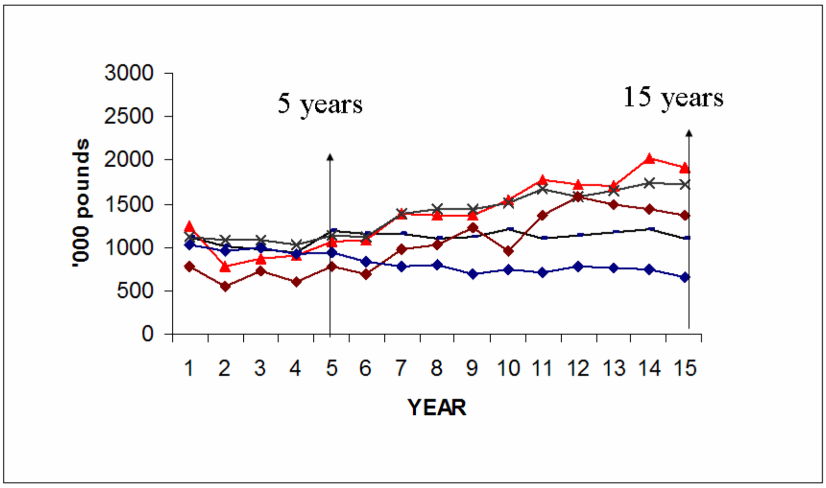
(Source: based on Constanza and Sklar, 1985)

Short-term versus Long-term

It is an obvious concern of any dynamic model that as the model is projected through time, uncertainty in the model results becomes greater over time. In fisheries, this is especially so as there are obvious events (particularly biological and environmental) that can not be accounted for in advance. However, when comparing management options against each other, we need to look at possible changes over time. This is because over a short time horizon (e.g. 5 years), trends in the effects of an option may not be evident. Whereas over a long-term time horizon (e.g. 15 years), these trends may become clearer.

An example using hypothetical data is presented below. After 5 years, the effects of the five options are not clear. However, after 15 years, the trends of the worst performing options versus the best performing options become clear. As mentioned previously, each option is subject to the same basic assumptions, so in a relative comparison across options, it becomes clear which options should be investigated further.

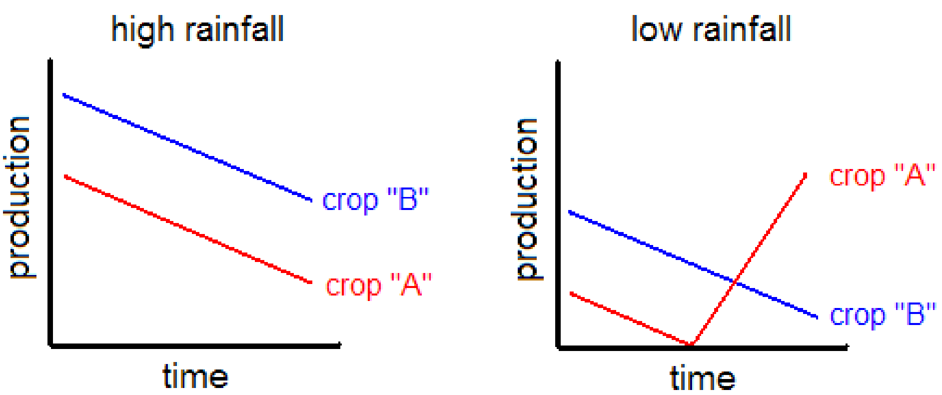
Figure 4 – Short Term v Long Term Modelling



Inductive versus deductive and the baseline scenario

When using relative comparisons, it is important that an indicative view of the results is used rather than a predictive view. It is the options that we are comparing to each other after all. The importance of the baseline in this process is that it is a constant or foundation for testing things against. Allowing the baseline to 'adjust' given some ad hoc rule(s) would remove the power of the model in relative comparison, as different assumptions are then being made and options can no longer be compared for their relative value.

An analogy from agriculture can help show this. If an experimental model evaluates production of two crops over time in an arid country, then results will be highly dependent on rainfall. Take the situation where rainfall is consistently high: both crops survive over time even with production decreasing. However, crop "A" shows almost zero production at the end of the period. But, take the situation where rainfall is consistently low: after a certain period crop "B" is still producing but crop "A" dies due to lack of water. So in this relative comparison, it is clear which option is best under uncertainty, that is crop "B" better than "A" in high rainfall situations.



However, in the "real" world a farmer would water the crop to prevent it dying. So, in this latter case crop "A" would be watered and then it could significantly outperform crop "B". However, crop "B" was not watered which then does not allow an unbiased relative comparison of options to be made. The strength of the baseline assumptions must be maintained to allow for comparisons.