Why an ecosystem approach is the wrong paradigm for the next stage of fisheries management

Christopher Corkett, Biology Department, Dalhousie University, Halifax.

NAFO SYMPOSIUM

Abstract

Scientists from the Department of Fisheries and Oceans (DFO) manage groundfish stocks by collecting biomass measurements that are used to provide scientific advice on catch limits. Clearly, if the data is uncertain or incomplete the scientific advice will be uncertain and incomplete. Better decisions come from finding better data, data that are more certain (by removing uncertainty?) or more complete (**by taking an ecosystem approach?**). However, it is a matter of elementary logic that policy decisions together with goals (such as sustainability) and standards (such as the precautionary principle) cannot be produced from, or be reduced to, facts or data; *decisions have to be taken*.

1. Introduction

There are two ways a decision in the fisheries can be based on facts or data; two ways that can be put in the form of two simplified general schemata (Corkett, 2006a):

decision ← negative feedback ← facts or data Eq.1

facts or data → biomass model → prediction → decision Eq.2

2. Management as decision making

Just as laws are made by a collection of people in a parliament; so regulatory management policies for a fishery are made by a collection of people - *the decision makers* – as are found, for example, in a Lobster Advisory Committee together with the Regional Director General of DFO. Scientific advice based on scientific fact is one of the important inputs the decision makers seek in order to help them make the decisions needed to manage a fishery.

2.1. Feedback models (Eq. 1, Fig. 1A).

The engineer makes decisions all the time and this is done by *trial and error*; that is, a decision is taken (trial) and factual feedback is obtained by 'seeing what happens' (error elimination) (Eq. 1). In the early days of the International Pacific Halibut Commission (IPHC) regulatory policy was guided by a *social engineering* with feedback from a commercial catch-per-unit-effort (CPUE) index under the direction of R.W. Thompson (Fig. 1A). This objective form of managing can be represented by Karl Popper's (1972) analytic problem solving schema, as:

P1 → TP1 → EE1 → P2 → TP2 → EE2 → P3 → …. Eq. 3

where P1 represents the initial problem situation, TP = decision in the form of a trial policy developed by the IPHC to solve the initial problems, and P2 the new problem situation generated by error elimination (EE). Under this objective feedback, goals and objectives (such as sustainability), standards (such as the precautionary principle) and policies (such as a TAC) constitute part of the problem situation (P1, P2, P3… in Eq. 3), as: 'How do we establish and maintain a sustainable fishery?' 'What policy should we adopt to achieve sustainability?'

2.2. Biomass models (Eq. 2, Fig. 1B).

Under the schema of Eq. 2 scientists collect data that is used to form a model that is used to provide advice. This is the type of biomass modeling used in the management of groundfish by DFO. A classical example of a biomass model is given in Fig. 1B where a 'parameter' or prediction of about 30 million pounds for the MSY for Pacific halibut was derived by Ricker (1975) from the same data set used by Thompson in his CPUE feedback model (Fig. 1A).

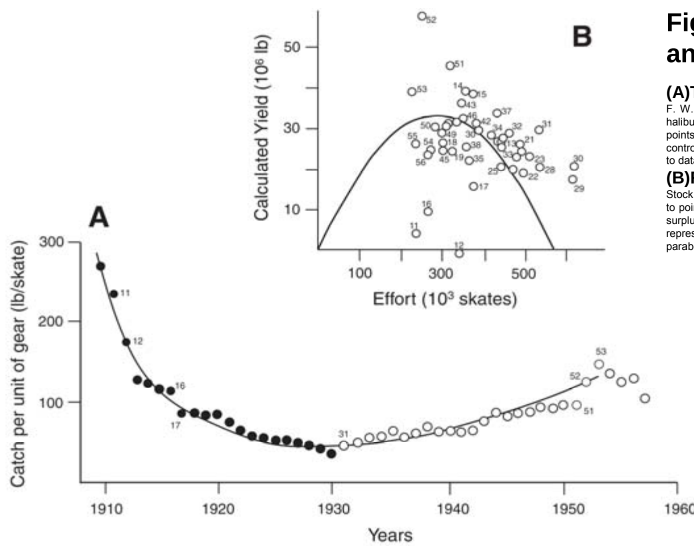

Figure 1. One set of data: two (Thompson's and Ricker's) Interpretations

(A)Thompson's Feedback model

F. W. Thompson's commercial catch (in lbs)-per-unit-effort (in skates) (CPUE) index for the Area 2 stock of Pacific halibut; solid points (•) represent the historical record of over-fishing before the 1931 formation of the IPHC; open points (o) reflect a trial and error social engineering in which the IPHC developed regulatory policy in an attempt to control over fishing; points marked 11, 12, 31, 53 represent years 1911, 1912, 1931, 1953 etc.; the line is fitted by eye to data obtained from Table 13.1 in Ricker (1975).

(B)Ricker's Biomass model

Stock assessment's data based version of the Schaefer model in which a GM regression line is fitted by Ricker (1975) to points representing yields derived from the same IPHC data base used in (A); plots show the relationship between surplus production (yield, in millions of pounds) and effort (thousands of skates); as in (A) plots marked 11, 12, represent years 1911, 1912, etc; no distinction being made between the pre and post 1931 historical record. The fitted parabola gives an optimum 'parameter' of about 30 million pounds for the MSY.

3. Concluding remarks

3.1. Where does biomass modeling go so wrong?

Unlike the feedback model of Eq. 1 where the empirical evidence provides feedback *after the decision has been taken*, DFO scientists collect data that is used to form biomass models that provides advice for the decision *to be taken* (Eq. 2). Clearly, if the database is uncertain the scientific advice will be uncertain; sometimes summarized as: 'Garbage in: Garbage out'. The prediction or advice derived from this kind of model describes a decision to be adopted as, for example: 'The TAC should be 30 million pounds' (perhaps '10 million pounds' allowing for a precautionary approach). However, it is a matter of elementary logic that decisions together with goals (such as sustainability) and standards (such as the precautionary principle) cannot be produced from, or be reduced to, facts or data. Decisions, goals and standards, by reflecting the values of the proponents, form part of the problem situation requiring solution (P1, P2… in Eq. 3); solutions require *ingenious and creative policies* not accurate or 'certain' measurements of biomass!

3.2. Ecosystems form 'better' (more complete) data?

The reason why ecosystem and biomass approaches to decision making are so damaging is that they put the emphasis in entirely the wrong direction; instead of understanding that all decisions *have to be taken* we are now led to believe decisions can be *reduced to facts* - better decisions require better facts – find the 'better facts' and we have the 'better decisions'. Clearly information on ecosystems is 'more complete' or 'more comprehensive' than say lobster landings or cod biomass so that basing decisions on such 'complete' information should lead to better decisions? However, it is a matter of elementary logic that increasing the amount and quality of data cannot turn an unsound argument (Eq. 2) into a sound one (Eq.1 and 3) (Corkett, 2006a).

3.3. Decisions have to be taken

Nobody knows how many lobsters are on the bottom or how many cod are in the sea but even if we did a management decision could not be obtained from this information. Decisions have to be taken; a failure to understand this simple fact ensures our mistakes with the management of groundfish stocks will continue and may even be repeated with the future management of lobsters (Corkett, 2006b).

References

Corkett, C. J., 2006a. Karl Popper's Organon and the world's fisheries: fish stock assessment as a pseudoscience, an inductivism that can bear no fruit. *Paper presented to the International Institute of Fisheries Economics & Trade (IIFET) Portsmouth conference: Rebuilding Fisheries in an Uncertain Environment. Portsmouth, UK, 11-14th July 2006.*

Corkett, C. J., 2006b. Can we stop the lobster going the way of the cod? *A report prepared in response to the FRCC's request for opinion on how to reduce risk in Atlantic Canada's lobster fishery*.

Popper, K. R., 1972, Epistemology without a knowing subject, In *Objective Knowledge*, pp. 106-152, Oxford, Clarendon.

Ricker, W. E., 1975, *Computation and Interpretation of biological statistics of fish populations*, Bulletin No. 191, Department of the Environment, Fisheries and Marine Services, Ottawa, Ontario.