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Why Iceland Has a Cod Fishery and Newfoundland Does Not.

Chris Corkett uses the Principles of Transference and Barrenness in an analytic explanation for why Newfoundland lost its cod fishery

Introduction

As everyone knows Newfoundland's Northern cod fishery has been under a fishing moratorium since 1992 with the stocks still showing no real sign of recovery some 13 years later. However Newfoundland is not alone in being short of cod. Britain, for example, has long been unable to satisfy demand for its traditional fish & chips and now has an annual demand for cod of 170,000 t well above the British fishing fleet's quota for North Sea cod which, in 2002 was just under 34,000 t.[1] By contrast, Iceland and Norway both have cod fisheries that are in excellent condition with 'fishing quotas of both countries fluctuating only slightly from year to year around an average of 190,000 t.'[1] Cod is Iceland's biggest fish export and this Island country supplies much of the British demand for cod, a lucrative market it meets with value added chilled and frozen cod fillets.

Assessing Iceland's success and Newfoundland's failure: an analytic or science of science approach

So what lessons can we learn from Iceland? Perhaps if we study the history of their fisheries we can find some factual difference from those of Atlantic Canada that will explain Iceland's success. This is not the approach I take in this article; here, I do not look for factual answers but look for analytic answers; analytic answers are applicable universally and are sought for the management of commercial fisheries by applying the *Principle of Transference* – what is true in logic is true in scientific method. So when a scientific method analyses science-based activity, the method becomes a *science of science*.

Who are the management decision makers?

Just as laws are made by a collection of people in a parliament (or in some societies by a single Monarch); so regulatory fisheries policy is made by a collection of people (the decision makers) in a fisheries commission (or in some cases by a single Minister of the Crown). 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.

How are decisions based on scientific fact?

From a logical point of view there are two ways a decision can be based on facts or data; two ways that can be put in the form of two simplified general schemata:

(a) facts → model → positive prediction → decision
(b) decision ← negative advice ← facts

Under scientific schema (a) it is very clear how the decision makers get their advice; scientists collect data that is used to form a model that is used to provide advice. Clearly, if the data is uncertain the scientific advice will be uncertain; sometimes summarized as: ‘Garbage in; Garbage out’. This is the type of scientific modeling used by the Federal Department of Fisheries (DFO) and the type of advice it produces will be called *positive political advice*; it is the type of scientific advice given the decision makers responsible for managing the Newfoundland cod stocks. This advice is referred to as being ‘political’ since it is not neutral in policy terms. It describes a decision, a political or policy decision to be taken as, for example: ‘The total allowable catch (TAC) should be 20 million pounds’. Less clear is how the decision makers obtain their scientific advice under schema (b).

How is advice derived from a science?

Since we are making use of logical analysis we do not answer the question ‘What is scientific advice?’ with the obvious: ‘Scientific advice is advice given by scientists’ but rather re-phrase the question to read: ‘How is advice derived from a science?’ and turn to the laws of physics (and physical engineering) as a paradigm on which to base our answer.

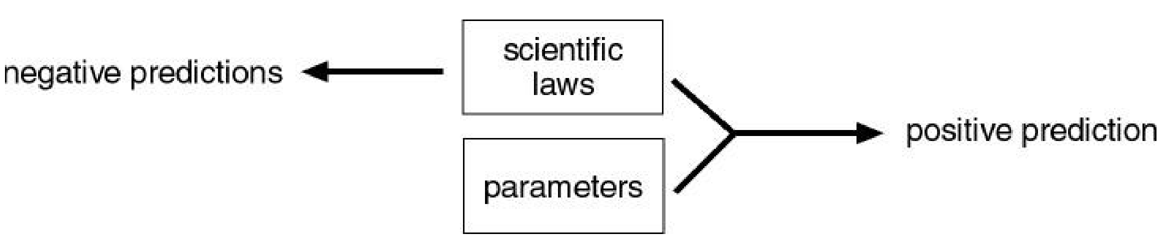

Fig. 1 An analytic illustration of how the laws of physics (i) predict the weather with *positive* predictions, predictions derived from the dual premises of scientific laws and their parameters and (ii) guide an engineering with *negative* predictions, predictions deduced from the scientific laws themselves (after the philosopher Karl Popper).

Logic involves a study of the transfer of truth (or the retransmission of falsity) between the premise and conclusion of a formal argument. Under the Principle of Transference, a prediction, such as the prediction of tomorrow's weather ('positive prediction' in Fig. 1), becomes a conclusion derived from dual premises where one of the premises represents the scientific law ('scientific laws' in Fig. 1.) and the other the parameters in the law ('parameters' in Fig. 1). We will call this type of prediction a *positive apolitical prediction*, apolitical because it does not describe a decision that is to be taken.

It is not generally realized however that, from the logical point of view, by far the most common type of scientific prediction is not positive at all but *negative*. The physical engineer is guided by negative scientific predictions ('negative predictions' in Fig. 1); predictions that set limits on what can be achieved. These negative scientific predictions, unlike the positive predictions which are dual premised, are deduced directly from the scientific law itself.

We are now in a position to understand decision making schemata (b) above; here the management decisions of a *social engineering* are guided by negative predictions, generalized predictions that tell the fisheries manager what can not be accomplished and should not therefore be attempted ('negative predictions' in Fig. 1). We will refer to this kind of advice as *negative apolitical advice* - 'apolitical' since, like the prediction of weather, it is not descriptive of a policy decision.

So far so good, but we have a problem. If scientific advice is given as advice that describes what *not* to do; how do the decision makers know what actually to do?!

How do the decision makers decide what to do?

Again we look to our paradigm of the physical sciences for answers as to how decisions are made but this time we look, not to the laws of physics, but to physical engineering. 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). We can represent this engineering decision making by the schema:

(c) decision ← error elimination ← facts

Schemata (b) and (c) have clear similarities and can be summarized by the *analytic problem solving schemata* provided by the philosopher of science, Karl Popper [2], as:

$$P_1 \rightarrow TD \rightarrow EE \rightarrow P_2 \rightarrow TD \rightarrow EE \ldots etc. \qquad (1)$$

where P_1 = the initial problems including the goal to be pursued (How do we obtain a sustainable fishery? How do we obtain further employment for our fish processors?); TD = tentative decision, a tentative policy that reflects the chosen goal; EE = error elimination, objective feedback by which the effectiveness of the policy is assessed and P_2 = the new problems and consequences that arises as the result of the decision taken.

So what are the social laws that guide the fishery decision makers?

So far we have been talking about scientific laws and have used the laws of physics as our paradigm. It is pretty obvious to everyone we have nothing like the laws of physics to guide our fishery decision making – so what is it that forms the scientific laws for the fisheries? The answer is surprising and, at first glance, not very convincing; it is the models of fisheries economics that form the 'scientific laws' that guide our trial and error managing; again, we turn to logical analysis to make our case.

Iceland and its tradition of fisheries economics

Models of theoretical economics are built around 'agents' that act entirely rationally. In fisheries economics this modeled rationality involves a totally unregulated fishery, referred to as an *open-access* fishery that allows for the prejudicial nature of derby fishing to be assessed logically. Just as the laws of physics set limits on what can be accomplished by the engineer, the logical models of fisheries economics give *negative advice* that explains what can not be accomplished by a decision taking; as:

'You *cannot* obtain a sustainable fishery (goal) while at the same time providing unlimited jobs for fishermen (social objective)'

'You *cannot* obtain unlimited jobs for fishermen (goal) without using tax payer's money'

'You *cannot* obtain a sustainable fishery (goal) without controlling the prejudicial behavior of fishing derbies'

'You *cannot* control fishing derbies (goal) without assigning property rights in the form of Individual Transferable Quotas (ITQs)'

The point I am making here is *not* that these examples are necessarily true or even particularly good (they may or may not be well corroborated by

the facts). The important point is these examples show how, from the logical point of view, scientific advice takes the analytic form of a *politically neutral* conditional argument, as:
‘*If* you choose to accept goal or objective A *then* you *cannot* at the same time achieve goal or objective B’
‘*If* you wish to achieve goal A *then* you have to control consequence B’ or:
‘You *cannot* achieve goal A without also controlling concomitant effect B’

A fisheries economic tradition involves *negative apolitical advice*. Options and goals, together with their potential problems, are presented to the decision makers but the decisions, *and the responsibility that goes with these decisions*, remain entirely in the hands of the decision takers. This is quite different from the positive advice given to fishery management by DFO science; positive advice that is not politically neutral since it describes the actual policy decision that should be taken, as, for example: ‘The TAC should be 20 million pounds’

Where does DFO science go so wrong?

The scientists at the Federal Department of Fisheries (DFO) frequently complain that the politicians do not listen to their advice, and indeed there is some truth to this; but, from a logical point of view, it is not at all surprising DFO advice is not listened to since this advice itself is not politically neutral; quite simply, there is no reason why DFO’s advice describing the decision to be taken (such as: ‘The TAC should be 20 million pounds’) should not be changed for political policy reasons! Why should the decision makers not strive to reduce unemployment (goal) by favoring a TAC of, say, 30 million pounds instead of 20 million pounds? Or strive to raise the standard of decision making by apply the precautionary principle (standard) and setting a TAC of, say, 10 million pounds or should it be 5 million pounds?

Unlike the ‘decision first’ of scheme (b) above, DFO advice follows schema (a); here, decisions come after the facts since they are seen as being derivable from facts. The reason this approach is so damaging is that it puts 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’. Whereas 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.

Concluding comments

Individual Transferable Quotas (ITQs) were introduced into Iceland in 1984 and Iceland has had over 20 years to overcome some of the many difficulties associated with this way of maximizing economic benefit. It is very easy to find objections to the ITQ system; detractors point out, for example, you end up with the smaller fishing boats being bought out; the larger boat owners and processors end up owning much of the available quota. Quite so, but if your goal is to maintain high employment for fishermen and processors then you should never even consider introducing a management system involving quota ownership. However, if your goal is to establish and maintain a sustainable fishery you will then appreciate the wisdom of involving market forces in both reducing and controlling overcapacity. The supporters of the ITQ system point out that under this system of economic benefit vessel owners have an incentive to buy one another out, a form of fleet downsizing that, contrary to the usual practice, reduces fishing overcapacity without involving government money[3].

Unlike Iceland, Newfoundland has never had a real chance to even begin to control its overcapacity; DFO scientific advice; advice on which the Newfoundland fishery decisions have been based has been fundamentally flawed in three basic ways:

1. Newfoundland's management decisions have been guided by models that model fish populations (and more recently describe ecosystems); while we need to understand fish populations and ecosystems, these are not the models needed to guide political and management decisions; social science models, models that allow us to understand the prejudicial behavior of derby fishing, are needed for guiding management decisions.
2. Newfoundland's management decisions have been guided by positive *political* predictions; while positive predictions (such as a prediction of the weather) exist, these are not the predictions based on facts that are needed to guide decisions; negative *apolitical* predictions, conditional predictions that outline what cannot be achieved are needed for guiding policy decisions.
3. It has been generally assumed that the goals and standards of Newfoundland's fisheries may be reduced to facts or data. Fishery goals (such as sustainability) and fishery standards (such as the precautionary principle) form normative laws (not scientific laws); like decisions, normative laws or norms reflect the values of the proponents and cannot be produced from, or be reduced to, facts or data.

These three fundamental errors in methodology have meant that the management of Newfoundland's fisheries has been, and continues to be, guided by a science of science or scientific method that is both illogical and irrational; but does this matter? Just as a *science* is contained by its own laws, a *science of science* or scientific method is contained by the laws of logic; just as we can expect empirical consequences if we break the laws of a science there are methodological consequences if we break the laws of a logic, consequences that can be summed up under the *Principle of Barrenness*, as: 'Irrational scientific methods can bear no fruit'. Quite simply, the long established irrationality of a DFO science has never given Newfoundland the same chance as Iceland; the chance to take control of its overcapacity and so achieve a sustainable cod fishery.

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