

5 The challenge of communicating science effectively in fisheries management

Doug S. Butterworth



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Introduction

This chapter presents a short case study of a particular field of science communication: scientific advice to decision-makers¹ in fisheries management. Scientific advice to decision-makers is a special type of science communication, as it is directly linked to political decisions. Thus, the advisory process requires certain institutional structures that guarantee the quality of the process.

The chapter commences with a very brief introduction to fisheries management: what are the basic objectives, and what makes them difficult to attain. It then proceeds to summarise the basic structures that underlie the process of developing scientific advice for fisheries management measures, and of transmitting this advice to decision-makers (such as the government ministers responsible) for final decisions. This is discussed both in a South African and international context, addressing whether they are working and where the problems lie.

Finally, problems in the way scientists try to communicate scientific results in these processes are highlighted, with some suggestions given of how they might be improved.

¹ 'Decision-maker' is the term customarily used in fisheries management; other fields may refer to 'policy-maker'.

Fisheries management (in brief)

At base fisheries management has two objectives. The first is the sustainable utilisation of a renewable marine resource such as a fish population – both use for the present, and also maintaining the potential to continue that use indefinitely into the future. The second is the recovery of depleted resources – if previous over-exploitation has depleted a resource to a low level of abundance where it can provide only a small sustainable yield, facilitate that resource's growth back to a higher abundance where that sustainable yield will be larger (ideally to provide the maximum sustainable yield).

Sustainable utilisation mirrors the situation of a pensioner who retires with a lump sum invested in a bank. To continue to live 'sustainably', the pensioner must live off the interest, and not dip into capital. The pensioner's annual budget process is simple: multiply the sum invested by the interest rate per annum offered by the bank, and then ensure that projected annual expenditure does not exceed the result of that computation.

So why is the equivalent process not as straightforward in fisheries management? The answer is that fisheries have uncooperative bank tellers. Typically, the information available for the capital multiplied by interest rate computation has the following features:

1. Capital:
 - The amount is advised only once a year (e.g. by a sampling survey of the resource conducted by a research vessel in what is an expensive exercise).
 - Typically, the result will be in error by some 25%.
 - The units differ from those for amounts withdrawn (the catch taken), e.g. balance in roubles, withdrawals in rands, and no information on the exchange rate.

2. Interest rate:
 - No advice is available on the interest rate.
 - The rate varies greatly from year to year – often within a

range from negative by up to half the overall average to positive and triple that average.

- The value of that average rate has to be inferred from few and noisy data.

Hence the computation each year of a catch level that will be sustainable is much more difficult than the multiplication which a pensioner needs to do. In essence, the underlying problem stems from the fact that fisheries is an inexact science.

Furthermore, difficult trade-off decisions are required. For a depleted resource, rapid recovery will require a large reduction in the current catch; with slower recovery, that reduction can be smaller. Unsurprisingly, commercial interests tend to favour the latter given the immediate losses in profitability and employment associated with the former. Small-scale industry has an even greater preference for the latter option because it will typically not have the access to the cash reserves which larger companies can use to see out a period of poor financial returns before resource improvements (hopefully) occur later. In contrast, environmental non-government organisations (ENGOS), such as the World Wide Fund for Nature (WWF) and Greenpeace, will advocate the rapid recovery option with a longer-term perspective in mind.

Many interest groups and professions can become involved in the resultant discussions and provision of advice: applied mathematicians, statisticians, biologists, oceanographers, economists, social scientists, lawyers (even judges), civil service managers and bureaucrats, industry, ENGOS, journalists and politicians. Many of these can be acting as advocates for certain interest groups.

At the end of all this, the decision-maker is frequently left with a difficult task, namely to make sense of available scientific evidence as well as the information provided by other groups, to relate it to the interests of various stakeholders, and to shape a decision that is, ideally, both epistemologically and politically robust (Lentsch & Weingart, 2011).

Basic advice and decision structures in fisheries management

Generally, these structures have four levels, though those can differ in detail from one dispensation to another.

1. *A technical team* of scientists (usually mathematical specialists) who conduct the basic calculations for catch limits – these calculations are termed ‘assessments’ of the resource.
2. *A scientific committee* of scientists with a broader range of specialities (occasionally some other stakeholders too), responsible for developing scientific recommendations for management measures (including catch limits in particular).
3. Some form of ‘*intermediary group*’ that may assume many forms, but essentially reflects the interface at which scientists, managers and stakeholders (such as industry and ENGOs) will exchange views on the scientific committee’s recommendations; these recommendations are then forwarded (perhaps amended and likely embellished) to decision-makers.
4. *Decision-makers* who are seldom scientists, and are responsible for making final decisions on management measures.

Note that it is at the third of these levels at which the effective communication of science and the results it provides is of the most importance, if that science is going to have its appropriate impact on final decisions.

South African structures

Local structures differ somewhat from the general form set out above.

1. *A technical team* of scientists who may be drawn from government agencies, academics or freelancers on contract, and industry; such groups develop the assessments.

2. *Government department scientific working groups* (typically one for each fish species group, for example, for small surface shoaling fish including sardine and anchovy). The (voting) members of these groups are scientists, mainly drawn from the government department responsible, but observers representing stakeholders (such as industry and ENGOs) are generally permitted and participate quite fully in discussions. These groups develop scientific recommendations for management measures.
3. An *intermediary discussion process* within the responsible government department. This process is primarily internal amongst civil servants, though at times includes other stakeholders.
4. *Decision-makers*, usually the minister of the government department responsible, though the minister sometimes delegates this responsibility to the deputy director-general (DDG) responsible for fisheries. Final decisions on management measures are made at this level.

Effective communication (to non-scientists, i.e. laypersons) of science and the results it provides becomes important here at the second level. But it is at the third level where this communication process may often matter most, and unfortunately may frequently be poor because of under-representation of scientists. In other words, preparing the decision may become over-politicised at an early stage at the expense of giving due weight to scientific evidence.

How well are these structures working?

Over the first 15 years of this century, there was only one instance of a non-trivial change made at a higher level to a scientific working group recommendation for the catch limit for a major South African fishery. Probably this is a record second to none elsewhere in the world.

While communication of science in the scientific working groups has not been perfect, it has been adequate. Often the standard scientific conference style of presentation of results is

used, though in a more interactive and conversational format with much more intensive discussion than customary at scientific symposia. Understanding of those results has been aided by most of the observers either having a scientific background or being highly qualified senior executives from major companies.

However, starting in 2016, a highly problematic situation developed regarding the West Coast rock lobster (known colloquially as *kreef*) fishery. By way of background, this resource is highly depleted, primarily as a result of the very heavy exploitation that took place in the 1950s and 1960s. The resource's abundance at present is estimated to be only some 2% of what it was about 100 years ago before large-scale harvesting commenced. The harvesting policy had been one of slow rebuilding of the resource (a more rapid rate of rebuilding would have necessitated sharply reduced catch limits and consequent socio-economic hardship). This lobster species, being relatively easily caught close to the coast, is also an important component of the government's small-scale fisheries policy, which aims to empower marginalised coastal communities by granting fishing rights to co-operatives within those communities.

The year 2016, however, brought a marked change in perceptions of this resource and fishery in general. There was strong evidence of a recent marked reduction in the abundance of the resource, particularly in the important Cape Peninsula region. This was coupled to evidence of substantial increases in poaching (illegal fishing) in this region. The scientific working group recommended a marked reduction in the allowed catch limit so as to prevent further reduction in abundance and restore sustainable utilisation. But the decision-maker – the DDG responsible for fisheries – decided to maintain the existing catch limit (see Rogers, 2018).

This sequence of events was repeated in 2017. As a result, in July 2018, WWF instituted litigation seeking that future West Coast rock lobster catch limits be set consistent with sustainability. Two months later, Justice Rogers issued a landmark and precedent-setting judgment (in that it applied also more widely

to other renewable resources and to decisions relating to them as well) in the Cape High Court (Rogers, 2018). He found that the DDG's catch limit decision the previous year had violated the South African Constitution and the relevant national environmental and fisheries laws, and had been irrational. He also emphasised the need for such decisions to be based on the best available scientific evidence.

The government subsequently reduced the West Coast rock lobster catch limit for the 2018/19 season in line with a two-year step-down process, as recommended by the scientific working group. The minister and DDG initially gave notice of intent to seek leave to appeal the judgment (e.g. see Nkwanyana, 2018a). This gave rise to concerns that if the appeal were successful, some South African marine fisheries products might no longer be acceptable for import into certain countries with strict provisions that fish products come from sustainable fisheries. However, in December 2018, the government changed its mind and decided not to seek leave to appeal the judgment.

In terms of science communication, the chief concern to which this sequence of events gave rise was that evidence provided to the court by the DDG (see Rogers, 2018), together with press statements made by the minister's spokesperson (Nkwanyana, 2018a, 2018b), demonstrated an absence of fundamental understanding of the scientific concepts underlying sustainable management of renewable resources.

International structures

Fisheries that take place in international waters (outside national 200 nautical mile exclusive economic zones), or in the national waters of more than one country, are generally managed under Regional Fishery Management Organisations (RFMOs). The most important of these in terms of high-value fisheries are the five tuna RFMOs, including, for example, the International Commission for the Conservation of Atlantic Tunas (ICCAT). Their structures mostly follow the general form set out above quite closely.

1. *Scientific sub-committees* consisting of scientists who conduct assessments.
2. *A scientific committee* of scientists, generally (but not always) restricted to the nominees of member governments, who may also include fishery managers and/or other stakeholders. These develop scientific recommendations for management measures.
3. Some form of '*intermediary group*' comprising scientists, managers and stakeholders who may modify and/or extend the recommendations to be made to decision-makers (the Commission itself).
4. *The commission* consisting of one commissioner (usually a senior civil servant) from each member state who vote on the final decisions to be made.

RFMOs, which typically try to operate by consensus, often experience many difficulties in discussions and reaching such decisions. For example, most have many member countries (often in the dozens). There are usually very different levels of ability and experience amongst the scientists and amongst the managers from these different countries. This can make a consensus on other than 'no change' (status quo) to catch limits difficult to achieve, and this has at times led to poor performance by these organisations in managing their fisheries.

Commissioners (and also government fishery managers) are typically more skilled at negotiating (involving, for example, sharing an overall catch limit), but less comfortable when participating in scientific discussions.

A form of 'competition' can arise with other international organisations which have partly overlapping responsibilities. One such example is the Convention for International Trade in Endangered Species (CITES), particularly as national delegations to RFMOs tend to be dominated by representatives from fishery departments, while those to CITES tend to come primarily from environment departments, and these two groups often have conflicting views on utilisation versus species protection trade-offs.

An attempt to improve this situation

Recently, a broad initiative has developed to attempt to improve this situation by adopting what is called a ‘management procedure’ approach to recommending catch limits in these organisations (Butterworth, 2007; Punt et al., 2016). The approach was first developed in the scientific committee of the International Whaling Commission in the late 1980s. The primary motivation behind this approach was the simulation testing of proposed formulae to set catch limits so as to ensure that they were appropriate in the face of uncertainty about resource abundance and productivity, i.e. even if best perceptions about the resource were wrong, the formulae would self-correct adequately to ensure the resource was safeguarded, hence taking due account of the precautionary principle (Anon., 1992).

The approach has since been adopted in, for example, some national fisheries in South Africa, Canada and New Zealand, and internationally by the North Atlantic Fisheries Organisation for Greenland halibut and by the Commission for the Conservation of Southern Bluefin Tuna for that species (see Punt et al., 2016; Nakatsuka, 2017).

A key aspect of the approach is that the data inputs and formulae to be used in calculating catch limit recommendations for the next few years are *pre-agreed*; in other words, the rules are agreed before the fisheries management game is played out. In this way, it is hoped that consensus can be built around the catch limit recommendation arising from this process, rather than reverting to the status quo, so that catch limits will change in scientific accordance with the changing status of a resource.

A positive development in this process of achieving wider usage of the management procedure approach was the agreement by all five tuna RFMOs that they would all move in the direction of setting catch limits on this basis in the future (Anon., 2011). However, progress is not proving as rapid as initially hoped, with one somewhat surprising reason being advanced that it is scientists themselves who constitute the major stumbling blocks to the process. Complaints include the fact that there is a lack of

commonality in explanations given and material (such as tables and plots of results) provided by scientists in different RFMOs, which confuses stakeholders (particularly government managers) who often attend meetings of more than one of these RFMOs. There are complaints that many scientists are themselves not well versed in the concepts that underpin this new management procedure approach.

Essentially then, it is scientists' poor ability to communicate with stakeholders from outside their scientific discipline that is argued to be the root of the problem. This realisation led, in turn, to an initiative launched by the PEW Organisation in 2017 to improve the situation, as discussed in more detail below.

Addressing problems in communication between scientists and stakeholders in fisheries

A scientist's basic training runs along the lines that any conclusion (and related recommendation) put forward must be prefaced by statements of the assumptions made, and a full explanation of the underlying analysis to provide defensible justification for the advice provided. Often scientists' expectations of stakeholders and decision-makers is that they will interact on the basis of this scientific paradigm, and will have the time and interest to participate fully in the associated scientific discussions.

Generally, however, stakeholders and decision-makers simply do not follow the scientific paradigm. Many scientists need to better realise that presentations of their arguments must be styled to target their audiences, which in fisheries will often consist primarily of laypersons. A senior official in the Australian southern bluefin tuna industry, also with considerable experience in negotiations with politicians in that country, advises that Australian government cabinet ministers generally want to hear no more than the recommendation itself with possibly a soundbite on the underlying rationale. This preference on the part of politicians has been aptly expressed by the famous quote attributed (amongst

others) to President Truman: ‘give me a one-handed economist’.² Personal experience of international courts has indicated that (unsurprisingly) the primary ability required by counsels in presenting their cases in these fora is to style their presentations in a manner that will maximise understanding by and impact on the judges.

Essentially therefore, when fisheries scientists present to primarily lay audiences, they need to be able to reverse the standard scientific approach which they were taught. Hence present ‘top-down’ rather than ‘bottom-up’, i.e. start with the conclusion, and follow that with the essence only of the justification for that conclusion, expressed in laypersons’ language.

This was the main message to emerge from the PEW organisation’s initiative mentioned above. In January 2017, they organised a workshop including primarily scientists and stakeholders from RFMOs which had successfully implemented the management procedure approach to try to distil what had been the main reasons behind those successes. The outcome is reported in Miller et al. (2018). The workshop’s primary recommendation was for a greater focus on meetings of ‘intermediary groups’ to allow for improved scientist–stakeholder interactions, together with the development of improved visual communication tools for the presentation of what are often quite complex results.

Conclusion

To summarise on the key science communication needs for fisheries, in South Africa these would seem to involve improved interactions between scientists and decision-makers. The recent judgment by Justice Rogers in the Cape High Court (see above) should assist, given the emphasis it placed on the important role for science in management decisions for fisheries.

More generally, there is a need for scientists to better style and focus their presentations and interactions for primarily layperson

2 <https://quoteinvestigator.com/2019/04/10/one-handed/>

audiences. An increase in the interaction between scientists on the one side, and stakeholders and decision-makers on the other, in ‘intermediary groups’ within the fisheries management decision structures, would also be advantageous.

It is evident that the general guidelines for science communication to the general public are not the most appropriate in contexts where scientific evidence is needed to inform decisions which have direct political and/or economic consequences, or may adversely affect the natural environment. While the effects of science communication to the general public are rarely ever evaluated, the communication of scientific evidence or the lack thereof to stakeholders or decision-makers are evaluated by implication if decisions are based on this.

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SCIENCE COMMUNICATION IN SOUTH AFRICA

Reflections on Current Issues



**Edited by Peter Weingart,
Marina Joubert & Bankole Falade**

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