CHAPTER 15
BRINGING EXPERIENTIAL KNOWLEDGE INTO FISHERIES SCIENCE ADVISORY PROCESSES: LESSONS LEARNED FROM THE CANADIAN EXPERIENCE OF PARTICIPATORY GOVERNANCE

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Abstract

Canada has made a policy commitment that the science peer review and advisory processes of government departments should be transparent and inclusive of diverse sources of knowledge. During this policy's development, the Canadian Science Advisory Secretariat experimented with many approaches to include fishermen and others with experiential knowledge in the science-based meetings to assess fish stock status and produce harvest advice. Approaches explored included a) "open door", b) institutional representatives, c) invited individuals, d) industry "observers" without full intervention privileges, e) alternating technical meetings of scientists and non-technical meetings with industry. This paper reviews the strengths and weaknesses of each approach.

Among the lessons learned are:

a) Invited individuals with full participation rights has the most strengths and fewest weaknesses.
b) Never designate an individual at a science meeting as a **representative** of an organisation or sector.
c) The presence of media is highly disruptive.
d) Skilled chairs of inclusive meetings are essential (and hard to find)
e) 'Consensus advice' does not mean all participants must agree on a single interpretation of stock status and harvest. It is enough to reach consensus on the risks and the evidence consistent and not consistent with competing interpretations, and let the political process manage the risks.

15.1 Introduction

It is well established that people whose lives are associated with living resources and marine ecosystems acquire substantial knowledge about ecosystem relationships, the status of species in the ecosystem, and the interactions between human activities, such as fishing, and major ecosystem components (Neis and Felt 2000; Murray *et al* this volume; Vodden *et al* this volume). Many other chapters in this book document the potential value of incorporating such information into fisheries management. Such incorporation of knowledge requires not just processes for recording that knowledge, however. It also requires processes for applying that knowledge to the decisions being made and fisheries management plans being developed. This chapter is about the effectiveness of various mechanisms which have been tried by governments to bring that knowledge into the formal scientific advisory processes, as a key step leading to the development of fisheries management strategies and plans.

T. S. Gray (ed.), Participation in Fisheries Governance, 249–268.

The nomenclature used to make reference to this type of knowledge is diverse. Experts make many carefully nuanced distinctions among terms like 'traditional ecological knowledge', 'aboriginal traditional knowledge', 'community knowledge' (Haggan *et al* 2003). I use the collective term 'experiential knowledge' to refer to the broad category of knowledge gained through focused personal experience rather than through designed and controlled experiments or systematic scientific monitoring and data analysis (Stanley and Rice 2003). The term is intended to be broadly inclusive of all types of knowledge gained through experience, and not to differentiate among the heritage of those holding experiential knowledge, or the dynamics of the community in which they live. I do not assume that the experiential knowledge gained is independent of heritage or community context; rather, the processes being discussed for applying that knowledge to decision-making do not differentiate among the various sources of experiential knowledge.

Much of the literature on the use of experiential knowledge in fisheries management focuses on community-based management approaches (Dyer and McGoodwin 1994; Wilson and Delaney this volume; Vodden *et al* this volume). Without judging the relative value of community-based management compared to other approaches, in practice it is currently the exception rather than the rule. Can the benefits of incorporating experiential knowledge in fisheries management be obtained from management systems that are currently more widely used?

The processes used by governmental and international agencies to develop fisheries management strategies and plans are complex and often poorly documented, but typically include both well-structured processes for obtaining advice, consultation, and decision-making; and informal, opaque (not transparent) expressions of politics and power (Parsons 1993; FAO 1997). They can differ substantially according to provisions of national legislation and international treaties. Nonetheless, in essentially the entire developed world, fisheries management and policy bodies receive formal scientific advice from some source (Table 15.1).

These science advisory bodies give science advice a privileged place in government decision-making and policy development. The justification is that science advice is considered to be intrinsically different from most of the other types of input that policy and management experts receive while developing fisheries management plans. Science advice is supposed to be objective, impartial, value-neutral, and empirically-based, whereas 'advice' received from other sources is considered to be to some degree partisan and advocacy-oriented towards the social or economic objectives of the source. The information base for such 'advice' is thought to be selectively filtered by those social and economic objectives, whereas the information base for science advice is considered to be filtered only by professional standards for testing robustness and reliability of results. There is a vigorous debate in the social sciences about the degree to which scientific advice from experts in the natural and physical sciences meets the high standards of objectivity and empiricism (Pickering 1992; Hannigan 1995; Irwin and Michael 2003).

Table 15.1. Examples of the ubiquity of formal science advisory processes associated with various national fisheries management agencies and regional fisheries management organisations (RMFO)

Country / RFMO	*Science advisory body*	*Recipient of advice*
Australia	Fisheries Assessment Group*	Management Advisory Committee
Canada	RAP/ZAP/NAP (Regional, Zonal and National Advisory Processes; coordination by Canadian Science Advisory Secretariat and regional satellite offices*)	Fisheries Resource Conservation Council, Pacific Fisheries Resource Conservation Council, Minister of Fisheries and Oceans
European Union (and member states)	ICES Advisory Committee on Fishery Management and Advisory Committee on Ecosystems	DG Fisheries, Northeast Atlantic Fisheries Commission, International Baltic Sea Fisheries Commission, North Atlantic Salmon Conservation Organisation. (others)
New Zealand	Independent Contractors*	Ministry of Fisheries
United States	Regional Scientific and Statistical Committees, in turn supported by SARC (Northeast Atlantic, Mid-Atlantic), STAR (North Pacific and Pacific), SEDAR (South Atlantic, Gulf of Mexico) committees of the National Marine Fisheries Service	Seven Regional Fisheries Management Councils (Northeast; Mid-Atlantic; South Atlantic; Gulf of Mexico; Caribbean; North Pacific; Pacific
International Commissions for the Conservation of Atlantic Tunas (ICCAT)	Standing Committee on Research and Statistics	ICCAT Commission
North Pacific Anadromous Fish Commission (NPAFC)	Committee on Scientific Research and Statistics	NPAFC Commission
International Pacific Halibut Commission	Scientific Peer Review Committee	Commissioners
Northwest Atlantic Fisheries Organisation (NAFO)	NAFO Scientific Council	NAFO Commission

* Industry Participation permitted

I will not address that debate here, although if science does not meet those standards, then there is little justification for its privileged place in policy formation and management decision-making. For this chapter, however, I will assume that it is possible for science advisors to apply those standards in their work, and advisory processes should strive to meet those standards in their structure, dynamics and outputs. I address the challenge of trying to augment the data, analyses, and information characteristic of contemporary fisheries science with the additional insights and information of holders of experiential knowledge, without losing the goals of objectivity and impartiality that are the basis for the privileged place that science has in decision-making and policy formation. **What can be done to make science advice more inclusive of wider sources of 'knowledge' while still (or finally) deserving its privileged place in governance?** In what follows, I answer this question in the light of my experience of fisheries governance in Canada, where, during the last ten years, five different 'experimental' approaches to the problem of including fishermen's knowledge have been tried.

15.2 The current role of fishermen in science advisory processes

At present, fishermen have very limited roles in the science review and advisory processes used in many regions of the world. Science Advisory Committees of groups such as the Northwest Atlantic Fisheries Organisation (NAFO), the Pacific Salmon Commission, and the International Commissions for the Conservation of Atlantic Tunas (ICCAT) have industry members restricted to observer status. Observers can address the science bodies during their deliberations, but the interventions are scheduled and usually time-limited. The privileges extended to industry observers do not include participating in the give-and-take debate characteristic of challenge-style peer review and advisory meetings, nor in the word-smithing of the consensus advice from the body. The US, Australia, and a number of other counties have Regional Advisory bodies, typically supporting two levels of discussion of stock status and management prior to management decisions. There is, first, a science process (the STAR panels in the US Northeast, SARC Panels in the US Northwest, and SEDAR panels in the US Southeast) where industry observers have very limited intervention privileges. These science advisory processes report to a second-level committee where industry has substantial representation and privileges, and the science advice may or may not form the foundation for their work.

Many of these international and national agencies have begun to acknowledge that fishermen have information and perspectives that can increase the body of information on which science advice can be based, and reduce uncertainties about stock status and trends and impacts of the fishery. Meetings between scientists and industry participants are encouraged prior to the assessment meetings, so industry information can be extracted, consolidated, and used subsequently in the science processes. To my knowledge, the success of these pre-meeting consultations between science and participants in the fishing industry has never been evaluated formally. In fact, it is not even clear what currency would be used to measure 'success': the satisfaction of fishermen and scientists with their interactions; the sheer quantity of information which originated with the industry that ended up in the outputs of the science advisory processes; or the reliability of the science advice at the end of the process?

Interestingly, in talking to senior officials of various agencies, one of their key measures of 'success' of these two-tiered processes is the degree to which the fishing industry buys into the output of the science advisory process. Their goal is to increase the credibility of the science process, rather than to expand the information input to those processes. If giving industry members an opportunity to input at least narrative information into the science process reduces industry opposition to advice coming out of the science process, then they feel that the efforts have been worthwhile, even if the industry input is not apparent in the science outputs.

The feedback that I have received from both science and industry participants in these two-tiered processes is mixed, however. Uniformly, though, if industry participants do not see the information they contributed to the consultations somehow reflected – or at least acknowledged – in the outputs of the science process, they rapidly become cynical about the separate-and-not-equal role that they are given. They commonly see these two-tiered systems as inherently giving experiential knowledge second-class status. The perception is that where typical fisheries science analyses of surveys, population

reconstructions via sequential population analyses (Quinn and Deriso 1999) can be the basis for a parameter value or determination of a trend, information from industry is only referenced when it is consistent with the parameter or trend estimate. If the input from industry does not match the 'science' information, the industry information is either ignored or explained away. This creates stress and distrust between fishermen and scientists.

Moreover, it appears to me that agencies where the role of industry participants in science processes is most tightly constrained, also tend to be agencies where decision-making is most centralised – although again these processes have not been studied formally. These agencies do have consultation processes where the fishing industry is supposed to give input to decision-makers with regard to what management options should be chosen (given the conclusions about stock status and trends). However, when these consultation processes give the industry little real power (and responsibility), then it is a common experience for the industry to try to use their presence in the science process to influence decision-making on management, as well as conclusions about stock status. This increases the tension between the scientists in those meetings and the industry participants, further stressing the entire process.

The issue of fishermen's participation in science advisory processes is particularly divisive in Europe. The International Council for the Exploration of the Sea (ICES) has been discussing with clients of its advice what role, if any, industry members should have at the assessment working group and subsequent advisory committee level. There are deep divisions among member countries, and the positions of agencies which request (and pay for) advice from ICES also differ greatly. Importantly, some countries and some clients have grave reservations about *any* presence of persons associated with the fishing industry in Working Groups or Advisory Committees. The reason given is always that their presence even as silent observers will still politicise the science process, and pressure individual scientists to abandon best science practices in order to avoid angering the industry members who will be following their every word. Some of this debate is summarised in the report of the 5th Dialogue Meeting of ICES from Dublin in 2004 (ICES 2004), where options as artificial as allowing fishing industry members to sit in a different room and watch the science meetings over a video feed were discussed.

Fishermen are not the only stakeholders excluded from a meaningful role in science review and advisory processes. Many environmental groups have well-credentialed scientists who can bring different interpretational ideas to the same data and analyses used in the science review and advisory meetings. These experts may frame different hypotheses, or give credence to different assumptions, even when starting with the same corpus of information. Good science practice embraces many hypotheses as legitimate to test, and should encourage challenging assumptions, so a strong case can be made that these groups should be included fully in the science review and advisory processes. Nonetheless, ENGOs are rarely given full status in the science review and advisory process, again because of concern that they would bring a biased approach to all the discussions – though biased in a different direction than that of the fishing industry.

15.3 Impetus for change in the Canadian science advisory processes

The past decade has seen wider acknowledgement by governments that top-down

management does not work as well as stewardship and co-management approaches (Hall-Arber, Hernes *et al*, and Wilson and Delaney, all this volume). In Europe, the Directorate-General for Fisheries (DG Fish) is introducing Regional Advisory Councils (RACs) to give stakeholders a more direct voice in governance, while ensuring the industry input is provided in a structured and transparent manner (EU 2003). In Australia, the Management Advisory Councils, with primarily industry membership, also input directly to the Australian Fisheries Management Authority (Commonwealth of Australia 2003). In Canada, the Fisheries Resource Conservation Council (FRCC) was created in 1993 as the formally designated advisory body to the Minister of Fisheries and Oceans on Atlantic fisheries, composed of a majority of members from the fishing industry, augmented by academics and provincial representatives (FRCC 2004). Two years later, the Pacific Fisheries Resource Conservation Council was created, with a similar makeup and mandate for Pacific salmon fisheries.

In making the management side of governance more inclusive, calls to make the science processes advising the governance systems more inclusive as well have been inescapable. In Canada, a policy of increased inclusiveness was adopted earlier than in most jurisdictions. The collapses of Atlantic cod and other groundfish from the late 1980s to the early 1990s, and widespread closures starting in 1992 with Newfoundland cod (Rice 2002; Rice *et al* 2003) prompted an angry Minister of Fisheries and Oceans to dissolve both the science advisory committee (Canadian Atlantic Fisheries Scientific Advisory Committee - CAFSAC) and the industry advisory board on management (Atlantic Groundfish Advisory Committee - AGAC) (Parsons 1993). AGAC was replaced immediately with the FRCC, whereas the science review and advisory processes were devolved to regional processes, working with general guidelines and a fairly vague mandate (Anon 1994). Assessments were reviewed and conclusions regarding stock status and trends were provided to the FRCC, which was supposed to consult widely with the fishing industry on management options, given the stock status, before formulating management advice to the Minister (behind closed doors). Very quickly, different research centres and regional authorities began to diverge in their approaches to the science review and advisory tasks, and the industry began to use the FRCC consultations to contest the science assessments of stock status, rather than to discuss management options with stock status as a given.

Within a few years, it became clear that greater coordination of the science review and advisory processes was needed to ensure consistency and credibility of the work being presented to the FRCC. The Canadian Stock Assessment Secretariat (CSAS in its earlier form) was created in 1996 with a mandate to coordinate the regionally-based processes. To reverse the trend of using FRCC consultations to contest the science advice, CSAS was also explicitly mandated to make the science processes fully inclusive of academic experts and experiential knowledge, with full participation by persons from the fishing industry as well as environmental organisations.[1]

The mandate to make the science peer review and advisory processes inclusive of more types of knowledge got a boost from a report entitled Science Advice for Government

[1] In 2000, following implementation of Canada's Ocean Act, the mandate of CSAS was expanded to guide and coordinate peer review and provision of advice on all oceans management issues as well as fisheries issues. CSAS then became the Canadian Science Advisory Secretariat

Effectiveness (the 'SAGE Report', CSTA 2000), produced by the Federal Government Council of Science and Technology Advisors. The SAGE Report was the basis for a government-wide policy developed by the Privy Council Office and adopted by the Canadian Cabinet (2000). This policy, which applies to all science advice used in government decision-making, has six fundamental Principles, with associated Guidelines (Table 15.2).

Table 15.2. Extracts of text from Principles and Guidelines from Science Advice for Government Effectiveness (CSTA 2000)

Principle	*Associated Guidelines*
Early Issue Identification: Departments need to anticipate, as early as possible, those issues (representing both challenges and opportunities) for which science advice will be required. A broad base of advice can lead to improvements in the timeliness of issue identification.	• Cast a wide net (consulting internal, external, and international sources); • Support and encourage science and policy staffs to establish linkages with each other and with external and international sources. • Maximise the use of expertise across government departments to identify and address 'horizontal' issues; • [Two other Guidelines].
Inclusiveness: Input should be drawn from a variety of scientific sources and from experts in many disciplines in order to capture the full diversity of scientific schools of thought and opinion so as to enhance the debate and draw in scientific findings, which may not otherwise be considered.	• Science input and advice needs to be sought from a wide range of sources; due weight needs to be given to the 'traditional knowledge' of local peoples; decision makers need to balance the multiple viewpoints received; • While advice from external and international sources needs to be sought regularly, it is especially important to seek such advice in the following situations: o [four listed]; • Decision makers need to be open to both solicited and unsolicited advice from external sources.
Sound Science and Science Advice: The public expects government to employ measures to ensure the quality, integrity, and objectivity of the science and the science advice it utilises, and to ensure that science advice is considered seriously in decision making. Due diligence procedures for assuring quality and reliability, including scientific peer review, need to be built into the science advisory process.	• All advisory processes, including those involving traditional knowledge, need to be subject to due diligence. This should include rigorous internal and external review and assessment of all input, analyses, findings, and recommendations of advisors; • Science advice needs to be supported by research and policy analysis (4 subpoints); • Selection of advisors needs to: o be balanced to reflect the diversity of opinions and to counter potential biases; o include at least some experts from other, not necessarily scientific, disciplines; o [two others]; • Advice providers need to: o clearly distinguish scientific fact and judgement from their personal views; o [two others]. [Further guidelines giving responsibilities of

Principle	*Associated Guidelines*
	Departments and Decision-makers are listed]
Uncertainty and Risk: Science in public policy always contains some uncertainty and often a high degree of uncertainty which must be assessed, communicated, and managed. As such, it is important to consider adopting a risk management approach	[Four guidelines]
Transparency: Democratic governments are expected to employ decision-making processes that are transparent and open to stakeholders. Transparency implies a clear articulation of how decisions are reached, policies are presented in open forums, and the public has access to the findings and advice of scientists as early as possible…decision-makers need to treat the science advisory function as an integral part of the management process	• Departments need to allow scientists freedom to pursue a broad base of inquiry and undertake widespread and thoughtful discussions; • Departments need to publish and disseminate widely all scientific evidence and analysis (other than proprietary information) underlying policy decisions, and show how the science was taken into account in policy formulation; • Decision makers need to explain how the advice they received was used and why the ultimate decision was made; • [Three other guidelines].
Review: 1) subsequent review of science-based decisions to determine whether recent advances in knowledge impact the science and science advice used to inform the decision, and 2) evaluation of the decision making process.	• Departments should capture best practices that emerge from the advisory process and feed these into their guidelines for use of science advice in the future; • [Three other guidelines].

The prominence of Inclusiveness and Transparency as two of the six pillars of science advice in government empowered the CSAS to push aggressively on a programme of assuring the presence of individuals with experiential knowledge in *all* meetings that were to produce science advice to fisheries management or policy.

This institutional mandate to proceed was essential to implementing change, because there was entrenched reluctance in some quarters to bring the fishing industry and environmental groups into the science processes. Reasons for this reluctance were diverse. Parts of the science community were concerned that the presence of fishermen would lower the technical quality of the review, and allow weaker science to be the basis for advice on management. Parts of management and policy sectors were concerned that too much transparency would undermine the effectiveness of the science advice, through revealing how many sources of uncertainty really were present. Throughout all sectors of the department were pockets of suspicion that industry and environmental participants would not respect the rules of objectivity and non-partisan consensus-building, and use the science forum to push their policy agendas. At a practical level, the science review and advisory processes in the four Atlantic Regions (Newfoundland, Scotia-Fundy, Gulf, and Quebec) had evolved in different directions since CAFSAC had been dissolved, and in the Central and Arctic Region and Pacific Region, their processes had never been under the guidance of CAFSAC. These Regional differences meant that a common nation-wide policy on inclusiveness ran into different institutional impediments – some formal and many informal – in different parts of the country, so the path to planning and implementation of consistency was bumpy.

Notwithstanding the reservations in various parts of the department, between 1996 and the early years of this decade, the Department for Oceans (DFO) made its science peer review and Advisory Processes inclusive of people with experiential knowledge in all their advisory tasks at National, Zonal, and Regional scales (NAPs, ZAPs, and RAPs). In all cases, the changes were not just allowing the **presence** of these people at the meeting, but giving them full **membership** in all steps from presenting original material, through challenge and debate of other presentations, to helping to formulate the consensus advice.

In making this fundamental change, we experimented with many different ways to bring those with experiential knowledge into the peer review and advisory processes. In retrospect, these 'experiments' should have been conducted much more formally than they were. When we began, those of us driving the change were unaware of how precedent-breaking our 'experiments' were, and failed to appreciate fully how much more could have been learned from pre-identified performance measures and structured evaluation of the results of each meeting. Rather, we were primarily just trying to make a real-world change successful, and had to take an opportunistic approach to each challenge. We had no control over who from DFO participated in each meeting, and often limited control over who attended from outside the Department. Hence, the degree of shared commitment to make the new processes work was an uncontrolled variable across all our meetings. Moreover, replication and scientific controls of a review and advisory meeting were nearly impossible, so the evaluation methods in which we had been trained were inappropriate.

Despite these short-comings in our 'experimental' approach, over a few years we converged on a number of generalisations from our experience. These have proved a sound basis for codifying the 'rules' of participation in our various types of meetings (Anon 2004). These 'rules' have the flexibility to deal with a variety of types of meetings, while ensuring that all the DFO science review and advisory processes meet the SAGE guidelines for inclusiveness and transparency. The rest of this paper presents the five different models for inclusiveness that we explored, the strengths and weaknesses we identified (particularly weaknesses considered nearly fatal), and what overall lessons we have learned.

15.4 Five approaches explored

In this section, the five different experimental approaches that were tried are explained. They are listed in rank order of the degree of participation by fishermen that they incorporated, from the highest degree to the lowest.

15.4.1 OPEN DOOR

This approach incorporates the highest degree of fishermen's participation, and it may be characterised as 'inclusive participation'. Here, the peer review and advisory meeting is publicised widely through industry and media outlets. Participation of specific individuals from industry, academia, and environmental groups may be encouraged, but all who show up are given full privileges of participation. Anyone can make presentations or challenge other presenters, and all participate in what becomes the consensus advice.

15.4.2 ORGANISATIONAL REPRESENTATIVES

This approach incorporates the next highest degree of fishermen's participation, and it may be characterised as 'representative participation'. Here, for each peer review and advisory meeting, a list of relevant industry organisations, environmental groups, and community associations is assembled. Some or all of these groups are asked to send one or more representatives to the meeting. These representatives have full participation rights in all stages of the meeting; presentation of material, challenge of other presenters, and development of consensus advice. The meeting is closed to those not sent by any organisation which was invited to send one or more representatives. Informal Chatham House rules apply, such that outside the meeting, the substance of the deliberations can be discussed but interventions may not be attributed to individuals or sectors.

15.4.3 INDIVIDUAL INVITEES

This approach incorporates a medium degree of fishermen's participation, and it may be characterised as 'invited participation'. Here, the same list of groups is assembled as in Approach 2, and individuals known to be respected or influential within each group are listed. This list of individuals is often augmented by names of individuals known to be respected among their peers, even if they are not part of formal associations. From this list, CSAS (or the Regional Review and Advisory Offices) picks a slate of individuals who are invited to the meeting. Selection is usually made in consultation with the scientists working on the stock and clients of the advice in Fisheries Management, and often options are discussed with key industry organisations. The selection aims for balance among perspectives (fishermen and environmentalists) and among fleet sectors and harvesters and processors in complex fisheries. All who are invited have full rights of participation, as in the preceding approaches. The meeting is closed to those who have not been invited, and the same informal Chatham House rules are supposed to be followed.

15.4.4 SCIENTISTS MEETING WITH INDUSTRY OBSERVERS

This approach incorporates a lower degree of fishermen's participation, and it may be characterised as 'observer participation'. Here, scientists have a standard assessment meeting with working papers, technical review, and development of consensus advice, in which only scientists are participants. Industry is allowed to be present, usually with selected individuals invited to be observers, or selected associations asked to send an observer. The observers usually are allowed to address the meeting at particular points on the agenda, and sometimes even may be allowed to pose questions of scientists presenting working papers, once the review by the scientists is largely completed. The scientist-to-scientist challenge and response has higher stature in the meeting, and observers have no rights during the development of the scientific advice. This model was never an intended goal of the push to make the meetings inclusive, but for regions sharing trans-boundary stocks with the US, this model was both familiar and strongly promoted by colleagues from the US.

15.4.5 ALTERNATING MEETINGS

This approach incorporates the lowest degree of fishermen's participation, and it may be characterised as 'consultee participation'. Here, non-technical meetings with industry and technical meetings of scientists are held in alternating sequence. This approach was favoured initially by many scientists and departmental administrators, and is similar to the 'sandwich approach' attempted by ICES in 2004. A small group of scientists go to a major fishing centre and have an open meeting with fishermen. The scientists summarise their research results, invite comment from industry participants, and ask the fishermen for their views on the state of the resources. The scientists then go back to their laboratory, conduct analyses, and assemble the general contents of the stock assessment. The scientists then return to the fishing community, discuss their results with the fishermen, and get the fishermen's views on their conclusions. The scientists then revise their assessment as they feel appropriate, hold their peer review and advisory meeting in a scientist-only setting, and prepare a draft of assessment results and conclusions. The results of the assessment are usually discussed one final time at a meeting in the fishing community, with the intent of gaining feedback that will guide improving the clarity of conclusions and draft advice.

15.5 Strengths and weaknesses of each approach

In this section, the five different approaches are evaluated for their success or failure.

15.5.1 OPEN DOOR

15.5.1.1 *Strengths*

This approach ranks as the highest on inclusiveness and transparency. Industry feels highly empowered in this approach, and most like it. They feel it offers them the greatest degree of democratisation of the entire management process, and gives them the fullest opportunity to input to evaluation of stock status and associated scientific advice. In several parts of Canada, the fishing industry is highly fractionated into diverse gear sectors, geographic subdivisions, and linguistic profiles. An 'Open Door' policy means that all industry sectors are present and may participate, no matter how complex the fishery. In this approach, a diversity of perspectives are sometimes presented, so all participants are challenged to defend their contributions to the assessment. With most scientists untrained in conducting rigorous but respectful 'peer review' of experiential knowledge, this approach usually results in different industry sectors cross-examining each others' contributions, while the scientists refrain from appearing to doubt or oppose statements by any single industry sector. However, the sense of ownership of the advisory products by industry is actually highly variable in this approach. It can be very high or very low, depending on the dynamics of the meeting. If the interactions of all the industry sectors, environmentalists, and scientists can be kept constructive, industry confidence in the meeting products can be high.

15.5.1.2 *Weaknesses*

Within one or two assessment cycles, these meetings become unworkably long and large. Very large rooms with layouts not conducive to dialogue are necessary. It becomes nearly impossible to pursue complex topics in depth because dozens of people can be waiting on the speakers' list. Hence there can be long gaps between related interventions, and several different points of discussion can be in play at once. With large numbers of people potentially speaking on each topic, it becomes very difficult to

establish the direction in which a real consensus may be found. Individuals can and do orchestrate their interventions to make it appear that a particular point of view has gained far more momentum that it really has. This can be sorted out eventually, when it comes time to establish the point on which consensus has been reached, but only with investment of a very large amount of time. Moreover, notwithstanding full explanations of the 'rules of engagement' for science peer review and advisory meetings, feuds between different sectors of the industry, between industry and environmental groups, or dissatisfactions of anyone with the science components of the assessment or even past departmental actions, all tend to be raised and sometimes played out at the table. Again, this can be managed, but only by very strong and experienced meeting Chairs, who pay a heavy toll for the role they had accepted. Over time it has become very difficult to find individuals adequately knowledgeable of fisheries science who are willing to chair meetings using an 'Open Door' approach.

Furthermore, if the industry is not only divided, but sectors are unequal in size and organisational support, then the format ends up being biased against independent and weakly organised groups. Many fishermen are not comfortable speaking out in large meetings, nor in meetings organised to address science issues, and the combination of these circumstances means that the true amount of original contribution from the industry may be much less than inferred from the number of people present at the meeting.

Also, these meetings can become very expensive if any travel assistance is offered to participants. To be perceived as fair, if support is offered to any participants, all participants should receive the same support. Offering support to no-one immediately biases the 'Open Door' meetings towards the wealthiest sectors and the sectors or interest groups living closest to the meeting venue. This consistently prompts strong protests from those who feel they are being *de facto* disenfranchised from what is supposed to be a science peer review and advisory meeting, not a consultation. Keeping this type of meeting within a budget is very difficult.

Finally, with a highly diverse participation, particularly if there are internal antagonisms among sectors, any achievable consensus is confined to high-level and abstract conclusions. Attempts to move the conclusions and advice to specific points tend to prompt competing sectors to wish to add riders that are unacceptable to other sectors. Uncertainties in science data sources, analyses, and modelling results tend to be emphasised by either industry or environmentalist participants (depending on the direction of the uncertainty) as reasons why no strong conclusions on stock status can be drawn. As a result, the scientific advice from such meetings may be of comparatively little help in supporting hard management decisions, and additional science input is required, usually through informal and sometimes undocumented sources. Finally, once a meeting has been conducted in an 'Open Door' format, it is very difficult to move back to more restrictive formats. Industry feels that their rights are being withdrawn unilaterally, even if they have had the opportunity to participate for a very short time. This approach should only be tried, therefore, if one is ready to live with it for a long time.

15.5.2 ORGANISATIONAL REPRESENTATIVES

15.5.2.1 *Strengths*

This approach also ranks high on inclusiveness and transparency, and where the fishing industry and environmental groups are well organised, the associations feel particularly empowered. 'Organisational Representatives' also facilitates having the experience of all the different sectors presented, and usually someone relatively at ease with meeting formats will contribute the experiential knowledge. Both fishing industry and environmental groups are good at choosing representatives who present their knowledge and perspectives articulately. This results in a good diversity of perspectives being presented, with discussions sometimes becoming quite technical. This trend builds over time, because associations tend to send the same representatives to numerous meetings, so they learn how the meeting dynamics work, and develop the same histories of interactions that have long characterised the traditional science-only assessment review and advisory meetings.

These meetings can be cost-effective logistically and tractable to run, because numbers can be fairly closely controlled. Moreover, if the representatives feel they have been effective in having their experiences and perspectives captured in the science conclusions, there is a fair sense of ownership of the meeting products spread throughout the industry. On the other hand, if one group feels that its interests lost out to those of another group, even if the choice was strictly on objective factual grounds (hypotheses can be refuted, and data sets or analyses shown to be fatally flawed), then the whole sector may reject the legitimacy of the conclusions and advice.

15.5.2.2 *Weaknesses*

Over time, meetings applying this approach usually lose any semblance of pursuing objective, non-partisan science. Just by being named a 'representative', most participants abandon any pretence of objectivity and impartiality. They are there to **represent** the interests of their organisation, and take that role more seriously than helping a science peer review and advisory process achieve its objectives. When individuals are representatives of particular sectors, they commonly come to review and advisory meetings with clear organisational guidance that they cannot agree to any conclusions which are counter to the interests of the organisation. Industry sectors may focus on impeding consensus conclusions which would have detrimental social and economic consequences for their sectors, but representatives of environmental groups can resist just as doggedly any conclusions contrary to policies that their organisation has adopted. In both cases, the factual and analytical evidence for a particular conclusion may be compelling, but their responsibilities as a representative of their organisation commonly take priority. As a result, meetings are frequently characterised by substantial confrontation between competing industry sectors, between industry and environmental groups, and between any of the parties and government scientists, over issues of policy, not science. Strong meeting chairs can reduce this tendency, but in all of DFO there is only a handful of scientists with the technical skills and meeting skills to run such meetings successfully.

15.5.3 INDIVIDUAL INVITEES

15.5.3.1 *Strengths*

This approach allows for good coverage of all perspectives, through care in the selection of the slate of invitees. It thus ranks high on inclusiveness and transparency, again as

long as the slate of invitees is balanced and broad. It is possible to get a mix of individuals who understand and respect what a science review and advisory process is, and come prepared to make it succeed in its goals, rather than just to promote sectoral interests. The meetings can be kept at a tractable size and cost-effective, by distributing the range of invited participants carefully across organisations and functional communities according to common interests and experiences. Compared to the two preceding approaches it is also often easier for a meeting Chair to keep the meeting focused on the agenda, and on peer review and integration of all the types of knowledge into science advice.

Individuals who are invited feel an obligation to participate actively, because they understand that there are limited places at the table and they have been selected as having particularly valuable experiential knowledge to contribute, and perspectives to share with other participants. Moreover, as long as they are confident of individual anonymity, industry members can and do make candid interventions which help to establish actual stock status and true activities of the fisheries on the water, even when their interventions are not in the short-term interests of their industry. Invitees from environmentalist perspectives sometimes offer interpretations or perspectives somewhat at variance with the policies of their organisations. It is often possible to reach consensus on science issues of substance and of sufficient specificity to guide management. Individuals acting as individuals often do show common sense, and concede points made or lost on the strength of the evidence (experiential and scientific). Participants often show ownership of the meeting products, to the point where they may explain and defend the advice to their own sector.

15.5.3.2 *Weaknesses*

Meetings in this format are always vulnerable to accusations that the secretariat picked sympathetic external participants, who were known to be predisposed to agree with government experts and policies. Significant effort is, therefore, required to get good and balanced participation. To maintain the credibility of meetings by invitation only, it is necessary to ensure good coverage of even the smaller industry and interest group sectors. This can make it costly to run such meetings if the industry or public interest groups are highly fragmented.

Similarly, if even a few key invitees fail to show up, the credibility of the whole meeting can be placed at risk. In practice this has been more of a problem with invitees from environmental groups than from fishing industry sectors. There has even been speculation that some groups practice this strategically, by accepting invitations and then not showing up at meetings where they expect the evidence will support conclusions that run counter to their policy interests. We also hear reports that over time, individuals from industry who are frequently invited to peer review and advisory meetings because they contribute constructively to the process are pressured by their industry sector to be ‘unavailable’ so alternates who may be more confrontational may have to be invited.

15.5.4 SCIENTISTS MEETING WITH INDUSTRY OBSERVERS

15.5.4.1 *Strengths*

In the Canadian context, many participants from science, industry, and environmental

groups were familiar with this format, because of participation in US-run meetings on trans-boundary stocks,. That familiarity usually outweighed concerns of the few people who were uncomfortable with even having industry present in the room for fear that their presence would deter free debate of sensitive issues, such as the quality of catch data. If the industry observers are at least allowed to speak to agenda items or are give a period for asking questions, some degree of inclusvieness is achieved. Transparency is high with this approach, because industry gets to see directly what uses the science meeting made of the information that they have contributed. This feeds back on the scientists to be more candid in any pre-meetings with industry, with regard to lines of reasoning or information sources which industry may support but which the scientist knows will be rejected at the review and advisory meeting. Costs of time (for everyone) and logistics are moderate and controllable, because there is only a single meeting.

15.5.4.2 *Weaknesses*

In practice, this format gives very little chance for meaningful contributions of knowledge from industry. Occasionally industry participants, or science contractors working for the industry, may make polished presentations that look and sound much like the presentations of the scientists themselves. Only in these cases is it likely that the industry 'interventions' will actually carry weight into the fuller peer review process and the formulation of advice. Otherwise, much of the experiential knowledge of the industry (and interpretational hypotheses of environmentalists) is lost by the time the advice is finalised. Moreover, there is a tendency towards grandstanding on both sides during meetings in this format. Compared to science-only meetings, some scientists lean towards more polished presentations, which address the spectators but lack the grist for the rigorous peer review. This frustrates the subsequent process, which has to dig deeply to find the hard-core science for the necessary peer review.

Comparably, if the audience of observers is large, some individuals from industry tend to use their intervention time to gain stature with their own peers, or define 'battle-lines' with the scientists, possibly to position themselves to have greater leverage during the subsequent consultation phase. In the end, again, there is very little sense of ownership by industry of the final product. They may understand the product somewhat better than had they not observed the meeting, but it is still a product of scientists, not a joint product, and there is no assurance that they will see any of their own experiential knowledge in the advice which is produced by the meeting.

15.5.5 ALTERNATING MEETINGS

15.5.5.1 *Strengths*

Scientists are very comfortable with this format. They get to be highly technical with each other, and only a subset who interact well with industry need to attend the industry meetings. Clients of the advice in management and policy are also comfortable with this format. They see industry given ample chance to input to the science process, yet the science process is sheltered from the reality or perception of pressure from partisan directions. Industry gets repeated exposures to the assessment as it develops, and, from meeting to meeting, can pursue its aim of developing support for its own perspective(s). Those who attend all meetings may end up with an in-depth understanding of the assessment.

15.5.5.2 *Weaknesses*

This format is very demanding of time for everyone and costly for industry. If industry participants are actively fishing, or members of environmental groups have other jobs than full-time advocacy on fisheries conservation issues, then every meeting is time away from their source of income. The more that sequenced meetings are used to bring industry along with the assessment, the greater this loss of income and cost for travel and meeting logistics mounts up.

Moreover, the demands of multiple meetings often result in a lack of continuity of industry and environmental group participants from one meeting to the next. This in turn means recovering ground at every meeting, which is perceived as inefficient by the regular participants. Also, the presence or absence of even a few individuals might lead to very different priorities being expressed from meeting to meeting on the industry side, or different importance given to various sources of information on the science side. Consequently, each side may perceive the other as flip-flopping on views and treatment of information, or as unresponsive to past input.

This approach is also weak on real transparency and inclusiveness. Many scientists learned to 'spin' their presentations to appeal to industry, knowing full well that at the science-only review and advisory meeting the scientists would attach different interpretations and weights to the information available. Likewise, industry had no opportunity to see how little or much attention the ultimate science-only meeting gave to the information which they have contributed during the joint meetings, and rarely received justifications when their contributions were not the key determinants of the advice. As a result the fishing industry frequently had little sense of ownership of the final product.

15.6 Lessons learned

The DFO has adopted the third approach of inviting specific individuals as its standard now. This approach has many valuable strengths and more importantly, its key weakness is one about which we can do something. Constant vigilance is necessary to provide a balanced slate of invitees, and to select individuals credible to broad constituencies, not just easy to deal with from within government. This has not proved easy, but it is easier than dealing with the weaknesses of the other options.

We now carefully avoid using the word 'representative' when discussing participation at any science review and advisory meeting. The word itself seems to impel people to take responsibility for protecting the interests of the group they 'represent', and to place that role ahead of any collective interest of objective presentation of the facts. This is anathema to what a science advisory meeting is trying to achieve. However, it has proved hard to avoid this approach completely: in particularly high-profile issues, leaders of industry organisations do lobby the most senior levels of government for invitations to the science review and advisory meetings, and they are rarely placated unless someone very close to a 'representative' ends up with an invitation. Officers of

industry unions and executives of environmental organisations are particularly at risk of being a disruptive influence in science meetings. This is far from universal, and there are very responsible individuals in both types of groups – particularly if they feel that they have a chance of winning favourable conclusions on the merit of arguments presented. Nonetheless, as a generalisation, the risk of 'representative advocacy' in a science meeting is higher with officers than with respected individuals from the ranks of either type of organisation. Moreover, even when union officers or environmental group executive members are showing appropriate objectivity in their interventions, their presence alone introduces an undesirable dynamic. The other fishermen usually defer to their union officers, and individual members of environmental groups to their organisations' officers. Once the official has spoken, other individuals from either type of group will rarely offer contrasting experiences or perspectives. This greatly diminishes the potential contribution that experiential knowledge can make to the review and advisory process; presenting only one experience to an assessment group is rarely any better than presenting only one analysis.

The presence of the media in the room is highly disruptive. Many participants are unwilling to speak at all with the media present, while others speak to the 'public' rather than address the agenda item seriously. The press is categorically not allowed in our review and advisory meetings now. However, immediately at the conclusion of any meeting where there is interest from the press, the meeting chair and other individuals nominated by the meeting as a whole will brief the press on the meeting's conclusions. Even if not selected to speak for the meeting, any external participant can stay for the press briefing and speak to the media on the conditions that they make clear they are speaking as individuals, and respect the informal Chatham House rules by not attributing comments to other individuals at the meeting.

Skilled and experienced Chairs for these inclusive meetings are essential but rare. Good chairs need significant technical knowledge, good people skills, and a broad perspective on issues. They also need a clear understanding of what will be done with the products of each meeting, to guide the meeting to produce advice that the clients actually can use in development management and policy, and not just 'advice' that the meeting participants could readily agree on.

The Chairs have to be empowered to not just explain why the meeting needs all participants to be objective and impartial in their interventions, but to enforce those standards. Our practice is to issue one warning to an individual for comments which are either clearly partisan and biased, or disrespectful of other participants or sectors. A second transgression at the same meeting results not just in ejection from the meeting, but has more lasting consequences. External individuals who are ejected once lose the right to any future invitations to any review or advisory meetings. Departmental staff who fail to show respect for external participants – or each other – see the issue taken to the Director of their institute. This power has rarely been used, but even a few instances have conveyed clearly that science review and advisory meetings are serious in maintaining their objectivity and impartiality, while at the same time determined about bringing experiential knowledge into the process.

We have come to make a distinction between 'Facilitators' and 'Chairs'. Facilitators were tried in several types of meeting, but seemed to interpret their job as keeping everyone happy and engaged, and finding a place for everyone's opinion in the meeting

conclusions. From all sides, there was agreement that this approach was a major liability in a science challenge-format review, whatever form was used for contributing experiential knowledge. Some ideas and analyses are just plain wrong, and **should** be discarded, and an effective chair has to ensure that happens. As a corollary, scientists need to be educated in how to conduct 'peer review' of experiential knowledge. Standards do exist, and scientists can learn them, but not without some retraining.

It is usually necessary to explain what we are seeking in 'consensus advice'. Consensus does not require universal agreement on one interpretation and one option as superior to all others. Useful consensus is agreement among all participants that:

a. There is sufficient evidence to render some interpretations implausible and some options not viable. These are rejected and the evidence for rejecting such interpretations and options is documented;
b. The available evidence (including experiential knowledge) cannot provide a conclusive *scientific* basis to consider any one interpretation or option 'best'. For each retained interpretation/option we seek agreement on the key evidence consistent with it, and the key evidence that is NOT consistent with it. Industry, environmentalists, and scientists can all agree on that type of consensus, and even often on the weight of evidence.

This information is enough for policy and management to take the next step. The inclusive science review and advisory process has obtained consensus on the descriptions of the risk involved in each option ('probability' from the weight of evidence associated with each option; possible 'consequences' through dialogue). Management and policy then manage the risks, which is their mandate.

The single most important lessons, however, are that it is possible to have inclusive science peer review and advisory meetings on a wide range of issues, and, if done well, that the improved advisory products justify the efforts. Consensus advice from inclusive meetings can be clear, restrictive enough to be useful to managers and policy-setters, and widely supported by diverse participants from the meeting. If the meeting dynamics are constructive, all participants share a sense of ownership in the meeting products, which has many subsequent benefits later in the process of forming policy and management plans. We have found that if the meeting format is correct, discussions in inclusive settings can be objective and non-partisan. Narrative information can be effective from the start, and, over a series of meetings, fishermen readily learn to package their annual experiences in ways that are clear and have impact. Highly technical scientific issues can still be treated professionally in these inclusive formats. It is true that fishermen may not be prepared to participate in every technical debate, but the reality is that in a meeting of a couple of dozen scientists, often only a handful are engaged in debates about some of the more obscure statistical and modelling issues which arise.

15.7 Conclusion

The first attempts at greater inclusiveness in fisheries science advisory meetings are

likely to be disappointing to participants from most perspectives. However, professionals in fisheries science tend to forget that the core members of their review and advisory meetings often have been working together for two decades or more. That history contributes to their effectiveness as a group. Even scientifically well-credentialed newcomers to these meetings often are lost for the first meeting or two, and only slowly assimilate into the dynamics of the group. We found that within two or three meetings, invited industry participants became very skilled in presenting their information effectively, and asking questions of the scientists which moved the meeting forward for everyone. The path is not easy, especially if there is a history of antagonism or distrust between industry and government experts, among industry sectors, or between industry and environmentalists. Not every series of meetings has made progress at the same – or even encouraging – rates. However, from the Canadian experience, we conclude that once a commitment is made to make the review and advisory processes inclusive of experiential knowledge, the benefits justify the efforts. If everyone tries to make the meetings work as review and advisory processes, rather than as another setting to argue and lobby, inclusive approaches become the norm for *all* fisheries scientific peer review and advisory meetings, not just the handful of cases when the preconditions for success were mostly met already.

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