ICES WKSCIENCE2ADVICE REPORT 2018

ICES INTEGRATED ECOSYSTEM ASSESSMENTS

ICES CM 2018/IEASG:14

REF ACOM AND SCICOM

Report of the Workshop on translating science into advice (WKSCIENCE2ADVICE)

9-11 October 2018

ICES Headquarters, Denmark

ICES International Council for the Exploration of the Sea

CIEM Conseil International pour l'Exploration de la Mer

International Council for the Exploration of the Sea
Conseil International pour l'Exploration de la Mer

H. C. Andersens Boulevard 44–46
DK-1553 Copenhagen V
Denmark
Telephone (+45) 33 38 67 00
Telefax (+45) 33 93 42 15
www.ices.dk
info@ices.dk

Recommended format for purposes of citation:

ICES. 2018. Report of the Workshop on translating science into advice (WKSCIENCE2ADVICE). 9-11 October 2018. ICES Headquarters, Denmark. ICES CM 2018/IEASG:14. 26 pp.

Contents

Executive summary

The Workshop on translating science into advice (WKSCIENCE2ADVICE) met at ICES HQ in Copenhagen, Denmark, on 9–11 October 2018. Six participants from four countries contributed and the workshop was chaired by Eskild Kirkegaard and Simon Jennings. The translation of science into advice is an important topic for scientists who would like to see their discoveries and innovations applied and 'making a difference' and for advisers who are seeking to address the broad range of questions posed by clients using the best available science.

The objectives of the workshop were (1) to identify factors that influence the rate and extent of uptake of science conducted in projects and expert groups into ICES advice and to evaluate their relative influence, and (2) to produce a short guidance document for expert groups and our wider network of scientists and advisers on the working practices and other considerations that accelerate uptake. Twenty-seven factors applicable to projects and/ or expert groups were identified and were loosely clustered into groups relating to (1) the behaviours, diversity and working practices of people involved in the project or expert group, (2) the analytical approaches applied by scientists, and their accessibility, repeatability, quality assurance and consistency with expectations in the advisory systems, (3) the fitness for purpose of science in relation to advisory needs or priorities, as influenced by the methods used for commissioning projects or the development of terms of reference and (4) the legitimacy of the science, as influenced by the extent of engagement between scientists and advisers, the strength of scientific consensus and trust in the impartiality and credibility of the scientists working in projects and expert groups. The uptake of science into advice from 13 projects and 14 expert groups was evaluated in relation to these factors.

Results from the evaluation demonstrated that there were substantial differences in science uptake into the advisory system among projects and expert groups. For those projects and expert groups seeking to see the science they are developing used in the ICES advisory system, there are many actions they can take to advance uptake. This is especially true for expert groups where there were very strong differences in the behaviours, working practices and networks of those groups that conducted science that was ultimately used to support advice and those that were not. The assessment of the relative impact of different factors on uptake was used to inform the drafting of two guidance documents, one for projects and one for expert groups. Two guidance documents were drafted because the factors having the greatest influence on uptake differed between expert groups and projects. For projects, the most important factors influencing uptake were the effectiveness of stakeholder engagement, the extent to which the diversity of people engaged in translation of science to advice spanned science, advice, advice recipients and knowledge brokers, and the salience of the science in relation to advisory needs and priorities. For expert groups the most important factors were the extent to which the advisory community is willing to accept and assimilate science subjects and the evidence base; the effectiveness, resourcing and relevance of stakeholder engagement in relation to product or advisory needs; and the clarity of, support for and durability of follow-up processes after terms of reference are completed.

The workshop also considered it likely, although it could not be tested directly, that the full involvement of people who understand advisory needs and priorities is essential during both call development and the review of project proposals, if project science is expected to lead to advice.

The guidance document intended for project leaders and participants who would want to see the science they are developing used in the ICES advisory system will be made available to project commissioners or project leaders who contact ICES to ask how they can contribute to the provision of advice. The other guidance document, intended for expert group chairs and members who would like to see the science they are developing used in the ICES advisory system, or consider that the science they have developed is sufficiently mature to be used to support advice, would be made available to expert group chairs. We recommend that the guidance document for expert group chairs is added to the "Guidelines for ICES groups".

Key messages from this workshop as now described in the guidance documents are to engage the Advisory Committee leadership at the concept stage of projects and during the planning of expert group work to assess the relevance of science to advisory needs and to develop actions to facilitate uptake.

1 Introduction

1.1 General background

A key criterion for ICES advice is that it should be based on the best available science. Despite this, ICES has conducted rather little systematic evaluation of the processes that support the uptake and translation of science conducted in projects and expert (and related) groups into advice. ICES has also not yet provided guidance to our expert groups, projects and to our wider network of scientists and advisers on the working practices, project funding mechanisms and other considerations that accelerate uptake and translation.

The main objectives of the WKSCIENCE2ADVICE workshop were (1) to identify factors that influence the rate and extent of uptake of science conducted in expert groups and projects into ICES advice, (2) to evaluate the relative influence of these factors, and (3) to produce short guidance documents for project and expert groups, and our wider network of scientists and advisers, on the working practices, project funding mechanisms and other considerations that accelerate uptake. In addition, it was intended that workshop outcomes would help to raise awareness of the factors that influence the translation of science to advice in the ICES community in general and the factors that commissioning agencies way wish to consider when projects propose science that may be translated into ICES advice.

The workshop took as a starting point the assumption that guidance would be directed (a) towards project leaders and participants who would want to see their science used in the ICES advisory system and (b) expert group chairs and members who would like to see the science they are developing used in the ICES advisory system and/ or consider that the science they have developed is sufficiently mature to be used to support advice.

The workshop focused on two pathways of science uptake that are core to the ICES model: uptake of results from externally-funded projects into expert groups that provide the basis for advice (either directly or via science groups) and the development of science in expert groups that subsequently forms the basis for advice. The workshop proposed these foci because better understanding of these pathways and the ways in which they can support the translation of science to advice will lead to actions that can be taken within the existing ICES system and thus have the potential to have rapid impact on our capacity to use science more effectively. The workshop did not consider the role of ICES structures or systems, or make efforts to reiterate the qualities of effective knowledge brokers (who are essential to the functioning of the advisory system), or on the benefits of participatory science in general. Rather, the workshop sought to develop guidance on pragmatic actions that can be taken within the next 1-2 years to ensure that more of the maturing and mature science in the ICES community can support existing and emerging advisory needs.

The guidance documents developed during the workshop are intended to strengthen links between science and advisory processes in ICES and to guide the future development of those projects and expert groups aiming to develop methods and tools to support advice.

1.2 Opportunities to contribute to ICES advice

ICES is seeking to increase the range of topics on which it can provide advice and to use a greater proportion of the science conducted in the network to contribute to this advice. Although, with the exception of the viewpoints process, advice is always on

request, there is flexibility to strengthen responses to many of these requests by ensuring prompt uptake of the best available science. Some of the more constrained requests (e.g. recurrent advice on fish stocks) provide a narrower range of opportunities to introduce new science than the broader requests (e.g. to provide fisheries or ecosystem overviews). But the potential for uptake of science in advice should not be seen as limiting in ICES, provided the resulting advice is based on the best available science and characterized by quality assurance, developed in a transparent process, unbiased, independent, and is recognized by all parties as being relevant to management; and is therefore suitable for sign-off by ACOM.

In the case of viewpoints, the process of selecting viewpoints, which involves review by ACOM and SCICOM, provides a route by which scientists can gauge the potential of their work for supporting advice. Viewpoints also provide a route to support agile development of future advisory capacity, without soliciting or waiting for an external request for advice.

1.3 Overview of workshop process

Workshop participants developed the process shown in Table 1.1 to meet workshop objectives and fulfil their terms of reference.

Table 1.1. Overview of process adopted to meet workshop objectives

Step	Description
A	Define science and advice for the purposes of this workshop
B	Define the interlinked stages in the process from science commissioning (in projects or in expert groups) to the provision of science that may be used to contribute to advice
C	Identify factors that may influence the uptake and translation of science into advice at different stages in this process- and classify into higher level clusters
D	Through exploratory analysis of case study projects and expert groups develop a system for qualitatively scoring the relative role of different factors in influencing science uptake into advice from projects or expert groups
E	Apply the qualitative scoring system to projects and expert groups identified during the workshop, and use the results to assess the relative role of different factors in influencing uptake from projects or expert groups
H	Summarize and report outcomes of the analysis
I	Use outcomes of the analysis to develop guidance for projects and expert groups on the factors that accelerate uptake and translation of science into ICES advice

1.4 Defining science and advice

For the purposes of the workshop analyses, and to explain the remit of the workshop guidance, the workshop agreed working definitions of science and advice.

For science, the workshop adopted a definition developed by the UK Science Council: "the pursuit and application of knowledge and understanding of the natural and social world following a systematic methodology based on evidence". The workshop considers that this definition was applicable to science conducted throughout the ICES community.

Advice can be defined in broad terms as "guidance, options, recommendations or assessments developed following a scientific method to address a specified question" but in the ICES system, and for the purposes of this workshop report, the term "advice" is only applied when the advice has been formulated through ICES advisory processes

(expert groups, advice drafting group, peer-review and approval by the Advisory Committee (ACOM).

ICES aims to produce advice that is based on the best available science, characterized by quality assurance, developed in a transparent process, unbiased, independent, and is recognized by all relevant parties as applicable to management (ICES, 2018). Expert groups in ICES are not mandated to provide ICES advice directly. For this reason, expert group reports includes a statement to indicate that the expert group report "does not necessarily represent the views of the Council" and nothing in an expert group report is, or should be referred to, as ICES advice.

ICES advice is provided on request to governmental and intergovernmental organizations from, or with links to, ICES Member Countries. ICES does not provide advice to non-governmental organizations or private companies.

ICES also generates viewpoints. These are not developed in response to requests for advice but are used to develop and illustrate ICES capacity to provide scientific advice on new or emerging topics with relevance to the vision and mission of ICES. Topics to be addressed as viewpoints are defined by ACOM and the Science Committee (SCICOM) based on their own deliberations and proposals from the ICES community and availability of resources. Viewpoints are developed by an advice drafting group, based on background documents prepared by expert groups and are peer-reviewed, and are signed off by the Advisory Committee, so they meet the standards expected of ICES advice.

2 Methods

2.1 Summarizing the project or expert group process

The workshop defined the interlinked stages in the process from science commissioning in projects or in ICES expert groups to the provision of science that may contribute to advice. This was done to encourage workshop participants to systematically review all stages in the project or expert group process when evaluating the effects of different factors on uptake. Projects were in this context defined as scientific work of relevance for ICES advisory services but not organized as part of ICES work. The projects may or may not have direct involvement of scientist representing ICES but will often involve experts who are active in ICES.

The summary processes are tabulated in Table 2.1, but participants noted that these processes are not strictly sequential and often interlinked.

Table 2.1 shows that there is considerable structural similarity between the processes for projects and expert groups, which creates a potential for mobilizing project outcomes in support of advice through ACOM. However, for this to happen effectively, the project process need to be well aligned, and engage in a timely way, with expert group processes. Projects and expert group processes also differ in some important ways, the main ones being that expert group members have significant self-determination over scoping of ToR and often more flexibility to adjust their work to new circumstances than many project allows.

Table 2.1. Interlinked stages of project and expert group work, classified for the purposes of identifying factors that influence the uptake of science into advice

Project	Expert group
Call development	Define scope/ question/ problem
Call publication	Prepare terms of reference (ToR)
Interpret call for funding (by bidders)	Review of resolution (ToR) by ACOM and SCICOM
Assess feasibility/ resource needs (by bidders)	Assess feasibility/ resource needs
Bring together expertise (project participants, advisory boards, stakeholders)	Bring together expertise (expert group members)
Design research approach	Design research approach
Prepare proposal/ tender	-
External review of tender	-
(Access/ collect data)	(Access/ collect data)
Conduct analyses	Conduct analyses
Synthesize results	Synthesize results
Draw conclusions	Draw conclusions
Write report	Write report
Disseminate results	Disseminate results

2.2 Identifying factors that influence uptake of science into advice

Factors were identified during a structured discussion of the ways in which uptake of science into advice may occur at different stages in the work of a project or expert group (Table 2.1). These factors were then refined and amalgamated by directly testing

whether their role could be assessed on a simple qualitative scale (high impact on uptake, or medium or low), initially for five projects and expert groups.

The resulting factors are presented in Table 2.2. Some factors could not be scored at the next stage in the process because the factors influenced processes of project commissioning and review that were not known to workshop participants.

Table 2.2. Factors considered to influence the uptake of science into advice in projects and expert groups. The influence of these factors was compared for projects and expert groups having a high, medium or low contribution to ICES advice using a scale from high influence (score=3) to low influence (score=1). Relevance codes: project (P) expert group (EG).

Category	Code	Factor	Relevance
People	1	Availability of advisory expertise (quality and quantity)	EG, P
	2	Strength of motivation and positive incentives for a range of experts to contribute to advice	EG, P
	3	Awareness of opportunities to contribute to advice	EG, P
	4	Desire of groups to draw in participants with knowledge of advice development (from inside and outside ICES) and to constructively engage these new contributors	EG, P
	5	Allocation of time/ priority to developing existing science to meet advisory needs relative to time allocated to other scientific tasks	EG, P
	6	External reviewers ability/ knowledge to assess components of project leading to advice	P, not scored
	7	Reviewers ability/ knowledge to assess viability of terms of reference in supporting a process leading to advice	EG
	8	Extent to which the diversity of people engaged in translation of science to advice span science, advice, advice recipient, knowledge broker and stakeholder	EG, P
	9	Extent to which clearly defined person(s) are responsible for taking the science into advice	EG, P
	10	Strength of ACOM members' awareness of the project	EG, P
	11	Strength of ACOM members' support for translating this science into advice	EG, P
Analytical approaches	1	Accessibility of methods, data and results (i.e. how closely have FAIR principles have been adopted- findable, accessible, interoperable and reusable- and is there consistency with ACOM guidance)	EG, P
	2	Comprehensiveness and clarity of process/ interpretive guidance provided to repeat analyses and methods	EG, P
	3	Extent of quality assurance (QA)	EG, P
	4	Clarity of, support for and durability of follow-up process after terms of reference or project completed	EG, P

Category	Code	Factor	Relevance
Fitness for purpose	1	Strength of prioritization of advisory needs by project commissioners	P, not scored
	2	Strength and frequency of interchange and understanding between advisers, recipients of potential advice and funders at commissioning of call	P, not scored
	3	Consideration of advice priorities / policy relevance during term of reference formulation	EG
	4	Extent to which reviewers of project proposals understand advisory needs	P, not scored
	5	Strength of guidance to reviewers of project proposals on the importance of assessing the probability that a project can meet advisory needs	P, not scored
	6	Extent to which a review of terms of reference focuses on the suitability of the proposed work to support advice and have advisors been consulted	EG
	7	Salience of the science output to advisory needs or priorities	EG, P
Trust and legitimacy	1	Effectiveness, resourcing and relevance of stakeholder engagement through project in relation to product/ advice needs	EG, P
	2	Time and resources allocated to advisor/ knowledge broker (ACOM) engagement	EG, P
	3	Extent of trust in impartiality and credibility of scientists by advice community	EG, P
	4	Extent to which advisory community is willing to accept and assimilate subjects and scientific evidence base	EG, P
	5	Strength of scientific consensus on basis for advice	EG, P

2.3 Scoring the impact of factors on uptake of science into advice

Factors identified in Table 2.2 were used for a wider assessment of the uptake of science from the selected projects and expert groups (Annex 3). The 13 projects and 14 expert groups included in this analysis were selected based on proposals from the workshop participants. The projects and expert groups were selected to achieve a balance among projects and expert groups that had high, medium or low contribution to ICES, to represent a wide range of advisory relevant topics and with at least one of the workshop participants having some knowledge of the project or the expert group.

The influence of each factor on uptake was scored for each project or each expert group and then converted to a numeric score (3 = high, 2 = medium, 1 = low) that was used to summarize results and to compare the impact of different factors. The main objective of this process was to catalyse discussions that helped the workshop participants to understand how the different factors might influence advice and hence to inform the development of guidance.

Each selected project or expert group was scored by one workshop participant. Scores were reviewed by a second participant. In case the review led to differences in proposed scores, a discussion followed and the final score was reached in consensus. For

these reasons, the results of the analysis are regarded as indicative rather than the outcome of a rigorously framed experiment. Some factors could not be scored because the factors influenced processes of project commissioning and review that were not known to or observed by workshop participants. Scores by project are not presented in this workshop report as the aim of the scoring was not to pass judgement on the success of projects or expert groups but to use the analysis to better understand how different approaches to developing and running projects and expert groups would influence the probability that science was taken into advice.

To compare factor scores we compared projects and expert groups having a high or medium impact on ICES advice (science developed in the project or expert group has directly contributed to advice, during or immediately after the term of the project or expert group) with those having low impact (science developed in the project or expert group made no contribution or just a small indirect contribution to advice, usually after the term of the project or expert group). Of the 27 projects or expert groups included in the analysis the workshop considered that 5 projects and 8 expert groups had a high or medium impact on advice and 9 projects and 5 expert groups had a low impact.

The scoring of the relative impact of different factors on uptake was reviewed by the workshop and used to inform the drafting of two guidance documents. Two documents were produced because the factors having the greatest influence on uptake differed for expert groups and projects.

2.4 Factors that could not be scored

Workshop participants could not score a number of the factors in Table 2.2, because these related to processes such as project commissioning and the review of proposals which were not observed by workshop participants. These include the extent to which project commissioners prioritize advisory needs, the extent to which reviewers of project proposals understand advisory needs and priorities, the strength of guidance to reviewers of project proposals on the importance of assessing the probability that project can meet advisory needs, and the ability/ knowledge of external reviewers to assess components of the project leading to advice.

The workshop considered that the formulation of funding calls will heavily influence the probability that advisers will be engaged in a project and thus the potential for the project to produce research outcomes with high advisory relevance. In some cases, project proposals may include strategies for making outcomes available as inputs to ICES advice. The definition of such strategies and outcomes may increase the chance of the project of being funded if impact is a review criterion for the funding agency. But the reviewers understanding of advisory needs, as well of the procedures and requirements involved in translating science to advice in ICES, will be important if the reviewer is to critically and effectively evaluate the prospect that the project outcomes will actually generate impact for ICES advice.

3 Results

Different factors were identified as important in determining the extent of science uptake into advice from projects (Figure 3.1) and expert groups (Figure 3.2). In general, most factors had a weaker, and in some cases negative, impact on uptake of science into advice from projects than from expert groups. When the influences of different factors on the uptake of science into advice in projects and in expert groups were compared directly (Figure 3.3) the analysis suggested there were major differences in the roles of individual factors. Thus awareness of opportunities to contribute to advice, the durability of a scientific project after project or expert group completion, ACOM members awareness of a project and allocation of time to advisory requirements all had a relatively strong positive effect on uptake from expert groups but not on uptake from projects (Figure 3.3).

For projects, the most important factors influencing uptake were the effectiveness of stakeholder engagement; the extent to which the project included a diversity of people engaged in translation of science to advice (to span science, advice, advice recipients and knowledge brokers); and the salience of the science in relation to advisory needs and priorities (Figure 3.4).

For expert groups the most important factors were the extent to which advisory community is willing to accept and assimilate science subjects and the evidence base; the effectiveness, resourcing and relevance of stakeholder engagement in relation to product or advisory needs; and the clarity of, support for and durability of follow-up processes after terms of reference are completed. (Figure 3.5). The latter result is perhaps unsurprising given the broad scope of science activity in ICES and the lesser scope in the range of topics addressed in advice. For both projects and expert groups high realized uptake of science into advice was linked to a high level of engagement of ACOM.

The analyses summarized in Figures 3.1-3.5 were used to identify factors to be emphasized in the draft guidance for projects and expert groups (Annex 4 and Annex 5)

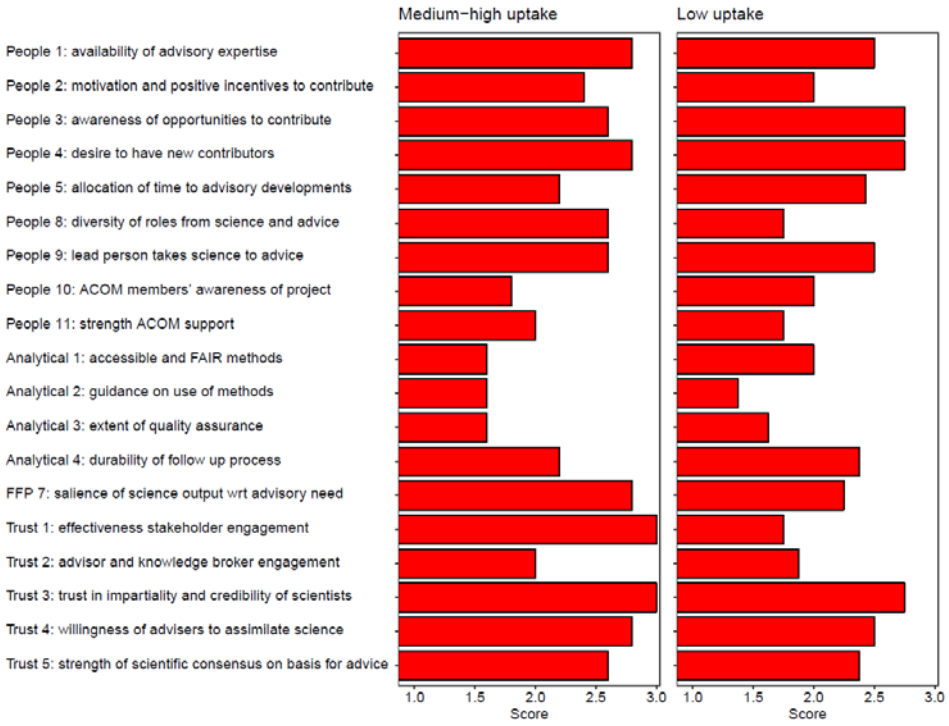

Figure 3.1. The role of different factors in contributing to the uptake of science into advice, for projects. Mean scores (where 3 = high impact and 1 = low impact). Some factors identified in the workshop review do not appear in these figures because they were relevant to processes of project commissioning and review that were not observed by workshop participants. The numbering of the short factor codes corresponds to the numbering for the full codes used in Table 2.2.

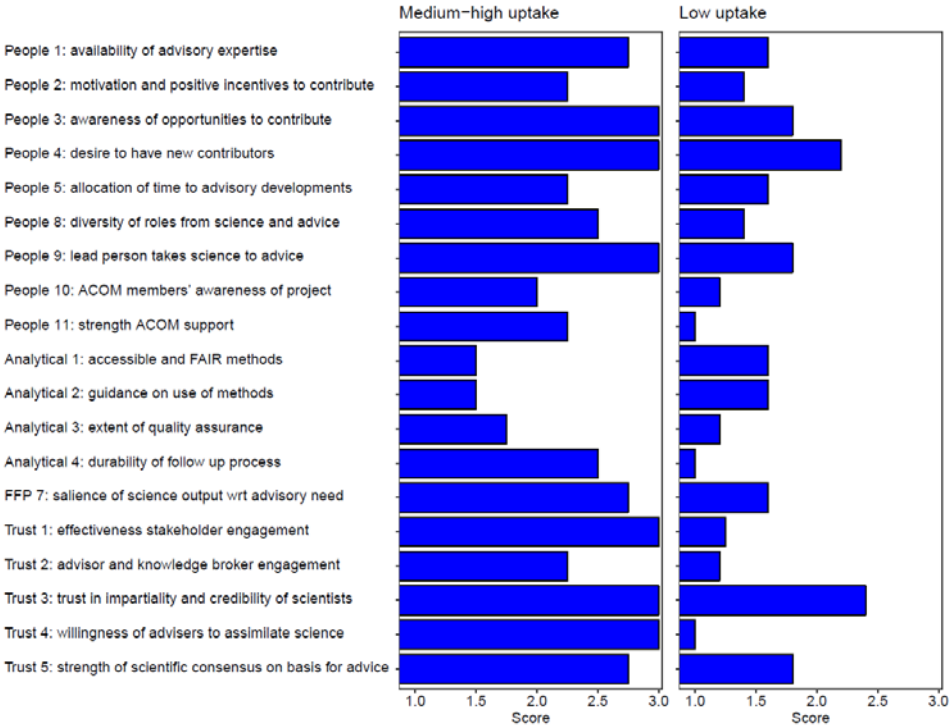

Figure 3.2. The role of different factors in contributing to the uptake of science into advice, for expert groups. Mean scores (where 3 = high impact and 1 = low impact). Some factors identified in the workshop review do not appear in these figures because they were relevant to processes of project commissioning and review that were not observed by workshop participants. The numbering of the short factor codes corresponds to the numbering for the full codes used in Table 2.2.

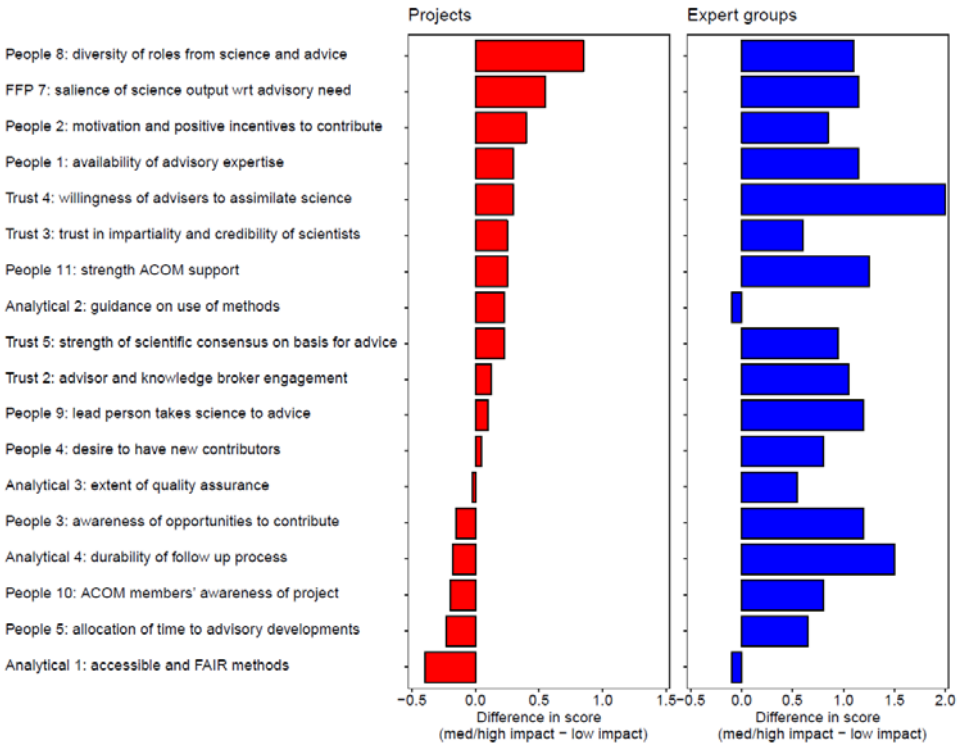

Figure 3.3. A comparison of the extent to which different factors influence the uptake of science into advice in projects and in expert groups. The left panel is ranked by the differences scores (showing relative influence of factors) for projects and the right panel shows the corresponding difference scores for expert groups. Some factors identified in the workshop review do not appear in these figures because they were relevant to processes of project commissioning and review that were not observed by workshop participants. Factors that were not common to both projects and expert groups were also excluded. The numbering of the short factor codes corresponds to the numbering for the full codes used in Table 2.2.

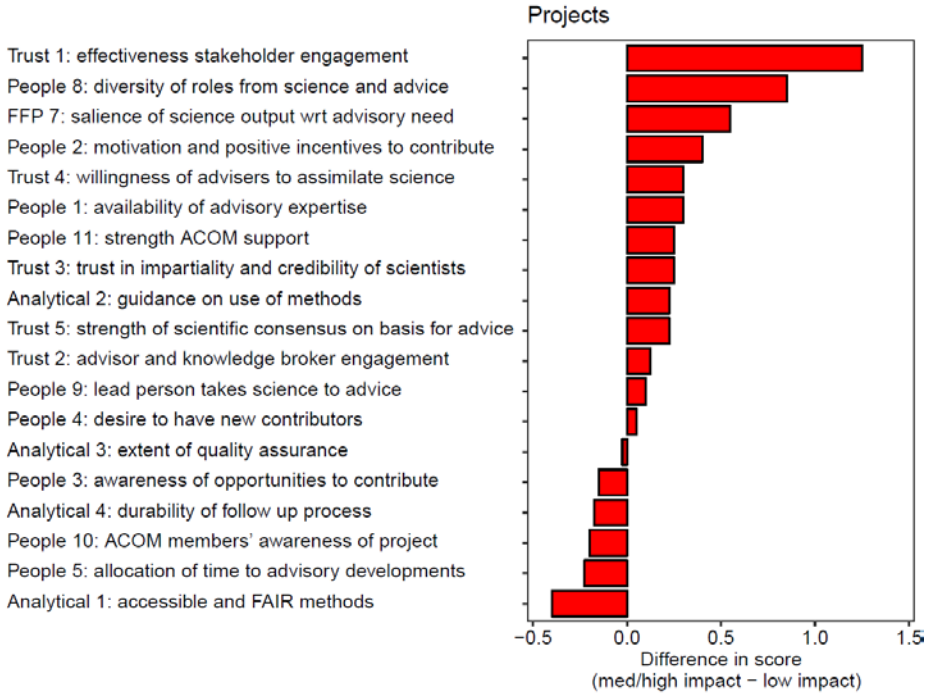

Figure 3.4. The role of different factors in contributing to the uptake of science into advice, for projects. The plot shows the difference in factor scores between projects with a high or medium uptake or science into advice and those with low uptake. Some factors identified in the workshop review do not appear in these figures because they were relevant to processes of project commissioning and review that were not observed by workshop participants. The numbering of the short factor codes corresponds to the numbering for the full codes used in Table 2.2.

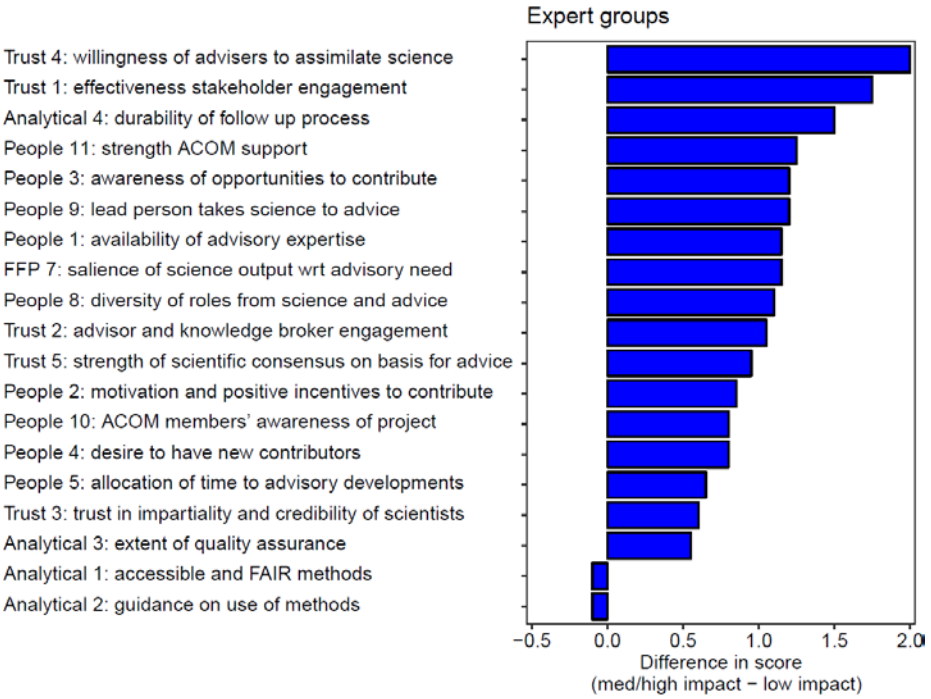

Figure 3.5. The role of different factors in contributing to the uptake of science into advice, for expert groups. The plot shows the difference in factor scores between expert groups with a high or medium uptake or science into advice and those with low uptake. Some factors identified in the workshop review do not appear in these figures because they were relevant to processes of project commissioning and review that were not observed by workshop participants. The numbering of the short factor codes corresponds to the numbering for the full codes used in Table 2.2.

4 Implications

4.1 Lessons for Advisory and Science Committees

The analysis of factors affecting the uptake of science into advice show that projects and expert groups with high realized uptake of advice had a high level of engagement of ACOM. Some of the projects and expert groups that led to uptake had clearly defined ICES processes to feed the science into advisory work, as laid down in the ToR for the expert groups. For this reason, the workshop concluded that ACOM and SCICOM may indirectly (and unintentionally) block the uptake of science by not engaging in and supporting the uptake process.

Both ACOM and SCICOM have adopted descriptions of the role of members and these are published in the guidelines for ICES groups. At present, these descriptions do not explicitly address the role of ACOM and SCICOM in supporting the uptake of science into advice. The workshop recommends the role of ACOM and SCICOM members in supporting the uptake of science into advice is added to these descriptions. Potential wording of a point to be added to the job descriptions could be:

- **To identify science relevant to ICES advisory services and to contribute to the uptake of the science into advice by planning, supporting and participating in processes to facilitate the uptake.**

4.2 ICES approaches to project engagement

The workshop highlighted the need to explore the ways in which ICES engages as a partner in externally funded projects. The current system seems to result in a disjoint between the projects and ICES network, with much of emphasis on translating science into advice or achieving other forms of integration and uptake being a responsibility of the ICES secretariat. This usually results in barriers to uptake of relevant science and tools into the advisory system, because ACOM and SCICOM have not been actively engaged.

Given that the workshop analyses highlighted the importance of connecting the relevant people in projects with the right players in the advisory system, and the need to engage early, the workshop suggests that:

1. Further efforts are made to find members of ACOM and/or SCICOM to liaise/ buddy with projects that are partnered with ICES. This includes encouraging committee members to understand the relevance of this engagement to achieving ICES strategic goals
2. ICES use project resources to fund travel and subsistence for those ACOM and SCICOM members taking part in relevant project activities (e.g. advice boards, relevant work package and/or plenary meetings)
3. Efforts are increased to embed review of outputs from any project in which ICES is participating into expert groups and the advisory system
4. Consortia that are preparing proposals for projects that seek to achieve impact by developing science for advice, should note the benefits of early engagement with ICES and note that this should be with ACOM and/or SCICOM as much as it is with the ICES secretariat.

4.3 Developing guidance

In the ICES community, there are research-oriented expert groups that aspire to translate their science into advice, but they have not always been successful in getting their

science work taken up in the advice. One of the conclusions from the workshop analysis is that lack of uptake can be related to a lack of awareness of experts within the community about how the advisory process works and, hence, which route(s) increase the chances of successful uptake.

The workshop recommends that additional guidance on how to input science into the advisory process is included in the current guidelines for expert groups. The proviso is of course that the expert group has the desire to translate science into advice in the first place.

The workshop considered that the guidance for expert groups that aspire to translate science to advice should include the following elements, and have sought to include these elements in the draft guidance presented in Annex 5.

- A definition of ICES advice to indicate that advice does not become ICES advice until it has been approved by ACOM and that ICES advice is based on peer-reviewed expert group reports and is prepared in an advice drafting group
- The definition of advice, including potential recipients and an explanation that viewpoints are an ICES initiative.
- Emphasis on contacting ACOM leadership to gauge the role of a science product in supporting future advice (cc. SCICOM chair and Steering Group chair). ACOM leadership can then assess whether there is a (future) advice need or priority relating to the topic proposed by the expert group and can give them further guidance and develop advice targeted ToRs for approval by ACOM-SCICOM.
- An infographic on ICES advisory process that makes clear the process used to request and develop advice. Ideally, such an infographic should also make clear that if an EG or external project aspires to feed their science work into the advisory process, they should first contact the ACOM chair.

Annex 1: List of participants

Member	Dept/Institute	Email
Eskild Kirkegaard (chair)	International Council for the Exploration of the Sea	eskild.kirkegaard@ices.dk
Kåre Nolde Nielsen	The Norwegian College of Fishery Science	kare.nolde.nielsen@uit.no
Mark Dickey-Collas	International Council for the Exploration of the Sea	Mark.dickey-collas@ices.dk
Nathalie Steins	Wageningen University & Research	nathalie.steins@wur.nl
Robert Thorpe	Cefas, Lowestoft Laboratory	robert.thorpe@cefas.co.uk
Simon Jennings (chair)	International Council for the Exploration of the Sea	simon.jennings@ices.dk

Annex 2: Agenda

Chairs: Eskild Kirkegaard and Simon Jennings

Baltic Room, ICES, Copenhagen

Tuesday 9 October 2018 10:00 – Thursday 11 October 16:00

Tuesday 9 October

1. Opening and welcome (10:00)
2. Review of workshop objectives, scope and focus (10:10)
3. Break (11:00)
4. Define, in generic terms, the cycle/ process that leads from framing a scientific question to provision of advice (11:30)
5. Identify and categorize factors that have the potential to influence the rate of uptake of science into advice (12:30)
6. Lunch (13:00)
7. Identify and categorize factors that have the potential to influence the rate of uptake of science into advice (continued) (14:00)
8. Break (15:30)
9. Identifying and reviewing case-studies (16:00)
10. Close for day (17:00)

Wednesday 10 October

1. Opening and continuation of identifying and reviewing case-studies (09:00)
2. Analysis of case-studies (10:00)
3. Break (11:00)
4. Analysis of case-studies (continued) (11:30)
5. Lunch (13:00)
6. Summarize analysis of case studies (14:00)
7. Break (15:30)
8. Lessons-learned from analysis of case studies (16:00)
9. Assign drafting tasks (16:45)
10. Close for day (17:00)

Thursday 11 October

1. Opening and drafting of guidance/ report (9:00)
2. Break (10:30)
3. Drafting of guidance/ report (continued) (11:00)
4. Lunch (13:00)
5. Review and sign-off of guidance/ report text (14:00)
6. Close (16:00)

Annex 3: Expert groups and projects considered in the review

Expert group or project full name	Short name	Allocation
Benthic Ecosystem Fisheries Impact Studies	BENTHIS	Project
Co-creating Ecosystem-based Fisheries Management Solutions	MAREFRAME	Project
Development of innovative tools for understanding marine biodiversity and assessing good environmental status	DEVOTES	Project
Fish Population Structure and Traceability	FISHPOPTRACE	Project
Forage Fish Interactions	FACTS	Project
Making the European Fisheries Ecosystem Plan Operational	MEFEPO	Project
Marine Biodiversity and Ecosystem Functioning EU Network of Excellence	MARBEF	Project
Marine Ecosystem Evolution in a Changing Environment	MEECE	Project
Marine Ecosystems Research Programme	MERP	Project
Maximising yield of fisheries while balancing ecosystem, economic and social concerns	MYFISH	Project
Strategies for the gradual elimination of discards in European fisheries	DISCARDLESS	Project
Understanding the Mechanisms of Fish Stock Recovery	UNCOVER	Project
Vectors of Change in Oceans and Seas Marine Life, Impact on Economic Sectors	VECTORS	Project
Working Group on Aquaculture	WGAQUA	Expert group
Working Group on Crangon Fisheries and Life History	WGCRAN	Expert group
Working Group on Electrical Trawling	WGELECTRA	Expert group
Working Group on Fisheries-Induced Evolution	WGEVO	Expert group
Working Group on Integrated Assessments of the North Sea	WGINOSE	Expert group
Working Group on Integrating Surveys for the Ecosystem Approach	WGISUR	Expert group
Working Group on Maritime Systems	WGMARS	Expert group
Working Group on Mixed Fisheries Advice	WGMIXFISH	Expert group
Working Group on Multispecies Assessment Methods	WGSAM	Expert group
Working Group on Seasonal-to-Decadal Prediction of Marine Ecosystems	WGS2D	Expert group
Working Group on Spatial Fisheries Data	WGSFD	Expert group
Working Group on the History of Fish and Fisheries	WGHIST	Expert group

Expert group or project full name	Short name	Allocation
Working Group on the Northwest Atlantic Regional Sea	WGNARS	Expert group
Workshop on the Development of Quantitative Assessment Methodologies based on LIFE-history traits, exploitation characteristics, and other relevant parameters for data-limited stocks	WKLIFE	Expert group

Annex 4: Draft guidance for projects

This annex includes the text of a draft guidance document for project commissioners, leaders and participants who would like to see the science they are developing used in the ICES advisory system. The intention is to make this guidance available when project commissioners or project leaders contact ICES to ask how they can contribute to the provision of advice.

Guidance for projects seeking to use their science as an input to ICES advice

This guidance is written for project leaders and participants who would want to see the science they are developing used in the ICES advisory system (Box 1). This guidance was developed by an ICES expert group that reviewed the factors affecting the influence of science conducted in a range of projects on the ICES advisory process. The factors considered included the roles and expertise of people involved in the project, the fitness for purpose of science conducted, the perceived legitimacy of the science and trust in the scientists, and the analytical approaches applied and their repeatability. The guidance will have most influence on outcomes if it is consulted as soon as a decision is taken to develop a project proposal. Key actions for projects seeking to use their science as an input to ICES advice are summarized in Table A4.1

Table A4.1. Key actions for projects seeking to use their science as an input to ICES advice

If a project (proposal) includes science of relevance for ICES advisory services and the project wants the science to feed into the ICES advisory system the project should:	-	Contact ICES at the concept stage so that specific advisory needs and possible actions to facilitate the uptake of science into advice can be included in the project.
	-	Ensure that resources within the project are allocated to support the transfer of science to advice.
If ICES (secretariat, ACOM, SCICOM) is contacted by a project that seeks to feed science into ICES advisory system:	-	The ACOM/SCICOM leadership should establish whether the science developed in the project is relevant to ICES advisory services.
If the project is considered relevant to ICES advisory services:	-	The ACOM/SCICOM leadership should identify a person(s) to represent ICES in the development and execution of the project.
If the project is considered not relevant to ICES advisory services:	-	No action will be taken by ICES in relation to ICES advisory services. ICES may still wish to participate in the project if it is likely to contribute to the implementation of ICES Strategic Plan.

The factors expected to have most influence on uptake are the effectiveness of stakeholder engagement; the extent to which the diversity of people engaged in the translation of science to advice span science, advice, advice recipients and knowledge brokers; and the salience of the science in relation to known advisory needs and priorities. Analyses of previous projects have also shown that the project is also more likely to support uptake if there are positive incentives for a range of experts to contribute to the development of a product or method of relevance to the advisory system.

If project leaders and participants are committed to applying their science in the advisory process then the probability of uptake is increased when the ICES advisory community wishes to accept and assimilate the subjects and scientific evidence base. The chance of such acceptance is increased by interaction between the project team and

members of the ICES advisory committee, to understand emerging needs and priorities of ACOM, to make ACOM members aware of the possibilities provided by the available scientific methods or information and to encourage support from the committee that is ultimately responsible for signing-off ICES advice.

Science that is trusted and salient in relation to advisory priorities and needs is more likely to be translated into advice. Trust is increased by ensuring advisor and knowledge broker engagement is frequent and effective throughout the project and increasing the resourcing and relevance of stakeholder engagement.

Table A4.2 highlights the factors that previous analyses have shown to influence the probability of successfully translating science to advice, categorized according to the roles and expertise of people involved in projects and the advisory system, the fitness for purpose of science conducted, the perceived legitimacy of the science, and the analytical approaches applied and their repeatability.

Box 1. What is ICES advice?

Advice can be broadly defined as "guidance, options, recommendations or assessments developed following a scientific method to address a specified question" but in the ICES system the term "advice" is only applied when the advice has been formulated through ICES advisory processes (expert groups, advice drafting group, peer-review and approval by the Advisory Committee (ACOM)). ICES aims to produce advice that is based on the best available science, characterized by quality assurance, developed in a transparent process, unbiased, independent, and is recognized by all relevant parties as applicable to management. ICES advice is provided on request to governmental and intergovernmental organizations from, or with links to, ICES Member Countries and not to non-governmental organizations or private companies, for example.

Table A4.2. Factors shown to have a positive influence on the uptake of project science into advice

People	More people with advisory expertise engage with the project
	There are positive incentives for a range of scientists with advisory expertise to contribute to the project and they are motivated to do so
	Projects seek to draw in participants with knowledge of advice development from inside and outside ICES and seek to constructively engage these new contributors
	Diverse expertise is engaged in the translation of science to advice, in and outside the project (spanning science, advice, advice recipient, knowledge broker and stakeholder)
	There is a clearly defined and known person(s) responsible for taking the science into advice
	ACOM members' have high awareness of the project and support of the plans of the project to translate their science into advice
Analytical approaches	Good interpretive guidance is generated and published by the project, ideally with named contacts for ongoing support
Fitness for purpose	The science output is salient to the advisory needs and priorities
Trust and legitimacy	The advisory community have trust in the impartiality and credibility of scientists in the project
	The advisory community is willing to accept and assimilate subjects and the scientific evidence base
	The scientific consensus on the science that results from the project, and may form the basis for advice, is strong

Annex 5: Draft guidance for expert groups

This annex includes the text of a draft guidance document to be shared with ACOM and SCICOM for review, with the reviewed version added as a section to the "Guidelines for ICES groups". The purpose of the guidance is to support expert group chairs and members who would like to see the science they are developing used in the ICES advisory system or consider that the science they have developed is sufficiently mature to be used to support advice.

Guidance for ICES expert groups seeking to use their science as an input to ICES advice

This guidance is for expert group chairs and members who would like to see the science they are developing used in the ICES advisory system or consider that the science they have developed is sufficiently mature to be used to support advice. This guidance was written by an ICES expert group that reviewed the factors affecting the influence of science conducted in a range of expert groups on the ICES advisory process. The factors considered included the roles and expertise of people involved in the expert groups and the advisory system, the fitness for purpose of science conducted, perceived legitimacy of the science and trust in the scientists, and the analytical approaches applied and their repeatability. The review showed there were very substantial differences in these factors between expert groups that had little or no impact on the development of scientific advice and those generating science that has substantially changed ICES capacity to provide advice. Key actions for expert groups seeking to use their science as an input to ICES advice are summarized in Table A5.1.

Table A5.1. Key actions for expert groups seeking to use their science as an input to ICES advice

If the science developed by an ICES expert group is not used in the ICES advisory system and the expert group would like to see it used in this way then the expert group chair should:	Contact the ACOM leadership (cc SCICOM leadership and relevant Steering Group Chair) to explore if the science is relevant to ICES advisory services If considered relevant the expert group should, in cooperation with the ACOM and SCICOM leadership, set up a plan detailing responsibilities for translating the science into advice, including development of advice-related terms of reference.

Perhaps the most important lesson from the review of factors affecting uptake is that successful uptake relies on a pull from the needs and priorities of the advisory system and a push from the expert group to raise awareness of their work among advisers and to develop it in ways that meet advisory norms for quality, repeatability and fitness for purpose. If expert group chairs and members are committed to applying their science in the advisory process then the probability of uptake is increased when the advisory community is willing to accept and assimilate their science. The chance of such acceptance is increased by interaction between the expert group and members of the ICES advisory committee, to understand emerging needs and priorities of the Advisory Committee (ACOM), to make ACOM members aware of the possibilities provided by the available scientific methods or information and to encourage support from the committee that is ultimately responsible for signing-off ICES advice. We recommend that scientists who are seeking to contribute to advisory products make early contact

with the ACOM leadership to gauge the role of their science in supporting future advice (cc. Science Committee and Steering Group chair). The ACOM leadership can then assess whether there is a current or future advice need or priority relating to the topic proposed by the expert group and can give them further guidance on developing advice-related terms of reference.

Translation of science into advice requires a significant commitment of time and resources to engage people and groups with expertise in advice generation. But translating science to advice is highly rewarding for the people involved, can create an impactful legacy for the expert group and make a real difference to the conservation and management of the seas.

It is helpful if people with experience generating advice can actively contribute to the expert group and if the majority of expert group members are motivated in their own right to translate science into advice.

Translation of science into advice has generally been more successful when one person takes clear responsibility for maintaining strong and active links between science and advice. This person may be, but does not have to be, the chair of the expert group. It is also more likely to be successful if the terms of reference of the expert group clearly explain the intention to generate products that can help to meet advisory needs and are developed in consultation with scientists familiar with the advisory system.

When working planning the work of an expert group it is important to allow a reasonable allocation of time and effort for developing existing science to meet advisory needs. The allocation of time and effort to this step of the process is often underestimated, and an appropriate allocation to support translation should be carefully considered with scientists who are familiar with the characteristics of scientific studies and methods that would underpin draft advice that would ultimately meet expectations for sign-off by ACOM because it is based on the best available science and characterized by quality assurance, developed in a transparent process, unbiased, independent, and recognized by all relevant parties as applicable to management.

Table A5.2 highlights all the factors that previous analyses have shown to influence the probability of successfully translating science to advice, categorized according to the roles and expertise of people involved in the expert groups and the advisory system, the fitness for purpose of science conducted, the perceived legitimacy of the science, and the analytical approaches applied and their repeatability.

Table A5.2. Factors shown to have a positive influence on the uptake of expert group science into advice

People	Many people with advisory expertise engage with expert group
	There are positive incentives for a range of experts with advisory expertise to contribute to the expert group and they are motivated to do so
	Expert group members develop high awareness of opportunities to contribute to advice
	Expert groups seek to draw in participants with knowledge of advice development from inside and outside ICES and seek to constructively engage these new contributors
	Expert group members devote a larger proportion of their working time to developing existing science to meet advisory needs
	Expert group terms of reference are reviewed by people with sufficient knowledge to assess the viability of a process leading to advice
	Diverse expertise is engaged in the translation of science to advice, in and outside the expert group (spanning science, advice, advice recipient, knowledge broker and stakeholder)
	There is a clearly defined and known person(s) responsible for taking the science into advice
	ACOM members' have high awareness of the work of the expert group and support the plans of the expert group to translate their science into advice
Analytical approaches	Quality assurance of the science has been conducted
	There is a clearly defined and durable follow-up process to support contributions to advice after terms of reference are fulfilled
Fitness for purpose	Term of reference formulation is effectively and strongly tailored to supporting advice priorities
	Terms of reference focus on the suitability of proposed work to support advice and advisers have been consulted during their development
	The science output is salient to the advisory needs and priorities
Trust and legitimacy	The advisory community have trust in the impartiality and credibility of scientists in the expert group
	The advisory community is willing to accept and assimilate subjects and the scientific evidence base
	The scientific consensus on the science that may form the basis for advice is strong

Box 1. What is ICES Advice?

Advice can be broadly defined as "guidance, options, recommendations or assessments developed following a scientific method to address a specified question" but in the ICES system the term "advice" is only applied when the advice has been formulated through ICES advisory processes (expert groups, advice drafting group, peer-review and approval by the Advisory Committee (ACOM)). ICES aims to produce advice that is based on the best available science, characterized by quality assurance, developed in a transparent process, unbiased, independent, and is recognized by all relevant parties as applicable to management. ICES advice is provided on request to governmental and intergovernmental organizations from, or with links to, ICES Member Countries and not to non-governmental organizations or private companies, for example.

ICES also generates viewpoints. These are not developed in response to requests for advice but are used to develop and illustrate ICES capacity to provide scientific advice on new or emerging topics with relevance to the vision and mission of ICES. Topics to be addressed as viewpoints are defined by ACOM and the Science Committee (SCICOM) based on their own deliberations and proposals from the ICES community and availability of resources. Viewpoints are developed by an advice drafting group, based on background documents prepared by expert groups and are peer-reviewed, and are signed off by the Advisory Committee, so they meet the standards expected of ICES advice.