

# WORKSHOP ON ACCOUNTING FOR FISHERS AND OTHER STAKEHOLDERS' PERCEPTIONS OF THE DYNAMICS OF FISH STOCKS IN ICES ADVICE (WKAFPA)

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## WORKSHOP ON ACCOUNTING FOR FISHERS AND OTHER STAKEHOLDERS' PERCEPTIONS OF THE DYNAMICS OF FISH STOCKS IN ICES ADVICE (WKAFPA)

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## i Executive summary

The objective of the Workshop on accounting for fishers and other stakeholders' perceptions of the dynamics of fish stocks in ICES advice (WKAFPA) was to identify where and how stakeholder information could be incorporated in the ICES fisheries advice process. It adopted an operational definition of the concept of perception, where perceptions result from observations, interpreted in light of experience, that can be supported by data, information and knowledge to generate evidence about them. Stakeholder information can be either structured (e.g. routinely collected information in a standardized format) or unstructured (e.g. experiential information) and either of those can inform decisions made during the production of ICES advice.

Most notably, the group identified there was a need to engage with stakeholders earlier in the process, i.e. before benchmark meetings take place and before preliminary assessment results are used as the basis to predict total allowable catches for upcoming advice (Figure 4.2). It was therefore recommended to include in the ICES process the organisation of pre-benchmark/roadmap workshops where science and data needs of upcoming benchmarks can be identified, followed by making arrangements how scientists and stakeholders can collaborate to access, prepare for use (where relevant) and document the structured and unstructured information well ahead of the benchmark meetings.

It was also recommended to organise 'sense-checking' sessions with stakeholders when preliminary assessments are available but not yet used as the basis for advisory production. This would allow stakeholders and assessment scientists to verify available knowledge and data against stock perceptions and provide additional considerations relevant for the production of TAC advice. Next to these two additional activities, it is recommended that communication on differences in stakeholder perception or data derived perceptions are communicated within the ICES assessment reports as well as in the ICES advice in a transparent manner. Not only should differences or similarities be documented and communicated, in those cases where there are differences in perception between ICES stock assessments and stakeholders, a working group, external to the assessment working groups, should evaluate these differences and describe whether these differences can be logically explained or require further investigation. This outcome of this process may potentially lead to new data collection or additional analyses suitable for input to benchmarks.

Essential in this entire process is making sure the same language is spoken between scientists and stakeholders, that there are clear and transparent processes in place on how to deal with stakeholder information and communicate clearly how this information is used in the preparation of ICES advice.

## ii Expert group information

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|                                   |   |
|-----------------------------------|---|
| <b>Expert group name</b>          | Workshop on accounting for fishers and other stakeholders' perceptions of the dynamics of fish stocks in ICES advice (WKAFPA) |
| <b>Expert group cycle</b>         | Annual  |
| <b>Year cycle started</b>         | 2023  |
| <b>Reporting year in cycle</b>    | 1/1   |
| <b>Chairs</b>                     | Steven Mackinson, United Kingdom<br>Niels Hintzen, The Netherlands  |
| <b>Meeting venue(s) and dates</b> | ICES HQ, Copenhagen, 10-12 October 2023, hybrid (34 participants)   |

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# 1 Introduction

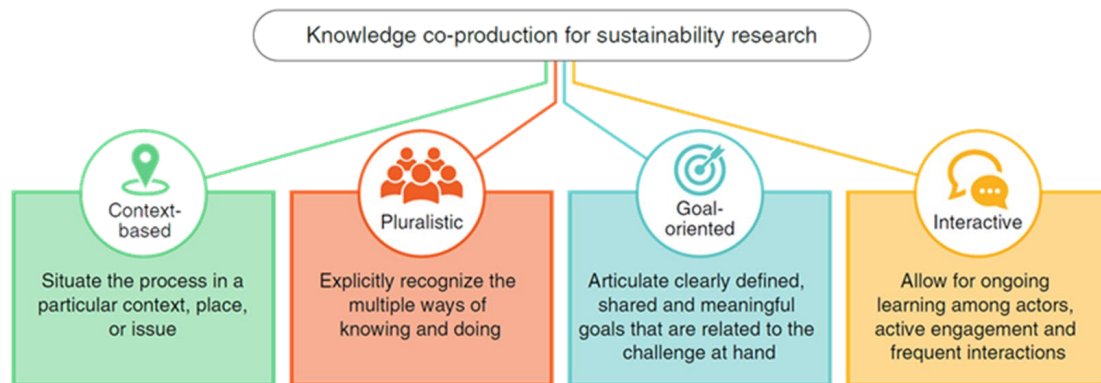
## 1.1 Motivation and aims

During recent years, ICES has been looking for more concrete actions how to use fishers and other stakeholders' perceptions of fish and fisheries dynamics in the process of sense-checking ICES assessment and resulting advice on fishing opportunities. Initially, stakeholder perceptions had been covered through a section in the fishing opportunity advice where stakeholders were invited to provide information relevant for a specific fish stock. This approach was abandoned over time to ensure that all statements in the advice sheet were backed by traceable and reviewed data and/or science, but this left a gap in stakeholder information utilisation and led to frustration among some of the stakeholders because they were limited to contribute to the production of ICES advice. As part of series of measures aimed at improving its advisory process, ICES has established a stakeholder engagement strategy and worked towards providing the means to utilize stakeholder information in an effective way.

The specific topic of sense-checking assessments and advice was prominent in research roadmap workshops WKRRMAC (2019) and WKRRCOD (2019) and has overlap with a series of workshops building on the theme of how to improve professional engagement and involvement of industry (and other third parties) in ICES work (see section 3). This WKAFPA workshop sought to identify the most appropriate 'contact points' and processes within ICES in accounting for fishers and other stakeholders' perceptions of the dynamics of fish stocks in ICES advice while ensuring that the integrity and credibility of ICES assessment and advice processes are maintained. It also aimed to identify realistic proposals for more systematic and routine input of relevant information from fishers and other stakeholders.

## 1.2 Stakeholder engagement strategy – roles and paths to contribute to ICES

Following the same principles as Norström *et al.* (2020), ICES created its stakeholder engagement strategy (ICES 2023). Norström *et al.* (2020) proposed that research aimed at addressing sustainability challenges is most effective when 'co-produced' by academics and non-academics, because co-production offers the promise of addressing the complex nature of contemporary sustainability challenges better than more traditional scientific approaches. But definitions of knowledge co-production are diverse and often contradictory. Norström *et al.* (2020) proposed a set of four general principles that underlie high-quality knowledge co-production for sustainability research, and how to evaluate their quality and success (Figure 1.1).



**Figure 1.1** Set of four general principles that underlie high-quality knowledge co-production for sustainability research (Norström *et al.* 2020)

The ICES strategic and advice/science plans mention the importance of engagement and also provide context for an implementation plan. At the strategic level, the mission and objectives to account for fishers and other stakeholders (Figure 1.2) perceptions is already developed and available. The task now is to establish specific actions necessary to develop a concrete process. A summary of the main points of ICES stakeholder engagement strategy that need to underpin this are provided below.

**Principles:** Five principles guide ICES engagement with stakeholders. These principles provide the overarching context in which engagement occurs.

1. Opportunities for stakeholder involvement are inclusive and proportional to the issue
2. Active stakeholder participation is consistent with the impartiality, independence and integrity of ICES.
3. The roles, responsibilities, and expectations of participation are transparent, and participants understand and respect their roles and the roles of others.
4. ICES communication strategy is aligned with the engagement strategy, and meaningful feedback is provided when appropriate.
5. Stakeholder participation is assessed, the engagement process is monitored, and constant organizational learning occurs.

Transparency is a core tenet of the strategy. However, there are exceptions to this principle to preserve the confidentiality of personal and sensitive information. Confidential conditions are indicated in ICES procedures.

**Duties and responsibilities of stakeholder:** stakeholders engaging with ICES are committed to:

1. Abiding by ICES Code of Ethics and Professional Conduct, which defines the standard of behaviour of stakeholders contributing to ICES science and advice, provides guidance on identifying and handling actual, potential, or perceived conflicts of interest, and sets the responsibilities of those contributing to ICES work.
2. Respecting the formal processes and rules associated with the roles within which they engage with ICES (i.e. expert, observer, contributor, and partner).
3. Contributing to ensuring the transparency of the process, namely by sharing the outputs with their constituencies (if applicable); likewise, fully respecting the confidentiality conditions that ICES applies, particularly in the advisory process.
4. Being mindful of the plurality of views and values of the stakeholders engaging with ICES; and 5. understanding ICES mission and vision, accepting that participatory



processes operate within the remit of the science organization, and restraining from opportunistic behaviour.

**Duties and responsibilities of ICES scientists (engagers):** researchers, scientists, and ICES bodies (e.g. a committee or secretariat) initiating a participatory process are committed to:

1. Abiding by the principles of stakeholder engagement set in this strategy and ensuring ICES Code of Ethics and Professional Conduct is effectively implemented;
2. Setting a “rationale for stakeholder engagement” for those in the role of participants before initiating the process. This includes a written definition of objectives, expected outcomes, stakeholder profiles, roles, and potential risks. The statement will be reported to ICES Secretariat for each engagement process.
3. Considering communication as an integral part of the process, in particular regarding goals, timeline, documentation, feedback, and the use and sharing of data and information by the stakeholders, in accordance with ICES data policy.
4. Being mindful about communication in relation to jargon and power dynamics.
5. Performing a self-assessment of the participatory process once it is completed and providing feedback to and receiving feedback from stakeholders in relation to outcomes and experiences.

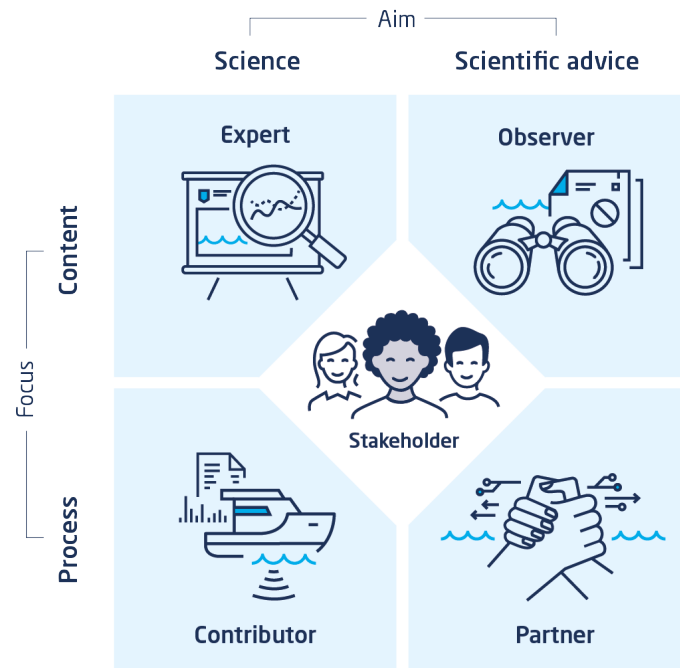


Figure 1.2. Stakeholder role within ICES. For details see Ballesteros and Dickey-Collas, 2023.

The Strategy (12 pages) is available here <https://doi.org/10.17895/ices.pub.21815106>

## 2 Terminology

*“Common definitions facilitate concepts’ applications and increase the clarification of their consequences”.*

Alexandra Blöcker gave a presentation on Perceptions, the what, why and how. The way of perceiving is elusive. People perceive the world around them differently and built in that way a certain thinking and opinions. Talking about concepts raises different thinking in each person involved in discussion or interactions. Concepts can have a strong ambiguity; the angle looking at them determines the perception, as well as the person’s background, personality, experience and knowledge. This makes the application of concepts difficult to the real world, and sometimes requires several definitions of the same concept. The regime shift concept is a prestige example of elusiveness and a clear definition is yet still under discussion. Interviewed stakeholders (management, science, fisheries, eNGOs) perceive the regime shift concept at different depths of knowledge: non-knowledge, general knowledge (abrupt changes), detailed knowledge (multiple states and irreversibility). This shows that concepts can be considered as boundary objects and multiple applications of one concept to diverse events highlight a concept’s fragility, as different concept versions exist simultaneously. Pushing a concept beyond its initial intention will demand the development of further concepts to maintain the first. Hence, to find an alignment of concept understanding, we need to understand how concepts are perceived by stakeholders and what stakeholders desire. This way, scientific results can be communicated and become more robust and acceptable among stakeholders. Common definitions facilitate concepts’ applications and increase the clarification of their consequences.

Acknowledging that perceptions are a multidimensional and complex concept, WKAFPA adopted an operational definition of the concept of perception, narrowing the scope to attributes pertaining to:

- i. the structure and dynamics of fish stocks (e.g. trends in spawning biomass, recruitment, abundance of fish below and above minimum conservation reference size, environmental factors, changes in natural and fishing mortality),
- ii. the operational and technical aspects of fishing operations (e.g. gear type and selectivity, use and performance of bycatch mitigation device, market/product and fuel prices, etc.), and
- iii. the components of ecosystems where fish stocks and fishing activities occur (e.g. environmental factors, predator/prey abundance, habitat quality and availability, etc.).

The characteristics that define perceptions of these attributes as relevant to ICES fish stock assessment and advisory process are **knowledge and value** (in terms of worth or usefulness). Aspects excluded here are beliefs and belief systems, opinions, perspectives, and world views.

Within that scope, perceptions **result from observations, interpreted in light of experience, that can be supported by data, information and knowledge to generate evidence about them**. Perceptions can be at an early stage, flagging the need to systematically collect and make the knowledge that supports them available, or be on at a mature stage and have useful information already available to be integrated into the system, which may come in different forms (definitions from Steins et al. 2022 and references therein. Additional relevant definitions are given in Annex 2):

- **Data:** individual facts, figures, signals and measurements that are products of observation. Data represent the properties of objects, events and their environments but lack meaning or value as data are without context.
- **Information:** extracted from data, through processing, analysis and organization, to add value to the understanding of a subject
- **Knowledge:** facts, information, and skills acquired through experience or education, resulting in theoretical or practical understanding of a subject.

### 3 Previous ICES work leading to WKAFPA

Table 3.1 provides an overview of ICES work that is either directly or intimately related to the subject of accounting for fishers and other stakeholders' perceptions of the dynamics of fish stocks in ICES advice. Stakeholder contributions to the development of the research roadmap for mackerel was one of the first opportunities where the desire for more systematic 'sense-checking' of the ICES advice was reported. This was followed by discussions with clients and within the advisory committee leading to a number of workshops that focused on either data products, its integrity and, most recently, a plan on how to implement ICES stakeholder engagement strategy.

**Table 3.1. Relevant work leading to WKAFPA**

| Reference document            | Publication date | Relevant actions / information by ICES  |
|-------------------------------|------------------|---|
| <a href="#">WKRRMAC</a>       | 01.01.2019       | Research roadmap for mackerel. Outline a sense-checking procedure.  |
| <a href="#">ICES AP 2019</a>  | 12.12.2019       | Improve the mechanism for sharing alternative perceptions of the state of stocks and fisheries (p16).   |
| <a href="#">WKSHOES 2021</a>  | 01.01.2021       | Organize the background information needed for SCICOM and ACOM to develop a formal ICES Stakeholder Engagement Strategy.  |
| <a href="#">MIACO 2021</a>    | 18.03.2021       | Action point 6.1. ICES to work to bring in data and knowledge from fishers, and sense checking of advice.   |
| <a href="#">ACOM Dec 2021</a> | 31.03.2022       | Focus Group on 'Sharing alternative perceptions of the state of stocks and fisheries' see section 9 and Annex 2 in report. (Facilitated by Steven Mackinson)  |
| <a href="#">MIRIA 2022</a>    | 13.10.2022       | Industry perceptions of stock and fisheries status e.g. cod in mix fisheries. 'In order to tackle industry perceptions of stocks and fisheries status ICES will consider including data collection and provision by the industry, creating a process similar to WKIRISH for the Baltic Sea, hosting a stakeholder workshop on mixed fisheries, and develop guidance for ensuring the integrity of scientific information submitted to ICES by data providers.   |
| <a href="#">MIACO 2022</a>    | 11.01.2023       | Form a subgroup with ACOM, scientists engaged in ICES with and volunteers from MIACO to explore the Information from Stakeholder section issue and look at concerns, opportunities and potential solutions and look at the sense testing study done with Steve Mackinson. The subgroup will report back to MIACO 2023.<br><br>Industry perceptions of stock and fisheries status e.g. cod in mix fisheries<br><br>A more open mind concerning the applied nature of the science behind ICES advice was advocated and a higher engagement in discussions with fishery/industry on differing perceptions of science. ICES acknowledged this input as crucial and ICES strives towards such an openness.'<br><br>Forthcoming challenges. 'In terms of longer-term science developments, the alignment of the advice and the 'reality' in terms of sense-checking should be further worked on, implemented and made operational. Regular discussions would be a good tool.'<br><br>'Sense-checking of the advice and the consequences of the advice provided was an important issue raised by MIACO.' |
| <a href="#">ACOM 2022</a>     | 18.01.2023       | 'A number of suggested priorities to initiate the discussion with MIACO were presented. Inclusion of data from the industry (series of WKS on this) will increase the credibility of the advice, visibly including the information from fishers, however, there is still a perceived need for a qualitative input from the stakeholders. For any quantitative assessment the data is the foundation, this is a  |

| Reference document                   | Publication date  | Relevant actions / information by ICES  |
|--------------------------------------|-------------------|---|
|                                      |                   | <p>well-known fact in the communities, however, the inclusion of these may not end up with assessment results which agree with the perception of the stocks in the stakeholder community. ACOM chose to go forward with quality and credibility. The importance of this opening should not be cancelled out by an option of ‘alternative facts’; ACOM should consider framing this as an opening for all, including Science as well.</p> <p>Risk-based tools could be used (scoring approaches of fishers’ perception of stock size, spatial distribution, etc.) to map such perceptions (i.e. a different way to re-introduce the independent fisheries survey done in the North Sea). The application of these tools will have to be quite case-specific and be evaluated in terms of added value/information.</p> <p>Holding a MIACO workshop to present and discuss examples of where perceptions of advice has been discussed and the process has been operational/not-operational. Meeting to be held prior to MIACO 2023. 2-hour workshop on alternative perceptions with ACs, asking for case-studies to be brought to the meeting.</p>   |
| <p><a href="#">WKRRCOD</a></p>       | <p>16.12.2022</p> | <p>A strong emphasis on trying to reach agreed perception of stock status and the role that contribution of information from industry might play in this. For example, p6 section 3.4.3 ‘Industry data and sampling can provide substantial knowledge about stock status and distribution, a knowledge that is presently not utilised in the assessment beyond the inclusion of total catches. There is a need for greater clarity on where data can be particularly useful, how observations enter the data stream and therefore where and how fishers can potentially contribute with additional data and knowledge. If assessments and advice can be updated with real time data from fisheries, this can alleviate the problem of the stock developing in a different direction than expected at the assessment in the year that it takes to implement the new quota. There was a general concern that the observed changes in stock distribution and structure were not appropriately addressed in the current assessment and reference points.’</p> <p>‘Science has a role to help industry get to the point where they are producing quality assessment input for the benefit of all, with particular focus on identifying places where data or knowledge can really help and where fisher knowledge to the assessment.’</p> <p>‘It was generally thought to be an excellent idea to have pre-assessment meetings.’ Recommendation 3: A pre-assessment meeting should be organised to discuss new knowledge in support of the annual assessment including intermediate year assumptions. This meeting should take place together with an overview of survey results and be repeated annually. The meeting should be at least two weeks in advance of the benchmark to allow the stock assessors to consider the discussion points.</p> <p>Recommendation: (pertinent to the ongoing debate about the removal of the Information from stakeholders box on advice sheet). ‘In the assessment report, a short text should be added stating the main input from the industry in the pre-assessment meeting as well as how this was investigated or incorporated in the further work’</p> |
| <p><a href="#">MIRIA 2023</a></p>    | <p>01.01.2023</p> | <p>Agreement for the preamble for the new workshop to include specific mention of information from stakeholders and adjust the terms of reference</p> <p>Action Point: Further development of terms of reference on workshop on perspectives of advice</p>  |
| <p><a href="#">WKEVUT</a></p>        | <p>09.01.2023</p> | <p>The need for ICES to be able to understand the value of new data streams coming from stakeholder, and what it implies for the assessment and advice processes to incorporate and apply them in future work.</p>  |
| <p><a href="#">MIACO_SG_2022</a></p> |                   | <p>Covers much the same ground as ACOM focus group, but some emphasis on semi-quantitative time series as basis for monitoring stock trends and comparing perceptions with assessments. North Sea stock survey mentioned again.</p>   |

| Reference document                                   | Publication date | Relevant actions / information by ICES   |
|--|------------------|--|
| <a href="#">MIACO 2023</a>                           | 27.04.2023       | Subgroup of MIACO that met in November 2022 for an online session about the information from stakeholders and perceptions of stock and fisheries dynamics. The subgroup proved to be a useful process and resulted in a proposal for a workshop on the next steps on perceptions of stocks and fisheries.  |
| <a href="#">ICES Stakeholder Engagement Strategy</a> | 01.05.2023       | Outlines the key principles of stakeholder engagement and defines the roles of both stakeholders and scientists in the engagement. The strategy gives general guidance and mission for ICES community on how to organize stakeholder engagement, with concrete details and guidance being developed in the implementation plan. It lists the scope, context and rationale for engagement, and describes the roles and responsibilities of stakeholders and researchers |
| <a href="#">WKEnsure</a>                             | 12.05.2023       | About maintaining integrity of information submitted for use in ICES, with focus on processes identifying, making transparent and managing potential conflicts of interest related to data provision.  |
| WKRRCOD2 (draft)                                     | 23.05.2023       | Section 3 on summarising the input from industry to a pre-assessment meeting and the recommendations arising.  |
| <a href="#">WKSTIMP</a>                              | May, 2023        | WKSTIMP proposes 35 time-based priority actions, urges the implementation plan's timely approval, and suggests strengthening ICES capability by creating an expert group on engagement.<br><br>Potential actions developed by stakeholders beyond ICES provide synergies that could reinforce the Strategy.  |

The concept of 'sense checking' stuck, and it is generally considered useful to get stakeholder perceptions on stock trends as a non-data driven verification tool for ICES advice. Stock assessments use data and models to create a perception of the size and changes in fish stocks over time. Different perceptions of the stock arise when different input data, model configurations or types are used. The resulting advice on fishing opportunities also changes as the perception of the stock changes. When this occurs frequently, or the change in perception is large from one assessment to the next, it is cause for concern, both for the quality of the assessment and the credibility of the advice that uses it. Therefore, it makes sense that the information used in stock assessment and the results produced by it go through a process of sense-checking, reinforcing also the legitimacy of the advisory process.

In the main, the process for this relies on quality control of input data and statistical measure of model performance and parsimony, which are established at benchmark assessment meetings, and applied at subsequent routine assessment meetings, until such time as it is deemed necessary to review the methods. Alternative perceptions of the size and changes in fish stocks over time may exist and be available from the fishing industry and other stakeholders, but these are not typically recorded or organised in a way that makes them routinely available for comparison and sense-checking stock perceptions derived from assessment.

In WKAFPA we also explore alternative routes to include stakeholder information beyond, but also including, sense-checking. This is presented in section 4.

## 4 Operationalising the application of alternative knowledge in ICES assessment and advice process

To have the best possible chance of contributing to the generation of ‘best available evidence’, alternative information on (or ‘perceptions’) fish stocks needs to be relevant to the assessment and advice process, and provided in form that is useable in that context. So whether that information is hard data, qualitative structured information or unstructured ad hoc observations it needs to be formalized to be mobilized. Operationally, ICES processes need to serve both as a gate and gateway in this regard, and to achieve this, several things need to be in place:

- (1) Guidance on the form and quality criteria required for different types of information.
- (2) A process for identifying and assessing the potential utility of alternative information contributions and what actions should take place
- (3) Structures and pathways to prepare, direct, assess and make use of relevant information
- (4) A process for evaluation, reasoning and response

The following sections deal with each of these aspects in turn.

### 4.1 Criteria to facilitate inclusion of stakeholder perceptions

To establish a basis for developing guidance on 1, participants addressed the question *‘In what form and what quality criteria need to be met for information to be to be useable?’*. As general guidance it was considered that the following should be taken into account during preparation for provision of alternative information:

- Presented in a well-organised and structured manner, using the informal ‘Working document’ approach already used in ICES benchmark and assessment processes.
- Be verifiable.
- Be able to show that information carries a weight-of-evidence that is compelling and relevant to the issue.
- Is applicable at a scale relevant to assessment results, their interpretation, or application advice. This means aiming for information from collective experiences, not unique individual ones.
- Include a statement that its provision is free of intentional Conflict of Interest and intended solely for the purpose of improvement in the quality of the assessment.

More specifically, the following criteria were identified as being very useful in facilitating processes for evaluating the potential utility of alternative information and what to do with it.

1. Sampling should be representative of the fishery / issue, and ideally have an estimate of the relative sampling error in case of quantitative approaches. In case of more qualitative information (i.e., information from fisher’s knowledge research), theoretical saturation should ideally have been achieved.
2. Sampling design should be documented. Using the ICES Catch Sampling Summary Template (contact [WGCatch](#)) and [ICES Data Profiling Tool](#), would be very helpful in this regard.

3. Data collection and quality control procedures should be documented , and all documentation should be accessible
4. Any data should adhere to FAIR principles (Findable, Accessible, Interoperable, Reusable)
5. Information should strive for consistency in form and continuity in provision
6. Information should be accurate and complete and provided in a timely manner
7. Non-quantitative information of a contextual information should be documented provide reasoned narrative to justify/ explain any observations or patterns related to assessment and advice. If the scale of observations are small, they need to be linked to broader phenomena that demonstrates a compelling weight of evidence.

More specific examples of the types of information are covered under section 4.3 (see Figure 4.2)

In addition and complementary to these considerations, the ICES Workshop on Standards and Guidelines for fisheries dependent data ([WKDSG](#)) provides a good deal of useful and relevant information on this question. Annex 6 is of particular relevance because it provides an overview of the principles and processes for quality control and assurance of data intended for use in ICES advice. It is aimed at persons involved in the planning and delivery of fisheries-dependent data collection initiatives, with a focus on those who are not intimately familiar with the routine data collection programmes conducted by government institutions, and those whose data collection initiatives are not part of such programmes.

## 4.2 Process for identifying and assessing potential utility of alternative information contributions

Discussions led to the proposal to develop a Triage process (Table 4.1) to provide a rapid appraisal of the potential utility and priority that should be given to alternative information contributions in ICES stock assessment and advice process. Triage is the term derived from French verb *tier* meaning to sort or to choose. It is developed here as a process of classification and screening intended to ensure that (i) the utility and readiness level of an information source is identified, and (ii) those with potential utility are directed to the place in ICES assessment and advice where they could potentially be useful.

**The process of deciding which classification should be applied requires the development of decision-tree of screening questions.** Furthermore, in determining potential utility of alternative information, the process also provides the opportunity to consider risks associated with provision of information from third-party sources, following the finding of the ICES workshop on Developing guidance for ensuring the integrity of scientific information submitted to ices by data providers ([WKEensure](#)).

Operationalising processes for inclusion of alternative information relevant to ICES assessment and advice demands that clear and reasonable expectations are defined and mutually understood between ICES scientists and stakeholders. Failure to do so would undermine the effectiveness and legitimacy of the process, as well the credibility of its outcomes.



**Table 4.1. Triage classification**

| CLASS                     | UTILITY & READINESS  | ACTION   | Examples   |
|---------------------------|--|--|--|
| <b>ACTIONABLE (GREEN)</b> | Immediately useable information pertinent to stock assessment or advice  | <b>ACT</b> - notify Advice drafting group and chairs of relevant assessment working group  | Quality verified and documented time series data that can be used now in the assessment model/method, such as survey indices and biological data   |
| <b>IMPORTANT (ORANGE)</b> | Useable information that requires some work to prepare it in a form that is useable                              | <b>PREPARE</b> - notify relevant expert group chairs to engage with information provider to determine appropriate steps, likely leading to a contribution in a benchmark | Structured information relevant as input to assessment or in verification of inputs or outputs of assessment and advice, independent indices of relative abundance, but not yet representative at appropriate temporal or spatial scale. |
| <b>POTENTIAL (YELLOW)</b> | Potentially useful information but requires more work to make it relevant and applicable to assessment or advice | <b>REVIEW</b> - engage with information provider to explain possible shortcomings and, where relevant, how these may be remedied   | Information covering to issues or data needs relevant to assessment and advice but not sufficiently well organised or verifiable   |
| <b>DISMISS (WHITE)</b>    | Not considered useful in adding value to assessment and advice beyond the information already applied.           | <b>FEEDBACK</b> - engage with information provider to explain why the information is not useable in the assessment and advice process                                    | Information not relevant to assessment data, methods, assumptions, or to advice. Or information is not verifiable  |

### 4.3 Where in the ICES process

A simplified diagram of the ICES fish stock assessment and fisheries advice process (Figure 4.1) was used to identify where in ICES process the knowledge of perceptions of fish stock dynamics could usefully be applied.

Different pathways were identified for different types of information and knowledge, and it was considered that new pre-assessment & pre-benchmark processes would be required to be introduced to the existing ICES process to facilitate the inclusion of alternative information in an organized and systematic way (Figure 4.2). The proposed adaptations are intended to work with and evolve current ICES processes, and as such the details of their implementation would need to evolve to ensure that they are fit-for-purpose. Some participants suggested that a complete upheaval and re-design of the advice process would be preferable, but also saw the need for pragmatism. The adapted processes schematic (Figure 4.2) identifies what types and forms of information may be relevant and useful to introduce at different stages in the advice process, as well as the expected utility of their application. It includes opportunities for the inclusion of alternative information ranging from organized input of quality controlled quantitative data through to adhoc observation/ conversations on the perceived state of stocks and fisheries.

Specific consideration was also given to the fact that Management Strategy Evaluation would be a suitable process for early introduction of alternative information relevant to assessment and advice (see [Wilson et al. 2023](#) for example).

Participants reflected on the fact that additional processes may cause extra workload in assessment or benchmark groups. Accepting that this would be largely unavoidable, the proposed adapted process aims to place responsibility for preparation and organization of inputs to ICES through national structures and/or Advisory Councils, or a combination of both depending on what fits the needs best. National structures provide the benefit of enabling efficient interactions between scientists and stakeholders at a local level, while preparation via Advisory Councils benefits from a regional perspective that is relevant to the scale of fisheries and fish stock assessment. This is important because the value of alternative information is greatly enhanced when it is representative at the level of fisheries and fish stocks. Examples of such processes already exist, albeit in an ad hoc manner aiming to address particular assessment concerns and data deficiencies. Experience from these examples should be sought when considering how best to operationalize a structured approach that evolves existing ICES processes. Regarding the extra resource demands, comments from several participants suggest strongly that if ICES were to lead this initiative as part of ongoing efforts toward increasing transparency and assuring quality, Advisory Councils would be keen and willing to contribute to operationalize it; much as they did for the coordination of the North Sea Fishers Stock Survey.

While the focus of the work was on stock assessment and fisheries advice, processes for the inclusion of alternative information are relevant to other types of advice, such as VME advice, which could also follow similar pathways and implement similar protocols/ guidance on the type and forms of information that would have the best possible chance of being useable and useful.

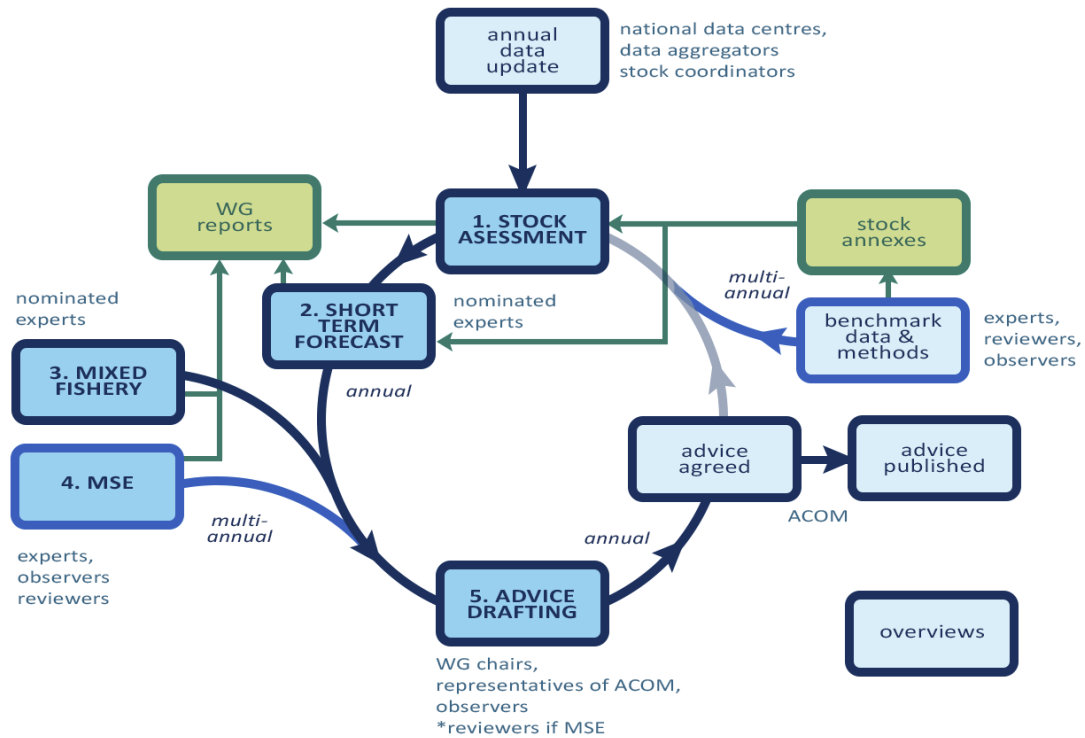


Figure 4.1. Simplified process for the production of ICES advice on fishing opportunities.

Where and how alternative knowledge and perceptions of fish stock dynamics can usefully be applied in ICES assessment and advice process

WKAPFA | November 7, 2023

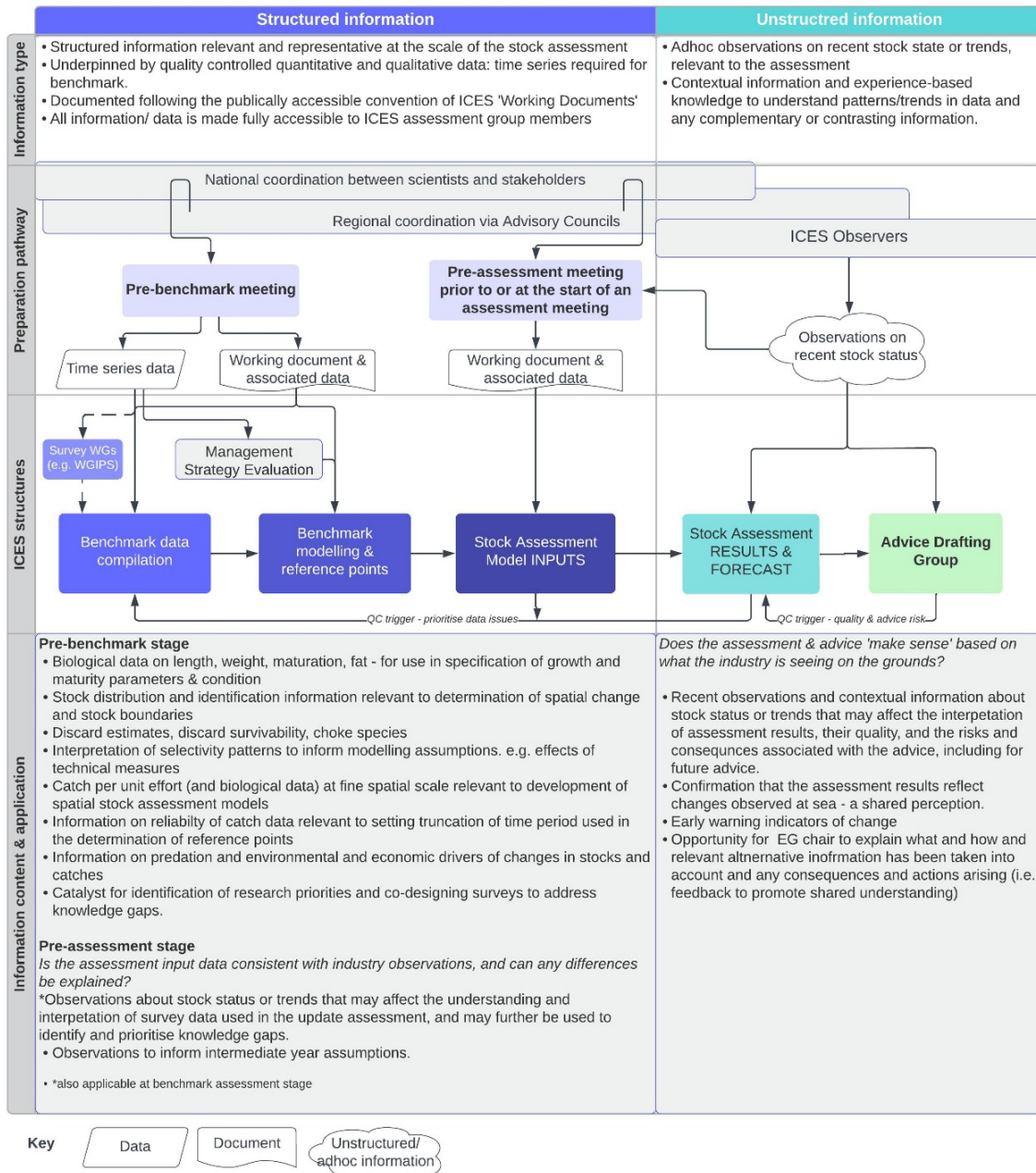


Figure 4.2. Schematic showing adapted ICES assessment and advice process to facilitate the inclusion of alternative information in an organized and systematic way.

### 4.4 Evaluate, reason, respond

Investigating similarities and differences in ICES assessments and stakeholder perceptions requires a process to document how similarities and differences were addressed and reflect the outcomes of the engagement.

### Documentation of similarities and differences

Participant noted that being precise in what aspect of an ICES stock assessments is being challenged is essential to make progress in reconciling differences in perception. Elements to consider and document are provided below:

1. Identify the scale of agreement / disagreement
  - a. In terms of how long agreement / disagreement is in place.
  - b. Who experiences the agreement / disagreement, large group, small group.
2. Identify what indicator (e.g. SSB, natural mortality, selection pattern) the agreement/disagreement is on.
3. Investigate if differences in perception on these indicators are related to each other and could point to a single source.
4. Document the information used to support the stakeholder perception
5. Investigate where data input used in the ICES assessment is different from data used to support the stakeholder perception.
6. Investigate where assumptions in the ICES assessment are different from assumptions made to derive the stakeholder perception.
7. Define what diagnostic should be demonstrated to reason divergent views.
8. Identify and execute sensitivity analyses (e.g. evaluating different input data, such as survey data, into stock assessments) to investigate diverging views.
9. Communicate about diverging views openly in ICES working group reports including a reflection on before/after differences in views from stakeholders and ICES scientists.
10. Describe the process undertaken to investigate the differences / similarities in perception and the uptake of stakeholder perceptions and/or data and highlight the next steps to take to further investigate the issue such as listing it for benchmarking.

As mentioned above, although ideally these differences would be discussed collaboratively between stakeholders and stock assessment scientists, this may not always be feasible noting high work pressure during benchmarks and/or assessments. Alternatively, an external expert could review these differences and report back to the working groups and stakeholders. These reviews could become part of the standard Terms of Reference of a new ICES working group focusing on stakeholder perceptions in the advice process (e.g. WGREVIEW, reviewing alternative perceptions on stock status). WKSTIMP also includes two useful actions: to set a system to monitor and evaluate ICES stakeholder engagement (action 22) which can include tracking advice challenged, perceptions exploration, outputs and outcomes; and to create a working group on stakeholder engagement (WKENGAGE, action 14) which could explore the impacts, analyze the processes and support improvement and organizational learning

'Speaking the same language' is crucial in working towards reconciling differences in perception and it is therefore recommended that ICES organizes training for stakeholders to explain part of the ICES vocabulary, the stakeholder engagement strategy and the ICES advisory process in general, and the other way around - where ICES helps train assessment scientists about social science methods (already exists) + talking/working with fishers and understanding how their world views come about. This may likely result in more effective communication between stakeholders and ICES scientists. Specifically, effort should be made to simplify language within benchmark meetings where technical details often prevail. An intensified collaboration between

stakeholders and ICES will carry many benefits for stakeholders, scientists and ultimately the legitimacy of ICES advisory products.

This work comes however at a great cost and burden on a stock assessment scientists that are often already handling a large number of tasks. We therefore recommend to take this process stock by stock and learn from experience before attempting to make it a generic system for all ICES stocks.

## 5 Mechanism to systematically monitor and collate information

A presentation by Paul MacDonald focused on vessels operating in the west coast of Scotland whitefish fishery that have been trialling a system for sharing information on high catches of stocks where there is limited or no quota, including cod, in real-time. The system was developed by the Scottish Fishermen's Organisation, University of Aberdeen and software developer Chor-data LLC, and is loosely based on a concept developed for use in the Alaskan pollock fishery. Vessels record all catch information for selected species in the BATmap (Bycatch Avoidance Tool with mapping) mobile app. Data are stored and processed securely on an online server using automated protocols. When catches of a given species exceed a previously agreed threshold, a high catch alert is sent to all participants, providing details on the location and amount of the high catch. This enables fishers to make informed decisions on where they fish and helps to avoid areas of high concentrations of unwanted catch. In addition to high catch alerts, the BATmap system generates highly resolved spatial data on catches of the reported species across the west of Scotland. These high-resolution data provide a level of spatial detail not currently available through traditional catch sampling and recording methods. Work is currently ongoing to deploy BATmap in the west of Scotland inshore Nephrops fishery with the hope of generating high resolution catch data for cod in inshore areas. Further details on the system are available at <https://info.batmap.co.uk/>

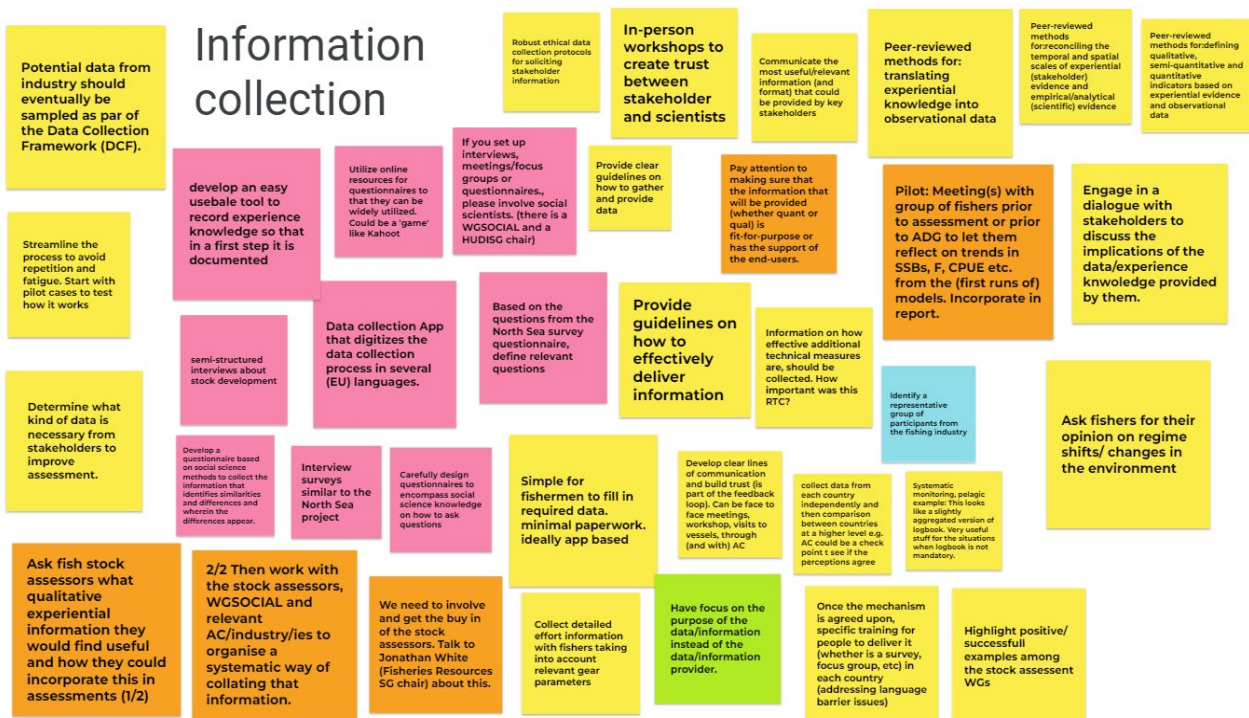
Ian Napier presented on the Fishers' North Sea Stock Survey (NSSS) that was an industry led initiative intended to make fisher's knowledge of the state of fish stocks available to fisheries scientists and fisheries managers. Following a pilot in 2002 the survey was carried out annually from 2003 to 2014. The survey was coordinated by fishermen's organisations in Belgium, Denmark, the Netherlands and the UK who distributed questionnaires to their members and entered the data from returned questionnaires. These data were then passed to the NAFC Marine Centre (now part of UHI Shetland) who collated the data, carried out some analysis and prepared a report which was distributed to interested parties, including ICES WGNSSK. The data collected was qualitative and subjective and focussed on comparing each year with the previous year although efforts were made to construct numerical time-series from the data and to compare it with ICES stock assessment results. Although ICES referenced some of the survey results in their advice (generally in the sense of whether or not the trends shown were similar to those shown by the assessments) no detailed use was made of the data collected within the stock assessment process. The survey was not repeated after 2014 due to a loss of interest by at least some of the participating organisations and falling number of responses from fishermen, at least in part due to a belief that the survey results weren't being used or weren't having any effects. Lessons that can be drawn from the experience of the survey include: the importance of scientific (including social science) input to survey design; the difficulties of using qualitative data in assessment models; and the importance of managing fisher's expectations.

WKAFPA discussed what the key elements of a mechanism to systematically monitor and collate information from fishers and other stakeholders should entail. A brainstorm session was first held where participants were asked to put their thoughts on paper using sticky notes at an online platform. Following from this, a brief summary was given to the entire group followed by some more discussion and clarifications. A small team of participants categorized the notes into three categories, as is presented below. Some of the notes were relevant but largely unlinked to this specific ToR. These are provided at the end under 'additional considerations'.

Three key elements were identified to systematically monitor and collate information from fishers and other stakeholders. First, a process how to reliably gather information needs to be in place. Second, a process to demonstrate how data is used in advice products needs to be organized and third, a process to communicate effectively with stakeholders during the process needs to be established.

## 1. Information collection

- Define who can provide data, this may help in notifying relevant stakeholders early on in the process.
- Define when this data can be provided, as timing of data delivery is key for effective uptake.
- Provide guidelines for easy data submission and data suitability, where data collection tools or apps may be used to provide this data to ICES.
- Define criteria for data quality and representativeness, making sure that submitted data follows the FAIR principles.
- Assist with data submission and data interpretation to convert experiential knowledge into observational data, to improve the data quality and understanding of stakeholders when data is usable in e.g stock assessment groups.



**2. Demonstrate use of data**

- Peer-review the data along the lines of the defined criteria and report on this in working group reports.
- Demonstrate the uptake of stakeholder information in advice products to end-users.
- Identify knowledge gaps that could be supported by stakeholder information.



**3. Communicate with stakeholders on the process**

- Organize workshop meetings to ensure the same language is being spoken.
- Develop a continuous interaction between ICES scientists and stakeholders to build mutual trust.
- Actively involve stakeholders in the process of developing and sense checking of advice.

# Process ideas



Additional considerations that are relevant in WKAFPA context, but more remotely related to this specific ToR are provided below.

# Other considerations





## 6 Test cases

A number of stocks were identified that are in or close to a benchmark for which it was considered useful to implement some of the lessons learned and recommendations made from WKAFPA. These stocks are listed below.

**Table 6.1. Participant suggestions for stocks that might be used as test-cases to enhance opportunities to account for stakeholders perceptions or systematically monitor and collate information.**

| Stock                                     | What information will be brought forward and how will it impact ICES assessments   | Who is responsible for appropriate information handling  | When will a preliminary information analyses be ready for review |
|---|--|--|--|
| hom.27.2a4a5b6a7a-ce-k8<br>hom.27.3a4bc7d | Genetic information on stock structure. Catch@age data will need to be splitted differently compared to current practice, this will alter the stock assessment input data  | KFO Ireland, PFA Netherlands   | December 20, 2023  |
| sol.27.4                                  | A workshop with Dutch common sole fishers was organised on 8 November 2023 by Wageningen Marine Research in preparation of the upcoming ICES benchmark WKBFLATFISH-1. Stock assessors first explained the current problems in the North Sea sole assessment. This was followed by a discussion around two question: (1) which changes do the fishers see in their fishery, and (2) which changes do fishers see in the North Sea ecosystem. The report of the workshop will be shared with WKBFLATFISH-1 as input for their discussions. | WKBFLATFISH-1 (participant)  | Post – WKBFLATFISH-1   |
| sol.27.7.a                                | Commercial tuning / CPUE indices. Fishers indicate that stock assessment and fishers' perception are not in line.  | ILVO   | Pre-benchmark WKBFLATFISH1                                       |
| her.27.3a47d                              | WGHAWG already adds 2 extra days in advance of the meeting to prepare data for the North sea herring assessment. Participation in these two days could be opened up to include more people as a pre-assessment meeting.  | DPPO   | Immediately prior to main HAWG meeting.                          |
| spr.27.22-32                              | Higher resolution data on catches, catch composition, effort and hydroacoustic measurements of industrial fisheries. Pre-assessment meeting with WGBFAS.   | Project needed to collect and analyse data. Participants could be Thünen Institute, DTU Aqua and DPPO. | Depends on the project funding                                   |

## 7 Conclusions

1. Perceptions on fish stocks and fisheries dynamics are framed in the eye of the beholder, whether that be ICES, or others. When talking about alternative perceptions, the context and framing needs to be clear so that the intended meaning can be understood and interpreted appropriately by others. WKAFPA adopted an operational definition of the concept of perception, where perceptions result from observations, interpreted in light of experience, that can be supported by data, information and knowledge to generate evidence about them.
2. There is a role for sense-testing/ validation of stock assessments using alternative perceptions of fish stock and fishery dynamics. The opportunities likely to be most fruitful in the short-term include information pertaining to:
  - Fish stock abundance and distribution.
  - Environmental and ecological factors that may influence fish stock abundance and distribution, such as changes in ocean conditions, predation.
  - Fish stock structure and health, such as weight, length and age composition, and condition of fish.
  - Recruitment indicators to inform intermediate year assumptions.
  - Catch rates (CPUE) for target and non-target species.
  - Environmental, ecological, economic factors that may influence, and therefore affect the interpretation of catch rates, such as changes in fish distribution, prices, costs, access relative to availability.
  - Information on catches and discards of unwanted species.
3. There are different points in the system where this could occur, but participants considered that probably the most effective would be the introduction to benchmarks and assessment processes. The benchmark process should be the route to introduce quantitative data that has been quality controlled and collected systematically according to documented sampling design and protocols. Opportunities for the introduction of other information on the perception of fish stocks and fisheries that is pertinent to stock assessment and advice should be more varied, and depend upon the nature of the information, the type of assessment and the opportunity to ensure that the best available information is used (see Figure 4.3.). As general rule, for the best chance of success, provision of alternative information should take into account, and use as a guide in preparation, the following:
  - Presented in a well-organised and structured manner, using the informal 'Working document' approach already used in ICES benchmark and assessment processes.
  - Be verifiable.
  - Be able to show that information carries a weight-of-evidence that is compelling and relevant to the issue.

- Is applicable at a scale relevant to assessment results, their interpretation, or application advice. This means aiming for information from collective experiences, not unique individual ones.
  - Include a statement that its provision is free of intentional Conflict of Interest and intended solely for the purpose of improvement in the quality of the assessment.
4. In addition to the existing benchmark process for provision of alternative information relevant to assessment, ICES is recommended to open up the assessment working group process for opportunities to introduce alternative structured information. In particular, participants consider that the most appropriate pathway(s) would be via a separate pre-assessment and pre-benchmark meetings hosted by ICES, or front loading of existing assessment meetings with additional day(s), or / and via nationally organised pre-assessment meetings that may feed in to the ICES expert groups. The latter pathway may provide an efficient route and benefit (assumed) from a quality vetting process beforehand.
  5. To facilitate the provision of alternative information on perceptions of stocks and fisheries, ICES needs to define the quality criteria, which if met, would provide the best chance of success for being useable and useful to ICES assessment and advice. Guidance should also be given on the forms of information that would facilitate the efficiency of the process.
  6. When alternative information on the perception of fish stocks and fisheries is provided, ICES should commit to ensuring that constructive feedback is given regarding how the information has been considered and used, or where it is not considered useable or not used, guidance should be given on how the information may be improved.

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## Annex 2: Definitions

From Steins et al. 2022 and references therein.

**Best available (scientific) information:** Refers to not only the data, information, knowledge used for assessment and decision-making, but also the framework and processes that ensure this information is solicited, reviewed and evaluated, including objective-setting. The information may include environmental, biological, technical, economic and/or social data. The process should be iterative and targeted to address specific needs and aims and must be transparent, open, inclusive and objective. It should include independent review, validation, and be central to and embedded within management mechanisms [2–4].

**Fishers' Experiential Knowledge:** Contextual knowledge and sensitivity about the social-ecological system as a result of fishers' or fishing communities' experiences from working in that system and its associated socio-economic, cultural, technological, physical or other changes, often over many generations [5–11]. Experiential knowledge includes Traditional Ecological Knowledge with a focus on Indigenous peoples [5] and Local Ecological Knowledge with a focus on fishers rooted in communities with a long history of engaging in particular subsistence, commercial or recreational fisheries [6].

**Fishers' Knowledge Research:** A body of research that does not regard science and fishers' knowledge as two separate entities but suggests that data from measured observations and experiential knowledge of fishers should be included in scientific assessments in support of management. Fisher's Knowledge Research covers a broad spectrum, from providing observational-based data or experiential information to scientists to full participation and acceptance of experiential knowledge as part of using the best available information [9].

**Fishing industry:** Generic catch-all term representing both fishers, i.e., those who fish whether it be small-scale, large-scale, independent, contractual, and irrespective of their gender, and the fishing organizations, i.e. those higher-level entities such as alliances, associations, companies, cooperatives and unions, that represent fishers, fleets or sectors

**Knowledge – fishers' knowledge:** Both a body of knowledge held by individuals or groups of fishers or fishing communities and a process of producing and assembling that knowledge through observations, trial and error, contextual experiences and research.

**Knowledge – scientific knowledge AKA Mode 1 science:** Both a body of knowledge and a process of producing knowledge in which that knowledge is produced and organized in systematic ways and according to general principles. Processes of observation and experimentation are typically used to produce empirical scientific knowledge and support scientific theory building. This traditional interpretation of scientific knowledge is also referred to as Mode 1 science [16].

**Co-production of data, information and knowledge AKA Mode 2 science:** Scientific knowledge that is co-produced with stakeholders in academic-industry/stakeholder interactions. Compared to Mode 1 science, Mode science 2 is characterized by: (1) a context of application; (2) transdisciplinarity; (3) heterogeneity in terms of organizations involved; (4) reflexivity, in that is a dialogic process that incorporates multiple perspectives; (5) a novel quality control approach, where traditional peer-review is supplemented by additional criteria (socio-economic, cultural, political) [16].

**Integrity of science:** Defined as research that is: (1) reliable – as it ensures research quality; (2) honest – by being transparent, fair, full and unbiased; (3) respectful – for participants,

stakeholders and the social, cultural and natural environment; (4) accountable – for its design, organization and wider impacts [14].

**Quality of research:** Narrow definitions of quality used in disciplinary research focus on scientific excellence and relevance, with established disciplinary criteria and processes for evaluating research quality [17]. We define Quality from a Mode 2 science perspective. Good quality ‘trans-disciplinary research’ [18] meets 4 principles: (1) relevance – the importance, significance, and usefulness of objectives, process and findings to problem context and society; (2) credibility – robustness and trustworthiness of knowledge produced; (3) legitimacy – research is perceived as fair and ethical by end-users; (4) effectiveness – research contributes to positive change in the social, economic and/or environmental problem context [17].

**Statutory data:** Fisheries-dependent quantified data that fishers or the fishing industry must provide to national authorities and science organizations as part of legal obligations. Examples of statutory data include landings and effort data, discards data from observer schemes, biological data on species, results of gear selectivity trials, data on the frequency of interactions with vulnerable species, economic performance data and social metrics.

**Uniqueness of knowledge available from fishers:** Knowledge that is the result of fishers’ experience and observations, which cannot be derived from other sources.

**Voluntary contributions:** Data, information and knowledge actively contributed to science by industry’s own initiative or willingness to engage in SIRC. Examples of voluntary contributions can be similar as those mentioned under statutory data; they may also be transactional in nature such as chartering their vessels for research surveys. Voluntary contributions are always by the fisher’s own choice.



## Annex 3: Resolutions

### Terms of Reference

- a. Synthesize the findings of WKRRMAC, WKRRCOD, WKENSURE and other relevant reports on using knowledge of fishers and other stakeholders perceptions of fish and fisheries dynamics in the process of sense-checking ICES assessment and resulting advice on fishing opportunities.
- b. Identify where in ICES assessment and advisory process, the knowledge of perceptions of fish stock dynamics could usefully be applied.
- c. Describe a process for reflection and reasoning on identified similarities and differences in ICES assessments and fishers and other stakeholders perceptions of fish stock dynamics.
- d. Provide the key elements of a mechanism to systematically monitor and collate information from fishers and other stakeholders on fish stock status (and relation to reference points) and trends, and fishing patterns, which may be useful to evidence and understand any similarities and differences in their perceptions compared to ICES assessments.
- e. Suggest key fisheries and stock assessments to test the sense-checking process.

## Annex 4: Agenda & presentations

| CET           | 10-Oct<br>Tuesday   | 11-Oct<br>Wednesday   | 12-Oct<br>Thursday  |
|---------------|---|---|---|
| 9:00 - 9:30   | General ICES introduction<br>Introduction of participants<br>Code of Conduct<br>ToRs    | 3. Introduction ToR 3   | 4. Breakout group: key elements<br>Minutes: Patrick Murphy              |
| 9:30 - 10:00  | Workshop agenda   | 3. Breakout group: reflection and reasoning<br>Minutes: Stephanie Haase | 4. Breakout group: key elements<br>Minutes: Heike Schwermer             |
| 10:00 - 10:30 | 1. Presentations ToR 1: Lotte Worsøe Clausen  | 3. Breakout group: reflection and reasoning<br>Minutes: Elena Balestri  | 4. Breakout group: key elements<br>Minutes: Martin Pastoors             |
| 10:30 - 11:00 | BREAK   | BREAK   | BREAK   |
| 11:00 - 11:30 | 1. Presentations ToR 1: Alexandra Bloecker  | 3. Breakout group: reflection and reasoning<br>Minutes:                 | 4. Breakout group: initial feedback<br>Minutes: Claus Reedtz Sparrevojn |
| 11:30 - 12:00 | 1. Working definitions of perceptions<br>Minutes: Jacob Bentley                         | 3. Summary brainstorm and reasoning<br>Minutes: Helle Christensen       | 4. Breakout group: key elements<br>Minutes: Els Toreele                 |
| 12:00 - 12:30 | 1. Presentations ToR 1: Lisa Anne Libungan  | Report drafting   | 4. Summary brainstorm and plenary<br>Minutes: Kathleen McBride          |
| 12:30 - 13:00 | LUNCH   | LUNCH   | LUNCH   |
| 13:00 - 13:30 | LUNCH   | LUNCH   | LUNCH   |
| 13:30 - 14:00 | 2. Presentations ToR 2: ICES process  | 4. introduction ToR D   | 5. Stock and fishery suggestions  |
| 14:00 - 14:30 | 2. Breakout group: Discussing useful application of perceptions<br>Minutes: Ed Farrell  | 4. Presentation ToR 4: Nathalie Steins                                  | 5. Stock and fishery suggestions  |
| 14:30 - 15:00 | 2. Breakout group: Discussing useful application of perceptions<br>Minutes: Hannah Rudd | 4. Presentation ToR 4: Paul MacDonald                                   | Agree products and actions  |
| 15:00 - 15:30 | BREAK   | BREAK   | BREAK   |
| 15:30 - 16:00 | 2. Summary brainstorm and plenary<br>Minutes: Anne-Marie Kats                           | 4. Presentation ToR 4: Ian Napier / Chevonne                            | Final wrap-up   |
| 16:00 - 16:30 | 1. Presentations ToR 1: Anna mercer   | Report drafting   |   |
| 16:30 - 17:00 |   | Report drafting   |   |
| 18:00 - ??    |   | Social dinner   |   |

### List of presentations

|                      |   |
|----------------------|---|
| Chairs               | <a href="#">WKAPFA introduction</a>   |
| Lotte Worsøe Clausen | <a href="#">Stakeholder engagement in ICES</a>  |
| Steven Mackinson     | <a href="#">ToR a review</a>  |
| Alexandra Blöcker    | <a href="#">Perceptions: what, why and how?</a>   |
| Knut Korsbreke       | <a href="#">True numbers</a> and <a href="#">The Norwegian Reference Fleet</a>                                |
| Lísa Anne Libungan   | <a href="#">The role of the fishing industry in providing data for stock assessments</a>                      |
| Anna Mercer          | <a href="#">Progress in using fishers knowledge and data to inform stock assessments in the northeast USA</a> |
| Nathalie Steins      | <a href="#">Working with fishermen on perception of lobster stock densities</a>                               |
| Paul MacDonald       | <a href="#">Experiences with real-time industry data collection in Scottish demersal fisheries.</a>           |
| Ian Napier           | <a href="#">The North sea fishers stock survey 2002-2014</a>  |