ICES WORKSHOP ON STANDARDS AND GUIDELINES FOR FISHERIES DEPENDENT DATA (WKDSG; OUTPUTS FROM 2020 MEETING)

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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

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Editors

Edvin Fuglebakk • Steven Mackinson

Authors

Brett Alger • Elena Balestri • Mattias Bernreuther • Kirsten Birch Håkansson • Katie Brigden • Pierluigi Carbonara • Richard Caslake • Liz Clarke • Jessica Craig • David Currie • Ingeborg de Boois • Lauren Dolinger Few • Jon Elson • Gjert Endre Dingsør • Edvin Fuglebakk • Hans Gerritsen • Neil Holdsworth • Andrew Jones • Henrik Kjems Nielsen • Colm Lordan • Steven Mackinson • John Manderson • David Miller • Estanis Mugerza • Macdara O' Cuaig • Gudmundur Oskarsson • Martin Pastoors • Campbell Pert • Jens Rasmussen • Mike Rinaldi • Daniel Roberts • Julie Simpson • Marie Storr-Paulsen • Els Torreele • Wouter van Broekhoven • Cooper van Vranken • Sofie Vandemaele • Berthe Vastenhoud • Jon Helge Vølstad • Sarah Walmsley • Tom Williams

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i Executive summary

The Workshop on Standards and Guidelines for fisheries dependent data (WKDSG) convened to evaluate whether available documentation on Standards and Guidelines provides data-collectors and users with sufficient guidance on the requirements for quality assurance that should be applied to data used in supporting ICES advice. Particular focus was given to the need for guidance on data collection initiatives that fall outside of the scientific institutions that routinely participate in ICES, such as the fishing industry or other third-parties. This was motivated by recognition that participation of more (and different) data-collectors may provide new opportunities for ensuring that ICES advice is based on 'the best available data', and can assure its quality, credibility and legitimacy.

Participants reviewed available documentation, distilled the elements considered important for good guidance, identified what was missing, and what actions are required to fill critical gaps. The workshop found that in many respects, data collection initiatives by industry would be well-served by the same quality assurance strategies that cover data-collection by scientific institutions. But in most cases, existing documentation is not sufficient to provide adequate guidance to new data-collection programmes. Much of the available guidance is fragmented and difficult to find or access, often being embedded in expert-group reports, when it is needed in a standalone format. The status of documents can also be difficult to assess; whether they are up to date, which audiences they are intended for, etc. These issues are of particular importance for data-collectors that are new to contributing data to ICES. An inventory standards and guidance documents that was prepared during the workshop, and includes information from ICES and further afield, will be made available as a resource to support all fisheries dependent data collection initiative (see Annex 1 for example).

Many issues discussed during the workshop were already known by the groups working on quality assurance issues in ICES. Participants identified specific supporting actions that should feed into the ongoing activities of the Working Group on the Governance of Quality Management of Data and Advice (WGQUALITY), the Data and Information Group (DIG), and the Working Group on Commercial Catches (WGCATCH) (Table 4.3), developed a schematic overview of the documentation needs and roles that follow data from collection to advice (Figure 4.1), and documented a short summary of key lessons learned (Annex 5). In addition, outputs from the workshop were used to draft the outline of a standalone document *'Overview of the principles and processes for quality control and assurance of data intended for use in ICES advice'* (Annex 6), further development of which is made in a recommendation to WGQUALITY and the Data Science and Technology Steering Group (DSTSG).

To facilitate understanding of, and access to, ICES quality assurance process and documentation, pathways connecting the flow of data were mapped (Figures 3.1, 3.2, 4.1), and data collection activities were classified and matched to relevant sources of guidance (Table 4.2). For a few categories of data-collection activities, the workshop did not find evidence that suitable standards or guidance were developed or in development. In particular, management of conflicts of interest was identified as being an important issue that needs differentiated treatment between different data-collectors in order to reduce the risk that wider participation in data-collection compromises real or perceived legitimacy of advice. No such standards or guidance is currently available in ICES, but experience exists elsewhere that can be used to develop it. A specific recommendation was made to WGQUALITY (Jan 19–22, 2021) for proactively developing standards addressing this concern.

ii Expert group information

Expert group name	Workshop on Standards and Guidelines for fisheries dependent data (WKDSG)
Expert group cycle	Annual
Year cycle started	2020
Reporting year in cycle	1/1
Chairs	Edvin Fuglebakk, Norway
	Steven Mackinson, UK
Meeting venue and dates	23-26 November 2020, Online (43 participants)

1 Introduction

Purpose and expected outcomes

The Workshop on Standards and Guidelines for fisheries dependent data (WKDSG) arose as a recommendation from the Workshop on Industry-Science Initiatives (ICES, 2019). The purpose was to review existing scientific data standards for fisheries dependent information and use it to develop an ICES reference document for new (and existing) fisheries data collection programs. The terms of reference are given below.

The outcomes of the workshop are intended to facilitate and contribute to ICES work on developing an accredited Quality Assurance system, which evidences the processes to ensure that advice is founded upon fit-for-purpose information that makes best use of all available data.

Participants

The workshop was aimed at, and included participation from: (i) scientists and others involved in the design, development and implementation of data collection programmes, this includes routine and ad-hoc research programmes that may be carried out by scientific or industry organisations either on their own or in partnership, (ii) people responsible for scientific data quality assurance processes, (iii) people that are required to evaluate the quality and utility of data before using it in fish stock assessments.

Terms of Reference and supporting information

The **Workshop on Standards and Guidelines for fisheries dependent data (WKDSG)**, chaired by Edvin Fuglebakk (Norway) and Steven Mackinson (UK), will meet 23–26 November 2020 through remote means to:

ToR a) Review existing documentation from ICES and other sources on science and data standards. Identify and synthesise elements necessary to provide guidance to the scientific community and industry on fisheries dependent data collection and its application in ICES. Standards for information relating to both improvement of existing data streams, as well as the incorporation of new kinds of fisheries dependent data will be considered.

ToR b) Map out the connections and relationships between the existing components of ICES work on science quality assurance (e.g. Transparent Assessment Framework, Quality Assurance Framework, Regional Database and Estimation System) and define how and where they fit in with the need for a higher level document on the principles and criteria for establishing standards in science information used in ICES (see Tor c)

ToR c) Using outputs from ToR a-b, evaluate if existing standards provide sufficient guidance for data collection programs carried out in collaboration with industry or other data providers outside the scientific community. Suggest revisions to existing guidelines if necessary, and draft an outline Science Information Standards

document that provides guidance to data collectors and users on the quality assurance requirements necessary for application of data in ICES. The document should include a description of the flow of data through the quality assurance system.

Supporting information

Scientific justification	Term of Reference a) Considerable resources already exist relating to the standards required to ensure that fisheries data collection programs provide information that is fit-for-purpose for scientific application. They include guidance documents on survey design, data collection protocols, quality control and quality assurance. But most of these documents are intended to apply to data collection programs carried out by scientific institutions under agreed sampling and survey frameworks. The increasing prevalence of research collaborations between science and industry and sole industry initiatives, is yielding new sources of data collected in different ways. Documentation that defines the standards for research and science information, irrespective of its source, are needed to guide best practice in relation to the delivery and quality assurance of data and scientific information. In addition, there is a great potential for incorporating new kinds of data from new technology applied in the industry. Particular consideration will therefore be given to standards pertaining to incorporating new fisheries dependent information arising from industry-science initiatives, and whether and how these might differ depending on application. This documentation needs to be accessible and understandable so that data collection initiatives with and by industry are well supported and lead to data that is useable and useful for science and advisory purposes. Participants will review available documentation and define elements necessary to develop an ICES-led document on research and science information standards (see ToR c). Term of Reference b) ICES staff are expected to actively participate in ToRa, bringing their knowledge and current work to bear on the discussions and documentation that arises. ToR b provides a specific opportunity to learn from ICES secretariat about progress towards the planned data accreditation system and to discuss within the workshop whether and to what extent the products can and should be aligned. Term of Reference c) The intended Science Information Standards document is not intended to be a detailed methodological manual. Rather, its main purpose is to define the standards for quality and integrity that should be met for any data submitted to ICES to be considered for use in ICES work. Its secondary purpose would be to provide guidance on how to meet those standards, so that any data collection initiatives, irrespective of source, have access to sufficient information to successfully get underway. ToR c should consider ways to make the information dynamic in terms of its accessibility and updatability.

Linkages to advisory committees	ACOM supports the recommendation from WKSCINDI to organise this workshop, which is closely aligned with recommendations 6 & 7 from WKRRMAC.
Linkages to other committees or groups	There is strong affiliation to WGCATCH, whose chairs played a lead role in the initiation and preparation of the resolution. In particular, WGCATCH ToR 'Review of sampling and estimation procedures, including use of new technology and other data sources' is highly relevant. Issues regarding data acquisition, provision and quality assurance also imply strong links with PGDATA, WGBIOP, WGTIFD, WGIPS, DIG, WGDG, WGRFS, and EU Regional Data Coordination Groups.
Linkages to other organizations	The work of this group is closely aligned with various national programmes across ICES regions. In particular, the EU Regional Data Coordination Groups, and similar initiatives in other countries.

Context

Increasingly ICES is trying to globalise and harmonise the way it handles data, which means thinking carefully about issues that affect the quality of data and reliance placed upon it by the scientific community, and also about issues of transparency and openness that affect how receivers of scientific advice judge its trustworthiness. Internationally, the motivation for establishing standards and guidelines on the quality of scientific information has been similar:

"To implement a formal and accountable system for monitoring and ensuring the quality of scientific information and advice provided to Government; and thereby to increase government, stakeholder and public confidence and trust in scientific information, and in policy or management decisions made by Government based on scientific information". Penney *et al*. 2016 (Guideline for Australian Fisheries, [Inventory doc #20])

As work on quality assurance processes and tools in ICES evolves, the discussions at WKDSG provide a timely sense-check and evaluation that can help to facilitate the success of opportunities for new and novel data collection, by extending ICES support in ways that are relevant and accessible beyond ICES immediate existing community.

The workshop was not all about fisheries advice, but fisheries provide a clear link that starts with a defined need for information and flows through to what to data collect and how to collect it.

Definitions

Workshop discussions revealed a need for clarification of the key terms 'standards' and 'guidance'. For this report the following definitions have been adopted:

Standards: Principles and associated criteria used to define conditions that should be met for information to be considered fit-for-purpose. *About: Quality of information and processes that determine and evaluate the quality of information and how trustworthy it is.*

Guidelines: Provide guidance on how to meet standards (or sometimes guidance on what the standards should be). *About: Procedures (methods, testing, analyses, evaluation)*

Quality assurance framework = Standards + Guidelines+ Tools

2 ToR a. Key elements for guidance to the scientific community and industry on the collection and application of fisheries-dependent data in ICES.

Strongest and weakest links in ICES work on data standards and quality assurance

Planning for the workshop identified specific documentation, expertise and examples relevant to addressing the ToRs. A document inventory with metadata of key information on standards and guidance was prepared in advance and elaborated further during the workshop (see Annex 1). Eleven presentations were selected to describe the work and current status on aspects of quality assurance (Table 2.1 and Annex 2). Presenters were specifically asked to highlight the elements necessary to provide guidance to the scientific community and industry on fisheries dependent data collection and its application in ICES.

Table 2.1. Presentations list (see Annex 2 for summaries)

Title	Presenters and affiliation relevant to presentation content
Why quality assurance matters to ICES	Colm Lordan (ICES ACOM)
Mapping the connections in ICES quality assurance work	Neil Holdsworth (ICES Data Centre) & David Currie (chair WGQUALITY)
Documentation of fisheries dependent data: relevant outputs from PGData	David Currie (chair WGQUALITY)
Introduction to Statistically Sound Catch Sampling, WGCATCH and other key expert groups	Kirsten Birch Håkansson, Nuno Prista, Hans Gerritsen, Jon Helge Vølstad, Estanis Mugerza & Kirsten Birch Håkansson (WGCATCH)
ICES Regional Database and Estimation System (RDBES) – a commercial fisheries database	Henrik Kjems-Nielsen (ICES Secretariat)
EU Regional Coordination Groups	Jon Elson, Els Torreele (Regional Coordination Group)
Protocols and standards in pelagic industry self-sampling data collection	Katie Brigden (Scottish Pelagic Fishermen's Association) and Martin Pastoors (Pelagic Freezer Trawler Association)
Other international work on standards and guidelines for fisheries science	Steven Mackinson (WKDSG co-chair)
Marine ecosystem assessment & management needs credible, fishery owned knowledge trusts	John Manderson (OpenOcean Research)
WGTIFD Update & US East Coast Data Standards	Brett Alger, Lisa Borges (WGTIFD), Lauren Dolinger (NOAA Fisheries), Julie Simpson and Mike Rinaldi (Atlantic Coastal Cooperative Statistics Program)
Catch lottery – collaboration-enabled sampling	Edvin Fuglebakk (IMR, WKDSG co-chair)

Prompted by the list of questions below, participants were asked to make virtual 'post-it' notes on the presentations, which were combined and summarised in to the main emergent themes, and discussed in plenary (Figure 2.1).

Questions

1. *What stands out as important?*
2. *What is missing?*
3. *What examples of standards and guidelines are working well already and can be used more widely?*
4. *Where is there overlap and duplication and how can it be avoided?*
5. *Is it necessary and how might standards differ depending on application?*

Focussing on what's important and what's missing, ICES ten principles for advice (documented 23 November 2020, Table 2.2 (Inventory doc #24)) were mapped on to the emerging themes (Figure 2.2). Seven of the ICES ten principles for ICES advice were identified as relevant for this workshop. All of those had an obvious connection to the emerging themes but there were additional themes that were identified by participants as being important but had no obvious parallel with ICES ten principles. These are picked up again under ToRc.

Plenary discussions noted several points reinforcing the themes identified from the review, and welcomed the cultural shift in the ICES community towards **'quality assurance as the cornerstone of ICES activities'**. It was noted that there is a lot of activity and available information in the field of standards, guidance and quality assurance, but it was not clear to everyone how things link together and **an overview of relevant documentation is lacking**. The issues were also reflected in participants response to a questionnaire on the suitability of existing documentation (see Table 4.1 and Annex 3). There is a **need for more awareness raising actions, joined-up thinking and a structured overview** that provides access to different levels of detail required according to different needs yet is flexible to allow for future changes.

It was reiterated that ICES advice is broader than fisheries stock advice only (e.g. bycatch, ecosystem advice, etc.) and that opportunities to work together more closely with industry could include these also. Emphasis on quality assurance would mean that there needs to be a focus on the effect of new data streams being incorporated in advice.

Data primarily collected for stock assessment purposes is being used far more than by stock assessment groups only. This means that **documentation on the standards applied, data collection methodology and quality control must be available**. Governance groups would be expected to play and important role on this topic. There are many **good examples to draw from** already, both locally and further afield. The **document inventory developed by WKDSG is a good resource** for that should be made available widely to help share relevant information within and beyond the ICES community.

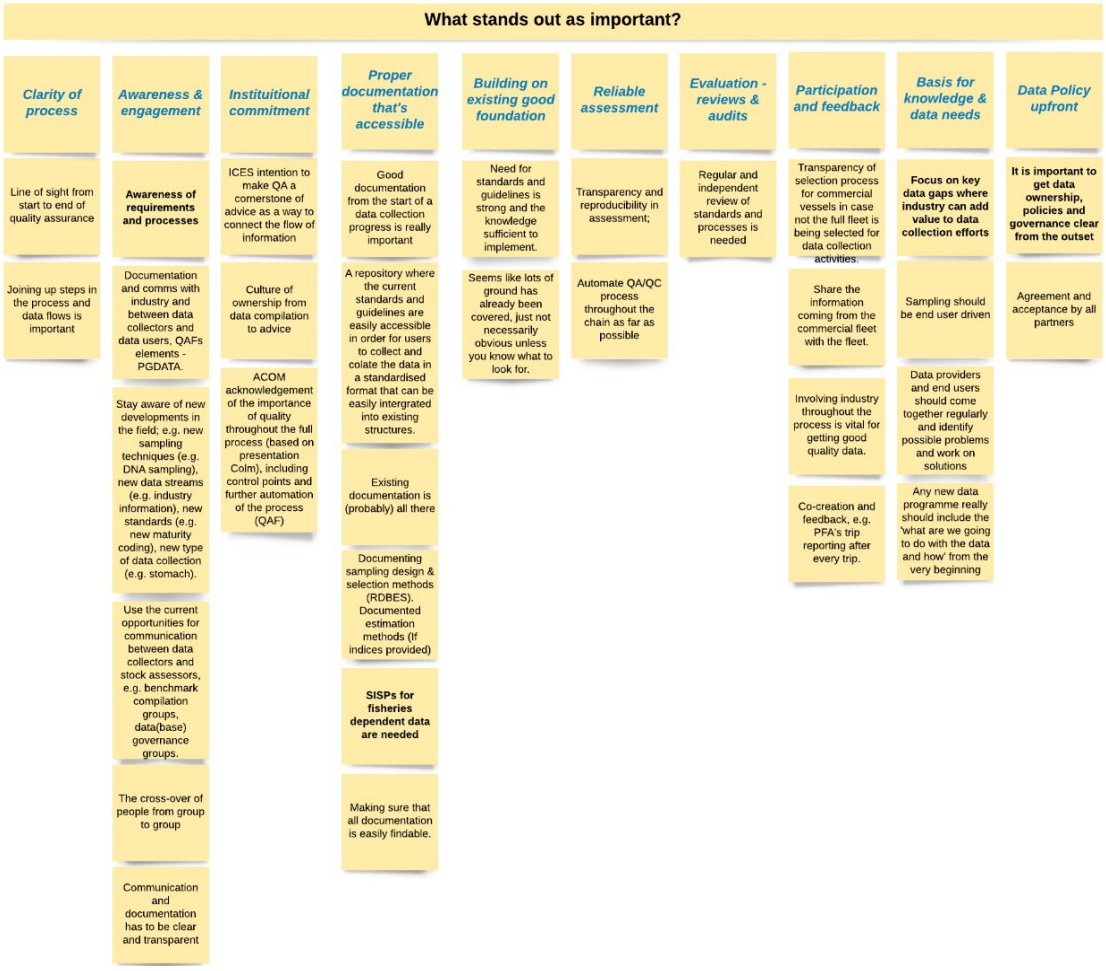
The ICES template for **Science Survey Protocols (SISPs) were specifically identified as useful** existing documentation that **could be developed further to help enable industry data collection initiatives** to get things right from the beginning. PGDATA have previously proposed that templates for fisheries dependent sampling should be designed modelled on the SISPs (ICES 2020, PGDATA report, section 2.4, (Inventory doc #19)). It was noted that a co-development review and refine process would work best to ensure the SISPs were fit-for-purpose. In 2020, the ICES Survey Protocols (SISP) is merging with the 'Techniques in Marine Science' TIMES series as a new collection: ICES Survey Protocols.

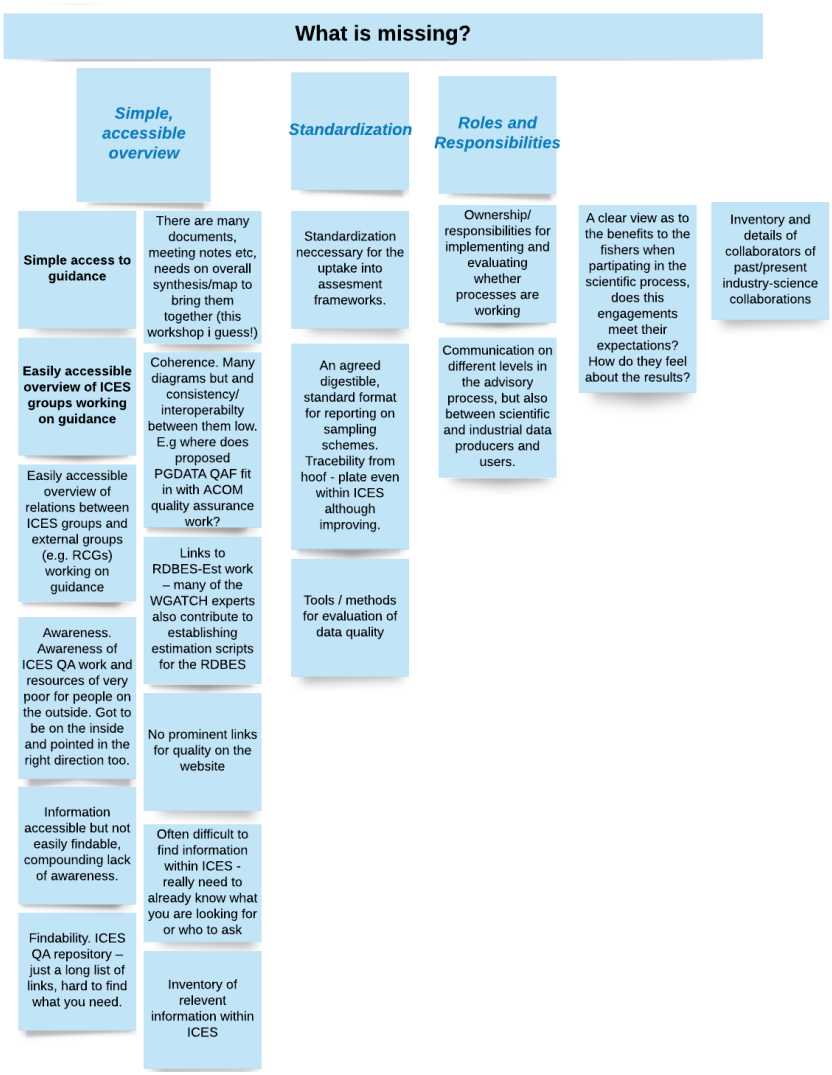
While documented standards and guidance were considered very important, **communication between data providers and data users was seen as crucial.** For incorporation of new data series into assessments, the **Data Compilation Workshop of a benchmark process is the key point for bringing the two expertise fields together to address the quality and utility of data. Data governance groups are the other key arena for cross-fertilization.** These arenas are particularly

useful for those involved in established data collection. We did not identify similar meeting points that are suitable for new data-collectors to get in touch with potential data-users.

Participants were mindful of possible duplication (such as between the RCGs and ICES work), but noted the value of overlap in people and processes also served as a synergy to reinforce and expedite progress. One of the challenges noted was that it was not clear what happens when third countries are not obligated to have to follow common standards set.

Finally, it was noted that **standards and guidance documents do not help if people to choose not to follow them**, such as when it relates to sensitive issues such as reporting bycatch of Protected, Endangered and Threatened Species.




What is missing?
Simple, accessible overview
Standardization
Roles and Responsibilities
Simple access to guidance
There are many documents, meeting notes etc, needs on overall synthesis/map to bring them together (this workshop i guess!)
Standardization neccessary for the uptake into assesment frameworks.
Ownership/ responsibilities for implementing and evaluating whether processes are working
A clear view as to the benefits to the fishers when partipating in the scientific process, does this engagements meet their expectations? How do they feel about the results?
Inventory and details of collaborators of past/present industry-science collaborations
Easily accessible overview of ICES groups working on guidance
Coherence. Many diagrams but and consistency/ interoperabilty between them low. E.g where does proposed PGDATA QAF fit in with ACOM quality assurance work?
An agreed digestible, standard format for reporting on sampling schemes. Tracebility from hoof - plate even within ICES although improving.
Communication on different levels in the advisory process, but also between scientific and industrial data producers and users.
Easily accessible overview of relations between ICES groups and external groups (e.g. RCGs) working on guidance
Links to RDBES-Est work – many of the WGATCH experts also contribute to establishing estimation scripts for the RDBES
Tools / methods for evaluation of data quality
Awareness. Awareness of ICES QA work and resources of very poor for people on the outside. Got to be on the inside and pointed in the right direction too.
No prominent links for quality on the website
Information accessible but not easily findable, compounding lack of awareness.
Often difficult to find information within ICES - really need to already know what you are looking for or who to ask
Findability. ICES QA repository – just a long list of links, hard to find what you need.
Inventory of relevent information within ICES

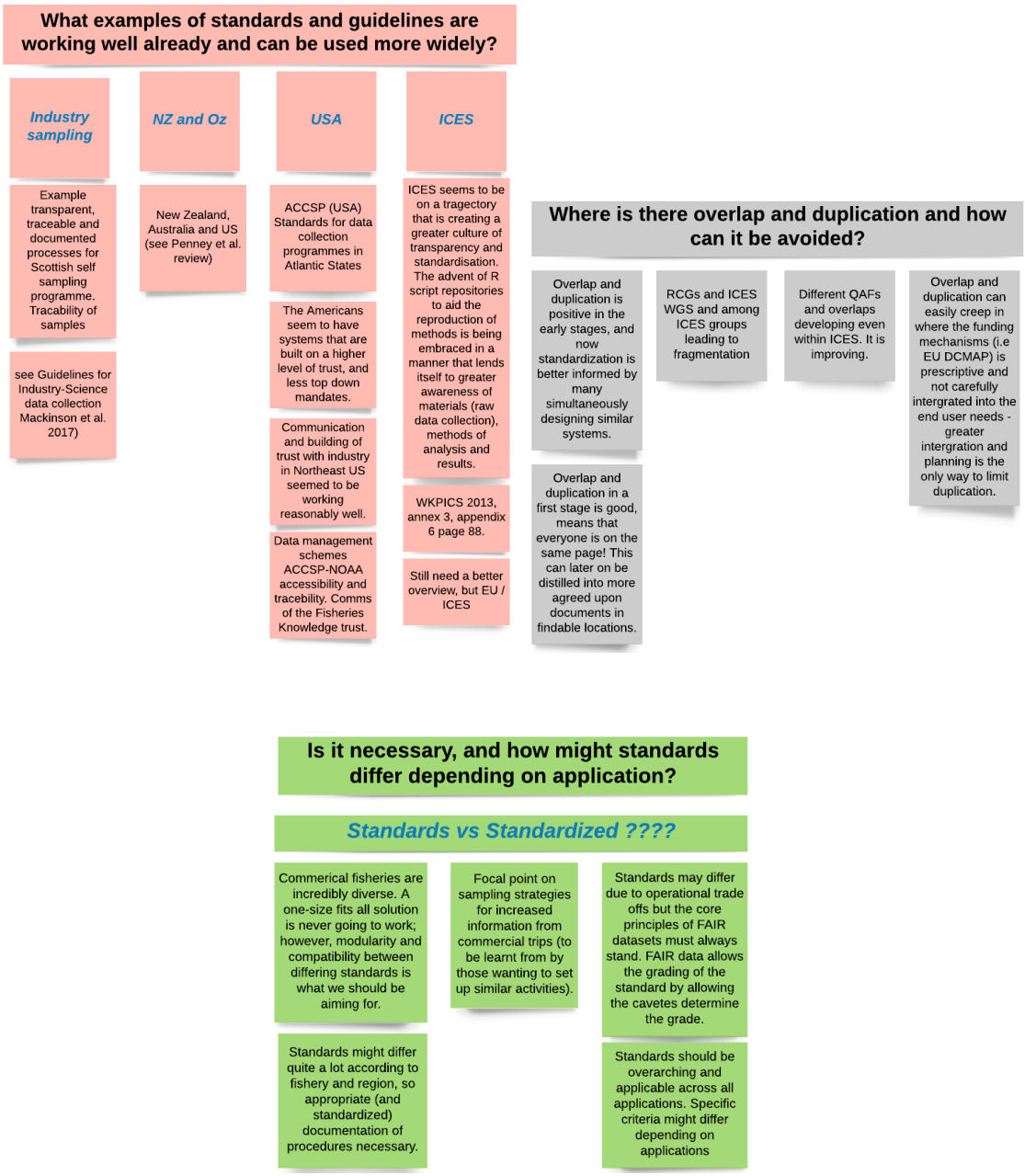


Figure 2.1. Post-it responses and emerging themes on elements necessary to provide guidance to the scientific community and industry on fisheries dependent data collection and its application in ICES.

Table 2.2 Ten Principles for ICES advice (documented 23 November 2020, applicable from January 2021) (grey – linked themes identified as important by WKDSG, yellow – no obvious link identified)

Principle 1. The guidelines and procedures to produce ICES advice are documented, openly accessible, and up to date.
Principle 2. Final request formulation is agreed through dialogue to clarify the requester's needs and expectations, the ICES process, likely resource implications, timelines, format of advice and roles and responsibilities of the engaged parties.
Principle 3. Where possible, existing policy goals, objectives, and the level of acceptable risk relevant to the advice request are identified. Where these objectives and descriptions of risk are unclear, ICES will identify these in the advice, and, where possible, provide options for management action and the consequences of the options and their trade-offs.
Principle 4. The deliberations of all relevant expert groups are published by the time the associated advice is published.
Principle 5. The best available science and quality-assured data are used. ICES selects and applies relevant methods for any analysis, including the development of new methods. The methods are peer-reviewed by independent experts and clearly and openly documented.
Principle 6. Data are findable, attributable, researchable, reusable, and conform to ICES data policy. Data flows are documented.
Principle 7. To ensure that the best available, credible science has been used and to confirm that the analysis provides a sound basis for advice, all analyses and methods are peer-reviewed by at least two independent reviewers. For recurrent advice, the review is conducted through a benchmark process. For special requests through one-off reviews.
Principle 8. Advice is comprehensive, unambiguous, and consistent with the synthesised knowledge, while taking the peer-review into account. All advice follows existing advice frameworks and any deviation from the frameworks or related, previous advice is identified and justified.
Principle 9. All ICES advice is adopted by the ICES Advisory Committee (ACOM), through consensus, prior to being made available to the requester and simultaneously published on ICES website.
Principle 10. ICES provides advice as an impartial response to a request, and does not lobby the requester or any other party to implement its advice.

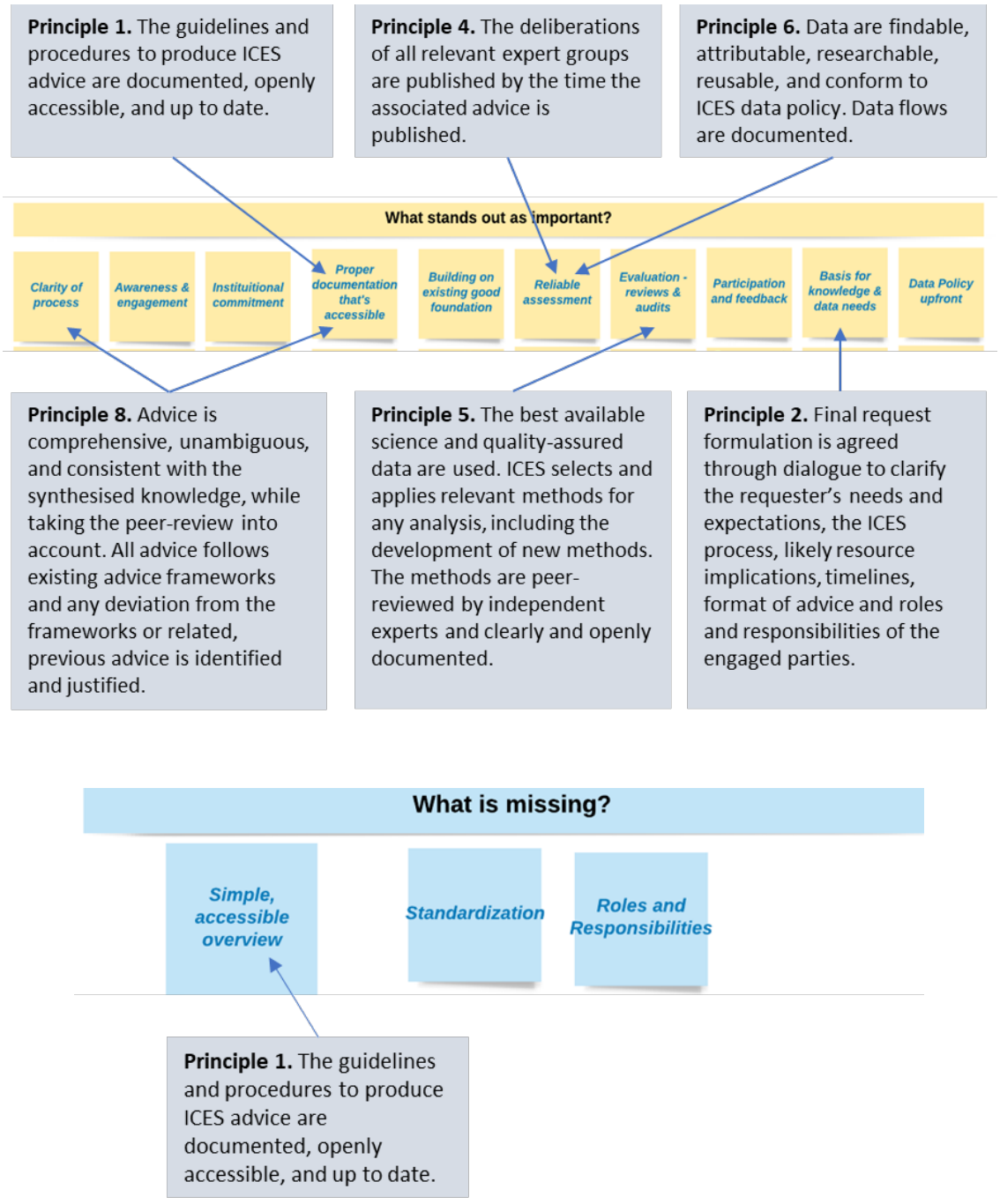


Figure 2.2 Mapping ICES ten principles for advice mapped onto key themes about what is important and what is missing.

Key elements for guidance based on applied examples

Participants used four different hypothetical case studies to work step-by-step through the details what would be necessary to provide guidance to the scientific community and industry on fisheries dependent data collection and its application in ICES. Each subgroup was asked specific questions to aid in identifying and synthesising the main elements. Their detailed summaries are provided in Annex 4.

Due to time-zone differences, Group 1 was comprised of all the participants from the US.

Group 1. New data stream. ***Scenario:*** All vessels in a producer organisation want to record bycatch and discards of non-quota species. How can it be used? What procedures should they follow to collect and report on the data to ensure it is fit-for-purpose? What specific review assurance processes are needed for it to be used?

Group 2. Existing data stream ***Scenario:*** A new 5-year data series of age, length and weight measurements of a category 1 stock from a fleet that has been poorly covered in the past is introduced at a benchmark assessment workshop. What criteria are needed to determine (i) the quality of the data (ii) the utility of the data?
What process and evidence is needed to justify whether and how the data should be used in the assessment?

Group 3. Novel data stream ***Scenario:*** An industry organisation has been collecting spatial data on its fishing activities and biological parameters of its catch. They want to make it available for science on stock status and other research. The stock has survey coverage but no established catch sampling programme.
What standards should the data meet to be considered useful? What information is needed and what analyses should be performed to determine / verify utility of the data.

Group 4. Industry-Science partnership.
Scenario: A scientific organisation is thinking of working in partnership with industry to develop a new data series on fishing effort, catches and biological characteristics of a data limited stock.
What specific guidance will they need to ensure that the data collection will provide results that can be used by ICES and other researchers?

The subgroups detailed the requirements and steps necessary to provide appropriate guidance in each situation, each identifying relevant information and links to sources on guidance for collecting quality data, its evaluation and quality control. Several themes were discussed in plenary. The theme of **awareness of quality control processes and access to guidance information** was reflected in most groups, citing the need for the 'rules of the game' to be made known both with the ICES community and outside. Three groups **proposed a form of pre-screening questions or checklist of requirements** to be the starting point; the purpose being to establish the requirements and expectations for data collection intended for use in ICES, and to signpost the guidance needed to achieve that. The pre-screening questions should address issues about data policy/ licence/ ownership and continuity of programmes and would be particularly relevant in relation to criteria for new data submissions to a benchmark. More detailed suggestions for such pre-screening questions are included in the sub-group reports (Annex 4).

In relation to new data streams where data collected by or with industry was involved, groups emphasised that **communication and engagement needs to be appropriate and realistic** and the importance in the process understood. **Collaboration/ co-development/ co-implementation were repeatedly mentioned and considered fundamentally important** to id data gaps, priorities where the best chances exist to collect data to improve current assessment and develop better ones in the future. **Engagement with stock coordinators and assessors is essential**. One problem noted about prioritisation, is that **working groups are not looking for new data, they are just getting by** doing the same thing for years. New knowledge and data is available and such innovations/ opportunities should **drive a continuous improvement process**. New information can address questions that may have been left parked in the past. There needs to be an ambition to improve, and guidance is needed to achieve this.

Data reporting timeliness, and specifically the mechanisms for submitting data from industry for use in ICES requires specific consideration because it is essential that data should be ready when needed. Participants noted that submission depends on whether data is collected collaboratively with a science institute that already submits data or done independently, which would require some form of independent evaluation. **There was a preference for greater collaboration with industry within framework of national sampling schemes as a pathway to data incorporation.** At least initially the pathway would be much more difficult if done independently. However, if the industry collects data from across multiple countries, this might make things very complicated if each part had to be submitted by each country. In this case, fragmented data submission would be a bad idea because it may risk overlap and double counting. A direct submission to RDBES should be possible to achieve, and a lot of work has already gone in to thinking about the technical issues of regional sampling and raising of data specifically so that sampling can be harmonized. Another reason that it is important to look at the possibilities for direct submission is because sometimes industry sampling activities fall in-between the cracks and data risks not getting used (E.g. samples for UK landings of horse mackerel in the Netherlands do not get submitted by the Netherlands.) A whole fleet in one go makes sense and links with the ideas of the herring lottery sampling initiative (CATSAM) being extended to whole fleet. Need to know about fisheries of all countries combined. **Plenary discussion concluded that a good starting point would be submission through a national institute prior to moving forward with a regional approach**. The main challenges of immediate interest are about how to ensure quality of the data rather than the precise mechanism to submit it. A suggestion was made for an experiment, put out a data call for industry data, perhaps modelled on the data call used for VMEs because it provides 'cook book' level guidance on what's required and how to do it.

The ownership of knowledge and data was discussed at length**. Sharing/ access and licencing agreements were consider 'super-important' to establish,** otherwise use in applications might not be possible. Instruments like MoUs, NDA, licencing, Data Policies and sharing agreements, rules, etc all important in increasing move to transparency and open access. Risks occur where access arrangements could be rescinded. E.g. selective withdrawal. Reference was made to the Data Policy for RDBES (5/12/18; Inventory doc #27). Colleagues in the ICES Data Information Group were very aware of these issues and noted that guidance is needed to help people navigate this area because a single recipe won't work for all data sources – different data licencing arrangements can apply in parallel to different sources of data used for assessment. Creative commons licencing arrangements safeguard the data owners by licencing the right to use the data. The Fishery Knowledge Trust (see presentation by Manderson, Annex 2) in the US are looking at how to certify knowledge products. In relation to concerns that much of the data that science contributes is not open and accessible, reference was made to the FAIR principles (Findable, Accessible, Interoperable, Reusable). The clarification was made that the **FAIR principles are not about open access to everything, but rather about being open and transparent about what information you have.** It's about publishing metadata. FAIR is not the same as open access, but about accurately profiling your data. FAIR needs also to apply to data and to processing scripts and about how data is treated and QA'd.

All the subgroups' focussed some attention on the **practical details of the operational steps**, all identifying key aspects that should be taken into consideration, including:

- The 'needs' should be clearly established / identified first to improve chances of being fit-for-purpose. Necessary to align expectations with data uses. [ICES guidelines 12.5 3 Criteria for the use of data in ICES advisory work needs more work to be practically useful; Inventory doc #4].
- Establish roles and responsibilities of the 'players' in data provision.

- Identification of and access to existing ICES guidance on quality standards for data collection, to be used in quality evaluation to determine trustworthiness (e.g. WKPICS 2013, Annex 3, appendix 6, SISP templates; Inventory doc #7). SISPs (TIMES survey protocols) can provide a useable template for new data collection streams.
- Data context, purpose, types, formats, units, precision
- Minimum standards for measurements? – depends on purpose Data handling and processing quality control
- Calibrated instruments (precision)
- Quality evaluation - comparative approach to evaluation of data quality – representative, consistency – with other data and with itself (e.g. tracking cohorts for example)
- Commitment to time-series: Need to evaluate risk of withdrawal of participation once data collection is established.
- Utility – cost/benefit analysis is important, but how should it be evaluated? More knowledge may entail conflicting signals and hence worse model fits, but that does not mean that the new knowledge does not have utility. That is why it is critically important to have documentation to demonstrate the representativity and reliability of a data source. Quality of a sampling survey programme should be evaluated in relation to two aspects of sampling: 1) the ability of the programme to (in principle) deliver data that are fit for purpose, by reviewing the design of the programme against guidelines and standards for best practice; and 2) evaluation of the quality of the data following implementation of the sampling survey, covering each of the two components of accuracy: bias and precision. [Note: this comment was noted for requiring further consideration in WKEVUT in 2021]

3 ToR b. Mapping the connections in ICES science quality assurance work.

David Currie and Neil Holdsworth presented details of the data pathways and its management in ICES. The details are quite convoluted and overwhelming, demonstrating the difficulty of providing an overview that's meaningful to everyone. Different audiences require different perspectives and levels of detail.

The focus at WKDSG was thinking about an audience that are largely unaware of the processes and structures through which data needs to flow through to be useable and useful in ICES applications, because third parties are generally a bit lost when it comes to understanding '**what applies to me**?' Such a summary level overview has largely been missing or not communicated to this audience.

In advance of the meeting the presenters were tasked with presenting a 'straw-man' that mapped the connections in ICES quality assurance work, and could be reviewed and refined during the workshop. Specifically, they were asked to include the connections and relationships between the existing components of ICES work on science quality assurance (e.g. Transparent Assessment Framework, Quality Assurance Framework, Regional Database and Estimation System) and define how and where they fit in with the need for a higher level document on the principles and criteria for establishing standards in science information used in ICES.

Two main schematics summarising the data flows from different perspectives were presented (Figure 3.1, 3.2). Both were considered useful and were welcomed by participants as important insights to ICES processes that are rarely seen. It was, however, noted that the schematics lacked the regional perspective in relation to sampling and data flows and that Figure 3.2 was an ICES only view, omitting national level work flows. The reason for this is that national level details are not known to ICES in their entirety, and such a level of detail is just too complex to be a useful navigational guide to ICES processes.

Figure 3.1 was considered particularly useful, and could serve as an access portal to navigate ICES data flows and associated QA processes from start to end. To achieve this, the schematic would need to be kept simple yet dynamic, allowing users to be able dig behind each node to access additional detail and guidance documentation. The most essential requirements in the design of such a navigational aid, is that it should help users answer these questions:

- What do I need to know before I start data collection and where do I go to get that information?
- Where and who should I go to with my data?

Participants felt that it was important to make at start now, and the ICES website page on Data Guidelines and Policy would be a good home for the schematic, which should be refined over time.

Regarding the question of 'who should I go to with my data', participants identified the data governance groups were the appropriate first port of call.

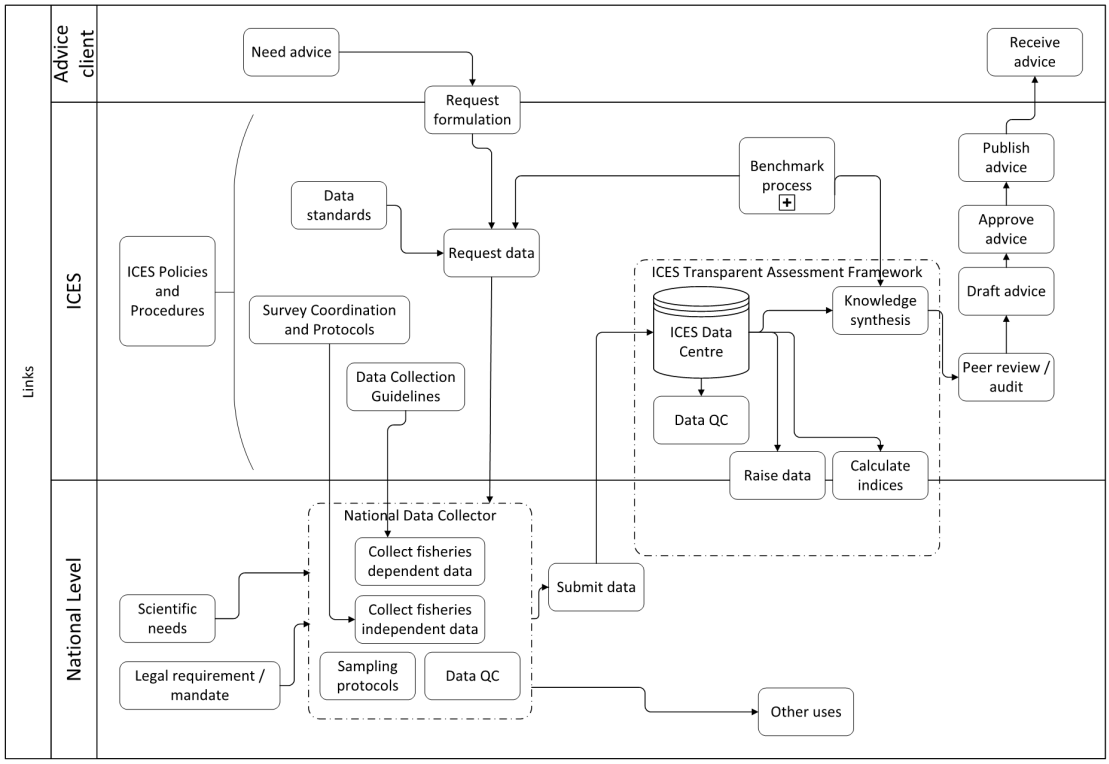


Figure 3.2. Process-based flow diagram of the pathways for data used in ICES advice.

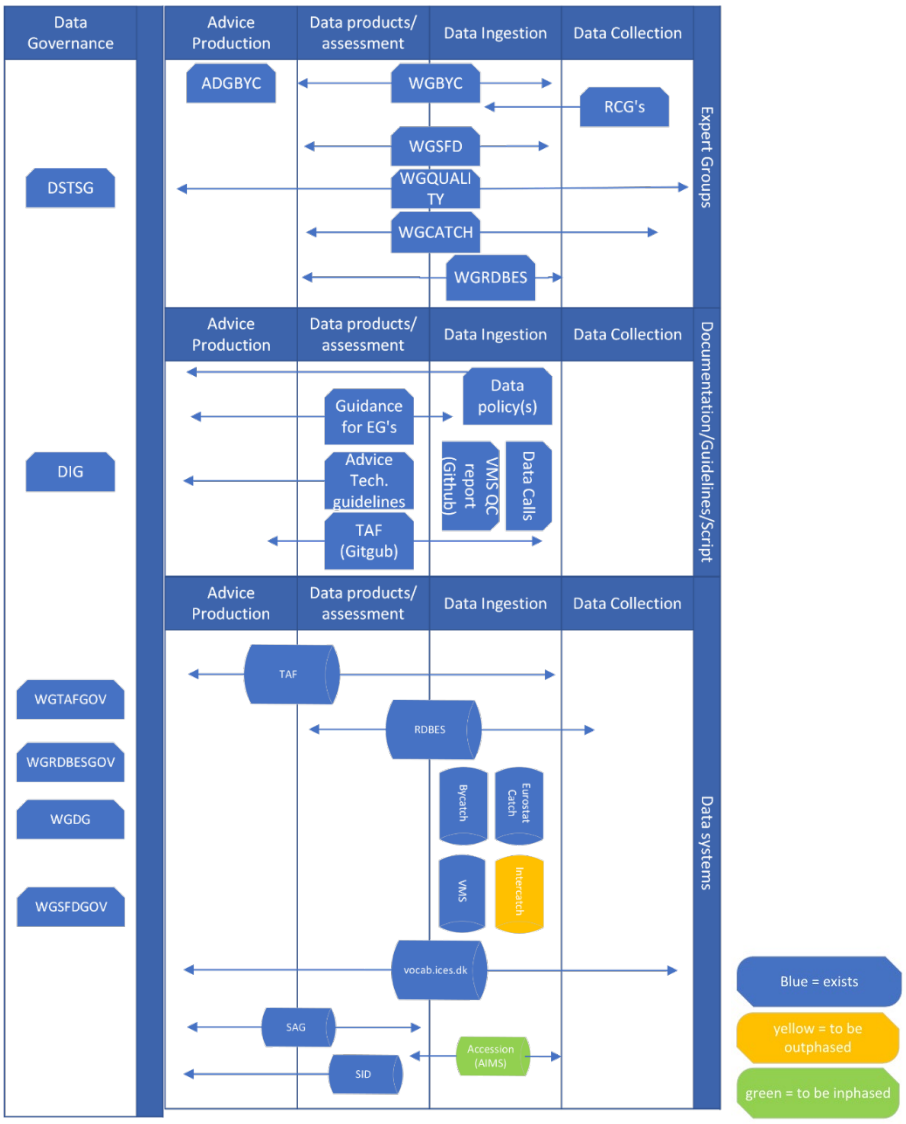


Figure 3.2. Role-based Schematic of ICES structures and processes (working groups, tools, guidance sources) covering the flow of data into ICES and the production of ICES advice.

4 ToR c. Evaluate if existing documentation provides sufficient guidance to support data collection programmes carried out in collaboration with industry or other new data providers. And where necessary, suggest revisions and outline requirements for necessary standards and guidelines documentation relevant to application of data in ICES.

A questionnaire was used to solicit participants initial thoughts on the suitability of existing standards and guidelines, and to help identify any specific requirements for documentation (Table 4.1, with detailed responses recorded in Annex 3).

Table 4.1 Summary of questionnaire responses

Question	Summary of responses
1. What criteria are necessary to evaluate whether existing standards and documentation is suitable for providing guidance to the scientific community and industry on fisheries dependent data collection and its application in ICES?	• Findable, accessible and current. • Clearly defined purpose and scope – relevant to intended data use /application. • Easy to understand and use – must be concise, consistent and useful to the practitioner and to ICES to ensure quality of data and ICES outputs. • 'Approved' documentation – developed together by relevant groups (expert groups, governance groups, data centre) as part of a quality assurance scheme (preferably accredited) that satisfies the needs of those that give scientific advice and those that receive and use it. • Contain information on quality indicators – specifically about (a) Representativity – if data is representative of the 'population' measured, (b) Conformity - whether a value conforms to the syntax of its definition (format, type, range). (c) Stability - if values vary at an acceptable level on the basis of values of the recent past, (d) Coherency - if reported values are equal among different data tables, (e) Accuracy (precision and bias) - the degree to which values vary from a true or expected value. • Interoperable – applicable to different fisheries and data sources.
2. Do you know of specific documents that are relevant for this workshop that are missing from the repository? Please provide a reference and link.	• New documents were provided by participants and included in the WKDSG document inventory. • Existing ICES documentation sites include: https://www.ices.dk/community/Pages/PGCCDBS-doc-repository.aspx) https://www.ices.dk/community/groups/SiteAssets/WGCATCH-publications.aspx
3. When planning fisheries-dependent data collection work, are you able to locate guidance about who you need to communicate with in advance and how data collection should be documented?	• Only those with prior knowledge and experience were confident about who to contact. Others were unsure and noted the lack of information available to direct them. Several noted they were more confident as a result of the workshop. • Contacts points that people would turn to were: experience colleagues, ICES expert group / committee chairs, national DCF data coordinator. The Data centre and data governance groups are also important contact points. • In the US finding appropriate contacts of willing and helpful people requires knowledge and interaction with both science and policy-making institutions.

Question	Summary of responses
	• Guidance is available in ICES documents but scattered and difficult to navigate. Using google is easier than navigating the ICES website. The WKDSG document inventory is helpful for finding the necessary documentation.
4. Are you able to locate documentation about the process that allows new data collection to be approved in a benchmark?	• It's easier when you understand the Benchmark process in ICES, or know who in ICES to ask. • A schematic to help navigate would be a helpful contribution. • While some documentation is available, it's hard to find anything on the data compilation process. Acceptance criteria are grey and the process unclear because it's hard to be definitive. The process is often worked out through negotiation with assessment scientists. And often there is unwillingness to acknowledge new data is necessary or could be useful to understand changes in underlying ecological and observation processes.
5. Is there anything relating to standards and guidance on fisheries-dependent data collection where more work is obviously needed? And, which improvements should be prioritised?	• Most documentation deals with default requirements for stock assessment purposes, but new data collection initiatives may go beyond this and thus require specification of protocols specific to the type of data collection and application, such as catch data for demersals vs pelagics, acoustic data. Different aspects could be considerations such as sampling in higher space-time resolution; sampling certain processes throughout the year instead of once per year; scouting activities prior to a large survey effort etc. The SISP for industry collected data should be a priority. • Data ownership and sharing agreements. • Accessibility of information (clear signposting and availability) to those new and unfamiliar with ICES, such as the inventory prepared for WKDSG. • Routes to get industry collected data in to RDBES. • Material to help guide people's expectations in relation to how useful industry data can be and criteria necessary to determine their adequacy and utility (e.g. how much of a fleet needs to participate for how long to develop something like a useful independent index?). • In order to establish trust with data users, standards and guidance for industry data collection are likely to be expected to have better documented procedures than standard scientific institutes might have. • Time in motion studies could be used to demonstrate costs and benefits and facilitate continuity of industry data collection programmes. • More work is needed on non-probabilistic sampling by industry. • Standards and guidance will be needed when issues related to data occurs (e.g. differences in the estimates, (especially with sensitive data: PETS bycatch, discards), reasons? conflicts of interest? • Institutional change that allows for sustained respectful engagement with governance institutions and an acknowledgement by governance institutions that solutions in fisheries are always provisional and new data requirements are going to be required in due course because socio-ecological context is always changing.

Overview of the need for Standards and Guidance documentation

In evaluating whether the existing guidance is sufficient and whether there are gaps that need filling in order to support industry or other third-party data-collection initiatives, we found it useful to reflect on the difference between standards and guidance provided in the beginning of this report. *Standards* refer to the principles and associated criteria used to define conditions that should be met for information to be considered fit-for-purpose, and *guidelines* provide guidance on how to meet the standards. While these terms may have been defined differently in some of the ICES documents reviewed, they are useful in this context because they help to identify in what respects the overview of available standards and guidance documents needs to be complete.

Since standards define criteria for acceptance of data, we find that it is important for data collectors to have a complete overview of these already in the planning stage. It is likely to hurt the

relation between the scientific community and third-party data collectors if expectations have to be adjusted after much resources have been invested in data-collection, which might occur if standards are introduced late in the data-collection process.

Under these definitions *standards* and *guidance* also differ in their need for maintenance. Documentation that has the status of a standard needs to accurately reflect ICES policies on advice and quality assurance, and thus must be kept up to date as policies are refined. If guidance documents get outdated, any required updates are easily identified if the status of corresponding standards are made clear.

Standards

In identifying standards, we find it natural to start with the mandate of advisory working groups which is to provide timely advice using the best available science. This makes it clear that standards are highly dependent on intended use and on what other kind of data or knowledge is available. In the end, the evaluation of what available data should be considered the best fit for the purpose has to be decided by the working group in question. In order to make clear what standards are applicable to ensure data is fit-for-purpose, data-users need to coordinate with data-collectors. This can be made clear by a good description of the *data acceptance process*: how advice-groups work and a good description of the benchmark processes for recurrent advice.

The fact that the final say in data acceptance is delegated to discussions in scientific fora, and may often be a matter of debate, makes scientific data standards different from many industry standards, and in some sense it limits how much standards can be elaborated without interfering with the mandate of the advisory group. Some topics are however sufficiently general for scientific application that principles can be formulated so that data-collectors can form informed expectations about fitness-for-purpose considerations. Such principles constitute standards under the definitions used in this report, even if their status is not that of legal, enforceable standards. In particular almost all scientific application of data requires a good description of how data is collected and measured. This amounts to *documentation standards*. In addition, the ICES advisory process requires that data is handed over for unconstrained scientific analysis and that the result of the analysis can be made public with sufficient detail, which amount to *data-licensing standards*. While these concerns may be further subclassified, and while the exact standard applicable may vary accordingly, there are near universal concerns for application of data in advice, and it will be important for all data-collection to identify relevant standards in these respects.

For many types of data-collection that are regularly performed by scientific institutions and that are routinely applied in scientific advice processes, expert groups have established procedures to assess the quality and utility of data. These procedures effectively take the form of standards and may be referred to for the data acceptance process by advisory groups. They are typically specific to certain types of surveying or measurements and may be required, in part, for interoperability with other data sources. Integration of different data sources may for instance require unified precision in measurements and coherent definitions of categorical variables such as maturity scales, gear or spatiotemporal variables. We will refer to these as *context-dependent standards* and find that they are best accessed through communication with relevant data users.

Figure 4.1 gives a schematic overview of the quality concerns that follow data from collection to advice. It illustrates that data-collection early in the processes need to be informed about the criteria for data acceptance process that comes later and is decided by different actors. A prerequisite for successful collaboration between data users and data-collectors is that both the criteria for acceptance and the processes meeting those criteria are well documented. Within the schema, the setting of standards and data use criteria are the responsibility of benchmark and data governance groups, while provision of guidance on how to achieve that is within the remit of working groups.

All the aforementioned types of standards are relevant for almost all types of data-collection, and we were not able to identify, possibly apart from data licensing, that special adaptations of these were relevant for industry-initiated or other third-party data-collection. Although practical experience with applying these standards to a broader group of data-collectors may well reveal that some amendments need to be considered, the current scope of the documents considered and tabulated below (Table 4.2) applies to data collection by scientific institutions and third-party data collectors.

We consider that the issue of *conflict of interest* requires specific attention in the case of third party data-collection. While conflict of interest is always a concern, the scientific institutions are designed to maintain some level of impartiality. This impartiality may be perceived as compromised when data-collection is delegated to actors outside these institutions, as these actors can be expected to have different conflicts of interest than those assumed to be managed by scientific institutions. At the same time, the impartiality of scientific institutions are not completely guaranteed by design, and the basis for legitimacy could be improved if also scientific institutions could provide reassurance that conflicts of interests are being well managed, beyond simply referring to their institutional status. Therefore, the issue of conflict of interest calls for additional strategies to ensure trustworthiness of data-collection. Since these stakeholders may want to inquire about this specifically, isolated from other technical concerns, we find it suitable to address conflict of interest explicitly, in a separate standard.

While the importance of the topic of conflict of interest in data collection was recognized at the workshop, we did not find time during the workshop to synthesize a description of what such a standard needed to address. After the workshop, the chairs formulated such a description which in presented in the section *Standards for managing and resolving conflicts of interest*. This description was circulated to the participants for comments after the workshop, and discussed in an online meeting on 13 January 2021, and since refined with subsequent iterations of the document incorporating comments from participants.

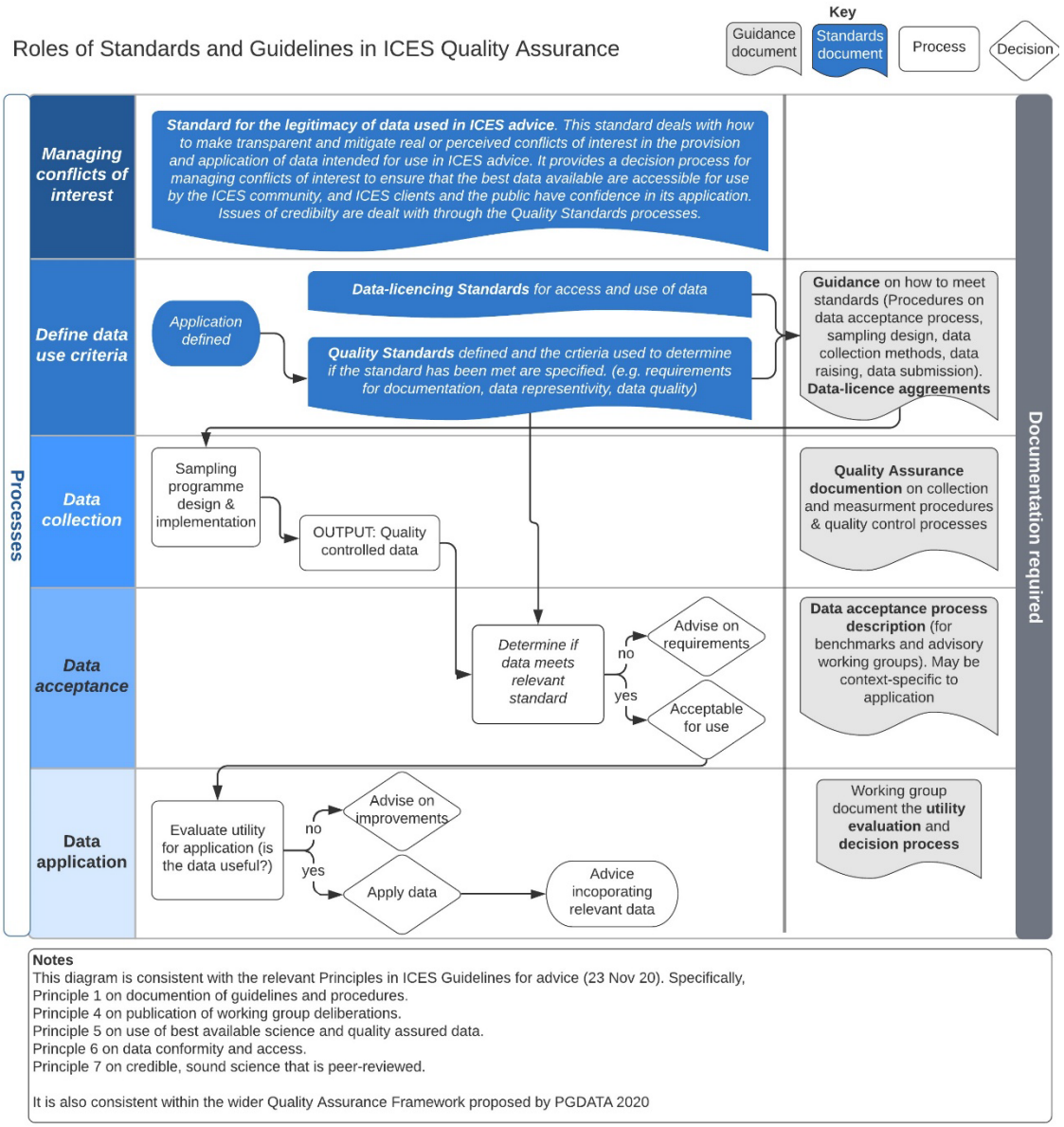


Figure 4.1. Roles of standards and guidelines in ICES quality assurance. Setting of standards and data use criteria are the responsibility of benchmark and data governance group, while provision of guidance on how to achieve that is within the remit of working groups.

While we consider the categories of standards introduced above as relevant for most kind of data-collection, the details of how a standard is formulated is dependent on its exact use. Based on some of the existing documentation on standards that were reviewed at the workshop, we identified that general documentation on standards are being developed for some types of data collection (Table 4.2). The discussion also revealed that there are some types of data-collection where industry participation has been proposed or experimented with, but for which documentation standards seemed to be absent. These are tabulated in (Table 4.1) and will be explained in the following paragraph.

One of the more established avenues for industry participation is self-sampling of their catch to describe the demographics of resource harvest. For such *Catch sampling time-series* PGDATA has proposed documentation standards for producing manuals analogous to the SISPs and TIMEs that ICES provides for survey time-series (ICES 2020, PGDATA report, Section 2.4). We also experience that there is an interest in the industry for participating in collection of data for

observational time-series. That is data collected via regular fishing operations that is intended to inform on environmental variables or other statistical populations than the harvest of particular marine resources. Examples include vessel- or gear-mounted sensor-data or acoustics data.

Some novel designs for fisheries independent surveys also aim to utilize commercial activity to expand the scope (spatio-temporal) and/or reduce the cost of data collection. We have referred to this as *Collaborative industry-science surveys*. This is distinct from observational time-series taken during commercial fishing activity as it imposes fisheries independent design by for instance controlling sampling effort, standardizing sampling gear, or supplementing activities for complete spatial coverage of stocks. It is also distinct from using fishing vessels as platforms solely for fisheries independent survey work where no commercial fishing is undertaken.

Common to all these kinds of data collection is that they in the end record measurements or observations. The choice of parameters to record, the means of observation and the coding system chosen may have consequences for interoperability of data. Standardization in this regard constitute *Measurement and coding standards***.** This may be standardized maturity scales, length-classifications (market size-categories etc), sensor quality specification, instrument calibration routines, etc.

In Table 4.2 we have tabulated these categories of standards and identified examples of available standards and ongoing processes that aim to develop standards. This may serve as a tool to locate standards that are available at the moment, and as a draft for ongoing efforts in organizing the available standards and guidance documents. But most importantly, it serves to highlight areas we were not able to locate relevant standards. We did not identify any existing developments of guidance or standards for the emerging approach of Collaborative industry-science surveys or for the management of conflict of interest in data collection.

Table 4.2. Categorization of standards, with some examples of available standards or guidance, and some examples of ongoing developments. Some topics relevant for industry participation have no available examples or ongoing development.

Information need		Processes	Standards and Guidance development and examples
Description of data acceptance process		Data acceptance	Relevant documents are in the WKDSG resource inventory, e.g. #5-Introduction to Benchmarks at ICES_2013.
Documentation standards	Catch sampling time-series	Data collection	PGDATA has proposed SISPs for catch sampling. Will be followed up by WGQUALITY. The WKPICS3 report proposes a standard framework for describing commercial catch sampling. [Inv doc #7] The RDBES is developing an encoding standard for commercial catch sampling.
	Observational time-series	Data collection	WGTIFD is following up on standardization issues, and guidance for operationalization of electronic technologies for extracting information from fisheries. WGCATCH developed guidelines on what should be documented and considered when commercial fishery CPUE/LPUE indices are developed and used in stock assessment. [Inv doc #21]
	Collaborative industry-science surveys	Data collection	WKSCINDI and this workshop provide contributions to developments, as well as recent work by WGQUALITY on further development of SISP template. See also Guidelines for Industry-Science Data Collection [Inv doc #22]
Standards for managing Conflict of interest		Managing Conflict of interest	
Data-licensing standards		Data acceptance	DIG has been working on clarifying the distinction between data policies and data licenses and have evaluated the applicability of standard licenses for use in ICES.

Information need	Processes	Standards and Guidance development and examples
Measurement and coding standards	Data collection	WGBIOP has been following up practices in recording biological parameters and has produced documents that serve as standards. For instance, WGBIOP have developed a handbook on maturity staging of marine species. PoseiDAT, a data format with the purpose to standardise and join haul-based catch and environmental data, is under development as part of the Dutch EMFF project "Catching Data" (https://github.com/PoseiDAT/schemas). Potentially interested users or contributors are encouraged to contact the authors via Github or through project lead partner VisNed.

Standards for managing and resolving conflicts of interest

The review of available standards and guidance did not uncover existing standards for addressing potential conflict-of-interest of data-collectors. During plenary discussions, conflict of interest was highlighted as an important potential threat to the integrity of advice, and perceived conflict of interest as an important potential threat to the legitimacy of advice. Data-collectors have privileged and unchecked access to measurements, and in principle have opportunity to sample and record data selectively, or even fabricate data. This situation is different from other situations where concerns about conflict of interest may arise, such as scientific meetings and review panels. In those other situations conflict of interest may be handled by balancing representation of participants, an option that is much less straightforward when it comes to data collection. The recipients of the scientific advice need to be assured that the risk of biased sampling or reporting is adequately managed, particularly when data-collectors are perceived to have a direct stake in the application of the scientific advice. For industry self-sampling, a stake in the application of the scientific advice can be perceived from economic interest, and for scientific institutions the investment of researchers prestige in theories and predictions can threaten the perception of impartiality. In a discussion about legitimacy of advice, many other motivations may be brought into questions, but these two examples are mentioned in order to highlight that also traditional data-collection by scientific institutions may be subject to concerns about conflict of interest. Development of good standards for managing conflict of interest should not only address the additional legitimacy-risks introduced by industry participation in data-collection, but also manage the risks that may already be associated with the data-collection performed by scientific institutions.

Legitimacy of data-collection and advice does in the end rest on perceptions and opinions of the general public and in particular stakeholders. The process that forms these opinions is ultimately not only influenced by technical measures and standards, but it is clear that a pre-requisite for opinions about legitimacy to be well informed is that data-collection is conducted in a transparent and well-documented way. A good standard for managing conflicts of interest in data collection should therefore clearly address requirements for transparency and documentation.

Workshop participants were aware that standards for managing conflicts of interest have been developed for participation in scientific meetings and review-panels. While these are not directly applicable to data collection, the principles that underpin them are relevant. The *ICES code of conduct*, for instance, makes it clear that it is important to consider both perceived and real conflicts of interests. It also makes it clear that a conflict of interest does not need to prohibit participation. The *Development of guidelines for quality assurance of Australian fisheries research and science information* (section 5.1.9; Inventory doc #18) and the *Research and Science Information Standard for New Zealand Fisheries* (section 3.5; Inventory doc#17) highlights that perceived conflict of interests is associated principally with sector affiliations, so that the specificities of what concerns need to be addressed may be different for scientific institutions and industry participants. The *Magnuson-Stevens Act Provisions; National Standard 2* (Inventory doc#27) and the accompanying comments

to proposed revisions, is very much focused on avoiding conflict of interest, but also contains provisions for cases when conflict of interest is unavoidable. All of the standards reviewed made clear that conflict of interest need to be identified and transparently documented.

Even if legitimacy cannot be ensured by standards alone, an important component for most stakeholders will be the credibility of the data collection programmes. We find it useful to distinguish between credibility and legitimacy, in order to highlight that checks and balances may be implemented to provide assurance for the credibility of data, while recognizing that legitimacy emerges from a more complex social process. The specifics of what checks and balances may be implemented depends on particularities of sampling programs, and standards for handling conflict of interest in data collection may have to be limited to specifying how such checks and balances, or absence of checks and balances should be documented. Several of the presentations of operational self-sampling programs that were given during the workshop are relevant in this regard. These presentations highlighted that the integrity of data collection and data-recording can be verified by comparative analyses that look to evaluate how data from self-sampling programs overlap with other data sources. Such data sources may be other data-collection programs with partial overlap in sampling, or other use of the self-sampled data, such as statistical catch-descriptions for auctions (see Fuglebakk *et al.*, Brigden or Pastoors in Annex 2). This kind of validation analyses may address concerns that clients of the scientific advice or the general public may have about credibility of the data used. They are mainly mentioned as candidate for guidance documents, rather than standards documents. Also in this respect, quality assurance processes including transparency and detailed documentation stands out as an important tool to allow the final call on data-acceptability to be done by data users (advisory groups). The Fishery Knowledge Trust provides an example of data collection where transparency and clear description of process and roles enables data-users to evaluate their concerns about conflict of interest (see Manderson *et al.* in Annex 2).

The documents and examples mentioned in this section may serve as a good starting point for formulating standards and guidance for resolving and managing conflicts of interest in data collection.

Actions identified as needed by WKDSG

Following subgroup work and plenary discussions around ToR a) and b), participants agreed that existing documentation was not sufficient to provide guidance for data collection programs carried out in collaboration with industry or other data providers outside the scientific community, and that revisions or additional material would be beneficial. The group recognised that plans were underway among different ICES groups to address many of the needs identified during the workshop (in particular by WGQUALITY, WGCATCH, DIG) and the outcomes of the workshop should be used to reinforce the importance and prioritisation of these. Thus, effort should be directed at providing support to ongoing actions and ensuring any new actions are appropriately aligned existing plans. Specific suggestions for both s*upporting and new actions* are given below, with additional description and their alignment with existing ICES actions detailed in Table 4.3. To aim for efficiency of work, only actions that were considered sufficiently novel were defined as new actions and used as the basis for formal recommendations given in Section 6.

1. **Awareness – inform and provide access**
    a. establish a simple easy-access landing point to navigate QA information
    b. make accessible the flowchart mapping from WKDSG
    c. communicate QA development process to facilitate opportunities for alignment

d. identify who to go to for information - need for ICES to define roles and responsibilities. Presently lacking accountability and ownership of ICES products.

2. **(NEW) Develop standards for resolving and managing conflicts of interest in data-collection**.

3. **(NEW) Develop an ICES guidance document providing an overview of the overall data flow and principles for science standards. Include a checklist** to help establish the requirements and expectations for data collection intended for use in ICES and **make the WKDSG resource inventory publicly available.** (See Annex 6)

   Regarding the format, the group considered that at overview-type document aimed at collating and communicating existing work and needs is presently needed more than a detailed document on standards and guidance for scientific research in ICES. The content of this report is a start towards that (Annex 6). More detailed guidance would require a complete and thorough knowledge of the working components of a quality assurance system, many of which are still in development. It was noted that standards are the be-all and end-all, and at this stage ICES requires something with more flexibility for application to the broad range of circumstances/ opportunities that may arise.

4. In collaboration with scientist working for industry, **review and refine ICES Science Survey Protocols template (SISPs)** for use documenting industry self-sampling and other data-collection programmes and surveys. **Incorporate new documentation guidelines for non-probabilistic sampling that are being incorporated into the RDBES.**

5. **(NEW) Initiate dialogue on data access and use agreements** between industry and ICES.

6. **Encourage expert groups to publish any data collection guidance standalone documents** (rather than buried in EG reports), and make them available and accessible outside ICES. **Use the lessons-learned at WKDSG to document a short summary** of the main things that should be taken into account when documenting guidelines on data collection and quality assurance (relevant to fisheries dependent and other also). Share this in the ICES community and beyond. (See Annex 5.)

7. **Reinforce ICES development of a collaborative approach to working with its stakeholders, by offering a contribution to WKSHOES.** Participants expressed that to ensure there is coordination with ICES process and National programmes and priorities, collaboration is critical in industry data collection initiatives intended to provide information to ICES. Stronger collaboration would help important challenges such as achieving a high participation rate in voluntary probabilistic self-sampling schemes.

8. The **workshop on 'Evaluation and utility of industry data' (WKEVUT)** should be prioritised for the early-half of 2021, and elaborate further the issues surrounding when new data brings additional knowledge that may be inconsistent with existing knowledge, because this has direct relevance to data evaluation process in Benchmark Data Compilation Workshops.

Table 4.3 Alignment of 'supporting tasks' recommended by WKDSG with existing planned actions in ICES.

Tasks / deliverables already identified in relevant ICES groups ToRs	Source (Actioned by)	Supporting actions recommended by WKDSG to address identified issues/ needs.
As part of the quality assurance framework (QAF), map out process flows and critical control points and feedback loops in the advisory system and begin to address identified critical control points	Advisory Plan (ACOM)	(1) Using the flowcharts presented at WKDSG, **make the mapping of ICES data flow accessible** to users as a navigation aid for guidance on ICES quality assurance system.
Seek international quality accreditation for ICES advisory system	Advisory Plan (ACOM)	(1) Communicate the QA development process to **facilitate opportunities for alignment** with the development of national quality assurance initiatives.
Develop a comprehensive quality management system for advice including implementing Regional Database and Estimation System (RDBES), TAF, etc	Advisory Plan (ACOM)	
Where possible ensure that all advice products are based on data that adhere to the FAIR principals	Advisory Plan (ACOM)	
Application and ongoing development of the benchmark system to ensure the advice is fit for the evolving advisory demands	Advisory Plan (ACOM)	
Draft an ICES quality manual which will describe the overall approach to assuring the quality of assessment and advice within ICES. This will cover the quality assurance process from data collection to advice publication. (ToRb) Collate existing policies that relate to the quality of ICES advice and identify any gaps. (ToRa) Define what documentation is needed for the processes that contribute to ICES advice (such as process flows, standard operating procedures, guidelines, and manuals). Propose tools such as standard templates when required. (ToRb)	WGQUALITY	**(3) Develop an ICES guidance document** providing an overview of the overall data flow and principles for science standards, with links to appropriate (ICES or other) guidance documents. The purpose would be to support the scientific community and industry (and collaborations) on achieving the collection of quality fisheries-dependent data and its application in ICES. The guidance overview should include a **checklist** on any data requirements relating to use in assessment so that data providers are clear on expectations upfront. This has clear relevance to the existing guidance on benchmark data evaluation process, Inventory Ref: #2. As part of the overview documentation, **make available publicly the WKDSG Inventory on standards and guidelines** in quality assurance. **(2) Develop standards for resolving and managing conflicts of interest in data-collection.**
Prepare a quality assurance communication plan for the ICES network. (ToRc)	WGQUALITY	**(1) Awareness of who to go to** rather than where to go or what documents exist repeatedly featured as an important element identified by participants. While having place to go is important, identifying relevant persons that can answer questions and signpost relevant information would be very beneficial. This

Tasks / deliverables already identified in relevant ICES groups ToRs	Source (Actioned by)	Supporting actions recommended by WKDSG to address identified issues/ needs.
		speaks to the issue of the **need for ICES to define responsibilities** in the quality assurance process. Defined responsibility are specific elements in scientific standards and guidance documents in New Zealand, Australia and the US.
Finalise the "Series of ICES Sampling Protocols" template for fisheries dependent data and encourage countries to start using it. (ToRe)	WGQUALITY	**(4) Work with industry scientists to review and refine SISPs** for use in documentation of industry self-sampling of catches and industry-led scientific surveys. The categories of data-collection summarized in Table 4.1 may suggest relevant refinements.
Review status of the PGCCDBS (Data Quality Assurance) repository and agree on the way forward. (ToRe) Start to create a collection of useful data quality, scripts, graphs and function that can be used within the RDBES/TAF. Design processes that will allow people to contribute to this work. Agree how this work fits with the PGCCDBS (Data Quality Assurance) repository and how it will be maintained. (ToRe)	WGQUALITY	(1) Establish a simple **easy-access landing point to navigate information** on the quality assurance process and to access relevant guidelines and standards documentation needed for implementation of data collection initiatives within and outside of the existing ICES community. Further consideration of maintenance is required. **The document inventory developed for WKDSG provides and additional resource that should be made available** in appropriate format/ integrated with existing plan for an information repository.
Intersessional identify relevant topics | contents for commercial sampling guidelines and come up with a framework for having ready-available and updated guidelines. Liase with PGDATA, RDBES core group and ICES data centre in the process and take the work done by former WK's into account Based on real case studies, produce a Cooperative Research Report (CRR) with updated guidelines for on-shore and off-shore sampling of commercial catches (2022). (ToRa) Develop guidelines for SSF biological data sampling. 2021–2022 (ToRb) Continue to develop best practices guidelines on sampling and census data for SSF transversal variables-and evaluate its implementation 2020–2022 (ToRb) Report on - and support on board sampling practices at national institutes with regard to PETS (2020–2022). Annual reporting. (ToRb)	WGCATCH	(6) WKDSG participants support the plan to **publish standalone guidance documents** and note the importance that relevant potential users are made aware of these and they are accessible from a central landing point. It was suggested to **Use the lessons-learned at WKDSG to document a short summary** of the main things that should be taken into account when documenting guidelines on data collection and quality assurance (relevant to fisheries dependent and other also), which could be shared widely with the ICES community and beyond.
Actively seek involvement in a review and update of the current benchmark process for data compilation of commercial catch data, so these take resent WGCATCH findings into account. (ToRe) Intersessional liaise with PGDATA and ACOM to start a process of giving WGCATCH (as a proxy for commercial catches) a more active role in the assessment and benchmark pro-cesses. (ToRd)	WGCATCH	(1) WKDSG participants emphasised the need for **continued efforts of cross group engagement to facilitate awareness** and joined up work on quality assurance processes in ICES. Need for ICES to clearly define roles and responsibilities, so ownership and accountability is transparent.

Tasks / deliverables already identified in relevant ICES groups ToRs	Source (Actioned by)	Supporting actions recommended by WKDSG to address identified issues/ needs.
Collaborate with other ICES groups dealing with other aspects of catch data (e.g., WGBIOP, WGRFS, PGDATA, WGTIFD, WGBYC), RCGs (LM) and commercial catch focused external projects. (ToRf)		
Advise on data regulations and their impact on ICES Strategy, ICES Data Policies, and license considerations. (ToRb)* Facilitate data governance by performing evaluations and encouraging dialogue between expert groups, governance groups, DIG, and the ICES Data Centre to adopt best practises in data management. (ToRc)	DIG and Data Governance groups	(5) With respect to future opportunities for inclusion of industry self-sampling data in ICES, WKDSG recommends that **dialogue on data access and use agreements get underway soon** to avoid later bottlenecks in potential applications. * Such agreements are essential to help agree expectations and safeguards necessary to promote continuity of future data streams.

* ICES Data and Information Group (DIG) is working to revise the approach to data policy and licensing in ICES. Currently, both information about receiving and using data are encapsulated in the ICES Data Policy. This means that for data with different usage conditions, it is necessary to create completely separate versions of data policies, even if most of the processes still work in the same way for submitting data. Thus, looking forward, DIG is proposing that the data policy remains a universal document that describes the process for submitting data to ICES, and what ICES will do in terms of retention and preservation of data. Data licenses associated with datasets will then detail what users can and cannot do with the data. In many cases, and the default position, will be to make data openly available under the creative commons by attribution licenses (cc-by). However, where restrictions are necessary, other licenses can be applied to datasets. This proposal is still to be finalised and approved, but forms part of the wider approach outlined in ICES Data Centre accreditation under Core Trust Seal. Where more restrictive licenses are to be applied for commercial or data protection reasons, a framework for outlining considerations explicitly will also be prepared.

5 Summary of progress against ToRs

ToR a. Key elements for guidance to the scientific community and industry on the collection and application of fisheries-dependent data in ICES.

- We reviewed information that participants were aware of, including reviews by others and listed important elements, missing elements and noted where good examples were being applied. An inventory of information on Standards and Guidelines was created.
- We used four example data-collection scenarios to focus attention on what key elements / requirements should be available and accessible, and then discussed whether the information available was sufficient and where more work was needed. Scenarios illustrated different needs for standards and guidance and different pathways to get them, but requirements were similar whether it they related to including data from industry or existing providers.

ToR b. Mapping the flows in ICES work on science quality assurance.

- We mapped details of the data pathways and its management in ICES, so people involved in data collection have an overview when trying to understand 'What applies to me, what guidance do I need and where do I get it?'. A process based-schematic (Figure 3.1) was considered particularly useful, and could serve as a simple access portal to navigate ICES data flows and associated QA processes from start to end. The ICES website page on Data Guidelines and Policy would be a good home for the schematic, which should be refined over time.

ToR c. Evaluate if existing documentation provides sufficient guidance… And where necessary, suggest revisions and outline requirements relevant to application of data in ICES.

- Developed a schematic overview of the quality concerns that follow data from collection to advice (Figure 4.1), and identifies documentation needs and roles.
- We made some recommendations on what more is needed and how it can be carried out by/ with existing plans of ICES WGs (Table 4.3, Section 6). In particular, we identified the need for a standard on the resolution and management of conflicts of interest in data collection, and identified key sources that may inform on how a standard may be developed.
- Outputs from the workshop were used to draft the outline of a standalone document *'Overview of the principles and processes for quality control and assurance of data intended for use in ICES advice'* (Annex 6)

Reflections from ICES secretariat

Initiating plenary discussions on day 4, David Miller and Colm Lordan provided their reflections on progress against the ToRs and identified particular things that stood out as important.

David noted the value of the inventory of guidance documents collated for the workshop, the usefulness of the flowcharts and the quality of contributions from subgroup work. The work had illuminated both the need for efficiency and simplicity, but also the challenges of achieving this among the diversity of fisheries and possible sources of information they may offer. In particular, he noted needs for: enhancing opportunities for back-and-forth dialogue, a simple accessible overview 'central guidance document', efforts at standardization/ harmonization, establishing

clear roles and responsibilities, and enhancing communication between data collectors and users in possible future hybrid WG meetings (i.e mix of online and in person). He also commented that ICES should be thinking quite broadly about alternative data sources beyond that required for fish stock assessment inputs; including for example, information relevant to advice on bycatch of sensitive species, VMEs, etc, where data is often limited and scope for improvement is high. Regarding the question of 'Who can I learn from?', the importance of potential data providers teaming up with people who 'know the system' (e.g. hiring experts with experience in ICES or teaming up with institutes involved in ICES work) was seen as a useful way to kick-start and navigate the process. He also liked the suggestion from subgroup 4 for an inventory of known collaborations between scientific institutions and industries.

Colm Lordan reflected positively on the increased willingness and drive from industry to contribute to ICES science, commenting that including industry data in science for assessment and research may or may not alter the stock perceptions from current assessments, but it provides considerable opportunity to enhance knowledge and design new ways of doing things with more finely resolved information. But, continuity of representative and reliable data is key. He added that the onus was now on the science community to make the most of the opportunities for improving knowledge and resource efficiency by addressing any cultural and technical challenges that may present themselves. He noted that whether people like it or not, there will be more scrutiny over new data provided by industry than is typically applied to established data streams from National laboratories, and emphasised the importance of continuity in data intended for use in assessment and advisory products.

6 Recommendations

Recommendation	Addressed to	Timing
WKDSG recommends that standards be developed for managing conflict of interest in collection and application of data for use by ICES. The purpose of such standards should be to protect the legitimacy of advice when data-collectors with potential conflict of interests are involved. A more detailed problem description can be found in the WKDSG report (2020), section *Standards for managing and resolving conflicts of interest.*	WGQUALITY	January 2021
WKDSG recommends that resources are developed for assisting data-collectors in identifying standards their data-collection need to adhere to. WKDSG suggest that this can be implemented as a publicly available online 'portal' that utilises existing document repositories and the WKDSG resource inventory. It should include a guidance document whose purpose is to assist the process of identifying which standards are relevant for a particular data-collection activity. It will be important in this respect that the document explains the principles for data acceptance, and that it explains the data-flow pathways so that data-providers are able to identify which data-users to coordinate with.	WGQUALITY, DSTSG	January 2021
WKDSG recommends that with respect to future opportunities for inclusion of data streams from industry or other third parties, ICES establishes dialogue on data access and use agreements as a matter of priority. Data licencing arrangements may take time to agree and implement, so work is needed now to avoid later bottlenecks in potential applications. Such agreements are essential to realistically manage expectations and provide the safeguards necessary to promote continuity of future data streams.	DIG	May 2021

7 References

ICES. 2020. Planning Group on Data Needs for Assessments and Advice (PGDATA). ICES Scientific Reports. 2:105. 36 pp. http://doi.org/10.17895/ices.pub.7571

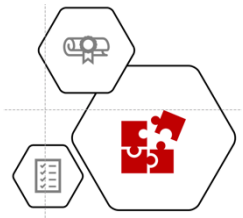
Annex 1: Document Inventory on standards and guidelines

Structure of the WKDSG document inventory spreadsheet, which is available on WKDSG share-point and will be made publicly available in the future, probably via WQUALITY.

Section	Content
BASIC INFORMATION	DocNo
	Year
	Title
	Relevance to WKDSG ToRs (1-high,5-low)
CLASSIFICATION of doc type following existing classifications	QA_DocType (ref PGCCCDBS repository)
	QAF-level1 (ref PGDATA 2018)
	QAF-level2 (ref PGDATA 2018)
	Tag1 (ref PGDATA 2018)
	Tag2 ((ref PGDATA 2018)
CONTENT DESCRIPTION	no. pages
	What it's about
	Purpose
	Synopsis
	Authors
	ICES Parent Group
REFERENCING	On QA repository
	Source
	Reference
	Link

Annex 2: Presentation summaries

WKDSG - Background and scope preparatory meeting 16 Nov 2020



Edvin Fuglebakk, IMR, WKDSG co-chair

One key motivation for this meeting was some experiences reported in the WKSCINDI-meeting held in Copenhagen in June 2019. Some industry-participants reported that data-collection they had participated in was not utilized to the extent anticipated in the advisory groups that data was collected for. Identification of standards for industry initiated data-collection was proposed as a means to manage such expectations. A clearer up-front description of what is expected from data that is used in advice from ICES, would increase the confidence of industry partners in that their efforts would result in useful data and thereby facilitate more commitment. While standards may evoke associations of detailed protocols and checklists, it has been important for the chairs to highlight that the ultimate criteria for data acceptance in ICES is formulated in context-specific scientific discussions. We therefore think that we need to provide guidance to this process and formulate standards first and foremost in terms of over-arching principles.

We do not think it is given that standards and guidance for contributions from industry needs to differ much from the standards and guidance developed for contributions from scientific institutions, but it would be a task for this workshop to identify to what extent that is the case. As a pointer in that direction we find it useful to think of the inclusion of industry provided data as a move from a *scientific institution model* of data collection to *collaborative science model*. Where the former designates an advisory process where scientific institutions control the entire knowledge chain from data-collection to advice, while the latter to a larger extent seeks to leverage that industry has cheaper access to larger amounts of data. It is important in such a transition to ensure that the benefits of the scientific institution model is not unknowingly compromised. Particularly we find it crucial to ensure that the legitimacy or trustworthiness of advice is not compromised. The scientific institution model provides legitimacy by the knowledge and impartiality associated with scientific institutions, but tends to implicitly argue for the quality of advice by reference to authority, which may be considered an unscientific way of arguing. The increased focus on transparency allows us to avoid such reference to authority, and rather display the support for advice for direct scrutiny. This also opens the door for other players to provide data or analysis of similar trustworthiness, at least for specific purposes. In order to ensure that trustworthiness is not jeopardized, it is important that such data-collection are held to standards that addresses the concerns of stakeholders and the general public.

The issue of data-collection from other institutions than traditional scientific ones should in principle be generalized to non-industry data-contributors as well. Examples may include NGOs, hobbyists or educational programs. Since sampling of fisheries dependent data cannot be done without some degree of collaboration with the industry, formulation of standards for collaborative science if particularly important in this area. Yet the litmus test for whether standards and guidance serve to ensure trustworthiness of data-collection and advice is to imagine that other stakeholders apply the same standards.

In the upcoming workshop we plan to: Identify over-arching questions, check if we have documentation standards, check if we have guidance and if it is findable, and plan how to amend if something is lacking.

Why Quality Assurance matters to ICES

Colm Lordan, ICES

ICES is an independent intergovernmental science organisation which provides a range of advice products relating to marine ecosystems, from advice on fishing opportunities for around 260 stocks to advice on ecosystem and environmental issues. Any ICES Member Country or intergovernmental organization that has an agreement with ICES can make an advice request to ICES. The majority of requests are in support of the development or implementation of policies and legislation to meet conservation, management, and sustainability goals and objectives.

The Advisory Committee (ACOM) approves all ICES advice and has overall responsibility for all advisory products and for the ongoing development and improvement of the advisory process. It consists of representatives appointed by each ICES Member Country, and decisions are made by consensus. The ACOM Leadership consists of the Chair of ACOM, its Vice-Chairs, and the head of advice support from ICES Secretariat. All advice is published on ICES website.

In 2019 a subgroup of ACOM, SICOM and the secretariat explored quality issues related to the ICES advice. The main conclusion of this was that there is a broad range of quality related activities going on within the community and that better interconnections, implementation and feedback loops were need in the form of an end to end quality assurance system for the advice (Figure XX). An analysis of errors in the advice found that more substantial errors that impacted of the headline advice tended to be a lower level in the assessment and advice pipeline. The problem of quality of advice products is broader than ensuring that errors are minimised, issues such as bias and variability in the assessments, sudden changes due to benchmarks and inconsistent application if frameworks and guidelines all impact on whether advice users consider the advice fit for purpose. "Assuring Quality" was established by as the first priority areas by ACOM in the ICES Advisory Plan and this was endorsed by advice users in early 2020 at the MIRIA and MI-ACO meetings.

Figure A2.1. Overview of quality related activities and groups impacting on ICES advisory products.

The ICES Advisory Plan sets out a number of key tasks are currently being actively worked on by the community and the secretariat. The 2 key developments of relevance are the Transparent Assessment Framework (TAF) and the Regional Database and Estimation System (RDBES). These require a huge effort for the community and it is important to ensure that future fisheries dependent information pipelines are compatible with these systems. In addition, ACOM has recently developed 10 overarching principles for the advice again it is important that fisheries dependent information is compatible with these principles. ACOM has also established a Benchmark Oversight Steering Group. This is important because for fisheries dependent information to be integrated into an assessment it will need to go through a benchmark process. This involves a number of steps over two years and any new data would be scrutinised at a benchmark data compilation workshop.

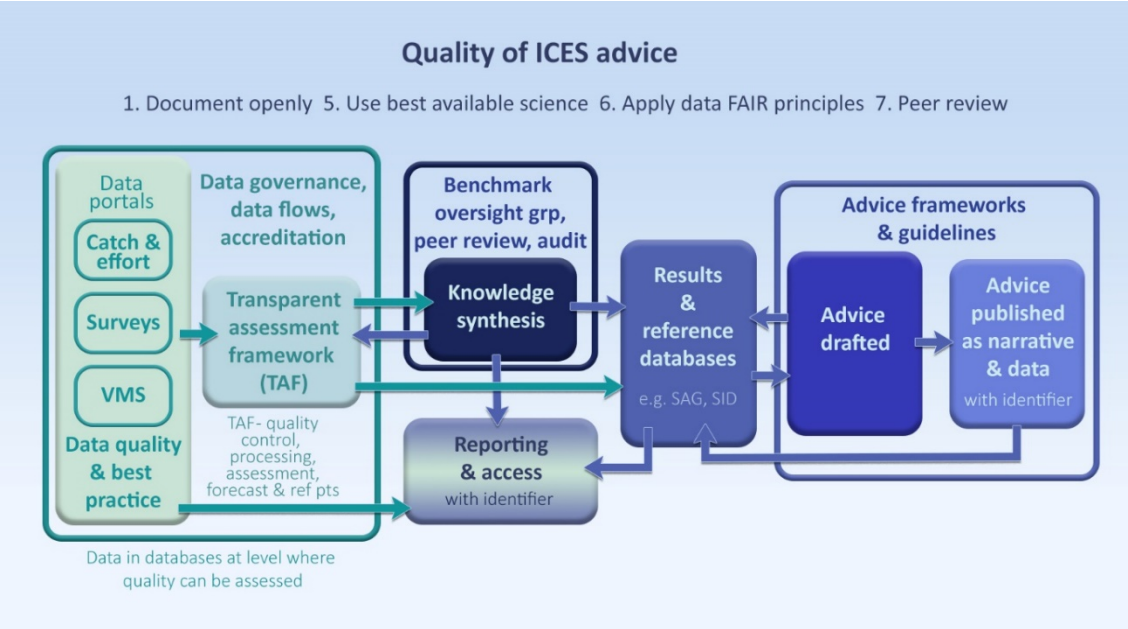
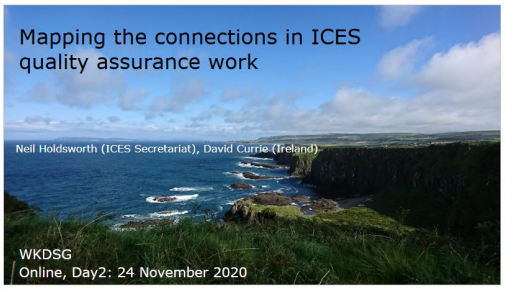


Figure A2.2. Simple overview of the ICES assessment and advisory pipeline from data to advisory products.

A particular challenge is to reconcile quality assured advice with commitment to use best available science. There are many operational advantages to using more fisheries dependent information in assessments and advice. The scientific standards need to be rigorously upheld since there may be a perception that data from stakeholders undermines the objectivity and credibility of the scientific advice.

Mapping the connections in ICES Quality assurance work

Neil Holdsworth (ICES Data Centre) and David Currie (Chair of WGQUALITY)



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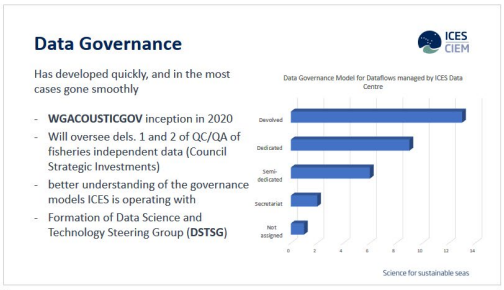

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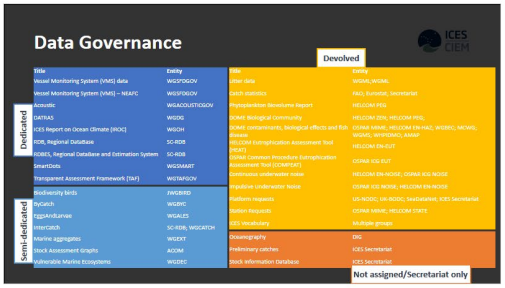

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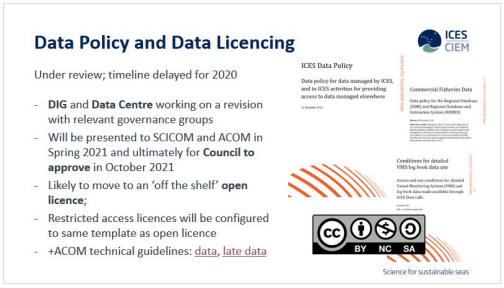

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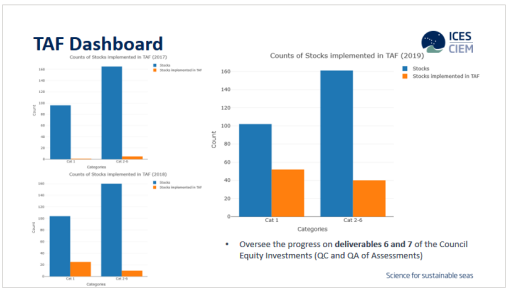

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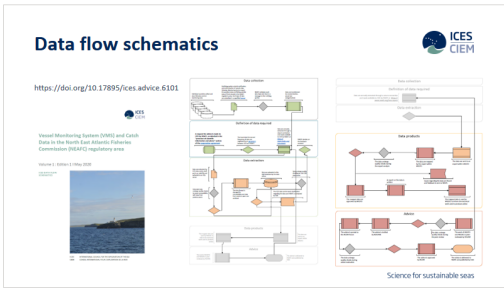

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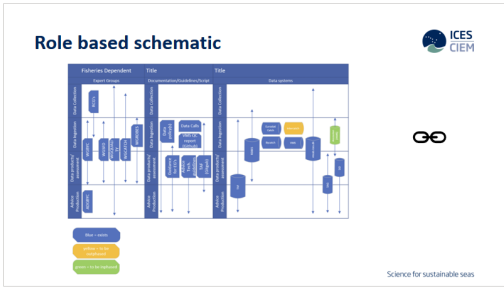

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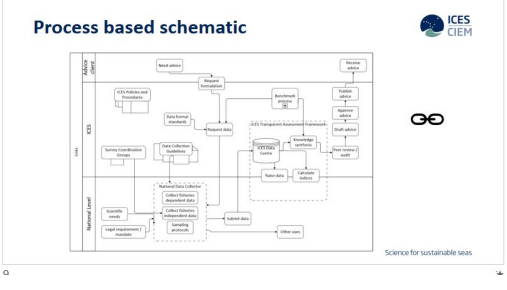

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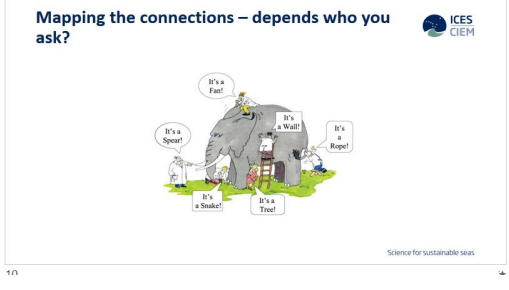

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Introduction to Statistically Sound Catch Sampling - WGCATCH and other key expert groups

Jon Helge Vølstad, Kirsten Birch Håkansson, Nuno Prista, Hans Gerritsen and Estanis Mugerza

In 2002, the ICES Planning Group on Commercial Catches, Discards and Biological Sampling (PGCCDBS) was established to enhance quality assurance of fishery sampling data and biological parameter estimates. Its role was to promote best practice so that data sets and parameters supporting assessments and advice for the ICES area are based on:

i) statistically-sound sampling schemes;
ii) correct and consistent interpretation of biological material such as otoliths and gonads;
iii) technology that improves accuracy and cost-effectiveness of data collection;
iv) comprehensive and easily sourced documentation, and
v) efficient collaboration between PGCCDBS, expert groups and other bodies in relation to data collection.

PGCCDBS established Workshops and Study Groups to bring experts together to address specific issues. These have included the Workshop on Methods to Evaluate and Estimate the Accuracy of Fisheries Data used for Assessment (WKACCU: ICES, 2008); the Workshop on methods to evaluate and estimate the precision of fisheries data used for assessment (WKPRECISE: ICES, 2009a); the Workshop on methods for merging métiers for fishery-based sampling (WKMERGE: ICES 2010a); the Workshops on Practical Implementation of Statistical Sound Catch Sampling Programs (ICES WKPICS 2011, 2012, 2014); the Study Group on Practical Implementation of Discard Sampling Plans (SGPIDS – ICES 2011b, 2012b, 2014).

The Working Group on Commercial Catches (WGCATCH) was established in 2014 and has continued the work with documenting national fishery catch sampling schemes, establishing best practice and guidelines on sampling and estimation procedures, and providing advice on other uses of fishery data. During the years, WGCATCH has developed e.g. best practice and plenty of examples of sampling of commercial fisheries, best practice guidelines for data collection from small-scale fisheries, templates for documentation of sampling design and estimation and CPUE/LPUE indices guidance.

Presently a lot of the past guidance documents related to commercial catch sampling are hidden in very long reports and one of the future tasks for WGCATCH is to publish standalone and peer-reviewed guidelines to make sure that these are quality ensured, findable, accessible and current. In the pipelines are guidelines for data collection from small-scale fisheries, practical guidelines for on-shore and at-sea sampling of commercial catches and ratio estimators. Further, WGCATCH will continue the close work with WGBYC, including support to develop guidance on onboard sampling of PETS, and support the RDBES, which is a cornerstone in transparent fishery dependent sampling, data-storage, and estimation. Lastly, there is a need for developing criteria for including non-probabilistic methods in fisheries surveys, both for national sampling institutions and the industry, and to document assumptions. Nonprobability sampling is an alternative method that is often used when it is unfeasible or impractical to conduct probability sampling. The main problem is that it is difficult to generalize research findings from nonprobability-based surveys, and to assess sampling variability and identify possible biases, as compared to probability-based sampling. There is a need to develop criteria for including non-probabilistic methods in fisheries surveys and to document assumptions. A key feature of statistical inference from sample surveys is that it requires some theoretical basis and explicit set of assumptions for making the estimates and for judging the accuracy of those estimates. WGCATCH

will start joint intersessional work with WGRFS in 2021 to develop standards and guidelines for documentation and estimation for non-probabilistic catch sampling surveys.

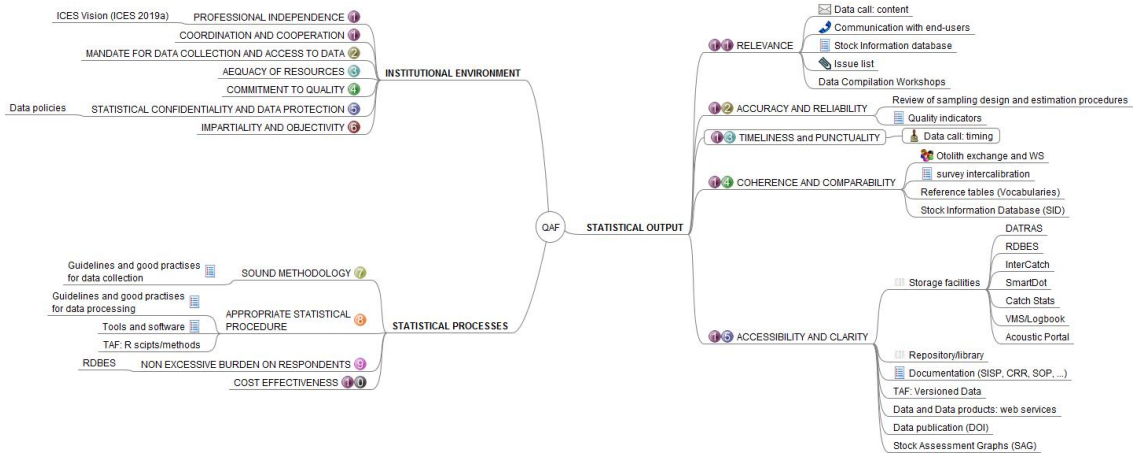
All relevant reports and standalone guidance can be found in the document inventory in WGCATCH.

Documentation of fisheries dependent data: relevant outputs from PGData

David Currie, Chair of WGQUALITY

The last 3 year cycle of the ICES Planning Group on Data Needs for Assessment and Advice (PGDATA) ran from 2018–2020[1]. Its Terms of Reference were: i) design a Quality Assurance Framework to ensure that information on data quality is adequately documented; ii) ensure consistency of approach for fishery dependent and fishery independent data quality framework; iii) develop and test analytical methods for identifying improvements in data quality; and iv) improve or create communication routes between data collectors, data managers and end-users.

During this cycle PGDATA proposed a Quality Assurance Framework for ICES proposed based on the European Statistical System[2].



PGDATA also proposed a "Series of ICES Sampling Protocols" which would be similar to the existing Series of ICES Survey Protocols (SISPs)[3] but used for documenting fisheries dependent data. A common template should be developed and published by ICES – countries can then be encouraged to document their commercial sampling schemes using this template. A common structure will make it easier to: i) find specific information in different protocols, ii) document a new protocol, and iii) identify missing information (if any). EU member states have to complete a national work-plan, part of which involves describing their sampling schemes – the common structure could also be used for this. EU member states (and others) can also make the protocols publicly available on their web-sites.

[1] The latest report is available at http://doi.org/10.17895/ices.pub.7571).

[2] https://ec.europa.eu/eurostat/documents/64157/4392716/ESS-QAF-V1-2final.pdf/bbf5970c-1adf-46c8-afc3-58ce177a0646

[3] E.g. http://www.ices.dk/sites/pub/Publication%20Reports/ICES%20Survey%20Protocols%20(SISP)/SISP%2010_Manual%20for%20the%20International%20Bottom%20Trawl%20Surveys%20-%20Revision%2010.pdf

It would be important to ensure sampling scheme names match between sampling protocols, ICES Regional Database & Estimation System (RDBES) data, and EU national work-plans (if relevant). This would provide a link from sampling design, to the data (RDBES) and assessment (via the ICES Transparent Assessment Framework).

The EU Regional Coordination Group data quality sub-group analysed a number of real sampling documents provided by member states – there was a good match to the proposed template structure[4].

PGDATA also considered the accessibility of good practice and guidelines. The ICES Data Quality Assurance Repository[5] was examined - a large number of issues have found answers, there are examples of good practices, and recommendations for practical implementation, but as it is, only a few experts in each of these fields are able to dig out this information. Moreover, other information sources exist on the ICES website[6] but some sources are either not accessible to the public (e.g. held in private SharePoint folders) or accessible only on demand (age-reader forum).

The presentation of more than 200 links to reports in the Data Quality Assurance Repository could be done manually (as now) or dynamically, and PGDATA recommended exploring this latter option. If tags or key words are embedded in the document meta-data a web-site could then dynamically present documents based on these tags.

The ICES library[7] hosts several types of information (expert group reports, survey protocols, CRR, user handbooks, data outputs etc.) and is available to the public. If the user knows exactly what to look for then this task is relatively easy to accomplish but if this isn't the case it can become a little bit more cumbersome. The ICES Data Mining Tool[8] shows groupings of words either based on ICES group acronyms or individual documents – this makes it easy to pick out common themes and topics from groups and documents. Potentially this could be used to semi-automate document tagging.

Generally, it can be difficult to find documents within the ICES website – however it is designed to be Googled. Google advanced search functions can help with finding information e.g. "best practice" sampling age site:ices.dk filetype:pdf

There is a large amount of activity in the ICES world focussing on data needs for assessment and advice. One of the major benefits of having a large number of expert groups, organisations, and individuals participating in this process is the high level of innovation displayed. However, the downsides of this can include a lack of knowledge about what work is being done by other people and a lack of coordination in harnessing this work. A new group is proposed: "Governance Group on Quality Management of Data and Advice" (WGQuality) to help remedy this.

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[4] https://datacollection.jrc.ec.europa.eu/documents/10213/1239599/2020_RCG-NA-NSEA+and+RCG-Baltic_partIII_ISSG.pdf/80dbfefd-d74d-4eb1-a746-3e4aa3baa2e5

[5] https://www.ices.dk/community/Pages/PGCCDBS-doc-repository.aspx

[6] e.g. the WGCATCH repository https://www.ices.dk/commu-nity/groups/SiteAssets/WGCATCH-publications.aspx

[7] https://www.ices.dk/publications/library/Pages/default.aspx

[8] http://data.ices.dk/DataMiningICESLibrary/SearchPerAcronym.aspx

Draft ToRs for the next 3-year cycle of work are:

- Analyse existing ICES quality management processes within advice production and evaluate their coherence with the objectives of the ICES advisory plan. In particular highlight any gaps and overlaps between different processes.
- Specify a fully operational ICES advisory quality management system that is in line with the scope and direction in the advice plan.
- Create and implement an internal communication plan to explain the quality management system, ensure effective feedback mechanisms to identify needed improvements and highlight existing good practice.
- Use the quality management system to evaluate current activities.
- Operationalise the quality tools and processes that were proposed during the previous 3-year cycle of PGDATA.

RDBES – the new ICES commercial fisheries system

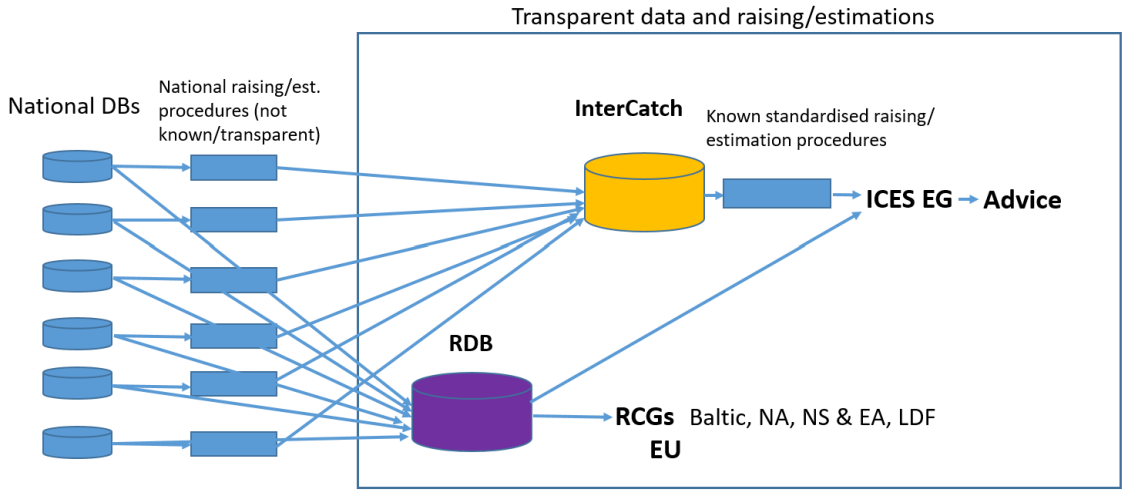
Henrik Kjems-Nielsen, ICES Secretariat

Reasons for developing Regional DataBase and Estimation System, RDBES:

- Provide a regional estimation system for ICES stock assessments
- Give RCGs access to detailed data in the way it was collected
- Support the collection of design-based data collections
- To increase the data quality, documentation of data, and transparency of estimations
- To facilitate the production of fisheries management advice and reports
- To increase the awareness of fisheries data collected and the overall usage of these data.

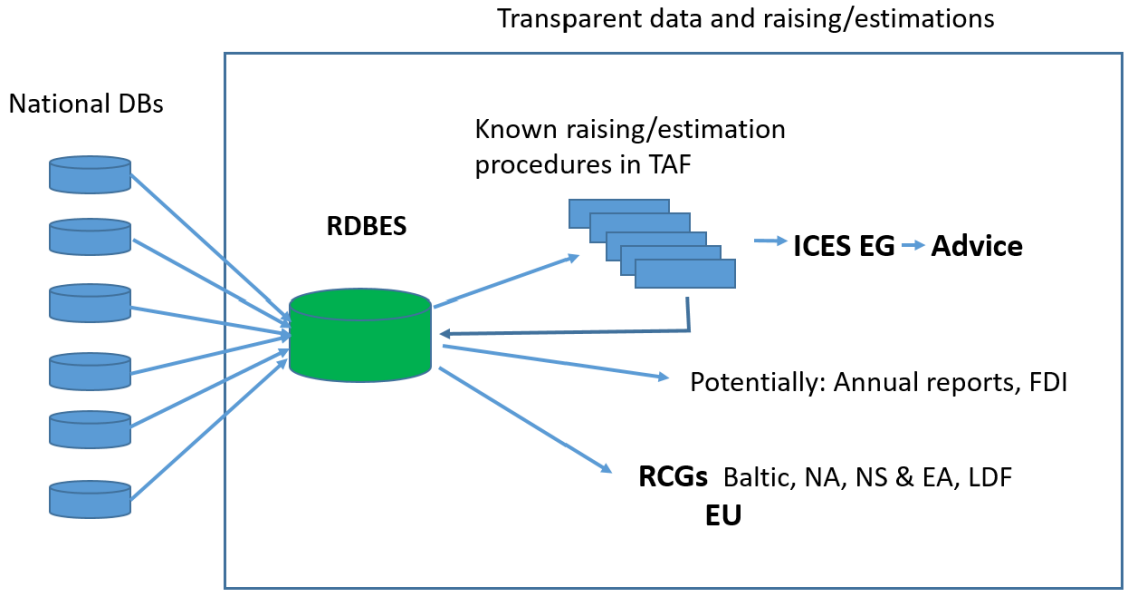
The systems used today for commercial fisheries

Below the current detailed data flow from national institutes to RCGs (NA NSEA, Baltic and LDF) and ICES Expert Groups are shown. The data is collected through two data calls to the countries. How the countries are raising/estimating the data for upload to InterCatch for ICES Expert Groups and advice is not known, and that will be improved in the new RDBES.



The RDBES used in the future for commercial fisheries

Below the future detailed data flow from national institutes to RCGs (NA NSEA, Baltic and LDF) and ICES Expert Groups are shown. The data is collected through one data call to the countries. It is documented and known how the raising/estimating of data for the ICES Expert Groups and advice is done.



Needed functionalities are moved to the new RDBES

The existing RDB is used by a number of RCGs (North Atlantic, North Sea & Eastern Arctic, Baltic Sea and Long Distance Fisheries). If a need is identified in the existing RDB, the solution is moved to the new RDBES, so it is ensured that the new RDBES also fulfils the needs when the RDBES takes over.

For example last year the RDB Long distance Fisheries started using the RDB, but it was identified that there was an issue regarding splitting of area 34.1.2 'Canaries/Madeira Insular', and a new request regarding landing by country and not area, was solved by creating a list of countries referring to areas using the 'Subpolygon' field in the existing RDB. But the meant that there had to be created a new field, which was named 'Jurisdiction area' in the new RDBES for the RCG LDF.

The Core Group specifies the RDBES

The Core Group is specifying the RDBES or developing the specifications. The ICES Secretariat develop the software and the RDBES database and web system. The core group have discussed what information that is needed, and how it should be structured throughout 2020 through 33 weekly online meetings, it have been a huge task. Then ICES Sec. sent out the first data call for the RDBES. After that the meeting shifted to answer issues posted on the public RDBES issues GitHub website. The Core Group is now entering a phase where there will be focused more on estimations in R scripts in TAF. But still many thing to specify and develop further: roles, access, checks, output format, overviews, data inspections.

WGBYC

ICES Sec. had two meetings the 4 and 5 Feb. 2020 with the chair of WGBYC Sara Königson, where WGBYC's wishes and what as achievable was discussed and expectations adjusted. The WGBYC's wishes/requests was brought forward by ICES to the Core Group and discussed and the final fields and mandatory/optional status was finalised the 11th March, and the agreed information is in the current RDBES data format. The Core Group tried to include as many of the WGBYC requests as possible in the specifications for the RDBES.

RDBES data call

ICES sent the first data call for data to the RDBES the 27 May 2020 with a deadline the 30 September 2020. Before that ICES requested SCRDB (3-5 December 2019) for stocks for the data call, which together would cover all countries, and giving the possibility to test different scenarios - 11 stocks was selected: spr.27.22-32, cod.27.21, whb.27.1-91214, yellowfin tuna , sol.27.7fg, mur.27.67a-ce-k89a, mac.27.nea, mon.27.78abd, mon.27.8c9a, ank.27.78abd, ank.27.8c9a. ICES drafted the Data Call, which was presented to PGDATA (21-24 January) which reviewed it. A notification email was sent the 21st Feb. regarding the data call to prepare countries for the new RDBES data call. The data call can be found here:

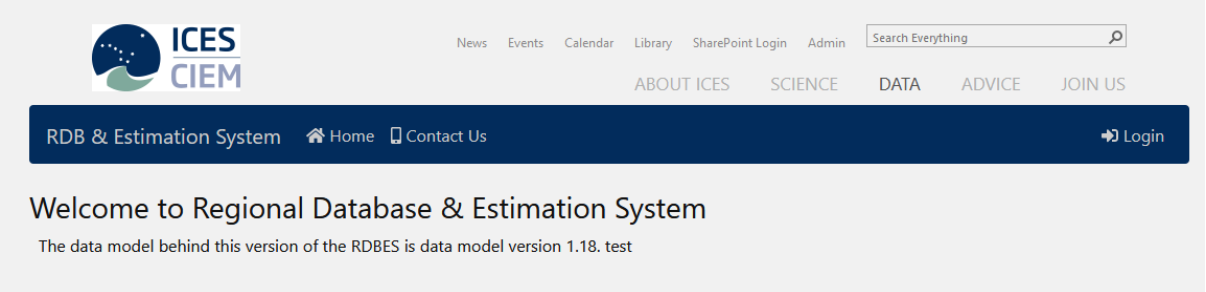
http://www.ices.dk/sites/pub/Publication%20Reports/Data%20calls/data-call.20202705.RDBES.pdf

RDBES web system

ICES have developed the RDBES web system. The RDBES web system can be accessed only by named users at:

https://sboxrdbes.ices.dk/

The RDBES entry web site looks like the following



The RDBES system is not finished, it will be further developed.

Questions and support regarding upload of data on the RDBES system or user set up should send an email to:

RDBsupport@ices.dk

The data model and documentation for the RDBES can be found here:

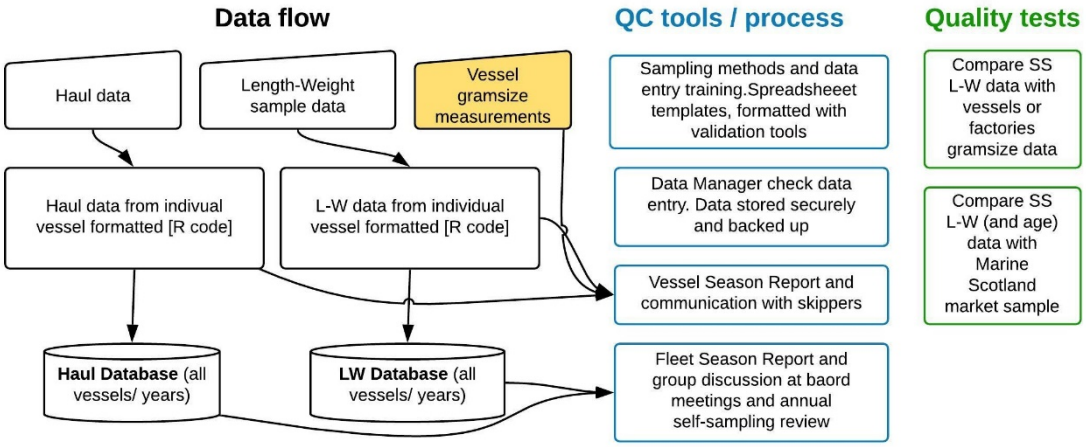
https://github.com/ices-tools-dev/RDBES/tree/master/Documents

Protocols and standards in pelagic data collection: Scottish self-sampling

Katie Brigden, NAFC Marine Centre UHI, Shetland

The Scottish pelagic self-sampling scheme was established as a pilot project in 2018, in partnership with the NAFC Marine Centre, the Scottish Pelagic Fishermen's Association (SPFA) and Marine Scotland Science (MSS). The aim of the project is to establish a self-sampling programme that is fit for purpose and can be fully implemented, collecting quality data that can be utilised within science and management.

Since the project began in 2018, the focus has been on establishing methods and processes for data collection, data processing and data analysis, with an emphasis on developing transparent, traceable and documented processes.



QA processes overview for Scottish pelagic self-sampling programme

The **QA processes overview** demonstrates the **flow of data** through collection and processing, and the **quality control tools and processes** which support the flow of data from collection to end product. As part of the pilot phase, **quality testing** is also carried out in order to demonstrate the methods and process are fit for purpose and capable of providing high quality usable data.

Within the **data flow** and **QC tools/process** elements a range of documentation has been established and continues to be built upon. This includes **operational documents**, which provide a clear step-by-step guide to processes (for both scientists/data managers and industry), and **supporting documents**, which offer more detailed information on the sampling programme and the framework behind the processes (where possible supporting documents are publicly available).

Operational documents	*Data chain of custody; Data collection protocols & entry files; Data checking guidance notes; Standard R scripts for data processing and reporting; Data logs*
Supporting documents	*Science data policy; Data collection strategy; Data sharing agreements; Methods and procedures manual*

Quality testing has included an internal evaluation of processes (led by MSS) and data comparisons with MSS market sample data, in order to demonstrate data quality (in terms of processes and the end product), with the aim that the self-sampling data can be utilised.

EU RCGs – Regional Coordination groups.

Jon Elson, Cefas UK, Els Torreele, ILVO Belgium

From 2019, Regional coordination groups have evolved from annual Regional Coordination meetings between EU member states that shared the same marine region to ensure that the **EU data collection regulation** was implemented, that standards are agreed and that national programmes delivered quality data that was needed to support the common fisheries policy.

In the latest draft of the regulation (EU) 2017/1004 the RCGs are regularly referred to but their work is seen as an ongoing process to better progress any development in cooperation between members, standards and quality.

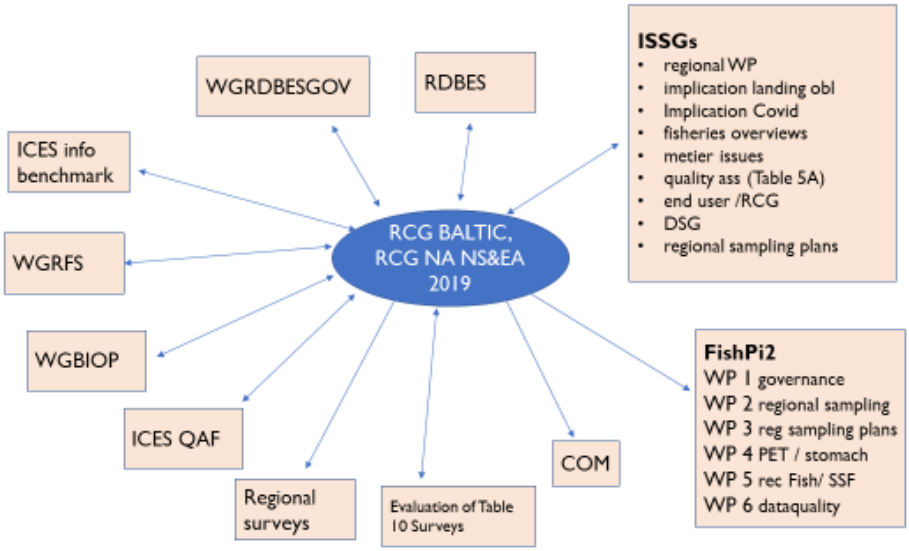
What is the data collection regulation? The regulation was implemented in 2002 and provided an opportunity for funding for members states to ensure commitment to a minimum programme for stock-based variables with annual quotas based on numbers of fish with rules on data delivery. It evolved through being more prescriptive with defined precision targets at national level and stricter penalties to the latest draft of the regulation advocating a more statistical, regional approach to sampling with the focus being on meeting end users' needs assuring quantity and quality and optimising sampling through Regional Work Plans.

The regulation obliges member states to collect and report on and deliver data to endusers and if its insufficient there is the threat of infractions. Annually MS have to review their national programmes and ifrelevant, update national workplans. MS are obliged to submit annual reports in a standard format to the commission which provide summary documentation of national sampling programmes; achievements and data delivery. **The National Work Plans and Reports include a quality assurance framework table – a table submitted by each member state which provides reference to progress in making quality information on national sampling schemes available to the scientific community and public. The table needs to include reference to where to find documentation on the protocols and quality check procedures**

What are the aims of RCGs? The aims of the RCGs are to improve quality of the data that form the basis for advice; improve the effectiveness and efficiency of its collection through the cooperation of Member states through consultation with end users, stakeholders and third countries at a regional and supra regional level. And to develop, draft, submit and implement Regional Work Plans.

How are these aims achieved? This is achieved through an annual cycle and ongoing programme of work by inter-sessional sub groups (ISSGs). Milestones throughout the year start with agreeing the tasks of the subgroups; data is submitted to the RDBES by Member state to be available in April for ISSG work; progress is reported and reviewed in May June; culminating in decision meetings in September to agree the work plan for the coming year, actions and recommendations and a Liaison meeting of the RCG chairs with the commission and end-users (RFMOs).

The terms of reference are extensive, covering all areas of RCG commitment under the regulation and are dependent on collaboration with ICES and the commitment of experts and technical support from the institutes around the EU throughout the year. Most of the work is of pan-regional benefit and the RCGs coordinate the work of around 20 ISSGs with 3 focusing on Data Analysis and quality. One of which is reviewing the availability of the information on sampling schemes through the QAF table in the National Work Plans and Annual Reports. The other is reviewing methods for determining and interpreting metiers as defined and submitted by members states. And the other is developing tools for reviewing the data submitted annually to the RDB by member states as a form of quality control.



RCGs are involved and present in different quality related work independent of and at ICES to ensure the integration of their output in the RCG work, and vice versa, to ensure the integration of the RCG work in theirs. The schematic above provides an example overview of the interactions for some the RCGs in 2019.

Other (non-ICES) work on Standards and Guidelines for fisheries science

Steven Mackinson, Scottish Pelagic Fishermen's Association

Internationally, the overall purpose of guidelines to review, evaluate and validate the quality of scientific information has been similar: *To implement a formal and accountable system for monitoring and ensuring the quality of scientific information and advice provided to Government; and thereby to increase government, stakeholder and public confidence and trust in scientific information, and in policy or management decisions made by Government based on scientific information.* Penney *et al*. 2016 (Guideline for Australians Fisheries, [Inventory doc #20]

To help discussions during the workshop, the following definitions were proposed:

Standards: Principles and associated Criteria used to define conditions that should be met for information to be considered fit-for-purpose. Standards are about **the quality of information and processes** that determine and evaluate the quality of information and how trustworthy it is.

Guidelines: Provide guidance on how to meet standards. (or guidance on what the standards should be). They are about **procedures** (methods, testing, analyses, evaluation)

Quality assurance framework: = Standards + Guidelines+ Tools

ICES Advisory plan states that '*quality assurance of the advisory processes will underpin our role as an independent and legitimate evidence provider (2019 ICES Advisory plan)'*. Good overviews of the progress and issues related to quality standards and guidelines and reported in PKPICS 2013, Annex 3 [Inventory doc # 7], and the PGDATA 2020 [Inventory doc #19] report, which proposes a structure for a quality assurance framework (Figure 1).

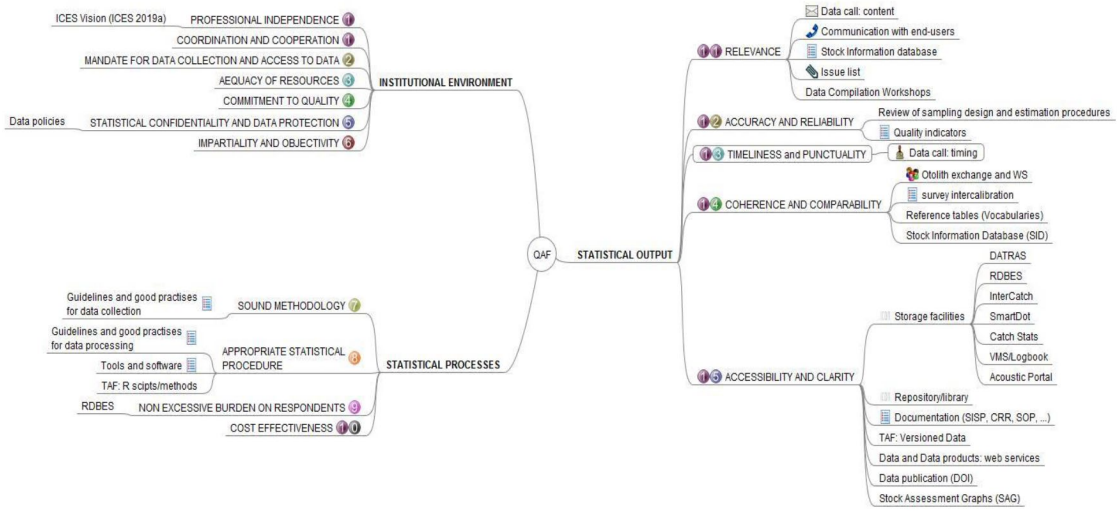
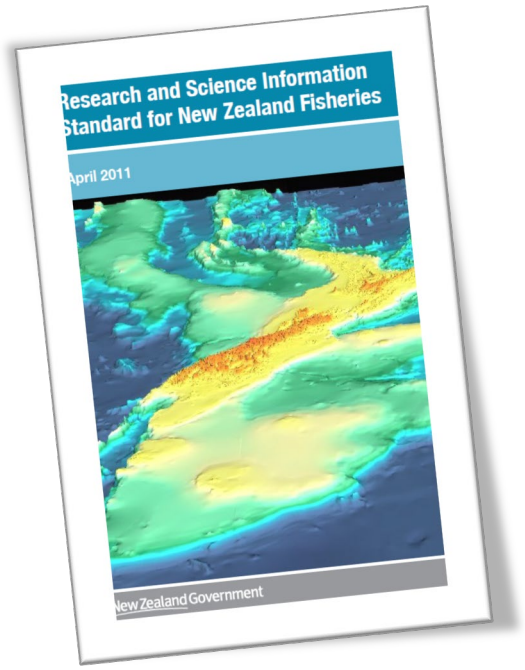


Figure 1. Proposed ICES Quality Assurance Framework (PGDATA 2020)

The important question now is how to move from the somewhat jumbled collection of relevant components to the fully operational machinery that is required. There a several excellent examples from other countries that can be used to support that transition, and attention is given here to those that are already being successfully applied.

The New Zealand Research Science and Information Standard [Inventory doc #17] **is a policy statement of best practice** in the delivery and quality assurance of research and science information that is intended or likely to inform fisheries management decisions, regardless of the source of that information. Its p**urpose is** to ensure that "government, stakeholders and the public can be confident in the research and science information used to inform fisheries management decisions. It provides **guidance** as to what constitutes *high quality* and *reliable* science information. Key elements include



Data must be collected according to documented procedures in accordance with community best practices.

- **Data collection** methods, systems, instruments and statistical sampling designs must be **designed to meet the requirements and should be validated** before use. Calibrated instruments.

- Data must **undergo internal or external quality assurance prior to being used** in analyses that are intended or likely to inform fisheries management decisions.

- Emphasises independent peer review to ensure the **relevance, integrity, objectivity and reliability of information.** The science quality assurance and peer review processes are required to use a quality ranking system to inform fisheries managers and stakeholders of those datasets, analyses or

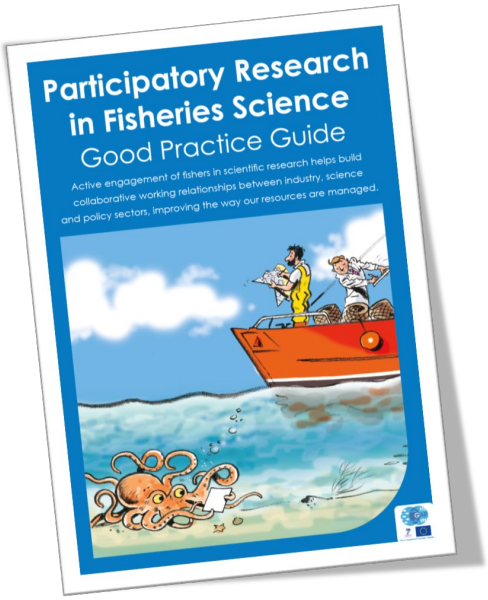
models that are of such poor quality that they should not be used to make fisheries management decisions

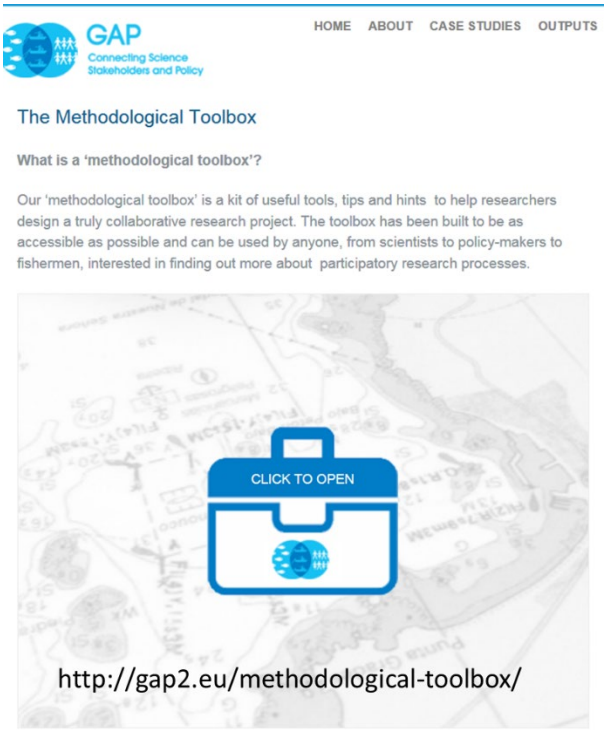
- **Responsibilities of different 'actors' are clearly defined. In particular, r**esearch providers providing *research* and science data, analyses, results and reports intended or likely to inform fisheries management decisions must meet certain requirements for: appropriate and adequate qualifications and capabilities; project management and quality management; data management and provision; certification of laboratories and equipment; data collection; data analysis and synthesis; experimental studies; technical protocols; internal and external *peer review*; and research reports.

The lead author of the NZ document led the work on a similar document for Australian fisheries, called the Research and Science Information Guidelines for Australian Fisheries. [Inventory doc #20], but of particular interest here is the comprehensive review document that resulted in the guidelines. This 'Development of guidelines…' document [Inventory doc #18] reviews existing system in other countries (including UK, Europe, USA, Canada, NZ) of which perhaps the most important one to take note of is the USA because of the level of detail, which is documented in the Magnuson-Stevens Act Provisions; National Standard 2 – Scientific Information (NOAA 2013).

1. Executive Summary
2. Introduction
2.1. Structure of this Report
3. Objectives
4. Review of Science Quality Assurance Guidelines
4.1. Review of International Science Quality Assurance Guidelines
4.1.1. United Kingdom: Evidence-Based Policy
4.1.2. European Union: Use of Expertise
4.1.3. Canada: Science Advice for Government Effectiveness
4.1.4. United States of America: Information Quality and Peer Review
4.1.5. New Zealand: Research and Science Information Standard
4.2. Australian Science Quality Assurance Processes
4.2.1. Responsible Science Code of Conduct
4.2.2. Australian Official Statistics and Data Quality
4.2.3. Australian Fisheries Management Authority
4.2.4. Australian Bureau for Agriculture and Resource Economics and Sciences
4.2.5. South Australian Research and Development Institute
4.2.6. Northern Territory Department of Primary Industry and Fisheries
4.2.7. Commonwealth Scientific and Industrial Research Organization
5. Information Quality: Key Principles and Best Practices
5.1. Key Principles for Ensuring Scientific Information Quality
5.1.1. Purpose and Objectives
5.1.2. Definitions of Science Quality
5.1.3. Definition of Best Available Scientific Information
5.1.4. Scientific Methodology and Objectivity
5.1.5. Peer Review Criteria and Mechanisms
5.1.6. Composition of Peer Review Panels
5.1.7. Transparency and Openness
5.1.8. Evaluation and Reporting of Uncertainty and Risk
5.1.9. Management of Conflicts of Interest
5.1.10. Management of Research Data and Primary Materials
5.1.11. The Science-Policy Interface
5.1.12. Trends and Trade-Offs
6. Implementation Plans
6.1. Australian Fisheries Management Authority – Draft implementation plan
6.1.1. Introduction

There are also guidelines specifically focussed on the participation of industry in science and provision of data for use in science and management, and although perhaps less widely known, they are important reference and resource documents. In ICES, the report of the Workshop on Fishers Sampling of Catches (WKSC 2008) [Inventory doc #8] is of particular importance. The EU Framework 7 projects GAP and GAP2, provided various tools including published guidelines [Inventory doc #23] and an online toolbox to aid participatory research.





Mackinson *et al.* 2017 published Guidelines for Industry-Science Data Collection [Inventory doc#22] The guidance is provided as a tool to help fishermen in collaboration with scientists and managers, to generate trusted, credible and relevant data which has the best chance of being applied as evidence in fisheries management. It is intended to help support the development of industry-led initiatives from the bottom-up, as well as top-down initiatives from managers and scientists, and everything in-between (Figure 2). There also various recent examples from the pelagic industry including publicly available documentation on Data Policy, Data Collection Strategy and Methods from the Scottish Pelagic Fishermen's Association and reports on industry data collection from the Pelagic Freezer Trawler Association

(https://www.pelagicfish.eu/research).

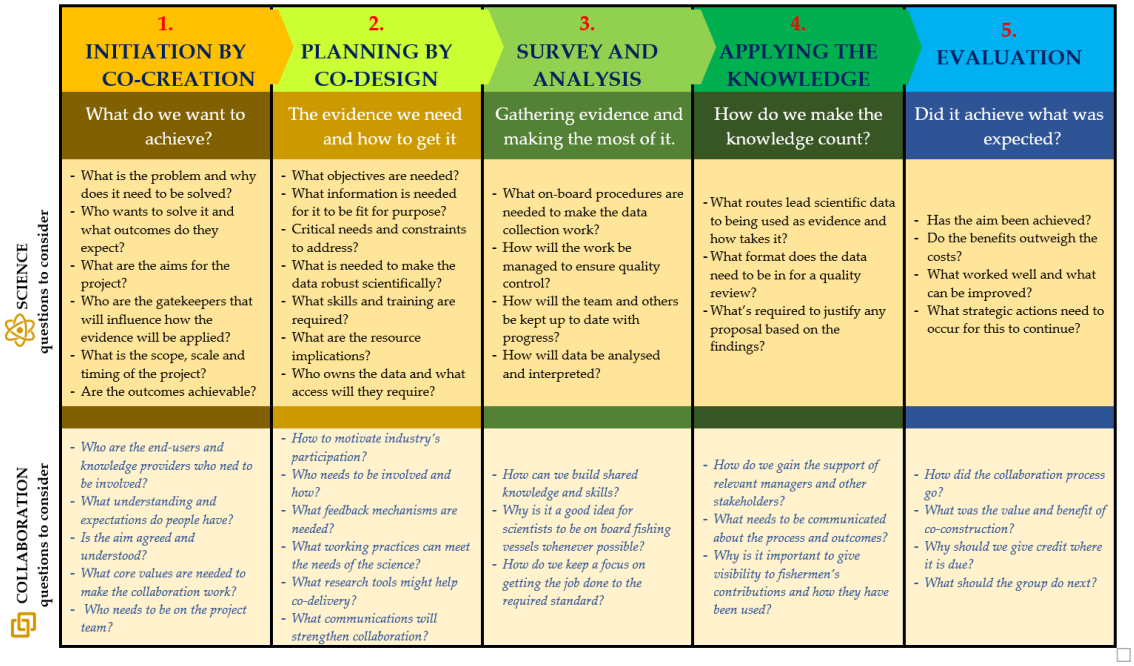


Figure 2. Guidelines for industry data collection (from Mackinson *et al*. 2017, [Inventory doc#22])

A detailed document inventory was prepared to support WKDSG, with additional documents added resulting from the reviews of material undertaken under ToR a. The inventory is available on the workshop sharepoint and available on request. It is intended that the inventory and source document will be made publicly available as one of the workshop outputs.

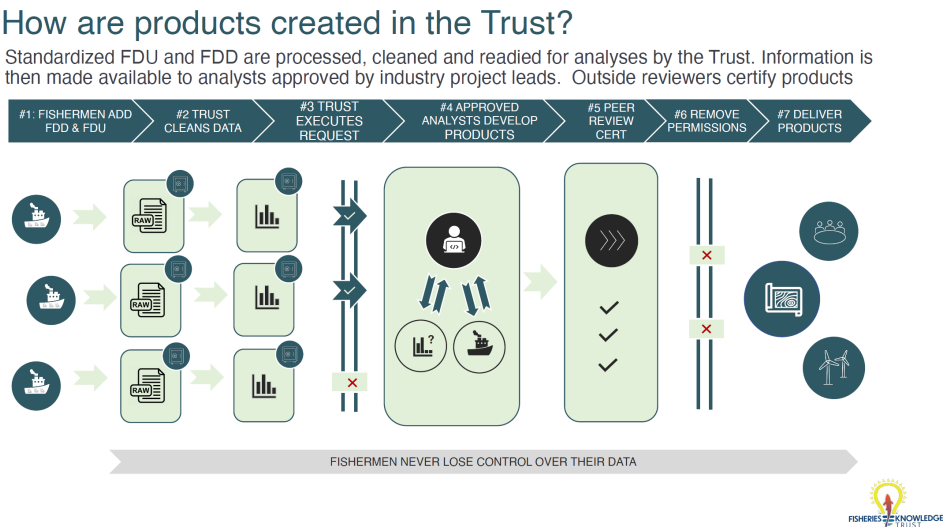
Marine ecosystem assessment & management needs credible, fishery owned knowledge trusts

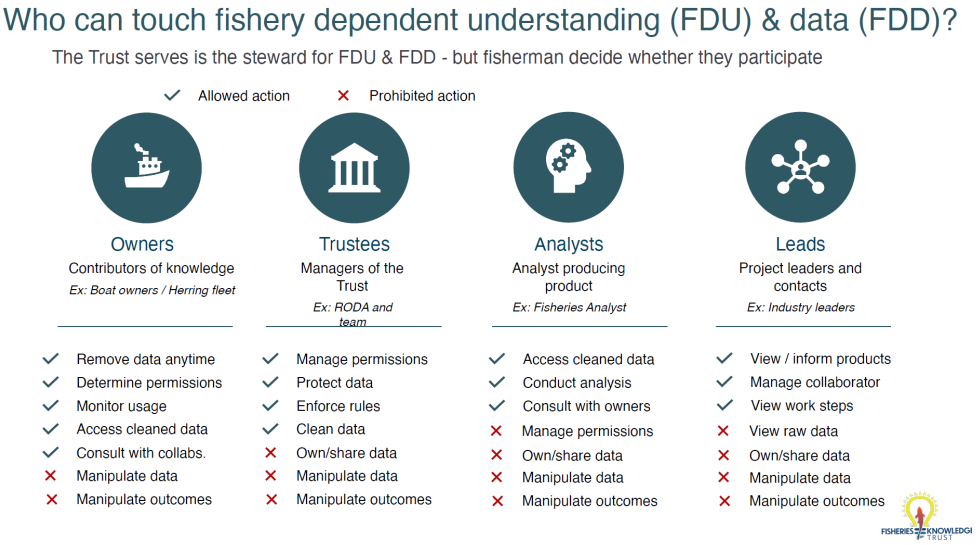
John Manderson (OpenOcean Research); Steven Jacobs (Concitor LLC), Annie Hawkins (Responsible Offshore Development Alliance)

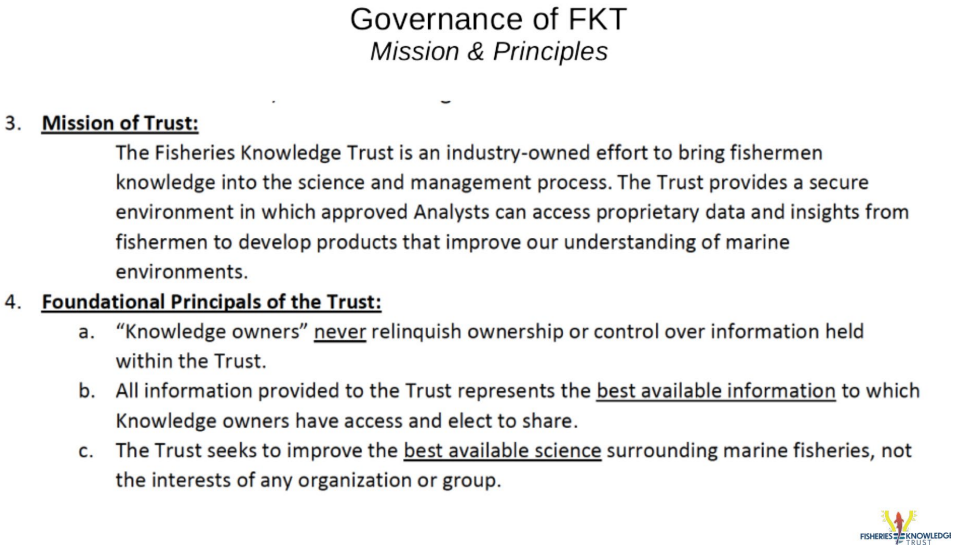
Individuals in the fishing industry interact daily with marine ecosystems and have timely, fine grained, tacit knowledge of the ecological and social dimensions underlying their fisheries. Fisherman are not just "citizen scientists", but practical experts who sustain engagement with changing marine ecosystems. This fishery dependent understanding (FDU), if made explicit, could fill many gaps in information used to assess marine ecosystems and thereby reduce the risk of mismatches between ecosystem dynamics and governance that frequently result in the loss of natural resources and/or services they provide to humans. However, as a result of economic incentives, fisherman rarely share qualitative information (FDU) to develop consensus hypothesis or the quantitative fishery dependent data (FDD) that could be used along with other data to evaluate their consensus hypothesis. As a result, ecosystem scientists and policy makers often dismiss the "tacit" knowledge of individual fisherman as anecdotal and biased.

We are developing a fishing industry owned Fishery Knowledge Trust (FKT) that allows fisherman to collaborate amongst themselves and with others to develop credible science products to inform marine ecosystem management. The FKT is an organizational knowledge creation platform built on the foundation of the tripartite definition of knowledge as "justified true belief" and the concept of the legal trust. The knowledge creation platform infrastructure combines 3

components; 1) tools allowing individual industry experts to collect qualitative knowledge of ecosystem dimensions (FDU) in a standardized form so it can be aggregated to develop consensus hypothesis, 2) a distributed data storage and sharing system for standardized fishery dependent data (FDD) and qualitative knowledge (FDU) in which knowledge owners retain ownership and control over information through access permissions, and c) a library of shared and evolving software tools for processing and analysis facilitating the development of transparent, reproducible research products from FDU and FDD held within the FKT. We have developed strict rules governing the use of FKT infrastructure with regard to access to data and knowledge, project development, oversight and review of projects by advisory/review panels, and certification of quality science products by the FKT. These rules are codified in the mission and foundational principles of the FKT that are explicit in Memoranda of Understanding and Non-Disclosure Agreements knowledge owners, analysts, advisors and trustees are required to sign. We are developing the infrastructure and governance of the FKT in pilot projects focused on analyses of the potential impacts of offshore wind energy development on several US fishing fleets.







Governance of FKT

Mission & Principles

3. **Mission of Trust:**

   The Fisheries Knowledge Trust is an industry-owned effort to bring fishermen knowledge into the science and management process. The Trust provides a secure environment in which approved Analysts can access proprietary data and insights from fishermen to develop products that improve our understanding of marine environments.

4. **Foundational Principals of the Trust:**
   a. "Knowledge owners" never relinquish ownership or control over information held within the Trust.
   b. All information provided to the Trust represents the best available information to which Knowledge owners have access and elect to share.
   c. The Trust seeks to improve the best available science surrounding marine fisheries, not the interests of any organization or group.

Working Group on Technology Integration for Fisheries-Dependent Data (WGTIFD) and Data Standardization Efforts in Several U.S. programs

Brett Alger (United States, NOAA Fisheries) and Lisa Borges (Portugal, FishFix) (WGTIFD Chairs), Lauren Dolinger Few (United States, NOAA Fisheries), Julie Simpson and Mike Rinaldi (United States, Atlantic Coastal Cooperative Statistics Program

ICES WGTIFD

WGTIFD's primary objective is to examine the electronic tools and applications used to support fisheries-dependent data collection, both on shore and at sea, including electronic reporting (ER), electronic monitoring (EM), positional data systems, and observer data collection. Last year, WGTIFD explored different stages of a fishing trip to examine data types, the purpose of each data element, and the tools for how each data element may be collected. From there, WGTIFD compared data collection from traditional means (i.e., manual processes) with technologies that allow for automated collection of the same data. This year, WGTIFD discussed how the lack of interoperability and data standards impedes progress of technology development, and that data-poor fishery stocks (and the associated data-poor ICES WGs and assessment scientists) may provide advice on how to include new data streams from technology into science advice. Lastly, the WGITD highlighted the importance of standardizing lighting, field of view, and background colours on fishing vessels to optimize using artificial intelligence (AI) for EM systems, and to focus on feedback to the vessel crew to improve (and standardize where possible) catch handling and system maintenance in order to improve data quality collected from EM.

WGTIFD will meet next year to draft an EM data standard, examine progress on EM-AI applications, and make recommendations how to include EM data into fishery stock assessments. Additionally, based on the efforts in Years 1 and 2, WGTIFD hopes to make recommendations on selecting different technologies based on the data collection requirement (e.g., catch, gear metrics) in different types of fisheries (e.g., longline, large pelagic species vs bottom trawl, mixed-groundfish species).

Marine Recreational Information Program (MRIP) Survey and Data Standards

NOAA Fisheries and its state, regional, and federal conduct different types of surveys to measure effort and catch of saltwater anglers. When combined with commercial catch data, biological research, and direct observation of a fishery, these effort and catch estimates are used to monitor U.S. fish stocks. MRIP is developing a set of guidelines on seven aspects of recreational fisheries data collection and estimation, including: 1) Survey Concepts and Justification; 2) Survey Design; 3) Data Quality; 4) Transition Planning; 5) Review Procedures; 6) Process Improvement; and 7) Access and Information Management. This effort will guide the design, improvement, and quality of information produced by recreational fisheries data collection programs.

Atlantic Coastal Cooperative Statistics Program (ACCSP)

ACCSP is a cooperative state-federal initiative in the United States focused on marine fishery-dependent data. The organization has staff dedicated to coordinating with 23 partner agencies to produce dependable and timely marine fishery statistics from Atlantic coast fisheries. Data are collected, processed, and disseminated according to common standards agreed upon by all program partners, and maintained by ACCSP in two separate databases across various coastal programs. The ACCSP software team also builds data reporting applications in collaboration with data collection programs. Current initiatives include:

- One Stop Reporting
    - Creating a flexible electronic reporting module that allows fishermen and seafood dealers to report with one form that meets the requirements of multiple jurisdictions, permits, and fleets
- ACCSP SAFIS Redesign and Fisheries-Dependent Data Visioning
    - Linking and consolidating various data sources into a comprehensive data structure across fishery-dependent data sources
    - Universal trip identifiers that link various federal and state data sources, including harvester reports, dealer reports, vessel monitoring systems, electronic monitoring, observers, seafood traceability, and fishery-dependent biological sampling.
- Electronic Monitoring Data Standards
    - Working with commercial and for-hire sector representatives in order to develop data standards for existing and future programs
    - Allow the integration and ingestion of data from multiple sources into a single data structure for use by scientists and managers.

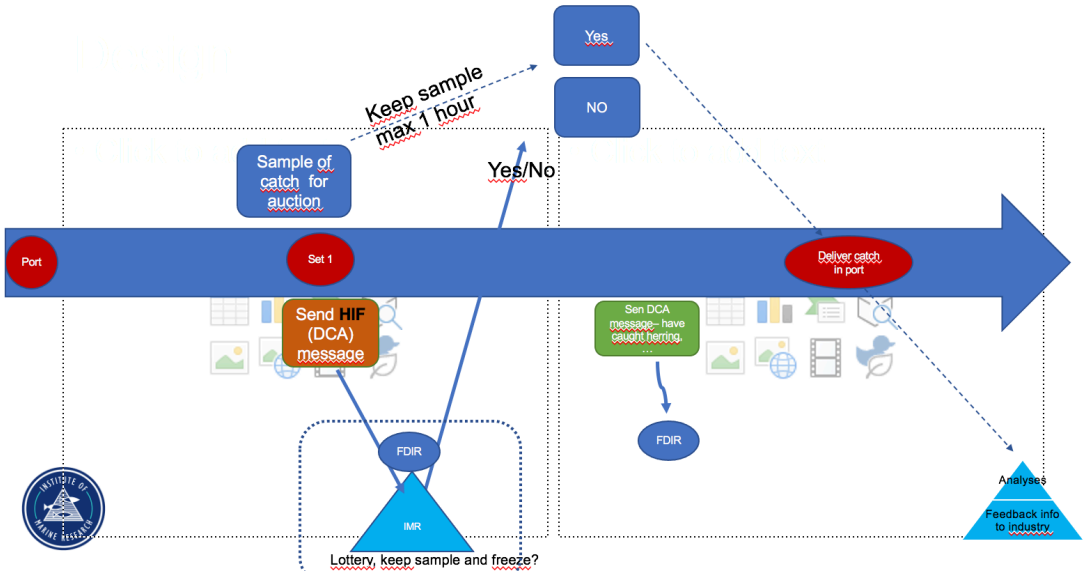
ACCSP publishes standardization products on a regular basis. These include the overall data structure and standardized data elements.

- Coastal Fishery-Dependent Data Standards
    - https://www.accsp.org/wp-content/uploads/ACCSP_StandardsandAppendices2012_Final05082012.pdf
- Coastal Fishery-Dependent Data Elements
    - https://safis.accsp.org:8443/accsp_prod/f?p=1490:200:4759312680763::NO

Catch-lottery: Collaboration-enabled sampling

Edvin Fuglebakk, Jon-Helge Vølstad, and Håkon Otterå (Institute of Marine Research, Norway)

The Institute of Marine Research has together with the Norwegian Directorate of Fisheries and in collaboration with the Norwegian industry organizations launched a novel program for probabilistic sampling of pelagic fisheries by vessels larger than 15 m with hauls as the primary sampling unit. The program maintains rather strict control of sampling by the scientific institution involved, deciding both which catches to sample, and performing the biological measurements in lab. The part delegated to self-sampling is the selection of fish from hauls. This selection is tightly integrated with sampling for industry purposes, and the samples may be subject to quality control against public auction data.



Message flow that allows probabilistic selection of hauls via the electronic logbook reporting (ERS)

The program is thus not particularly collaborative in nature, but the collaborative elements that are included are key in achieving the statistical efficiency of the sampling design, as the logistics of on-board observers would be prohibit probabilistic selection at the haul-level. The design is otherwise enabled by technological developments around the standard for electronic logbook-reporting (ERS), allowing two-way communication to communicate estimated catch sizes for calculation of inclusion probabilities, and indicate haul selection to the vessel over the ERS-system. The program has been piloted in 2018 and 2019 for selected fisheries and will be fully operational in 2020 for a range of pelagic fisheries. We are so far satisfied with the operationalization of the program, but we still have concerns about the non-response rates and will be working with measures to ensure participation and improve logistics to prevent sample loss. A big challenge for voluntary probabilistic sampling schemes is getting a sufficiently high participation rate, so from Jan 2021 participation in the lottery. Participants can get feedback on their participation through the national citizens portal.

Annex 3: Questionnaire about existing standards

Questions for helping evaluate the suitability of existing standards and defining specific requirements for documentation of science information standards where needed [ToRc).

1. What criteria are necessary to evaluate whether existing standards and documentation is suitable for providing guidance to the scientific community and industry on fisheries dependent data collection and its application in ICES.
2. Do you know of specific documents that are relevant for this workshop that are missing from the repository (https://www.ices.dk/community/Pages/PGCCDBS-doc-repository.aspx) Reports from workshops you participated in, etc. Please write down a reference them, and upload a copy to sharepoint folder '\02. Background documents\Standards and Guidance.
3. When planning fisheries-dependent data collection work, are you able to locate guidance about
    a. who you need to communicate with in advance?
    b. how data collection should be documented?
4. Are you able to locate documentation about the process that allows new data collection to be approved in a benchmark?
5. Is there anything relating to standards and guidance on fisheries-dependent data collection where more work is obviously needed? And, which improvements should be prioritised?

1. What criteria are necessary to evaluate whether existing standards and documentation is suitable for providing guidance to the scientific community and industry on fisheries dependent data collection and its application in ICES?
Is it easily findable. Is it easily understood without any background in the ICES world. Is the purpose of the particular document clearly and concisely explained at the top of it. Is the scope clearly defined.
That's two slightly different things often. Standards are mandated either by expert groups, externally, internationally, or even globally (e.g standards for GPS datum labelling is global, But composite of different fields and standards are typically decided within ICES/member countries). Documentation is typically written by a mandating body with authority to do so. So within ICES, documentation of standards would ideally be worked up by a combination of expert groups. governance groups, and Data Centre to make the documentation useful and workable. Subsequent guidance based on the more technical documentation should be trialled and tested with stakeholders.
Very difficult question. Criteria to evaluate whether existing standards are suitable for guidance ... My interpretation of the question: Are existing standards suitable for providing guidance on fisheries dependent data collection? Existing standards and documentation requirements are not easy to find, as they are distributed in several different documents. For example, where to find guidance on the sample size and/or sampling frequency when looking to collect length frequencies from commercial catches. Is this under WGBIOP? WGPICS? PGDATA? Or is this what will go into the future SISP?
The main criteria to me is accessibility of the said documentation. There are many expert groups to which fisheries dependant data could be submitted and each will have a set of

specific needs with regard to the documentation required to ensure that the data can be used in a meaningful way. It seems to me that currently one needs to be very familiar or even actively involved in ICES to be able to navigate the correct pathways. I see fisheries dependant data as an asset in a few ways a) providing data where none is currently available, b) providing higher resolution data to better tune existing datasets c) adding value to existing data by providing auxiliary data (i.e. gear parameters to landings..) d)platforms to provide environmental data with greater temporal and spatial resolution. Each of these data types will have specific standards and an portal accessible portal is required as a navigation aid. All data collection will follow the basic overarching principle of FAIR data.
a. if the documentation is understandable for people not fully involved in ICES b. if the documentation relates to data collection and/or data use and/or data submission
Are they easily accessible? Publicly available? Are current standards and documentation process driven? Do they provide information and expectation of the process of data collection through to data application? Are they clear and easily understandable for those not familiar with ICES? Are they current / kept up-to-date? Can the information be applied across different fisheries / industry / aspects of industry? (Large/small scale fisheries, data poor fisheries, non-biological data e.g. temperature, etc etc)
I think that clear examples of the process would be really helpful. Because FDD sets are so diverse having test cases that span the range from rather simple catch/discard data to something more complicated like environmental/acoustic data would be best. Ideally, there could be examples of when things also have gone wrong (even if they were rectified later). As was discussed having documents targeted towards different audiences (data contributors and data users) outlining the standards and processes could also be very useful.
Understandable, clear, concise, practical, consistent, current and versioned, scalable
-Feedback from the main end-users is needed to evaluate whether they meet the proposed objectives. To this end, it is necessary that these end-users are aware of them and follow them. Not sure if this always happens
Standards: Is the data collected directly and clearly relevant to assessment, policy making? Is there a clearly stated question/hypothesis that can be evaluated with the specific data? Is the data collection coverage comprehensive enough to support general conclusions about the fishery/focal stocks ie the question? Is the data being collected carefully and precisely (Is there a low proportion of NAs, what are the confidence bands for statistics computed from measured variables). Can near real time data inspection/evaluation routines be built make it transparent to both data takers and users what the level of the data quality is, whether it meets target and that progress is visible being made now (Ie the data isn't disappearing into a fishery governance institution black hole for years). Documentation: Is it clearly stated what questions are being addressed by the data and how it will be used to address them? Is the documentation clearly articulated in a manner that an intelligent non-specialist can understand? Is there clear timeline describing when the data is likely to have impact in assessment science/management and thus affect people's lives? Are methods rigorously, clearly and simply described so that both the data takers and data users understand how the data should be/was collected? Is there a data dictionary clearly defining measured variables and units, and there abbreviations.
There a number of criteria that spring to mind: For the data collector – is the documentation actually useful? Can somebody take what is there and actually either design or improve a data collection scheme? The more specific the documentation is, the more useful it is. It can be difficult to work with high-level documents when you just want some practical guidance.

For ICES – does it improve the quality of data? Does it improve ICES outputs? Does it improve the perception of ICES outputs eg. Well-documents, transparent steps leading to the outputs?
Are there open questions by the stakeholders? Is everything clear? Accurate and complete documentation of all components of the sampling programme (standards) is needed, including key assumptions in the processing and analysis of the data. High agreement among all stakeholders? Soft criteria: Are the end users ok with the standards/documentation (end user satisfaction vs. Complaints) Funding solved? Evaluation at specific intervals Quality indicators (QI): Precision-accuracy of sampling; Precision of estimates and Biases The documentation must be accessible and transparent Does the „data collector“ or „data submitter“ have a certification or an accreditation for the data sampling and manipulation process? <- who will do the accreditation? (ICES data accreditation scheme?) Do laboratories involved have certification required? Sampling equivalent to „SISP-standards“ for scientific surveys? Experience in other countries is that quality evaluation should be through a well-structured peer-review process supported by clear documentation of all components of the sampling programmes and the sampling outcomes. Quality of a sampling survey programme should be evaluated in relation to two aspects of sampling: 1) the ability of the programme to (in principle) deliver data that are fit for purpose, by reviewing the design of the programme against guidelines and standards for best practice; and 2) evaluation of the quality of the data following implementation of the sampling survey, covering each of the two components of accuracy: bias and precision. Quality indicators-> (a) Conformity: It checks whether a value conforms to the syntax of its definition (format, type, range). (b) Stability: It checks if values vary at an acceptable level on the basis of values of the recent past. (c) Coherency: It checks if reported values are equal among different data tables. (d) Accuracy (precision and bias): It checks the degree to which values vary from a true or expected value. Is there a standard for reporting of quality protocols?
Whether they have been drafted as guidance or approved by an ICES Working Group/Governance Group. Would they need to be peer reviewed independently of ICES? Or in line with current ICES QAF recommendations.

2. Do you know of specific documents that are relevant for this workshop that are missing from the repository. Please reference them.
There was wide-ranging talk about data collection for science as well - e.g. environmental data. These standards are elsewhere. The repository mentioned is targeted for fisheries dependent data. But apart from that, documents are already in the folder I think.
Report on evaluation of North Sea fishers survey https://www.ices.dk/sites/pub/Publication%20Reports/Expert%20Group%20Report/acfm/2006/rgfs/RGFS06.pdf
Unfortunately I have nothing more to add here. Papers such as this Mangi *et al*. 2018, I find useful Progress in designing and delivering effective fishing industry–science data collection in the UK DOI: 10.1111/faf.12279

as far as I can see, no crucial documentation is missing from the current list.
No
I think over here we are limited in the amount of good documentation. Some regions use FDD extensively, while other use very little. In the northesat (where I work) there is a growing interest in using more FDD, but the group has not focused much on data standards (more data applications) -- https://s3.amazonaws.com/nefmc.org/6a.-Fishery-Data-for-Stock-Assessment-Council-Presentation.pdf. Individual collection programs (such as the observer program) tend to have some documentation, but this is generally not synthesized. There is ongoing work to try to resolve some of this, but it seems a long way off.
No
All relevant documents I´m aware of are included under the PGCCDBS and WGCACTH repository
Don't know of any
Nothing specific. I think the problem with the repository is less that of the lack of content and more to do with the accessibility and findability of the content.
No
Every time I think of one and I look its already there but I think I might have found one... GFCM (General Fishery Council for the Mediterranean), 2019. GFCM Data Collection Reference Framework (DCRF). Version: 2019.1. http://www.fao.org/gfcm/data/dcrf/
3a. When planning fisheries-dependent data collection work, are you able to locate guidance about who you need to communicate with in advance?
N/A
Through prior knowledge on the advisory system it is relatively easy to find the appropriate groups / experts with whom to communicate on the fisheries-dependent data collection; Focus in the self-sampling within our association has been on targeted ICES expert groups (HAWG, WGWIDE, WGDEEP).
Yes, by firstly going to the people in my national institute who currently work with ICES. Their experience is the short cut to get to the relevant guidance workshops etc.. searching the ICES website is also a start but with so much present in the ICES repository and so many workshops it can be a large undertaking to take this on without some experienced guidance firstly.
Due to the high number of guidance documents, I think there's no clear overview of who to approach first, but from the discussions over the past two days, I'd day: --talk to someone involved in setting up sampling designs for fisheries-dependent data collection --read through information on standards in biological data collection if relevant (WGBIOP); and even the length measurement method is already important to register
Only through experience of fisheries-dependent data collection work
Not really. Generally, guidance seems to be project/assessment specific.
a. I have been involved in several pilots years ago and at that time there was limited guidance available. There has been alot of guidance produced in recent years but it is scattered and not always obvious which is the most relevant and current. Generally I would say the national labs are the best starting point on who to communicate with in advance, Another very good starting point is the EOSG chair or other relevant steering group chairs in ICES. Also DCF national correspondents.

For catch sampling programmes yes, as I´ve been involved or I´m a member of many of the WG dealing with these issues.
It is generally not clearly documented in the US, but requires knowledge and interaction with science and policy-making institutions. In general programs are only successful when they are co-created by willing partners including people who can and WILL! help bring the information to bear. IE. An assessment scientist, fishery management council staffers. Experts in the fishery who are also leaders, who understand the goals and believe them are also required for success.
Not before the start of the workshop, but discussions/presentations have given me a better idea of where to go. Not sure i would have picked that up from the ICES website
N/A (I haven't been involved with planning fisheries dependent data collection work so I can't answer this meaningfully)
I guess so. I would contact the coordinator of the DCF sampling program at our institute who has the contacts of the relevant fishing companies and associations. Additionally, I would of course contact the relevant assessment group(s) chair(s) that will most probably receive the data. A document placed on the ICES webpage about all fishing associations/Companies with contact information would be nice to have.
Working for an institute that relies on and collects these data most of the communication is internal, with end users and/or our customers and the industry. However more attention should be paid to some of the external recommendations and the communication might be weighted differently.

3b. When planning fisheries-dependent data collection work, are you able to locate guidance about how data should be documented.
N/A
No easy to find guidelines on documentation of data collection. WKDSG is providing some important elements. Probably some guidelines can be derived from WGPICS and PGDATA but it is still a bit distributed between different reports.
I can get guidance from available ICES documents but it is a very involved process. Involves the reading of many reports to follow through the correct pathways
on top of more generic documentation like background doc 01 (or better, it's update that will become available early 2021): --get into contact with ICES data centre/governance groups for data quality requirements and storage options.
Only through experience of fisheries-dependent data collection work and this workshop
Not really. Generally, guidance seems to be project/assessment specific.
Best practice is guidelines are provided by ICES EG. These are not necessarily operational how to guides. WKDSG could make it more easy to locate the most relevant and current ICES guidance and also provide examples of "how to guides".
Same answers as to the previous question: For catch sampling programmes yes, as I´ve been involved or I´m a member of many of the WG dealing with these issues.
This is often made up on the fly in the US which is a problem and results in inconsistencies even for data streams collected and held within federal agencies.

Again, the ICES website is not necessarily intuitive if you are new to ICES or its work. The presentations and discussions this week (and the background documents being in one place in particular), have given me somewhere to start from, if not all the answers i might want.
N/A (I haven't been involved with planning fisheries dependent data collection work so I can't answer this meaningfully)
Again, I would have to refer to our DCF sampling program coordinator.
In relation to commercial catch sampling wkpics guidance and for data delivery PGDATA 2020 SISPs and PGDATA Annex 4 but using case studies from here and examples from other workshops on how the document or protocols might look.

4. Are you able to locate documentation about the process that allows new data collection to be approved in a benchmark?
N/A
There is limited documentation on the process but knowing the benchmark system allows one to operate relatively easily.
Yes via Google and ICES http://www.ices.dk/community/Documents/PGCCDBS/Annex%204%20%20Updated%20guidelines%20for%20the%20ICES%20benchmark%20data%20evaluation%20process.pdf
I'd expected it to be in guidance document 2, but that's very much focused on the details. Otherwise I'd expect it to be in guidance document 5, but that doesn't seem to mention it either. Addition of a schema laying that out would be helpful. I think we've suggested a number of crucial elements in this workshop though.
Probably if I asked the right people!
Not really. Generally, guidance seems to be project/assessment specific.
Yes, but the acceptance criteria for data are necessarily grey since it is hard to be definitive on whether data can be included or not.
Not always. In the case I need to find something specific related to this I contact colleagues more involved in the benchmark process.
No. In general this is worked out by long "negotiation" with assessment scientists. Often there is an unwillingness to acknowledge that new data is necessary because the default is to use traditional methods with assumptions of stationarity in either observation or population/ecosystem processes. Thus the same data gets used over and over again even when there has been an important change in an underlying process, including observation process. The new data streams may in fact be built to address these nonstationarities but it takes time and technical expertise to modify old approaches or to develop new ones. Given the time sensitivity of assessments there is resistance to change and acknowledging changes that may require the work. This is a serious problem in the US particularly in the face of rapid environmental change. Acknowledgement that new data might be necessary is required before clear documentation of standards for new data will be created.
No, i tried searching for 'benchmark' on the ICES webpage and none of the returned records was relevant. i then tried looking through the ICES website, but could not find anything that helped.
Not very much – I found https://www.ices.dk/community/Documents/Advice/Introduction%20to%20Benchmarks%20at%20ICES.pdf and https://www.ices.dk/advice/advisory-process/Pages/Benchmarks.aspx but they don't really give any information about the data compilation process.

Honestly, I would have to dig into the ICES homepage…
No, there is information on the benchmark process and evaluating new data but there isnt anything on how that data should be provided or could make its way independently of the normal stream of data providers.

5. Is there anything relating to standards and guidance on fisheries-dependent data collection where more work is obviously needed? And, which improvements should be prioritised?
Recognition that fisheries dependent data collection will be very different depending on whether it's demersal/pelagic, catch, acoustics, other. Some of these would probably be closer to the science-institute based survey manuals already in the data quality repository and SISPS. (E.g. an industry led acoustic survey would likely have more similar data QC needs to the herring acoustic survey than it would another industry led catch sampling scheme).
Many of the standards are dealing with the default requirements for stock assessment; new data collection initiatives from fishing industries could go beyond the default requirements, e.g. sampling in higher space-time resolution; sampling certain processes throughout the year instead of once per year; scouting activities prior to a large survey effort etc.
Accessibility to me is key. I am relatively new to this level of working with the ICES process and find it some-what overwhelming the amount of information that is available and needs trawling through to ensure that the work is carried out to the best possible standard. By default I defer to my colleagues who have years of collective experience with the processes and navigation of different working groups and ICES workshops and am very grateful of the way they share this experience and point me in the right direction!
A clear inventory of the current documentation, e.g. as made available in Document_Inventory_WKDSG, but then better updateable.
Materials are available but 'signposting' to them would be beneficial, and/or inventories of information. Data ownership/sharing?? Routes of fisheries-dependent data into RDBES?? The proposed SISPs for fisheries-dependent sampling / data collection could provide key guidance and should be prioritised.
I think that developing materials to help guide expectations for participants would be very useful. In the US there is limited understanding about how useful these data sets can be, and the criteria that make them potentially useful for things like assessments (i.e., how much of a fleet needs to participate for how long to develop something like a useful independent index). When data is collected but not used it can lead to frustration with the scientific bodies and loss of participation. This may seems a little separate from 'standards' but I think for the 'sample adequacy' is so important to getting the data used, that developing guidance for just want 'counts' and communicating it is pretty important. It is also different from FID where the sampling frame/intensity is less dynamic.
If anything standards and guidance have to be even more documented (than standard scientific institutes where there is sometimes an assumption that best practice is being followed) for FDD to establish trust with data users. One of the key issues with fisheries-dependent data collection is the sustainability of data collection programs. It is necessary to demonstrate that the program is (or can) be sustainable in the long term otherwise its usefulness will be limited. Time in motion studies or other approaches could be useful to demonstrate the cost benefits and advantage of FDD over

existing data streams. Funding mechanisms such as EMFAF could be useful to support FDD programs.
1) Non-probabilistic surveys are used in some cases, although not optimal, and more work is needed under this topic. 2) We´re used to working on sampling programmes "controlled" by scientific institutes. A lot of work has been done under ICES umbrella trying to get us all on the same page. However, a possible future scenario can be data coming from sampling programmes fully developed (not a collaboration between industry and scientific institutes) by the industry. Standards and guidance will be needed when issues related to data occurs (e.g. differences in the estimates (especially with sensitive data: PETS bycatch, discards), reasons? conflicts of interest?
In the US there really needs to be institutional change that allows for sustained respectful engagement with governance institutions and an acknowledgement by governance institutions that solutions in fisheries are always provisional and that novel solutions, often new data requirements are going to be required in due course because socio-ecological context is always changing, sometimes significantly. The clear standards and guidance for new fishery dependent data collection will come once there is acknowledgement that in the near future new data will probably need to be required to maintain accuracy in assessments.
A single starting point that is obvious that contains some basic documentation. Fishery dependent data collection programmes are all likely to have different needs/ challenges and intentions, but some generic documentation as a starting point would be useful. As has been mentioned in discussions, if you are already part of ICES, life is much easier, but if you are not familiar with ICES, its processes and its many and varied acronyms it is difficult to get started. Also, many of ICES' reports etc are written by scientists and for scientists. Maybe some initial guidance that is better targeted to a non-scientific audience?
There is lots of guidance but it is spread around a lot of different ICES outputs. This is ok if you are involved in the relevant groups but it makes the system difficult to navigate for other people. Not really many standards – but this is due to the fact that ICES doesn't perform or control fisheries dependent data collection schemes.
Currently, I am not in the position to identify anything that is missing.

Annex 4: Subgroup reports

Group 1. New data stream. ***Scenario:*** All vessels in a producer organisation want to record by-catch and discards of non-quota species. How can it be used? What procedures should they follow to collect and report on the data to ensure it is fit-for-purpose? What specific review assurance processes are needed for it to be used?

Prerequisite:

- Develop reference for existing and accepted methods for each level of granularity.
- Define core standards and common elements and methods from existing methods to ensure compatibility and usability.

Questions to ask:

- Why do they want to collect more data? What is the perceived value of collecting the data? Drivers?
    - changing regulations
    - changing characteristics of bycatch
    - improved quality of estimates
    - MSC certification
    - conflicting fishery and fishery science/policy perceptions
- What are minimum elements/granularity to capture to meet new needs?
    - Age, length, weight, sex, count, species, trip, haul
- Will this impact quota-based data collection efforts?

Identify appropriate methods for level of granularity from the aforementioned list.

- fleet, fishery, related fishery, research?
- Select methods that address drivers and maintain scientific objectivity

Where existing methods are not available or appropriate, consider:

- how data will be used to address drivers.
- Ability to use data in a timely manner by management
- What proportion of the fleet does this organisation comprise, and is it representative of the fleet in methods and coverage?
- What proportion of the catch is the bycatch?
- Will reporting be mandatory or voluntary?
- Are new regulations necessary?

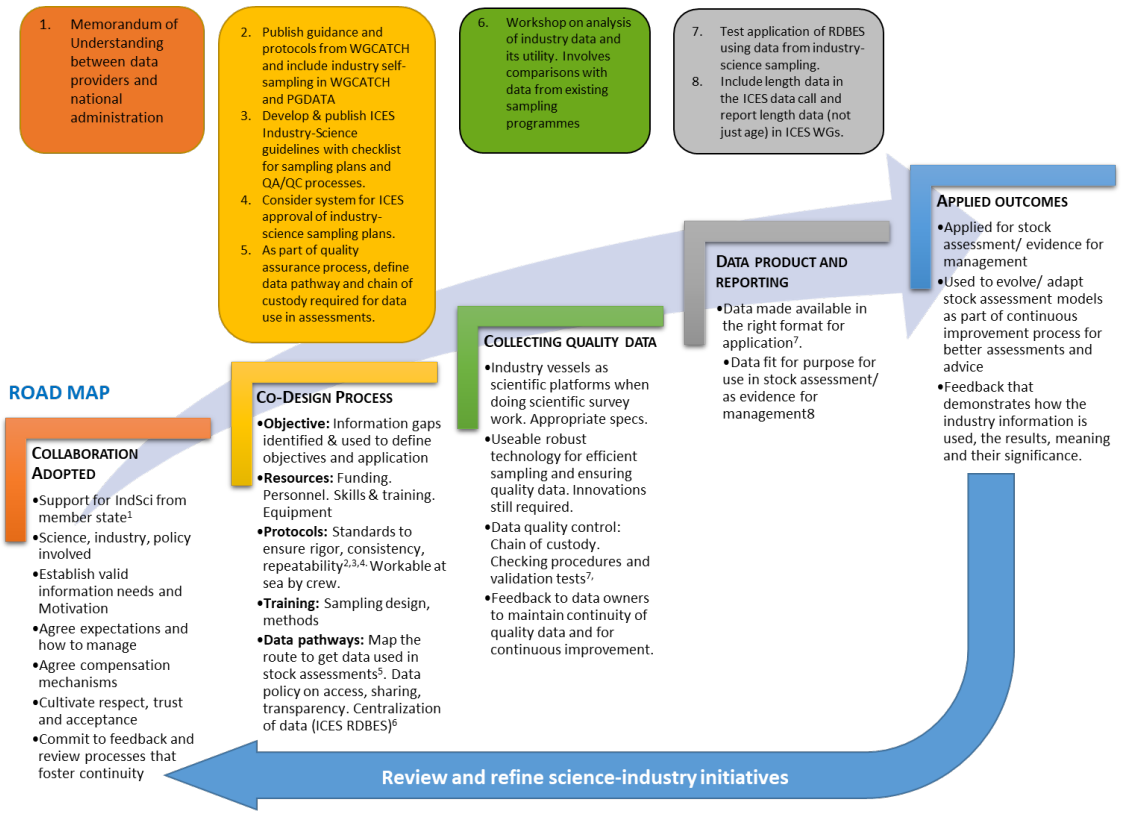
If new methods need to be developed:

- Scientific/peer-reviewed methods that meet specified standards.
- Co-created with science & fleet
- New methods should be tested, iterative
- Data producers and users should contribute feedback
- Apply Bais scorecard to evaluate data quality

- Follow roadmap established by WKSCINDI

Reference:

Standardized Bycatch Reporting Methodology



Group 2. Existing data stream ***Scenario:*** A new 5-year data series of age, length and weight measurements of a category 1 stock from a fleet that has been poorly covered in the past is introduced at a benchmark assessment workshop. What criteria are needed to determine (i) the quality of the data (ii) the utility of the data?

What process and evidence is needed to justify whether and how the data should be used in the assessment?

Evaluation Process.

The text below outlines a draft evaluation process for the inclusion of a new data set into a benchmark process. Throughout the evaluation there should be clear communication with data providers such that the rational for decisions is provided and expectations are managed.

Although all steps in the process should be applied to each new data stream added to a benchmark, especially when new data providers add data series (whether industry, NGOs or scientific bodies new in the system) as they may not be aware of the process.

Criteria Yes\No -

- Willing to share: Access, ownership, governance, future submission process.

- Willing to accept any outcome?
- What is the perceived relevance of the new data?
- Is this a sustainable time series into the future?

Data submitter responsibility. Should be Yes to all the questions above before you can proceed further to evaluation.

Qualitative evaluation:

Descriptive information:

Data submitter:

- Provide a working document and presentation that allows for evaluation of whether the sampling design is expected to provide representative data following the WKPICS best practice guidance and PGDATA 2020 SISP: https://community.ices.dk/ExpertGroups/WKDSG/2020%20Meeting%20Docs/02.%20Background%20documents/Standards%20and%20Guidance/7-%20Practical%20Implementation%20of%20Statistical%20Sound%20Catch%20Sampling%20Programmes_WKPICS3%202013.pdf , Annex 3 - Appendix 6)
    1. Description of the sampling
    2. Survey sampling design
        a. Sampled population vs total population
        b. Description of sampling units
        c. Stratification
        d. Allocation procedure
    3. Sampling procedure
    4. Data storage
        e. National, International
    5. Data quality checks and validation
        f. National, International, Quality indicators
    6. Estimation procedure g. For each parameter, including variance estimators
- Consistency with ICES Working Group on Biological Parameters (WGBIOP) standards for age reading and maturity
    - Quality Assured Age data – e.g. calibration and validation workshops (SmartDots)

Data Coordinator/Benchmark data compilation workshop

- How is that stock/fleet currently treated in the assessment?
    - Coverage (Fleet, space, time, area, number of samples)
    - Data aggregation
    - Description of the current estimation/imputation processes.
    - Foreseen improvement of the estimation/imputation processes using the new data.

Quantitative Evaluation

Benchmark data compilation workshop

- https://community.ices.dk/ExpertGroups/WKDSG/2020%20Meeting%20Docs/02.%20Background%20documents/Standards%20and%20Guidance/2-Annex%204%20%20Updated%20guidelines%20for%20the%20ICES%20benchmark%20data%20evaluation%20process.pdf
- Compare with other data sets for the same stock:
    - Selectivity with other fleets
    - Length, weight, age data
- Check Internal consistency (cohort tacking within the dataset) and external consistency (with other data for that stock).
    - Evaluate the new dataset which may result in worse model fit but better representation of the underlying reality with more uncertainty.

Over-all evaluation

- Is the perceived relevance borne out by the results of the data evaluation process?
- There could be a cost-benefit evaluation of the data collection programme.

Group 3. Novel data stream ***Scenario:*** *An industry organisation has been collecting spatial data on its fishing activities and biological parameters of its catch. They want to make it available for science on stock status and other research. The stock has survey coverage but no established catch sampling programme.*
What standards should the data meet to be considered useful? What information is needed and what analyses should be performed to determine / verify utility of the data.

Sub group 3 important issues from discussion

- Documentation about sampling program and data processing and analysis
    - Target audience is ICES
    - PGData proposed "SISP" for fisheries dependent data – would this be suitable as a template
    - Clear guide on what needs documenting
    - Governance about sampling process
        - Who is involved and what do they do?
        - Data policy / license / ownership /stewardship / hosting – clear answers to who owns the data and what can be done with it
        - Data confidentiality / protection
            - E.g. what level of aggregation can be made public? What level of data will be supplied?
    - Sampling unit and relation to population
    - Expectation of continuity of program (e.g. pilot program or ongoing collection?)
    - Drivers for the program? Goals for the program? (Might not always be clear to identify: multiple stakeholders / multiple drivers)
    - Data formats and accessibility
    - Type of data being collected e.g. biological, oceanographic, gear parameters, acoustic data, EM etc.
    - Units actually being measured (tonnes, kgs, cm, scm)
        - How fishing parameters are measured? e.g. are differences in recording shot time, haul time being controlled for? (Important for CPUE. Take into account searching.)
- Handling data within ICES
    - Easy to know the route if you are already in the system
        - Partner with organisations who know the process
        - Industry hire people who know the process
        - Can ICES make the process clearer?
            - Portal / information sources to present relevant information to industry
            - Can provide the information we have been talking about (documentation) and the "rules of the game"
                - Know whether your data is usable (Or if there is a longer term process where your data can be made usable in assessments)
    - Agreement that data can't be withdrawn from assessment process
    - Standards required related to quality of data?

        - Existing minimum standards relating to number of length measurements etc?
            - Depends on purpose
        - Sensor data will have required calibration information
            - Extensive quality control procedures in addition to this minimum – after the data is collected
        - Format of data defines units for weights, positions, time
- Communication between science and industry
    - Not just telling industry how to talk to ICES, but teaching ICES how to talk to industry
    - Set realistic expectations
    - Best practices / experiences
    - QA/QC procedures defined and in place before you start – as early as possible
    - Clear reporting timelines
        - Difference between reporting on data collection and the results of the data collection – how will the data be used?
    - Different / appropriate media and formats
        - E.g. 1-to-1 talks
    - Some guidelines exist already – do we need an ICES specific one?

Group 4. Industry-Science partnership.
Scenario: A scientific organisation is thinking of working in partnership with industry to develop a new data series on fishing effort, catches and biological characteristics of a data limited stock.
What specific guidance will they need to ensure that the data collection will provide results that can be used by ICES and other researchers?

Useful documented guidelines

- What is a data limited stock how to categorise the data?
    - 1.1 Guide to ICES advisory framework and principles
    - Category 1 - stocks with quantitative assessments
    - Category 6 - negligible landings stocks and stocks caught in minor amounts as bycatches.
    - https://www.ices.dk/news-and-events/news-archive/news/Pages/WKLIFE-Call-for-participants.aspx. ICES group on finding methods to assess data-limited fish stocks
- Fair principles – https://www.force11.org/group/fairgroup/fairprinciples
    - Identifies early on in the process the need for good documentation, clear rules on access, facilitating data transfer and increasing the potential re-use/value of the data.
    - Accessible A1.1 – open, free and universally implementable. Will this be possible? Does the conditions of industry collaboration restrict the use of the data?
- ICES User Handbook: Best practice for data management (https://www.ices.dk/sites/pub/Publication%20Reports/User%20Handbooks/uh-best-practice-data-management.pdf)

- Provides generic principles and thoughts on how to make data ready for sharing
- **Agreed methods** – Which expert group to look for the right manuals, instructions and recommendations
- **Data documentation** - Metadata offer an ideal way to document variations from agreed methods
- **Using existing references and vocabularies** - Aphia ID or LSID for species. Industry often have their own name for fish species and fish products that can cause misunderstandings. Norweigian Storskate and stor skate.
- **Data roles** –
  - Custodians: The persons or organisations responsible for **maintaining and ensuring access** to the data.
  - Originators: The persons or organisations that acquired the data. Often custodians and originators are the same, but not always.
  - Publishers: The persons or organisation that is responsible for publishing the data.
- **Data ownership** - If best practices have been considered thoroughly, it should be straightforward to find out exactly what needs to be shared, how, and by whom. **How can data ownership and authority on use of the data affect data quality and suitability for the stock-assessment?**
- Data quality
  - Timeliness
  - Completeness
  - Consistency
  - Accuracy
  - Uniqueness

- 22-Guidelines for Industry-Science data_FINAL.pdf (ices.dk)
- Guide to the ICES Advisory Framework and Principles
  - In particular principle 5,6 and 7. Benchmarking process
- 1.2 General context of ICES advice
- Data quality assurance repository (https://www.ices.dk/community/Pages/PGCCDBS-doc-repository.aspx)
  - Large collection of guidelines and workshop reports on methods and survey design relevant to the formation of a new data series.
- WGCATCH resources (https://www.ices.dk/community/groups/SiteAssets/WGCATCH-publications.aspx)
  - Collection of documents on sampling designs, survey designs, discard sampling etc.
- ICES Data Centre web pages – specifically:
  - Data validation (https://www.ices.dk/data/tools/Pages/data-validation.aspx)
  - Data formats (https://www.ices.dk/data/tools/Pages/Data-formats.aspx)
  - Vocabularies (https://vocab.ices.dk/

Summary from the discussion.

Much of the discussion in the group focused on the importance of communication, feedback and trust for maintaining a good collaboration between science and industry both with regards to data quality and the continuing engagement of the industry in the partnership.

- Making sure there are ways to retain the context around the data – to avoid incorrect interpretation/conclusions by the data users.
- This links with properly documenting the process (including what sampling schemes are used and why), but also includes making sure that where data were not/could not be collected is also recorded.

Good communication:

- Transparency, traceability and documentation
- **stakeholder inclusion** in data use and feedback.
- Using **stakeholder knowledge** in the science
  - Where to find guidelines? GAP project: http://gap2.eu/

Recognise there will be **an iterative process in developing** new data collection.

Identification and prioritization of data needs.

- The need to map out the expectations of the project/sampling from the start.
- This may help with managing industry expectations and probably couples with industry commitment and continuity – knowing it might take 5 years to build a time series might head off any apathy after 3 years with no result?

Large scale versus small scale fisheries.

- The workshop has mainly focused on the large-scale fisheries on larger vessels
- Small scale fisheries
  - Often data limited
  - Different challenges for data collection, both with regards to technological solutions and capacity.

How does the **industry benefit** from the data collection?

- What is in it for the fishermen providing the data?
  - How will this affect data quality and accuracy?
  - How will this affect productivity?

Commitment and continuity? Risk that funding can run out.

Co-development and collaboration – who I can learn from? An inventory of known collaborations between scientific institutions and industries.

Scientific information from surveys is quite well standardized already between countries. Survey and scientific observer data are already quite well standardized, but industry collaboration data often does not fit the same standardization.

- Proposed ICES sampling protocols, similar to the ICES survey protocols (SISPs), could be useful in industry-science collaborations. Pasted from David Curries presentation day 1:
    - Similar to the existing Series of Sampling Protocols (SISPs) but for fisheries dependent data http://www.ices.dk/sites/pub/Publication%20Reports/ICES%20Survey%20Protocols%20(SISP)/SISP%2010_Manual%20for%20the%20International%20Bottom%20Trawl%20Surveys%20-%20Revision%2010.pdf
    - The EU Regional Coordination Group data quality sub-group analysed a number of real sampling documents provided by member states – there is a good match to the proposed template structure.
    - https://datacollection.jrc.ec.europa.eu/documents/10213/1239599/2020_RCG-NA-NSEA+and+RCG-Baltic_partIII_ISSG.pdf/80dbfefd-d74d-4eb1-a746-3e4aa3baa2e5

Reliability, validation, trustworthiness - A point relevant to both cases below is the confidence in the truthfulness of data from science-industry collaborations in cases where data are collected without the presence of an independent observer.

- The turbot and brill survey (below) in 2020 was carried out differently than before because observers could not be taken on board as a result of corona virus restrictions. Instead of measurements taken on board, the crew stored all turbot and brill separately per haul and measurements were carried out at the fish auction by project staff. This method proved efficient and cost-effective and there is discussion about the merits of making this change permanent. One issue that needs to be addressed is the truthfulness of the samples provided. Without on-board oversight, there is the possibility that samples are manipulated (either fish added to skew the index upward, or not all fish stored with the opposite effect). Most likely at least one of the three survey vessels each year will have an observer on board, and in addition comparisons are made using electronic log book reports to flag any significant deviations.
- The data collection programme (below) also raises questions regarding how to collect and store data in such a way that researchers can have confidence in the truthfullness of the data. A kind of checklist of what information to provide with the data and what steps to take to ensure its quality and integrity would be very useful.

Case example 1. – Development of an industry survey for turbot and brill in the Dutch demersal fishery in response to a data gap pointed out in the annual ICES advice sheets for a number of years. The survey was co-developed by industry and Wageningen Marine Research, with the goal of developing an index reflecting stock size. The first sampling design was carried out in 2018 and presented to WGNSSK both the year before and after the first survey was completed. Good feedback was given and the design was modified to the extent that the first year could not be considered useful as the first data point in the time series. The modified design has run from 2019 onwards and is now considered fit for purpose by the research institute and by industry.

This case illustrates the inevitable iterative nature of developing a new data series. Industry scientist would have liked to have had access to a practical guideline or checklist of essential points

to cover in order to evaluate and improve the survey design before the first year. However, the first year provided essential information regarding the workload that was feasible in a survey trip and so the pilot character of the first survey with significant modifications afterwards was probably unavoidable. Also, see the point about trustworthiness, above.

Case example 2. – Automated data collection in the Dutch demersal fishery. A project is under way where vessels are equipped with a "concentrator" device capturing and bundling various sensor information streams and transmitting these to shore. Catches at the haul level coupled to environmental parameters result in a very high-resolution data set. Data are accessible by the vessel owner in various visualisations aimed at improving efficiency of the fishing operation and insight into patterns that could be used to make improvements in the day-to-day running of the vessel. The second possible use of the data is for research purposes. The fishing enterprise owns the data and determines what data are provided to whom. For research purposes, a model is envisioned where projects can be proposed to the participants, coupled with concrete data use agreements specifying permissions and limitations, and participants can choose individually to share their data or not.

This project raises questions regarding what needs to be done to ensure the data are useful for research purposes, see the point made above about reliability. The flip side of taking steps to guarantee the quality of the data is concerns regarding privacy and potential misuse of data. These concerns put restrictions on the kind of steps that can be taken for quality purposes.

Use of monitoring and control data – the workshop has had focus on scientists and industry, and their roles as data-providers/originators and data custodians, but what about fisheries managers and in particular the application of the use of monitoring and control data for scientific advice?

Annex 5: Key Lessons learned

There is a cultural shift in the ICES community towards 'quality assurance as the cornerstone of ICES activities'. The key lessons emerging from WKDSG listed below can contribute towards establishing best-practice.

1. Communication between data providers and data users is crucial. For incorporation of new data series into assessments, the Data Compilation Workshop of a benchmark process is the key point for bringing the two expertise fields together to address the quality and utility of data. Data governance groups are the other key arena for cross-fertilization.
2. New data-collection initiatives are sometimes leveraging existing data-flows because the nature of the data collected suggest usability in ICES advisory work. In these cases data-collection may be initiated without data users being identified, or being aware of new data opportunities. Bridging the gap between data providers and data users is particularly challenging in these circumstances, but key to encourage new data streams.
3. Documentation on the standards applied, data collection methodology and quality control must be easily available and accessible to all potential users as standalone documents, and should include some form of pre-screening questions or checklist of requirements.
4. Science Survey Protocols (SISPs) provide useful 'templates' that new data collection initiatives can use.
5. Collaboration/ co-development/ co-implementation of new third-part data collection initiatives is fundamentally important if they are to have their best chance of success in providing data to ICES that is useful and useable. At the present time, it is preferred that new data collectors partner with national institutes to facilitate this.
6. Conflict of interests need to be transparent and managed from the start. Existing self-sampling programs have explored promising strategies for implementing checks and balances that can provide data users and stakeholders with assurance about the integrity of data collection.
7. Ownership and data access agreements between providers and ICES are very important and need be established early.

Annex 6: Overview of the principles and processes for quality control and assurance of data intended for use in ICES advice

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1 Context

Increasingly ICES is trying to globalise and harmonise the way it handles data, which means thinking carefully about issues that affect the quality of data and reliance placed upon it by the scientific community, and also about issues of transparency and openness that affect how receivers of scientific advice judge its trustworthiness. Internationally, the motivation behind establishing standards and guidelines on the quality of scientific information has been similar:

> *"To implement a formal and accountable system for monitoring and ensuring the quality of scientific information and advice provided to Government; and thereby to increase government, stakeholder and public confidence and trust in scientific information, and in policy or management decisions made by Government based on scientific information"*. Penney *et al*. 2016 (Guideline for Australian Fisheries, [Inventory doc #20])

As work on quality assurance processes and tools in ICES evolves, this overview is part of the support required to facilitate the success of realising opportunities for new and novel data collection.

2 Purpose

The purpose of this document is to provide 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. It is particularly applicable to data initiatives conducted under science-industry research collaborations and self-sampling programmes by industry.

The guidance does not provide a comprehensive set of instructions or a recipe, because different data collection initiatives have different requirements.

It is intended to be a 'Getting Started' overview, so that those starting out might better understand how to ensure that their efforts to collect data will have the best chance of being rewarded, by it being useable and useful in supporting ICES in developing fisheries advice. In particular, it aims to shed light on these questions:

- What do I need to know before I start data collection, and where do I go to get that information?
- Where, and to whom, should I go with my data?

This overview arises out of the needs identified during the ICES workshop on Data Standards and Guidelines (WKDSG, 23-26 November 2020[9]) and is part of the documentation underpinning the ongoing development of a Quality Assurance Framework for ICES advice (ICES Advisory Plan, 2019), being led by WGQUALITY.

[9] WKDSG evaluated whether available documentation on Standards and Guidelines provides data-collectors and users with sufficient guidance on the requirements for quality assurance that should be applied to data used in supporting ICES advice. Particular focus was given to the need for guidance on data collection initiatives that fall outside of the scientific institutions that routinely participate in ICES, such as the fishing industry or other third-parties. This was motivated by recognition that participation of more (and different) data-collectors may provide new opportunities for ensuring that ICES advice is based on 'the best available data', and can assure its quality, credibility and legitimacy.

3 Terms and definitions

3.1 Quality Assurance Framework, Standards and Guidelines

Quality assurance framework: refers to the overarching framework that defines the process structures for quality assurance and how they are mobilised to meet required quality goals through implementation of standards, guidelines and tools at various stages.

Standards: refers to the principles and associated criteria used to define conditions that should be met for information to be considered fit-for-purpose. They are about the quality of information, and the processes that determine and evaluate the quality of information and how trustworthy it is.

Guidelines: refers to any information that provide guidance on how to meet standards *(or sometimes guidance on what the standards should be)*. They are about procedures and methods for collection information, analysing it and evaluating its usefulness.

3.2 Quality principles

The ICES Advisory Framework and Principles apply to the production of all ICES advisory products (ICES 2021). They are not limited to advice on fish stocks and fisheries. ICES advice is produced through a four stage framework of request formulation, knowledge synthesis, peer review and advice production (Figure 1).

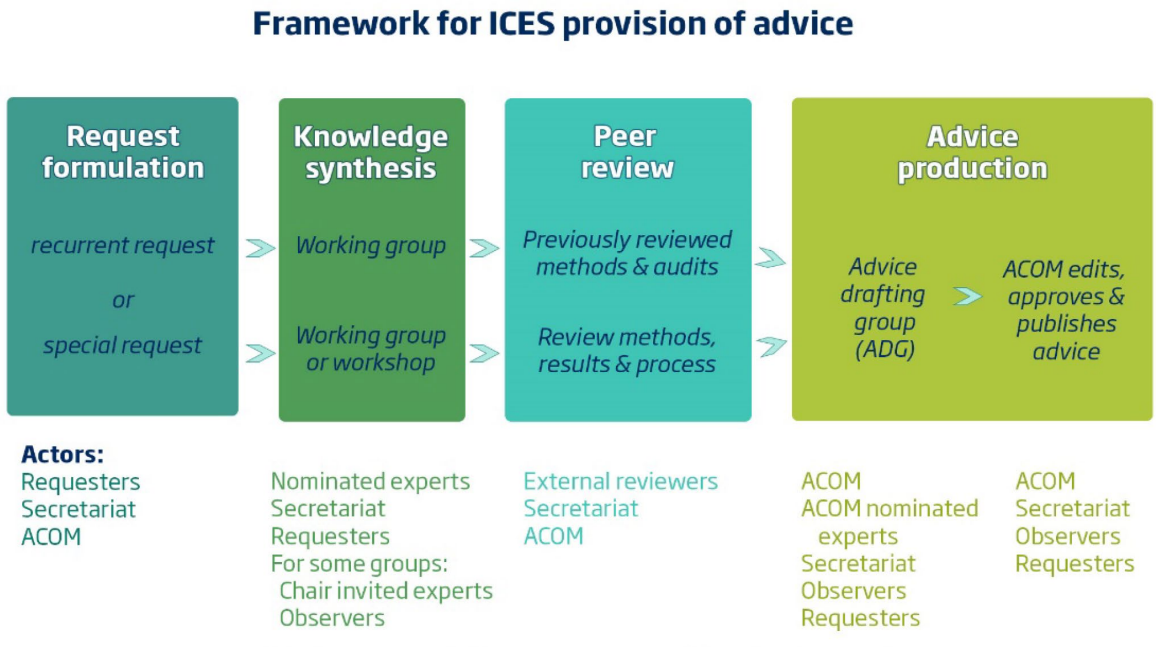

Figure 1 - Framework for ICES provision of advice

There are ten principles applied across these four stages, which vary slightly based on the advice type or product. In this overview, they are referred to as **the ten quality principles** because they express the quality control and assurance processes upon which the credibility and legitimacy of ICES advice is founded.

Ten quality principles for the production of ICES Advice

Principle 1. The guidelines and procedures to produce ICES advice are documented, openly accessible, and up to date.

Principle 2. Final request formulation is agreed through dialogue to clarify the requester's needs and expectations, the ICES process, likely resource implications, timelines, format of advice and roles and responsibilities of the engaged parties.

Principle 3. Where possible, existing policy goals, objectives, and the level of acceptable risk relevant to the advice request are identified. Where these objectives and descriptions of risk are unclear, ICES will identify these in the advice, and, where possible, provide options for management action and the consequences of the options and their trade-offs.

Principle 4. The deliberations of all relevant expert groups are published by the time the associated advice is published.

Principle 5. The best available science and quality-assured data are used. ICES selects and applies relevant methods for any analysis, including the development of new methods. The methods are peer-reviewed by independent experts and clearly and openly documented.

Principle 6. Data are findable, attributable, researchable, reusable, and conform to ICES data policy. Data flows are documented.

Principle 7. To ensure that the best available, credible science has been used, and to confirm that the analysis provides a sound basis for advice, all analyses and methods are peer-reviewed by at least two independent reviewers. For recurrent advice, the review is conducted through a benchmark process. For special requests through one-off reviews.

Principle 8. Advice is comprehensive, unambiguous, and consistent with the synthesised knowledge, while taking the peer-review into account. All advice follows existing advice frameworks and any deviation from the frameworks or related, previous advice is identified and justified.

Principle 9. All ICES advice is adopted by the ICES Advisory Committee (ACOM), through consensus, prior to being made available to the requester and simultaneously published on ICES website.

Principle 10. ICES provides advice as an impartial response to a request, and does not lobby the requester or any other party to implement its advice.

4 What do I need to know before I start data collection?

4.1 Data pathways for ICES fisheries advice

Figure 2 gives a generalized **overview of the quality control processes that follow data collection initiatives from inception through to application in advice**, and is a useful starting point to show where those involved will need to access more detailed guidance. It illustrates that data-collection early in the processes needs to be informed about the criteria for data acceptance process that comes later and is decided by different actors. The description of the benchmark processes for recurrent advice is essential reading in this regard (Inventory doc #5).

Building on Figure 2, Figure 3 and 4 look in more detail at the **existing ICES processes and structures for managing the flow of fisheries data**, providing understanding and navigation support aids. In the process flow-diagram (Figure 3[10]), 'Need advice' is the driver which leads to data being collected to address that need.

It is essential that data-collectors coordinate with data governance groups and data-users in expert groups in the planning stages of data collection, because in the end, the evaluation of what available data should be considered the best fit for the purpose will be decided by the expert group that will use it.

The fact that the final say in data acceptance is delegated to discussions in these scientific fora, and may often be a matter of debate, makes scientific data standards different from many industry standards, and in some sense it limits how prescribed data standards can be without interfering with the mandate of the advisory group. Nonetheless, processes for inferring the quality of data from information on data collection procedures and evaluation through quality indicators routinely exists, and should be available so that new data collectors have the best chance of meeting any specified quality requirements/ expectations.

[10] [NB: it is hoped that in the future an updated version of Figure 3 will be used as an online access portal to navigate ICES data flows and associated QA processes from start to end, and allowing users to be able dig behind each node to access additional detail and guidance documentation].

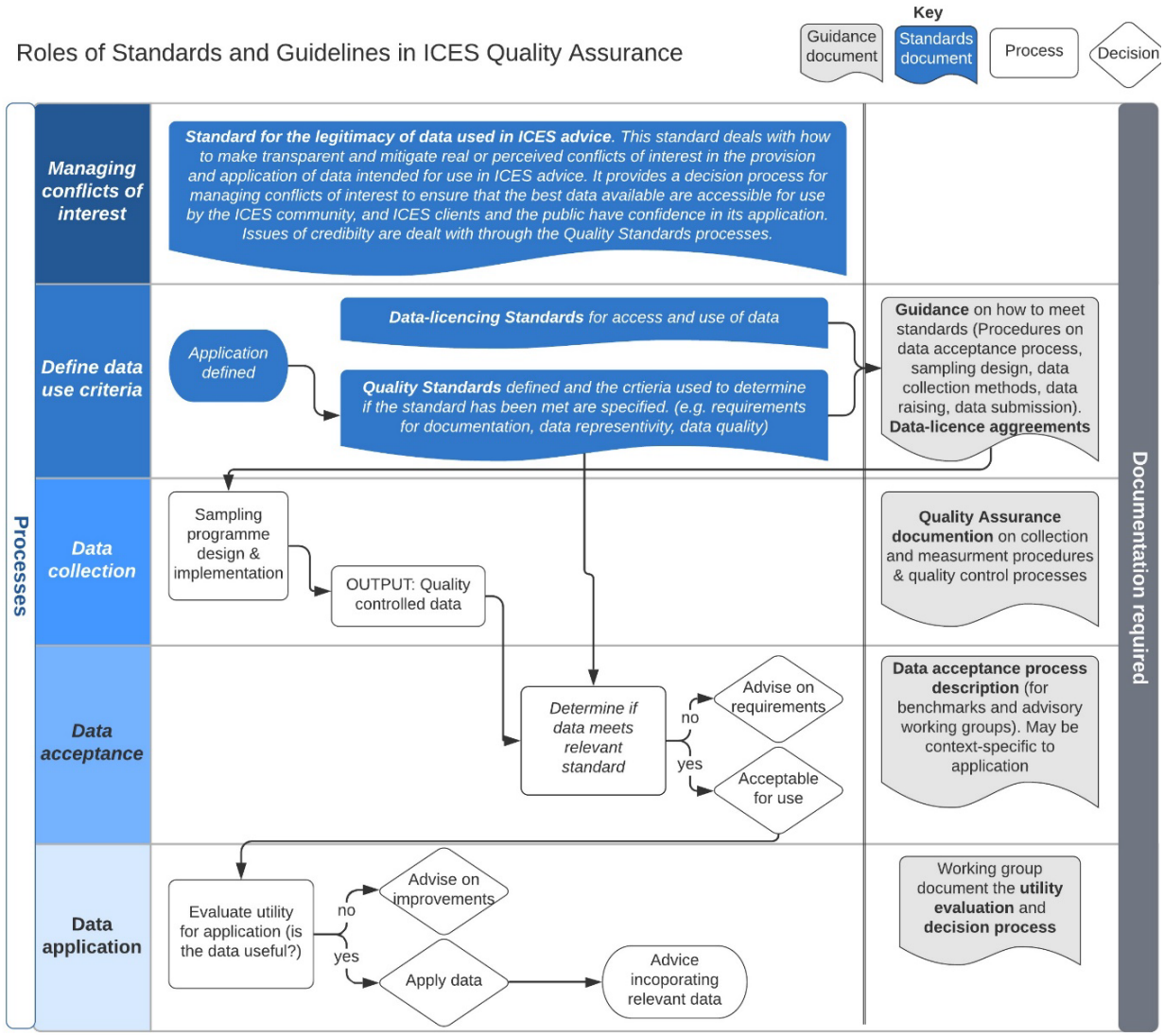

Figure 2 - Roles of standards and guidelines in quality assurance process for fisheries data in ICES. Setting of standards and data use criteria are the responsibility of benchmark and data governance group, while provision of guidance on how to achieve that is within the remit of working groups.

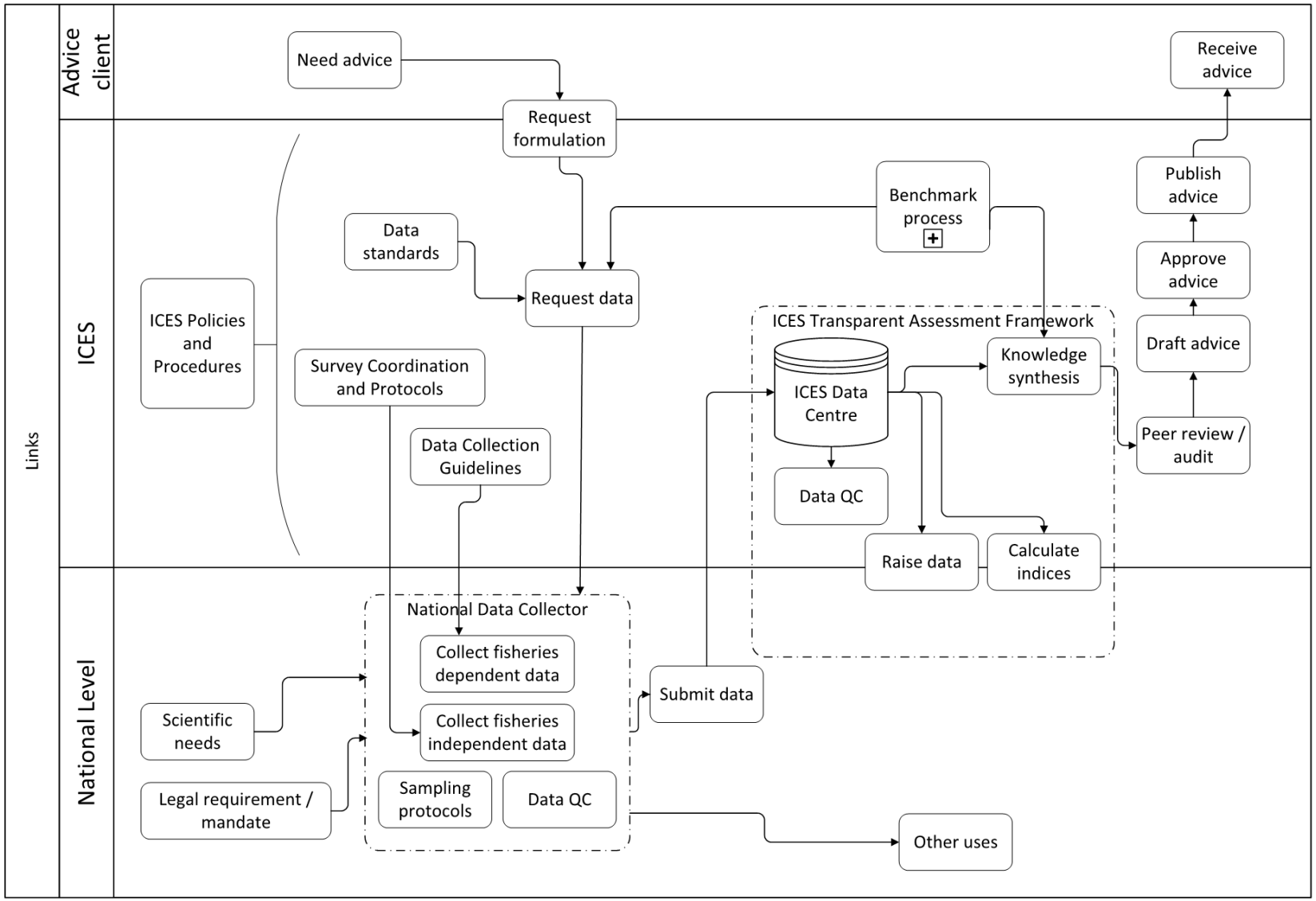

Figure 3 - Process-based flow diagram of the pathways for data used in ICES advice.

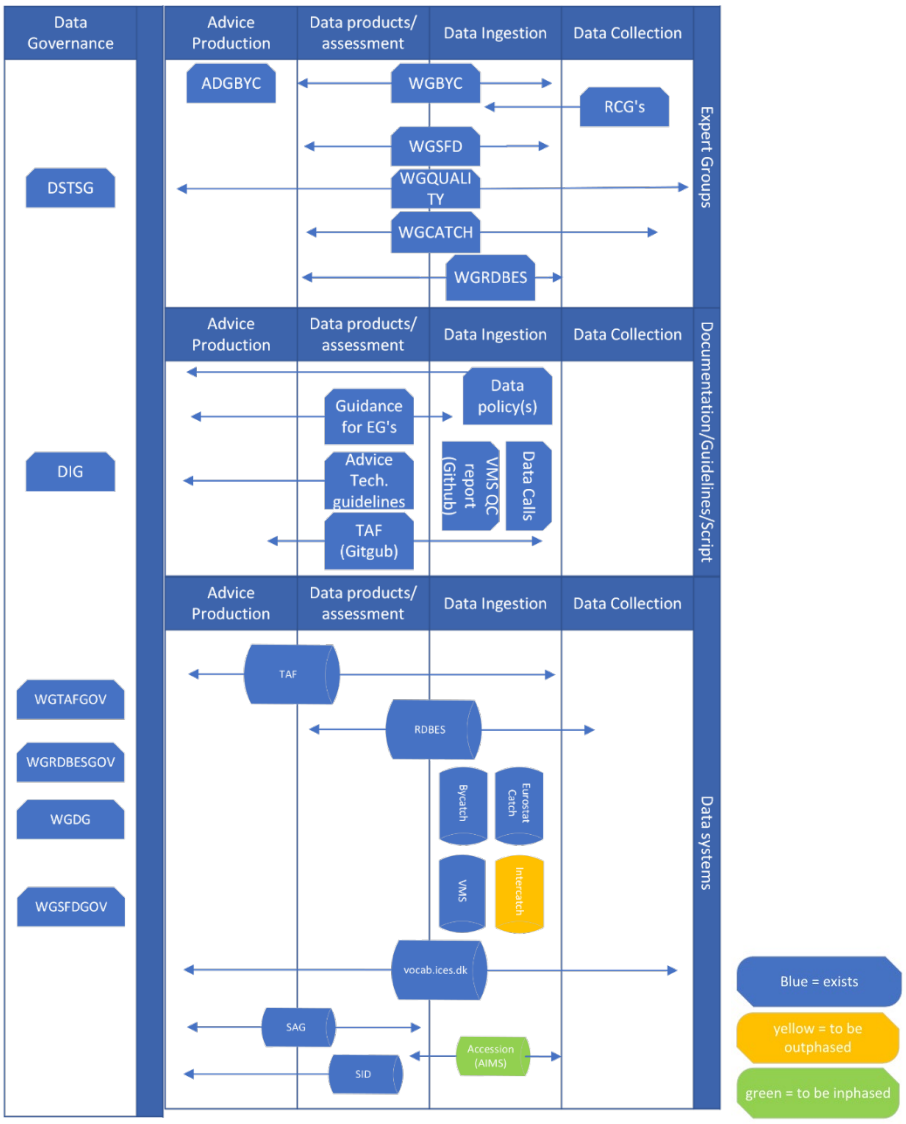

Figure 4 - Role-based schematic of ICES structures and processes (WG=working groups, tools, guidance sources) covering the flow of data into ICES and the production of ICES advice.

4.2 Checklist of requirements for data intended for use in ICES advice expert groups

The purpose of the checklist (Table 1) is to provide data collectors with a simple list of the requirements that would reasonably be expected to apply to data collection and quality control processes when the expectation is for the data to be used by ICES expert groups. It serves as a 'pre-screening' tool to manage expectations of data collectors and assist them in planning successful data collection activities by signposting relevant guidance.

The checklist aims to provide some sort of logical flow from start to end, and to identify priority element for consideration. Not all elements would be expected to apply in all cases.

Table 1. Checklist of questions for new data collection initiatives

Element	Questions	Relevance	Guidance/ further information
Identifiable need	Why is the data collection needed and who needs it?	To be fit-for-purpose, the easiest route to having data used is when a lack of relevant data or need for improving quality or enhancing understanding is clearly identifiable. Opportunities to think beyond what is needed now to facilitate future improvements are also important.	'Issue lists' published by expert groups for each stock. Stock Annexes – that describe the status of information sources and how they are used.
Conflict of Interest	How will potential CoIs be identified, recorded, mitigated and managed?	Concerns over potential conflict of interest influence the credibility and legitimacy of third-party data collection programmes, and may derail them. Transparency is required.	WGQUALITY working on CoI issues. WKDSG report
Data pathway	How will the data make its way through the structures that get it to where it is needed?	Collaboration/ co-development/ co-implementation of new third-part data collection initiatives is considered fundamentally important if they are to have their best chance of success in providing data to ICES that is useful and useable. At the present time, it is preferred that new data collectors partner with national institutes within the framework of national sampling schemes as a pathway to data incorporation**.**	See discussions in WKDSG
	Who will be responsible for what?	Important to establish clear roles and responsibilities of the 'players' in data provision.	Data governance group, partners in collaborative research.
Data policy	What is the policy and arrangements for ownership, sharing and use of the data?	For data to be used in ICES it needs to be openly available to the expert groups. Sharing/ access and licencing agreements need be established early, otherwise use in applications might not be possible.	DIG, Data governance groups [ICES guidelines 12.5 3 Criteria for the use of data in ICES advisory work needs more work to be practically useful; Inventory doc #4].
Continuity of data collection	How will the data collection be maintained over the long term?	Applications in fish stock assessment and monitoring of environmental changes require a time series with a minimum of 5 continuous years of observations.	
	What is the risk and impact of withdrawal of participation in data collection?		
Quality Control	How will the procedures and methods for data collection, compilation and analysis ensure the data is of a quality that is fit-for-purpose?	Documentation on the standards applied (e.g. formats, units, calibration, precision), survey design (particularly in terms of representativity), data collection methodology and quality control processes must be easily available and accessible to all potential users as standalone documents	ICES template for Science Survey Protocols (SISPs). (e.g. Inventory doc #7. Contact WGQUALITY for recent update). [NB. SISPs merging with the 'Techniques in Marine Science' TIMES series as a new collection: ICES Survey Protocols].
	How will the quality of the data be evaluated?	It is necessary to demonstrate the data meets any quality or 'performance' requirements (e.g. consistency, CV) by providing metrics on Quality Indicators, and, where relevant, making appropriate comparisons.	Expert Group advice on quality indicators
Quality Assurance	How will you provide evidence to provide data-users with	An audit trail will be necessary to verify that process are in place to ensure quality information can be delivered. This could be a made official	

Element	Questions	Relevance	Guidance/ further information
	confidence that the data are trustworthy?	using recognised quality assurance certification schemes.	
Data Access	How will access be provided to those that need to use the data?	The mechanisms for making data available in correct format need to be in place.	
	How will timely provision of data be ensured?	Data reporting timeliness and the mechanisms for submitting data requires specific consideration because it is essential that data should be ready when needed.	

5 Where and to whom do I go with my data?

Within the schema in Figure 2, the setting of standards and data use criteria are the responsibility of benchmark and data governance groups, while provision of guidance on how to achieve that is within the remit of working groups.

Planning of new data collection initiatives should include Data Governance groups (Figure 4) and the relevant expert groups that will specify any data requirement based on existing needs or new opportunities to evolve and improve support for fisheries advice.

For incorporation of new data series into stock assessments, the Data Compilation Workshop of a benchmark process is the key point for bringing the two expertise fields together to address the quality and utility of data.

6 Where do I find relevant guidance?

Table 2 provides a static inventory of documentation on standards and guidelines relevant to the collection of fisheries-dependent data that was developed during WKDSG and is available here as an Excel file that can be filtered, and sorted for easier use. It includes information from existing ICES document repositories as well as additional documents from around the world that are specifically relevant to the purpose of this overview.

It is part of work in progress, with efforts already underway in ICES WGQUALITY to make relevant documentation more findable and accessible so that people can get the information and support they need. The documentation classification schemes being developed for this purpose are applied in the inventory to help users more readily identify documents of relevance to their needs.

Table 2. Structure of the WKDSG document inventory spreadsheet, which is available on WKDSG sharepoint and will be made publicly available in the future, probably via WQUALITY.

Section	Content
BASIC INFORMATION	DocNo
	Year
	Title
	Relevance to WKDSG ToRs (1-high,5-low)
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	QAF-level1 (ref PGDATA 2018)
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CONTENT DESCRIPTION	no. pages
	What it's about
	Purpose
	Synopsis
	Authors
	ICES Parent Group
REFERENCING	On QA repository
	Source
	Reference
	Link

Annex 7: List of Participants

Name	Institute	Relevant position	Country (of institute)	Email
Brett Alger	NOAA	ICES WGTIFD (Chair)	USA	brett.alger@noaa.gov
Elena Balestri	Scottish Fishermen Federation		UK-Scot	E.Balestri@sff.co.uk
Mattias Bernreuther	VTI		Germany	matthias.bernreuther@thuenen.de
Kirsten Birch Håkansson	DTU-Aqua	WGCATCH (Chair), PGDATA	Denmark	kih@aqua.dtu.dk
Katie Brigden	NAFC Marine Centre	PANDORA	UK-Scot	katie.brigden@uhi.ac.uk
Pierluigi Carbonara	COISPA	WGBIOP Chair	Italy	carbonara@coispa.it
Richard (Gus) Caslake	Cornish Sardine Management Association (CSMA)	Chairman & Seafish SW England regional advisor	UK-Eng	Richard.Caslake@seafish.co.uk
Liz Clarke	Marine Scotland	WGCATCH, Regional Database group	UK-Scot	Liz.Clarke@gov.scot
Jessica Craig	Marine Scotland	WGCATCH	UK-Scot	Jessica.Craig@gov.scot
David Currie	Marine Institute	Regional Data group, WGQUALITY (Chair)	Ireland	David.Currie@Marine.ie
Ingeborg de Boois	WUR	ICES DATRAS Gov Chair, DIG member	Netherlands	ingeborg.deboois@wur.nl
Lauren Dolinger Few	NOAA		USA	lauren.dolinger.few@noaa.gov
Jon Elson	Cefas	Regional Coordination group	UK-Eng	jon.elson@cefas.co.uk
Gjert Endre Dingsør	Fiskebat (Norwegian Fishing Vessel Owners Association)		Norway	gjert@fiskebat.no
Edvin Fuglebakk	IMR	RDBES	Norway	edvin.fuglebakk@hi.no
Hans Gerritsen	Marine Institute	WGCATCH	Ireland	hans.Gerritsen@Marine.ie
Neil Holdsworth	ICES	ICES Data Manager	Denmark	NeilH@ices.dk
Andrew Jones	NOAA		USA	andrew.jones@noaa.gov
Henrik Kjems Nielsen		ICES Data Centre, RDBES	Denmark	henrikkn@ices.dk
Colm Lordan	ICES	ACOM vice-chair	Denmark	colm.lordan@ices.dk

Name	Institute	Relevant position	Country (of institute)	Email
Steven Mackinson	Scottish Pelagic Fishermen's Association	co-Chair, WKSCINDI	UK-Scot	steve.mackinson@scottishpelagic.co.uk
John Manderson	Open Ocean Research	Open Ocean Research	USA	john.manderson@openoceanresearch.com
David Miller	ICES	Professional Officer	Denmark	david.miller@ices.dk
Estanis Mugerza	AZTI		Spain	emugerza@azti.es
Macdara O'Cuaig	Marine Institute		Ireland	macdara.ocuaig@marine.ie
Gudmundur Oskarsson	Iceland govt fisheries lab	WGWIDE chair	Iceland	gudmundur.j.oskarsson@hafogvatn.is
Martin Pastoors	Pelagic Freezer-Trawler Association	WKEVUT, WGCATCH	Netherlands	mpastoors@pelagicfish.eu
Campbell Pert			UK-Scot	Campbell.Pert@gov.scot
Jens Rasmussen	ICES	Moving from Chair Data and Information group over to the new Data Science and Technology Steering group	UK-Scot	J.Rasmussen@marlab.ac.uk
Mike Rinaldi	ACCSP	Data Coordinator for the Atlantic Coastal Cooperative Statistics Program (ACCSP)	USA	Mike.Rinaldi@accsp.org
Daniel Roberts	WaterInterface LLC		USA	science@waterinterface.net
Julie Simpson	ACCSP	Deputy director	USA	julie.simpson@accsp.org
Marie Storr-Paulsen			Denmark	msp@aqua.dtu.dk
Els Torreele	ILVO – Fisheries	EU DCF National Correspondents, PGDATA, WGCATCH, WGBIOP, ACOM member	Belgium	els.torreele@ilvo.vlaanderen.be
Wouter van Broekhoven	VisNed		Netherlands	wvanbroekhoven@visned.nl
Cooper van Vranken	Berring Data Collective		USA	cooper@berringdatacollective.com
Sofie Vandemaele	ILVO		Belgium	Sofie.Vandemaele@ilvo.vlaanderen.be
Berthe Vastenhoud	Berring Data Collective	Berring Data Collective	Brussels	berthe@berringdatacollective.com
Jon Helge Vølstad		CATSAM - RDBES, WGCATCH, WGRFS	Norway	jon.helge.voelstad@hi.no

Name	Institute	Relevant position	Country (of institute)	Email
Sarah Walmsley	Cefas		UK-Eng	sarah.walmsley@cefas.co.uk
Tom Williams	IMR	Norwegian Ref fleet manager	Norway	tom.williams@hi.no