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Nantes, France

ICES International Council for the Exploration of the Sea
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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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Executive Summary

The Planning Group on Data Needs for Assessments and Advice (PGDATA), meeting was hosted in Nantes in France from the 7–10 of February 2017. Eighteen experts from eleven countries participated to the meeting chaired by Joel Vigneau, France, and Marie Storr-Paulsen, Denmark.

The main output of the meeting was an evaluation of the 2017 ICES EG data call, where the PROXY data call on length data from data limited stocks was included. The audit included redefinition of some variables, mainly concerning the landing obligation and clarification of the proposed text. The process was thought to be very useful as the data provider had not earlier been involved in the process of committing on the data call but merely been trying to comply on their own with the data call text. It was however thought that the involvement of PGDATA earlier in the process could improve the process, as the data call deadline prevented the needed review thoroughness. Further, the meting focused on finalizing the ToRs for the workshop on BIOPTIM and establish the work process and preparation for the workshop. The BIOPTIM aims to look at ways in which biological parameters obtained from sampling commercial catches can be optimized so that the time and money spent on sampling can be effectively justified in terms of providing quality information to end-users. The aim is to develop an R toolbox which can be used by national labs to quantify the effects of different sampling intensities and sampling designs, and support discussions on the advantages and disadvantages of different sampling strategies in terms of time and cost savings. As part of the improvement of the data quality on biological parameters (mainly otoliths) PGDATA and WGBIOP developed a roadmap for implementing the SmartDots software developed by ILVO to replace WebGR as the regional/European system for otolith age reading and possible maturity classification. Further development in spring 2017 will make it possible for SmartDots to be integrated in a web platform provided by ICES. PGDATA 2017 also finalised the guidelines for the data compilation workshops taking into account the feedback from the 2016 benchmark data evaluation meeting for the Irish Sea (WKIRISH2) and Kattegat cod (WKBALT), and streamlining the benchmark process even further by updating the issue list template that are normally populated by the assessment working groups. In order to increase the data quality and communication between the expert groups and data providers, PGDATA suggested a further development and maintenance of the Data Quality Assurance Repository. The idea is to structure in the Repository all the work done, within the different technical workshops, on data quality and best practices, thereby avoid that scientist from national institutes, or from other working groups, having to read through all the reports in order to find the relevant guidelines.

1 Introduction and detailed Terms of Reference

The PGDATA meeting was hosted in Nantes France and had 18 participants from 11 countries.

PGDATA evolved from the ICES Planning Group on Commercial Catches, Discards and Biological sampling following the splitting of the bulk of the PGCCDBS work into two separate expert groups, one dealing with collection, interpretation and quality assurance of data on commercial catches (WGCATCH: ICES, 2014) and the other on biological parameters (WGBIOP: ICES, 2015).

In practical, PGDATA was created **to improve the effectiveness of the ICES benchmarking process and the quality of ICES advice,** and for **ensuring the best use of available resources for data collection**. An objective of PGDATA was to help ICES to develop advice using the most appropriate assessments given the quality of the data, and to be able to explain uncertainties in the assessments due to aspects of data quality and how these are reflected in the advice.

A further goal was to develop objective procedures to identify where data quality improvements would have greatest impact on quality of advice, and to ensure that proposals to collect new data or amend existing data collection schemes could be made in an informed way taking account of factors such as feasibility, methods for collection and use of the data, impact on advice, costs of data collection relative to precision, implications for regional sampling schemes or surveys, and how the quality of the data can be evaluated.

The remit of PGDATA differs from WGCATCH and WGBIOP in focusing on all end-user needs for data and information on data quality. The main objectives of PGDATA are:

i) Design a Quality Assurance Framework to ensure that information on data quality is adequately documented and applied in assessments, particularly benchmarks.

ii) Develop and test analytical methods for identifying improvements in data quality, or collections of new data, that have the greatest impacts on the quality of advice;

iii) Engage with end-users, including managers, to raise awareness of what types and resolution of management decisions (e.g. by fleet or area) can realistically be supported by present or proposed data collections;

iv) Advise on objective methods to apply criteria (e.g. as proposed by STECF) for evaluating requests by end-users for new or amended data collections.

v) Plan workshops and studies focused on specific methods development.

The background and three-year ToRs and workplan for PGDATA are given in Annex 3, and the detailed ToRs for the 2017 meeting are included in the "Summary of the Work Plan" section of the annex and extracted below. The participation at the third meeting is given in Annex 1 and the agenda in Annex 2.

Participants in PGDATA 2017 included chairs of the Regional Coordination Meetings (RCMs), WGCATCH, WGBIOP, National correspondents, and people with detailed knowledge of the statistical design, implementation, data processing and analysis of fishery sampling programmes and programing skills.

Detailed ToRs for PGDATA 2017:

Terms of Reference for the third annual meeting of PGDATA were composed of the original terms of references provided by ICES, plus new terms of references reflecting additional issues with more recent development such as the review of the full ICES data call, the SmartFish initiative and the fishPi project. The structure of the reports reflects the comprehensive list of ToRs addressed by PGDATA 2017 as given below:

1) Design and test a Quality Assurance Framework for assessment EGs to evaluate fisheries dependent and fisheries independent data quality and its impact on assessments, particularly within the benchmarking process, and test this in regional case studies.
    a) Using the 2016 benchmark data evaluation meeting for the Irish Sea (WKIRISH2) and Kattegat cod (WKBALT) as examples, work with the data and assessment teams to review the benchmark process and modify the guidelines for benchmark data evaluation meetings where required, and on how the future benchmark system could work;
    b) Give feedback to the new suggested structure from ICES on how the future benchmark system could work. Develop a generic template for the data call benchmark / update assessment including information on data quality;
    c) Provide an overview of the discussions within ICES concerning its data strategies and how the future structure and functioning of PGDATA could be adapted to ensure the most effective steering and implementation of these strategies;
    d) Planning of BIOPTIM workshop and a roadmap for further development of SMARTFISH;
    e) Review the outcomes of WKCOSTBEN 2016 and identify the tasks, skills and related Terms of Reference needed for future development of WKCOSTBEN in 2017 and 2018;
    f) Review the outcomes of the fishPi project to propose a quality control framework for all data provided to assessment working groups;
    g) Develop and test analytical methods for identifying improvements in data quality, which have the greatest impacts on the quality of advice;
2) Advise on objective methods for improving the data flows and communications between end-users and data collection, with the aim of proposing an effective use of survey resources.
    a) Review and suggest a generic template for the ICES data calls, including information on quality and possible scientific surveys.
    b) Advise on objective methods for evaluating requests by end-users for new or amended data collections within the new DCF/DC-MAP, by making use of efficient and effective use of survey resources
    c) Elaborate and give suggestions on how the communication on data flow and quality can be improved between working groups and data providers, including requirements on data from surveys;

d) Review the outcomes on methodological procedures and quality estimates from all ICES technical workshops and working groups (i.e. WGBIOP, WGCATCH, WGRFS, WGFTFB, WGELECTRA, WGISDAA, WGISUR) and advise on ways forward;

e) Respond to recommendations and requests for advice addressed to PGDATA from other ICES Expert Groups, RCMs or other bodies;

f) Recommendations for STECF/EWG on data quality;

3) Provide a summary of the PGDATA 3–year program and its achievements in relation to its terms of reference.

4) Proposed future for PGDATA

2 Design a Quality Assurance Framework

2.1 Using the 2016 benchmark data evaluation meeting for the Irish Sea (WKIRISH2) and Kattegat cod (WKBALT) to review the guidelines for benchmark data evaluation meetings (ToR 1a and b)

In 2015, PGDATA drafted guidelines for ICES benchmark data evaluation process (PGDATA 2015, annex 4) as part of the quality assurance framework. These guidelines were tested in the 2016 data compilation workshops WKBALT and WKIRISH2. In both data compilation workshops the guidelines were found useful and gave a good support for planning the work before the benchmark as well as used as a guideline for the chair during the meeting. It was however noted that the guideline were relatively detailed and it was not in the present form easy to prioritize between subjects.

In the expert assessment working group's reports, each stock section contains an issues list with information on areas/ data that needs to be improved before the next benchmark and the issue list table should in principle include all relevant issues to help planning the future work before the next benchmark. At the data compilation work-shop WKBALT 2016 it was proposed to standardize the issue list and the data compilation guidelines from PGDATA 2015 giving them a similar template. This would support that all relevant issues would be discussed already at the assessment working group and not first be raised at the data compilation workshop. It would also to a larger extent support that not only new issues are looked at for the benchmark but also that all the basic data such as discard data and survey data are evaluated thoroughly. Based on this initiative, PGDATA worked on a comprehensive and generic template for the issues list impeding the quality of the assessments, focusing only on data aresues. The guidelines for ICES benchmark data evaluation process (PGDATA 2015, annex 4) was reviewed so that each entries of the generic issue list correspond to a section of the guidelines. The updated guidelines and generic issue list are given in Annex 4, and Annex 5, respectively.

2.2 Give feedback to the new suggested structure from ICES on how the future benchmark system could work.

ACOM and the Benchmark Steering Group established in December 2015 a joint subgroup to develop a proposal for a new benchmark system, and a Joint BSG-ACOM adhoc subgroup to improve links between Expert Groups and Benchmarks.

From the subgroup, the present benchmark system was thought to have:

- Too many instances where problems occurred and benchmark decisions were changed soon after;
- Too high workload, too many meetings and insufficient resources for experts to prepare the work in good condition and more efficiently;
- Insufficient incorporation of data quality aspects and scientific knowledge (e.g. biological processes, survey use, ecosystem knowledge);
- Are we focusing on the real issues and challenges or too focused on "technicalities"?
- Regional benchmarks needed to progress on incorporation of ecosystem based management (EBM).

The new proposed system was thought to be a two-step system with 1) enhancing the present stock assessment EGs work. This should be conducted in cooperation with the ICES Secretariat (the transparent assessment framework -TAF system) and thereby making room for a more productive working environment for the stock as-assessment EGs, which should focus their work strategically towards improving stock assessments and benchmark preparation. 2) The benchmark system (scoping system) should be steered by the ACOM leadership together with the EG chair and be driven by the management challenges. It was suggested that the benchmark process should take place in the physical space of an assessment EGs every 3-4 years. However, a broader list of participant than the present EG would be needed to achieve the goal.

The report of the joint ACOM-BSG subgroup was presented at an Open Session at the ASC 2016. The participant at the Open Session was quite critical to the proposal and the main criticism was on the complexity of the proposed process. The Open Session feedback was discussed at the ACOM-BSG subgroup and by ACOM. ACOM concluded hereafter that the proposal prepared by the subgroup represents the view of ACOM and that we should work towards implementing part of the proposal, starting with test cases.

ACOM agreed to use the North Sea demersal and herring stocks as test cases and requested the ACOM leadership to liaise with the chairs of WGNSSK and HAWG to set up scoping workshops back to back with the expert group meetings in 2017. The test cases was to be focused on implementing the data flow in the TAF system. However, due to the feedback at the ASC it was decided not to force the process and change the present benchmark system, before a more detailed proposal was developed.

As the suggested changed structure of the benchmark system will probably change PGDATA has not commented on the present proposal. PGDATA will however follow the process and will gladly give feedback on the new proposal.

See Annex 6 for the full text of the suggested new structure.

2.3 Provide an overview of discussions within ICES concerning its data strategies and how the future structure and functioning of PGDATA could be adapted to ensure the most effective steering and implementation of these strategies.

One of the ToRs for this year's PGDATA meeting was to present an overview of the data strategies within ICES and come with suggestions on how the communication on data flow and quality can be improved between working groups and data providers.

2.3.1 Overview of discussions within ICES concerning its data strategies

Last year (ICES 2016) PGDATA suggested how SSGIEOM could be re-organized as a strategic data advisory group with membership derived from chairs (or other members with required skills) of related data EGs and end-users of data (ICES 2016). The idea was to achieve a better balance between the different types of data used in assessments, with increased focus on longer term strategic development and how these should translate into the ToRs for each EG, compared to the present setup. There has not been any formal feedback to PGDATA on the suggested new structure. However, the suggestion was discussed at intersessional meetings with the ACOM leadership and the SSGIEOM, WGISDAA and WGISUR chairs. As 2016 was the last year for the former SSGIOM chair, the ACOM leadership thought that the new chair needed to redefine

the role of SSGIEOM. The new SSGIEOM chair has not until the PGDATA meeting 2017 been given his view and feedback on a revised structure.

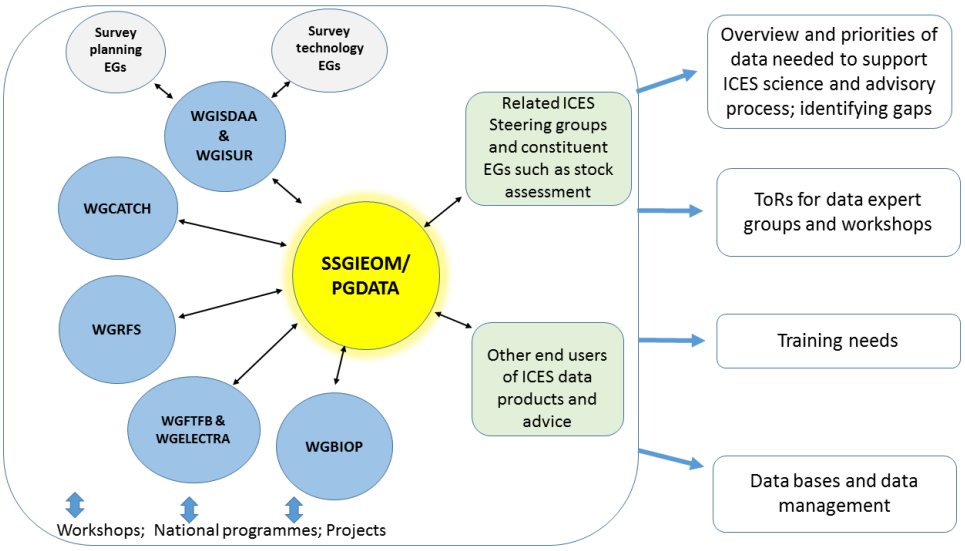


Figure 2.3.1. The proposed re-organized SSGIEOM (ICES 2016).

2.3.1.1 How can the communication on data flow and quality be improved be-tween working groups and data providers

PGDATA proposed (and started) to improve the communications between working groups and working groups and data providers by extracting guidelines of best practice on quality and data improvements from ICES technical workshops to a repository. The idea is to structure all the work done on data quality and best practices in the different technical workshops and thereby avoid that scientist from national institutes or from other working groups has to read through all the reports to find the relevant guidelines. To this aim, PGDATA would make use of the Data Quality Assurance Repository, presently hosted at http://www.ices.dk/community/Pages/PGCCDBS-doc-repository.aspx and point directly to the relevant searched information in the specific reports. For example, to develop a statistical sound sampling design, fisheries catch sampling schemes can broadly be categorized into four principal classes based on the number of stages in the sample selection (ICES WKPICS3, 2013). In summary, PGDATA would make the link between all technical working groups and keep memory of the recommendations, guidelines and best practices for each types of data.

2.3.1.2 The new suggested structure on data handling from ICES

At PGDATA 2017 an overview of ICES strategies on data handling and data flow was presented by the ICES secretary. The new data flow strategy is focusing on:

- Documenting and automating the data processes of the assessments/advice
- Support the ICES Expert Groups with data, quality assurance and functionalities

This is implemented through the development of a new Regional Data Base system (RDB), which will include a regional estimation procedure. The RDB is a prerequisite for the regional data collection and is going to be further developed to form the basis for the commercial fishery data used by the assessment working groups. The input data will be coming from existing and/or new systems/databases, and the methods will

be written in R on an open access platform. The new RDB will document detailed commercial fisheries data and estimation procedures, which forms the data basis for the input data in the stock assessment Expert Groups. In addition a new Acoustic database (for acoustic surveys) and a Bycatch database (for PETS) have been developed to store and document relevant datasets and help improving the use by Expert Groups. Improvement on existing database systems are also part of the development plan such as including new web services in DATRAS (the demersal survey database) and working with age and length data in parallel in InterCatch. There is a general focus on machine interfaces, typically web services, but R is widely used and integration to R is therefore also important. The new RDB will together with the transparent assessment framework (TAF system) be a tool box to be used by the assessment Expert Groups, where all data sampled and processed will be documented.

2.3.2 The Regional DataBase, RDB

ICES Secretariat is hosting and maintaining the RDB, presently mainly used by the Regional Coordination Meetings, RCMs, to coordinate the sampling between member states. ICES Secretariat has supported the countries when uploading data and the RCMs with the data call, data extracts, upload overviews and participated in the RCMs. Further, standardization on species and harbour codes has been conducted and added codes for the new landing obligations and improved the quality control and data uploads functionality. Design based sampling has in later years been recommended by WGCATCH, PGDATA, WKRDB, the FishPi project and the ICES community in general to be able to conduct a uncertainty estimation of data used for the fish stock assessment Expert Groups. It was recognised that there was a need for a major development on the RDB in order to be able to support upload of design based sampling information and to estimate the catch accordantly. Therefore, ICES Council agreed to provide 135,000 EUR for a 2–year development project of a new RDB. The project will be steered by two steering committees; the RCG Steering Committee for the RDB, SCRDB and the ICES Steering Committee for the RDB (for ICES countries, which are not members of the RCG Steering Committee for the RDB). The RDB Project Expert Group, who has the knowledge of how to generate statistical estimates, will play a more prominent role within the steering committees, to ensure that the statistical estimates needed by the countries will be available, both as end-user and as countries out-side the EU DCF.

2.3.3 The new RDB System

In recent years many countries within the ICES community has changed their sampling strategy to fulfil the requirement of a statistically sound sampling strategy. As a first step in the development of the new RDB the SCRDB will need a feedback from a core user group on the updated RDB format which will form the basis of the further development. The specification requirements involve following topics; the exchange format, data model, security, checks, processing before estimation, estimation using R, processing after estimation and output formats and reports. The ICES Secretariat development team will start on the setup and development of the new RDB before the Requirement Specification Document is delivered not to waste any time. It is recognised that changing the new RDB will be a process and therefore it is not expected that the Requirement Specification Document is a fixed and final document for the Regional Estimation System (RES), but the document should state the needs known at this point.

The RDB is the main prerequisite for development of regional sampling programmes, for standardisation of data, and the tool for ensuring transparency and quality assurance of input data for stock assessment, and for the management of the marine living resources by the EU and non-EU countries in the North Eastern Atlantic area.

It is very cost efficient to collect and combine countries commercial fisheries data in the RES. One of the benefits is the harmonisation of all the data going into the RES. All codes are standardised and all uploads of national data are logged and automatically combined in the relational database.

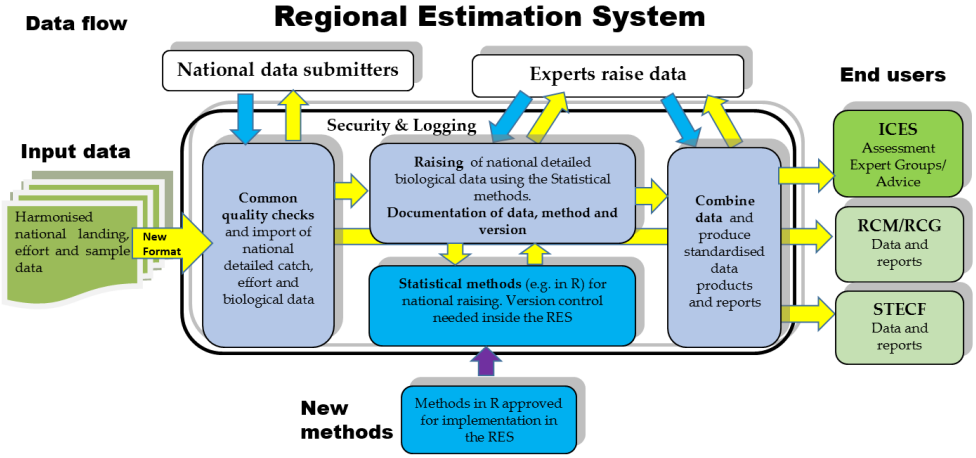
The estimations will be based on statistical sound methods, which are written in R, which have been encapsulated into the RDB using version control. The encapsulation of the methods into the RES is important, because this will ensure the methods are approved and it is not possible to modify the encapsulated methods written in R inside the RES. Having the estimation methods defined in R would make the estimation more transparent and easier for the experts to update, if needed. It should be possible to download both the data and the methods from the RES, so the experts easily can mimic the estimation in the RES and further develop the methods.

When a group of experts have developed a new statistical estimation method or updated and existing method, the group should approach the WGCATCH, which have the task to test and approve estimation method. When the method have been approved, the method will be encapsulated into the RES, using the RES's version control of methods. The method can then be used to estimate data, but the method cannot be manipulated/edited by the users, and the estimated data will be transparent and documented, regarding data and what method and version that was used.

There are many advantages of having the RES:

- Ensure approved standardised statistical methods are used for estimating the data for the stock assessment;
- Document data used for the stock assessment at detailed level;
- Support the Regional Coordination Groups with data for coordination;
- Higher data quality by using common quality checks across all countries' da-ta;
- Reduces the workload for the countries in estimating data because the RES contains needed methods;
- One data call for upload of data to the RES for the RCGs and ICES Expert Groups and other end-users;
- The data handling is as efficient and easy as possible;

The figure below gives an overview of the flow of data in the new RDB from data uploads and the interaction with the national experts to the two main end-users ICES and the RCGs, but data could also be downloaded for other relevant end-users e.g. STECF.



The SCRDB is steering body of the RDB and the RES/new RDB. At the end of the year the ICES Steering Committee RDB will, as described above, together with the SCRDB be the steering body of the RES/new RDB. To support the development of the new RDB, the SCRDB have made the RDB Project Expert Group, the core persons of this group (the core group) consist of the following six persons:

- Kirsten Birch Håkansson, DTU Aqua, Denmark: kibi@aqua.dtu.dk
- Nuno Prista, SLU Aqua, Sweden: nuno.prista@slu.se
- Alastair Pout, Marine Scotland Science, Scotland: A.Pout@MARLAB.AC.UK
- Norbert Billet, IRD, France: norbert.billet@ird.fr
- Peter van der Kamp, WUR, Netherlands: peter.vanderkamp@wur.nl
- David Currie, Marine Institute, Ireland: David.Currie@Marine.ie

The more lose RDB data analysis group (see Liaison Meeting report 2016 section 2.5), also called the RCG Data group (SCRDB 2016 report section 10), is supporting the core group regarding the new exchange format.

Below is the timeline for the RDB Project Expert Group/core group and the RDB data analysis group, which in this case regarding the exchange format is work as a support group for the RDB Project Expert Group/core group.

	RDB Project Expert Group/ core group (under SCRDB)	**RDB data analysis group/RCG Data group (under RCG)**
Start Dec. 2016	Established 1st Dec. 2016.	5th Dec. 2016 voluntary task: Try to populate the new RDB exchange format with sample data. Deadline: 28th Feb. 2017
Start Feb. 2017	2nd Feb. 2017. Task: Write the requirement specification document. Deadline: 14th Mar. 2017	
End Feb. 2017	Take the feedback from RDB data analysis group into account when writing the requirement specification document	Report feedback to the core group. (If not completed, it could be taken up at a later point, maybe after summer)
14th Mar. 2017	Requirement specification document send to ICES RDB development project manager	

2.3.3.1 User security

Data policy document is available, but amendments are foreseen for e.g. taking account of regions and distinction of detailed and aggregated data for data access and use. The current data policy document is specifying the security and access rights for the current and future ICES RDB.

2.3.3.2 Exchange format

The latest version of the RDB exchange format is the one used for the fishPi project. This version of the exchange format needs to be tested, and cannot be, as such, be used to start the development of the ICES RDB.

In October 2016, the RCMs asked for different expert groups to be set up as part of the RCG networks. The Liaison Meeting endorsed this demand and recommended the setup of a 'data analysis expert group' (recommendation LM-4). In order to address this recommendation before the legal status of RCG is voted (recast of the 199/2008), an informal group of experts was formed in November 2016 and consists of 24 individuals from 13 countries with skills in R. In December 2016, the SC-RDB came up with a plan to review the data exchange format and channelled this request through the "data analysis expert group". A core group of experts was further established to draft an RDB requirement specification document, part of which includes the data model and associated exchange format.

There is a request by ICES to have a revised version of the exchange format by mid-March to start the development of the RDB.

PGDATA chairs will send a message to the RCM data analysis group, SC-RDB core group and all members of PGDATA to recall the need to test the EF before the end of February 2017. The current version of the EF will be attached to the e-mail, in order to forward it to national experts in IT systems, sampling designs and estimation for comments and proposals of modifications.

The core group has been given the task of gathering all the returns and finalise a version enabling to start the development of the ICES RDB. This version will have the possibility to further evolve, at time intervals, during the development phase of the RDB.

2.4 Review the outcome of WKCOSTBEN 2016 and the ICES 2016 theme session O ("when is enough, enough?) and identify the tasks, skills and related Terms of Reference needed for future development of WKCOSTBEN in 2017 and 2018 (ToR 1e).

At PGDATA it was not possible for the group to review the outcomes of WKCOSTBEN 2016 as the report had not been finalised prior to the meeting. There was a plenary discussion on identifying the tasks, skills and related ToR's for WKCOSTBEN2 and how best to proceed with the planning of the workshop. The outcome of the discussion was an agreement that cost issues will be better addressed after a workshop on the optimisation of biological sampling and this is referred to in the section below on "Future work". The group spent time discussing the WGCATCH 2016 proposal for realization in 2017 of WKBIOPTIM (Workshop on Optimization of Biological Sampling at Sample Level) with minor changes being agreed on by the group. The final proposal has been sent to ICES and is awaiting approval from ACOM and SCICOM. The revised ToRs are outlined here:

Proposal:

The **Workshop on Optimization of Biological Sampling at Sample Level (WKBIOPTIM),** chaired by Ana Cláudia Fernandes (Portugal) and Julie Coad Davies (Denmark) will meet in Lisbon, Portugal from the 20–22 of June 2017, to:

a) Discuss indicators of the quality of biological parameter estimates obtained at both sample-level and national level that can be used in communicating the need and effects of statistical optimization of sampling to end-users (e.g. effective sample size; variability in mean length, variability in age frequency, number of modes in distributions, between-trip variability in length and biological data, etc.);

b) Carry out hands-on simulation work using R code for statistical optimization of biological samples based on the RDB exchange format (CS, CL, CE tables) and sampling strategy used to obtain the data. The R-scripts should be of general use and applicable to samples from different commercial catch sampling programmes. Different sampling strategies will be considered (e.g. simple random of individuals from a sample, one-stage cluster sampling, two-stage stratified random cluster sampling, etc.);

c) Develop an R tool-box that can be used by national labs to quantify the effects of different sampling intensities and sampling designs and support discussions on the advantages and disadvantages of

different sampling strategies in terms of cost and time-savings involved;

d) Identify a road map for the discussion with end-users of optimization perspectives and discuss the publication of results in scientific literature.

Pre-WK work on scripts and quality indicators will be required.

WKBIOPTIM will report by DD MMM to the attention of ACOM and SCICOM.

Supporting Information

Priority	**This workshop is considered to have a high priority for already established and new commercial fishery and survey sampling programmes developed under the MAUP. The expectation is that the time and costs that will be saved by the development and implementation of the R-toolbox will be fundamental to increase data provision on data-limited stocks and environmental variables.**
Scientific justification	The new EU-MAUP increasingly relies on multi-purpose statistically sound catch sampling programmes able to meet the needs of various end-users (COM IMPL DEC 2016/1701). One important component of the ability of multipurpuse sampling schemes to meet end-user needs is that sampling effort is optimized and fit for purpose, i.e. that time and costs spent on sampling are effectively justified in terms of quality of the information they provide to end-users. Increasing requests to determine MSY reference points for previously not assessed stocks, including many data-limited stocks, and, at the same time, to collect additional information (e.g. bycatch information during at-sea sampling), make optimization of the number of length measurements, age and maturity estimation a priority since these tasks involve costs and time that could alternatively be spent in data collection of other stocks and variables. Economy-related fluctuations in the budgets available for sampling in some ICES countries also endanger data collection and further emphasise the need to secure national labs spent time and funds where they are are most needed. Several ICES EGs, including e.g. WKPRECISE 2009, PGCCDBS 2012, PGDATA 2015 and WKCOSTBEN (in publication), have pointed out that clustering effects in multistage catch sampling programmes may lead to effective sample sizes much lower than the number of units sampled. The reason is that, e.g. fish caught during one trip or haul often have more similar characteristics then the general population of fish they came from. This effect highlights the likely existence of oversampling in the lower stages of many national catch sampling programmes (e.g. trips, hauls within trips, samples within hauls), where an excessive number of individuals may be being sampled and not accruding significant additional information to estimates provided to end-users. The WK will produce and test a set of simple R-scripts that produce a range of simple statistical and graphical ouputs and can be used to identify appropriate sampling levels for biological samples of different stocks that meet end-user needs. To facilitate widespread use and discussion of sampling intensity and design issues the R scripts will be grouped in a ready to use and well documented R package that runs on the now commonly available RDB exchange format. Evaluation of the effects of statistical optimization requires the identification of indicators that characterize the main properties of the samples in terms of the information obtained on length, age, sex and maturity (**ToR a**). Statistical optimization is carried out with R-scripts that simulate the effects of different sample strategies (**ToR b**). To ensure exchange of R code and future developments, the RDB exchange format will be used. The final output from the WK will

	be an R-package that can be used by national labs to quantify the effects of different sampling intensities and strategies and support national and international discussions on the advantages and disadvantages of different options in terms of cost and time-savings involved (**ToR c**). A roadmap for future discussions with end-users of optimization perspectives and the possibility of publishing the results in a peer-reviewed journal will also be discussed (**ToR d**). Main results will be brought to further discussion in WGCATCH and PGDATA.
Resource requirements	The data collection programmes which provide the main input to this group are already underway, and resources are already committed. All EU countries have already available the datasets in the RDB format required for analysis. The additional resource required is limited to the preparation of R-scripts, selection of case-studies, and attendance at the workshop. Participants are requested to bring to the WK, national examples of CS, CL and CE tables they wish to analyse during the WK (e.g. their 2015 upload to RDB).
Participants	WK should be composed of participants involved in the annual planning of fieldwork and laboratory analysis, including e.g. number of trips to be sampled and fish to be measured and aged/sexed. In view of its relevance to the data collection within ICES, the EU-MAUP and regional sampling designs, the Workshop is expected to attract wide interest from those involved in WGCATCH and WGBIOP. Members of survey groups located under SSGIEOM and national staff responsible for planning protocols for biological sampling are also among the potential participants.
Secretariat facilities	Some secretarial support will be needed. The WK should take place in 2017. Therefore it will need to be approved by ACOM and SCICOM early in 2017.
Financial	Member States may fund this through their EMFF programme..
Linkages to advisory committees	ACOM and SCICOM
Linkages to other committees or groups	WGCATCH, WGBIOP, PGDATA, SSGIEOM
Linkages to other organizations	RCGs

WKBIOPTIM aims to look at ways in which sampling effort of commercial catches can be optimized so that the time and money spent on sampling can be effectively justified in terms of providing quality information to end-users. The aim is to develop an R tool-box which can be used by national labs to quantify the effects of different sampling intensities and sampling designs, and support discussions on the advantages and dis-advantages of different sampling strategies in terms of time and cost savings involved. The workshop will be structured around results from hands-on simulation work using R code for statistical optimization of biological samples from different commercial catch sampling programmes. The code will be developed in the preparation of the workshop and its application to case-studies will lead to discussions on quality indicators of the biological parameter estimates (e.g. length, age, sex and maturity) that can be used in communicating the need and effects of such optimization procedures to end-users. Finally, a roadmap for future discussions with end-users will be drafted and the publication of results will be considered.

At PGDATA a mind map was constructed which will ultimately be used to develop the WKBIOPTIM toolbox to be tested at the workshop (Figure 2.4.1). In developing the toolbox the group will first work at sample level and develop code that allows the

evaluation of the effects of different sampling alternatives (e.g. different sample sizes, different sampling strategies) in the estimates of biological parameters obtained from the samples. Following this it will be possible to test an array of scenarios at national level where the group will look at the effects of reducing the number of trips and the corresponding sample sizes comparing the results against the present estimates. The figure also outlines the estimates to be produced under the different simulations. The variability in the biological parameters obtained from the various simulations will be presented and analysed via simple graphs, designed to quickly convey the consequences of any changes to end-users. The outcomes of the analyses will aid the end-users in deciding how to fulfil their needs in terms of data quality vs. sample size and sampling strategy.

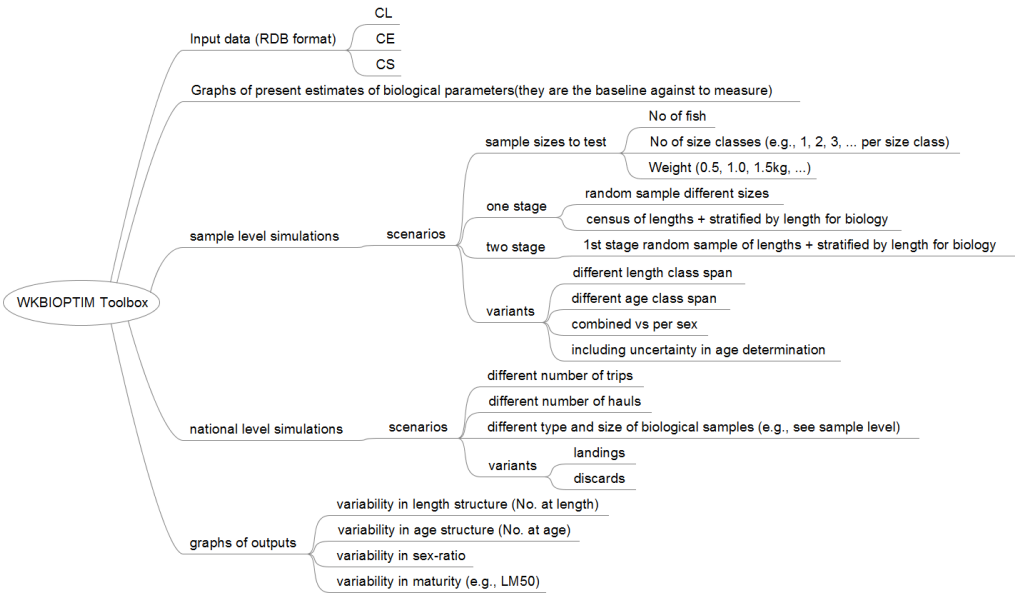


Figure 2.4.1. A description of the WKBIOPTIM toolbox

Future work

The need for a cost benefit framework is highlighted in the ICES document on "Implementing the ICES strategic plan 2014–2018" (ICES, August 2014). PGDATA (2016) identified the need for long-term work aimed at addressing the cost–benefit issues of data collection and in 2016, WKCOSTBEN was established with the intention to define a "cost–benefit framework for data collection". WKCOSTBEN identified a range of case-studies where the cost–benefit framework could be tested in the longer term. This development was further addressed at PGDATA 2017 and the group agreed that a multiyear plan should be considered and, in the meanwhile, concrete examples of optimization and cost savings should be pursued that readily demonstrate the utility of the wider framework to end-users. The simulations planned for WKBIOPTIM will aim to support this process and be applied to the cost–benefit framework which is envisioned to be implemented in the next 2-3yrs. After this first WK, a second WKBIOPTIM may be planned where the various costs of sampling collection and processing can be included in the simulations to better demonstrate their results. For this to take place, a template will be developed to outline the different costs and time spent in processing bio-logical samples (WGBIOP) and in collecting data from trips, hauls, auctions etc. (WGCATCH), considering several scenarios of the sampling procedures. This should be as detailed as possible and should be available for 2018.

2.5 Roadmap for further development of SMARTFISH (ToR 1d)

A follow-up to the initial discussion with WGBIOP and ICES on the potential for the ILVO SmartDots software to replace WebGR as the regional/European system for otolith age reading and possible maturity classification.

2.5.1 Otolith software package

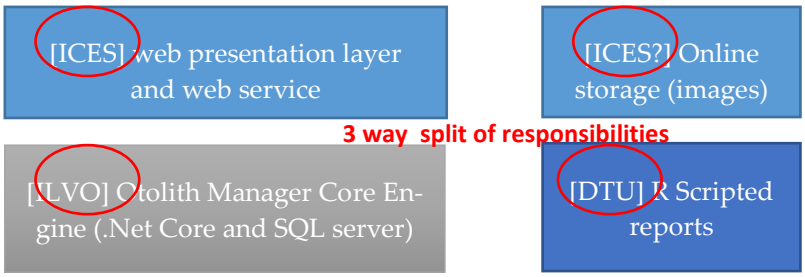
In 2015 ILVO developed OtolithManager as a software tool which supports age-readers. OtolithManager was developed as a fat WinForm Windows client. Annotations are made on otolith images, each dot represents a year and the age is automatically calculated based on the annotated dots. The annotated lines & dots are stored as vectors in a SQL database.

In 2016, OtolithManager was further developed; the core age-reading module remained the same, but with extended functionalities. In the fully developed version, SmartLab & SmartDots, general LIMS functionality was integrated in SmartLab, and SmartDots kept as a separate age reading module. The SmartLab software is developed as a fat WPF Windows client and is built in Microsoft .Net C# 6.0 using SQL Server 2012 as a database server. The Entity Framework is used as object-relational mapper. The user interface is built with the DevExpress WPF library (https://www.devexpress.com/products/net/controls/wpf/).

In February 2017 SmartLab (including SmartDots) will be released internally at ILVO. Following this some extra functionality will be developed for SmartDots (interface, sample metadata, security, etc.) which will make it possible for SmartDots (the age reading module) to be integrated in a web platform provided by ICES.

2.5.2 Architecture, roles, governance and steering

The rough diagram below describes the main components of this new tool and those who are responsible for them. The initial idea would be to keep the core engine and functionality development of the age-reading tool largely with ILVO but inevitably some functionality would be developed by ICES to provide the web platform (interface and web services). Storage of images was not discussed in the meeting, but it seems likely that this would have to be offered centrally as part of the web presentation. DTU Aqua has translated the traditional analysis of age reading exercise results into an R script with some additions; AEM (age error matrix), APE (average percentage error), analysis of growth data, various analyses depending on the number of participants and methods used for reading and standardised reports. An inventory is needed on what the R-script requires to improve the data quality in term of statistics but it is envisioned that standardised reporting will be an integrated feature of the new tool.



In cooperation, ILVO, ICES and DTU Aqua (the development team) would be responsible for the operational governance while WGBIOP (or a subgroup) would be responsible for identifying user needs and prioritising development wishes to be brought forward to the development team. A number of countries represented at WGBIOP have expressed interest. The aim is to test the SmartDots module as an age calibration tool which can be used by the age reading community at the WGBIOP meeting in October 2017.

With the proposed split of responsibilities above, it would be necessary to use an open project/code development system such as Github for planning and mapping. It is envisaged that the DTU Aqua R Scripts for analysis and reporting could be housed here.

In March, a 2 day 'hands on workshop' will be organized at ILVO, with ICES and DTU-Aqua to determine the priorities and an action plan to achieve the objective for having a full test possible at WGBIOP2017. Every 6 weeks, a WebEx meeting will be set up by ICES with the 'steering' group to evaluate the progress being made and where discussions will include unforeseen problems and how to tackle these.

2.5.3 Funding and Resources

Short term (2017)

The development team would rely on existing resources initially; this would slow the pace of development but would allow a manageable development where a proof of concept of the regional system would be the outcome.

Longer term (2018 onwards)

With the outlook of providing a European system– there is a very good case to put together a study proposal under the EMFF, spanning the northern and southern region; it would be a strong proposal if GFCM were also engaged and supporting the proposal.

2.5.4 Ownership and Licencing & Data Policy

Generally, it is thought the template developed for the licencing between DTU and ICES for the RDB (FishFrame) would be a good starting point. This gave ICES rights to use the software (and develop), and DTU retained rights on the distribution of the software beyond its use at ICES. Likewise, any developments performed by other parties would be made available to ILVO. The nature of this arrangement would be slightly different from the RDB as development in this case will be shared between ICES and ILVO.

It is believed that the general ICES Data policy, which is open in nature, would be sufficient to cover the information in SmartDots. However, it would be necessary to check with the institutes that there are no specific copyright restrictions for the otolith images.

2.6 Review the outcomes of the fishPi project to propose a quality control framework for all data provided to assessment working groups (ToR 1f)

A work package of the fishPi project was dedicated to data quality control. The objectives of the WP were to develop guidelines to evaluate the quality of data at national and regional levels using shared tools and to agree on timetables for the implementation on annual quality checks. The Guidelines on the use of the quality checks functions were structured as follows:

- Verification of the data structure. Import csv files into csPi structure with integrity control of the tables, and check every field against reference tables and agreed list of entries.
- Verification of the consistency of the information populated into the database, e.g. identification of trips without fishing operations, missing sampled weight, …
- Advanced data checks. Smart outlier detection of outliers in the numerical fields, identification of errors in fishing operation positioning
- Exploratory data analysis. Production of maps, figures and reports, adapted from the COST library exploratory analyses functions.

The source code of all the functions is available on a free access website (https://github.com/ldbk/fishPifct), and it is possible to compile a library directly from the website. Discussion in PGDATA were on the potential use of the library in the ICES RDB, acknowledging the fact that an RDB must internally develop input controls with the risk of inconsistencies between the two control tools (the internal and the external).

The solution lies on the reference excel table controlling both the table structure and the fields code lists and their control rules. This unique table, support of the R library may also be support of the RDB internal control rules. Using the same references would enable the use of the R library at national level to test and make ad hoc corrections before uploading to the RDB. Links to the R library could also be embedded in the RDB in order to run the most advanced quality checks and exploratory functions on the international datasets.

2.7 Benefits of a Regional Data Base

The new RDB (see section 2.3.3), well documented in the Steering Committee on RDB (SC-RDB 2016) is essential to the plan of improving and tracing all input data to stock assessment models, will start soon, based on a Data Exchange Format (DEF). This DEF is an extension of the FishFrame/COST DEF to accommodate for new statistical development in the raising procedures, as proposed by the Steering Committee on RDB (SC-RDB 2014) and used in the fishPi project (MARE/2014/19 project).

The proposed DEF is bound to evolve with time, but would need to be checked thoroughly in order to kick-start ICES development, planned mid-March. This means that a short window of opportunity is given to us to modify the DEF and ensure that it meets international standards for DEF and is consistent with the data stored in national institutes. In PGDATA we thought that the best means to test the DEF was to **try to export your national data into this format and comment back to us, before the 3rd of March.** A group of experts will then compile all your comments for proposing an amended DEF to ICES.

3 Advise on objective methods for improving the data flows and communications between end-users and da-ta collection, with the aim of proposing an effective use of survey resources (ToR 2)

3.1 Review and suggest a generic template for the ICES data calls, including information on quality and possible scientific surveys (ToR 2a).

The group revised the 2017 ICES EWG data call for and provided feedback to ensure that the content is clear from the data submitters' perspective. The 2017 ICES data call contains the general data call from expert groups NWWG, WGBFAS, WGBIE, WGCSE, WGDEEP, WGHANSA, WGMIXFISH-ADVICE, WGNSSK and WGWIDE, furthermore, the PROXI data call for assessment and advisory purposes for category 3 and 4 stocks that are scheduled to have update assessments and advice in 2017 was included.

The data call consists on a text file providing guidelines and information for data submitters, and an excel file (Annex 1) providing a list of on species and stocks, for which data should be submitted, together with the information on the area descriptions and Working Group (WG) chairs' contact details.

PGDATA participants found the revising exercise very useful. Data calls have historically been elaborated between the ICES secretary and stock assessment groups, but the data calls have not been revised or committed on by data submitters. This has led to a number of inconsistencies and misunderstandings in the data uploaded for different stocks, which provokes inconsistencies and errors in the data submitted, and increases the work load of data submitters for no reason. Furthermore, additional information on how data are used in InterCatch (IC) has been included in the data call, to avoid that data submitter by mistake are uploading information twice.

PGDATA recommends that data calls are routinely revised by a group of experts including data submitters. A suggestion is made that the revision should be made earlier in the year, January, given the group time to consult with the working groups before the final data call.

The 2017 ICES data call includes survey data for the first time, which was seen as an improvement by PGDATA participants. Data on recreational fisheries are requested in the data call text, and PGDATA suggested including them in the Annex 1 with specifications of the stocks and the type of data requested. Some general tiding up and minor corrections were suggested through the text, in an attempt to make it clearer for data submitters and to avoid many repetitions. Two main issues were discussed:

3.1.1 Sample information on data quality

At present, the variables NumSamplesLngt, NumLngtMeas, NumSamplesAge, NumAgeMeas in the IC format are defined to inform about the number of sampling events and the number of fish sampled for length and for age. These fields are relevant when age or length data are imported as they may provide information on the quantity and quality of the data submitted. However, they are not mandatory and only a few institutes are presently providing the information. In addition, the units of the sampling events are not specified in the IC file, and therefore the information provided can be very different between institutes; number of harbour-days, trips, vessels, boxes etc. and for the stock coordinator will not know the units each data submitter is using.

PGDATA suggested to include the units in which "NumSamplesLngt" and "NumSamplesAge" are provided to primary sampling units (PSU*), and to ask data submitters to inform on the type of PSU used. The text suggested by the group was the following

The unit of the samples in the record types "NumSamplesLngt" and "NumSamplesAge" of the species data record should be number of primary sample units (vessel, trip, harbour day, etc.). The used unit (the type of PSU) should be given in the InterCatch species information field named "InfoFleet".

3.1.2 Catch category

Due to the landing obligation the field Catch Category was modified last year to adapt data submission to the Landing Obligation, and the categories BMS Landing (B) (bellow minimum reference size) and Logbook Registered Discard (R) were created.

PGDATA realized that there were different interpretations on how to fill in the Catch category in IC format, and that some clarifications were needed to avoid double counting and ensure that the best data are provided for the stock assessment.

Due to the landing obligation observers often changes the way they sample the different catch fractions on board, and the landing obligation may also have an increased the observer effect. For the BMS Landings and Logbook Registered Discard this information is additionally provided as census information in the logbooks. This information can therefore be obtained from both the logbooks or from observer programs.

In order to clarify this issue, PGDATA decided to use a combination of the fields CATON and OffLanding and suggested some text with guidelines on how to fill in these fields. The group also provided examples corresponding to three real cases showing different sampling situations and how IC format should be completed. The suggested text for the data call was the following:

In InterCatch only "CATON" is used to derive the total catch used for stock assessment. The values for the different categories in the OffLandings fields are only informative and will not be used in the catch estimate.

Only use the Reporting Category R, in case there are black landings please use Reporting Category N for Non-reported.

3.1.3 Landing, 'L'

The 'Landing' catch category in InterCatch will cover the landing as it has done previously and it will apply to landings above minimum size.

3.1.4 Discard, 'D'

The 'Discard' catch category in InterCatch will cover the discard as it has done previously and will continue to be used. This is the part of the catch, which is thrown overboard into the sea and not registered in the logbook. This is based on fishery observer estimations.

This component will be in the CATON field and in the OffLandings field a 0(zero) will be added.

3.1.5 BMS Landing, 'B' (new)

Relevant for stocks under landing obligation. The BMS landing will consist of fish Below Minimum Size, BMS, and damaged fish as registered in the logbook.

This component will be added to the OffLandings as reported in the logbook. If the discard catch category includes the BMS category a 0 (zero) should be added to the CATON. Otherwise, your best estimate should be added to the CATON.

3.1.6 Logbook Registered Discard, 'R' (new)

Relevant for stocks under landing obligation. Logbook registered discard are discards, which are registered in the logbook and are under the exemption rules (e.g. de minimis). Damaged fish can also be included under this Logbook registered discard.

This component will be added to the OffLandings as reported in the logbook. A 0 (zero) has to be added to the CATON because this already included in the discard estimates (10.2).

Examples on how three different countries would fill out the data call on landings, discards, BMS and registered discard is provided;

Table 3.1. Example from the Danish cod landings under landing obligation.

The species information (SI) record in InterCatch – landing obligation Danish example - made up figures							Comments
Record number	10	11	12	13	19	20	
Field code	Species	Stock	Catch Category	Reporting Category	CATON	OffLandings	
	COD	NA	L	R	7100	7000	CATON equal to the official landings multiplied with a constant based on the difference between the 'claimed' box weight and the sampled weight.
	COD	NA	D	R	1300	0	Denmark do not see any observer effect in respect to the discard/ BMS fraction, so the discard estimate is an estimate of the discard and do not include the BMS
	COD	NA	B	R	0.1	0.1	The BMS from the logbooks in both columns, see above
	COD	NA	R	R	0	0.2	

3.2 Advise on objective methods for evaluating requests by end-users for new or amended data collections within the new DCF/DC-MAP, by making use of efficient and effective use of survey resources (ToR 2b.)

Under the new EU MAP (Commission implementing decision (EU) 2016/1251 of 12 July 2016) data requirements section (Chapter III) point 3 **"Data to assess the impact of Union fisheries on marine ecosystems in Union waters and outside Union waters"**, data to be collected is defined. This includes, data on Protected, Endangered and Threatened Species (PETS) and predator- prey relationship and natural mortality in each marine region. These are new variables to be collected comparing with the previous DCF (Council Regulation (EC) No 199/2008).

fishPi project (MARE 2014/19) under its WP3 **"Regional sampling programmes for fisheries and ecosystem impact data not currently collected",** covered the collection of these new variables, based in regional sampling programmes. In addition to PETS and predator–prey data collection (considered under the project as "stomach content" data collection), small-scale and recreational fisheries data collection was considered too. The reason for including these fisheries is because due to the difficulties found in monitoring and surveying, their coverage and data quality is still quite poor comparing with the rest of commercial fisheries (i.e. large-scale fisheries).

Summary of the work done

PETS and stomach content data collection was not well covered under the previous DCF as the collection of these variables wasn´t mandatory. fishPi WP3 focused on how future regional programmes should be carried out to collect these variables included in the new EU MAP. A regional sampling programme was described and the work to be carried out in the different stages analysed. Regional Coordination Groups (RCGs), experts in fisheries monitoring and end-users coordination and role was discussed too.

In the case of small-scale and recreational fisheries (SSF/RFS), fishPi focused on the current state of knowledge of SSF and RFS in Europe, the drivers and end-users of data from these fisheries, the sampling methods that can be used, and how national sampling programmes could be coordinated regionally.

Main conclusions

1) PETS

Nowadays, data availability on PETS bycatch data are quite scarce, not standardized and not included in a specific database that could be used for the design of regional sampling programmes. At present, the main sources of data available from PETS come from the previous DCF and Council Regulation (EC) No.812/2004.

Although there is a wish to monitor a broad range of species, covering several taxa, an overarching design that adequately covers all taxa within the new EU MAP is not realistic. When incorporating monitoring of PETS in the new DCF/ DC MAP, the emphasis should therefore be on improving on board sampling protocols to ensure PETS bycatches are captured within the data recording system and to alter downstream data handling systems to ensure bycatch records of PETS are easily accessed by end-users.

One approach to help address some of these issues maybe to use data collected under the DCF or other sources to help identify "hot spots", such as areas, seasons or métiers with relatively high bycatch rates of PETS. Based on initial assessments of the data at this larger scale, relevant Member States or RCG's may then need to carry out more

focused surveys to fully assess the scale and patterns of PETS bycatch in specific fisheries. This approach would require Member States or RCG's to identify additional fisheries and/or species requiring sampling.

A combination of scientific observers at sea programmes and Remote Electronic Monitoring (REM) methodologies will be probably the best approach when directed PETS bycatch monitoring is needed as cost-effective and optimized sampling programmes.

2) Stomach contents

Some Member States already collect diet information, but it is not a general practice and in the majority of the cases the sampling is not coordinated at a regional scale and the information obtained is not available for the scientific community.

There is also considerable historic data mostly from pelagic and demersal commercial species that could be integrated in common regional datasets to feed existing models and understanding long-term community interactions within each ecosystem.

Defining a sampling plan using a single stock has no added-value as it does not provide enough information to move towards the Ecosystem Approach to Fisheries (EAF) with sufficient, statistically-sound samples of all the key species needed for foodweb characterization. The most effective sampling scheme is hostage of specific user needs and highly dependent on the species considered. These should be agreed between the MS scientific community based on some general principles. Many of the sampling guidelines suggested highly benefit from an opportunistic sampling in internationally coordinated surveys inside the DCF and add on fish diet sampling to minimize direct costs, providing comprehensive and comparable diet description on a regional basis.

3) Small-scale and Recreational Fisheries

An unambiguous definition of SSF would help with managing the sector and implementing targeted policies. The fishPi project agrees with the 2013 DCF (Nantes) workshop that SSF should refer to <10m (LOA) vessels, for which there is no Control Regulation requirement to submit EU logbooks, and to a separate 10-12m category which is excluded from the VMS regulation. fishPi also noted that many countries have exemptions from VMS regulations for some vessels of 12-15m LOA.

The types of data needed from SSF and RFS should be defined by end-user needs to achieve Common Fisheries Policy goals as well as to support national inshore management. Marine Spatial Planning and the Marine Strategy Framework Directive also define the types and resolution of data to be collected. Data on structure, activities and catches of the fisheries are also needed to help design effective and enforceable control measures and to monitor the outcomes.

Where census data are not available for SSF or RFS, surveys are needed to estimate catches, effort, or other information needed for stock assessment and fishery management. The surveys normally involve two stages: first, a survey to describe and quantify the total population of vessels or fishers, and secondly, selection of a representative sample of the population to collect more detailed data on catches, effort, gears used and other information needed. The survey design depends on what data are already avail-able, such as the existence of vessel registers or lists of recreational license holders.

A diverse range of survey methods are possible and are described in this report. Essential requirements for each national survey are: i) a fully documented, statistically-sound survey design and analysis aligned with end-user needs; ii) a quality assurance

procedure to ensure that survey protocols are followed and that archived data are quality-controlled; iii) full documentation of issues arising during implementation, such as non-responses or incomplete coverage, to allow evaluation of potential for bias; and iv) provision of quality indicators needed by end-users.

The range of survey designs for RFS is wider than for SSF, for example including nationwide population screening surveys, and the collection of catch data using off-site surveys (e.g. catch diaries) or on-site surveys (intercept and roving-creel surveys). The appropriate design of a sampling program for recreational or small-scale fisheries in a region does not necessarily have to be completely harmonized between countries. The most important attribute is that surveys have robust statistical designs to minimise bias and allow correct calculation of precision. Catch estimates from different surveys can then be reliably combined.

Future needs

Regional coordination of the three programmes covered under fishPi WP3 (PETS, stomach content and SSF/RFS) will improve the quality and cost-effectiveness of the new data to be collected under the new EU MAP. Coordination should involve the lead scientists for the surveys in each country in liaison with the Regional Coordination Group and ICES Working Groups on fishery data collection.

In the case of PETS, on-board sampling coverage and protocols should be adapted to cover those areas, seasons or métiers with relatively high bycatch rates of PETS.

In the case of stomach contents data, synergies between a stomach collection protocol and the monitoring of human pressures and impacts under the Marine Strategy Framework Directive (MSFD descriptors, D1, D4 and D10), and surveillance of marine biotoxins should be considered. This valuable additional information could be analysed at very little additional cost but relevant in many areas of scientific knowledge and with significant added value for the fishing industry, economies and human health.

In the case of SSF/RF, this will require knowledge of what fraction of the total regional harvests of each stock is attributable to SSF and RFS in each country, considering catches of all species subject to assessment and management in a region. In most cases, surveys can collect multispecies catch data with relatively little extra effort, but regional RFS catch estimates are currently available for very few species.

As a first step to regional coordination data collection programmes for the variables covered (PETS, Stomach content and SSF/RFS), substantial work needs to be carried out between main end-users (i.e. ICES), data collectors and experts in sampling, under the umbrella of the RCGs, to: i) identify priorities on data needs and criteria (i.e. for shared international stocks in the case of SSF/RF); ii) identify additional national requirements for data to support national inshore management schemes, and find a trade-off be-tween regional and national needs; iii) identify appropriate data collection methods for each country taking into account cost/benefits analysis and practical implementation considerations; and iv) develop standardized guidelines and protocols. This work will lead into a second phase of development to design a regional data collection programme to cover needs identified in the first phase. This should be fully documented and submitted by the RCG for peer review by experts in survey design. The process outlined implies considerable intersessional work between end-users (i.e. ICES) and data providers, led by RCGs, and for which some funding and resources will be need-ed. Expertise and training is needed on data collection and analysis methods and sharing of expertise and skills across countries.

The potential for a diverse range of survey methods for RFS in a region means that the concept of a regional database for recreational fishery data may not be easily achievable. A principal focus in the short term should be to ensure that data from national surveys are properly archived and quality assured and that the surveys are fully documented and transparent for each country contributing to a regionally coordinated recreational survey programme. This would be a prerequisite to consideration of any regional database structures that could accommodate such diverse data.

In the case of PETS and Stomach content data, common databases (RDB, DATRAS) should be the preferred selection to upload these data. A lot of work has been done during the last years to standardize formats, protocols to upload this data into this databases.

3.3 Review the outcomes on methodological procedures and quality estimates from all ICES technical workshops and working groups (i.e. WGBIOP, WGCATCH, WGRFS, WGFTFB, WGELECTRA, WGISDAA, WGISUR) and advise on ways forward (ToR 1d).

3.3.1 WGCATCH

The main goal of WGCATCH is to ensure the quality of commercial catch data used by ICES focusing on the science behind data collection and estimation

- Documenting national fishery sampling schemes,
- Establishing best practice and guidelines for sampling and estimation
- Advising on the uses of commercial fishery data and developing indicators of fishery data quality for different end-users
- Promoting training courses and workshops

WGCATCH also evaluates how new data collection regulations and management measures alter the way fishery data needs to be collected and estimated, and advises on how to deal with biases and disruptions induced in time-series of commercial data.

WGCATCH actively promotes and advises on exchange formats and the RDB development: accurate estimates require good data but also good data storage, capability of exchanging that data and estimation methods that follow from the sampling design.

Commercial catch or landings per unit effort indices (CPUE/LPUE): The derivation of commercial CPUE/LPUE dataseries in the ICES community generally does not follow best practice. In many cases the dataseries are used as relative abundance indices to inform stock assessment and advice without standardisation to remove, as far as possible, temporal and spatial variation due to factors other than fish abundance. Additionally, procedures used to derive CPUE/LPUE indices are often poorly documented in ICES stock annexes and working documents. WGCATCH developed guidelines on what should be documented and considered when commercial fishery CPUE/LPUE indices are developed and used in stock assessment. A workshop on standardisation of CPUE/LPUE is proposed.

Documentation of national sampling designs: WGCATCH reviewed the new EU-MAUP tables on sampling of commercial catches to examine if they provided statistical indicators and descriptions that allowed WGCATCH to assess the statistical merits of sampling programmes and maintain routine documentation of sampling schemes. WGCATCH found that **while significant progress has been made towards documenting the sampling designs, some modifications will be necessary for them to be useful for routine documentation of sampling designs for WGCATCH purposes.**

STECF FDI datacall: The participation of an element from JRC at the WGCATCH meeting provided an opportunity to communicate some concerns of the group with the use of the data held by JRC as a result of the 'Fishery Dependent Information' (FDI) data calls (formerly 'effort' data calls) issued by the Commission's Scientific, Technical and Economic Committee on Fisheries (STECF). **The outcome of this discussion was a new data format for the data call which accounts for the limited resolution of sampling data.**

Small-Scale Fisheries data: WGCATCH drafted **best practice guidelines for collection of transversal variables and biological data in small-scale fleets.** The usefulness of some new technologies such as remote electronic monitoring by CCTV and vessel position recording by AIS/GPS in monitoring SSF was also evaluated.

Protected Endangered and Threatened Species (PETS): WGCATCH concluded that there is need for joint work with the ICES Working Group on Bycatch of Protected Species (WGBYC) on the design of pilot studies to monitor incidental bycatch which are being planned under the EU MAUP and on estimation of incidental bycatches. **Two joint WGCATCH/WGBYC workshops are proposed: one in 2018 on the design of dedicated sampling schemes on the monitoring of protected species and a second one in 2019 on the estimation of incidental bycatch rates and raising from sampled vessels to fleet level.**

Regional Database (RDB): WGCATCH was requested to provide advice for development of RDB by documenting and approving the estimation methods for incorporation in the RDB. WGCATCH decided **on an intersessional workshop that will test the documentation of sampling designs and estimation methods and attempt to produce InterCatch-type estimates using the RDB format as a starting point.**

Participation in the ICES advisory process: WGCATCH discussed the historical difficulties that expert groups dealing with catch sampling (WGCATCH and other related groups such as the Planning Group on Commercial Catches, Discards and Biological Sampling and the Planning Group on Data Needs for Assessments and Advice) have had to engage with assessment EGs. WGCATCH concluded that **preparing specific working documents on fishery data quality for assessment and/or benchmark meetings could be the most efficient way of increasing participation in the advisory process.** A workshop to develop and test this approach is proposed by WGCATCH.

Landing obligation: The group reviewed the impact of the landing obligation (LO) on sampling and on the quality of stock assessment data. The overall impression is that there is only partial compliance with the requirements. Data collection and estimation under the landing obligation could potentially be very problematic in terms of high refusals (biased estimates), observer effects on sampled trips and missing sampling some components of the landings (under MCRS). WGCATCH (2014) issued several recommendations of best practice in data logging and reporting under the landing obligation and proposed analyses to examine how the implementation of the LO is affecting the sampling programmes and data collection. **MS are advised to adopt them so that losses in data quality provided for assessment during the transition period are minimised.**

Intersessional workshops for 2017: The following workshops and training courses were proposed for 2017:

1) Workshop on Sampling Design and Estimation of Commercial Catches (WKSDECC I),

2) Workshop on Optimization of Biological Sampling at Catch-Sample Level (WKBIOPTIM),

3) Workshop on methods for developing fishery-dependent indices of abundance for use in stock assessments (WKCPUE).

The future of WGCATCH

1) Sustain progress on statistically sound sampling and manage end-user expectations

2) Increase the focus on estimation

3) Collaborate in optimization of sampling in an increasingly multi-purpose con-text

4) A more active role in regionalization

5) Following up and advising on the Landing Obligation and other legislative changes

6) Increasing expertise in the ICES community

7) Increasing support to the ICES structure

8) Strengthening the role of WGCATCH in the ICES advisory process

9) Meeting needs of RDB development

10) Improving sampling and estimation of incidental catches of PETS and other rare species Section adjusted after consultation with WGBYC

11) Small-scale fisheries

12) WGCATCH: a forum for commercial catch issues

3.3.2 WGBIOP

Refers to smartfish (see section 2.5)

3.3.3 WGRFS

The ICES Working Group on Recreational Fishing Surveys (WGRFS) role is to pro- vide recreational fishery data for stock assessment and advice that satisfies the ICES Quality Assurance Framework and requirements of the EU Data Collection Frame- work (DCF). WGRFS addressed Terms of Reference related to documentation and quality evaluation of recreational fishery surveys from the initial survey design through to implementation and analysis, and the compilation of national estimates to give international estimates for stock assessment or other purposes.

The work carried out on these ToRs built on proposals for data quality indicators, and guidelines for best practice in sampling designs and development of data quality scorecards.

Best practice guidelines, terminology associated with recreational fishing and surveys and the questionnaire for the evaluation of the National surveys produced by WGRFS has been provided to PGDATA to include them in a common repository on methodological procedures and data quality issues.

3.3.4 WGFT+FB

No methodological procedure or quality estimates reported, but the WS is an example that works well

3.3.5 WGELECTRA

No methodological procedure or quality estimates reported

3.3.6 WGISDAA

No methodological procedure or quality estimates reported

3.3.7 WGISUR

No methodological procedure or quality estimates reported

3.4 Respond to recommendations and requests for advice addressed to PGDATA from other ICES Expert Groups, RCMs or other bodies (ToR 2e)

PGDATA reviewed all recommendations from WGBIOP, WGCATCH, WGRFS, WGFTFB, WGELECTRA, WGISDAA, WGISUR. No specific recommendation was addressed to PGDATA, although these workshops liaise on many fields to the work of PGDATA, especially on methodological procedures and quality estimates (see section 4.4. for more details).

3.5 Recommendations for STECF/EWG on data quality (ToR 2f)

As the former quality indicator (coefficient of variation, CV) has been removed from the Annual Report template STECF has arranged an expert group to take place the 3-7 of July 2017. STCEF has asked PGDATA to co-chair the expert working group as well as be involved with participants.

The aim of this EWG is to agree on common and adequate quality indicators for all sets of data collected under the DCF (biological, socio-economic, transversal).

The EWG is requested to compile existing knowledge of quality evaluation of data in order to define: (i) type of information that should be in DCF reports (Work Plans, Annual Reports) for end-user needs, like bias, precision, associated uncertainty of data etc.; (ii) minimum requirements for acceptable quality of DCF data; (iii) principles and set of criteria that can be used by the STECF for evaluation of DCF reports; (iii) set of guidelines on quality criteria to be used by Member States when filling in the DCF reports. The EWG is also requested to give an opinion on the role of various bodies (STECF, end-users, RCMs/RCGs, PGECON etc.) in this process

PGDATA promoted the meeting to all participants and the Tors for the meeting was discussed during PGDATA.

4 Provide a summary of the PGDATA 3-year programme and its achievements in relation to its terms of reference (ToR 3)

A self-evaluation summary has been conducted and can be found in Annex 7

4.1 Future of PGDATA (ToR 4)

In order to initiate the reflexion on the future of PGDATA, the group undertook a SWOT analysis to highlight weaknesses and strength and to improve the role of the PGDATA in the future. The table below provides the raw inputs given by each participants.

Strength	Weakness
• Addressed concrete issues, such as ICES data call (2017) • Started to fill voids in steering data collection process • Advise on data collection • Only group where data aresues and data quality can emerge and be addressed	• Diversity of topics to address • Lack of overview from ICES and non-ICES groups • ToRs loosely defined • Original ToRs (benchmark assistance) loosely defined • Work not effective enough • Overlap with WGCATCH mandate • Role not clear • Participants missing from surveys, ecosystem approach • Unclear role for recommendation • Difficult to extract data needs from end-users • Ambiguity in ACOM/SCICOM coordination • No survey issues addressed • Positioning as a strategic or hands-on working group? • Timing of the meeting non optimal
Opportunity	**Threat**
• Promote interaction between data providers and data users • Liaise outputs from technical workshops into a general frame • Continue to steer the development of quality of data and promote best practices • Advise ACOM and SCICOM • Meeting in Copenhagen to get higher profile (ACOM, SCICOM leaders) • Back to back with WGISDAA to address survey issues • Could be turned into a Steering Committee	• Reflecting on issues already addressed in other forum • No prioritization of data collection • Unclear role if to be continued in relation to available expertise and path for recommendations • Address issues from non-ICES world (RCGs, STECF, …) • Who will address the coherence and quality of survey indices

At first sight, the SWOT exercise highlights the difficulty linked to the diverse issues to address, the danger of overlapping with WGCATCH or other expert groups, and the lack of guidance from ICES. PGData are seen as the only group where data aresues and data quality can emerge and be addressed, and work done during the meeting should be more concrete. The initial goal of PGDATA (promote interaction between

data providers and data users) is given as an opportunity, which means that this original goal was not met. In order to get more guidance from ICES, an idea was to organize the meeting at the ICES headquarter, but another idea could be to organize this specific reflection by correspondence. The difficulty to attract expertise from the survey field could be overcome with clarification of roles and objectives of the different groups and by naming a co-chair from the survey world to PGDATA.

5 References

ICES. 2012a. ICES Implementation of Advice for Data-limited Stocks in 2012 in its 2012 Advice. ICES CM 2012/ACOM 68. 83 pp.

ICES. 2012b. Manual for the International Bottom Trawl Surveys. Series of ICES Survey Protocols. SISP 1-IBTS VIII. 68 pp.

ICES. 2013. Report of the Second Workshop of National Age Readings Coordinators (WKNARC2), 13 - 17 May 2013, Horta, Azores. ICES CM 2013/ACOM:52. 65 pp.

ICES. 2014a. Report of the Planning Group on Commercial Catches, Discards and Bio-logical Sampling (PGCCDBS), 17–21 February 2014, Horta (Azores), Portugal. ICES CM 2014 / ACOM: 34. 103 pp.

ICES. 2014b. Implementing the ICES Strategic Plan 2014–2018. Produced by the ICES Secretariat. 70 pp. Available at the ICES website http://www.ices.dk/explore-us/who-we-are/Pages/council.aspx.

ICES. 2014c. Report of the third Workshop on Practical Implementation of Statistical Sound Catch Sampling Programmes, 19-22 November 2013, ICES HQ, Copenhagen, Denmark. ICES CM2013/ACOM:54. 109 pp.

ICES. 2015a. First Interim Report of the Working Group on Working Group on Biological Parameters (WGBIOP), 7-11 September 2015, Malaga, Spain. ICES CM 2015/SSGIEOM:08. 67 pp.

ICES. 2015b. Report of the Working Group on Commercial Catches (WGCATCH), 10-14 November 2014, ICES HQ, Copenhagen, Denmark. ICES CM 2014\ACOM:36. 295pp.

ICES. 2016a. Report of the Working Group on Data Needs for Assessments and Advice (PGDATA), 30 June–3 July 2015, Lysekil, Sweden. 103 pp.

ICES. 2016b. Report of the Working Group for the Celtic Seas Ecoregion (WGCSE), 12– 21 May 2015, Copenhagen, Denmark. ICES CM 2015/ACOM:12. 1432 pp.

ICES. 2018c. ICES Implementation of Advice for Data-limited Stocks in 2012 in its 2012 Advice. ICES CM 2012/ACOM 68. 75 pp.

Annex 1: List of participants

Name	Address	Phone/Fax	E-mail
Joel Vigneau *chair*	Ifremer Port-en-Bessin Station PO Box 32 Avenue du Général De Gaulle 14520 Port-en-Bessin France	+33 2 31 51 56 00	joel.vigneau@ifremer.fr
Laurent Dubroca	Ifremer Port-en-Bessin Station PO Box 32 Avenue du Général De Gaulle 14520 Port-en-Bessin France	+33 2 31 51 56 00	laurent.dubroca@ifremer.fr
José Castro	Insituto Español de Oceanografía Avda. Beiramar, 37 36202 Vigo Spain	+34 986 213107	jose.castro@vi.ieo.es
Nuno Prista	Havsfiskelaboratoriet Institutionen för akvatiska resurser Sveriges lantbruksuniversitet (SLU) Turistgatan 5 453 30 Lysekil Sweden	+46 725 450 676	nuno.prista@slu.se
Marie Storr-Paulsen *chair*	DTU Aqua Jægersborg Allé 1 2920 Charlottenlund Denmark	+45 35 88 34 41	msp@aqua.dtu.dk
Kirsten Håkansson	DTU Aqua Jægersborg Allé 1 2920 Charlottenlund Denmark		kibi@aqua.dtu.dk
Julie Olivia Davies	DTU Aqua Jægersborg Allé 1 2920 Charlottenlund Denmark		joco@aqua.dtu.dk
Els Torreele	ILVO Ankerstraat 1 8400 Oostende Belgium	+32 59569833	els.torreele@ilvo.vlaanderen.be
Lucia Zarauz	AZTI Sukarrieta Txatxarramendi ugartea z/g E-48395 Sukarrieta (Bizkaia) Spain	+34-946029400	lzarauz@azti.es
Estanis Mugerza	AZTI Sukarrieta Txatxarramendi ugartea z/g E-48395 Sukarrieta (Bizkaia) Spain		
Tiit Raid	Estonian Marine Institute, University of Tartu Mäealuse 14, Tallinn EE-12618 Estonia	+372 6718953	tiit.raid@gmail.com
Christoph Stransky	Thünen Institute of Sea Fisheries Palmaille 9 22767 Hamburg Germany	+49 40 38905-228	christoph.stransky@thuenen.de

Name	Address	Phone/Fax	E-mail
Ana-Claudia Fernandes	Portuguese Institute for the Sea and the Atmosphere (IPMA) Avenida de Brasilia 1449-006 Lisbon Portugal	+351 21 302 7132	acfernandes@ipma.pt
Henrik Kjems-Nielsen	ICES H.C. Andersens Boulevard 44-46 1553 Copenhagen V. Denmark		henrikkn@ices.dk
Rui Catarino	ICES H.C. Andersens Boulevard 44-46 1553 Copenhagen V. Denmark		rui.catarino@ices.dk
Perttu Rantanen	Natural Resources Institute Finland - Turku Itäinen Pitkäkatu 3 20520 Turku Finland	+358 295 327 680	Perttu.Rantanen@luke.fi
Maksims Kovsars	Institute of Food Safety Animal Health and Environment (BIOR) 8 Daugavgrivas Str. Fish Resources Research Department Riga 1048 Latvia		Maksims.Kovsars@bior.gov.lv
Edvin Fuglebakk	Institute of Marine Research PO Box 1870 Nordnes 5817 Bergen Norway		edvin.fuglebakk@imr.no

Annex 2: Agenda

Meeting Start: 10:00, Tuesday 7 February 2017

Meeting End: 14:00, Friday 10 February 2017,

Venue: Ifremer, Nantes, France.

Day	Tuesday	Wednesday	Thursday	Friday
09:00-11:00	Welcome participants 10:00 : Introduce ToRs and finalise agenda	Break into sub-groups	Subgroups are presenting the main outputs - a work plan for the report	Review text written.
11:00-11:15	Coffee break			
11:15 – 13:00	**Presentations** WKCATCH (Nuno) Review outputs from technical WS reports (ToR 2e) (Joël) Benchmark data evaluation template (ToR 1a) (Marie) SmartFish (Els/ Julie)	Work in sub group	Drafting of report text	Review text written.
13:00-14:15	Lunch			End of Meeting
14:15 – 16:00	Setting the scene for the sub-groups 1. Data call evaluation (ToR 2b) (Lucia) 2. Data quality (RDB exchange format and raising (Tor 1d, 2f) Kirsten/ ICES and Quality indicators (ToR 1c, 2f) (Joël) 3. Sampling optimisation WKBIOPTIM and CostBen (ToR 1b, 1c) (Julie/Ana/ Laurent) 4. New data collection needs (ToR 2c) Estanis.	Update from sub groups	PGDATA work plan for 2018 and beyond. (ToR 2a)	
16:00 – 16:15	Coffee break			
17:00 – 18:00		Cont. of work in sg	Review text written	

Annex 3: PGDATA suggested terms of reference for the next meeting

The **Planning Group on Data Needs for Assessments and Advice** (PGDATA), chaired by Joel Vigneau, will meet in **in Ifremer Nantes, 13–16 February 2018**, to work on ToRs and generate deliverables as listed in the Table below.

a) Provide a summary of the PGDATA 3–year program and its achievements in relation to its terms of reference.

b) Using the 2016 benchmark data evaluation meeting for the Irish Sea (WKIRISH2) and Kattegat cod (WKBALT) as examples, work with the data and assessment teams to review the benchmark process and modify the guidelines for benchmark data evaluation meetings where required.

c) Provide an overview of discussions within ICES concerning its data strategies and how the future structure and functioning of PGDATA could be adapted to ensure the most effective steering and implementation of these strategies.

d) Review the outcome of WKCOSTBEN 2016 and the ICES 2016 theme session O ("when is enough, enough?) and identify the tasks, skills and related Terms of Reference needed for future development of WKCOSTBEN in 2017 and 2018.

e) Respond to recommendations and requests for advice from other ICES Expert Groups, RCMs or other bodies.

Annex 4 Updated guidelines for the ICES benchmark data evaluation process

Based on the PGDATA 2015 report, Annex 4, including feedback from WGBFAS & WKIRISH2

a) Stock structure

Explain the basis for existing assumptions on stock structure and mixing rates between stock areas, or proposed new assumptions which form the basis for spatial aggregation of fishery and survey data and/or adjustments to datasets to account for stock mixing.

If no changes are to be made to stock boundaries, or to any procedures to separate fishery or survey catches into stocks within a stock mixing area, provide a brief summary of the current definition in a document for the data evaluation workshop report. This should include a map showing the existing stock boundaries along with brief text explaining the basis for the stock assumption and any methods to quantify stock mixing rates. Provide links to the Stock Annex, previous benchmark data evaluation reports or any other documentation explaining the basis for these assumptions and methods.

If the assessment expert group (EG) has evidence from genetics, tagging or spatial patterns in biological parameters to suggest that the current stock areas or mixing rates may need revision, it should consider involving experts from the ICES Stock Identification Methods Working Group (SIMWG; ICES 2015b and earlier) and the ICES Working Group on Biological Parameters (WGBIOP; ICES 2015c) to help evaluating the evidence.

Prior to any data compilation and evaluation for new stock areas, it must first be determined if the evidence is sufficiently robust and the work to create new datasets and parameters is feasible. Carry out the following tasks, in liaison with the other expert groups being consulted:

- Conduct an initial review and summarise this in a Working Document containing: i) a full explanation of the reasons for reviewing the stock structure or mixing rates; ii) an evaluation of the robustness of the evidence – e.g. the quality and comparability of data on growth, maturity, recruitment patterns, genetic structure, tagging results, morphemetrics and meristics or other population characteristics used as evidence of stock structure; and iii) an evaluation of the feasibility of aggregating or disaggregating catch and survey data and revise biological parameters to reflect the new stock definitions in time for the proposed benchmark data evaluation meeting. Which evidence is needed? What to be proven? Is the null hypothesis that only one stock exists?
- If the evidence is not sufficient to warrant a revision of stock structure, or if it is not possible to develop datasets for revised stock definitions in time for the benchmark assessment, the assessment EG should consult with the ICES Benchmark Steering Group to decide if the benchmark should continue using the existing stock definitions or be postponed until the required information is available.
- If it is decided to revise the stock boundaries and it is possible to complete such work in time for the benchmark data evaluation meeting, provide revised historical landings, catch composition data, abundance indices and biological parameters required according to the new stock boundaries. If the

assessment EG intends to account for mixing rates between stocks by adjusting input data (e.g. plaice stocks in VIId & e), thoroughly review the evidence of mixing rates and provide a plausible range of uncertainty to allow the sensitivity of the assessment and forecast to this to be evaluated. This is also required if mixing rates are to be estimated within a multistock statistical assessment model, to help develop prior distributions of input values.

- If the data can be compiled in time, provide the disaggregated or aggregated datasets for the revised stock definitions together with an evaluation of quality of the datasets. Depending on sampling and survey coverage, expanding or splitting the stock area could lead to truncation of the time-series and changes in the data quality at the stock level depending on the quality of data from the different sampling areas included in the range of the stock.
- In the event of a change in assumed stock structure or methods for quantifying stock mixing, the resultant change in quality of assessment data will also be covered in subsequent sections of the data evaluation report, and the revised input data for the new stock boundaries will be tabulated as an output of the data evaluation meeting.

b) Life-history parameters

Life-history parameters (e.g. growth parameters, maturity ogives, fecundity, natural mortality), for use in the assessments should be analysed. Where applicable, provide appropriate models to describe growth, maturation, and fecundity by age, sex, or length.

Growth, maturity and fecundity; mean weight-at-age, length-at-age

The data evaluation process will address the life-history parameters and specific issues identified by the parent assessment EG for the benchmark data evaluation process. Summarise the findings in a Working Document. If previous benchmark data evaluations of these parameters remain valid, provide references and links together with a summary of the parameter values and their precision if calculated. If a full evaluation is required, document the following aspects of design, interpretation and analysis:

- The sources of the samples (e.g. which trawl surveys or fishery sampling schemes), and the laboratories involved in data collection over time.
- Selectivity characteristics of gears providing samples, where these may lead to biases caused by skewed distributions of size at age.
- Coverage of the sampling in terms of geographic areas and seasons, relative to the known distribution of the population at different life stages, and an evaluation of possible effects of any spatio-temporal mismatch with the stock biology.
- Numbers of independent primary sampling units such as survey trawl hauls or commercial fishing trips with samples for the species, and total numbers of individuals sampled, by year. Gaps in sampling coverage that will affect quality of estimates should be identified.
- How the sampling units were selected (e.g. opportunistic or using a design-based random sampling scheme).
- Methods and criteria for identifying mature fish in samples, with reference to maturity keys, sampling protocols and calibration workshops or studies.

- Results of age validation studies, calibration studies and exchanges to document bias and precision of age estimates, highlighting any persistent differences between laboratories and changes in interpretation of age material over time.
- Description of fecundity estimation methods, if applicable.
- Description of analysis methods including use of statistical models to estimate growth, maturity and fecundity parameters by age, length or sex as appropriate.
- Derived parameter estimates, with diagnostics and evaluation of quality and evidence of stability or trends in parameter values over time.
- Recommended parameters for use in assessments. For statistical age- and length-based assessment models, specific statistics such as standard deviation of length-at-age, CV of ageing errors or age-error matrices, may be required and should be requested by the assessment working group.

c) Natural mortality

Within ICES, decisions on appropriate values for M generally rely on: i) results of multispecies models such as the Stochastic Multispecies Model SMS for the North Sea updated at intervals by the ICES Working Group on Multispecies Assessment Methods (WGSAM), or integrating single-species models with other forms of multispecies or ecosystem models; ii) methods that predict average or age-based natural mortality from life-history parameters such as growth and maturity parameters and maximum observed age; iii) an assumption such as 0.2 used in the absence of other information, or by comparison with similar species. For some data-rich stocks assessed using statistical models, it may be possible to derive some inference on plausible rates of natural mortality based on likelihood profiles over a range of M, or from tagging results included in the model .Are there any places where you can find this literature

Depending on information available, carry out the following tasks:

- Check changes in the ecosystem that can have affected the natural mortality over time (predators such as seal population, predator fish etc.). Evaluate how to use the information to adjust natural mortality by age/ length accordingly.
- If an estimator such as SMS, or another approach using multispecies models, is used by the assessment EG and it is intended to continue with this approach, or if it is proposed to start using M estimates from such a model, provide a reference and link to the latest model update and the values of M by age and year for the stock. Summarize information on the quality of the estimates given in the multispecies assessment report. It is important to consult the expert group providing the multispecies model estimates when preparing the data evaluation, to ensure the correct information is provided for the benchmark stock assessment.
- If life-history methods to infer M are to be proposed, provide the results of a range of plausible models from the literature, proposing a baseline method together with alternatives that could be used for sensitivity testing.
- If estimates of M have previously been derived from an assessment model including tagging, or inferences have been made from likelihood profiles or

other modelling approaches, summarise the findings of the relevant EG report including any information provided by the EG on the quality of the estimates or inferences.

- If there is no existing information, derive a range of plausible values for M for species with generally similar life histories and give supporting arguments.

d) History of fishery management

Describe the history of fishery management regulations and actions that are expected to have caused changes in the quality of fishery catch data or the selectivity patterns of fisheries that are of relevance for the scientific assessment of the stocks and provision of advice.

If there is an existing Stock Annex, this should already provide a history of management measures relevant for the assessment and advice. If this is not sufficiently complete and adequate, it must be reviewed and updated. Carry out the following tasks where appropriate (much of this will be generic to many stocks within a region. See PGDATA (Annex 1 of ICES 2015a) for further information:

- Provide a chronological description of management regulations and actions applied to fleets (rather than those specific to stocks), and the known or expected impacts on data quality and fishery selectivity in general. Include information such as: spatio-temporal closures; gear regulations (mesh size, selective devices, length of nets); direct regulation of fishing effort; decommissioning schemes (including how much of the targeted fleets are removed and the impact on overall fleet capacity) and any other measures having a significant impact on the amount of fishing and selectivity of fishing fleets.
- Provide a chronological description of management regulations both national and international and actions that are specific to the stock being benchmarked. This could include: TACs; individual boat limits; minimum conservation reference size (MCRS); implementation of the landing obligation, etc.
- Provide a chronological description of management regulations or actions that affect the compliance with management measures and the completeness and quality of fishery data supplied to assessment working groups. This may include changes in catch reporting systems such as national Buyers and Sellers regulations, and in vessel monitoring and control.
- For stocks where an understanding of changes in fishery selectivity is needed for the assessment model, document any management regulations or actions that are expected to cause a change in selectivity for the stock being benchmarked, and evaluate the known or likely outcomes.
- For stocks where fishery CPUE or LPUE is to be evaluated for providing abundance indices, identify management regulations or actions that are expected to cause a change in catchability or selectivity of the relevant fleets for the stock being benchmarked.
- Where possible, make use of graphical or tabulated summaries to give a clearer overview of changes over time. Some examples are given in Annex 1 of PGDATA (ICES 2015a).

e) Catch estimates

Develop time-series of commercial and recreational fishery catch estimates, including both retained and discarded catch, with associated measures or indicators of bias and precision.

The guidelines in this section relate to total retained or discarded fishery catch for all types of fishing. Separate data evaluations are needed for catches that are recorded exhaustively (e.g. landings logbooks), and for those estimated through sampling schemes (e.g. discards and recreational catches).

For exhaustively collected data:

- Provide full documentation of the derivation of the catch figures for the time-series available for assessment, and any adjustments made to official statistics. Such adjustments might have been made to allocate landings to the correct fishing ground, adjust for stock mixing, to disaggregate mixed-species landings records using sample data, or make other corrections for misreporting or underreporting. Explain how the adjustments are made.
- Document and explain differences between the landings figures recommended by the data evaluation team and the official statistics
- Evaluate the reliability of catch estimates in terms of historical biases and trends in bias, where evidence of such biases exist.
- Propose catch dataseries which are appropriate for use in a stock assessment. If there are historic data of poor quality, for example due to known or suspected inaccuracies in reporting, provide (if possible) different plausible catch histories that could be used for sensitivity analyses in the benchmark assessment. Consult with stakeholders in drawing up such scenarios.

For data collected non-exhaustively through sampling schemes, the description of the surveys and evaluation of data quality can be complex, requiring detailed examination of survey design and sampling achievement down to the level of sampling strata. Seek assistance from ICES Expert Groups dealing with such surveys well in advance of the data meeting (e.g. ICES Working group on Recreational Fishery Surveys - WGRFS; ICES Working Group on Commercial Catches - WGCATCH) unless members of these groups are part of the benchmark data evaluation team. If necessary, contact the ICES secretariat and the chairs of these EGs to determine a process by which the sampling survey experts may contribute to the documentation and evaluation of catch data from surveys of recreational fisheries or commercial discards and landings. This may require ToRs to be added to the next meeting of these EGs so this needs to be considered well in advance of the benchmark. The following data evaluation tasks will be required:

- Provide an overview of the survey methods adopted, with links or references to detailed scheme descriptions. This covers the design of the schemes, including: definition of the population being sampled; sampling frames and their coverage; primary and lower level sampling units and how they are selected; stratification of the sampling units and reasons for this; other relevant data collected such as recording of non-responses or refusals; and how the data are analysed to provide estimates of total catches.
- Document historical changes in sampling schemes that may indicate changes in data quality (bias and precision) over time. Some examples of how this could be presented are given in Annex 2 of ICES PGDATA (ICES, 2015a), though other formats are possible and full use should be made of

information in the ICES Regional Database or other databases to explore data quality.

- Evaluate the reliability of catch estimates in terms of historical biases and trends in bias, and in terms of precision. Where standard errors or CVs of estimates are provided, document these. Also provide simpler quality indicators such as numbers of primary sampling units sampled. See additional notes in Annex 1 of PGDATA (ICES 2015a) for further details.
- Propose catch dataseries which are appropriate for use in a stock assessment together with data quality indicators to help the stock assessment team to decide which data to use, to weight different dataseries if necessary, and to interpret the diagnostics of assessment models.

With regard to the integrity of the historical discard series, it is necessary to take into account the recent changes in the European fisheries legislation in relation to the Landing Obligation. Since 2015, it has been sequentially applied the obligation to land all catches of certain species. The volume of this non-commercial but compulsory landed catch must be recorded by fishers in the logbooks, so that it can now be known without having to be estimated. This change can produce bias in the historical series that must be perfectly documented and analysed; especially in those stocks whose assessment includes discards time-series.

f) Length and age structure

Estimate the length and age distributions of fishery landings and discards if feasible, with associated measures or indicators of bias and precision.

As with estimation of catches by surveys, the description and evaluation of additional sampling surveys to estimate length and age composition, and evaluation of data quality, can be complex. Include this aspect of data collection with catch estimation when seeking assistance from ICES Expert Groups dealing with such surveys. Assistance from the ICES Working Group on Biological Parameters (WGBIOP) should if needed be sought in relation to quality of age estimates (see guidelines for biological parameters).

With input from the relevant EGs as described above, where appropriate, document the derivation and quality of existing length and age composition data for fisheries, and of any new datasets that have been made available, as follows:

- Using ICES reports on age validation and calibration studies for the stock (see Data Quality Assurance Repository), or any other documentation on precision and bias in age readings: (i) evaluate if age readings are reliable enough for use in an assessment – i.e. sufficiently low bias, and (ii) provide metrics of precision such as CV or an age error matrix that can be incorporated into a statistical stock assessment model. Identify any systematic differences in interpretation of otoliths, scales or other material between laboratories, and any drift over time in age interpretation by national laboratories, where information is available. Seek guidance from the stock assessors on the metrics of bias or precision needed for incorporation in assessment models (see Annex 1 of PGDATA – ICES 2015a - for more information).
- Provide a summary of the historical design of national shore-based and at-sea sampling schemes or any other schemes to estimate length and age com-

positions, and the methods of raising data to give compositions at the national scale. Describe how total catches-at-age are derived from combination of length and age sampling, or from age sampling on its own.

- Tabulate achieved annual sampling rates in terms of numbers of fishing trips sampled for length and age, with supporting information on numbers of fish measured or aged. This should ideally be done by country and sampling stratum in each year together with the estimated annual landings or discards for each stratum. Use these data to identify deficiencies and gaps in sampling.
- Describe how length and age compositions are raised and aggregated within and across countries to give international estimates (e.g. by métier or métier group through InterCatch). Identify if the methods are statistically sound and the sample sizes are sufficient in each stratum to support the degree of resolution being applied, or if there is a substantial amount of subjective "borrowing" of estimates from other countries and métiers especially if done without reference to the quality of borrowed data. Consult with experts from the ICES Working Group on Mixed Fisheries Advice (WGMIXFISH) on their information needs. If necessary, rework the raising and aggregation using more statistically robust methods for comparison with InterCatch results.
- Describe how individual live weights are derived (e.g. direct measurement or from length-weight relationships) and evaluate known or potential errors introduced by this.
- Provide a recommended dataset of length and age compositions for landings, discards (and recreational catches where appropriate), and associated weights at age. If possible, provide estimates of precision (e.g. relative standard error or CV) for the raised international landings and discards at age, and the total discards. Consult the stock assessment team on whether numbers or weights at age should be sums-of-products (SOP) corrected so that the sum of numbers-at-age and weights at age is equivalent to the total catch weight figure input to the assessment.
- Use the information on sampling design, sampling achievements, precision over time and ageing errors to provide advice to the stock assessment team on changes in overall data quality (bias and precision) that will allow an objective decision to be made on whether the data can be used for all or some years, or weighted in an assessment model.
- Evaluate the internal consistency of proposed catch-at-age datasets in terms of consistent tracking of year classes, and identify the most likely sources of poor year-class tracking based on the data quality information available. This will help identify further research or additional sampling needed to improve data quality. Unless otherwise instructed, provide age compositions out to the oldest true age to allow flexibility in setting a plus group. Information on numbers of fish sampled at age each year can be useful statistics to help determine the most appropriate plus group for the assessment.

g) Selectivity

Develop recommendations for addressing fishery selectivity (pattern of catchability at length or age) in the assessment model.

Most age-based or length-based stock assessment models require some assumptions about selectivity, i.e. how catchability varies with size or age in fisheries. Selectivity in this context is a combination of the selectivity properties of fishing gears of different design, and factors influencing the probability of fishing operations encountering fish of different sizes and ages, for example related to distribution of fishing or behaviour patterns of the fish.

Statistical assessment models may involve fitting selectivity patterns of varying complexity (e.g. asymptotic or various types of domed curves) separately to individual fleets or groups of fleets. To help the assessment team decide on appropriate selectivity patterns and any changes over time, carry out the following tasks:

- Examine the spatio-temporal distribution of fisheries relative to the known distribution of fish of different sizes or ages, for example from trawl surveys.
- Review any available information on how the behaviour of different sizes of fish affect their likelihood of interacting with fishing gear at any location.
- Review existing information on selectivity characteristics of the main types of fishing gears used for the assessed stock, based on gear selectivity studies or other published studies.
- Refer to the guidelines for documenting changes in management regulations (Section 3 above) to identify expected changes in selectivity, and consider how changes over time in the contribution of catches by fleets with different selectivity characteristics may have altered the overall selectivity pattern for the combined fisheries.
- A comparison of the fleet-raised length and age compositions for separate fleets can provide information directly on the relative selectivity of the fleets and any historical changes.
- If an assessment is to be explored in which domed selectivity is to be assumed for some fleets, it can be helpful to have one fleet for which selectivity is most likely to be asymptotic and where the catches and input length or age data are sufficient to allow a good fit. If all of the fleets are expected to have domed selectivity, it may be necessary to fix the parameters of the descending limb for a fleet that is likely to have the least pronounced dome, and explore sensitivity of the assessment to different fixed parameters. Advise on which fleets (national or international), are most likely to be asymptotic or have the least pronounced dome, based on the tasks given above.

h) Discard mortality and survival rates

Recommend values for discard mortality rates, where appropriate, and indicate the range of uncertainty in values.

ICES assessment EGs have, for most assessed stocks, assumed that all discards die. The potential for dispensations from the EU landings obligation for species with high discard survival has resulted in a range of studies on the mortality rates of fish and shellfish discarded or released alive from fishing operations. Many recreationally-caught fish are also released alive after capture and have variable survival rate depending on a range of factors such as deep hooking, bleeding and water temperature. There are

numerous published studies on post-release survival of marine species, though relatively few are from Europe. Increasingly, ICES assessment EGs will need estimates or inferences of mortality of discarded or live-released fish caused by the fishing operation.

Carry out the following tasks to provide information on estimated or potential discard mortality:

- Review existing information on discard mortality for the assessed stock, or for similar species in similar fisheries and conditions, following the guidelines provided by the ICES Workshop on Methods for Estimating Discard Survival (WKMEDS: ICES 2015d and previous).
- Where supported by data or comparisons with similar stocks studied elsewhere, recommend discard mortality rates and range of uncertainty. Include thorough rationale for recommended discard mortality rates.
- Provided justification for any recommendations that deviate from the range of discard mortality provided in available research and published literature.

i) Abundance estimates

Review all available and relevant fishery-independent and dependent data sources on fish abundance, and recommend which series are considered adequate and reliable for use in stock assessments

Fishery-independent data

Assessment EGs make extensive use of research surveys to provide absolute estimates of abundance, or more commonly, relative abundance indices, for tuning length or age based stock assessments. In many data-limited assessments, surveys provide the main source of information on stock trends. Survey data may be used as size/age-aggregated indices or as length or age based indices. Some assessment models require the parameters of the selectivity pattern of a survey at length or age to be fixed or estimated, and for indicators of data quality such as CVs or effective sample sizes to be input to the model separately for the total abundance indices and the length or age compositions.

As with survey estimates of fishery catches and catch compositions, the evaluation of fishery-independent survey data can be complex and will require support from expert groups dealing with design and implementation (e.g. International Bottom Trawl Survey Working Group, IBTSWG) and those dealing with interpretation and end-use of survey data (e.g. Working Group on Improving Use of Survey Data in Assessments and Advice, WGISDAA). The appropriate survey EGs must be consulted at the initial stages of the benchmark process (See Figure 1) to identify tasks for providing advice or carrying out the evaluation work needed for the benchmark.

In collaboration with the survey EGs where required, carry out the following tasks to evaluate each fishery-independent dataseries:

- Document main objectives, timing, frequency, spatial coverage, survey sampling design including definition of sampling units, sampling gear, sampling intensity, stratification and methods for allocation of sampling effort to strata, subsampling procedures, and other relevant characteristics. Provide maps of survey coverage in relation to expected species/stock area of occupancy.

- Evaluate the suitability of the survey for providing abundance indices for the species/stocks being assessed given known aspects of fish behaviour, habitat preferences and vertical- horizontal distribution.
- Document changes in survey design, coverage, vessels and gears over time. Evaluate the potential for bias caused by systematic or step-changes in catchability over time due to such changes. Document any calibration factors applied following vessel or gear changes, and any estimates of uncertainty around these.
- Refer to guidelines for biological parameters to evaluate if age or maturity readings are of sufficient quality to derive abundance indices by age and maturity, including any changes in age interpretation or maturity criteria that would compromise integrity of time-series (liaise with WGBIOP where required).
- Describe the analytical methods used for deriving indices of abundance including any disaggregation by sex, maturity, length or age class. Describe any selection methods used in the analysis of the survey data to provider assessment inputs – for example restricting the analysis to spatial subareas (domains) or time of day of observations, or use of any modelling approaches such as GLMs or GAMs.
- For age-based CPUE/LPUE indices, evaluate the internal consistency of age compositions and if more surveys are used the external consistency between surveys.
- Describe the methods for deriving estimates of precision and provide the estimates for each year over the time-series – see Annex 1 of PGDATA 2015a for further details and caveats.
- Review any evidence that may help identify the shape of the selectivity pattern by length or age for the survey, if needed for the assessment. This is a complex function of gear selectivity, distribution of fish of different sizes relative to the survey coverage, and aspects of fish behaviour at a trawl station that affect the probability of fish of different sizes or ages interacting with the gear.
- Tabulate the recommended survey indices and quality indicators for use by the assessment EG.
- Tabulate all other survey data provided and evaluated, but not considered suitable for the assessment.

Fishery dependent data (CPUE/LPUE)

Fishery dependent abundance indices continue to be used for some species, with or without fishery-independent data, and may be the only information available on stock trends for some data-limited stocks. Assessment and advisory groups need to understand the limits imposed by the quality and resolution of such data. See Annex 1 of PGDATA 2015a for more details on the limitations of such data. The ICES Working Group on Fishing Technology and Fish Behaviour (WGFTFB) may be able to provide good advice on the suitability of a fleet for providing abundance indices and on issues such as technology creep, and should be consulted where required.

If fishery-dependent data are to be evaluated, consult the background documents listed in Annex 1 of PGDATA 2015a and carry out the following tasks, collaborating where needed with ICES WGFTFB:

- Document all fishery CPUE/LPUE series, addressing target species, fleet sectors, fishing gears, coverage, and regulatory measures affecting fleet behaviour. Evaluate the suitability of each CPUE/LPUE fleet for the species being assessed, in terms of known aspects of the fisheries and fish behaviour in relation to gear design and fleet coverage.
- If developing a CPUE index including discards, evaluate the quality of the discards data for each year in the series, following the approaches outlined above for developing time-series of fishery discards and landings.
- Define and describe the available effort metrics (e.g. hours, days, trips, number of hooks or nets, horsepower, soaking time, search time or any combinations of these), and evaluate which, if any, of the metrics are appropriate, and why.
- Describe the methods for data selection (e.g. subsetting of fishery trips according to vessel size, time, area, and gear or species composition). Provide maps of coverage of the selected vessels in relation to the entire selected fishery (e.g. VMS).
- Develop fishery CPUE/LPUE indices by appropriate strata (e.g. area, and fishery) and include measures of precision and assessment of bias; rank indices with regard to their suitability for use in assessment modelling. Describe methods of analysis of CPUE/LPUE data including any statistical modelling carried out.
- Evaluate the potential for changes in catchability over time due to changes in vessels, fishing gear and methods, or spatio-temporal activities. Document the methods and rationale for any factors used to correct for changes in fishing efficiency and feasible ranges for time-trends in efficiency.
- For age-based CPUE/LPUE indices, evaluate the internal consistency of age compositions and correlations between fishery dependent CPUE/LPUE series and surveys. Indicate if CPUE/LPUE fleets with age compositions provide a large fraction of the total international catches.
- Where needed for exploring assessment models, evaluate the length or age selectivity of the CPUE/LPUE fleet as described above for fishery length and age compositions. Indicate the extent to which components of the age composition are mainly observed in the fishery dependent CPUE/LPUE and not in the scientific surveys.
- Recommend and tabulate fishery dependent datasets that are appropriate for use in the assessment, together with any quality indicators such as precision estimates or plausible alternative scenarios for catchability trends.

j) Environmental impacts

Longer term or episodic/transient changes in environmental drivers known to influence distribution, growth, recruitment, natural mortality or other aspects of productivity and which are relevant for assessments and forecasts.

There are potential circumstances where the data inputs to an assessment model, or the assumptions in the model, need to take into account environmental drivers. These may be episodic or transient phenomena such as mortality or changes in fish distribution caused by low-oxygen water or lethal temperature events, or longer term trends in environmental conditions. The data evaluation team should source and review existing information and make recommendations on how this information should be used by the assessment team, as described below.

Long-term environmental drivers

Regional integrated ecosystem assessment groups, ecosystem overviews or scoping workshops may have identified environmental time-series that are relevant for an assessment or forecast – for example trends in environmental variables that affect recruitment and could be included as covariates in an assessment or used to modify decisions on recruitment for short-term or medium-term forecasts. Environmental variables may also be related to changes in growth and distribution, or catchability in surveys. Compile any such datasets supplied by regional integrated ecosystem assessment groups etc. and make available to the assessment team together with any specific comments on quality of those data (taking advice from ICES Data Information Group where needed)

Episodic / transient events

Identify any episodic / transient environmental events that have been shown to affect abundance or population dynamics of the stock being assessed, where these need to be accounted for in the assessment model and any associated predictions and advice. Data that could be used by the assessment team for this purpose should be developed if not already supplied by other expert groups (e.g. low oxygen or salinity events, exceptional warm or cold periods)

k) Research status

Review progress on existing recommendations for research to develop and improve the input data and parameters for assessments, and develop and prioritise new proposals.

Provide a review of existing recommendations for research to develop and improve the input data for the assessment, and what has been achieved. If work is still ongoing, describe progress, problems encountered, how these will be resolved and expected finalization of the work. If this cannot be progressed, consider a recommendation that the work should be stopped.

During the data evaluation workshop, proposals for changes to data collection or needs for new data or studies may be identified. The workshop must identify the relative priorities of the recommendations and expected impact on the quality of the assessment, and take into account feasibility.

l) Data quality indicators

Develop a spreadsheet of assessment model input data that reflects the decisions and recommendations of the Data Workshop.

Use a spreadsheet of assessment model input data and parameters that reflects the decisions and recommendations of the data evaluation workshop, covering all aspects of data and parameter estimates covered in 1–9 above. This will include quality indicators such as age-error matrices and time-series of CVs or sample sizes that are needed for input to the assessment model, in addition to plausible ranges of parameters such as M, and alternative catch histories where needed. Also document any data that were evaluated by the data evaluation team but not recommended for use.

This is a key output of the data evaluation process. The benchmark assessment workshop will use this table to indicate which data were used, and explain why any of the data are not used or are modified.

m) Workshop report

Prepare the data evaluation/compilation workshop report providing complete documentation of workshop actions, decisions, list of working documents, other information used by the workshop, and a list of any additional tasks to be completed following the workshop with dates and responsibilities for completion.

Finalise and agree the report of the data evaluation workshop, and the spreadsheet of recommended assessment input data, within two weeks of the end of the workshop. This is to allow the stock assessment team time to evaluate the recommendations, seek any clarification from the data evaluation team, or conduct any of their own analyses if they disagree with the findings of the data evaluation workshop.

The data evaluation workshop report and Excel tables of recommended inputs should stand as separate documents alongside the assessment workshop report with both being available from the same ICES web page.

Annex 5 Updated Issue-list

Stock	**Stock Name (Copy and paste from most recent ICES advice)**	
Stock coordinator	Name:	E-mail:
Stock assessor	Name:	E-mail:
Data contact	Name:	E-mail:

ISSUE	DETAILED DESCRIPTION	PROBLEM/AIM	WORK NEEDED / POSSIBLE DIRECTION OF SOLUTION	DATA NEEDED TO BE ABLE TO DO THIS: ARE THESE AVAILABLE / WHERE SHOULD THESE COME FROM?	RESPONSIBLE EXPERT FROM WG	EXTERNAL EXPERTISE NEEDED AT BENCHMARK TYPE OF EXPERTISE / PROPOSED NAMES
Stock ID	Genetic Tagging Morphemetrics Comparison of R, growth etc.	Is there enough data to create new datasets back in time.				
Life-history parameters	Age	Results of age validation exercise				
	Growth	Check if growth has changes over time				
	Maturity	Knife age Fixed mat Annual update				
	Fecundity	Skip of spawners				

ISSUE	DETAILED DESCRIPTION	PROBLEM/AIM	WORK NEEDED / POSSIBLE DIRECTION OF SOLUTION	DATA NEEDED TO BE ABLE TO DO THIS: ARE THESE AVAILABLE / WHERE SHOULD THESE COME FROM?	RESPONSIBLE EXPERT FROM WG	EXTERNAL EXPERTISE NEEDED AT BENCHMARK TYPE OF EXPERTISE / PROPOSED NAMES
	Natural mortality	Changes in time-series for predator (seals..) SMS results Literature				
Fishery Management	Describe historic changes in the management system Has selectivity changed					
Commercial Catch Document the derivation of the catch figures for the time-series. Explain how adjustments are made Evaluate quality of the catch estimates	Landings					
	Discards	Estimates and potential survival rates				
	Recreational	Estimates and potential survival rates				

ISSUE	DETAILED DESCRIPTION	PROBLEM/AIM	WORK NEEDED / POSSIBLE DIRECTION OF SOLUTION	DATA NEEDED TO BE ABLE TO DO THIS: ARE THESE AVAILABLE / WHERE SHOULD THESE COME FROM?	RESPONSIBLE EXPERT FROM WG	EXTERNAL EXPERTISE NEEDED AT BENCHMARK TYPE OF EXPERTISE / PROPOSED NAMES
	Length and age distributions	Provide a summary of the historical design of national sampling programs to estimate length and age Describe sampling rates (PSU) How is data raised				
Scientific surveys	Document timing, frequency, spatial coverage, survey sampling design Describe the methods to conduct the abundance indices Check consistency					
Commercial CPUE / LPUE	Describe data selection Maps of coverage of the selected vessels Correct for changes in fishing efficiency					
Assessment method						
Biological Reference Points	Regime shift					

For more detailed guidelines please look at the "Guidelines for the ICES benchmark data evaluation process"

Annex 6 Joint BSG-ACOM proposal to improve Benchmarks' work

Joint BSG-ACOM ad-hoc subgroup to improve links between Expert Groups' and Benchmarks' work and to increase efficiency of resource utilization

Background:

During the ACOM annual meeting in December 2015, ACOM discussed the need to develop a more flexible and productive environment for the ICES Expert Groups (EGs), particularly the assessment EGs, and for the benchmark process. An initial proposal was sketched during the ACOM meeting and a subgroup set up to work by correspondence according to Terms of Reference a-e below.

The main aims of the subgroup are to further develop the initial proposal prepared during the December 2015 annual ACOM meeting, focusing on

a) Enhancing the way stock assessment EGs work, in cooperation with the ICES Secretariat (in particular, the new stock assessment posts at the Secretariat).

b) Developing a more productive working environment for the stock as-assessment EGs, which should focus their work strategically towards improving stock assessments and benchmark preparation.

c) Creating a more flexible process to structure the work leading up to benchmarks, so that the work of EGs (including stock assessment EGs) can focus on the main issues of each ecoregion and benchmarks take place when sufficient work has been developed; this should al-low benchmarks to produce higher quality products. As this involves a wider range of experts and EGs in ICES, it should be considered in collaboration with the Benchmark Steering Group.

d) The subgroup should prepare a proposal for discussion during the ACOM consultations in September 2016. The proposal should be de-tailed (not just a sketch) and include a timeline for possible implementation. Foreseeable problems should be identified and, where possible, mitigation measures proposed to facilitate the implementation

e) The subgroup should propose a special session for the ASC2016 in Riga to allow feedback from a wider audience on the proposed changes.

As there is overlap with the work of the ACOM-SCICOM Benchmark Steering Group (BSG), it is considered appropriate that this should be a joint BSG-ACOM subgroup, chaired by Carmen Fernández (ACOM Vice-chair and BSG Co-chair) and Jörn Schmidt (BSG Co-chair). The following membership was agreed by ACOM: Larry Alade, Robert Aps, Fatima Borges, Harald Gjøsæter, David Miller, Carl O'Brien, Morten Vinther, Christopher Zimmermann. Cristina Morgado and Mark Dickey-Collas will participate from the ICES Secretariat.

The ACOM chair, Eskild Kirkegaard, also took part in the subgroup's work.

The subgroup worked intersessionally, including 5 WebEx meetings during March–July. This document has been prepared in response to ToRs d and e. The following pages summarise the subgroup's conclusions.

Subgroup's conclusions:

PART 1: Scoping

Scoping is key to this process and it is essential that it has the appropriate focus. Once the focus is clear, it must be ensured that the appropriate expertise (according to the chosen focus) is involved in the scoping.

Main aspects of the scoping process are discussed below.

1) Aim of the Scoping

The scoping should be conducted with participation of scientists, stakeholders and managers; it should, therefore, be open to ICES Observers and Clients. It should

consider the current regional fisheries management objectives and challenges and the science needed for assessment and advice provision for the fisheries addressed in that particular scoping process.

The scoping should identify the main problem issues and the priorities that should be addressed over the subsequent 3–4 years (but it should not invent new problems for the sake of inventing them). It should:

- Roadmap: prepare a roadmap of the work needed,
- Workplan: draft a plan for the development of that work (including milestones),
- Identify who will be responsible to deliver the different parts of the work,
- Identify the resources needed to accomplish the work.

The roadmap should also:

- Identify relevant linkages between different ICES EGs that will contribute to the agreed work,
- Include a plan to ensure communication continues between the groups while the various strands of the work develop over the subsequent 3-4 years.

The ICES recurrent advice products (advice on fishing opportunities, fisheries overviews/advice, ecosystem overviews) are central in the scoping. A key task should be to

identify aspects that need to be improved in order to improve the ICES recurrent advice products, with the objective of better responding to the management challenges.

As examples, for single-stock advice aspects in need of improvement could be related to the data and information used in the assessments, integration with data quality experts, aspects related to how the projections are conducted, etc. Mixed fisheries and bycatch aspects are also likely to gain importance over the next few years, e.g. with the landing obligation and the multiannual management plans in the EU system. In some regions, the science is at a stage where closer attention should be paid to multispecies stock assessments, as we may be in a position to use them more fully than we do at present (e.g. in the Baltic, North Sea, Arctic areas eventually multispecies assessment models may largely replace or supplement the single species models), whereas for other stocks the priority may be to develop other aspects (e.g. for deep-sea or elasmobranch stocks alternative ways to provide advice could be considered, such as by fisheries, using indicator stocks or on mitigation measures instead of the current catch advice based on assessing the status of every single stock). The essential point is that the advice products will have aspects that require improvement and development (relative to the management challenges) and this is what the scoping should focus on. To

make the task more manageable at present, the subgroup mainly considered the advice on fishing opportunities and fisheries overviews, and not the ecosystem overviews, which might re-quire a different way of setting up the scoping process.

The scoping process should identify the issues to be addressed during the ensuing 3–4 years. Some "upper level" guidance will be necessary, so that the scoping moves in the required directions rather than become uncontrolled processes; the ACOM leadership seems best placed to provide this guidance, which would require improved communication and discussion between the ACOM leadership and the relevant EG chairs, as well as participation of the ACOM leadership in the scoping.

The roadmap and required resources identified by the scoping should be clearly communicated within and outside ICES (e.g. to the national institutes), so that everyone is aware and can indicate if something is not doable due to insufficient resources. The agreed roadmaps should be presented for information to ICES national Delegates, Observers and Clients.

2) How broad should the scoping be in terms of the range of topics and issues it should address?

As noted under point 1, the focus of each scoping process should be driven by the management challenges; this will lead to identifying aspects of the current advice products that require improvement or development in a different direction. At this stage, the focus is on the advice on fishing opportunities and fisheries overviews.

Scoping workshops would be expected to occur every 3 or 4 years and normally to take place in the physical space of an assessment EGs. However, the range of participants should be broad, the intention being to open up the assessment EGs to other participants and to give better opportunities for science and development to take place in the assessment EGs; the intention is to make these EGs more attractive and to use their expertise better than solely to conduct annual update stock assessments.

Scoping workshops should be open to ICES experts, observers and clients and aim at having a wide range of participants, including:

- Stock assessment experts (both single-species and multispecies)
- Experts working on fisheries-dependent data (catch sampling, data quality assurance, sampling design, etc.)
- Experts working on fisheries-independent data (surveys and sampling design)
- Experts on biological data
- Experts on integrated / ecosystem aspects
- Stakeholders: as members, not just observers.
- Managers
- ACOM leadership
- ICES Secretariat

3) Should each assessment EG have its own scoping process? This would mean that e.g. demersals and pelagics could end up in different scoping processes, even if the stocks are in the same ecoregion.

The default option is that all assessment EGs have their own scoping process. However, there should be communication between the ACOM leadership and relevant EG chairs to draw up appropriate conclusions in this respect in each case: for example, in some cases it may be decided to have a regional scoping process including all relevant stocks and fisheries.

4) Should other groups also have scoping processes, or is the focus only on the assessment EGs?

Other EGs (e.g. mixed fisheries or multispecies EGs) are not necessarily expected to have this kind of scoping process. Scoping workshops would take place in the physical space of the assessment EGs and the idea is that relevant mixed fisheries or multispecies experts take part in them. Specific tasks related to the subject of those groups agreed at scoping workshops would after-wards be addressed at e.g. the WGMIXFISH-methods or WGSAM annual meetings.

5) **Who should attend the scoping workshops?**

This is described at the end of point 2 above.

6) **Who should chair the scoping workshops?**

Assessment EG chair + someone else (e.g. a data expert or a multispecies or ecosystem expert)

7) How to ensure that all relevant people attend the scoping workshops? (For example, how to ensure that relevant survey experts attend?)

Resourcing is an issue. There is a need to ensure scoping processes are sufficiently appealing to make people want to take part in them. The scoping idea has to be explained to the ICES delegates, observers and clients, as they are the ones most likely to be able to influence resources; the ACOM Chair already has close communication with the delegates, observers and clients. As noted under point 1, the agreed roadmaps should be presented to ICES national delegates.

If the new system is agreed, a timetable of scoping workshops should be pre-pared (e.g. for the next 5 years), so that everyone from inside and outside the ICES community is aware of what's planned and can prepare properly for it.

8) Example of ToRs for a scoping workshop

A generic example of how ToRs for a scoping workshop may look like is provided below. This is an example and will need adapting for each specific case.

Workshop on Scoping [GROUP]

20XX/X/BSGXX

The **Workshop on Scoping [GROUP]**, chaired by [names], [countries], will be established and will meet in [city, country].

The workshop will initiate a process to develop the assessment and basis for advice for [EG(s) acronym] stocks. The timeline for each issue needs to be specified beforehand. The process will be supported and monitored by the ICES Secretariat, who will monitor future progress on agreed work and inform the ACOM Leadership when a product is ready to be benchmarked.

The workshop will:

a) Scope the regional fisheries management objectives and challenges and the subsequent science needed for assessment and advice provision for [EG(s)] fisheries, and produce a list of issues that need to be worked on to address these needs [includes a prioritisation];

b) Identify potential tools, data and knowledge to investigate the challenges to the assessment and advice (including analysis of productivity changes, carrying capacity, multispecies models, and mixed fisheries approaches). These can be empirical, simulation or qualitative in nature. [The tools identified should be available for use throughout the following 12 months to explore the potential interactions of growth, selectivity and mortality on the dynamics of fish populations.]

c) Based on ToRs a) and b), develop a roadmap to generate the required scientific knowledge to produce assessment models and the framework to give advice to be benchmarked and subsequently used to conduct update assessments;

d) Identify intersessional work needed, including an action list of responsible people for each task to lead the intersessional work.

WKXX will report by XX for the attention of ACOM and SCICOM.

Supporting information

Priority	The current activities of this workshop are in line with the ICES strategic plan to provide advice based on best available science.
Scientific justification	TO BE SPECIFIED and elaborated: The scoping should include all biological, ecological and fisheries related issues. The process is not meant to be a full integrated assessment of a given region or set of stocks, but should communicate with relevant groups to exchange relevant knowledge and data.
Resource requirements	
Participants	Assessment Group members, stakeholders (industry, administrations, NGOs).
Secretariat facilities	Professional assistance by the ICES Secretariat and SharePoint.

Financial	No financial implications.
Linkages to advisory committee	ACOM
Linkages to other committees or groups	ACOM/SCICOM Benchmarking Steering Group (BSG), ACOM/SCICOM Steering Group of Integrated Assessments (SSGIEA), ACOM/SCICOM Steering Group on Integrated Ecosystem Observation and Monitoring (SSGIEOM), [list here ICES EGs relevant for that scoping process, e.g. WGEF, PGDATA, BEWG, WGZE, WGMME, WGSFD, WGSAM, WGMIXFISH, WGISUR, WGECO, WGBIOP]
Linkages to other organizations	[Stakeholders organization participating in the meeting, e.g. ACs, national administration, NGOs]

PART 2: Development of work in the 3–4 years after a scoping process has taken place

It is important that the assessment EGs have the ownership of this process, their work and outputs. The assessment EGs should be free to decide how they best organise themselves to deliver in accordance to what was agreed in the Roadmap. Support should be available to them, from the ICES Secretariat, ACOM leadership and/or Benchmark SG, in order to facilitate the process.

How to ensure:

- **There is enough communication between different people involved in different strands of the work in those 3-4 years?**
- **Communication with groups that can give relevant input into the different strands of work (or directly for the scoping), e.g. WGBIOP, WGCATCH, PGDA-TA, WGSAM etc.**

These questions should be addressed within the Roadmap. It is hoped that the relevant groups (WGBIOP, WGSAM,…) are represented in the scoping process, so communication will occur during the scoping. The Roadmap produced during the scoping process should address how to keep communication flowing while the work develops over the subsequent 3–4 years.

The ICES Secretariat should help facilitate the communication between the groups.

- **How to ensure the work develops as planned?**
- **Mechanisms for identifying lack of development? Mechanisms to help in such cases?**

This should be the responsibility of the EG chairs, together with the ICES Secretariat person assigned to each EG and scoping process, and appropriate co-chairs. Progress should be reported in the annual EG meetings, including realistic options for remedial action if progress has been problematic.

- What is a benchmark in this new system and when should it be called for?
- The benchmark system will be similar to the one ICES had in the last few years, but more flexible concerning the timing when a benchmark is called for.
- All methodologies that will be used as the basis for ICES advice should be benchmarked.

- The Roadmap producing at the scoping should have identified the expected products and approximate timings, which should give an indication of the expected benchmarks.
- The actual timing of the benchmarks should be driven by when the scientists involved in the work consider their work is ready to be reviewed: at that point, and not before, should a benchmark be proposed. The intention is to avoid the difficulties had in the past where benchmarks were organised before the work had been sufficiently progressed and then run into serious difficulties with work not done on time.
- Because the benchmark is proposed at the time the work is ready to be re-viewed, the benchmark essentially becomes a proper review process (rather than a process where new work is developed). As the benchmark should be open to stakeholders, the review process should be conducted in a workshop in which stakeholders are able to participate.
- The benchmark could be thought of as consisting of two elements: (1) the testing of a new product in the assessment EG meetings to prepare the peer re-view; (2) the peer review, which will be a (1-2 day) workshop with external re-viewers and stakeholders on running the test of old and new product.
- Are Data Evaluation Workshops still needed as part of these new benchmarks? It is expected that the data evaluation has already taken place during the previous years at the annual EG meetings (in the context of mini-workshops open to stakeholder participation), in the process of developing the work in line with the agreed Roadmap. So it is expected that only 1 workshop will be now necessary for the benchmarks. However, it must still be ensured that adequate data evaluation takes place within the system and adequate information on the quality of the data are available.
- Normally a benchmark would be proposed in a given year y, and take place in the following year y+1: so the results would be used in the advice issued by IC-ES on year y+1.
- The benchmark process should also identify longer-term future research and data needs.

- **How to ensure stakeholders have sufficient opportunity to participate in the system?**

Stakeholders will be able to join all workshops (scoping workshops, mini-workshops that may take place at the start of EGs, e.g. for data evaluation purposes, benchmark review workshops). If input from stakeholders is included in certain elements of the Roadmap developed during the scoping process, stakeholders should be part of the development of those elements.

- **How to ensure EGs can do this work while keeping the update assessments and advice going as agreed with clients?**

It should be noted that this process replaces the current benchmark process for stock assessments (so it is a replacement, instead of an addition).

ACOM is also currently working on an initiative to reduce the frequency of stock assessments, which should free up some time for stock assessment experts.

Success of the new system will require that sufficient resources are allocated for experts to do the agreed tasks, so that there is sufficient resource available to work intersessionally on the issues identified in the Roadmap. As noted under point 1 of "Scoping" (earlier in this document), the roadmap and required resources identified during the scoping should be communicated within and outside ICES (e.g. to the national institutes). The agreed roadmaps should be presented to ICES national delegates.

Support from the ICES Secretariat could take various forms:

- A workflow software could be used to enable the responsible person from the Secretariat to follow each process and ensure that reminders are sent to responsible people. The work could be updated each year in a one day workshop before the actual assessment EG meeting (to ensure that stake-holders can participate).
- There is a project currently being planned in the Secretariat to develop a tool to facilitate update stock assessments, which will reduce the workload of conducting update assessments.

- **When should the next scoping workshop take place?**

This is case-specific, but generally expected around every 3–5 years

- **Other aspects for consideration**

The review process will only take place at the benchmark, once the work has been conducted. In order not to miss the opportunity of receiving input that external experts could provide, relevant external experts could be invited to participate in the scoping process and to remain in touch by correspondence while the work is being developed. However, there should be a clear separation between the role of experts developing the agreed scientific work and the role of reviewers.

Annex 7: PGDATA Planning Group evaluation

Planning GROUP name: PLANNING GROUP ON DATA (PGDATA)

Year of appointment: 2015

Chairs: Mike Armstrong (2015–2016), Marie Storr-Paulsen (2015–2017), Joel Vigneau (2017)

Venues, dates and number of participants per meeting:

- 30 June–3 July 2015, Lysekil, Sweden, 18 participants
- 29 February–4 March 2016, San Sebastian, Spain, 14 participants
- 7–10 February 2017, Nantes, France, 17 participants

PG Evaluation

If applicable, please indicate the research priorities (and sub priorities) of the Science Plan to which the WG make a significant contribution.

The ICES strategic plan is building on four pillar including one or more goals with associated activities. The third pillar "Underpinning science and advice through data and information services" with the connected goal 4*; Promote the advancement of data and information services for science and advice needs* and goal 5; *Catalyse best practices in marine data management, and promote the ICES data nodes as a global resource* are the ones considered relevant for PGDATA.

Implementation of the strategic plan is to be found in the science plan and PGDATA has contributed to several of the objectives.

- *Advance the ICES benchmarking process to include ecosystem and ecosystem sub-component assessments, and develop regional ecosystem benchmarks.*
- *Define a clear roadmap with an achievable timetable for managing the benchmarking process.*

The first year (2015) PGDATA developed a detailed guideline for the data preparation workshops that was tested the two following years in two benchmarks and updated according to the feedback from the benchmarks chairs. In connection with the detailed guideline a roadmap was developed in coordination with the benchmark steering group (BSG) and an issue list updated in order to mirror all section headers of the guidelines. The issue list is specifically designed to be populated during the assessment working groups.

- *Develop a cost–benefit framework to evaluate and optimize monitoring strategies in the context of the capabilities of, and requests from, ICES, Member Countries and clients.*

In 2016, PGDATA started the process to establish a cost–benefit framework along-side a quality assurance framework and this lead to a cost benefit workshop that was conducted in 2016. Further work has been planned in 2017 to develop an open source R library enabling all countries to optimize their own sampling plan with regards to the number of samples and the resulted variance.

In order to progress on the link between end-users and data providers, PGDATA has given feedback to the ICES secretariat on the master stock list to ensure that the list can provide the full overview of the dataset used for stock assessment.

- *Ensure the development of best practices through establishment of guidelines and quality standards for: (a) surveys and other sampling and data collection systems; (b) external peer reviews of data collection programmes; and (c) training and capacity-building opportunities for monitoring activities.*

PGDATA 2015–2017 provided guidelines and advice for best practice in:

- Detailed guidelines for the data compilation and evaluation stage of ICES benchmark stock assessments to encourage a more consistent, transparent and objective approach for data evaluation. An issue list closely related to the guidelines was proposed for documentation by assessment working groups in preparation for the benchmark.
- Documenting fishery-dependent LPUE/CPUE indices (in cooperation with WGCATCH)
- In 2015 PGDATA conducted a quality guideline for new discard data to be used in stock assessment.
- Guidelines on how to identify recreational fishery data that should be collected (special request by EU commission)

In bullet form, highlight the main outcomes and achievements of the WG since their last evaluation. Outcomes including publications, advisory products, modelling out-puts, methodological developments, etc.

The 3-year ToRs of PGDATA focus on data needs and end use. This includes ensuring the implementation of quality assurance frameworks to improve the quality of data supplied to end-users, developing methods of evaluating cost–benefit of data collection, and working with end-users to ensure that data needs and data supply are aligned as effectively as possible. This means that quality of data should be well documented and understood before use, and that any re-quests by end-users (including groups carrying out scientific assessments) for new data or changes in amount of data or the way existing data are supplied (e.g. resolution) should take into account feasibility, costs, impacts on assessment results Other outcomes include documentation of sampling practices.

- In 2015, PGDATA (ICES 2016) drew up detailed guidelines on how data should be evaluated in the ICES benchmark stock assessment process, addressing the fundamental need for quality assurance and transparency in evaluating the quality of data before they are used. These guidelines already proved to be valuable in the preparation for the September 2016 data compilation workshop for the WKIRISH benchmark stock assessments of Irish Sea cod, whiting, haddock, plaice and herring and December 2016 WKBALT benchmark for cod and herring.
- During 2016, the focus of PGDATA shifted to the development of a cost–benefit framework for data collection, including planning for the June 2016 WKCOSTBEN and the 2016 ICES ASC theme session on the same general topic ("When is enough, enough?").
- The group had the opportunity to review the 2017 ICES EWG data call and provided feedback to ensure that the content was clear from the data submitters' perspective. The 2017 ICES data call contains the general data call from expert groups NWWG, WGBFAS, WGBIE, WGCSE, WGDEEP, WGHANSA, WGMIXFISH-ADVICE, WGNSSK and WGWIDE, further-

more, the PROXI data call for assessment and advisory purposes for category 3 and 4 stocks that are scheduled to have update assessments and advice in 2017 was included.

- Further, the 2017 meeting focused on how to ensure that the produced information and guidelines was made available in an easily accessible form on a repository on the ICES homepage.

Developed guidelines and advise of best practice:

- Guidelines for the ICES benchmark data evaluation process, including related issue list to be documented by assessment working groups. (ICES 2015 and 2017)
- Guidelines on how to identify recreational fishery data that should be collected
- Data-quality questionnaires for discards estimates (ICES 2015).

Workshops

- Workshop on cost benefit analysis of data collection in support of stock assessment and fishery management (WKCOSTBEN)
- Workshop on Optimization of Biological Sampling at Sample Level (WKBIOPTIM) – in cooperation with WGCATCH

Contributions to conferences

- PGDATA was initiating and the chairs were convening the Theme Session ASC 2016 O "When is enough, enough? Methods for optimising, evaluating, and prioritising of marine data collection" with more than 40 contributions.

Datasets

- RDB: PGDATA's repeated endorsement of the RDB as a fundamental tool for regional coordination of sampling and estimation has contributed to the progress in data submission that was observed in recent year and has commented on the format to the RDB steering group.

Has the WG contributed to Advisory needs? If so, please list when, to whom, and what was the essence of the advice.

Details of request from the Commission:

PGDATA was provided with an additional Term of Reference to help ICES develop advice to the European Commission on the need for, and use of, recreational fishery data. The request from the Commission was as follows:

DG MARE kindly requests that ICES provides advice on how data needs for monitoring the recreational fisheries should best be defined to meet expected end-user needs. This advice should be delivered the latest by 21st August 2015 and address the following questions in detail:

1) *What are the drivers for the collection of recreational fishing data?*
2) *What recreational fishery data (biological, economic & fisheries activity) are needed to support the scientific advice?*
3) *How will these data be used in stock assessment and fishery management advice?*
4) *What spatial and temporal resolution of data are needed to support fisheries management?*

The request was considered during June 2015 by the ICES Working Group on Recreational Fisheries Surveys (WGRFS; ICES 2015) which developed a detailed response to

the four questions which can be read in the report of that meeting. PGDATA (2015) reviewed WGRFS response, agreed with the contents and provided additional comments. The general idea was the confirmation of the urgent need to develop and test robust methods for including short time-series of recreational catches in assessments and advice.

Please list any specific outreach activities of the WG outside the ICES network (unless listed in question 6). For example, EC projects directly emanating from the WG discussions, representation of the WG in meetings of outside organizations, contributions to other agencies' activities.

See question 7

Please indicate what difficulties, if any, have been encountered in achieving the work plan.

The main difficulties can be summarised as follows:

- It has been challenging to get the right combination of participant to the PG with an equal amount of scientist with a scientific survey background as well as chairs from other main data sources (CATCH, BIOP etc.) and RCMs.
- It has also been challenging to get a clear overview of the ICES data strategy and many of the data initiatives are not consulted with PGDATA (or any other data groups) before they were launched, examples with the new suggested benchmark system presented at the ASC or the transparent assessment framework–the TAF system.

Future plans

Does the group think that a continuation of the WG beyond its current term is required? (If yes, please list the reasons)

Yes. The group thought that if ICES wants to develop a clear strategy on the data used for assessment, it is important to have a group that will focus on comprehensive data needs and end use. Most other data groups have only one data source which is considered whereas PGData are considering all data that can affect the assessment and advice. This includes ensuring the implementation of quality as-assurance frameworks to improve the quality of data supplied to end-users, developing methods of evaluating cost–benefit of data collection, and working with end-users to ensure that data needs and data supply are aligned as effectively as possible.

Moreover, PGDATA has reflected in 2017 on a procedure to keep track and organise in a coordinated way all the recommendations and best practices proposed by the specific data groups, whether they are fisheries dependent of independent. The objective is to keep memory of all the initiatives and recommendations and put them in a general perspective, easy to understand and access, rather than letting them in the body of the myriad of working groups, where it is extremely tedious to extract. PGDATA thought that this objective could be the backbone of the future of the group, and part of the ICES strategy on data.

If you are not requesting an extension, does the group consider that a new WG is required to further develop the science previously addressed by the existing WG.

NA

What additional expertise would improve the ability of the new (or in case of renewal, existing) WG to fulfil its ToR?

The participants of PGDATA mostly consist of people that carry out sampling design and estimation at national-level, chairs from other data WG (CATCH, BIOP) and RCM chairs and national correspondents.

It would strengthen PGDATA if participants from the scientific survey WG were participating as well as more people with a strong statistical background.

In what concerns the need for participants involved in the advisory process, the current shortage finds ground in historical difficulties of "sitting around at the same table" the "ICES data providers" and "ICES end-users". Such difficulties have been repeatedly highlighted by other EGs (e.g. PGCCDBS, PGDATA) as the cause of the low consideration given to catch data quality within assessments. It therefore requires ACOM/SCICOM strategy to be solved.