# JRC SCIENCE FOR POLICY REPORT

European
Commission

# Scientific, Technical and Economic Committee for Fisheries (STECF)
# -
# Quality Assurance for DCF data (STECF-17-11)

Edited by Clara Ulrich, Joël Vigneau & John Casey

2017

Abstract

Commission Decision of 25 February 2016 setting up a Scientific, Technical and Economic Committee for Fisheries, C(2016) 1084, OJ C 74, 26.2.2016, p. 4–10. The Commission may consult the group on any matter relating to marine and fisheries biology, fishing gear technology, fisheries economics, fisheries governance, ecosystem effects of fisheries, aquaculture or similar disciplines. This report present the STECF review of the EWG 17-04 which met in the ICES premises in Copenhagen, Denmark, from 3 to 7 July 2017 to agree on common and adequate quality indicators for all sets of data collected under the DCF (biological, socio-economic, transversal). The EWG 17-04 Report was reviewed by the STECF at its 55th plenary meeting held in Brussels, Belgium from 10-14 July 2017.

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**EWG-17-04 report:**

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## Request to STECF

STECF is requested to review the report of the STECF Expert Working Group meeting, evaluate the findings and make any appropriate comments and recommendations


## STECF response

### Background of the EWG 17-04

The quality of DCF data was formerly evaluated by the use of the coefficient of variation (CV). However, this is no longer the case, as previous STECF EWGs have come to the conclusion that the levels of CVs, as requested by the previous EU MAP, are not realistic and therefore cannot be met by Member States. As a result, this quality indicator has been removed from the Annual Report template of Member States. In addition, the new EU MAP no longer prescribes specific quality indicators for the reporting of Member States under the DCF. Instead, there is a more general reference to quality assurance in the Work Plan template. STECF Plenary (PLEN-16-02) discussed quality assurance procedures for biological and economic data under the DCF and suggested a dedicated EWG on data quality to establish: (a) guidelines on data quality for Member States; (b) main principles of evaluation of data quality for STECF EWGs; (c) minimum/ meaningful requirements. Although a wealth of information exists on data quality, clarity is missing on what should be the requirements for data quality under the DCF. The aim of the EWG 17-04 was to create a roadmap with timeline for all steps of the procedure of sampling pertaining to quality: 1) planning; 2) implementation; 3) reporting; 4) evaluation.

The EWG 17-04 took place from 3-7 July 2017 at ICES in Copenhagen and was attended by 20 independent experts, 5 Commission members (3 DG MARE, 2 JRC) and 2 observers.


## STECF comments

STECF acknowledges that the Commission has established EWG 17-04 based on a suggestion by STECF PLEN 16-02, in order to "*improve the guidelines on data quality for MS and set the main principles for evaluation of data quality and results of data collection as well as establish minimum/meaningful requirements*".

STECF acknowledges that the EWG 17-04 took place the week just before the STECF plenary. A draft EWG report was made available in time to be presented and reviewed. However, this STECF review of the EWG outcome is primarily based on the presentation by the EWG chair held during the Plenary meeting rather than on the draft report.

STECF considers that the EWG 17-04 has fully addressed all Terms of Reference and provided various suggestions for improvements of the Quality Assurance Framework for DCF data, including amendments to the Work Plan templates and Annual Report requirements.

STECF notes that the assessment of data quality has been addressed in many other fields (Eurostat, ISO norms, Farm Accountancy Data Network (FADN), etc.) and that existing principles (e.g. European Statistical System (ESS), ICES, GFCM etc.) criteria and guidelines should be fully utilised in the context of DCF data. STECF notes that PGECON has already made some steps in that direction.

STECF further notes that various parties are involved in the process of assessing and improving data quality, e.g. Member States, data end-users, STECF, regional

coordination groups (RCGs), PGECON. STECF considers that the roles of these parties have to be clarified based on the suggestions of the EWG 17-04, and once clarified, be taken up as firm commitments by the involved parties.

STECF acknowledges that its own role is enshrined in the EU regulation (2017/1004), which specifies that "*STECF shall evaluate the national and draft regional work plans referred to in Articles 6 and 9. When doing so it shall take into account: (a) the conformity of the work plans and any amendments thereto with Articles 6 and 9; and (b) the scientific relevance of the data covered by the work plans for the purposes laid down in Article 1(1) and the quality of the proposed methods and procedures*." (Article 10) and

"*In accordance with Article 10, STECF shall evaluate: (a) the execution of the national work plans; and (b) the quality of the data collected by the Member States.*" (Article 11).

As the DCF data quality assessment is strongly linked to the evaluation of DCF Annual Reports and Data Transmission, as well as the Annual Economic Report and other STECF reports, STECF provides general observations and suggestions for future improvements in this context in section 4.5 of this plenary report.

STECF also notes that metadata (e.g. on the number of samples from which the variables have been derived) and quality indicators should be reported with the data during data calls and stored in the respective regional or international databases. These databases should also be used to facilitate MS producing tables for the Annual Report and to inform STECF during evaluation of the quality of the data collected by MS.

## STECF conclusions

STECF concludes that the findings of EWG 17-04 should be fully considered by the Commission and supports the implementation of the suggested ways forward, including (i) better use of international standard procedures for quality assurance and transparency in protocols, (ii) areas of convergence between biological and economic sampling, (iii) improved statistical design and optimisation of sampling programmes.

In addition, STECF considers that perennial regional/international databases storing the detailed or aggregated data collected by Member States and adapted to the needs of relevant end-users would play an important role in the quality assurance of DCF data and facilitate the access to and use of data collected under the DCF. Regional Databases (RDBs) allow producing summary reports at regional level where metadata are presented and metrics are estimated together with their uncertainty. Additionally, RDBs allow for some internal peer-review, where data collected by one MS can be more easily used, and thus cross-checked, by other users. STECF supports therefore that steps are undertaken to further ensure the existence and maintenance of such databases.

Regarding Work Plans, STECF concludes that the current guidelines for the evaluation of Work Plans should be revised based on the suggestions of the EWG 17-04, to facilitate the STECF evaluation of the quality of the proposed methods and procedures. Additionally, the suggestions for changes in the Work Plan tables should be taken into account for future revisions of the Work Plan templates.

Regarding Annual Reports, STECF suggests that the format and guidelines for Annual Reports be revised before the end of 2017 and used by Member States during early 2018. That would enable the assessment of the quality of data collected by Member States under the revised EU MAP. For this revision, the suggestions of both the EWGs 17-04 and 17-07 should be taken into account.

In the medium term, STECF suggests that the proposals of the recent EWGs on the review of Annual Reports and Data Transmission (STECF EWGs 13-07[1], 14-07[2], 15-10[3], 16-08[4], 17-07[5]) and the EWG 14-17[6] (revised at EWG 15-15[7]) with regard to improved information flow for National Workplans and Annual Reports are implemented. STECF acknowledges that the Commission has launched the "FishHub" project (MARE/2015/04) that includes a proposal for "*a tool (…) that will enable to simplify the transmission and analysis of WPs and ARs and to automatize/verify the intended/mandatory data collection with the achieved data collection*".

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2 Scientific, Technical and Economic Committee for Fisheries (STECF) – Evaluation of 2013 MS DCF Annual Reports & Data Transmission (STECF-14-13) 2014. Publications Office of the European Union, Luxembourg, EUR 26811 EN, JRC 91550, 257 pp.

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# REPORT TO THE STECF

# EXPERT WORKING GROUP ON
# Quality Assurance of DCF data
# (EWG-17-04)

# Copenhagen, Denmark, 3-7 July 2017

This report does not necessarily reflect the view of the STECF and the European Commission and in no way anticipates the Commission's future policy in this area

# 1 INTRODUCTION

The STECF Expert Working Group (EWG) 17-04 met in the ICES premises in Copenhagen, Denmark, from 3 to 7 July 2017 to agree on common and adequate quality indicators for all sets of data collected under the DCF (biological, socio-economic, transversal). The work was conducted by 22 independent experts (20 invited plus 2 observers; the list and contact details of participants is included in Annex 1.

During the EWG and its following presentation to the STECF plenary, it became clear that the logical flow of discussion, from broad quality principles to concrete actions, did not follow exactly the order to the Terms of Reference. Additionally, the EWG made a clear distinction between the needs and requirements for the Work Plans in the one hand, and for the Annual Reports in the other hand, considering that different evaluation criteria apply for both types of reports. Therefore, the report is articulated following this logical flow, and not following the ToRs. The linkages with the ToRs are flagged in the headings as appropriate.

Finally, it is clear that there are obvious differences between the sampling programs and the reporting of biological data and economic data. Some differences are intrinsic to the type and size of the populations sampled, and to the nature and the use of the data collected; but some other differences are linked to different paths and priorities followed by different groups of people, regarding e.g. stratification and segmentation of the fleets and gears/métiers, minimum requirements and/or oversampling, and reporting of sampling protocols. These differences are discussed in the text where appropriate, and some areas for increased overlap between these two types of sampling programs are discussed

## 1.1 Terms of Reference for EWG-17-04

**Background**

The quality of DCF data was formerly evaluated by the use of the coefficient of variation (CV). However, this is no longer the case, as previous STECF EWGs have come to the conclusion that the levels of CVs, as requested by the previous EU MAP1, are not realistic and therefore cannot be met by Member States. As a result, this quality indicator has been removed from the Annual Report template of Member States (for an example, see the guidelines produced in STECF EWG 15-15 and reviewed by STECF written procedure). In addition, the new EU MAP2 no longer prescribes specific quality indicators for the reporting of Member States under the DCF. Instead, there is a more general reference to quality assurance in the Work Plan template3 (to replace the National Programmes). STECF Plenary (Plen-16-02) discussed quality assurance procedures for biological and economic data under the DCF and suggested a dedicated EWG on data quality to establish: (a) guidelines on data quality for Member States; (b) main principles of evaluation of data quality for STECF EWGs; (c) minimum/ meaningful requirements.

Although a wealth of information exists on data quality, clarity is missing on what should be the requirements for data quality under the DCF. The aim of this EWG is to create a roadmap with timeline for all steps of the procedure of sampling pertaining to quality: 1) planning; 2) implementation; 3) reporting; 4) evaluation.

**Tasks for the EWG**

The EWG is requested to compile and review existing knowledge on quality evaluation of data and propose:

   i.    type of quality indicators and information that should be included in DCF reports (Work Plans, Annual Reports) for end-user needs, like bias, precision, associated uncertainty of data etc.(details developed in section 4.3);

   ii.    minimum requirements for acceptable quality of DCF data (details developed in section 3.4);

   iii.    principles and set of criteria that can be used by the STECF for evaluation of DCF reports (details developed in section 2.5);

   iv.    set of guidelines on quality criteria to be used by Member States when filling in the DCF reports. As a secondary task, 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 (details developed in section 3.2).

The EWG will be divided in two subgroups: one subgroup dealing with biological data and one subgroup dealing with socio-economic data. As a secondary task, both subgroups should consider quality issues that prevent linking the abovementioned data sets between them as well as with transversal fishing activity variables. Where necessary, the EWG is also requested to define criteria for the different sampling designs, as implemented by Member States in the different sea basins (including international waters), so as to ensure their coherence with the sampling designs of other MS sharing the same or neighbouring sea basins. The aim of these criteria is dual: to be used by 1) STECF for evaluation of DCF reports and 2) Member States in their planning and implementation of sampling. For this, the EWG will need to use work already carried out by ICES relevant WGs (eg. WKPICS, WGCATCH etc.), STECF (e.g. EWG 13-06 Part 1), JRC (implemented quality checking procedures) and other relevant bodies. Any other issues linked to data quality should be discussed, like the appropriate data source(s) used for internationally standardised filling of Table 1A of the Work Plan template using an R-script. The EWG should take into account the comments for future improvement of the evaluation of work plans provided by STECF EWG 16-16 (STECF 2016); the ad hoc expert reports on evaluation criteria for the Work Plans (listed under 'background documents' of EWG 16-16); the relevant parts of the reports of regional grants MARE/14/22 (Anon 2016a and 2016b); relevant work carried out by PGECON for DCF data (Anon 2017); the reports of the two workshops on transversal variables (Anon., 2015, Castro Ribeiro et al., 2016,); relevant work carried out by EUROSTAT.

## 1.1 Acronyms used

**4S**:         Statistically Sound Sampling Scheme

**AER**:       Annual Economic Report edited by STECF based on data compiled from a formal data call

**AR**:         Annual Report as defined in article 11 of EU Reg. 2017/1004

**COM**:      European Commission (here DGMare)

**COST**:     Common Open-Source Tools (R library developed during project FISH/2006/15 – lot 2)

**CPCs**:     Contracting Parties and Cooperating Non-Contracting Parties

**CV**:         Coefficient of Variation (standard deviation divided by mean)

**DCF**:       In this report, used to refer to either the DCF or EU-MAP Regulation

**DCRF**:     GFCM Data Collection Reference Framework

**DLS**:       Data-Limited stocks

**DT, DTF**: Data transmission, Data Transmission Failures

**ESS**: European Statistical Standard

**EWG**: Expert Working Group

**FDI**: Fisheries Dependent Information edited by STECF based on data compiled from a formal data call

**GFCM**: General Fisheries Commission for the Mediterranean

**ICCAT**: International Commission for the Conservation of Atlantic Tunas

**ICES**: International Council for the Exploration of the Sea

**IOTC**: Indian Ocean Tuna Commission

**JRC**: Joint Research Center

**LM**: Liaison Meeting (liaising all RCM meetings to gather and streamline the recommendations)

**LP**: Large Pelagics

**Med&BS**: Mediterranean and Black Sea

**MS**: European Member States

**MSE**: Management Strategy Evaluation

**NEA**: North East Atlantic

**NS&EA**: North Sea and Eastern Arctic

**NWP**: National Work Plan as defined in article 6 of EU Reg. 2017/1004

**PGECON**: Planning Group on Economic Issues. Ad hoc forum taking place in lieu of the RCMs for dealing with economic issues in the DCF

**PSU**: Primary Sampling Unit

**QAF**: Quality Assurance Framework

**RCG**: Regional Coordination Groups as defined in EU-MAP Regulation

**RCM**: Regional Coordination Meetings

**RDB**: Regional DataBase. In this report, used in generic terms, i.e. not only the RDBs for biological data from commercial fisheries as e.g. hosted by ICES, but more generally, for any existing or future supra-national database storing some data collected under the EU data collection, including e.g. also the JRC database for economic data.

**RFMO**: Regional Fisheries Management Organisation

**RSE**: Relative Standard Error (standard error divided by the estimate)

**SDEF:** Standard Data Exchange Format (Jansen et al, 2009)


## 1.2 Background and perceptions on issues encountered regarding EU DCF data quality

This section aims to highlight the motivations behind holding this STECF EWG, and why it was important to gather a broad and diverse range of experts to discuss the Quality Assurance. The various bodies involved in the overall data collection process have described how they perceive the main issues and shortcomings in the current process.

The request for this EWG was made in order to address the evaluation of data quality by the STECF as well as to provide guidance for the MS, when preparing the DCF reports. The ultimate goal was to improve data collection through: (i) the national planning and implementation of data collection, (ii) the ensuing STECF evaluation and (iii) linking data collection to the scientific advisory process.

The timing of the EWG was linked to: (i) the recent adoption of the new legislative framework of the EU-MAP (Regulation (EU) No 2017/1004, Commission Implementing Decision (EU) No 2016/1251 and 2016/1701, STECF-16-07 Work plan template); (ii) the need for adjustment of the Annual Report template for the following year to make it in line with the Work Plan template; (iii) the well-known drawbacks of the current exercise of evaluation of Work Plans, Annual Reports and DT failures, whereby compliance is assessed but not data quality.

A number of meetings that took place prior to this EWG discussed relevant quality issues, and provided input to this EWG, namely PGECON 2017 (Anon, 2017) STECF EWG 17-07 (draft report).

The current evaluation of DCF reporting - Work Plans (WP), Annual Reports (AR) and data transmission (DT) failures - carried out by STECF mainly deals with conformity checks. According to the Basic DCF Regulation '*STECF shall evaluate (i) the <u>execution</u> and (ii) the <u>quality</u> of data collected'.* The execution is accomplished by cross checking AR against WP. As concerns the <u>quality</u> of data, in the case of AR, an effort was made to evaluate quality in the past by using the coefficient of variation (CV) for biological data. However, this was not realistic, as prescribed levels in the previous EU MAP could not be met by MS and likely did not address properly all issues relating to quality. As a consequence, STECF decided not to use this quality indicator in the evaluation process. The evaluation of NWPs follows the same standards as AR evaluation. For the evaluation of DT failures, the process has not been sufficiently standardized, although significant steps have been achieved. For example, a definition of what a DT failures should be, is still missing; the information provided to the EWG by end-users and MS is not always adequate, to allow STECF to provide an informed opinion. Due to these difficulties, not all DT failures can be assessed by the EWG and no information could be provided to COM qualifying these DT failures, in particular against risks induced within the scientific advisory process.

The new legal framework no longer prescribes specific quality indicators for the reporting of Member States under the DCF. **Quality issues are to be discussed at regional level**. Notwithstanding this, **the general quality principles should be respected and followed to allow the STECF assessing the statistical soundness of sampling strategies** which MS Work Plans are built on, their proper implementation and the accuracy of the collected data. Therefore, **MS reporting and STECF evaluation needs to be framed using common quality standards**. A wealth of information is available from different scientific groups but there is a need to compile relevant work carried out so far, that can be used in the DCF process.

<u>Challenges to be addressed</u>

The final assessment that is produced by the **STECF is currently dealing mainly with compliance and does not include specific outputs on quality issues**, which might relate either with the design of sampling strategies, ways Work Plans are implemented or data accuracy. This may result in mismatches between evaluated MS performance by STECF and actual shortcomings in data collection.

MS currently use two different sampling strategies for commercial fisheries: the long-standing 'métier-based' sampling and the more recently established '4S' sampling. The **STECF decided last year that it cannot evaluate 4S sampling in the ARs, because**

**the existing template is not aligned for 4S sampling**, only for métier-based sampling. Therefore, 4S sampling is not currently assessed by the STECF.

**The sections referring to quality in the AR do not have clear guidance on contents** and MS provide very general information that is not adequate for the STECF evaluation.

### 1.2.2 STECF

The STECF has a dual role with regards to data collection.

DCF data are the basis for the majority of STECF tasks and have direct implications for informing fisheries management. **The quality of the input data is crucial** for deriving fleet economic variables within the Annual Economic Report (AER), as well as STECF reports on the economic situation of European aquaculture and the processing industry. Furthermore, **the compilation of indicators** for the balance between fleet capacity and fishing opportunities, fisheries independent information (FDI, incl. fishing effort data) and Mediterranean & Black Sea stock assessments **are highly dependent on the quality of the collected/collated data**. In this regards, the FDI represents also a special case, as the data requirements for the fine-tuned effort management as implemented e.g. in the EU cod management plans have not always been aligned with the aggregation level of DCF data.

Another important part of the STECF work is to **check and report on MS compliance with the DCF and end-users' data needs**. For this purpose, MS efforts in planning (National Work Plans) and implementation (Annual Report) of their sampling programmes, as well as Data Transmission to end-users, are being evaluated by STECF. The aspect of data quality is currently not (fully) taken into account. The reasons for this are the lack of quantitative objectives and clear guidelines that the evaluation can be conducted against, as this has been detailed in various STECF reports (see section 1.5.3 and 4.1).

Finally, STECF is facing some challenges in gathering a sufficient pool of knowledgeable but independent experts, which could perform an evaluation fully decoupled from Member States' data collection.

### 1.2.3 RCM/RCGs

Tasks for the Regional Coordinating Groups (RCGs) are expressed in the DCF regulation 1004/2017 and EU-MAP implementing decision 2016/1251. Regarding quality the former states that *"Regional coordination groups shall aim at developing and implementing procedures, methods, quality assurance and quality control for collecting and processing data with a view to enabling the reliability of scientific advice to be further improved [...]."* (article 9.3). EU-MAP has a lot of references to agreements on the regional scale to be used based on end-user needs. This can be interpreted that data need to be of sufficient quality for end-users.

The real challenge for the RCG is thus to **get a clear understanding of what are these needs, in terms of resolution (aggregation level) and quality of data required by end-users**. It is also important that end-users have realistic expectations on the data that can be obtained through DCF. Too high resolution might result in poor quality of the data.

**The RCGs focus will be on quality on the regional scale**. Access to data is crucial to achieve this and for the functioning of the entire RCGs. This is why the groups have argued heavily for regional databases. In the ICES area most biological and transversal data are now uploaded to the RDB but progress in development have been slow due to lack in funding, and RDBs are not operational for other areas/types of biological data

(e.g. recreational fisheries, PETS bycatches etc). The RCMs have so far not spent a lot of time to assess quality of output data, as the focus has primarily been on the implementation of statistically sound sampling schemes. Another challenge for the RCGs is to **ensure time for experts to work intersessionally on regional objectives**.

**The RCGs need a central repository for sharing documents**, including different types of reference lists and best practices. This would benefit other groups dealing with quality evaluation of DCF data as well.

At this moment, there is not regional database for the Mediterranean, Black Sea and Large Pelagics. **The RCM Med&BS-LP considered that the development of regional databases was urgent** to allow an efficient use of the data received from the official RCM data call and to allow a correct management of the data used by PGMed and RCM. The process of development of the Mediterranean RDB started in 2011 and important steps were implemented. But the process was stopped in 2013, because the COM informed on the need to wait for the outputs of the "feasibility study" (Anon 2014a and 2014b) and of its update. However, RCM Med&BS would like to progress with the implementation of the RDB. A specific issue regards the wish from the RCM to involve GFCM as the official host for the RDB, and a clear feedback from the Commission is needed. It is therefore crucial to re-start the RDB process after it has been left in standby for more than two years. In the case of the surveys, there is a regional database (Fishtrawl) for the bottom trawl survey (MEDITS) and another in progress for the acoustic survey (MEDIAS).

From the RCM LP perspective, it was felt that **expanding the scope of the ICES Regional Data Base FISHFRAME, to include EU Large Pelagic fisheries data would be the most efficient solution in the short-term**. This would imply the inclusion of specific fields and codes of interest for the LP fisheries.

### 1.2.4 PGECON

PGECON has the same role as the RCGs, but specifically for the economic data and across all European regions. The procedures and standards for economic data collection have evolved largely independently from the biological data collection.

PGECON has considered quality issues with respect to both the procedures and the results. For the fleet economic data collection procedural aspects have been improved over the years. However, a systematic and comprehensive reporting has not yet been implemented, neither in the work plans nor in the annual reports. Therefore **it has been repeatedly suggested to include a methodological report as part of the work plan** (SGECA 09-02, 2009, annex I). **PGECON 2017** (Anon 2017) followed up on this recommendation and **proposed a structure for a methodological report** (Anon., 2017 Annex 8). This methodological report would address amongst others survey planning, design and strategy, estimation design and error checks. This would also cover some of the issues which are requested under table 5b of the National Work Plan template (COM decision 1701/2016, section 5). The methodological report would have to be evaluated once and then remain valid until major changes are applied.

**Quality aspects with regard to the accuracy of data have not yet been addressed in a quantitative manner**. Several indicators had to be reported, e.g. segment size, sample rate, response rate, CV, but they have never been evaluated quantitatively.

### 1.2.5 JRC

**A comprehensive and detailed list of issues relating to DCF data handled by the JRC was provided** by some key JRC personnel, and reported in Annex 2. This list is directly relevant for the STECF 17-07 (Data Transmission Failures). A number of observations can be made both with respect to uploading of data by MS  in response to

data calls handled by the JRC and to issues related to the quality and coverage of such data.

- Uploading issues - to deal with errors in uploading data, **JRC has implemented an automatic checking facility which checks for consistency of coding and coverage/completeness and for erroneous entries** (conformity, coherence and stability). The automatic checking facility results in many bilateral iterations between JRC and MS during upload to arrive at an agreed data set for each MS.
- **The quality (accuracy, bias and precision) of the data themselves is not extensively evaluated by the JRC**. This may be undertaken by the STECF EWG tasked with analysing the data and in principle, any issues identified will be reported in the EWG report and uploaded to the DCF website compliance platform[8]. In practice, such issues are not well specified and in some cases MSs have difficulty in responding to the issues raised.
- **Issues of missing information are reported in some cases** – see annual coverage reports prepared for data submitted in response to data calls handled by the JRC[9] There is a need to cross-check whether the data identified as missing in the coverage reports is consistent with data reported as missing on the DCF website compliance platform.

### 1.2.6  ICES assessments WG and other end-users

ICES stock assessment working groups are one of the main end-users of EU DCF data. Stock assessment builds on the recognition that many data are uncertain, and **models are increasingly taking** this **uncertainty into account**. The more uncertain are the data on catch, discards, length, age etc, the more robust the model needs to be, and **different models are** thus **applied to different stocks on the basis of data availability and quality** (e.g. ICES DLS categories). The robustness of assessment models to data uncertainty is tested through simulation, and the management targets such as the Fmsy (and thus TAC advice) are endogenously consistent, so **the more uncertain the data, the lower the TAC advice (uncertainty acts as a precautionary buffer)**. There are now also models to reconstruct missing data.

During stock assessment working groups, **the stock coordinators are generally not in a position to investigate the quality of the data in any detail** - this only happens at benchmark workshops. Stock assessors generally use the data they are given and have little option but to trust that the quality of the data is sufficient (unless model diagnostics indicate otherwise), **It would be very useful for stock assessors if there data were supplied with a very simple indicator of quality**; even if this is only in the form as a 'red flag' for data of dubious quality that warrants further investigation (e.g. sensitivity to using or omitting the data). This could help inform the raising procedures currently undertaken by stock assessors with Intercatch (until these are replaced by RDBs procedures)

**Current data calls are very time consuming with data needs compiled in excel spreadsheets** which are updated by many experts. **This is a cumbersome process prone to errors**. Spreadsheets are difficult to check due to the lack of standardization and data providers only have the first glimpse of the data call when receiving it. This process can be quite frustrating with problems reoccurring year on year. **Keeping accurate versioning of the spreadsheets is problematic and feedback from data providers not always implemented**.

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[8] https://datacollection.jrc.ec.europa.eu/compliance
[9] https://datacollection.jrc.ec.europa.eu/coverage/2016.

## 1.2.7 GFCM

GFCM receives data from all Mediterranean and Black Sea states through different channels: i) In reply to existing GFCM Recommendations (compulsory); ii) Through national reports to the Scientific Advisory Committee on Fisheries (SAC) and the Working Group of the Black Sea (WGBS) and iii) Through Stock Assessment Forms (SAFs)

Due to a mismatch between the data requested and received and the data needed by the SAC and the WGBS to provide advice, **in 2013 a process to make fisheries data submissions more efficient and better suited to the provision of advice was initiated**. Consequently: The Data Collection Reference Framework (DCRF) of the GFCM was adopted in 2014-2015 as a **technical document providing guidelines on how to collect the data needed** by the SAC and WGBS to provide advice. Most of the GFCM recommendations were revised and made in line with DCRF in 2016. A transitory recommendation in line with DCRF was adopted 2016 and a consolidated recommendation expected in October 2017.

Since April 2016, **a GFCM survey on fisheries data quality is being carried out**. The survey has been promoted with the aim of assessing the available information on **data quality control process** (internal validation mechanism) **currently carried out at the national level** by CPCs of GFCM. The preliminary results (data quality controls) show that it **is implemented in the majority of the data** (95% on average); only bycatch of vulnerable species and stock assessment have not 100% of quality control; documentation is widely available (84% on average); in the summary on the quality checks, validity and cross checks are the most cited methods, with some manual validation by national experts; coefficient of variation and bootstraps are listed as data quality checks tools in the comments, but they are more related to data accuracy in the context of this survey.

For an external validation, there was an agreement to temporarily adopt conformity, stability and consistency indicators for data quality checks (with preliminary thresholds). **Conformity, stability and consistency indicators for data quality checks** (with preliminary thresholds) **are being temporarily implemented on the DCRF online platform for data submission** in the second half of 2017, during the transitional period of the Recommendation GFCM/40/2016/2 on the submission of data in line with the DCRF. The results of this experience are expected to facilitate the work of the Scientific Advisory Committee on Fisheries (SAC) and Compliance Committee (CoC) in defining quality indicators (probably in 2018) to be proposed to the Commission for its final decision.

## 1.2.8 Tuna Commission

**Data collected for EU tuna long distance fleets** within the DCF **are considered of overall good quality** in the International Commission for the Conservation of the Atlantic Tunas (ICCAT) and Indian Ocean Tuna Commission (IOTC). **There is** however **a lack of availability of information on the procedures of data sampling and curation for EU long distance fleets**, i.e. it is hidden in the grey literature. In addition, **the current sampling design and stratification scheme** used for processing tropical tuna purse seine data, developed in the mid-1990s, **has been shown to be inconsistent and needs to be revised**. Assessing the improvement in data produced by Member States (and other Contracting Parties of tuna RFMOs) resulting from changes in sampling and processing methodology calls for clear quality indicators and reference points that are still lacking.

*1.2.9 Summary*

In conclusion there are many different views and opinions on what means data quality in DCF. A consensus can be seen on the difficulty to qualify the datasets and/or evaluating the quality of datasets, and no system tested so far proved to be satisfactory. As pictured during the meeting, and as underlined in the background, a lot of this can be summarised by the question "for or against the CV"? – where a target CV could simplistically appear as a convenient metric for quality evaluation, but is in reality challenging to define and achieve, and not directly linked to the statistical quality of the sampling program

## 1.3 From data collection to data use, the various stages of data quality

For biological data, ICES WKPICS (ICES 2012 and 2013) identified four principal design classes for sampling of commercial fisheries at sea or on shore, and provided detailed guidelines on design and analysis of data from each class of sampling. Table 1.4.1 below (from fishPi) summarises all elements needed for a proper quality evaluation for each of these classes.

| Programme stage | Existing guidelines and standards ("best practice") | Quality evaluation procedure | Performance measures | Possible Quality Indicators |
|---|---|---|---|---|
| Design of sampling scheme | e.g. WKPICS and WGRFS best practice guidelines; IBTS protocols etc. | Review of documentation on sampling design relative to quality standards | Indicators of bias potential due to design. | Score against quality standards, e.g. frame coverage, sample selection procedures etc. |
| Implementation of sampling scheme | e.g. WKPICS and WGRFS best practice guidelines; IBTS protocols etc. | Review of sampling outcomes – e.g. diagnostics of coverage, refusal rates, sample numbers and precision etc. | Indicators of extent of bias (e.g. low, medium, high, unknown); Indicators of precision. | Number of primary sampling units sampled in each sampling stratum; CV; frame coverage; refusal rates. |
| Data archiving and extraction | e.g. RCM North Sea and Eastern Arctic 2014 lists of data checks. | Review of documentation of QA/QC procedures relative to quality standards. e.g. use of electronic data capture; error traps etc. | Indicators of extent and effectiveness of QA/QC procedures. | Score against quality standards |
| Data analysis | e.g. WKPICS and WGRFS best practice guidelines; IBTS protocols; etc. | Review of documentation of estimation procedures relative to quality standards. | Indicators of extent of bias (e.g. low, medium, high, unknown) | Score against quality standards, e.g. analysis follows design |

Table 1.4.1. Possible elements of quality evaluation of a fishery or survey sampling programme (ICES (2014)

Moving further, ICES explained briefly the many ongoing initiatives regarding quality assurance beyond data collection. **ICES is in the process of getting its advice certified**, which requires an overarching policy of good governance and transparency at all stages involved in the advice provision, including data collection, data processing, stock assessment and advice process.

The STECF EWG is fully aware of these multiple stages and complex processes beyond data collection; however, it is underlined that the current EWG deals with a much narrower scope, focusing primarily on National WorkPlans and Annual Report.

## 1.4 State of play and relevant reference reports

### 1.4.1 COST, FishPi and MARE/2014/19 projects

The COST project started to mature in the ICES PGCCDBS (Planning Group on Commercial Catches, Discards and Biological Sampling, see also section 1.5.2.2) forum from 2003, where the methodological aspects of calculating precision were addressed. COST, standing for Common Open Source Tool, was accepted for financing through the call for proposal FISH/2006/15 – lot 2, was the result of a long history of projects and workshops held on the specific issue of raising and estimating properties of statistical estimates for fisheries data.

The COST tool is an open-source software developed in R (R core team, 2017) and consists of different packages that develop validated methods to investigate and estimate parameters for (i) discards volume, (ii) length and age structure of catches and landings, and (iii) biological parameters such as growth, maturity and sex-ratio. Where appropriate, the estimates are calculated according to one out of a fixed number of agreed raising procedures, based on the methods already developed by some Institutes. Linkage with ICES end-users has been consolidated through the exportation method to ICES InterCatch database. COST has been developed for both Windows and Unix/Linux environments. The source code of all the functions is available on a freely accessible website[10], and it is possible to compile a library directly from the website.

In 2010 a COST training workshop was held within ICES training sessions (ICES, 2010) followed by 30 participants. **The maintenance of the libraries halted soon after the workshop because of an impossibility to find financing means**. Nevertheless, some institutes continue to run the COST libraries on a routine basis for preparing their datasets, others are using the libraries for the quality checks functions, and the libraries were recently used at a regional level (RCM Mediterranean & Black Sea, 2015) and as support for the project on Strengthening Regional cooperation in the area of Fisheries Data collection (MARE/2014/22).

The twin projects "Strengthening Regional cooperation in the area of Fisheries Data Collection in the North Sea and Eastern Arctic (NS/EA) – Coordinator USTAN (FishPi project, Anon, 2016a) and "Strengthening regional cooperation in the area of fisheries data collection in the Mediterranean and Black Sea" – Coordinator COISPA (MARE/2014/19 Med & BS, Anon 2016b) were funded by the European Commission, in the perspective of a more regionalised management of fish stocks while pursuing an ecosystem approach, as envisaged by the Council Regulation 1380/2013 (Common Fishery Policy - CFP). **The projects aimed to put the basis for implementing a sampling system which is both more reliable in terms of sampling optimization, data precision, completeness, accuracy, and more consistent in terms of aggregation across the different data typology** (biological and transversal data), while taking into consideration the ecosystem components. The overall goal was to lay

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[10] https://github.com/ldbk/fishPifct

out an action to support the European Commission and MSs for a Multiannual Regional Work Plan. The projects ran from April. 2015 to June 2016

The fishPi project (Anon 2016a) consisted of a number of work packages addressing the overall aim of regional coordination of fisheries data collection. A work package covered the implementation steps for probability based sampling, planning of stratified regional sampling designs, and running simulations to evaluate alternative designs. Four case studies were considered for evaluating regional sampling designs for shared stocks: Small Pelagic fisheries, North Sea demersal fisheries, southern North Sea flatfish fisheries, and the northern and southern Hake fisheries. Another work package addressed the sampling of small scale fisheries, and the sampling designs for stomach contents and incidental bycatch. A work package developed open source software for data compatibility and conformity checks and the common format for recording sampling data from commercial fisheries. A work package also considered the role and evolution of the RCMs to the RCGs, the process of regional coordination, and carried out a consultation among member states and scientific institutions on various aspects of the regionalisation process of data collection.

In MARE/2014/19 Med & BS project (Anon 2016b) concerning the work related to the biological data of demersal and small pelagic species/fisheries, the following methods and approaches were applied: i) extended reviews of the RCM Med&BS, PGMED, Liaison Meetings, ICES, STECF, GFCM reports, National programs and Annual Reports; ii) questionnaires to national correspondents, end-users, stakeholders, experts; iii) data call, data processing, data elaboration and statistical analysis, development of R routines; iv) case studies to test developed methods/routine and propose sampling approaches according to the different needs and WPs.

Some of the outcomes from WP2 of the Mediterranean project consisting in guidelines and best practice for sampling, processing, analysing, managing biological data were reported to the STECF EWG focusing on (i) the development of a methodology that incorporates objective criteria for a more robust option for sampling, with scripts in R implementing the **Sampling Design tool** for optimization (MARE/2014/19 Final Report, Deliverable 2.5); (ii) the identification of a common data exchange format similar and compatible to the COST data format and standardized regional codes following the SDEF standard (MARE/2014/19 Final Report, Deliverable 2.2-2.7); (iii) the evaluation of the consequences of optimized biological sampling schemes in terms of budget requirements (MARE/2014/19 Final Report, Deliverable 2.8).

Concerning data quality, in WP4 **bottlenecks were identified in the approach of checking data, classifying the checks to be carried out both at national and regional level for improving the data quality. This task was conducted in cooperation with the twin initiative FishPi and had as outcome a specific tool** (SDEF Quality package) developed for evaluating the conformity of a dataset against a required data format (MARE/2014/19 Final Report, Deliverable 4.2).

During MARE/2014/19 project, case studies have been developed to test the tools on different species and GSAs: European hake and red mullet in GSA 7 (Spain-France), European hake and sole in GSA 17 (Italy-Croatia). Some problematic attempts were also made on turbot and sprat in GSA 29 (Bulgaria-Romania) (MARE/2014/19 Final Report, Deliverable 2.6).

**A practical session to spread the use of the Sampling Design Tool** was also attempted during the 2016 RCM MED&BS-LP (RCM, 2016), with applications to anchovy, sardine and Norway lobster in GSA 17 (Italy, Croatia and Slovenia) and European hake and red mullet in GSA 16 (Italy) (RCM Med&BS-LP Final Report, Annex XV: *Sampling stratification and optimization based on scripts delivered under MARE/2014/19 Med&BS-*

*LP project*). However, the short time available did not allow a deep and thorough assessment of the results, and some data issues also rose.

Hence, a workshop has been held on March 2017 (*Training Workshop on Sampling Intensity* organized by the RCG MED&BS-LP) to initiate a training of Member States' experts. During this WS, case studies on red mullet and bogue in GSA 25 (Cyprus), European hake in GSA 7 (Spain), GSA 15 (Malta), GSA 16 and GSA 17 (Italy) were carried out for training purposes (WKBIOPTIM, Lisbon 20-22 June, 2017).

*1.4.2 ICES*

1.4.2.1 Data policy for assessment working groups

For ICES, DCF relevant data falls into 5 main collections:

1. Database of (Biological) Trawl Surveys (DATRAS)
2. Commercial catch sampling (InterCatch and Regional Database but now in development as Regional Estimation System – RES)
3. VMS and coupled logbook collection
4. Acoustic surveys (Processed Acoustic and Biotic collected)
5. Eggs and Larvae collection

All data, except (3), are made available from the data collection instites at detailed level, that is to say some form of processing has been carried out upon the raw data.

As stated in the ICES data policy, **the quality of the data is ultimately the responsibility of the data collecting institute**. In order to be able to make valid estimates on the quality of the data, **ICES has pursued a policy of data calls[11], well described data formats and policies, and associated controlled lists** to enable the delivery of detail data into the regional systems. In addition, where some of processing is necessary prior to delivery, **ICES have provided** where possible **tools to enable the data provider to process their data in a consistent way** prior to delivery – see the guidelines for VMS workflow (ICES 2017) for an example. The newly agreed acoustic format, and the RES commercial catch data model (in development) are examples of where ICES have taken this approach to ensure the necessary level of detail are provided in the data so that assumptions are, as much as possible, eliminated.

This effort, coupled with the work on sampling design and survey protocols led by the RCG's and ICES survey groups, helps to reduce uncertainty in the data and increase quality. Increasingly, ICES is working with the experts in a collaborative scripting environment, to ensure a transparency to how the processing is performed, and a form of 'community' check on the logic.

**All incoming data undergo some form of checking**, the type of checking varies from data type to data type. There are a number of ICES systems in place to deal with this and information on the checks is available at each data portal, but also in the overall quality control database[12] . In most cases, a report is delivered back to the data submitter outlining critical errors or warnings on the data, in some systems the data provider has to acknowledge these errors before it is possible to submit the final data. Quality control and data delivery status are also made available to the ICES working groups i.e. the survey group or the assessment group, as they are looking at the data in detail in its context, and also comparing year on year the differences in data. The 'expert' evaluation from working groups is perhaps the most critical check to ensure, as they can

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[11] http://ices.dk/marine-data/tools/Pages/Data-calls.aspx
[12] http://ices.dk/marine-data/tools/Pages/quality-control.aspx

provide context that is very difficult to capture in a scripted check. See Annex 3 for an overview of the data and data portals considered.

**ICES is developing a new module of the Stock Database** (SD) which is expected to improve efficiency and reduce numbers of transmission failures. The new data call module of the SD will hold the data needs for each stock eliminating the need for excel spreadsheets. Data needs for individual stocks can be updated directly into the SD by stock coordinator or stock assessor.

The main novelty is that data providers will be able to see the data needs for each of the assessment working group's months in advance. Also, data providers will have the ability to flag issues regarding any of the data being requested. **The SD** will have the facility for data providers to flag/open one or multiple issues by species. This **is potentially where any quality indication could be flagged**, so the stock assessor would have an idea of the quality of the input data. When an issue is flagged the stock coordinator and assessor will receive an automatic email requesting action ensuring that no issue is overlooked. The contribution from the data providers will be key in the success of the data calls. Each new issue flagged by the data provider will supplemented with support text justifying an issue. Likewise, the stock assessor before closing the issue will add some comments and all information will be kept in the SD as metadata associated with each stock.

The new module is expected to be operational by the start 2018 and ICES is working together with WG and data providers to ensure the new module has what it needs to make the data call process more user friendly, efficient and transparent.

### 1.4.2.2 Technical groups

ICES initially set up the Planning Group on Commercial Catches , Discards and Biological Sampling (PGCCDBS) as a response to the EC-ICES MoU that requested ICES to provide support for the Data Collection Regulation (EC/Reg. 1543/2000 and 199/2008; 1639/2001 and 1581/2004). PGCCDBS was the ICES forum for planning and coordinating the collection of data for stock assessment purposes; it coordinated and initiated the development of methods and adopted sampling standards and guidelines. In 2014, PGCCDBS stopped, and the new ICES Working Group on Commercial Catches (WGCATCH) and the Working Group on Biological Parameters (WGBIOP) took over many of the responsibilities of PGCCDBS. A proposal was developed for a major revision of the PG to focus more on the end use of data. Renamed as the Planning Group on Data Needs for Assessment and Advice (PGDATA), the new group was meant to design a Quality Assurance Framework for assessment EGs to evaluate data quality and its impact on assessments, particularly within the benchmarking process, and test this in regional case studies; 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; engage with end-users (ICES EGs & SSGs, RCMs/RCGs; stakeholder Advisory Committees, STECF, European Commission and other RFMOs) to raise awareness of what types and resolution of management decisions (e.g. by fleet or area) can realistically be supported.

One of the tasks of PGDATA has been to develop advice in ICES 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. One way to achieve this goal has been to **contribute to the development of the benchmark process within ICES including templates to document the quality of the dataset used**. Presently, many ICES groups have provided valid information on best practice and guidelines but it is very time consuming to locate the relevant information on how to improve the data

quality for a specific domain. Therefore, **PGDATA locate and host a repository[13] where the information on best practice and guidelines are available**. However, a common description/ understanding of data quality from national institutes to stock level can be challenging to archive and here the national programmes and annual reports are important tool to obtain common grounds. It is therefore seen as a step on the right direction if MS obtain common understanding on reporting of the quality in the sampling program.

However, with increasing demands of more data and better documentation of the data quality there is an increasing need for cost benefit analysis of the data collected. The ICES document on "Implementing the ICES strategic plan 2014–2018" (ICES, 2013b) states that the main objectives of the ICES Integrated Ecosystem Observation and Monitoring programme include the need to "Identify and prioritize ICES monitoring and data collection needs" and to "Implement integrated monitoring programmes in the ICES area". The implementation document identifies a need to:

- Identify monitoring requirements for science and advisory needs in collaboration with data product users, including a description of variables and data products, spatial and temporal resolution needs, and the desired quality of data and estimates.
- 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.
- Allocate and coordinate observation and monitoring requests to appropriate expert groups on fishery-independent and fishery-dependent surveys and sampling, and monitor the quality and delivery of data products
- 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.

**To make the sampling design more cost–efficient on a regional scale, a regional database** in which all regional fisheries-dependent data are stored in common formats, **will constitute a core tool** for a regional sampling plan, **ensuring transparency, data quality and consistent standards for data aggregation/estimation and data dissemination facilities across Member States**. Further, the regional databases have substantial potential to support countries in calculating/estimating national biological data, landings and effort for e.g. ICES stock assessment and other bodies such as STECF. This means that regional databases have a key role to improve cost-efficient use of resources spent in calculating/estimating data for answering data calls. Currently, ICES already hosts one such RDB (RDB/Fishframe). The RDB has been built and refined with input of many ICES experts on fishery-dependent data and already allows a significant number of analysis, but needs improvement, particularly in what regards inclusion of sampling design and sampling probabilities. A key feature of the ICES RDB/Fishframe is that all RCGs are part of the Steering Committee, thus ensuring a close link between data providers and data users.

### 1.4.3 STECF

Quality aspects and harmonisation of sampling strategies for economic data have been discussed extensively in SGECA 09-02 and 10-03 and EWG 11-18, inter alia leading to recommendations for common methodologies and data quality indices.

The improvement of data quality and its monitoring have been subject to several DCF revision meetings. In the reports of EWG 12-01 (section 5.6) and EWG 13-18 (Annex 2),

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[13] http://www.ices.dk/community/Pages/PGCCDBS-doc-repository.asp

the current knowledge on establishing data quality assurance has been summarized, including corresponding ICES expert groups.

**It became clear** during the recent STECF EWGs on evaluation of Annual Reports and Data Transmission to end-users (EWGs 13-07, 14-07, 15-10, 16-08, 17-07) **that data quality cannot be fully assessed within the current formats for Annual Reports evaluation procedures**. The EWG 16-08 suggested that *"the Commission considers postponing the introduction of a Quality Assurance Framework (…) to allow a more in-depth review of the outputs. This would ensure the preparation of comprehensive guidelines to support the MS implementation in relation to quality indicators that will hopefully not need major revision."* Nevertheless, two tables requesting information on quality assurance had been introduced into the Work Plan templates (COM Implementing Decision 2016/1701. The Commission requested further guidance on quality assurance procedures for biological and economic variables as ToR of STECF PLEN 16-02, which recommended EWG 17-04 to improve the guidelines on data quality for MS and set the main principles for evaluation of data quality and results of data collection as well as establish minimum/meaningful requirements.

Further information on current data quality for various DCF variables can be found in JRC coverage reports in relation with data calls and chapters on quality of input data for the AER and reports on aquaculture & processing industry, FDI/effort and balance reports.

Recently, the quality of biological observer data has increased in importance in the context of regional (e.g. Baltfish, Scheveningen) groups establishing discard plans under the new CFP (Landing Obligation). The EWG 16-04 on Methodology and data requirements for reporting on the Landing Obligation inter alia reflected on data quality from catch sampling/observer programmes.

### 1.4.4   RCGs, RCMs

The regional coordination meetings (RCMs) were initiated in 2004. Reports are found on https://datacollection.jrc.ec.europa.eu/docs/rcm. The aim of the RCMs was to support the MS to coordinate their National Programmes. The RCMs have throughout the years spent considerable time to improve standardisation in the way MS identifies and name fisheries/métiers, areas, harbours and species. **The RCMs have worked intensively, together with MS, the RDB steering committee and ICES to establish reference lists for all these elements, but the information is not easily accessible and not well enough centralised into a central unique repository**.

A generic nomenclature allows for regional overviews of fisheries and their importance in terms of catches, effort and value as well as for regional overviews of sampling coverage and relative contribution of sampling by different MS. It is also a prerequisite for data quality evaluations at the regional level. RCM Baltic, RCM NS&EA and RCM NA have further implemented and populated a regional database (RDB). There is considerable potential to use this database for different types of transparent quality evaluations on the regional (and national) level. The RCMs have been involved in setting up bilateral agreements between MS to ensure sampling of landings in foreign countries.

The RCM will develop into Regional Coordination Groups following the recast of the Data Collection Framework regulation (2017/1004). This will widen the scope of the groups which also get clear aims to develop and implement procedures, methods, quality assurance and quality control (article 9.3). This will in turn require coordination with the work carried out by e.g ICES to avoid duplication. It is important that the role of the RCGs in the overall objective to improve quality assurance and quality control is made clear (cf section 1.6).

*1.4.5 GFCM and DCRF*

The General Fisheries Commission for the Mediterranean (GFCM) is a regional fisheries management organization (RFMO) established under the provisions of Article XIV of the FAO Constitution. The GFCM initially started its activities as a Council in 1952, when the Agreement for its establishment came into force, and became a Commission in 1997. The GFCM is currently composed of 24 members (23 member countries and the European Union) and 3 Cooperating non Contracting Parties. The GFCM aims to ensure the conservation and sustainable use of living marine resources – at the biological, social, economic and environmental level – as well as sustainable aquaculture development in the Mediterranean and the Black Sea. For this, the **GFCM has developed the Data Collection Reference Framework (DCRF).** The DCRF is the first GFCM comprehensive framework for the collection and submission of the fisheries-related data that are requested as per existing GFCM Recommendations and are necessary for relevant GFCM subsidiary bodies to formulate advice in accordance with their mandate (FAO 2017).

Within the DCRF, data quality validation is performed at two levels: internal and external (FAO 2017). The internal validation is performed by each country and the external validation by the GFCM Secretariat.

Internal validation: Countries are expected to produce two standard documents, a *Standard Operating Procedure* and a *Quality Manual*. The *Standard Operating Procedure* includes: (1) the quantitative goals of the monitoring programme, (2) the methodological details of all steps performed (e.g. field & laboratory aspects), (3) details of the procedure related to the analysis and archiving of data.

The *Quality Manual* describes: (1) the quality assurance system in place, (2) the frequency at which different aspects of quality assurance should be reviewed, (3) the standards that should be met, (4) the actions needed if the standards are not met.

External validation: The GFCM secretariat has to: (1) check the completeness of data collected, (2) identify deficiencies in the data submissions, (3) check differences between countries, (4) check problems connected with the quality of existing data, their completeness and the level of comparability, (5) check comparability with other sources of information/reference, (6) identify significant discontinuities in time of collected data, (7) identify significant outcomes.

GFCM highlighted the need for having quality indicators and suggested to work towards having national reports on this matter (GFCM 2014a). Preliminary standards for quality control were investigated upon adoption of the DCRF (GFCM 2014b). Four operational indicators have been established (GFCM 2016). These indicators are: (a) **Conformity**: It checks whether a value conforms to the syntax of its definition (format, type, range). (b) **Stability**: It checks if values vary at an acceptable level on the basis of values of the recent past. (c) **Coherency**: It checks if reported values are equal among different data tables. (d) **Accuracy** (precision and bias): It checks the degree to which values vary from a true or expected value.

As a test phase, there is tentative implementation of data quality checks on conformity, stability and coherency (with preliminary thresholds) on the online platform for data.

GFCM states that quality indicators such as statistical dispersion parameters are needed to perform quality controls. In the Mediterranean region, the definition of such indicators is in progress and needs to be agreed upon by all CPCs in order to establish control routines (FAO 2017).

*1.4.6 PGECON*

The 'Planning Group on Economic Issues' (PGECON) was established as a subgroup of the Commission Expert groups according to Commission Decision C(2016)3301 developed to assist the Commission in the implementation of the Data Collection Framework (DCF).

One term of reference for PGECON 2017 (Vilnius, May 2017) was to develop the framework for quality assurance for DCF data to meet the requirements of Commission Decision No. 2016/1701 Article 5. The Article 5 prescribes that "assurance and quality control framework shall be described in publicly available documents referred to in the work plans, where appropriate".

The objectives were to assess the main principles and requirements for Quality Assurance Framework and to define recommendations on quality requirements and procedural aspects.

The main recent STECF and PGECON reports used as information background to proceed with further development of the framework:

- STECF EWG SG-ECA 09-02: This **EWG defined the quality indicators** that have been implemented for the last DCF quality reporting. It contains a limited number of indicators of the statistical quality of the outcomes. (STECF SG-ECA 0902)
- STECF EWG 16-07: This **EWG** reviewed the proposed EU Map and the **included information on the set up of QAFC** (Quality assurance and Quality Control Framework) (STECF 16-07)
- Moura, C. 2016 (Ed.) Quality Guidelines For the DCF (Further – Report on QAFC) This report from **an ad hoc contract by the Commission specified the guidelines for quality reporting in the context of the DCF**, based a comparison of the DCF QAFC and the ESS QAF. (QUALITY GUIDELINES FOR THE DCF).
- Scientific, Technical and Economic Committee for Fisheries (STECF) – 52nd Plenary Meeting Report (PLEN-16-02). Commented on the ad-hoc report and the possibilities for implementation of the QAFC.
- Report of the meeting of the subgroup of DCF/PGECON on Statistical Issues and Methodologies (SIM) Edited by Heidi Pokki and Evelina Sabatella (12-14 December 2016). This report **commented on the practical implementation of the QAFC**.

A proposal with a structure and setup of guidelines for quality assessment and reporting and as well as adjustments on Table 5 of EU MAP Work Plan (WP) were provided.

Finally, PGECON recommends reporting in two stages:

1. **The methodological document**, including a detailed description of methods of surveys, structured in accordance with the ESS guidelines (Anon., 2017 Annex 7)) and references to selected ESS QAF Principles (Anon., 2017 Annex 6) listed in section 2.3.2 and in the amended WP Table 5B. This document can be either incorporated in the WP or used as a standalone document of the WP (Anon., 2017 Annex 8).
2. The **annual Quality report**, with tables and specified quality indicators, taking into account the checklist for quality reporting and structured according to the ESS guidelines (Anon., 2017 Annex 6, see also section 2.3.2).

PGECON recommends that this is the basis, but there is a need for further development of the methodological report and the quality report. Moreover, PGECON 2017 once again stressed the need for the "Handbook on sampling design and estimation methods for fleet economic data collection" as suggested in the past.

Furthermore, PGECON reviewed the quality assurance table 5B, agreed that it provides good general assessment framework, but it is not very suitable in its current form, being too broad and without traceability. Therefore PGECON suggested, that for the next reporting period, the table could better be replaced with the more specific checklist of ESS QAF Principles (Anon., 2017 Annex 6, see also section 2.3.2), relevant to current data collection framework and incorporated in the proposed guidelines for the methodological and the quality report.

### 1.4.7 Tuna RFMOs

Conservation and Management Measures (CMMs) in force within ICCAT and IOTC describe the mandatory data requirements (general sampling guidelines and objectives, formats, and deadlines for submission) for each Contracting Party. Although tuna RFMOs recommend that a comprehensive description of procedures of data sampling and processing is available, document standards and templates are lacking and prevent comparison between countries. Data quality is currently mainly assessed through availability and timeliness of data provision. Analysis of data and comparison between data sources are also commonly used to determine inconsistencies, evaluate usefulness and limits of data sets, and provide guidance for further collection (e.g. Hinton and Maunder 2004). Uncertainty in both biological (i.e. growth, natural mortality, maturity) and fisheries data (i.e. catch) on estimates of tuna stock status is mainly described with alternative runs of population models aimed at assessing the diagnostic sensitivity and robustness to the overall quality of information available. Management Strategy Evaluation (MSE) approaches currently developed within tuna RFMOs and supported by the EU aim to better address the sources of uncertainty in data inputs and population dynamics and eventually identify best management procedures (Cf examples for yellowfin and bigeye tuna, and for Indian ocean skipjack tunas)

### 1.4.8 FishHub

The FishHub project was not presented directly to the EWG, but EWG Members were aware of its existence. It has been discussed in the recent STECF EWG 17-07

## 1.5 Clarification of roles and responsibilities

It is recognised that several bodies have dual roles in the entire data process (e.g. ICES and GFCM are both a support for data collection and a data end-user; STECF is both an end-user and an independent evaluation body; RCGs are also involved in national data collection), and also that many individual scientists have multiple roles at multiple levels, and may be both data collectors and data users. This situation is an advantage (better common understanding and knowledge transfer within the community regarding data availability and quality) but can also be problematic to ensure independency of the evaluation. This problem cannot be easily resolved given the limited number of scientists knowledgeable about EU data collection but that can act fully independently from MS' stakes. **It is therefore best tackled through clear and objective evaluation guidelines which do not leave too much room for personal interpretation, which is also one of the objectives of this EWG.**

But this intermingled situation also means that in practice, it can be difficult to decide which institution has which role and responsibility; Rather, there might also exist some implicit collective agreement that a given group of people are the most legitimate to deal with a given topic, regardless of under which affiliation that is taken place.

A summary of roles is a follows:

### 1.5.1 RCGs

RCGs have a central role to implement the standards to be followed and coordinate the national sampling programs within a region. This is where the deepest knowledge on data collection is found. **RCGs** are also the ones most legitimate to coordinate and formalise what is needed for common tools such as RDBs, R packages etc, and **could be tasked with producing standard and automatised data quality reports at regional level**.

### 1.5.2 PGECON

PGECON is the most important body coordinating collection of social and economic data for fishing fleet, aquaculture and fish processing industry at EU level. Also responsible for harmonisation of definitions, methodologies and provision of the best practices for the collection of economic, social and transversal data. Objectives and tasks of PGECON have been discussed in the last [PGECON report](.).

### 1.5.3 Regional end-users

There are obvious benefits to have close relationships between end-users and data providers, such as 1) direct and quick feedback from users when data are missing or inaccurate, implying that many issues can be solved immediately rather than being reported as data transmission failures, 2) some trust that the data are used correctly and with full knowledge of their uncertainty and limitations, 3) some independency from the national level. As such, **supra-national end-users are the most legitimate bodies to host regional databases**, e.g. ICES for NEA biological data, GFCM for Med&BS biological data, JRC for Annual Economic Report etc. A similar setup could be considered in the future for Tunas RFMOs, as well as for data currently not held in RDBs (recreational fisheries, PETS bycatch..). Coordination with the RCGs is essential, e.g. during high-level planning meetings such as STECF Bureau or ICES WGChairs.

### 1.5.4 STECF

As an independent scientific body under the EU Commission, STECF is also a legitimate body to evaluate the work plans. But for doing so, STECF must have the full overview of what are the prevailing standards that are in use within and across the regions. As such, a close communication with the RCGs is essential too. It is the opinion of STECF EWG that the overall evaluation process could/should be fully transparent. As part of this, the anonymised pre-screening reports for example could be made public after validation by the STECF plenary, though with a disclaimer that these pre-screening are one step in the overall STECF evaluation process and have no legitimacy on their own.

## 2 PRINCIPLES UNDERLYING DATA COLLECTION

### 2.1 From prescriptive DCF to less prescriptive EU-MAP

The new legal DCF framework (Reg (EU) No [1004/2017](.), COM Decision (EU) [2016/1251](.), Work Plan (WP) template COM Decision (EU) [2016/1701](.)) addresses needs identified through experience with implementation of the previous DCF, such as improving the quality and availability of data, as well as the relevance of the data for end-users. It seeks to **introduce flexibility into the system and to allow adaptation in a timely fashion to emerging data collection needs**.

According to the [Recast](.), the legislation no longer determines details on methodologies. This is replaced by the description of processes, by which methodologies will be determined.

The new EU MAP prescribes the data requirements to be followed by MS. These include biological data on a specified list of stocks per marine region, data on activity under the Control Regulation (Reg (EU) No 1224/2009), specified list of socio-economic variables for the fleet and aquaculture (and optionally for the processing industry), specified variables for sustainability of aquaculture and pilot studies for the environmental impact of fisheries. The new EU MAP makes a general reference to data quality, in relation to best practices and relevant methodologies followed by scientific bodies. These have to be revised at regular intervals by independent scientific bodies. MS have to describe the methodologies used and the quality standards followed in the planning of data collection (WP). The **STECF,** as an expert body to the European Commission**, is requested** through this EWG, **to propose common and adequate quality indicators for data collected under the DCF**, for MS to follow in their planning of DCF activities and EWG experts to use in evaluation of MS DCF reports.

## 2.2 Types of sampling designs

### 2.2.1 Métier-based

The collection of biological parameters for all fleet segments or métiers may be difficult to achieve for obvious and practical reasons (i.e. technical cost, human resources) and thus a selection of which segments are to be sampled can help, trying to find the best compromise between quality and cost. The métier-based approach to sample is described in the Commission Decision of 6 November 2008 (2008/949) (ranking system) and an analogous methodology (weighting procedure) is described in the GFCM DCRF. This weighting procedure is based on landings (tons), effort (fishing days) and economical values (total landing value) and is applied to identify the métiers or fleet segments to be sampled, using as reference the average values of the two previous years. The métiers selected to be sampled are those that reach 90% of the cumulative percentage of each value (landings, effort and value), previously ranked from largest to lower percentages. From this point, **the sampling should be statistically planned and designed to avoid problems of under-sampled and unsampled strata or domains requiring imputation of missing data**. For data collected since 2017, métiers may be linked with fleet segments based on vessel length classes, as it is presented in Table 2 of the EU Decision 1251/2016. In order to optimize the sampling programs, the possibility to merge vessel length classes should be contemplated as reflected in the GFCM DCRF.

This type of approach in the sampling is used in Mediterranean MS for selecting those métiers for sampling length data and discards information, after an agreement reached in the RCM Med&BS&LP in 2016, taking into account the agreements reached in the RCM Med&BS 2010 and reproduced in the 2016 report.

### 2.2.2 4S statistically sound sampling scheme

The term 4S has been used to denote Statistically Sound Sampling Schemes. This refers to designs that employ probability based selection of the sampling units. Under 4S, samples are collected from the population and the sample data is used to make inferences about population parameters; the estimator most commonly used for this is the Horvitz-Thompson estimator (Horvitz and Thompson, 1952) and designs are typically stratified multistage sampling designs, hence the term 4S has also become synonymous with "design based sampling".

4S designs enable sample size to be controlled and the relative sampling effort directed to collect data from different parts of the population to be planned a priori. **4S designs are based on a sampling frame, which is some form of list that facilitates access to the sampling elements in the population**. A sampling frame will generally be

divided into mutually exclusive strata. Within each stratum the aim will be to collect a number of replicate samples thereby enabling the variability in the population to be estimated. Sampling effort is planned for each stratum before the data is collected, and the planned number of samples to be collected can be different in different stratum, allowing the allocation of differing sampling effort to different strata. One aim of differential effort allocation can be to take more samples in strata where the population was more heterogeneous, thereby improving the overall precision of the resulting estimate. Stratification may also be based on logistic and practical considerations.

**Under 4S, the samples within each stratum are collected using probability methods**, this means that the probability of selecting a sample can be calculated, and that each sampling element has a-non zero chance of being selected. The simplest form of probability based sampling is simple random sampling where each sampling element has n/N chance of being selected. Other probability based methods are systematic random sampling and sampling proportional to size. Probability based sampling ensures two things; firstly that **in the ideal situation the sample will be unbiased,** and that where the situation is not ideal (for example due to an inability to sample some elements of the population) the level of bias in the sample can be quantified, and potentially corrected. The second aspect of probability based methods is that **a measure of variation around the estimate can be obtained**. This measure of variability can be as a relative standard error, if an assumption of the normal distribution of the estimate is valid, or as confidence intervals where this assumption is not appropriate.

The distinction between 4S and non-probability based sampling methods is that the latter cannot be used to make inferences about the population being sampled in the strict statistical sense, this is because the probability of selecting a sampling element cannot be calculated.

For clarity, a terminology adapted from ICES/WKPICS3 can be proposed:

**SAMPLE DESIGN**: The totality of instructions, protocols, and rules that govern a sampling method.

**SAMPLING FRAME**: In statistics, a sampling frame is the list of primary sampling units from which a sample is drawn. The sampling frame comprises all the primary sampling units and any stratification of these, and may be based on a vessel registry or list of ports.

**PRIMARY SAMPLING UNIT**: Sampling can then be conducted by selecting units within the sampling frame at the first stage of selection. These units are called primary sampling units (PSU).

**STRATUM**: The decomposition of a finite population of sampling units into non-overlapping subpopulations, and every element in the population must be assigned to only one stratum, without any exclusion.

**SAMPLING SCHEME** : on-shore, at-sea, self-sampling, purchase of fish, …

### 2.2.3  Fleet segmentation for economic data collection

The population of MS fishing fleets is defined through the fleet register (COM decision 1701/2016, section 3). The segmentation is defined by predominant gear and length class (ibid.). Following this approach, the population is comprehensively defined and stratified: The length class is determined via the fleet register, the dominant gear via logbooks. If logbooks are not available, different approaches are applied by MS (e.g. 1st gear from fleet register, survey). If no activities are filed for a vessel, it is assigned to a gear class "inactive". Appropriate sampling designs are laid down e.g. in SGECA 09-02.

For each fleet segment the activity variables as specified in EU COM Decision (1251/2016, table 4) and economic variables (table 5A ibid.) have to be collected. For inactive vessels only a limited number of variables has to be provided. For fleet economic variables annual data have to be provided. Activity variables have to be provided at higher resolution.

### 2.2.4 Probability vs. nonprobability sample survey

According to the Commission Implementing Decision (EU) 2016/1701 *laying down rules on the format for the submission of work plans for data collection in the fisheries and aquaculture sectors* Section 3: "Type of data collection scheme" three different types of data collection schemes could be used for the data collection:

A. Census, which attempts to collect data from all members of a population. This would include collection of data from administrative records, as well as other cases in which data are derived from sources originally compiled for non-statistical purposes
B. Probability Sample Survey, in which data are collected from a sample of a population members randomly selected
C. Non-Probability Sample Survey, in which data are collected from a sample of population members not randomly selected.

The SGECA 09-02 Barcelona report from 11-14 of May 2009 provides principles how to choose the appropriate type of sampling for economic data. According to these principles "*Non-Probability Sampling refers, for example, to surveys where data are collected from a panel of vessels who have agreed to supply data on a voluntary basis or from a sample selected on the basis of a priori information, or other non-random methods. Technical details on how the sample was selected should be reported. The reason for not using probability sampling should be stated as well as an assessment of how the sampling procedures may affect the estimates. Different types of non-probability sampling, such as "cut-off" sampling (where units below a certain size threshold are not sampled) are described in Eurostat (2009a and 2009b)*".

Only few MS applied the Non-Probability Sampling for the economic data collection: France, Ireland, Italy and UK. For example, for Italy the variable concerning the financial exposure (ratio between Assets and Debt) is collected from the financial statement for companies and is provided on voluntary basis for the vessels which are not subject to the publication of the balance sheets.

## 2.3 Generic principles underlying data quality

### 2.3.1 International/generic quality norms and metadata

#### 2.3.1.1 ISO 9001

The [ISO 9001 standard](#) sets out the criteria for **a quality management system** and is a standard that can be certified. It can be used by any organization, large or small, regardless of its field of activity. This standard is based on a number of quality management principles including a strong customer focus, the process approach and continual improvement. For these reasons, **this standard is worth to be considered in the Data Collection world**.

Principles

ISO 9001 specifies requirements for a quality management system that can be used for internal application by organizations, or for certification, or for contractual purposes. It focuses on the effectiveness of the quality management system in meeting end-user

requirements. This International Standard specifies requirements for a quality management system where an organization

a) needs to demonstrate its ability to consistently provide product that meets end-users requirements, and

b) aims to enhance customer satisfaction through the effective application of the system, including processes for continual improvement of the system and the assurance of conformity to customer and applicable statutory and regulatory requirements.

The organization shall plan and develop the processes needed for product realization. In planning product realization, the organization shall determine the following, as appropriate:

a) quality objectives and requirements for the product;

b) the need to establish processes and documents, and to provide resources specific to the product;

c) required verification, validation, monitoring, measurement, inspection and test activities specific to the product and the criteria for product acceptance;

d) records needed to provide evidence that the realization processes and resulting product meet requirements

The organization shall take action to eliminate the causes of nonconformities in order to prevent recurrence.

Corrective actions shall be appropriate to the effects of the non conformities encountered. A documented procedure shall be established to define requirements for

a) reviewing non conformities (including end-users complaints),

c) determining the causes of non conformities,

d) evaluating the need for action to ensure that non conformities do not recur,

e) determining and implementing action needed,

f) records of the results of action taken and

g) reviewing the effectiveness of the corrective action taken.

Preventive actions. The organization shall determine action to eliminate the causes of potential nonconformities in order to prevent their occurrence. Preventive actions shall be appropriate to the effects of the potential problems. A documented procedure shall be established to define requirements for

a) determining potential non conformities and their causes,

b) evaluating the need for action to prevent occurrence of non conformities,

c) determining and implementing action needed,

d) records of results of action taken, and

e) reviewing the effectiveness of the preventive action taken.

Whether or not, the institutes and countries contributing to the EU data collection would be certified ISO 9001 is not crucial at this stage, but following the ISO 9001 principles should be the norm, since it perfectly matches to the DCF requirements.

Metadata provide the means of using common ways (i.e. terminology, nomenclature, terms) to describe the data collection and processing steps, from sampling operation to data provided to end-users. Using standard metadata formats within the DCF context would strongly facilitate the comparison between methodologies in use across MSs and

would constitute as such an improvement for the evaluation of national reports and a guarantee of overall homogeneity and quality.

### 2.3.1.2  ISO 19115

The norm ISO 19115 on geographic information provides elements to describe the sources and production processes used in producing a dataset (lineage information). The norm also provides the possibility to give a general assessment of the quality of a resource (e.g. elements such as evaluationMethodType and evaluationMethodDescription). The Directive INSPIRE, which has to be fully implemented by 2021, aims to build a European Spatial Data Infrastructure to facilitate the sharing of environmental spatial information among public sector organisations, facilitate public access to spatial information across Europe and assist in policy-making across boundaries. Metadata to be used in the DCF context should be developed within the framework of INSPIRE.

### 2.3.1.3  European Statistical Standard

Quality assurance is traditionally defined as a systematic process of checking to see whether a product or service being developed meets specified requirements (European Statistical Standard Handbook for Quality Reports).

Some tools and procedures to assure quality are described in the Eurostat project on Data Quality Assessment Methods and Tools. This comprises:

- Quality reports and indicators
- Measurement of process variables
- User surveys
- Self-assessment and auditing
- Labelling
- Certification

The European Statistics Code of Practice is based on 15 Principles covering the institutional environment, the statistical production processes and the output of statistics. A set of indicators of good practice for each of the Principles provides a reference for reviewing the implementation of the Code

Eurostat metadata for fisheries catch statistics are available at a dedicated website. The standard includes e.g. generic principles of *"Release Policy", "Accessibility and Clarity", "Relevance", "Timeliness", "Coherence and comparability".*

In the European data quality world, a lot of references are available, and may be directly applicable to the fisheries Data Collection. A broad list would contain the Guidelines for the implementation of quality assurance framework for international and supranational organisations compiling statistics, the Revised International Statistical Processes Assessment Checklist; The Eurostat handbook on Data Quality - Assessment Methods and Tools; Linking management, planning and quality in Statistics.

### *2.3.2    Applications of these principles in fishery data*

In the section 1.5 State of the art, a lot of information has already been provided on progresses achieved into increased standardisation and transparency of sampling programs in all bodies. However, the reference to these generic metadata and basic standards for data quality is not always clear. Additionally, during the EWG it became clear that while much work has been given into understanding and implementing 4S sampling in biological data in the ICES area, **some discrepancies across MS remain**, which have not been really investigated; for example the choice and frequency of which box/which fish are to be randomly chosen when an observer is onboard a vessel or in a

harbour. In such cases, **standardised protocols descriptions would greatly ease the further evaluation of the NWP**.

An exception is the work by PGECON. The 'Planning Group on Economic Issues' (PGECON 2017) has already investigated these generic quality norms, and recommended that the reporting on the economic data collection and its resultant quality could be best structured in accordance with the European Statistical System (ESS) Standard for Quality Reports Structure (release 2, December 2014).

PGECON 2017 also suggested to review the quality assurance table 5B in accordance with four of fifteen ESS Quality Assurance Framework Principles concerning *Sound methodology*, *Appropriate statistical procedures*, *Accuracy and reliability* and *Accessibility and Clarity* (Moura, C. 2016 (Ed.) Quality Guidelines For the DCF).

The principles mentioned above cover in particular the statistical process and the statistical output and provide guidance for the assessment of the overall quality of the Methodological and Quality reports according to the following Checklist (Anon., 2017 Annex 6):

**Sound methodology**

- Is sound methodology documented?
- Does it follow international standards, guidelines and best practices?
- Are methodologies comparable at MS, regional and EU level?
- Are all relevant definitions in place: statistical unit, population, derived data calculations etc.

**Appropriate statistical procedures**

- Is there consistency between administrative and other statistical data?
- Is there a set protocol for access and use of alternative data sets, intra or inter-agency?
- Are data collection, entry and coding checked?
- Are editing and imputation methods used and checked?
- Are revisions documented and available?
- Is duplication of data collection avoided?

**Accuracy and reliability**

- Are raw data inputs, intermediate results and outputs regularly assessed and validated?
- How are errors dealt with; if measured then how? documented? Corrected? Where in the process?

**Accessibility and Clarity**

- Are methodological documents publicly available?
- Are data stored in databases?
- Where can documentation be found?

## 2.4 Relationships between population heterogeneity, sampling intensity and precision

Statistically sound sampling is a requirement of the new EU-MAP that now specifies that "*where data are to be collected by sampling, Member States shall use statistically sound designs*" (Commission Implementing Decision (EU) No 2016/1701, article 5). One important component of a "statistically sound design" is that sampling effort is optimized and fit for purpose, i.e., that time and costs spent in sampling can be effectively justified in terms of quality of the information finally provided to end-users. Increasing demands to determine MSY reference points for an increasing number of stocks, including many

data-limited stocks, and, at the same time, to collect additional environmental information (e.g., during surveys), 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/or other environmental variables.

Representative sampling is critical to valid statistical inference, as (i) biased sampling can result in erroneous estimates and (ii) if a sample is too small there may be too little information to draw any conclusions. Therefore, accommodating the structure of the population is a key issue for sampling plans. Before designing a sampling strategy, whatever the sampling procedure, it is important to identify the target population (as a whole), the subset to be measured (i.e. the sample) and the nature of its individual elements – the sampling units. **The target population, the observable subset (sample) and the assumed link between them should be clearly identified**. The sample size; i.e. the number of sampling units to be included in a sample, must be estimated according to several criteria, as cost, precision level, confidence level, variability within the population and availability of resources.

The precision in terms of Coefficient of Variation, depending on the length structures of the samples, besides that the landings and the number of sampling unit (trips), is strictly linked to the selectivity of the gear, the availability of the species in the area and the species biological traits. Generally, the value of CV improves with the increase of the number of sampled trips (and consequently the number of individuals as shown in figure 2.4.1), but also its value varies according the considered species, therefore it is not easy to establish a fixed threshold as quality indicator.
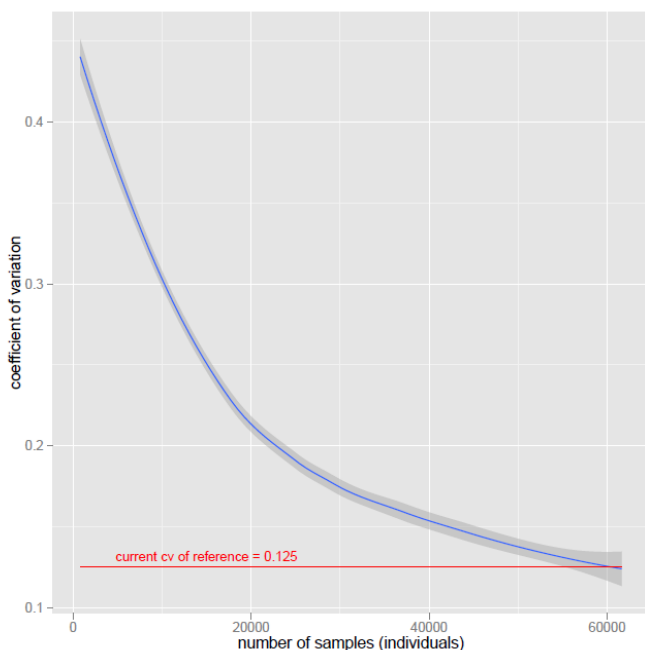


Figure 2.4.1: Coefficient of variation against the number of samples.

However, the precision against the number of trips can be analysed in different sampling schemes in order to observe the trends varying with the sampling effort.

The general rule regarding the implementation of the EU-MAP is that the sample size should be as large as possible, given the staff and resources available, as specified in the GFCM DCRF manual (FAO 2017).

A key point though, is that the precision tends to "level-off" after a certain number of samples, meaning that the precision level flattens and do not reduce further even if

sampling size increases (this would also be observed on Figure 2.4.1 if the number of samples was expanded further). Helle and Pennington (2004) showed that, from a certain number of samples, precision level did not increase further by increasing sampling intensity in terms of number of fish measured per day, or number of days sampled per vessel. Conversely, **the magnitude of the gain in precision was more important when increasing the number of vessels sampled**, indicating that most variability was found across vessels (taken as a primary sampling unit) rather than within or between hauls of the same vessels. **This work is central for the understanding of 4S sampling strategy, where the focus should be made on sampling as many primary sampling units as possible**.
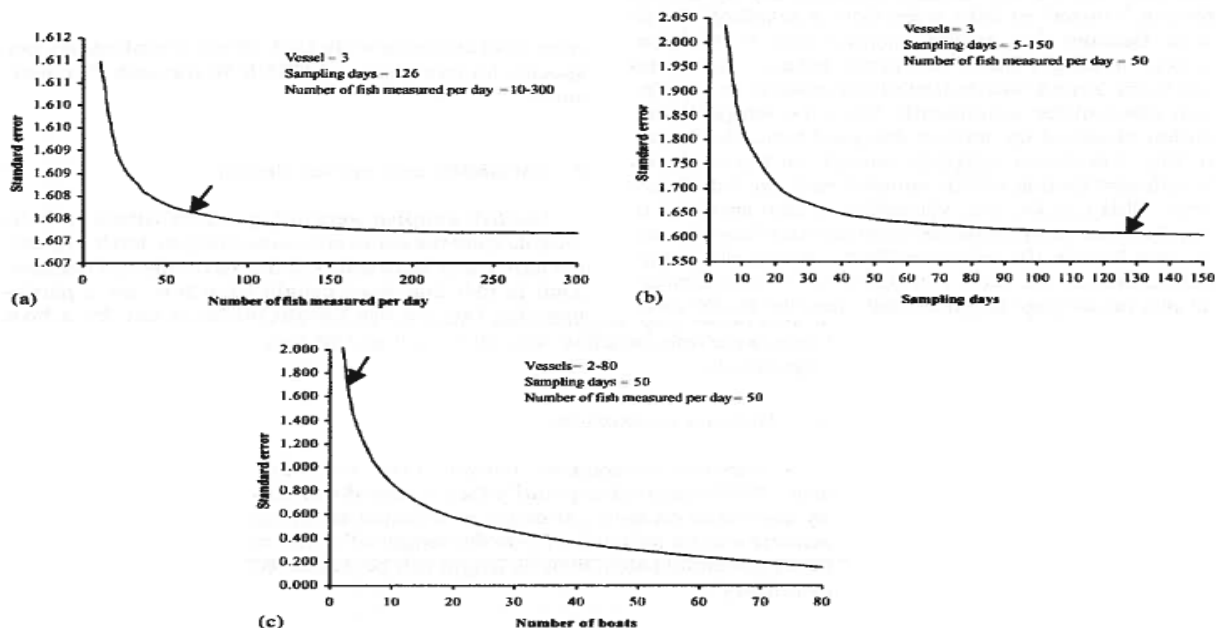


Figure 2.4.2, From Helle and Pennington (2004): Precision of the estimate of the mean length of tusk as a function of the number of fish sampled per day (a), the number of days each boat collects samples (b) and the number of boats in the reference fleet (c). The arrows denote the precision of the 2003 survey data.

In section 3.4 (Mimimum requirements), a lot of work is presented investigating this relationship further. In particular, the Mediterranean MARE/2014/19 project has produced valuable bootstrap analyses trying to identify what could be the "optimum" minimum sampling level as a trade-off between precision and sampling intensity, searching the inflexion point in the curve as on Figure 2.4.1. Also, ICES WKBIOPTIM has investigated the effect of modifying/removing some parts of the sampling programs on the final estimates of the variables. (see section 3.4.3) These work have been applied to length frequency distribution for some selected case studies, and it is expected that such work will develop further in the near future and underpin further refinements in the national work plans in order to get the most optimised sampling for a given amount of resources. (see section 5.2)

## 2.5 Quality requirements on fleet economic data

The Expert group discussed criteria for the evaluation of NWPs with respect to the collection of data on economic variables. The focus was set on fleet economics. The methods used by different MSs vary according to a variety of criteria including their fleet segment composition and existing national legislation. Data may be collected through a census of different fleet segments or through sampling. Guidelines for a selection of

sampling schemes were provided during SGECA 02-09 (see also 2.2.4: Probability vs. nonprobability sample survey).

### 2.5.1  Historical perspective

**The EWG proposed that retrospective analysis of data collected by different MSs** under previous sampling schemes be evaluated to establish whether such schemes have proven to deliver representative data of sufficient quality and whether the sampling strata (current feet segments) are appropriate. Such analyses could form the topic for a future STECF EWG.

A variety of analyses could be undertaken, but the group suggested that a retrospective analysis of sample size on the precision of data (CVs) collected within sampling strata would be a useful starting point. Such analyses would provide information on appropriate sample sizes for different strata thereby helping to ensure that MSs can deploy their sampling efforts in the most efficient manner.

### 2.5.2  Quantification of data quality

In previous years quality indicators had to be provided for each variable within a fleet segment. It is characteristic for certain variables to fluctuate more between years than others: "Repair and maintenance" is more variable than e.g. labour cost (given the same activity pattern) as some repair will only occur less frequent than annually. Therefore the CV for "repair and maintenance" will in general be higher.

Several (fleet economic) variables depend to some degree on other variables (e.g. effort, capacity) which are comprehensively available (=auxiliary information). This should be taken into account when analysing and evaluating the variability/"representativeness". Using auxiliary information will decrease the residual variability. The "Handbook on practical methods" is supposed to advise also on the use of auxiliary information.

In general, quality of data collection has been quantified through figures like sample rate, response rate, coverage rate and CV. These figures could also further be used as quality indicators. However, **the evaluation of "acceptable data quality" should be performed with caution**. Fleet segments are often small populations which cannot necessarily be regarded homogeneous. Therefore CV can easily be high even though the coverage is high, too (see also section 4.3 on the same issue for biologists).

For that purpose quality requirement should be associated with the importance of fleet segments, i.e. the more important, the higher the requirements. Importance could be defined by value of landings (amongst others, e.g. importance for certain stocks, if applicable).

Both CV and coverage should be taken into account. When the CV is high in spite of a high coverage, this could be acceptable as well. It would simply mean that the segment is highly variable. Moreover, it appears reasonable to request higher coverage rates for smaller segments than for larger segments.

In the past **there was consensus on not setting any minimum requirements as it might be unachievable**. In most countries data collection is voluntary for fishermen and thus the coverage often cannot be increased simply by increased sampling. A quantitative evaluation of quality indicators should be introduced as a feedback loop with the aim of optimisation. An increase in data quality, where feasible, always coincides with an increase in costs.

## 2.6 Generic Principles for the evaluation of NWPs and ARs (ToR III).

The review of the knowledge and state of the art around data quality has highlighted two points of importance in terms of fisheries data.

The first point is that a number of **established overarching principles already exist**. It is thus not desirable to define new standards specific to EU fisheries data. Rather, it is important to investigate these existing frameworks in more details, together with a review of procedures and standards applied in other RFMOs and other fisheries regions. These frameworks should then be applied and adapted to the various types of data and sampling schemes under the DCF, in order to define standard reporting frameworks which should ease the description and the evaluation of the sampling protocols implemented by Member States. **PGECON has already made good progresses in this direction, and similar approaches can be further developed and adapted to the biological data**.

The second point is that **it is not appropriate to evaluate the quality of a sampling program out of the resulting CV of estimates**. This is true both for biological data and for economic data, but for different reasons. For biological data, the populations to be sampled are extremely large, with unknown heterogeneity of the true population so a precision target can hardly be established; additionally, it is difficult to assess the impact of unprecise sampling because a great number of data sources are used in conjunction with assessment models to produce only a few summary metrics (SSB and Fishing mortality), whose uncertainty is the combined result of the high uncertainty of multiple data (e.g. age reading, survey data, discard estimates). Conversely, for economic data, fleet segments are smaller and better known, but they cannot necessarily be regarded homogeneous. Therefore CV can easily be high even though the coverage is high, too. Additionally in most countries data collection is voluntary for fishermen and thus the coverage often cannot be increased simply by increased sampling.

The EWG emphasised that under the reality of financial and staff constraints, **the national sampling programs face the need to make trade-offs between precision and sampling intensity, and trade-offs across all variables, stocks and fisheries** that must be sampled. In these conditions, the EWG considered that for biological data the most important quality criteria is the evaluation of **bias** rather than the precision of the estimate. Bias arises when the sampling program does not **cover** the entire population, and when the samples are not **randomly** chosen in a stratum.

In summary, the general principles for the evaluation of NWPs and ARs, is that quality should be evaluated in the NWP and compliance in the ARs.

## 3 NATIONAL WORKPLANS

### 3.1 Introduction: NWP 2017-2019 and STECF evaluation in 2016

The STECF EWG 16-16 evaluated the MS's National Work Plans for 2017-2019. During the evaluation, it became clear that information and standards were lacking to assess the (planned) data quality in the various WP modules. Preceding the EWG, however, a set of ad-hoc contract reports had been provided, laying out evaluation criteria for the WP modules. These documents have to be reviewed together with the EWG's suggestions for improvements of the WP templates and evaluation procedure (see sections below), in order to set up a system that takes into account the quality aspects of the planned (WPs) and conducted (ARs) data collection.

### 3.2 Filling-in of NWP tables by Member states (ToR IV)

EWG reviewed the comments and recommendations from various sources to understand the issues related to tables 1 and 4 (A,B and C) and come up with solutions and ways

forward. The reviewed sources were all RCMs in 2016, ICES/WGCATCH, STECF-EWG-16-16 and the proposals by external experts on guidelines for evaluation of NWP before the EWG, STECF-EWG-17-07 (first draft) and the guidelines in annex of the EU Reg. 2016/1701.

Additionally, the EWG had in mind the processes involved in filling in the tables. The current filling of Excel tables was considered particularly tedious and inefficient, not least because several cells cannot be easily filled automatically through script extracting the information from national databases, and require manual filling. The suggestions for improvements made by the EWG would ease the filling of NWP, and, even more, of AR.

### 3.2.1 Suggested changes in tables

#### 3.2.1.1 Table 1A

All RCMs and STECF-EWG-16-16 reflected on the need to shift toward automaticity of filling the table 1A using external sources of information (EuroStat, FIDES TAC database, RCM Mediterranean approved statistics, …), in order to provide the complete overview of where a Member State is operating. The EWG tested the procedures developed by a few experts in 2016, and suggested this work to be finalised and improved. For example a number of issues were listed e.g. TAC areas not matching stock units (WGCATCH), TACs combined for several stocks (RCM NA), stock definitions for elasmobranchs (RCM NA), aggregation to higher taxonomic level (STECF-EWG-16-16), inclusion of all stocks of the Commission Decision EU 2016/1251. In order to progress quickly, **it was suggested that every MS tests the script available,** and compare the outputs with their knowledge on the landings. The discrepancies should then be sent to the forthcoming RCGs for consideration. EU proposed to take part on the process and help in seeking the most appropriate landings database to be used as references (question raised by RCM NS&EA).

Modification of Table 1A setting

- Modification of the label of the column 'Threshold (Y/N)' to 'Threshold rules used' The accepted entries for this column would be 'TAC< 10 %', 'Landings < 10%', 'Landings < 200 t.'
- Addition of a column 'Data sources'. The agreed entries to be agreed after finalization of table 1A automatic filling process.
- Deletion of the column 'RFMO/IO' given to be of no use
- Addition of column 'regional coordination/arrangement' to identify bilateral agreements and RCG agreed sampling plans - this should be filled in at the species / stock level not just Area

Issues to consider during the RCGs

**EWG recommended that forthcoming RCGs consider adjustment of Table 1A** in annex of the Regulation with the ICES stock definition (WGCATCH) and GFCM list of stocks (RCM Mediterranean and Black Sea).

There is no reference to regions for the data collection of biological variables in the Comm. Dec. 2016/1251, although the information may be useful for RCG purposes. **EWG proposed for discussion in RCG** a region naming consistent with the RCG area of competence, the area referenced in the Table 3 (annex of Comm. Dec.) and the block headers of Table 1A (annex of Comm. Dec.), as follows:

- **Baltic Sea (ICES Subdivisions 22-32)** corresponding to a Table 3 region and block header 'Baltic Sea' in Table 1A
- **North Sea (ICES areas IIIa, IV and VIId)** and **Eastern Arctic (ICES areas I and II)** corresponding to 2 regions in Table 3 and to block headers

'Skagerrak and Kattegat', 'North Sea and Eastern Channel' and 'East Arctic, Norwegian Sea and Barents Sea' in Table 1A.

- **North Atlantic (ICES areas V-XIV, excl. VIId)** corresponding to Table 3 region and block headers 'North-East Atlantic and Western Channel' in Table 1A. Note that NAFO area as specified in Table 3 correspond to an area in Table 1C and should thus belong to 'Other Regions'
- **Mediterranean and Black Sea** corresponding to 2 regions in Table 3 and block header Mediterranean Sea and Black Sea' in Table 1A
- ·**Other regions** corresponding to all regions specified in Table 1C

When the landings of a stock is close to the threshold value (200 t. and/or 10% European share), the strict application of the threshold may lead to the sampling planned for some years and not for others (RCM Baltic). **EWG recommended** that a historical perspective should be given to these cases, together with a regional perspective, in order to assess, for a given period, whether the MS may exclude or not the stock from their obligation.

When the total international landings are less than 200 t. **EWG considered** that the same rule as the sum of MS with shares <10% are >25% should apply, i.e. Member States shall ensure task sharing at regional level in order to ensure that the stock is covered by sampling in concordance with end-user needs.


3.2.1.2 Table 1B

Very few comments were found regarding this table**. EWG suggested** that the demand by STECF-EWG-16-16 of a user needs column could be accounted for in Table 1B by colouring the cell in grey when the information was clearly required by an end-user. [any move to pre-fill the colouring feature by RFMO is welcome]


3.2.1.3 Table 1C

The removal of the planned minimum number of individuals (column J and K) reached a consensus in EWG, following the recommendations made by STECF-EWG-16-16 and several RCMs. Then, the question was about the need to keep this table or not, and if yes, what information should be asked to serve as a commitment for MS and evaluation of the quality of the data by STECF.

**EWG reminded** the importance to refer to effective sample size as part of a quality indicator, rather than the number of fish measured (WKPICS3). EWG was of the opinion that this effective sample size was given in Table 4A related to sampling scheme and sampling frames. The discussion put in evidence that not all sampling schemes were described in table 4A (self-sampling, purchase of fish for biological parameters, …), and that reference to sampling schemes should be made in Table 1C in the column 'Data sources'.

**EWG endorsed** the demand by RCM NS&EA, RCM NA and RCM Baltic to report on sampling protocols for surveys, and recommended to extend this demand to all sampling schemes. In addition, it was found relevant to keep the number of fish measured, together with the number of samples for each stock, variables and sampling schemes as part of the Annual Report requirement.

**EWG appreciated the initiative** by RCM Mediterranean and Black Sea to promote the tool developed in the Mediterranean project (MARE/2014/19) to define the number of samples and individual to measure, and train the experts in a workshop held in Cyprus in March 2017. This initiative could be shared between all RCMs, with the aim of improving the setting and use of the tool.

Modification of Table 1C setting

- Deletion of columns 'Planned minimum number of individuals at National (column J) and regional (column K) level'
- Addition of a column 'Sampling protocol' with the entries being a concise description like '10 ind/haul', 'max. 50 ind/box (comm cat)', '5 ind./cm/quarter', ….
- Addition of a column 'Achieved number of PSUs', to be documented in AR
- Addition of a column 'Achieved number of individual', to be documented in AR

3.2.1.4 Table 1D, 1E, 1F, 1G

The current guidelines provided in the COMMISSION IMPLEMENTING DECISION (EU) 2016/1701 were extensively reviewed at the RCMs in 2016 (RCMNA 2016, RCMNSEA 2016, RCMMED&BS 2016, RCM BALTIC 2016). Where possible clarity on how the tables might be completed was provided by the commission by direct correspondence at the meetings. During the evaluation meeting at STECF EWG 16-16 further clarity was provided by DGMARE on how the WP should have been completed. This additional guidance to MS has been combined with that from this EWGs review and is summarised below.

Section 1D and Pilot Study 1 (recreational fisheries)

Pilot Studies should be obligatory for MS that do not already survey recreational fisheries, and it should be designed to identify all species caught by recreational fisheries that could have a significant impact on stocks fished by commercial fisheries and for which there are catches and landings, or stock assessment, and therefore data needs. For MS which already conduct recreational fisheries surveys, a pilot study may also be needed to identify species caught by recreational fisheries which are not in Table 3 of the EU-MAP, but could have a significant impact on stocks fished by commercial fisheries and for which there are catches and landings, or stock assessment, and therefore data needs. However, whether these species should be included in this table is pending clarification by DG MARE. Within the guidelines a MS has 2 years to carry out a Pilot study so a reference to a pending study is still required if planned for the latter year.

STECF EWG 16-16 suggested that to scientifically evaluate these work plans, all the elements of statistically sound sampling design (target population, PSUs, sampling frames etc) should be either described in these tables or links to documents describing the schemes should be provided.

EWG 17-04 suggests that these tables should only be used for compliance to inform the user or evaluator of what is being done and any additional documentation should be referred to in Table 5A. With the addition of a *Survey ID* field and a line in Table 5A the description of the plan and all the elements will be apparent in any associated documents. WGRFS already use a rigorous evaluation process for these sampling schemes. It is recommended that the description of MS's sampling programmes for recreational fisheries follow their guidelines on best practice and the survey undergoes an external evaluation by WGRFS.

MS should only complete Table 1D for all mandatory species for their coastal regions. Null responses for other areas are not required.

All species from Table 3 of the implementing decision 2016/1251 should be included in Table 1D.

If a listed species is not selected for sampling, an explanation needs to be given, ie previous pilot studies, derogations etc.

If a country has already been granted a derogation based on previous pilot studies, it needs to check if the derogation is still valid.

**Guidance on the two new fields**

- *Survey ID* – a unique survey reference – this EWG recommends that WGRFS should either provide the unique ID or instruction on how it is derived.
- *Licence (Y/N)* – Member State shall indicate by 'Y' (yes) or 'N' (no) whether, for the mentioned species, a licence by a delegated authority is required.

Section 1E (anadromous and catadromous species)

There was limited expertise at this EWG to answer all the concerns raised by the RCMs and EWG 16-16. It is clear that further guidance is needed by MS for example on whether Sea Trout (*Salmo trutta*) data are required in all areas rather than just the Baltic Sea as listed in tables 1A and 1E of the implementing decision 1251/2016.

This table does not allow scientific evaluation of work plans. It provides a reference for compliance and is only informative. For quality evaluation of the work plans additional information would be required beyond this table. Evaluation by external experts can be managed in the same way as proposed for the recreational fishing. An appropriate Scheme ID would provide a reference to a completed line in Table 5A which would then link to any appropriate documents describing the sampling scheme and a reference to any external evaluation. To avoid confusion and aid clarity of meaning the heading *Area* has been changed to *Region* and *Water Body* to *Sampling Site*

The Scheme ID or a suitable method for creating one should be provided by the appropriate expert group (WGEEL, WGBAST, WGTRUTTA). The number of Eel Management Units (EMUs) and *Sampling sites* (Waterbodies) listed could be reduced significantly by describing the sampling schemes remotely following guidelines defined by the expert group.

If a MS is not sampling an EMU justification should be given in the field "reason for not sampling". This justification can be accepted if it is in line with recommendations made by RCM and ICES/WGEEL.

**Guidance on the additional fields.**
- *Survey ID* – a unique survey reference – this EWG recommends that appropriate expert working group should either provide the unique ID or instruction on how it is derived.
- *Management unit* – If management units are used, as in Eel Management Units (EMU) all of these should be listed in this field. The rivers sampled should be listed in the Sampling site field within that unit. If a MS is not sampling an EMU justification should be given in the field "reason for not sampling". This justification can be accepted if it is in line with recommendations made by RCM and ICES/WGEEL.
- *Agreed at RCG level* – The designation of rivers to be monitored for eel and salmon shall be defined at regional level. MS should indicate (Y/N) in this column if there is agreement at the regional level to sample the sampling site specified.

Section 1F (incidental bycatch)

There is no description of the data collected for Protected, Endangered and Threatened Species (PETS) in these tables. By including the Scheme and Stratum ID in this table it is explicit that PET sampling is included in those catch sampling schemes. If incorporated in current catch sampling programmes explicit protocols relevant to these species need to be included in the documentation referred to in Table 5A.

There should be a row for each of these strata in Table 4A

Member States shall list each group of species, based on provision 3(a) of Chapter III of the multi-annual Union programme (birds, mammals, reptiles and fish protected under Union legislation)

It is not possible to estimate *Expected occurrence of recording* so this field should be completed with and "X" to indicate if some recording will be done.

Any new catch sampling scheme set up explicitly to sample for PETS should be listed as a scheme with strata and included in the Catch Sampling section 4 tables.

**Guidance on additional fields**

- *PETS specific survey (X)* – Only in fill with an "X" if it is a PET specific survey all other rows should be left blank.

Tables 1G List of research surveys at sea

All mandatory surveys in Table 10 of the implementing decision 2016/1251 in a region in which a MS fishes commercially must be listed in 1G whether the MS is involved or not. This is needed to deal with thresholds and any compliance as a consequence of cost sharing agreements. A MS involvement whether technical, physical or financial is indicated in the MS Participation field.

An external reference list detailing which surveys a MS needs to participate in needs to be compiled. This EWG recommends that EWG 17-14 compiles such a list.

MS participation field should include the code for the participation type and all other MS involved e.g. F: DEU, ESP, FRA, GBR; C: IRL, NLD.

MS states should include a line for a survey in the text box even if the contribution is financial.

**Guidance on additional field**

- *Region* – Member State shall refer to the naming convention used in Table 5(C) of the implementing decision 2016/1251. This provides a reference for the appropriate RCG.
- A column needs to be included to assign a survey to a region. If a survey covers more than one region each region (and the relative contribution of the survey to that region) should be indicated by a line.
- Question 2 in textbox 1G needs to be adjusted to also cover the design of surveys.

Tables 1H Research survey data collection and dissemination

To clarify the guidance required on what species and data types should be listed here the EWG has suggested 2 new fields in line with Table 1A. The type of data collected can then be limited to a list and associated to stock references used in other tables.

EWG 16-16 suggested another field to record whether the data is used in advice. This EWG recommends that the review of compulsory surveys should also provide with those surveys a list of the main target stocks and indices they are designed for.

For consistency the survey planning groups (ICES area: WGBIFS, IBTSWG, WGMEGS, WGBEAM, WGIPS, WGIDEEPS//MEDBS: MEDIAS and MEDITS WGs) should provide the reference for the core variables required for this table.

**Guidance on additional fields**

- *Species* – Member State shall report (in Latin) the name of the species/stocks for which biological variables sampling is required according to the Tables 1(A), 1(B) and 1(C) of the multiannual Union programme, for all areas where the Member State's fishing fleet is operating.
- *Area/Stock* – Member State shall indicate the area of the mentioned species/stock, in accordance with Tables 1(A), 1(B) and 1(C) of the multiannual Union programme (e.g. GSA 16; ICES areas I, II; ICES areas IIIa, IV, VIId, etc.).

- (*Used in advice (Y/N)* – Member State shall indicate by 'Y' (yes) or 'N' (no) whether, for the mentioned variable is used in assessments for advice.)

3.2.1.5 Tables 4A and 4B

The following suggestions were made

- Merge tables 4A and 4B into a single table.
- Do not add or delete any columns
- Replace the term 'Sampling frame' with 'Stratum' for clarity
- The guidelines may need to be more explicit that "Strata with no coverage (i.e. no planned number of PSUs) shall also be detailed, in order to provide measurement on coverage of the sampling plan." – A good sampling design should not have unsampled strata, but should explain parts of the population with no coverage.

The merging of the two tables would be as follows:

| Name of the variable | Comment |
|---|---|
| MS | common to 4a and 4b |
| MS participating in sampling | common to 4a and 4b |
| Region | common to 4a and 4b |
| RFMO/RFO/IO | common to 4a and 4b |
| Sub-area/Fishing ground | common to 4a and 4b |
| Scheme | from 4a |
| Stratum Description | renamed from sampling frame description table 4b |
| Stratum ID code | from 4a |
| PSU type | from 4a |
| Method of PSU s | from 4b |
| Catch fractions covered | from 4a |
| Species/Stocks covered for estimation of volume and length of catch fractions | from 4a |
| Seasonality (Temporal strata) | from 4a |

| | |
|---|---|
| Reference years | from 4a |
| Average number of PSUs during the reference years | from 4a |
| Planned number of PSUs | from 4a |
| Comments | common to 4a and 4b |

### 3.2.1.6  Table 5A

Table 5A Quality assurance frame

The guidelines currently state **"this table is intended to identify data to be collected under tables 1 A to 1 C".**

The guidelines should be amended to **"this table is intended to identify data to be collected under tables 1 A to 1 F"** currently there is no way of obtaining information on data quality for surveys undertaken in Tables 1D to 1H.

The current Table 5A details where documentation are in place for processes used to provide data but this does not aid assessment of the quality of either the process or the results achieved.

It is proposed that columns be added under a group heading of Documentation of Data Quality that provide information as to if the documentation describing the process has been reviewed and meets with accepted standards, who it was reviewed by ( with a link to this information) and it who has accepted this review (RCG, ICESWG,STECF)

This would aid both the assessing of compliance with providing documentation and assessment of data quality in terms of ensuring the process undertaken is meeting agreed standards.

Age determination and other processes should be included in this Table as this can aid in the assessment process in trying to identify possible sources if an error is identified and a possible first step to finding a solution.

**Guidance on additional fields**

- *Have the processes been reviewed externally (Y/N)* - Member State shall indicate by 'Y' (yes) or 'N' (no) whether the process has been reviewed by an external expert or body relevant to the process
- *Do they conform with accepted standards (Y/N)* - Member State shall indicate by 'Y' (yes) or 'N' (no) whether the process conforms to an agreed regional or international standard
- *Body that undertook the review – Name of the relevant expert or body*
- *Link to review documentation* – Link to review documentation
- *Review accepted by* – Name of body who ratified the document (ICES / ISO organisation / RCG)

If a protocol or documentation is in the process of being reviewed this should be identified in the comments field.

For the evaluation of the tables **it is recommended to add table 1D, E, F, G and H surveys documentation, protocols etc. under 5A table** (Quality Assurance Framework for biological data) as it is done for tables 1A, B and C. It seems that Member States (MS), following the guidelines to fill in the tables, **"this table is intended to identify data to be collected under tables 1 A, B and C"** have not included any documentation about the surveys carried out on Recreational Fisheries Surveys (RFS), Anadromous and Catadromous species, PETS protocols etc. for the tables evaluated by this subgroup. This means that for any scientific evaluation these surveys should be documented too.

### 3.2.2 Suggested changes in guidelines

The EWG noted that several sets of guidelines were given in various places, for examples those given as background document for STECF EWG 16-16 (2016) are extremely difficult to access, and are different from those available on Data collection guidelines page. The **Data collection guidelines page should be the place to find guidelines** for MS to report on their NWP and AR, and for STECF to evaluate these reports.

#### 3.2.2.1 Tables 1

- Deletion of the 2 last lines of the example given table 1A
- Modification of the example given table 1B : all length cells should be ticked, and fecundity for *Nephrops* should be unticked.
- Entries to the column 'Data sources' to be changed into survey names, sampling schemes as referred in Table 4A, and specification that when a variable of a stock is collected through different sampling schemes, the information should be reported independently (each scheme detailed in a row)

### 3.2.3 Suggested changes in economics chapters

STECF EWG 16-25 suggested numerous changes on the templates of both the NWP text and NWP tables. The suggestions are self-explanatory and could be straightforward to implement. This work is provided in annex 4.

However, amending a system which has found to be suboptimal appears to be inefficient.

Therefore, the economic sub-group strongly advises to make use of the need for amendment for a fundamental review of all economic tables, thus suit them for a database approach. This would address numerous advices from different bodies.

Following a database approach would avoid redundancies and allow to considerably facilitate comparison between NWP and AR and thus evaluation of achievements.

The data could rather easily be implemented in the database which already exists at the JRC. The existing data could be linked with future NWPs and Annual Reports.

### 3.2.4 Pre-defined End-users inputs

The excel annex of ICES data call nicely sets up the requirements, by detailing all the expected variables by Member States and stocks. **EWG is of the opinion that a transcription of these requirements could easily be made in the tables of the NWP**. For example, **by highlighting in grey the cells of the table IB where the sampling by stock and variable is planned**. (cf also section 3.2.1.2 above).

Other such initiatives would greatly improve the linkage between the end-user expectations and the MS sampling plans.

### 3.3 Guidelines and criteria for the evaluation of NWP

The core evaluation criteria for the specific Work Plan Templates should consist on the review of all aspects of a sampling programme against documented standards (best practice guidelines) and quality assessment tools. **The critical requirement is to have accurate and complete documentation of all components of the programme**. The only evaluation criterion would be that the proposed sampling design and estimation methods are statistically sound, and where this is the case the NWP would be approved.

#### 3.3.1 Evaluation of compliance wrt. EU MAP requirements

The evaluation of compliance with regards to EU-MAP requirements should be as follows:

**Principles for the evaluation of National WorkPlan**

- Evaluation of the **completeness** of the plan (Region x modules)
- Evaluation of the number and definition of strata vs. the total population **(complete list of variables** to be collected**, segmentation :** complete coverage of the population as defined by the fleet register**, stratification :** avoid spreading small number of samples over too many strata**)**
- Evaluation of protocols and guidelines proposed to be followed, do they contain all expected basic principles, compliance with existing guidelines, **randomness** for data supporting probability-based sampling, description of estimation procedures.
- Evaluation of whether the WP takes account of previous Data Transmission Failures and end-user feedback (if any)

Similarly, evaluating Annual Reports should follow the same principles:

**Principles for the evaluation of Annual Report**

- Evaluation of the **realization against the plan**. This include all indicators of sampling effort realized against the plan, emonstrated **evidence of 4S**, e.g. nbr vessels vs. number of trips, etc…
- Evaluation of potential **bias** (non response/refusal rates, fraction of the population non sampled).
- Evaluation of the number of Primary Sampling Units (PSUs) realized by strata (proxy for **precision**)
- Evaluation of issues encountered by MS during the realization of the plan and of the initiatives taken to solve them (**avoiding deviations**)

#### 3.3.2 Evaluation of quality wrt. generic standards

As discussed in Section 2.3.1, there is a need to further develop some standard reporting of protocols, taking into account the guidelines, metadata and criterias established in generic data quality framework such as ISO, ESS, EUROSTAT etc. When those are available, the evaluation of sampling programs will be made easier.

#### 3.3.3 Evaluation using peer-review

The STECF EWGs are not always the only body evaluating different types of surveys performed under the DCF. **Reviews of survey might be undertaken by external experts** either invited by Member States or within different working and expert groups. For the evaluation EWG within STECF it might be of importance to know if such reviews have been performed, how they have been performed and if MS have adjusted their surveys in accordance with comments from reviewers. For an overall evaluation of DCF

programmes it might also be of interest to evaluate to what extent these types of reviews are conducted and what standards that are used. A main example is the review of recreational fisheries surveys that are reviewed by ICES Working group on Recreational Fisheries Surveys (WGRFS).

WGRFS started reviewing different National Recreational surveys since 2014. 3 National surveys have been evaluated each year since then. The main objective is the assessment of different surveys designs (onsite, offsite) for improved data collection and reviewing and optimizing the "Quality Assurance Toolkit" (QAT), based on the experience of completing at country level.

The "toolkit" and best practice guidelines were developed by WGRFS in 2013 to assess and document the quality recreational fishery surveys from the initial survey design through to implementation and analysis and thus catch estimates. These best practice guidelines and QAT were included in 2013 report (ICES, 2013c). The aim of this evaluation is to provide statements of quality of recreational data for end-users with the type of information that they require and identify potential improvements to survey designs.

The end-users and their requirement could include:

1. National laboratories (for documenting and monitoring National schemes).
2. Regional Coordination Groups (overviews of sampling schemes extant within the region; identification of important gaps in data; developing recommendations for optimizing sampling across countries.
3. European Commission (evaluation if Member States are meeting DCF/EU MAP requirements for delivery of data using statistically sound methods).
4. Stock assessment expert groups (data quality in terms of precision and bias of estimates being used for assessment).
5. WGRFS itself (monitoring the extent and effectiveness of recreational fisheries surveys; basis for ongoing development of methods, responding to specific requests).

**Any surveys, protocols etc. which have been evaluated under any WG or experts in the field, could be flagged and referenced**. In this case STECF, RCGs could validate or not these surveys based in the experts evaluation considering DCF/EUMAP requirements. Quality standards and criteria used in the evaluation by these experts in the field must be documented for any validation process.

This evaluation should be done by independent experts with the appropriate expertise in statistical survey design and practical implementation in these specific areas. The most appropriate experts are likely to be from the ICES Working Groups on Recreational Fisheries Surveys (WGRFS) for recreational fisheries, Working Group on Eels (WGEEL), Working Groups of the assessment of Baltic, Salmon and Trout (WGBAST) for anadromous and catadromous species, and Working Group on Bycatch of Protected Species (WGBYC) and Working Group on Commercial Catches (WGCATCH) for bycatch. The RCMs should engage with these WGs to help develop regional sampling programmes. These WGs can then kite mark the individual schemes.

The evaluation of research surveys in table 1G and textbox 1G should ideally cover both compliance (are MS participating in all surveys they are required to?) and the quality of the survey. **It is presently not possible**, as pointed out by EWG 16-16, **to fully evaluate compliance**. The main reason for this is that **no external reference lists with information on which surveys different MS should participate in exists**. Such a list need to be compiled but this require that "target species" from the different surveys are identified as MS responsibilities are dependent on quota/landings shares. **The list could either be compiled by the RCGs or by the future EWG on evaluation and updating list of mandatory surveys**. For evaluation purposes, it is beneficial if the list can be crossed checked with table 1A. The guidelines can also be

changed in a way that MS should list all surveys that are mandatory in the regions where they perform fisheries and indicate if they do not participate in a survey. This will make it easier for evaluators to assess acceptable reasons for non-participation. This will though require amendments of the guidelines and that a new column, showing what region the individual survey belongs to is inserted in table 1G.

Most of the surveys listed in table 10 are governed by different international planning or working groups. Usually these groups provide standard sampling protocols and documentation of the design of the surveys. It is however not always clear if all the different steps in the process are documented for all surveys (e.g. how survey indexes are compiled) so it is important that surveys are included in table 5A as well. From an evaluation point of view, it might be of importance to check that MS actually adhere to sampling protocols (or can justify when they do not). This will require that essential information (e.g timing of survey) in these protocols is condensed in a way that it is digestible for the evaluation EWG. It is also important to realize that MS can include other surveys in their WP. The EWG must be able to assess these surveys. This will for example require that question 2 in textbox 1G is expanded to also include design of the survey.

### Evaluation process:

This evaluation should be done by independent experts with the appropriate expertise in statistical survey design and practical implementation in these specific areas. **The most appropriate experts are likely to be from the ICES Working Groups** on Recreational Fisheries Surveys (WGRFS) for recreational fisheries, Working Group on Eels (WGEEL), Working Groups of the assessment of Baltic, Salmon and Trout (WGBAST), and Working Group on Bycatch of Protected Species (WGBYC) and Working Group on Commercial Catches (WGCATCH) for bycatch and WGISDAA for research surveys. The RCMs should engage with these WGs to help develop regional sampling programmes. These WGs can then kite mark the individual schemes.

### 3.3.4 Others

In addition to the above, the STECF EWG made a number of pragmatic suggestions to ease the evaluation of NWPs, including

- Check the coverage reported by MS with external information (FIDES, Eurostat, FAO, fleet register, mandatory surveys…).
- Check the spread of sampling across temporal, spatial, technical dimensions.
- Crosscheck with transversal and biological/economic variables. In a number of cases, the populations are the same for several transversal variables (total landings, total effort), and both biological and economic data could be cross-checked by matching those transversal data in the various places where they are reported
- Inclusion in a regional sampling program
- Consistency with previous year(s) NWP/AR
- Mention of previous data transmission failures and measures made to improve those.

## 3.4 Minimum standards/requirements (ToR II)

As discussed above, there is no clear answer about what minimum requirements should be. Nevertheless, it is clear that Member States need to decide on their own what is the minimum sample size they will undertake. Although catch estimates for stock assessment purposes are requested by quarter, area and level 6 métier, it is very important that member states don't over-stratify their sampling programmes in order to assure the quality of the collected data. There is an important distinction between the domains of interest (métier, area, etc) and the stratification of the sampling design. Stratifying along the domains invariably leads to an over-stratified sampling design.

This section reviews what is published in the literature about minimum requirements, and also what has been practically and empirically used by MS so far.

### 3.4.1 Empirical "rules of thumb"

**Domains:** Several institutes apply the following rule-of-thumb for supplying data:

- Domains with fewer than 3 primary sampling units (PSUs) are considered to be insufficient to be used for stock assessment purposes.
- Other institutes require 5 or 10 PSUs for 'important' domains, but would supply estimates from fewer PSUs for domains that contribute little to the overall estimates.

**Strata:** Guidelines for the minimum number of PSUs in each stratum vary, depending on the end-use of the data.

- Guidelines vary between at least 2, 5 or 10 PSUs per stratum (e.g. WGCATCH 2016 - guidelines for SSF, page 139). Cochran (1977) stated that there were usually little benefit to having more than 6 strata.

**Lengths:** There are published guidelines for the number of individuals that should be collected in a sample in order to obtain an 'adequate' distribution.

- Gerritsen and McGrath (2007) suggested that the number of fish to be measured should be at least10 times the number of size classes in the distribution. Note that the cost of measuring individual fish is usually very small compared to the cost of obtaining a sample in the first place.

### 3.4.2 Optimizing sampling intensity

MARE/2014/19 project has proposed a quantitative framework aiming at adjusting the sampling effort through an analysis of trade-offs between sample size (number of samples and individual length measurements) and precision levels, using the resampling method (*bootstrap approach*).

Recent WK and publications, including PGDATA (ICES, 2016) and WKCOSTBEN (ICES, 2017b), have pointed out to the likely existence of oversampling in some stages of the national sampling designs, where an excessive number of individuals may be sampled, which do not provide a significantly better estimate than with a lower number of samples.

The framework was applied to Length Frequency Distribution (LFD) as follows. Sampling data at the fishing trip level of a given sampling period (e.g. 3 years) is analysed in order to build a large pool of trips (identified by trip codes, referred as samples hereinafter), thus integrating the inter-annual variability and avoiding recycling too often the same samples in the bootstrap procedure. The following procedure is typically repeated a large amount of times (100 times) for each stratum. Firstly, the sampling size is randomly selected between the available sampling size. Secondly, a sampling data set is re-built from the random selection of trip codes. Then, a landings dataset is randomly chosen over the whole period. The landing sub-dataset generated is then linked to the generated sampling data set for the raising of the LFD in the stratum and the calculation of the associated CV (by means of COST functions). The scripts allow extracting the CV and the sampling size, associated to each iteration of the bootstrap procedure, in order to build a table for each stratum of the case study. Plotting those tables enables to get CV curves for a given dataset (Figure 3.4.1).
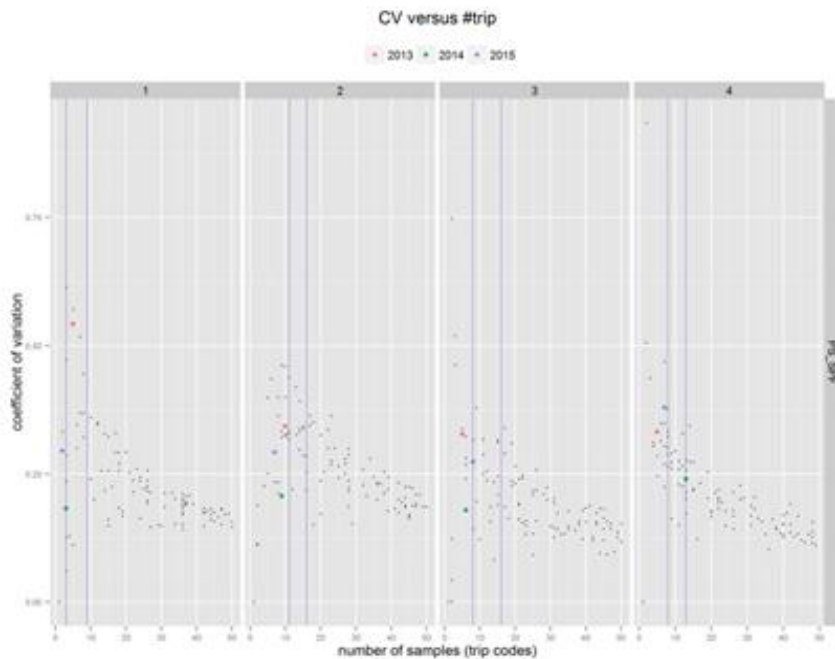
Figure 3.4.1 – Example of CV curves by métier and quarter: on the x-axis the number of trip codes and on the y-axis the value of s. The coloured points represent historical situations from 2013 to 2015.

From the CV curves, optimal sampling size ranges is proposed, identifying the part of the curve where its tangent changed and began to flatten. This part is considered as a suitable trade-off between the precision and the cost (in terms of sampling effort). This area is then referred as the "optimal" sampling size range. The "optimal" range, which is once again a term used for convenience and not strictly speaking related to an optimum, is defined as follows. A local kernel density (i.e. a smoother) is first applied to the ordered CV data. First order differences are then computed to obtain in each CV the tangent and assess its sign. The local maxima of the density function are localized and the first two are retained, in order to select the range of CVs for which the tangent starts to change before stabilizing. The "optimal" range (MARE/2014/19 Med&BS project, Deliverable 2.5) is finally derived as the sampling sizes corresponding to the selected two local maxima.

It is important to underline that the lack of data for some substrata is a strong limitation to the present approach. Thus, for some substrata, the CV curves are not generated when no data at all or only one trip code with no more than one length class sampled, or few classes sampled, are available. In some cases, the curves do not allow to find a trade-off (for example the curve is too flattened), and a range cannot be reliably inferred. Therefore the results must be interpreted with care for under-represented substrata.

Using the optimal range previously defined, one can then propose a number of individuals to be sampled per stratum (métier and quarter) by country, which also accounts for inter-annual variability in the landings. For this purpose, a bootstrap procedure is used for each substratum. Each trip of the sampling pool includes a given number of fish measures. Therefore, for a given sampling size (number of trip codes), the dataset contained different numbers of individuals fish measured depending on the subsample picked from the pool. The bootstrap approach allows including this intra-substratum variability in the estimate of the optimal number of fish to measure. Each iteration of the bootstrap consists in the following steps. Firstly, a sampling size is randomly selected within the optimal range (vertical blue lines on Figure 3.4.1). Then, a sampling data set is re-built from the random selection of trip codes, whose size is equal

to the sampling size previously defined. Finally, the associated number of individuals was extracted.

A large number of iterations bootstrap for each substratum allows computing the mean and the confidence intervals for the fish numbers to be sampled defining a proposal for an optimal sampling design (interval). When no optimal range can be defined, no optimal number of individuals is proposed.

The results are then compared to past sampling designs in order to assess past sampling sizes, but also conversely, to check the proposed ones. Scatter plots are generated in order to visualize, in number of individuals, the proposal made as function of the past situations (Figure 3.4.2). The oblique line, the first bisector, refers to the solutions for which both the variables are equal. If the points are above the bisector, it meant that the new sampling proposal involved more measures than in the past. Conversely, if the points are below the bisector, it means that the new sampling proposal under-estimated the required number of individuals compared to the past (MARE/2014/19 Med&BS project, Deliverable 2.5).
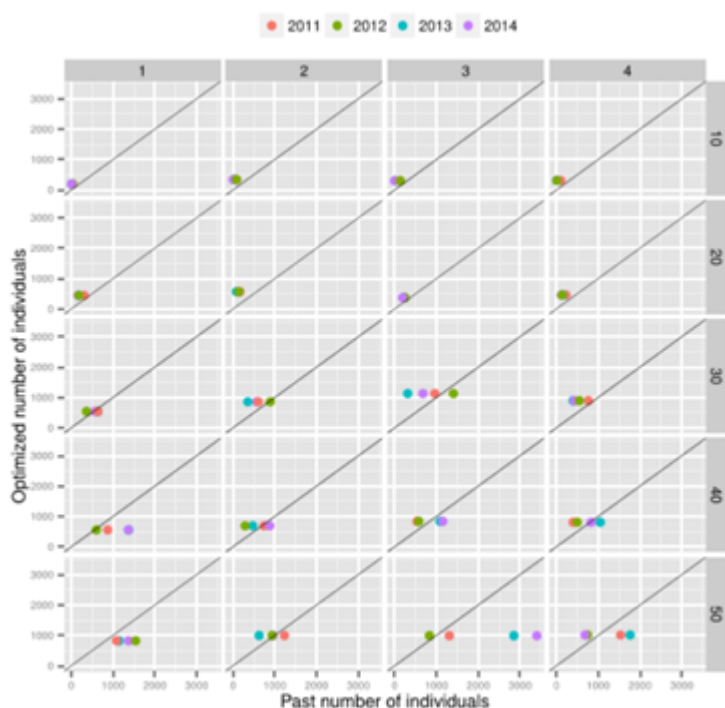


Figure 3.4.2 – Example of optimized (y-axis) versus past number of individuals (x-axis). Each coloured point refers to the proposed numbers of individual to be measured by quarter compared to those measured in each of the past years.

### 3.4.3 ICES WKBIOPTIM

The Workshop on Optimization of Biological Sampling at Sample Level (WKBIOPTIM, Lisbon 20-22 June, 2017) aimed to provide tools that can be used by national institutes to quantify the effects of different sampling intensities and sampling designs. Two sets of R-scripts producing a range of simple statistical and graphical outputs were developed to identify appropriate sampling intensity for biological samples of different stocks that meet the end-users needs. One R-script is aimed to work with the sample level optimization and the other for the population level optimization. They are supposed to be sufficiently generic and applicable to samples from different commercial catch sampling programmes. The R-scripts were developed based on the RDB exchange format (CS, CL,

CE tables) and on the sampling strategy used to obtain the data. Some case-studies were selected to be worked on during the workshop for both levels. In the sample level optimization, some species that are routinely oversampled were analyzed using the code developed to simulate different number of individuals to sample for lengths and ages. Output summaries from the simulation process were obtained and presented (e.g. Figure 3.4.3).
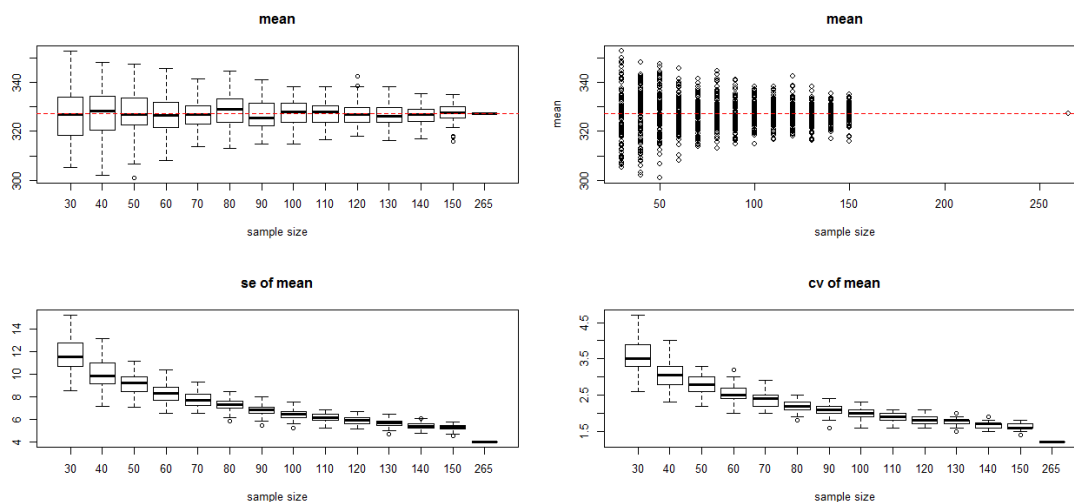


Figure 3.4.3 – Some examples of the outputs obtained from the sample level optimization code.

In the population level optimization, the code was developed to perform simulations of different scenarios of sampling strategies, e.g. decrease number of trips, or hauls or individuals to sample per haul. Graphical comparisons of the obtained results and analysis of their possible effects in population length structures were presented.

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. Discussions on possible quality indicators for biological parameters were also addressed during the workshop and the ICES group agreed that **components of quality such as precision, accuracy, completeness and comparability** referred in GFCM report (FAO 2017) **should be taken into account when defining quality indicators for biological parameters**.

This workshop was very useful because it provided a common R-tool that can be used and tested in institutes and labs allowing more inputs for improvements and discussions relating the optimization of sampling and also for determining possible quality indicators for biological parameters that can be used to evaluate sampling levels of the existing sampling schemes.

## 4    ANNUAL REPORTS

### 4.1    STECF process and comments from EWG 17-07

One of the tasks assigned to EWG 17-07 (26-30 June 2017) was to revisit the current procedure for the evaluation of AR and DT failures as relevant to STECF and suggest improvements. The report has to be finalised and presented to STECF plenary. Below is an overview of the results of ToR3.

*4.1.1  AR Evaluation process*

In general it was felt that **the current structure works well**, given the current time frame available**, but could be improved by adding an extra pre-screening step**. This additional step would **allow MS to answer pre-screener comments and clear the document from mistakes or unclear content** prior to final pre-screening before the EWG. It was also felt that as some of the legal constraints were no longer in place that the possibility of extending the process, after consultation with the MS to check feasibility, for the adoption of the ARs meaning the results of the AR Evaluation could be dealt with at the Autumn STECF plenary.

It was felt that **automation of the filling of the fields**, where appropriate, **in the AR for comparison with the NWP would save time** enabling the EWG more time to identify problems at the regional level which could be reported back to the RCG/End-user to ensure possible problems / issues were identified and reported quickly.

**The group opinion was that data quality could only be assessed by the end-users** and that the EWG could only assess if achievement met the NWP and comment on where the quality of the processes in place had been documented and if these met agreed standards / practices.

*4.1.2  DT Failures*

It was felt that **the current procedure was fit for purpose** with only minor adjustments to the platform being needed.

End-users were asked to make sure that in future the perceived failures were accurate detailing data variable (species / parameter etc) required and for what period to ensure clarity.

ICES had communicated DT failures to MSs and sorted miscommunications or incorrect failures (due to administrative issues) with MSs for DT 2016 prior to the STECF-EWG. MSs, end-user as well as STECF-EWG find this a useful approach for future DT evaluations as the number of DT failures was limited, and all failures were relevant for evaluation. This procedure would be of great benefit in easing the workload of the EWG if followed by other end-users.

The EWG notes that this subject has been discussed further during the STECF plenary (see section 4.4).

## 4.2  Principles and Information required for the evaluation of compliance with NWP

The general principles have been explained in section 2.5.

For annual reports, the most important task is to **check whether the sampling programs has been realised according to the plan**, and whether any deviations are justified and mitigated.

As for the WorkPlan evaluation, the key issues relate to ensuring that the realised sampling is not biased, with regards to coverage, stratification and randomness, Bias can also arise from skewed non-response and/or refusal rate.

An important aspect to investigate is the representativeness, linked to the number of PSU compared to the number of strata. Also, as mentioned above there is more variability across vessels than across fish caught in the same trip or across trips, so particular attention should be paid to the number of vessels sampled.

The EWG also discussed the format of the AR, albeit in less details as for the workplan. A key feature emphasised by the EWG was **the need to use the same structure across AR and NWP tables, to allow automating matching of tables**.

As also mentioned in section 3.2, the EWG discussed extensively the possibility to **improve the automatic filling of information directly from national databases rather than manually**. Beyond the suggested changes in the tables themselves, the EWG discussed that **NWP and AR would be better dealt through online filling tools**, which could also be updated and monitored regularly throughout the year.

The EWG noted that some additional suggestions for AR tables had been formulated by STECF 16-05, but these were not reviewed and commented in further details.

## 4.3 Principles and Information on data accuracy (bias, precision, uncertainty etc) provided to end-users (ToR I)

This fundamental question raised an important debate during the EWG, as there is no easy answer. The key part of the ToR is the reference to end-users, i.e. **this is not about the STECF evaluation itself but about the transmission of information to end-users**.

The following points were raised:

- It has long been stated that the CV as such cannot be used by evaluators to judge the quality of a sampling program, as the CV of each individual variable collected results from both the variability of the sampled population and the overall sampling intensity (see further explanation below). If the sampling program is performed fully randomly, some CV for some variables will by nature be larger than others. **The EWG reiterates that CV is an outcome, not a target**.
- For data which are used at stock level, **end-users would not be interested by uncertainty at national but at regional level.** If a country takes a small part of international catches and has poor quality estimates, the consequences will be limited
- **It remains to be proven which end-users might need this information in the AR** themselves. The primary end-users such as assessment working groups and AER will receive this information through other channels via the RDBs, the benchmarks etc and will not search for this information in the AR. It remains unclear which other data users (broader scientific community, NGOs etc) would be potentially interested in this information and at which scale and which level of precision. Ad-Hoc data requests made to labs are always very specific and will most likely not be answered by such standard summary information in AR. They are best addressed by specific interactions with the scientists in charge.
- It is tedious, time consuming to produce estimates to fill into excel tables, and this is not efficient if these are not used for evaluating quality anyway. It is much preferable to produce some standard summary reports from RDBs.

As discussed above, the EWG considers that only elements of bias are important in order to perform the actual evaluation of the quality. In particular, **non-response rates is a major indicator, together with effective sample size and the importance of non-sampled strata**.

Regarding the use of CV as a measure of performance, the EWG provided some additional explanations:

- A distinction needs to be made between the relative standard error (RSE) of an estimate, and a coefficient of variation (CV).

- A coefficient of variation is the standard deviation, divided by the mean. It is often expressed as a percentage. A CV can be obtained for any numerical group of data, and the CV reflects the relative variability in this data. A CV from sample data is a measure of the variability in the sample data, and also an estimate population CV. It does not impart any information about the precision of an estimate.

- A relative standard error RSE is an estimate of the standard error of an estimate divided by the estimate, and is thus only relevant, and obtained, when one is generating an estimate of a population parameter with data collected using probability based selection methods. The RSE of an estimate is often expressed as a percentage and often mistakenly referred to as a CV, and likewise a CV is often mistakenly ascribed to a population estimate.

As used by Member States as a measure of data quality then a "CV" may have been calculated in a number of ways, and can relate to quite different things. A CV from sample data is a measure of the variability of the sample data, completely unrelated to the precision of a population estimate (and a low CV would actually be indicative of few and/or homogeneous samples). A "CV", which is actually an RSE of an estimate at the national level, reflects the precision of a national estimate. This may, or may not, be important for a regional estimate, depending on the proportion of the population to which the estimate relates. The pertinent measure of precision for an estimate at the regional level would be the RSE of a regional estimate; the wherewithal of calculating this does not as yet exist.

**A major outcome of the EWG discussion is thus the suggestion that regional quality reports of data sampled, directly and automatically extracted from RDBs, could be produced annually by the RCGs** (for biological data) **and by JRC or EWG-AER** (for economic data) and made publicly available on the DCF website. These would include e.g. the regional summary of sampling coverage (across spatial, temporal and activity strata), as well as the estimate and precision level (RSE) of the different metrics sampled. The current RDBs as e.g. ICES RDB/FISHFRAME can already deliver such reports, but are not presently used.

**The EWG considers this to be the most efficient and most useful way to report on data quality and precision**, rather than through AR, AR would thus only be used for the internal evaluation, but not for any form of transmission to end-users. This would also justify the sustained financing and maintenance of regional databases, being the primary tool required to report on DCF data quality. RDBs need to be integrated in DCF Memorandum of Understanding, and be further developed where they are still not operational.


## 4.4 Feedback on data transmission failures from end-users

This question has not been extensively discussed by the EWG, which refers to STECF 17-07 instead.

However, some points of discussions were raised, including:

- It remains **unclear how the DTF**, once reviewed by STECF and approved by COM**, are addressed by MS and RCGs and then taken into account in the future NWPs**. This link should be made explicit in the NWP reports and be part of the evaluation
- The **definition of a DTF remains unclear**. Until recently, many reported DTF dealt with minor issues linked to wrong coding etc, and it remains a **difficult task to assess the severity** of these. STECF notes however that major progresses have been made in recent years to sort these out before being reported to COM, including more structured data calls, more stringent conformity checks in the data upload and

more direct feedbacks to Member state to correct issues before they are reported by end-users.

- **The current one-year gap in the DTF evaluation is problematic**. For example, in June 2017 STECF evaluated DTF for data provided under the data calls issued in spring 2016, more than one year earlier. This time lag means that (i) the annual work plans that are/can be revised by the end of each year cannot really address the potential failures of the most recent (in year) datasets, but only those linked to older data, and (ii) the following data calls cannot easily take into account the most recent issues experienced by data providers and end-users, as it remains unclear whether the previous issues have been addressed.

The EWG has not considered these issues further; but agrees that provided that the DTF process can be accelerated through increased filtering and quicker reporting, DTF might be better addressed in autumn shortly before the NWP evaluation rather than AR in spring?

## 5  WORK IN PROGRESS AT SHORT AND MEDIUM-TERM

This section provides a short overview of additional work currently in progress or planned for the near future regarding DCF data quality.

### 5.1  Regional Databases

At this moment, **there is no regional database for the Mediterranean and Black Sea or Large Pelagics,** though a proposal for establishing a RDB has been formalised in past occasions. The RCM Med&BS-LP considered that the development of regional databases is urgent to allow an efficient use of the data received from the official RCM data call and to allow a correct management of the data used by PGMed and RCM. The process of development of the Mediterranean RDB started in 2011 and important steps were implemented. But all the process was stopped in 2013, because the COM informed on the need to wait for the outputs of the "feasibility study" (Anon, 2014a) and of its update.

Area of improvement of the existing methods and tools will be investigated under the new Call for Proposals "Strengthening Regional cooperation in the area of fisheries biological data collection in the Mediterranean and Black Sea (Acronym: STREAM), building on the experience gained by the grants (MARE/2014/19 Med&BS and FishPi) funded under the Call for Proposals MARE/2014/19. The new call aims to further support the Commission and MSs to build up experience in new areas of regional cooperation. In particular, STREAM is meant to help MSs of the Mediterranean and Black Sea region proceed with the realization of the Regional Sampling Plans (RSP). According to the Annex 1 of the Call for Proposals MARE/2016/22, STREAM will focus on the **regional coordination of biological data collection**, for which differences on sampling approaches, procedures and rising methods across MSs and Geographical Sub Areas (GSA) in the Mediterranean and Black Sea do exist. A regional data storage system for Mediterranean and Black Sea being currently not available, **one of the aims of the project is to identify solutions of a regional system allowing storage, processing and analysis of the data at regional level, taking into account current situation, ongoing studies and developments**. Auxiliary tools aimed at standardizing and easing the procedures for data processing and management will be made available through ad hoc scripts for the conversion of primary data into the formats for data transmission to specific data call (e.g. EU-JRC DCF, GFCM DCRF, RCM Med&BS-LP) and use of existing tools (e.g. COST libraries) for data analyses. Previously tested data formats and tools will be updated, refined and/or consolidated to be used for data processing and management. As suggested by the RCM MED&BS-LP in September 2016 and by the Training Workshop on Sampling Intensity organized by the RCM MED&LP 2017 (Final

report of the Training workshop of Sampling Intensity) these upgrades will consist of the addition of information on the single fishing operation (duration, start/end position and depth), individual fish information related to weight, sex, maturity and age and information on commercial categories. Such updates will allow the introduction of analyses on the precision of the stock related variables (biological parameters).

## 5.2 Sampling optimization and minimum requirements

Under the new Call for Proposals STREAM (see paragraph 5.1), based on the experience of the previous grants and the experience of practical session and workshop done, the Sampling Design Tool developed under MARE/2014/19 (MARE/2014/19 Final Report, Deliverable 2.5) will be generalized in order to include options allowing a flexible definition of the sampling scheme before carrying out the simulations. The upgrades will allow simulations to be carried out on:

- different technical stratifications introducing options to define the technical strata on the basis of gear (level 4) and/or métier, so grouping strata with similar characteristics;
- different temporal aggregation in order to make flexible the stratification by quarter and/or semester, depending on fisheries and target species specifications;
- data of stocks considered shared among MS (e.g. the European hake stock in GSA 17-18 and 20 shared among Italy, Croatia, Slovenia and Greece), in order to get results on the whole area of the stock (not only by GSA).

The flexibility added to the tool through the implementation of the listed options will allow the comparison of the results obtained under different sampling scheme hypotheses and to identify the similar/dissimilar trends on precision with greater ease. For example, different spatial stratifications can be simulated in order to identify the one catching the lowest variability in the sampling on the basis of the trends of the coefficient of variation (CV). Sharing of sampling effort among MSs will be tested simulating different scenarios aimed at assessing the effect of the removal/addition of defined "portions" of sampling (in terms of trips), thus the effect of setting different proportions of sampling intensity.

Alongside the approach used for all the case studies developed so far that were working on data stratified in most of cases by quarter and métier grouped by GSA and country, analyses will be carried out taking into account the concept of shared stocks.

In addition, methodologies developed in the ICES context for optimising the sampling intensity related to the biological parameters will be taken into consideration. In this sense, possible oversampling at laboratory level (e.g. measuring and determining maturity) could be investigated in order to redirect time in analysing other species (e.g. data poor-stocks) (WKBIOPTIM, Lisbon 20-22 June, 2017, see below).

The upgraded methodology will be first tested on extensive case studies including the shared stocks of the demersal and small pelagic species characterizing the main fisheries in the Mediterranean and Black Sea areas. Four case studies will be developed that will cover: Western, Central, Eastern Mediterranean and Black Sea. Thus two Workshops, one for western and central Mediterranean and one for eastern Mediterranean and Black sea will be organised.

The new EU-MAP increasingly relies on multi-purpose statistically sound catch sampling programs able to meet the needs of various end-users (COM IMPL DEC 2016/1701). **One important component of the ability of multipurpose 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., by-catch 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 emphasize the need to secure national labs spent time and funds where they are most needed. In this optimization perspective, WKBIOPTIM will continue to develop its work by documenting and improving the codes already available, include the discussion of the calculation of the effective sample sizes for length and ages, see how to combine data from different onboard/onshore sampling schemes, etc. The future work on optimization also includes the preparation of an R-package that can be used by national institutes and 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. This R-toolbox will be able to improve national sampling procedures related to biological parameters, and it will also be fundamental to increase data provision on data-limited stocks and environmental variables.

## 5.3  Economic fleet segmentation and transversal vessel segmentation

The current system using predominant gear and length classes is applicable to all EU fleets. However, there are **several examples where vessels with clear different characteristics are joined in one segment whereas in other cases vessels which perform similar fisheries are separated in different segments** (mainly by length class). Different characteristics of vessels within the same fleet segment result in higher variability.

For the future **it is advisable to investigate if a more flexible definition of fleet segments would be feasible.** This new fleet segmentation might change the number of fleet segments which might even no longer equal the name of fleet segments in other MS. However, the naming of segments alone is not a good indicator for comparability.

A new approach for fleet segmentation for economic data would have to take into account the degree of similarity of fishing patterns. As an example, North Sea beam trawlers, which are currently only distinguished by length class, would then be separated by main fishery, targeting either shrimp or flatfish (or doing both). These fisheries differ considerably in cost structure and revenues. **Setting the focus on fishery rather than on physical characteristics (length) would also further align the fleet economic segmentation to the biological métier approach**.

Two major issues might occur when applying this new approach. Firstly, it might be difficult to create a segmentation scheme which allows for clear assignment of vessels. Secondly, the segments might become so small that confidentiality issues arise.

**The EWG suggests that this could be the topic of a specific STECF or PGECON EWG**, and would need the collaboration with people involved in the biological data collection to increase the consistency in strata definitions between biological and economic data.

## 5.4  Common métier definitions

During the last recent years different groups (WKPICS, SGPIDS, WGCATCH) have made relevant recommendations to **improve the métier-based sampling approach** established in the EU Data Collection Framework (DCF, 2009-2016). In those cases where problems were detected, MS are moving towards new sampling schemes to avoid some issues linked to métier-based approach, basically the risk of over-stratification and the lack of knowledge of all the PSU in advance. In other cases, as for the Mediterranean, problems have not been detected and sampling schemes are still based on the métiers in line with the GFCM/DCRF in which sampling should be based on fleet segments.

With the new sampling designs, MS, end-users and the EC expect an improvement in the provision and quality of the data provided by the sampling programmes.

Nevertheless, while it is not necessarily that the sampling schemes adopt métier as sampling strata, the objective of the catch sampling schemes remain to provide catch/discard data structured by métier. **Métiers become** then, in most cases, as **domains of interest and MS have to be able to provide unbiased estimates by these domains.**

Most relevant end-users (e.g ICES, GFCM) work with sampling and transversal data transmitted by métier and the list of métiers is widely used for scientific work in their own commercial databases (e.g. Intercatch in the case of ICES), regional databases (e.g RDB FishFrame for RCMs NA, NS&EA and Baltic) or Mediterranean data calls (RCM Med&BS, STECF for the Mediterranean)

DCF/EU-MAP establishes that data should consist in "volume and length frequency of all catch fractions (including discards and unwanted catches) for the stocks listed in Tables 1A, 1B and 1C" reported at the aggregation level 6 as set out in Table 2.", which is the métier. **A rule for naming these métiers is provided in Table 2** of that regulation, enabling MS to classify their fleet according to the activity, gear classes, gear groups, gear type and target assemblage.

Nevertheless, **the analysis to assign trips to métier has not been commonly agreed and each MS adopt their own methodology for this task**. RCM NA 2016 noted this problem and recommended a workshop to s*tandardise the processes that use trip based transversal data to determine the métier. In October Liaison Meeting 2016 endorsed this recommendation.*

While the procedure to assess several aspects related to the quality of the data are being addressed during the last years (e.g WKACCU, WKPICS, WGCATCH), the lack of common rules and analysis for determining the métiers level 6 may undermine the full utility of the data provided. The aggregations of data from métiers obtained by different procedures may compromise the quality of the results obtained.


## 6   SUMMARY AND CONCLUSIONS

This EWG has brought a number of important discussions, which hopefully will contribute to further improve the quality assurance of DCF/EU-MAP data. A summary of the most important conclusions is as follows:

- A general statement is that data collection is continuously improving, and that major positive changes have taken place over the last decade. The overall DCF is constantly being streamlined through more structured data calls, increased dialogue between data providers and end-users, increased regional coordination and better understanding of the fundamental requirement of statistically sound data collection. The EWG notes that most EWG making use of DCF data (such as, for STECF, the AER, the FDI and the Med&BS assessment) report an increased quality of the data available, not least regarding coverage and timeliness.

- Questions about the reporting and the evaluation of data quality are not specific to DCF, but are a widely generic issue. Therefore, DCF should not establish its own QAF "from scratch", but should learn from established standards and metadata as e.g. used by EUROSTAT, ESS or ISO, and adapt them to its own needs. The economists within PGECON have moved in that direction, and the experience gained should be helpful to the other fields of the EU-MAP. For example, it would be beneficial that all types of sampling design used in EU-MAP are described in a methodological document structured in accordance with the ESS guidelines.

- There is a very clear desire from data providers and RCGs to establish and maintain operational Regional DataBases, where nationally-collected DCF data can be shared and exchanged under an appropriate level of disaggregation (storing of detailed data rather than raw data). The EWG considers that in principle, any type of data collected by European financing under DCF should be made accessible at the supra-national level. This means (i) ensuring the sustained financing of the RDBs already in place in e.g. ICES and JRC, and (ii) developing RDBs in areas and data where such databases are not yet operational, in collaboration with RCGs and end-users. RDBs are best hosted by supra-regional bodies such as ICES, RFMOs and JRC. There are conditions to be established on data policy (access and use rights), but the best guarantee for data quality and "value for money" is to have the data "peer-reviewed" through their use by other member states and knowledgeable end-users. This can only take place through standardised exchange platforms such as RDBs. Moreover, during the EWG, it was a consensus that the quality of the data collected can only be evaluated at a regional level with agreed statistical procedures, i.e. in a RDB. The EWG thus recommends that RDBs are considered by COM as a necessary requirement in the DCF QAF, and thus that COM makes the necessary financial and institutional arrangements to ensure their existence.

- There are a number of bodies involved in the overall DCF process, a number of which having dual roles; similarly, there are a limited number of people involved, often participating in the different bodies. As such, it is challenging to define clearly the role of each body, and to ensure a full independence of the evaluation process. As the pool of independent knowledgeable experts cannot be easily expanded, transparency and objectivity are required in the evaluation process. It is necessary to further establish clear and standardised requirements for NWP and AR reporting, and clear guidelines for their evaluation, in order to limit the room for subjective interpretation. This process is already ongoing, but the EWG has made a number of suggestions to clarify some aspects.

- Progress is already ongoing for a better consistency in the transversal data (e.g. effort and catch) used for both the biological and the economic data sampling, but there is still a need for improved harmonisation and consistency across the two sampling programs.

- It is not always easy to reconcile wishes and realisms regarding the fine scale of disaggregation of sampling data. For ex. the level of details requested for the FDI database was linked to policy decisions (effort management plans), not scientific decisions, and was not in line with the disaggregation of the national sampling programs. Ideally, the full loop of data collection - stock assessment - management plans must be internally consistent: The more precise the knowledge, the more precise can be the management.

- End-users participating to EWG proposed initiatives to improve the quality of the data they use, and/or take into account the sources of uncertainties in their advice. ICES is in the process of getting its advice certified, and is proposing to test a stock database where quality indication could be flagged; GFCM has developed the Data Collection Reference Framework (DCRF) with quality checks implemented in the online platform for data submission; Management Strategy Evaluation (MSE) approaches currently developed within tuna RFMOs aim to better address the sources of uncertainty in data inputs and population dynamics and eventually identify best management procedures.

- Progresses are ongoing into the further optimisation of sampling strategies, to achieve the best trade-offs between precision and sampling intensity, and between the sampling of largest fleets and stocks and the smaller fleets/less abundant species.

- There is a lot of documentation dispersed into too many websites. The documents most directly linked to the DCF are to some extent available on https://datacollection.jrc.ec.europa.eu/index.html, but many other relevant documents produced by e.g. ICES or GFCM, even when centralised (ICES Data Quality Assurance repository) are difficult to find if one is not aware of their existence. It would be necessary to increase the centralisation of guidelines, codes, naming conventions, scripts etc into this central repository, regularly populated and updated.

- Regional coordination is considered a central fundament of the EU DCF, ensuring standardisation and burden sharing across MS. RCGs (incl. PGECON) play a central role in to this as an intermediate link between EU and MS. It is therefore important to ensure that RCGs have the necessary time and resources to conduct these tasks, including the possibility to launch thematic groups.

- For the evaluation process, it was made clear that quality of the data collected could be evaluated by STECF based on the information included in the NWP, and that compliance should be evaluated using the AR. The delays to address Data transmission failures should be shortened and considered during an in-year process. The quality in terms of precision and bias should be developed at a regional level, and informed from a RDB with agreed statistical tools. Some suggestions to improve the reporting of the NWP and ARs through some modifications of the excel tables and reporting documents.

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**Issues raised in relation to quality of data provided in response to the Mediterranean and Black Sea data call include the following**

1. Catch data are not always provided at the requested (quarterly) resolution. Some MSs report only annual data for most GSAs.

2. The timing of MEDITS survey is not coherent across MS and in some areas there are temporal shifts of multiple months that can introduce unknown bias in the survey.

3. Levels of sampling for age/length and catch composition at the métier level seems inadequate in many cases.

4. Reported landings and effort do not correspond between different data calls e.g. between the Med. And Black Sea and the fleet economic data calls

5. Time series of fishery data should be available from 2002 but many time series are much shorter.

6. Discard reporting is highly variable from year to year and by métier.

7. STECF EWG 17-02 noted that reported growth parameters (Linf, T0 and K) appear unrealistic and not in line with the biology of the species.

8. Sample size in landings/discards and numbers of samples for age/length for some GSAs is missing for all years in the catch table.


**Issues raised in relation to the response to the Fleet economics data call include the following:**

Overall data quality and coverage have improved but there are still several issues affecting overall quality.

1. Data for one member state (GR) are incomplete.

2. Due to confidentiality reasons, economic data some fleets are incomplete or not reported. Such fleets often comprise large vessels fishing in distant waters.

3. Discrepancies between reported landings (and effort) in different data calls.

4. Economic (income and costs) and landings data for fleet segments are often collected using two different methods. Some MSs have not established a system to "calibrate" both data sources. Consequently, the value of landings based on landings data and income from landings based on economic data are not the same.

5. Clustering issues: a) some member states clustering fleet segments when there is no real need to do it (large number of vessels in different segments and so they could be reported independently), b) cluster of fleet segments that are very different (e.g. targeting pelagic and demersal), c) fleet segments in a cluster changing overtime.

6. Estimation of fishing rights costs, income and value is not consistent across MSS. To a less extent, this also occurs for unpaid labour, total value of assets and investments.

7. In the fleet economic data call, we request year-2 economic data and year-1 transversal data. Not all MS deliver transversal year-1 data. This undermines the production of the forecasts for year-1 and the data call year.

8. High variability is economic data is observed for some fleet segments.

9. Estimating the opportunity costs of capital is problematic. The use of the real interest rate (interest rate of the 10 year national bond minus inflation) is used as a proxy but this introduces additional variability into the estimates which is not related to the fisheries sector.

**Issues raised in relation to quality of data provided in response to the aquaculture data call include the following:**

1. Freshwater aquaculture data is not reported by all MS, since it is not compulsory under the DCF (and the EU MAP). Hence it is difficult to evaluate the overall EU economic performance of the sector or to assess the impact of the structural funds allocated to freshwater aquaculture.

2. Data quality and reporting of the Eurostat data is low. Using Eurostat data to fill the potential gaps in aquaculture data reported under the DCF (not compulsory), a lot of effort is required to clean Eurostat data, and the estimates remain uncertain.

3. What constitutes "other income" is not clear. Some MS report other income generated by their aquaculture activities (not produced from the regular sale of fish) and they do not report the income generated by their other activities (e.g. reselling other products, fish processing, etc). Other MS report the income from these other activities inside other income.

4. Data on feed volumes and costs, and on livestock volumes and costs for some MS are of low quality. There is far too variability in certain cases.

5. With the introduction of thresholds for the aquaculture data collection in the EU MAP, there is a risk that coverage of reported data will be reduced and not representative of the overall EU sector.

6. The request of further disaggregated segments (e.g tuna farms segment, eels, etc.) would lead to more data not being reported or somehow clustered (which could lead to clustered segments not being significantly specific for one segment).

7. It is not exactly a quality issue, the population of the DCF aquaculture data call does not relate to all the EU aquaculture production, but only to those companies whose main activity is aquaculture.

**Issues raised in relation to quality of data provided in response to the fish processing data call include the following:**

1. A major issue is that it is not possible to establish a link between the processed product and the raw material either with respect to whether fish originate from wild capture fisheries or aquaculture, whether it is domestically sourced or imported. The quantities of raw material reported relate to all unprocessed material. Furthermore data collected and reported under the DCF is not provided by processing segment e.g. smoking, salting, filleting etc). Consequently there is no link to the fleet economic and aquaculture reports. Some MS have collected data on the raw materials (prodcom), but such data have always been criticised for their quality.

2. The Eurostat Structural Business Statistics collect data for the fish processing sector and account for about 90% of the information requested under the DCF.

Because it is not possible to establish a link between the DCF fish processing data and the primary production sectors, there seems little point in collecting data under the DCF in addition to those provided to Eurostat.

**ICES data hub and end-user -** An overview of fisheries and environmental data collected in connection with existing fisheries targeted monitoring.

International/regional perspective - beyond EU member contries. All databases listed cover ICES member countries but are not limited in geographical scope, and could be developed for inclusion of other geographic areas, facilitating comparability.

ICES
CIEM

| Fisheries Dependent Data | Regional Database (RDB) | |
|---|---|---|
| | Needed for development of regional sampling programmes | FUNDING NOTES: |
| | Standardisation of data and feedback to data collectors on quality and availability issues | EC-ICES Administrative Arrangement, funds maintenance |
| | Supports management of marine living resources | 2016–2018 redevelopment phase, funded by ICES |
| | Data policy protects sensitive data | ICES has also invested in other improvements/developments |
| | **VMS & Logbook data** | |
| | Vessel Monitoring System (VMS) and coupled logbook data to feed requests for scientific advice (who fishes where, what, and potential impacts) | FUNDING NOTES: |
| | Standardisation of data (input & output) | Financed through special and recurrent requests from the EC, RFMO's and RSC's |
| | Data policy protects sensitive data | |

| Fisheries Independent Data | DATRAS | |
|---|---|---|
| | Biological Trawl Surveys | FUNDING NOTES: |
| | Continual development of data outputs and geographical coverage | Initially developed in 2001 by ICES with funding from the EC under EC-ICES Administrative arrangement |
| | MSFD needs: litter/ Large Fish Indicator | |
| | **Acoustic surveys** | |
| | Fisheries observations collected from pelagic surveys (acoustic data, pelagic trawls). Combined they provide key biological data on fish stocks such as herring, mackerel and blue whiting as well as krill, and other prey species | FUNDING NOTES: Developed in 2015 under the H2020 AtlantOS project |
| | **Eggs & Larvae data** | |
| | International ichthyoplankton survey data available in a standard coordinated format and web portal for use in fish stock assessment and benchmarking | FUNDING NOTES: Developed by ICES in 2012 |

| Assessment results | Stock assessment database | |
|---|---|---|
| | The ICES ecosystem advice is based on assessment results that are presented in the stock assessment database. Data and plots, such as Fishing Pressure, Stock Biomass and stock status (MSY) are available online–accessible on ICES website | FUNDING NOTES: Released by ICES in 2014 |

Modification in the Work Plan templates for the sections 2A, 3A, 3B and 3C

Taking into account the previous year STECF EWG 1625 discussion the suggested amendments were applied in the WP template text boxes and tables:

- the column "Variable" was included in the table 2A to provide the links between Table 2A: Fishing activity variable and 3A: Population segments for collection of economic and social data for fisheries.

- the column "Planned coverage of data collected under complementary data collection (% of fishing vessels)" was included to the table 2A: Fishing activity variable. The changes were applied because the column "% of fishing trips" does not appear to be applicable in all cases, e.g. when sampling is performed on a vessel basis.

- the reference "the métiers should be provided only if relevant" was included under asterisk to the column "Métiers (level 6)".

- the column "Name of section (fleet, aquaculture, fish processing)" was included to the Table 5B: Quality assurance framework for socio-economic data. The inclusion of the column provides a link to the economic tables 3A: Population segments for collection of economic and social data for fisheries; Table 3B: Population segments for collection of economic and social data for aquaculture and Table 3C: Population segments for collection of economic and social data for the processing industry.

According to EU MAP, the data collection for the freshwater aquaculture is optional. The EU MAP includes different threshold that could have different implications in data collection. This situation creates different interpretation by MS and it is difficult to verify if thresholds are correctly applied.

STECF 16-16 (EWG16-25) suggests that Table 3B: Population segments for collection of economic and social data for aquaculture should allow to discriminate different types of thresholds:

• total production of the Member State is less than 1 % of the total Union production volume and value

• for species accounting for less than 10 % of the Member State's aquaculture production by volume and value

• simplified methodology for Member States with a total production of less than 2,5 % of the total Union aquaculture production volume and value

• no environmental data on aquaculture where the total aquaculture production of the Member State is less than 2,5 % of the total Union aquaculture production volume and value


The inclusion of the thresholds in the table was discussed by the economics subgroup during EWG 1704. However, the inclusion of the clear description how thresholds were applied by MS was suggested in the Text box 3B under Section 3 in the WP templates, but not in the table 3B. Text box 3B should include an ad-hoc section to inform if a threshold is applied and to justify it according to the EU MAP.


It was recommended by the EWG 1625 to revise the questions stated in the text boxes as they are ambiguous and do not necessarily address the intended issues. Some of the headings in the Text boxes 2A, 3A, 3B and 3C are misleading. The headings "Description of methodologies used to choose the different sources of data" have been changed into "Description of the different sources of data". The order of the headings should also be

changed. For instance, information on type of data collection should be requested before the information on data sources.

## STECF

The Scientific, Technical and Economic Committee for Fisheries (STECF) has been established by the European Commission. The STECF is being consulted at regular intervals on matters pertaining to the conservation and management of living aquatic resources, including biological, economic, environmental, social and technical considerations.

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