# WORKING GROUP ON COMMERCIAL CATCHES (WGCATCH)

VOLUME 2 | ISSUE 66

ICES SCIENTIFIC REPORTS

RAPPORTS
SCIENTIFIQUES DU CIEM

**ICES** INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA
**CIEM** CONSEIL INTERNATIONAL POUR L'EXPLORATION DE LA MER

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

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



ISSN number: 2618-1371 I 

ICES Scientific Reports

Volume 2 | Issue 66

# WORKING GROUP ON COMMERCIAL CATCHES (WGCATCH)

## Recommended format for purpose of citation:

ICES. 2020. Working Group on Commercial Catches (WGCATCH).
ICES Scientific Reports. 2:66. 106 pp. http://doi.org/10.17895/ices.pub.7428

## Editors

Kirsten Birch Håkansson • Ana Ribeiro Santos

## Authors

Maciej Adamowicz • Liz Clarke • Anne-Sophie Counou • Bram Couperus • Jessica Craig
Michiel Dammers • Sébastien Demanèche • Laurent Dubroca • Josefine Egekvist • Jon Elson • Ana
Cláudia Fernandes • Edvin Fuglebakk • Karolina Molla Gazi • Giorgos Gitarakos • Gildas Glemarec
Wlodzimierz Grygiel • Kirsten Birch Håkansson • Tiainen Joni • Allen Kingston • Henrik Kjems-Nielsen
Sara Königson • Maksims Kovsars • Uwe Krumme • Kelly Macleod • Ana Marçalo • Estanis Mugerza
Nuno Prista • José Rodriguez • Hanne W. Rognebakke • Ana Ribeiro Santos • Sven Stötera • Sofie
Vandemaele • Rita Vasconcelos • Jon Helge Vølstad • Adam Woźniczka • Lucia Zarauz

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

# Contents

# i Executive summary

WGCATCH contributes to ensure the quality of commercial catch data, which underpins stock assessments and advice. At this year's WGCATCH meeting all the proposed ToRs were covered and objectives were met. The group started documenting the national estimation procedures (Section 3.2). Most of the countries use ratio estimators for their estimation. Recent discussions at WGCATCH and other EGs have increasingly highlighted that estimation techniques currently used by many countries to process commercial catch data may not be the most up-to-date and/or ignore sampling design and/or are far from transparent and/or involve significant levels of ad-hoc decisions. Therefore, WGCATCH recommends a series of practical workshops on estimation procedures for the next 3 years to produce best practice guidelines for choosing methods and variables used to raise commercial sampling data. Under ToR a.3, the sample size thresholds used for national data provision were documented. WGCATCH discussed extensively use of specific thresholds, however, it is not possible to come up with a single universal rule to be applied across all countries and stocks. Instead, WGCATCH advises that specific analytical steps are taken during the benchmark process to test and evaluate the impacts of applying or not thresholds to national data before providing the data to the assessment. Intersessional work was carried out to develop tools to be used by the data submitters and stock coordinators to understand and summarise the quality and quantity of the data provided to Intercatch (Section 3.3).

The work developed under SSF, ToR b), continued to develop best practice guidelines on SSF data collection, with quantitative analyses on the coverage/completeness of fishing activity. PCA analysis was carried out of data incompleteness issue or over-declaration to build a risk' map where each country*area is positioned (Section 4.2). The sub-group reviewed the proposed CL and CE data formats from RDBES core group to accommodate 'scientific' and 'official' estimates to cover SSF data gaps. One of the main issues with this proposal was the lack of transparency that needs to be addressed (Section 4.4). The strengths and weakness of using ERS for monitoring SSF were also assessed (Section 4.3).

Under ToR c), sampling and estimation of by-catch species, the main focus during this year's meeting was to review the definitions of sorting, hauling and slipping processes for each gear type and how to implement in on-board protocols (section 5.2); and a detailed description on how to sample protected species on-board commercial vessels (Section 5.3). The RDBES structure was also reviewed to assess if it is suitable to accommodate the necessary information for WGBYC needs (Section 5.1).

WGCATCH continued to review the work developed under the RDBES. The documentation of the current estimation procedures will contribute to the prioritization of the estimation methods to be implemented as standard methods in the RDBES system. The series of practical workshops, proposed by WGCATCH, on estimation procedures for the next 3 years to produce best practice guidelines for choosing methods and variables used to expand commercial sampling data will also contribute to the development of the RDBES, as they will focus on the best statistical methods to expand the commercial sampling data.

Given that this is the third year of the current term of WGCATCH, future needs in line with the ICES objectives and Science plan were identified and a future work plan was proposed.

# ii Expert group information

| | |
|---|---|
| **Expert group name** | Working Group on Commercial Catches (WGCATCH) |
| **Expert group cycle** | Multiannual fixed term |
| **Year cycle started** | 2019 |
| **Reporting year in cycle** | 3/3 |
| **Chairs** | Kirsten Birch Håkansson, Denmark |
| | Ana Ribeiro Santos, United Kingdom |
| **Meeting venue and dates** | 4-8 November 2019, Gdansk, Poland, 34 participants |

# 1 Introduction

WGCATCH contributes by ensuring the quality of commercial catch data, which underpins stock assessments and advice. To achieve this, the working group documents sampling schemes and estimation methods, establishes best practice guidelines, and provides advice on the uses of commercial fishery data. The group also evaluates how new data collection regulations (or management measures) may alter the way data needs to be collected and provides guidelines about biases and disruptions induced in time-series of commercial data.

The ToRs for the 2019 WGCATCH meeting are outlined in Section 2. This was the last meeting of the current cycle, therefore a self-evaluation report was delivered with the main achievements and outputs of the working group. The group also discussed and agreed on the work plan and multi-annual ToRs for the period 2020–2022.

# 2 2019 Workplan

ToR a) Review current and emerging statistical and technical developments in sampling design, estimation, optimization and quality control of commercial catch data, focusing on total catches, length and age distributions and other biological parameters of ICES stocks.

1. Discuss sampling and estimation methods (including new technologies or other data sources), including results from intersessional WKs and training courses.
2. Best practice guidelines for choosing methods and variables used to expand commercial sampling data:
    a) Compilation and documentation of the present methods used.
    b) Start to develop guidelines for estimators (algorithms, tools for analysing the appropriateness of using the specific estimator: Ratio estimators; estimation of variance (e.g. design-based, bootstrap).
3. Develop best practice and guidelines on data request and data provision for frequency data (age and length).
4. Review intersessional work done on summarizing documentation of sampling design and estimation and plan how to continue the work.

ToR b) Review developments in sampling and estimation practices of catch, effort, length and age distributions and other biological parameters of small-scale fisheries.

1. Discuss and review main outputs from research projects focusing on SSF sampling and estimation (e.g. fish Pi2 and STEAM).
2. Continue to develop best practice guidelines on SSF data collection, standardize reporting and define quality indicators for sampling and census.
3. Analyse different options to monitor SSF with new technologies based on end-user needs.
4. Review the RDBES core group's suggestion for storing of and estimation with SSF data in the RDBES
5. Review the new EU-MAP tables and variables in light of the SSF (if available).
6. Review the progress of the scientific paper.
7. Review and document the sampling effort of biological data on SSF.

ToR c) Review developments in sampling and estimation of incidental by-catch, including Protected, Endangered and Threatened Species (PETS) and rare fish species.

*Routine ToRs*

ToR d) Review and suggest developments of the Regional Database (RDB) from a design-based sampling and estimation perspective.

ToR e) Liaise with other ICES groups (e.g., WGBIOP, WGRFS, PGDATA and SSGIEOM), RCMs/RCGs, the LM and research projects that deal with commercial catch data.

ToR f) Collaborate in the advisory process, liaising with assessment groups and benchmarks on commercial catch issues.

*Generic ToRs*

ToR g) Identify research needs, amend work-plan and propose new workshops, training courses and study-groups, reviewing their outcomes.

ToR h) Respond to recommendations to WGCATCH from ICES expert groups, RCM/RCGs, Liaison Meetings and other end-users of commercial catch data.

ToR i) Ensure, where appropriate, that systems are in place to quality assure the products of WGCATCH.

# Summary of WG Achievements during 3-year term

The most important goal of WGCATCH is to provide a forum for exchange of knowledge, ideas, and recent developments in the sampling and estimation of commercial catches. Some of the outcomes of this forum are difficult to measure as they translate into changes of practices in sampling and estimation at the national level which has gradually improved the quality of data used within ICES. An example of its success may be seen in the international coordination project fishPi[2] (MARE/2016/22), which many WGCATCH members participate in and was discussed during the WGCATCH meetings.

Other outcomes include documentation of sampling practices and estimation procedures:

- Templates to systematically document of sampling designs and estimation methods (2017 report, section 5.1.3).
- Documentation of sampling of national landings in foreign ports (2017 report, 5.1.2 section).
- Compile information on how different labs calculate effort for small-scale fisheries (SSF) and passive gears (2018 report, section 5.2.1).
- Documentation of declarative and register data in SSF across ICES countries.
- A set of R-scripts for sample-level and multi-level optimization of sampling was produced during the three Workshops on Optimization of Biological Sampling at Sample level (WKBIOPTIM 1-3) - 2017-2019: https://github.com/ices-eg/wk_WKBIOPTIM3
- Documentation on the current data collection of PETS under DCF and the adjustments to meet the EU-MAP requirements.

Guidelines and advice on best practices:

- Best practice on sampling and estimation of national landings in foreign ports, based on the case studies (2018 report, section 5.1.2). Tools and R-scripts to investigate the overall importance of the foreign landings (2018): https://github.com/ices-eg/wg_WGCATCH/tree/master/foreign_landings
- Best practice and guidelines on data request and data provision for frequency data (2019 report, section 3.3). Tools and R-scripts for national data submitters and stock coordinators to investigate the relative national importance and the impact on applying thresholds, when providing frequency data for stock assessment (2019).
- Guidelines on best practice for collection of data from Small Scale Fisheries: Fishing activity (2019 report, section 4.2).
- Developed quality indicators for sampling and census data in SSF (2019 report, section 4.2).
- Best practices for at-sea sampling for PETS were developed (2019 report, section 5).

Conferences:

- Participation on the International Fisheries Observer and Monitoring Conference (IFOMC, 11–15 June 2018, Vigo, Spain), on the work developed under ToR b–Review developments in sampling and estimation practices of catch, effort, length and age distributions and other biological parameters of small-scale fisheries.

Training courses and workshops:

- Training course: Statistically sound inference for commercial catch sampling (TCCATCH), instructed by Mary C. Christman (USA) and Jon Helge Vølstad (Norway), 2018.

- Training course: Introduction to CPUE standardization and development of annual indices of stock abundance, instructed by Mary C. Christman (USA) and Shannon L. Cass-Calay (USA), 2019.
- Joint WGCATCH–WGBYC workshop on Sampling of PETS (WKPETSAMP, 2018).
- Three workshops on the Optimization of Biological Sampling at Sample level (WKBIOPTIM 1-3) in the period 2017–2019.

Databases:

- RDBES: some members of WGCATCH have been involved in the development of the RDBES, both as members of the Steering Committee of RDB (SCRDB) and by participating in the core group of RDBES development. Among other aspects, WGCATCH has played an active role in the accommodation of PETS and SSF data in the RDBES.

Outreach:

- WGCATCH has contributed to the development of WKCELTIC Benchmark Workshop on Celtic Sea Stocks, which will be carried out during 2019 and 2020. WGCATCH reviewed the templates to documenting data quality and quantity provided for data-limited stocks (DLS) which were included in the 2019 ICES data call for certain stocks.

# 3 Review current and emerging statistical and technical developments in sampling design, estimation, optimization, and quality control of commercial catch data—focusing on total catches, length and age distributions, and other biological parameters of ICES stocks (ToR a)

## 3.1 Discuss sampling and estimation methods (including new technologies or other data sources) and results from intersessional WKs training courses (ToR a.1)

The outcomes of a set of intersessional workshops spanned by or with involvement from WGCATCH were presented and reviewed during the meeting;

- Workshop on Optimization of Biological Sampling (WKBIOPTIM3) – Ana Cláudia Fernandes
- Workshop on Science with Industry Initiatives (WKSCINDI) – Jon Elson

Further, a set of presentations relevant for this ToR, spanning regional design and optimisation, a national estimation framework and the re-development of a national sampling programmes, were given and discussed;

- FishPi2 WP2 & 3 – Liz Clarke
- ECA – A Bayesian Framework for Catch at Age Estimation – Edvin Fuglebakk
- French On-shore and Off-shore sampling programmes – Anne-Sophie Cornou

Abstracts can be found in Annex 4.

## 3.2 Best practice guidelines for choosing methods and variables in expanding commercial sampling data (ToR a.2)

### 3.2.1 Summary of national estimation procedures

The WGCATCH meeting started with the documentation of the current estimation procedures used by national institutes to provide their national commercial catch data. The participants were requested to complete the WGCATCH template for documenting national estimation procedures[1].

Fourteen countries completed the WGCATCH template on Estimation procedures. Some countries provided different approaches for different fleets, and some countries did not provide information for all estimates. The overview in table 3.1 presents the summary of the main estima-

[1] https://github.com/ices-eg/wg_WGCATCH/blob/master/templates/WGCATCH_estimation_template.xlsx

tion methods used by country to provide the weights and length and age distributions of landings and discards. In the table, the absence of information or the impossibility to identify the main method used at the national level is recorded as white cells.

Information obtained in the templates indicates that landing weights are mainly reported from census data, while for discards and size structure estimates, ratio estimators based on landings weights is the major method (reported 26 times). However, some countries use the landings of species/stock, while others use the landings of the target species or all total landings of all species. Fishing time (hrs), number of trips and horse power*days at sea are the three effort auxiliary variables used to raise estimates for discards and number at length, at population level. The age estimators rely mainly on an expansion using age-length key matrices (ALK). Variance calculation is only calculated by four countries, and is computed using bootstrap, analytic or model-based approaches.

The summary table confirms that most countries use ratio estimators for their estimation. Recent discussions at WGCATCH and other EGs have increasingly highlighted that estimation techniques currently used by many countries to process commercial catch data may not be the most up-to-date and/or ignore sampling design and/or not be well documented and/or involve significant levels of ad-hoc decisions. Therefore, WGCATCH recommends a series of practical workshops on estimation procedures for the next three years to produce best practice guidelines for choosing methods and variables used to expand commercial sampling data (algorithms, tools for analysing the appropriateness of using the specific estimator: Ratio estimators; estimation of variance (e.g. design-based, bootstrap).

**Table 3.1. Summary of the national estimation procedures for landings, discards and biological data.**

| Country | Weight of landings | Weight of discard | Length distribution, landings | Length distribution, discard | age distribution, landings | age distribution, discard | Note | Variance |
|---|---|---|---|---|---|---|---|---|
| DNK | Census | Ratio estimator (Landings weights, Number of trips) | Ratio estimator (Landings weights) | Ratio estimator (Number of trips) | Expansion (ALK) | Expansion (ALK) | | Bootstrap |
| ENG | Census | | Ratio estimator (Stock Landings weights) | Ratio estimator (Stock Landings and Fishing time) | | | | |
| ESP | Census | Ratio estimator (Landings weights) | Ratio estimator (Landings weights) | Ratio estimator (Landings weights) | Expansion (ALK) | Expansion (ALK) | | |
| FIN | Census | | Ratio estimator (Landings weights) | | Expansion (ALK) | | | |
| FRA | Census | Ratio estimator (Fishing time) | Ratio estimator (Landings weights) | Ratio estimator (Fishing time) | Expansion (ALK) | Expansion (ALK) | | Analytic |
| GER | Census | Ratio estimator (Landings weights) | Ratio estimator (Landings weights) | Ratio estimator (Landings weights) | Expansion (ALK) | Expansion (ALK) | | |
| IRL | Census | | Ratio estimator (Landings weights) | Ratio estimator (Fishing time) | Expansion (ALK) | Expansion (ALK) | | |
| LVA | Census | Ratio estimator (Landings weights) | Ratio estimator (Landings weights) | Ratio estimator (Landings weights) | | | | |
| NLD | Census | Ratio estimator (Horsepower days at sea) | Ratio estimator (Landings weights) | Ratio estimator (Horsepower days at sea) | Expansion (ALK) | Expansion (ALK) | Species specific | |
| NOR | Census | | Ratio estimator (Landings weights) | | Ratio estimator (Landings weights) | | | Model-based |
| POL | Census | Ratio estimator (Landings weights) | Ratio estimator (Landings weights) | Ratio estimator (Landings weights) | Ratio estimator (Landings weights) | Ratio estimator (Landings weights) | | |
| POR | Census | Ratio estimator (Fishing time) | Ratio estimator (Landings weights) | Ratio estimator (Fishing time) | Expansion (ALK) | Expansion (ALK) | | |
| SWE | Census | Ratio estimator (Fishing time or Landings target spp) | Ratio estimator (Landings weights category size) | Ratio estimator Fishing time or Landings target spp) | Expansion (direct) | Expansion (ALK) | | |
| GBS | Census | Ratio estimator (Landings weights) | Ratio estimator (Landings weights) | Ratio estimator (Landings weights) | Ratio estimator (Landings weights) | Ratio estimator (Landings weights) | | Bootstrap |

### 3.2.2 Sequence diagram of the estimation procedure at the national level

The WGCATCH estimation template[2] completed by the countries provided a detailed overview of the different analytical steps used to provide commercial catch estimates (landings, discards, and biological data). Six main categories summarized this information: 1) weight of the landings; 2) length distribution of the landings; 3) age distribution of the landings; 4) weights of the discards; 5) length distribution of the discards; and 6) age distribution of the discards. From the sampling data to the domain estimation, this process can be very intricate and difficult to understand, involving multiple raising and estimations steps throughout the estimation process. Moreover, a clear view of these procedures at the national level is lacking.

An attempt to generate the national synthesis of the estimation procedures was made to address this issue. Due to the lack of standardisation in the completion of the template filling it did not allow and automatic analysis of the different procedures in progress. The information was then synthesized by a human operator based on sketches provided by different national data providers (an example of a sketch can be seen in Figure 3.2). These sketches were considered to be very similar to a flow chart category called sequence diagram. Sequence diagrams describe how entities interact within a system (Poranen *et al*. 2003)[3]. For example, in the unified modelling language (UML: the standard notation for modelling software system), they depict systems dynamics by the interaction and the sequence of messages exchanged between objects. In the estimation procedure framework, we use the data type as objects and analytical procedure as interaction. The vertical dimension of the diagram was associated with the different fishery-dependent information categories (e.g. landings weight, length distribution of the landings, discard weight, length distribution of the discards), and the horizontal dimension was associated with the different levels at which the information was processed. The process was represented by an arrow with a description of the mathematical operations used to pass from one level to another. For example, this representation for the weights of discards:

raised by the number of hauls

haul ---------->trip

Means that the information in consideration (here the weights of the discards) in the haul is estimated at the trip level by multiplying the discards quantity in the haul by the number of hauls in the trip to estimate the discards at the trip level.

In this section, sequence diagrams are provided for six countries: Belgium, France, Spain, Portugal, UK- England and Ireland (see Figures 3.2 through 3.7). These diagrams were generated using the mermaid flow chart script language using mermaid.js (https://github.com/mermaid-js/mermaid). These diagrams are based on the processes provided by each member country. The estimation procedure presented in this document synthetize the estimation procedures used to provide data to ICES and do not include the methods used to provide fishery-dependent information to the other RFMO (ICCAT, IOTC, GFCM, etc.). The limited number of diagrams is because (1) the intense workload during the WG week and (2) not all countries have provided sufficient information to generate these diagrams.

These diagrams improve the transparency on the estimation procedure by documenting them synthetically and graphically and this documentation can feed the development of the RDBES.

[2] https://github.com/ices-eg/wg_WGCATCH/blob/master/templates/WGCATCH_estimation_template.xlsx

[3] Poranen T, Mäkinen E & Nummenmaa Jyrki (2003) *How to Draw Sequence Diagram*. Conference: Proceedings of the Eighth Symposium on Programming Languages and Software Tools, SPLST'03, Kuopio, Finland, June 17-18, 2003.

The proximity of these diagrams to the UML language introduce the need to model (in term of system design) the estimation procedures in order to prioritize the implementation of the estimation methods based on the RDBES format.

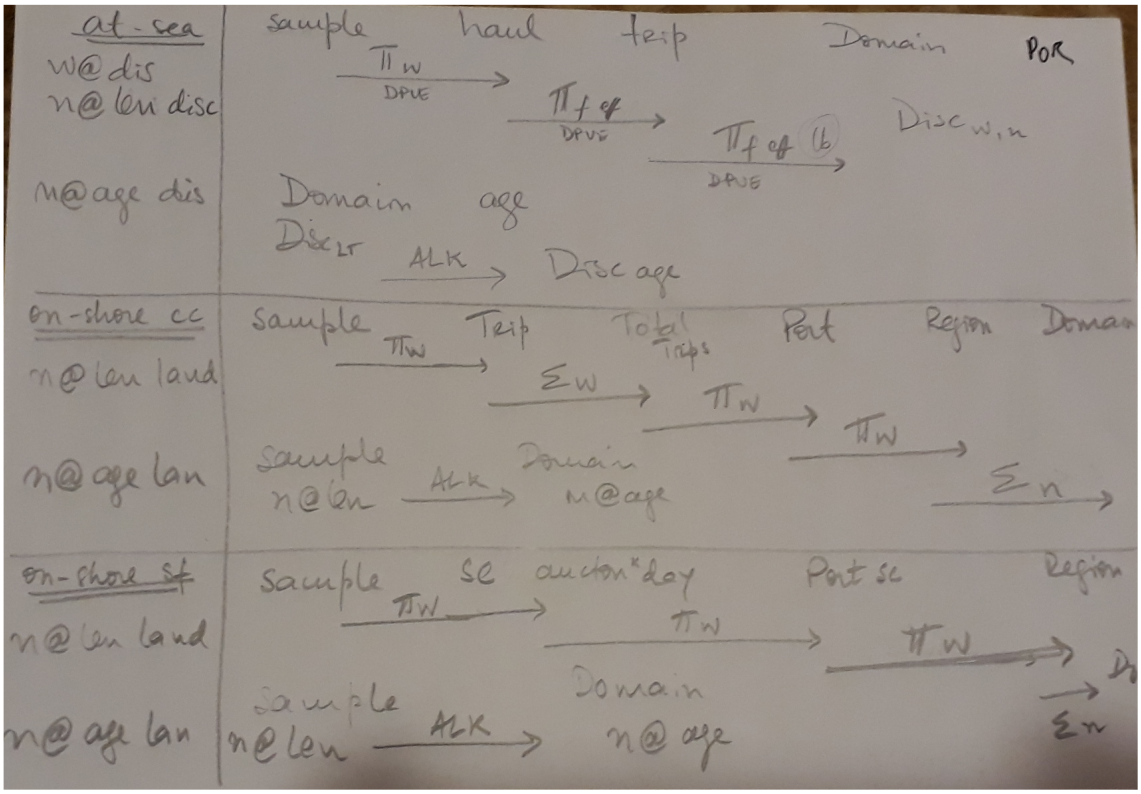



**Figure 3.1. Example of a sketch of the estimation procedure designed on 07/11/2019 by a national data provider.**

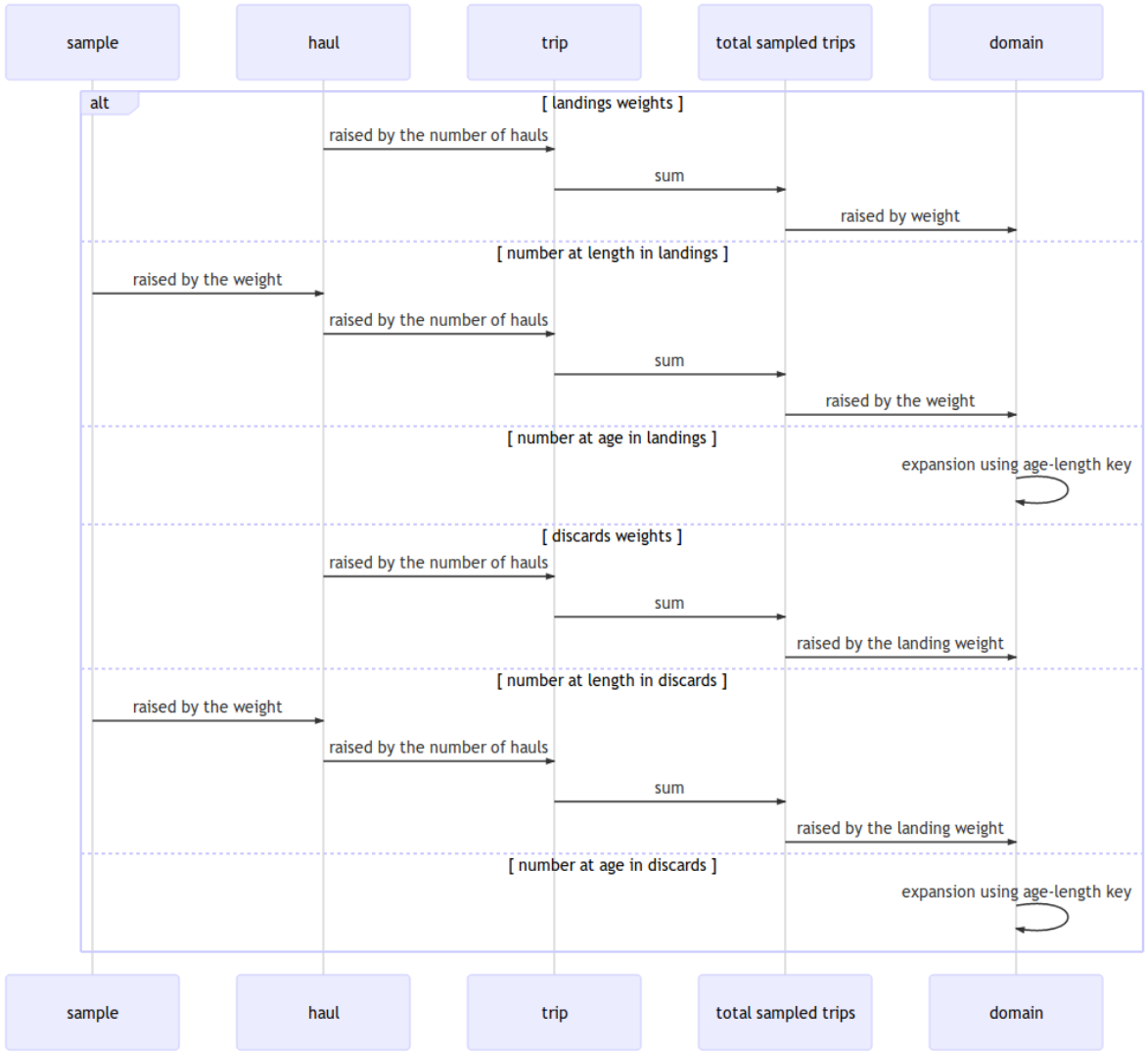



**Figure 3.2. Sequence diagram of estimations for Belgium.**

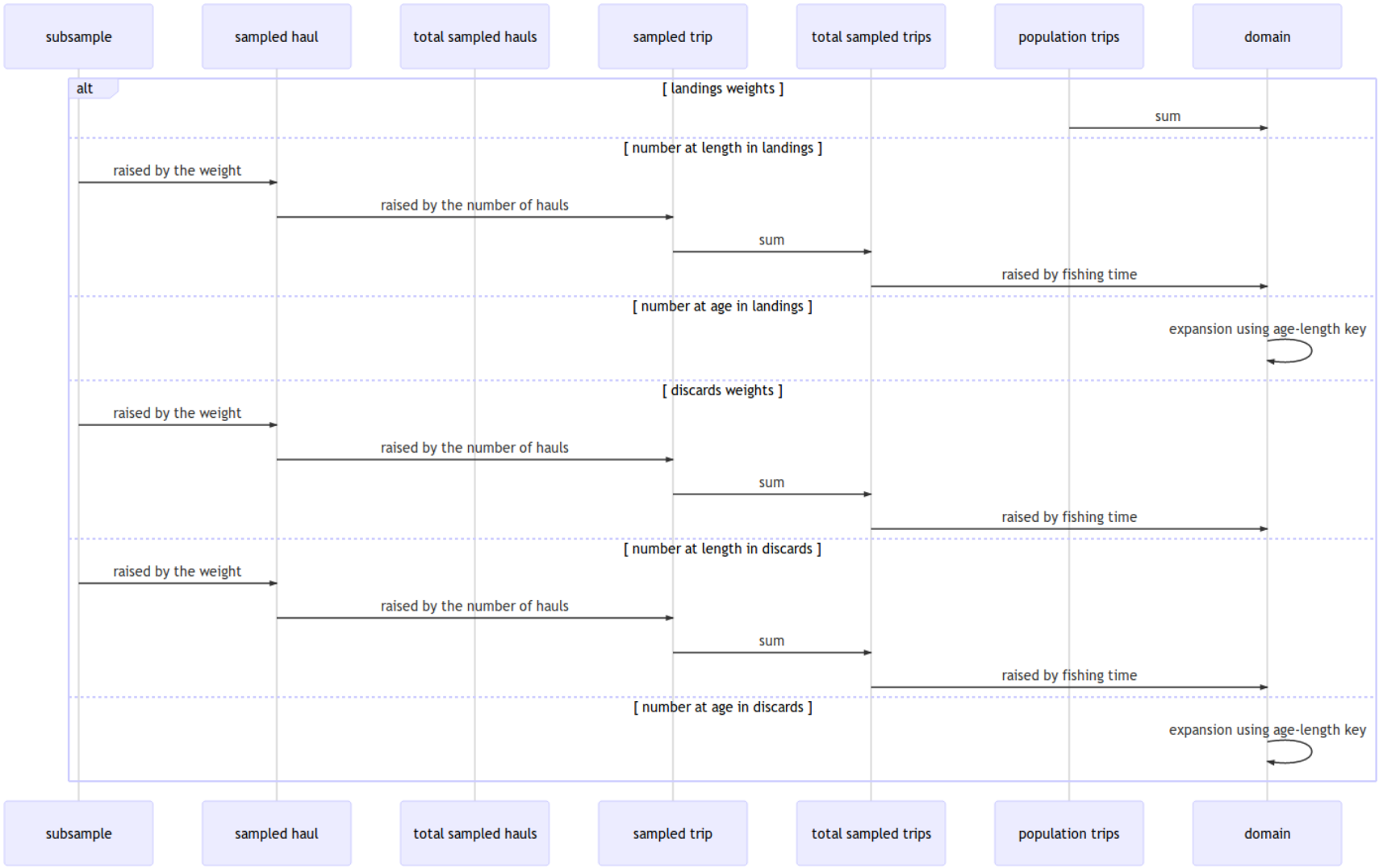



**Figure 3.3. Sequence diagram of estimations for France.**

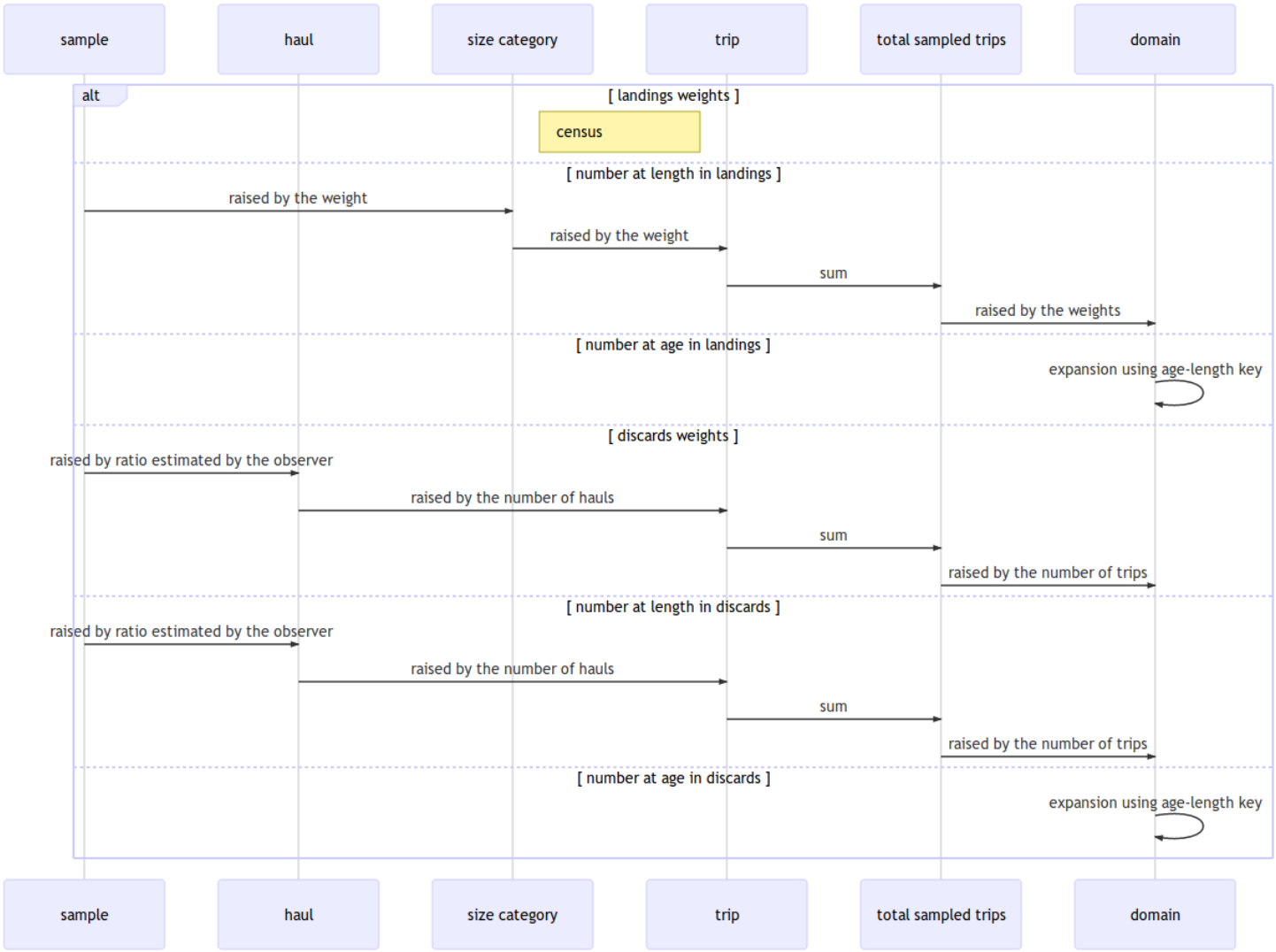



**Figure 3.4. Sequence diagram of estimations for Spain.**

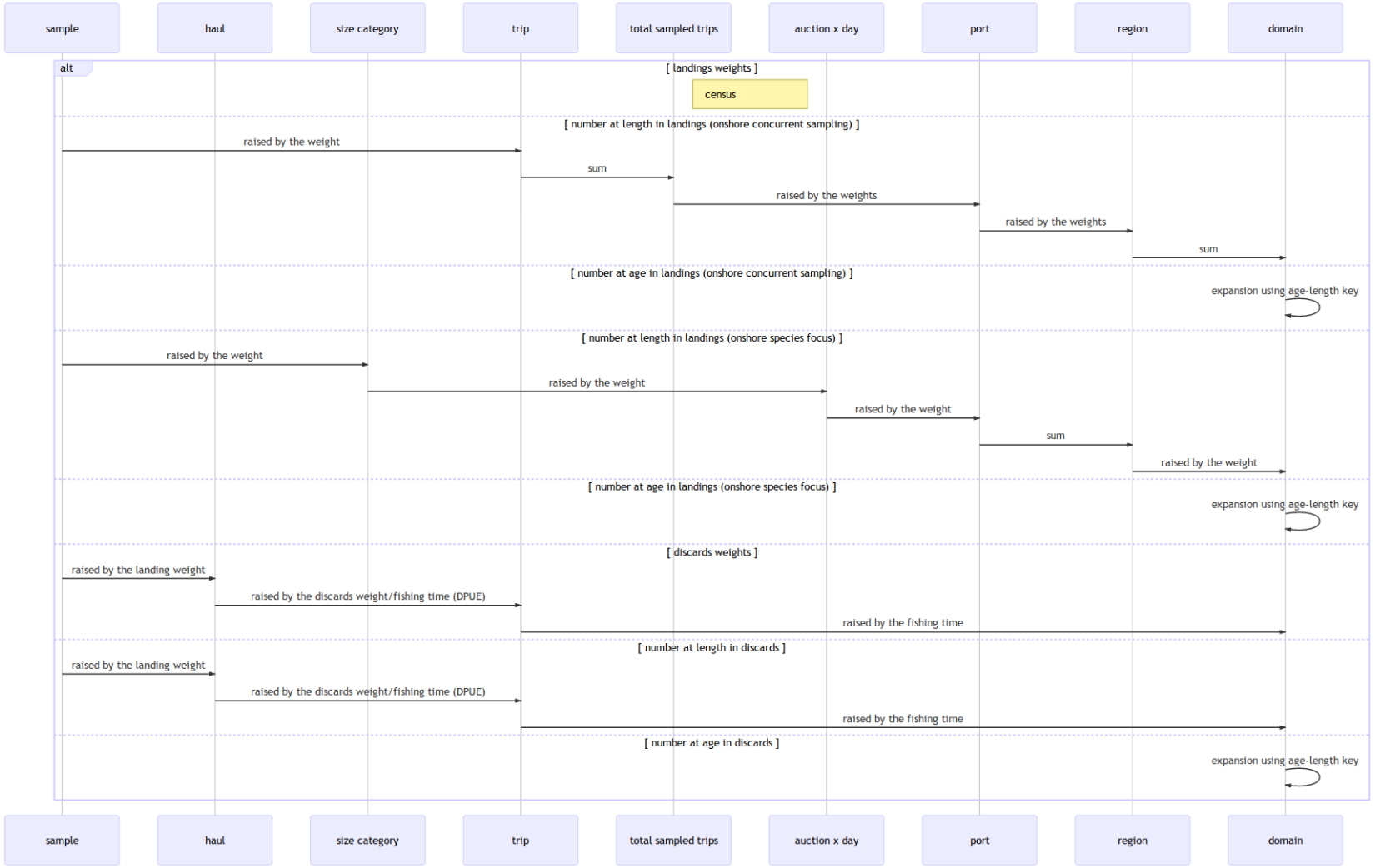



**Figure 3.5. Sequence diagram of estimations for Portugal.**

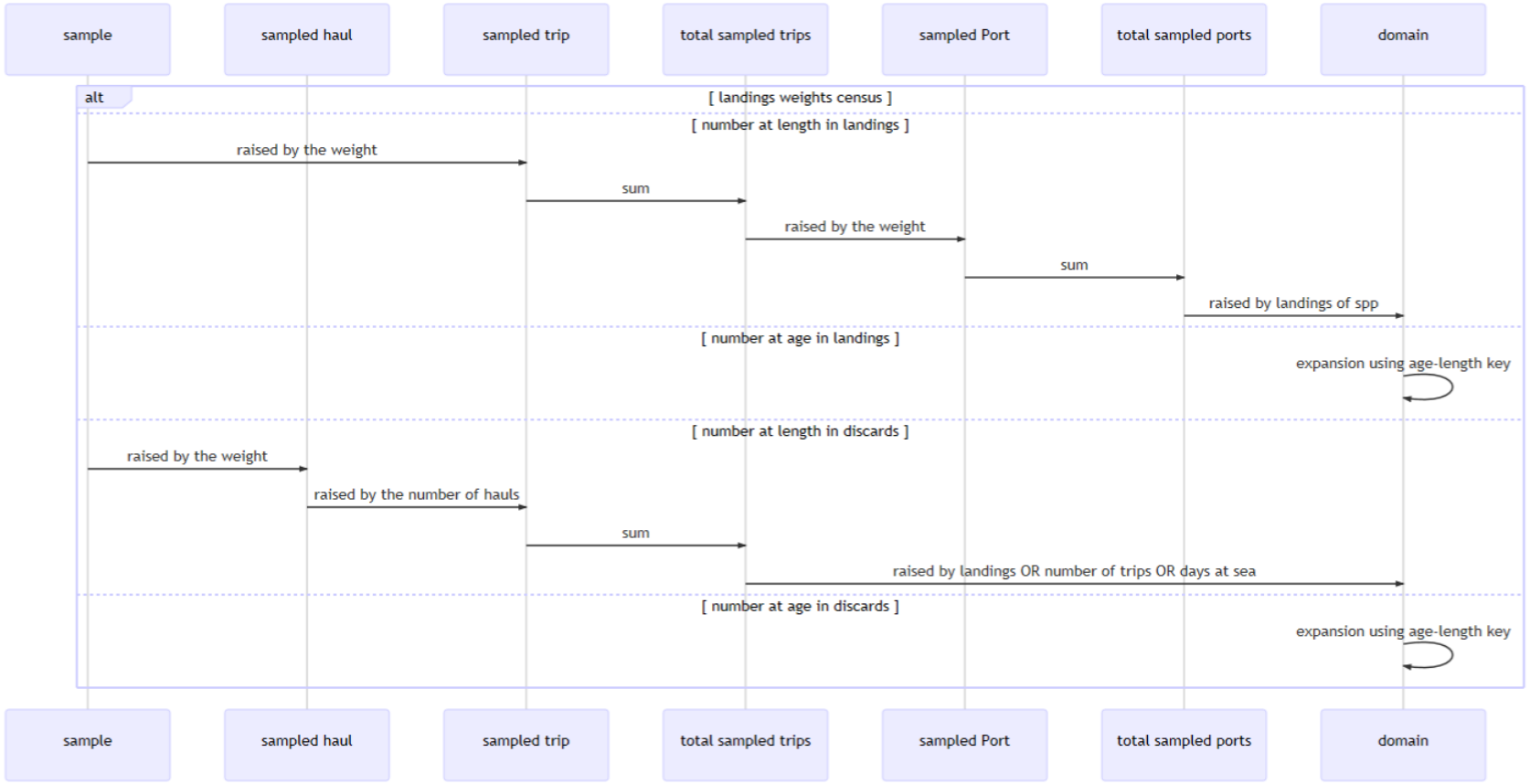



**Figure 3.6. Sequence diagram of estimations for UK–England.**

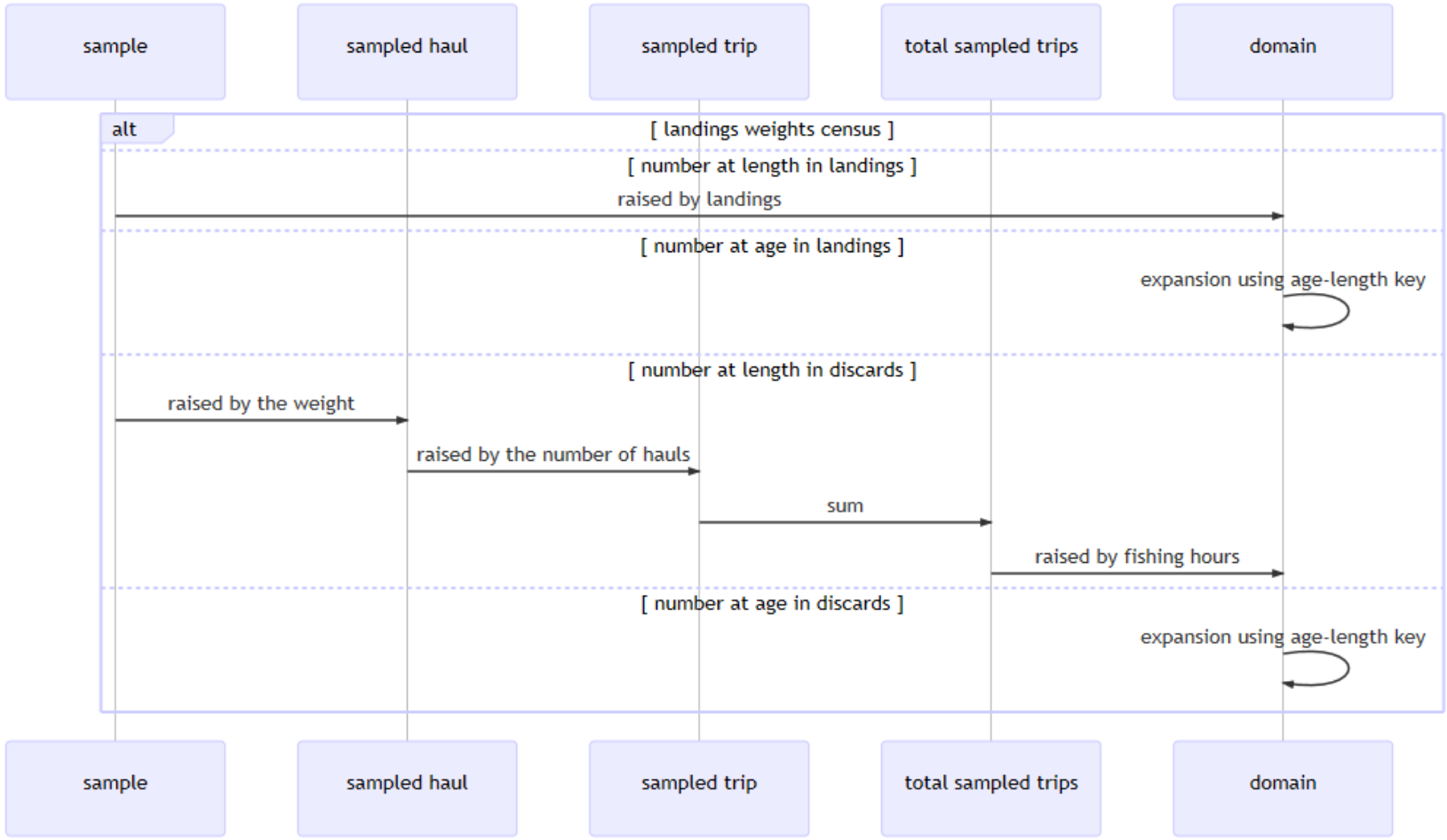



**Figure 3.7. Sequence diagram of estimations for Ireland.**

## 3.3 Develop best practice and guidelines on data request and data provision for frequency data (age and length) (ToR a.3)

One of the aims for the 2019 WGCATCH meeting was to develop best practice and guidelines on data request and data provision for frequency distribution data (age and length). The group decided that the guidelines should also include discard estimations, and that they are relevant to all stocks covered in the ICES data call, and not only to Data Limited Stocks, as interpreted in 2018. The reason for this is that current sampling programs do not always have the sampling effort needed to provide data at the level of disaggregation required in the data call, and therefore, the number of trips sampled is often not sufficient to provide reliable estimates for all domains.

In the current ICES annual data call, no threshold is set concerning a minimum number of samples that should underpin the commercial estimates input to ICES assessment. Data submitters are encouraged to fill in InterCatch (IC) fields such as NumSamplesLngt, NumLngtMeas, NumSamplesAge, and NumAgeMeas as a means to convey information on sample size to stock assessors and help them to make imputations in InterCatch (IC) and identify changes in sampling levels from one year to another. But the decision about which data to upload, is left open to different interpretations. Some data providers decide not to set any threshold and let stock coordinators make the decision about which data should be used using the sampling information provided. While others interpret that only data with a minimum quality/quantity should be sent to IC, and use thresholds before submitting the data. Stock coordinators, on their side, claim that IC does not have the tools needed to manage and quality check large amounts of data, identify domains with an insufficient number of samples, remove samples, merge several domains, etc. Therefore, the inclusion of low-quality data in the database has the risk of decreasing the quality of the stock assessment process.

This situation is foreseen to change with the new RDBES. During the estimation process, with raw data available, there will be the possibility of having a broad view of the number of samples for a domain across countries and take decisions on thresholds and domain merging in a case by case basis.

To better understand how national data submitters were providing national commercial data to Intercatch, WGCATCH produced a questionnaire "Data Quality and Quantity Information" to be completed during the ICES annual data call. The evaluation of the questionnaires showed that currently, the national data submitters are using multiple thresholds, and that there is no consistency across countries (Table 3.2). The variety of thresholds include: number of trips sampled in a domain; number of trips sampled with stock, the combination of number of trips, and number of fish measured/observed, or no thresholds applied. Also, which thresholds are applied and how they are applied to their data is not often documented nor communicated to the AWG or the benchmark process.

The current sampling programs do not always have the sampling effort needed to provide data at the level of disaggregation required in the data call, and as a consequence, frequently leads to 1 trip being sampled in domain, which is not sufficient to provide reliable estimates, as is not possible to calculate the variance of the estimate (RSE). To overcome this, several national data providers apply thresholds to try to ensure the quality of the data submitted at the national level. The application of thresholds will reduce the number of sampled domains provided to the AWG. While for the data-rich stocks, this might not have an impact, for the data-limited stocks, it may reduce significantly the sampled data available for the assessment (see section 3.3.1).

Other data providers resort to imputation or reallocate the samples to other strata, which can result in potential bias. While other countries for certain stocks (data-limited stocks in particular) provide all the data they have regardless of the sample size.

**Table 3.2. Examples of the diversity of thresholds used by data submitters.**

| |
|---|
| Yes. We reject samples that are not representative, e.g. where the spp is not the target, where there are less than say 60 fish, where there are too many gaps in the length frequency. |
| Yes. Usually, the number of fish per trip has been >= 50. Sometimes it is needed more than 1 trip to get 50 individuals per trap haul. |
| Yes. A threshold of >=2 trips and >=4 hauls have generally been applied, however, in a few cases, single trips have been used |
| Yes. Data were only used when the number of trips and number of length measurements is assumed to reflect the general fishing pattern. Length measurements were used for raising at a quantity of >10 (stocks with small length range and low landings) or >20 (for stocks with a larger length range and high landings). Gaps in the weight-at-length were filled using same-year length-weight coefficients. |
| Yes. Only fleets*quarter*stock*area with >25 individuals measured/aged |
| Yes. Only fleets*quarter*stock*area with >30 individuals measured in >=3 trips were used; Final frequencies were visually inspected and looked reasonable. |
| Yes. Only fleets*quarter*stock*area with >35 individuals measured/aged |
| Yes. Only fleets*quarter*stock*area with >5 individuals measured/aged |
| Yes. If the weight of measured fish in the landings was larger than 70 kg, the amount of discards was considered representative and raised discard weights were provided. |
| Yes. The length distribution is provided as the number of length measurements were considered sufficient (…) but was based on only 6 length measurement and thus includes gaps in the length distribution. |
| Yes. Sampling data was uploaded for metiers with 10+ sampling trips. |
| Yes. Quarters were aggregated as this is a slow-growing fish. Finally, length and age samples were merged for OTB DEF and CRU at appropriate mesh sizes |
| The stock is sampled by size sorting category |
| No threshold used. |

WGCATCH discussed extensively the use of sample size thresholds for data submission. The main conclusion was that it is not possible to come up with a single universal rule that covers all countries and stocks. This is because the assessment needs in terms of accuracy of the estimates depend on a variety of factors, such as the proportion of the domain vs. total, the specificity of the assessment models used (e.g., the relative weights of data from different sources) and the effective need for advice on a given stock. Still, there is a pressing need for a concerted action that clarifies and makes transparent for each stock what (if any) thresholds are being used *and* should be used in the data submitted at national level. Alongside, an evaluation of the impact of the use of different thresholds at national level may have in the availability of input data to stock assessments, particularly the data-limited stocks.

Tools to optimise sample sizes have been developed in workshops and projects such as WKBIOPTIM (ICES, 2017; ICES, 2018) and fishPi[2]. An example case study showed optimal sample sizes of 20 and 40 trips per year for purse seine caught anchovy and sardine in the Aegean and Eastern Ionian Sea, respectively (WKBIOPTIM3); and 20 to 50 trips for plaice caught by beam trawl in the North Sea (fishPi[2]). Where the sample sizes of strata fall far below these levels, data providers or the stock coordinators should consider aggregating data spatially, temporally or by métier. By reducing the resolution of sampling, the robustness of estimates is increased.

**WGCATCH recommends a clarification and revision of the size sample thresholds currently used at the national level during commercial data provision to ICES assessments. The best place of such clarification is probably the benchmarking process where time series of commercial data can be re-evaluated (and possibly re-estimated).** A working document was submitted with a proposed framework with a decision-key on the minimum sample sizes for data provision stock assessment (Annex 5). However, its adoption was not consensual within WGCATCH. Still, WGCATCH advises a set of steps are taken during the benchmark process to identify those thresholds and evaluate their impact:

1. Request information on the size sample thresholds being used by different countries.
2. Evaluate the significance of those thresholds for data provision in terms of the data limitations they generate and the relative importance of the landings of each national domain in relation to the whole stock. If a national domain is relatively important to the whole stock (e.g. >5% of the landings) large sample sizes may be needed. If not, lower sample sizes may be acceptable[4] . Plots like the examples below could be used to illustrate the relative importance and number of samples.
3. Evaluate the impacts of applying different levels of thresholds (in number of trips and number of fish sampled)
4. If sample sizes are found to be low, consider bias and variance trade-off involved and consider aggregation: temporal, spatial and technical and imputation for unsampled domains.
5. Define and inform on the thresholds and aggregation/imputation levels that should be used in data provided during the next assessment cycle.

**WGCATCH recommends that the current benchmark process for data compilation of commercial catch data are reviewed and updated with the contribution from WGCATCH, to ensure documented and harmonized methodologies for commercial catch data (including revising thresholds, fleet definitions, ALK estimations, etc.) for national data submission.**

### 3.3.1 Analysis for data submitters and stock coordinators

A series of tools and analyses for data submitters and stock coordinators were developed in R Markdown and R and were tested on selected data-limited stocks: dab (dab.27.2232), flounder in the western Baltic (fle.27.2223), plaice in eastern Baltic (ple.27.4232) and turbot (tur.27.2232) and one data-rich stock (North Sea sole (sol.27.4)).

[4] The value of n=30 is frequently cited in statistic books as a "large-enough sample size" for the application of the Central Limit Theorem (CLT) to relatively symmetric distributions. A larger value than n=30 is frequently needed for the CLT to hold on asymmetric distributions. Lower values than n=30 may be suitable for less important strata or when estimates do not require CTL application. Much lower values, down to n=2 or even n=1 are frequently justifiable on the basis of pressing needs to assess and advise on particularly data scarce fisheries and for strata with particularly low importance in the fishery.

Two sets of tools and codes can be found below: 1) for the data submitters, exploratory analyses can be carried out to understand the national relative importance concerning stock and the impact on applying thresholds; and 2) for the stock coordinators.

The main reason for the distinction between data submitters and stock coordinators is the availability of data, see Table 3.3. Presently no one has access to all relevant information. That will hopefully change in the future, when the estimation process is moved to the RDBES.

**Table 3.3 Overview of input data for the analysis.**

| Data type | Description | Availability to |
|---|---|---|
| WGCATCH template on Data Quality and Quantity (national level) | Summary data on national landings and discards, National sampling, thresholds applied to provide data to Intercatch<br>The template can be downloaded from https://github.com/ices-eg/wg_WGCATCH/tree/master/templates | Data submitters |
| WGCATCH template on Data Quality and Quantity (stock level) | Same as above | Stock coordinators – if provided by national institutes. |
| Provides summary data of the stock: overall landings, discards, recruitment, fishing mortality, SSB, reference points, etc. | icesSAG provides R functions that access the web services of the ICES Stock Assessment Graphs database (https://github.com/ices-tools-prod/icesSAG)<br>Further description can be found at http://ices.dk/marine-data/assessment-tools/Pages/stock-assessment-graphs.aspx | All |

### 3.3.1.1 Analysis for the national data submitters

#### 3.3.1.1.1 North Sea Sole–sol.27.4

It is important that the national data submitters understand the relative importance of their national commercial data might have in the assessment for the stocks they provide data to. An exploratory analysis, using the WGCATCH template on *Data Quality and Quantity*, to their national landings and sampling data can provide insights on their importance in relation to the stock and assist on decision on what data could and should be provided.

WGCATCH created some tools that will assist the data submitters on the data provision for the all the stocks, but in particular for the data limited stocks (R Markdown codes are available https://github.com/ices-eg/wg_WGCATCH/tree/master/DLS. Below are the outputs of that analysis, using UK-ENG data as an example:

*Summarise the landings and discards estimate for the country: UK-ENG*

**Table 3.4. Landings (L) and discard (D) estimates for sol.27.4 (kg).**

| stockCode | Year | LandingCountry | Discards | Landings |
|---|---|---|---|---|
| sol.27.4 | 2018 | UK-Eng | 3.59 | 392.12 |

### 1. Check what the contribution of your country is in relation to the total landings and discards estimated for the stock

Data submitters do not have access to overall landings of the stock from the latest year. Therefore, previous years' landings and discards (or an average of the last three years) can be used as reference to assess the relative importance of the national landings and discards in relation to the whole stock. The icesSAG library can be used to obtain landings and discards of the stock (Figure 3.8). The plot shows that the UK-ENG Sole North Sea landings proportion are low in relation to the whole stock landings - 3% (Figure 3.9).

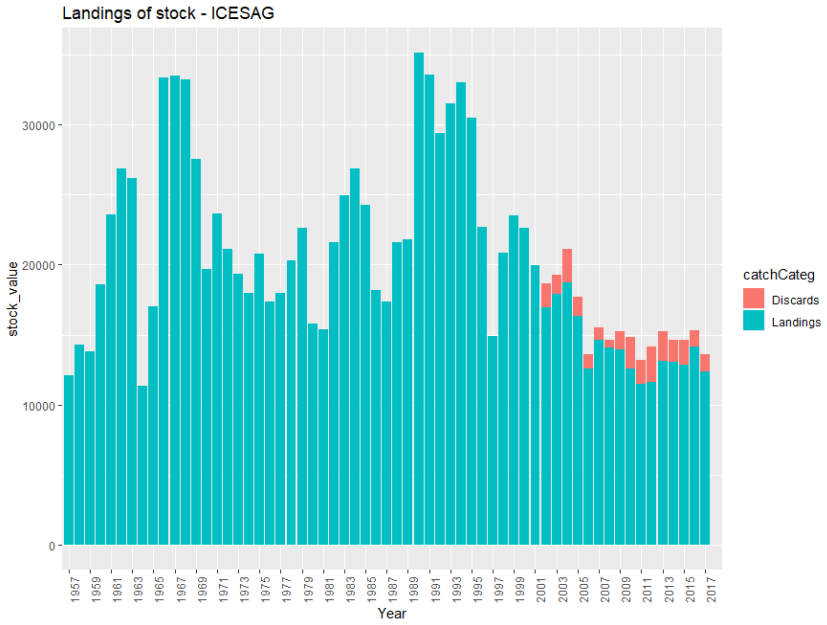



**Figure 3.8. Annual stock landings and discards. Source: R library icesSAG.**

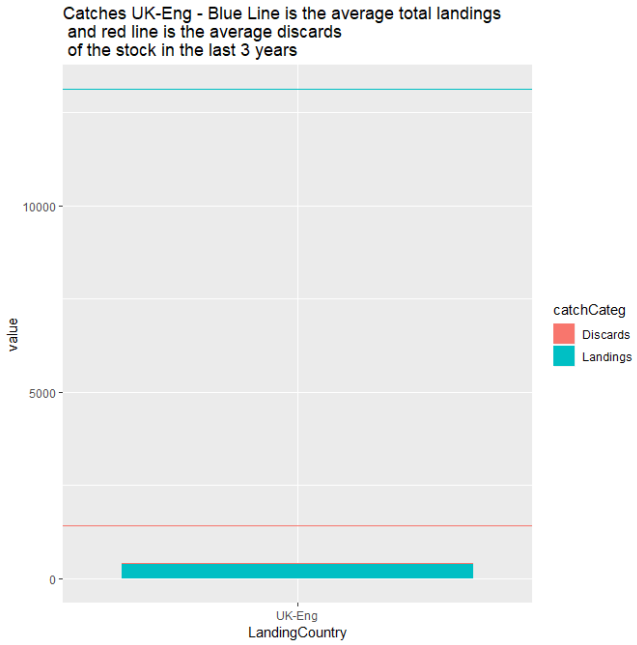



**Figure 3.9. Landings and estimated discards for UK-ENG (bar) and the average stock landings and discards for the last 3 years (lines).**

**Table 3.5. Proportion of national landings and discards in relation to the stock overall average of the last three years.**

| stockCode | Year | LandingCountry | catchCateg | Weight (tonnes) | Proportion |
|---|---|---|---|---|---|
| sol.27.4 | 2018 | UK-Eng | Discards | 3.60 | 0.3% |
| sol.27.4 | 2018 | UK-Eng | Landings | 392.13 | 3% |

## 2. National Landings and discards by IC fleet

Check how the national catches are distributed during the year and by Intercatch (IC) fleet.

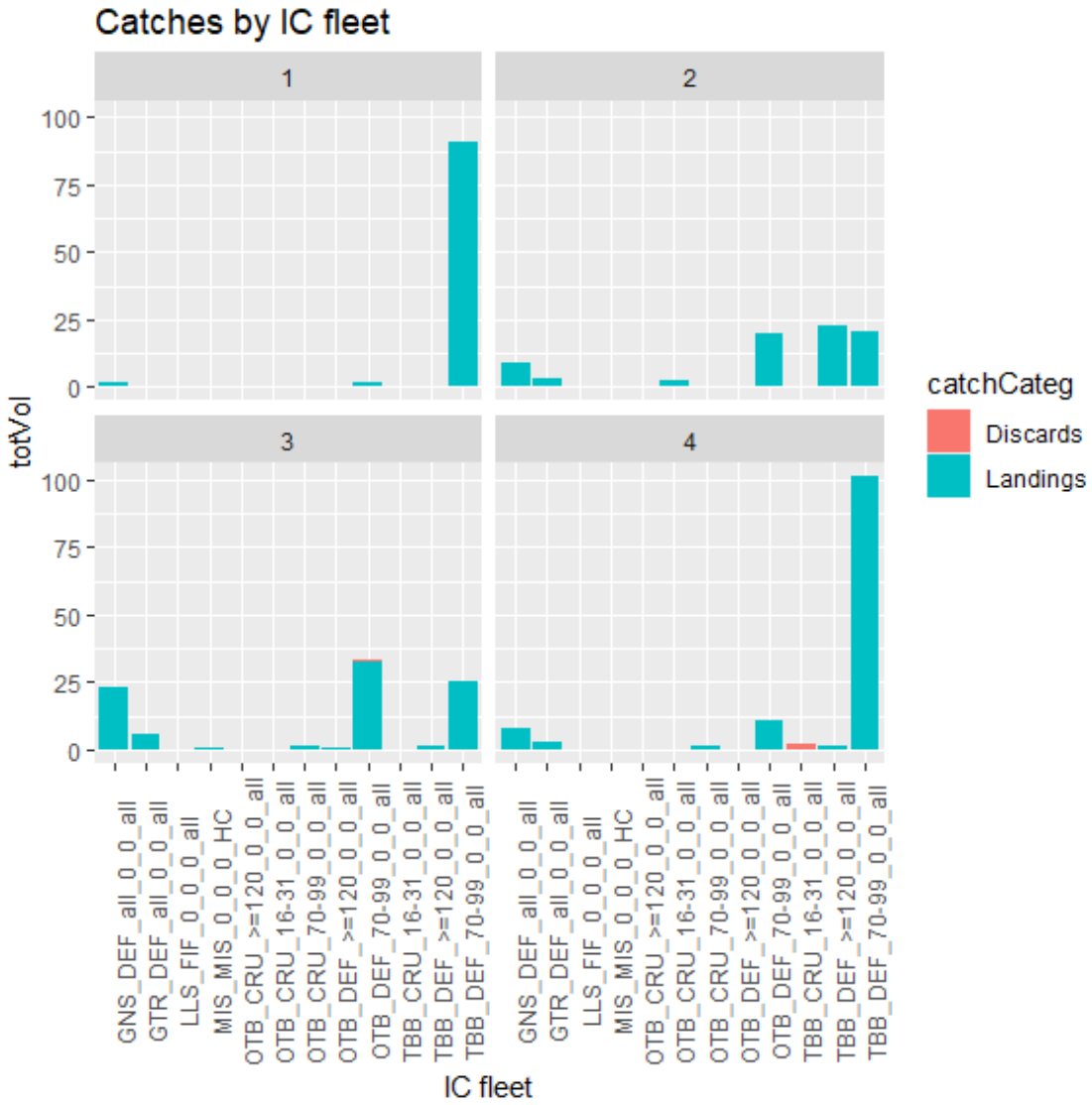



**Figure 3.10. UK-ENG landings and discards, by IC fleet and quarter.**

### 3. Check how the number of trips sampled sample relates to the landings and discards, by quarter and métier.

For the English example there is a predominant métier for the landings, TBB_DEF_70-99, that is not covered by the National sampling programme. However, this is not really an issue, because this métier is covered by NLD Annual Work plan, according with the bi-lateral agreement. Most of the landings samples are from gill netters (GNS) and bottom trawls (OTB). In this example, we used the number of trips, however, other measurements could be used to check how the sampling relates with the landings and discards, e.g. weighed sampled.

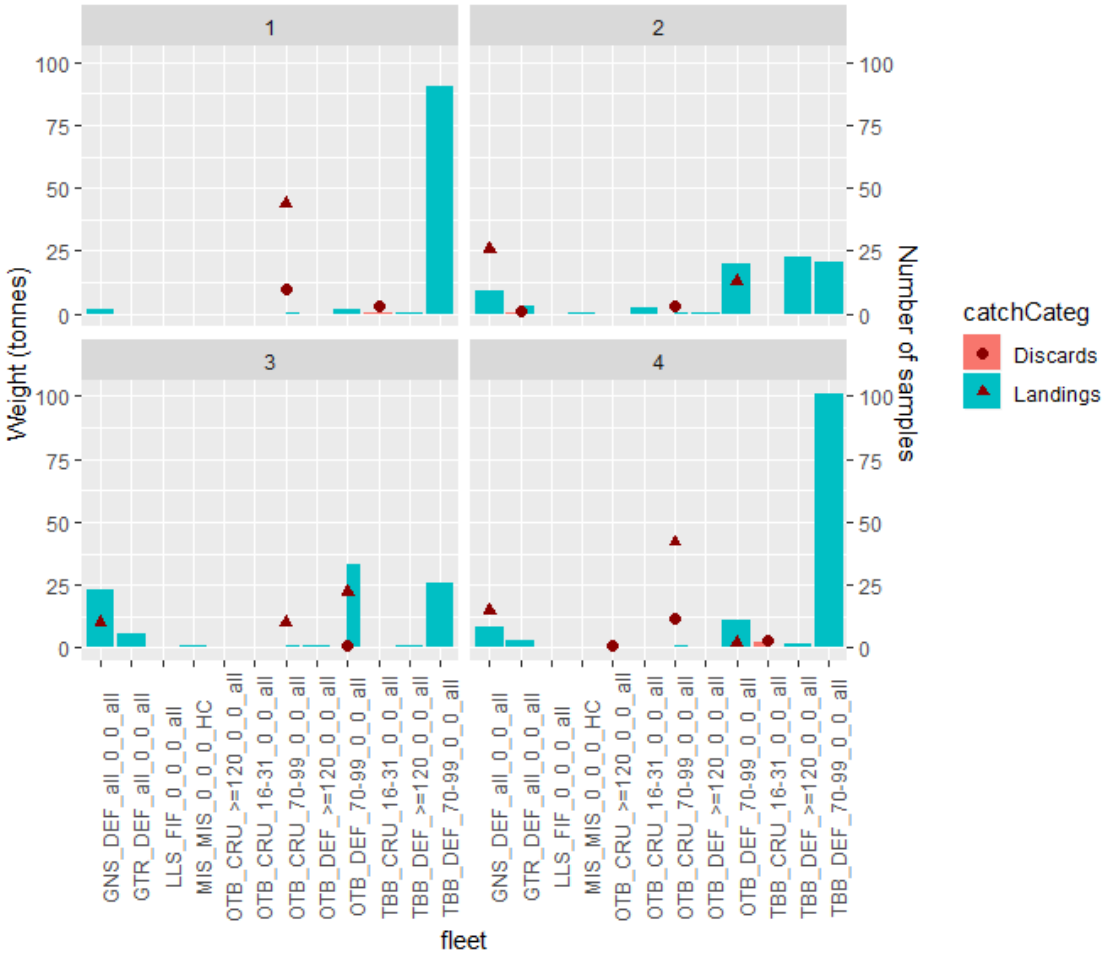



**Figure 3.11. Landings and discards by quarter and IC fleet (bar) and number of samples for landings and discards (dots), for the UK-ENG fleets.**

### 4. What is the proportion of trips sampled and the proportion of trips sampled with the stock?

**Table 3.6. Proportion of trips sampled and proportion of trips sampled with species.**

| Year | Landing Country | Catch Category | Percentage of trips with spp | Percentage trips sampled | Percentage of trips sampled with spp |
|---|---|---|---|---|---|
| 2018 | UK-Eng | Discards | 26.69% | 0.69% | 0.22% |
| 2018 | UK-Eng | Landings | 10.48% | 0.52% | 0.10% |

The table above summarises the percentage of total fishing trips with the stock. 10% of the total fishing trips landed sol.27.4. 0.52% of the trips were sampled, 0.10% of which had sol.27.4.

## 5. Check how much of the data was *not* provided, after applying the national thresholds

The thresholds applied on submitting the English commercial data where the stock was observed/measured in >=2 trips AND >= 25 fish measured at each domain (area - quarter - métier). The plots showed that after applying the thresholds UK-ENG, provided data for 8 out of the 17 domains sampled (Figure 3.12).

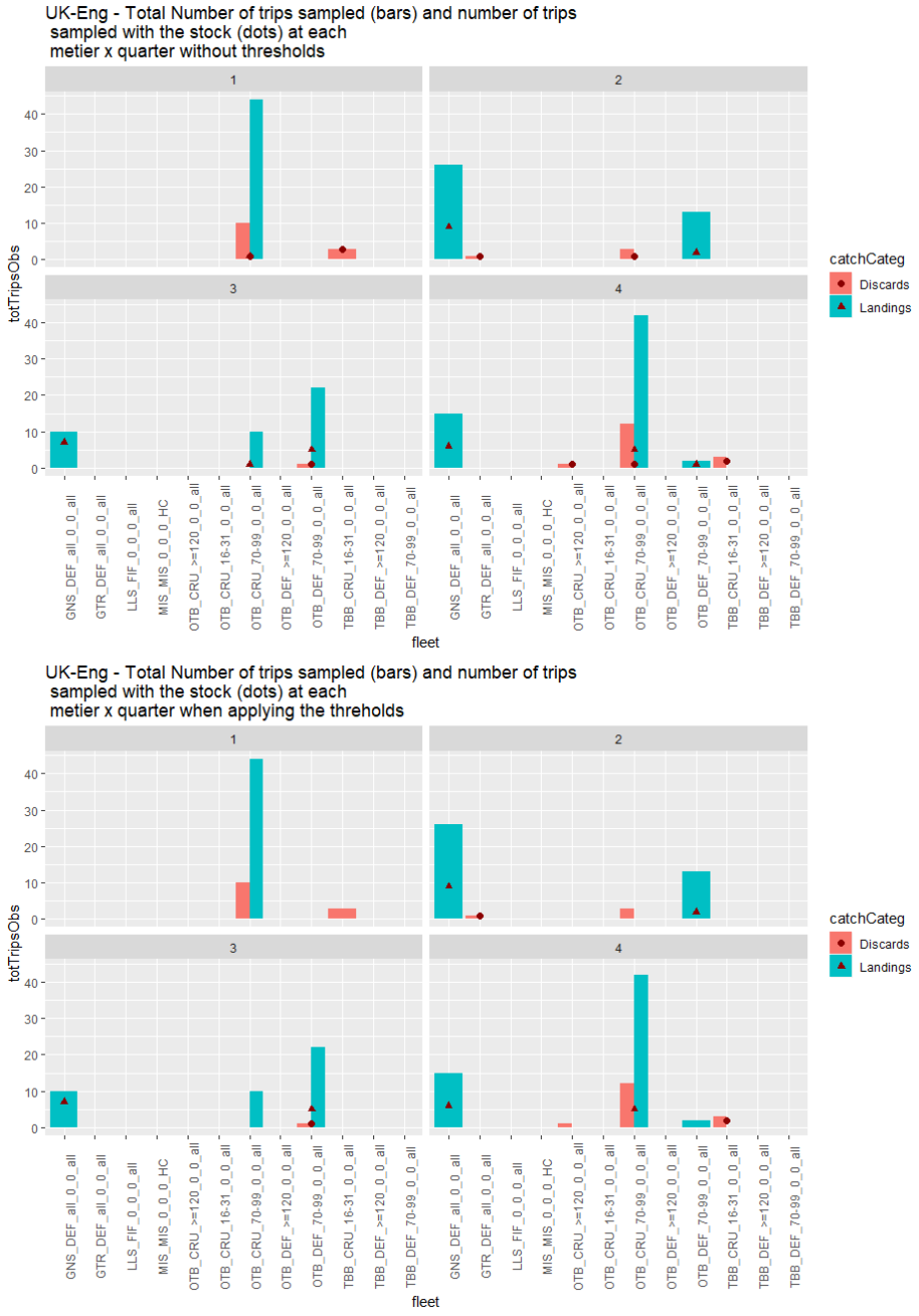



**Figure 3.12. Number of trips sampled (bars) and number of trips sampled with the stock (dots), before (top plot) and after (bottom plot) applying the thresholds.**

Figure 3.13. shows the amount of landings and discards for which sampling data was not provided and the amount of landings for which UK-ENG sampling programme does not cover. It shows that the UK-ENG National sampling programme does not sample the métier with the highest landings, i.e. TBB_DEF_70-99. However, this métier is covered by the NLD sampling programme. 3% of the sampled landings are not provided to Intercatch, while 24% of UK-ENG discards were not provided to Intercatch.

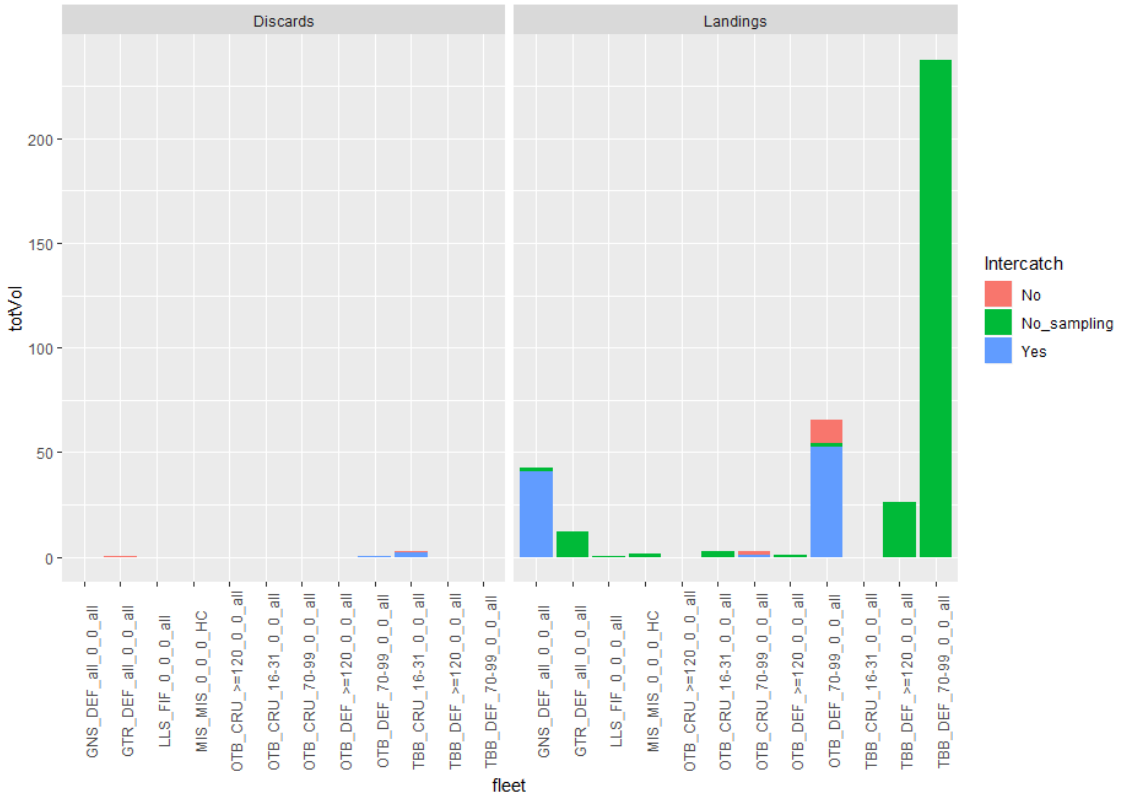



**Figure 3.13. UK-ENG landings and discards, by metier, not sampled (green), provided to Intercatch (blue) and not provided due to the application of the thresholds (red).**

### 3.3.1.2 Analysis for stock coordinators

#### 3.3.1.2.1 Baltic flatfishes

For the Baltic Sea, four flatfish DLS stocks were exemplarily chosen to evaluate whether data have been uploaded to international databases and if any kind of thresholds has been applied.

The selected stocks were dab (dab.27.2232), flounder in the western Baltic (fle.27.2223), plaice in eastern Baltic (ple.27.4232) and turbot (tur.27.2232). The four main fishing countries (Denmark, Germany, Sweden, and Poland) supplied information on fisheries and sampling intensity.

Countries also reported domains and sampled trips where the respective DLS did not appear. In case the species had been sampled, countries indicated whether data were uploaded to Intercatch (IC) or not. In case of the DLS stocks, only about 50% of the domains (i.e. domains, where either landings occurred or discards have been estimated) were sampled and afterwards uploaded to the database (and therefore used in stock assessment, Table 3.7).

**Table 3.7. Total number of domains with LAN/DIS entries, sampled domains and amount of uploaded data. Differences in sampled and uploaded strata might indicate that a threshold has been applied.**

| stock | domains | sampled | uploaded to IC |
|---|---|---|---|
| dab.27.2232 | 83 | 53 | 41 |
| fle.27.2223 | 41 | 24 | 23 |
| ple.27.2432 | 100 | 59 | 46 |
| tur.27.2232 | 125 | 65 | 44 |

The decrease is explained by the different national thresholds that have been applied to the sampled data (Table 3.8), where e.g. one country only uploads to IC, if a domain contained more than20 measured fish, which, in case of DLS species often results in a significant drop in registered data in IC. As seen by the questionnaire and the upload ratio, all countries have some kind of thresholds in place for DLS that differ between countries. However, every country applies the same threshold regardless of the species.

**Table 3.8. Applied Baltic DLS thresholds (2018 data)**

| Is a threshold applied to DLS data submission? |
|---|
| For DLS lengths a threshold of minimum 2 trips, 3 stations and 20 fish from the stock was applied. |
| Yes. Only fleets*quarter*stock*area with >20 individuals measured in every strata (when fleet further stratified) were used |
| no, but the samples were without size category and therefore not used |
| Yes. Data were only used when the number of trips and number of length measurements is assumed to reflect the general fishing pattern. Length measurements were used for raising at a quantity of >10 (stocks with small length range and low landings) or >20 (for stocks with a larger length range and high landings). Gaps in the weight-at-length were filled using same-year length-weight coefficients. |

DLS species are "data limited", they do not occur proportionally in every sampled trip (**Error! Reference source not found.**), in many cases, increasing the total number of sampled trips did not increase the number of trips, where the respective DLS occurred.

Applying fixed thresholds irrespective of the DLS status, spatial-temporal coverage of sampled fish or sampling intensity will result in a heavy data loss in case of the chosen Baltic DLS (**Error! Reference source not found.** to **Error! Reference source not found.** displaying such scenarios, where thresholds of 3 trips, 20 fish or 1% of landed weight were applied).

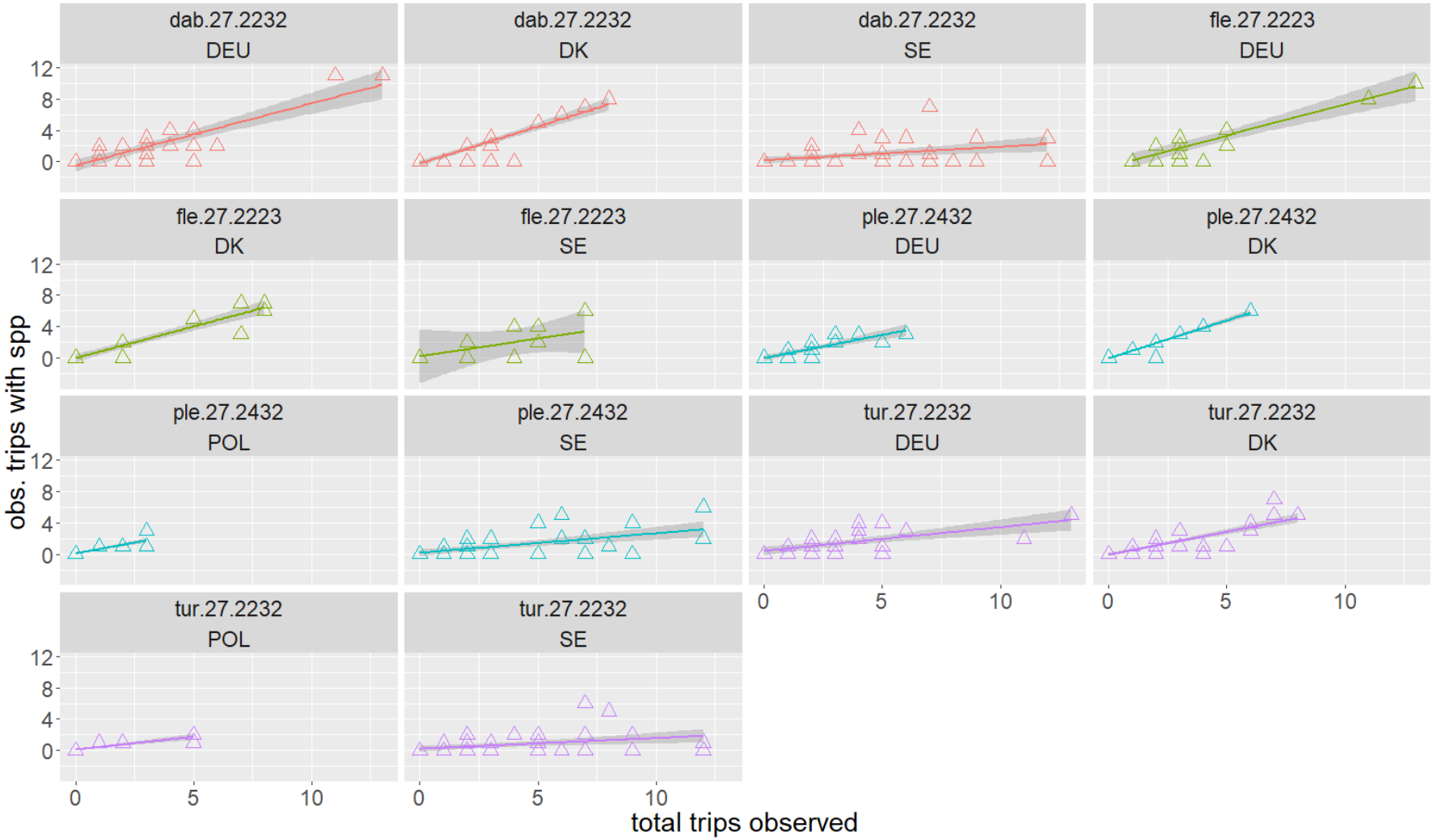



**Figure 3.14. Number of observed trips versus trips with respective DLS stock sampled. Flatter trend lines indicate low abundance of stock in the commercial sampling.**

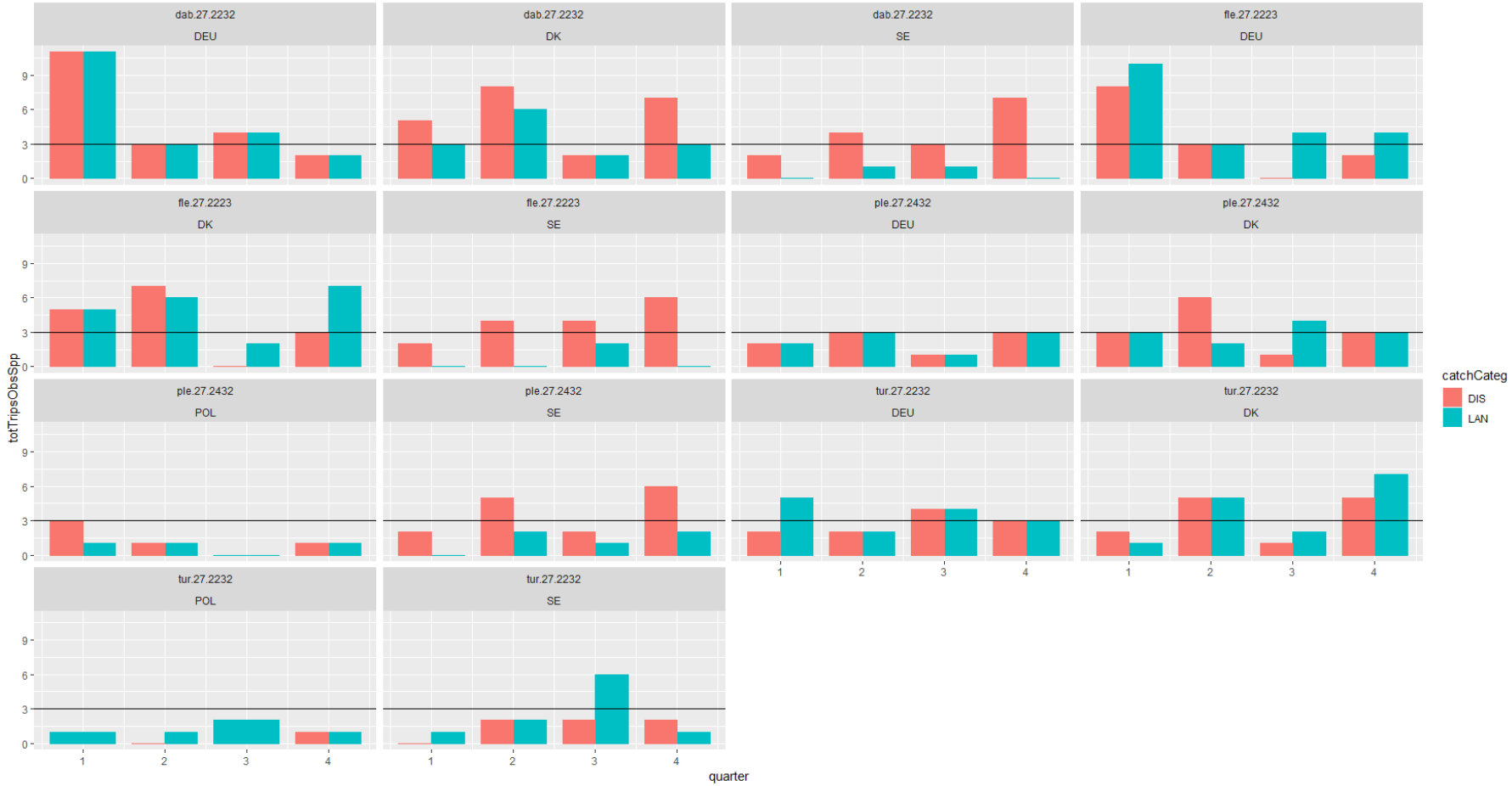



**Figure 3.15. Overview of domains that might not be uploaded if a threshold of 3 trips is applied with no regards to sampled numbers or total trips.**

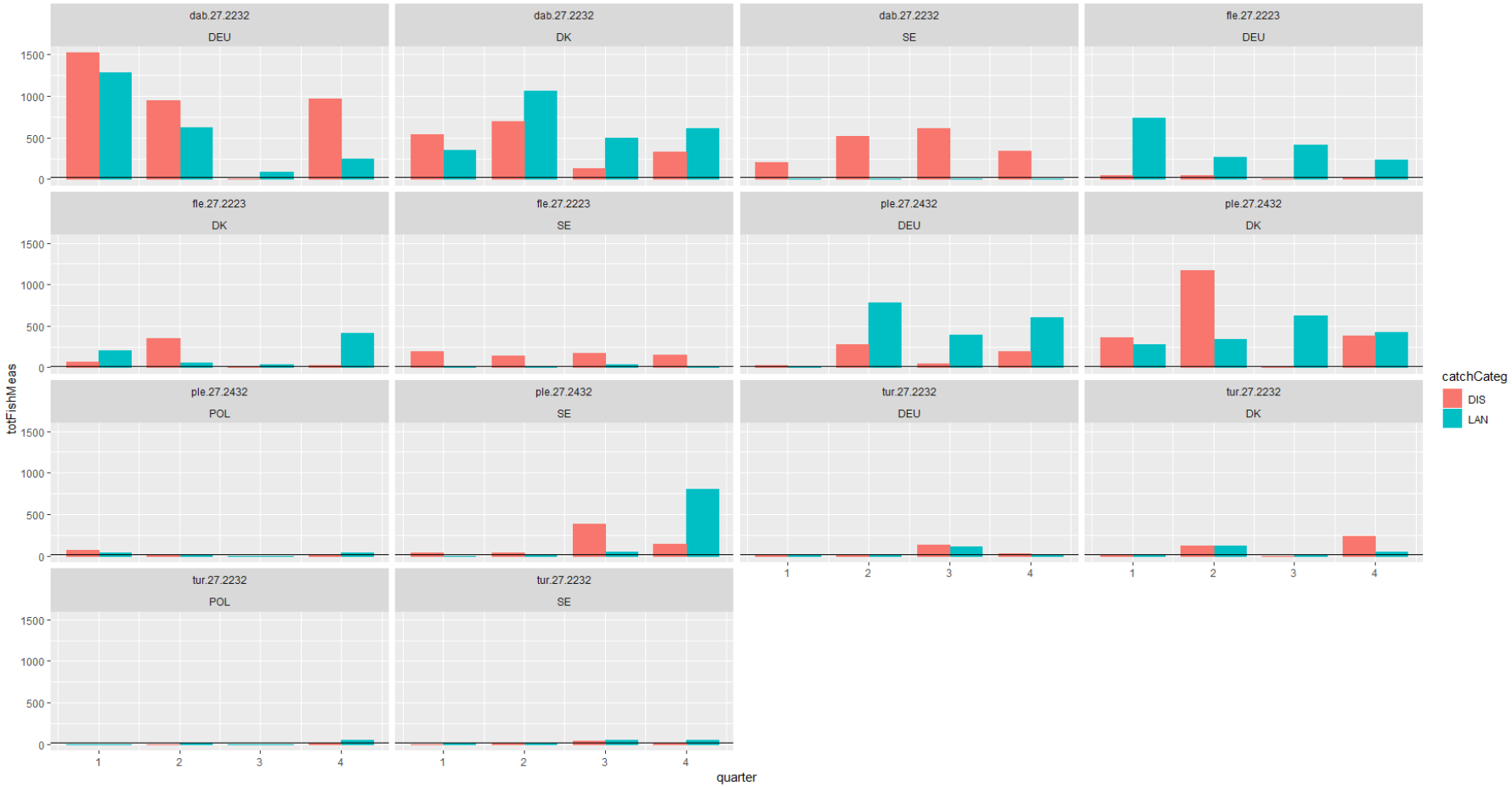



**Figure 3.16. Overview of domains that might not be uploaded if a threshold of 20 length-measured fish is applied with no regards to sampled trips or landings.**

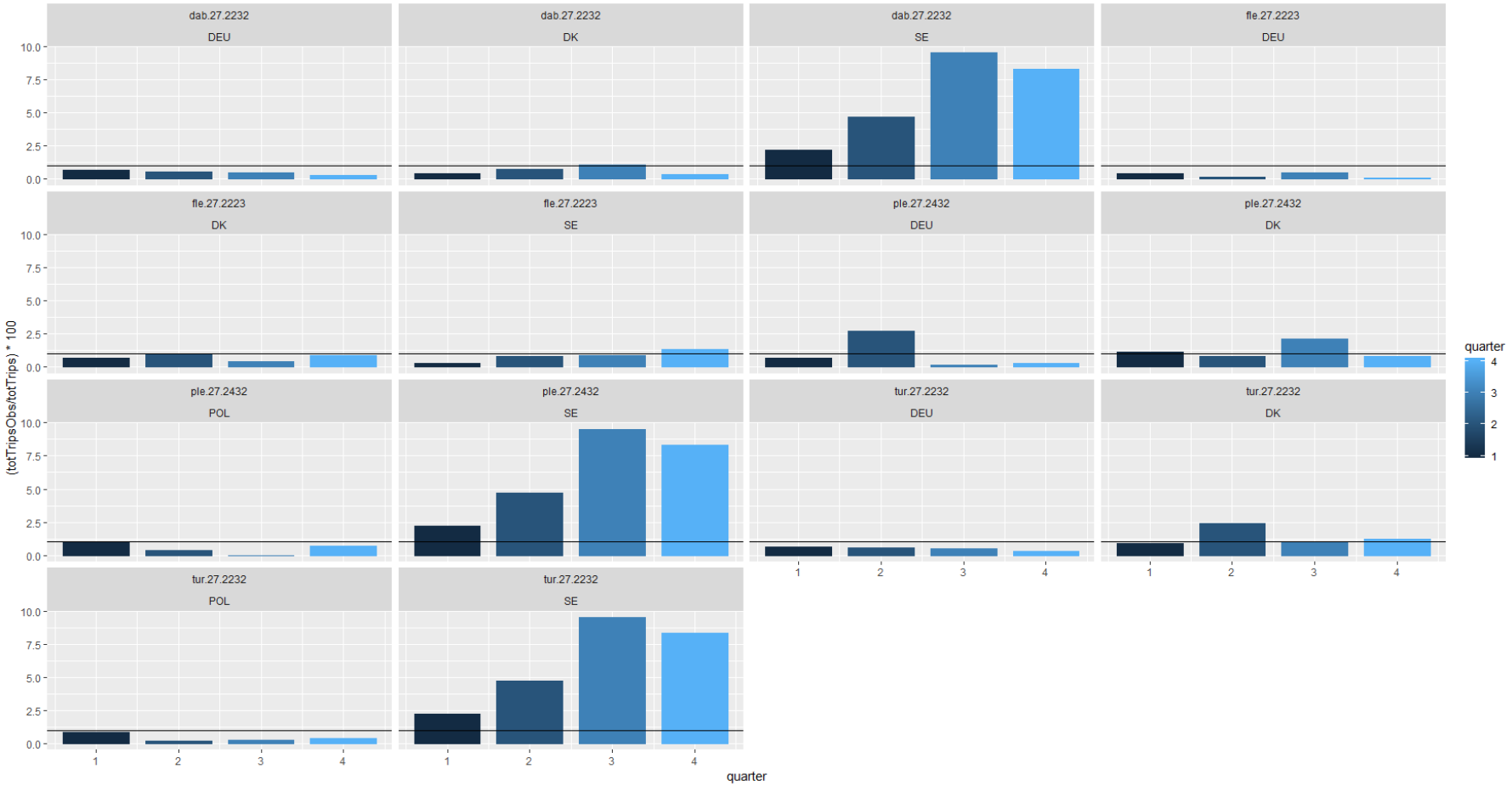



**Figure 3.17. Overview of domains that might not be uploaded if a thresholds of 1% of landings has been sampled (only LAN is displayed).**

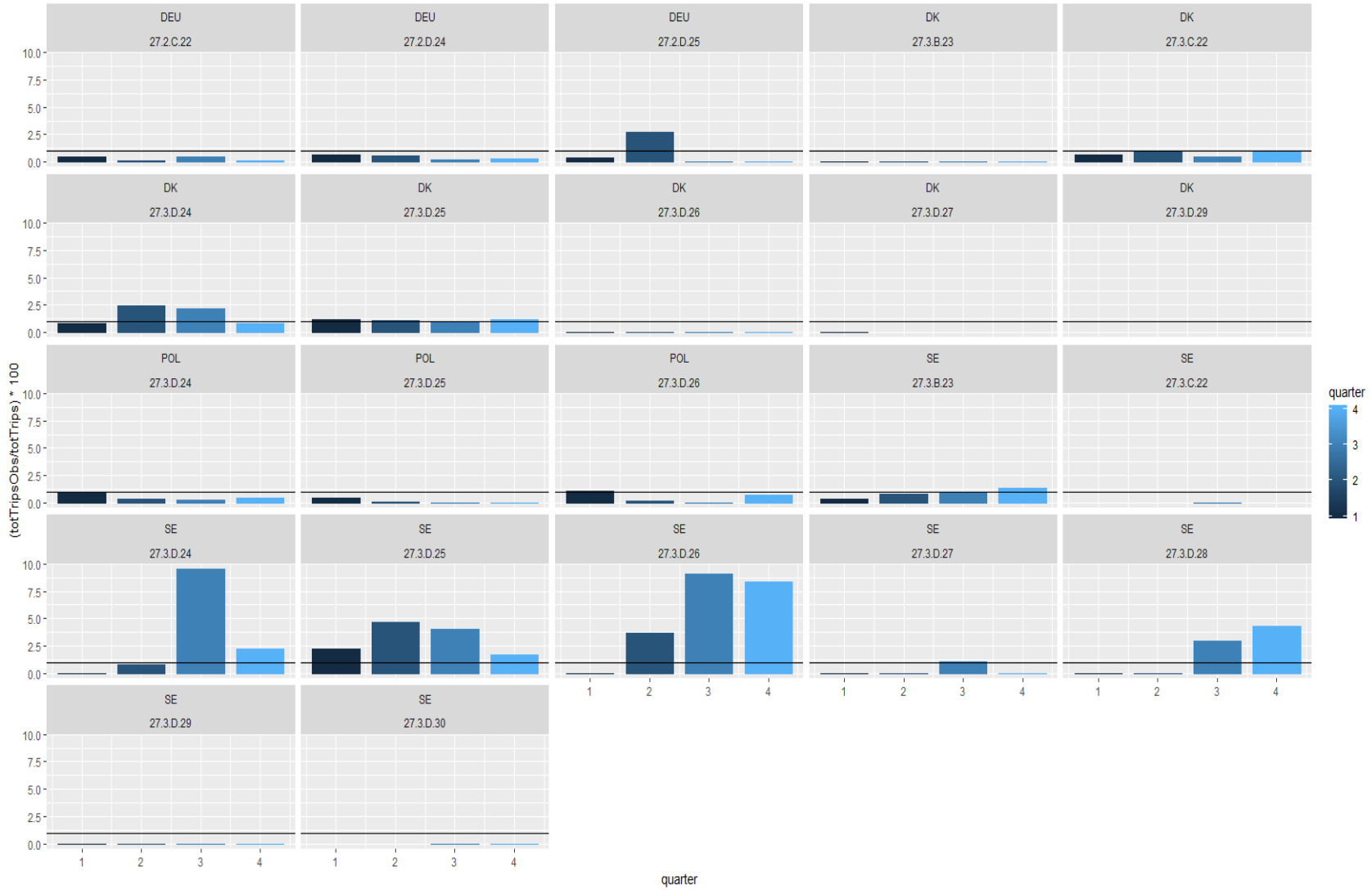



**Figure 3.18. Overview of domains that might not be uploaded if a threshold of 1% of landings in a certain area has been sampled (only LAN is displayed).**

Summary:

→ *"Hard" thresholds are not be advised by WGCATCH guidelines; however, they should sensitize data submitter and stock coordinator about handling of DLS data. More feedback and exchange should be established between submitter (estimator) and stock coordinator to determine and understand why certain thresholds have been applied nationally and if data might be submitted.*

→ *Domains with a low coverage of DLS stocks should be evaluated to determine if they are important (e.g. in terms of contribution to the landings) and sampling scheme might be adjusted to enhance data coverage and quality.*

A general guideline can state a combination of several factors that would be needed to ensure reasonable data quality (given the DLS status), especially in stocks, where the occurrence does not increase with sampling effort.

The RDBES might offer a platform to review all data of the DLS stocks by the respective stock estimator(s), stock viewers and coordinator. This might be done in advance of a benchmark or a dedicated workshop (ideally on a regional level, including experts of the region and stock). Working towards regional sampling plans, national estimation and raising, not only the sampling designs for DLS should be reviewed, but also the estimation procedure and justification of thresholds.

#### 3.3.1.2.2 North Sea Sole–sol.27.4

**Table 3.9. Total number of domains with LAN/DIS entries, sampled domains and amount of uploaded data. Differences in sampled and uploaded strata might indicate that a threshold has been applied.**

| stock | Total number of domains with landings | Number of domains sampled | Number of domains uploaded to IC |
|---|---|---|---|
| sol.27.4 | 81 | 21 | 14 |

**1. Thresholds applied by each country to their national sampling data**

**Table 3.10. Thresholds used to provide data to Intercatch.**

| |
|---|
| Yes. We provided a length and age distribution when at least 2 trips and 70 kg was sampled. |
| Annual aggregation used when there are low numbers of trips/frequencies. Final frequencies are visually inspected. |
| No thresholds applied |
| Yes. Only fleets*quarter*stock*area with >=25 individuals measured in >=2 trips were used; Final frequencies were visually inspected and looked reasonable. |

**2. Landings by country**

In 2018, countries submitting data for this stock are BE, UK-Eng, UK-SCO, DK, NLD. Areas reported to Intercatch are 27.4.b, 27.4.

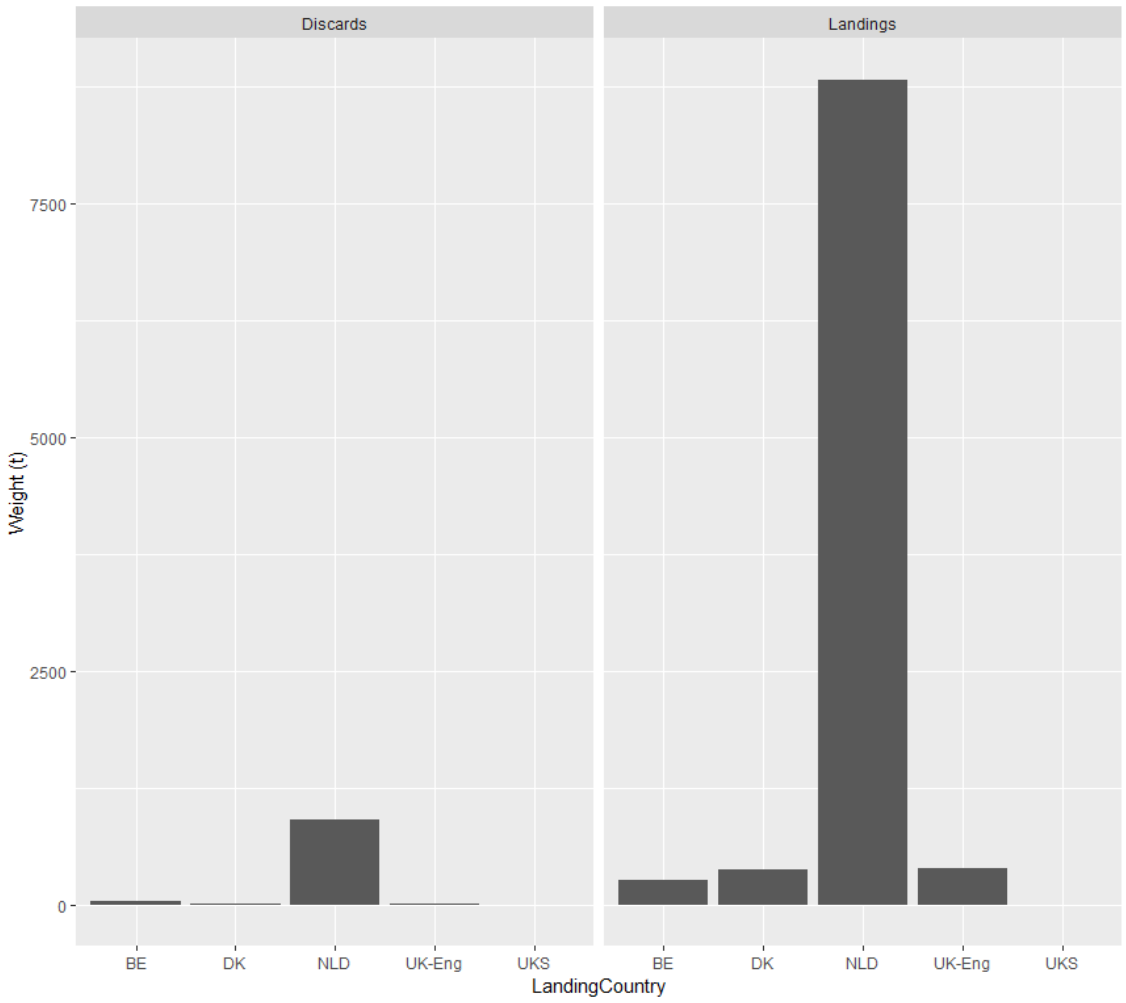



**Figure 3.19. Landings of North Sea sole, as provided to Intercatch in 2018.**

The Netherlands contributes with 90% of the landings for this stock, followed by England (3%) and Belgium (3%).

**Table 3.11. Percentage of the national landings and discards in relation to the total landings and estimated discards of the stock.**

| Landing Country | Catch Category | Weight by country (t) | Overall weight of stock (t) | National Percentage in relation to total weight |
|---|---|---|---|---|
| BE | Discards | 41.87 | 951.71 | 4.40 |
| BE | Landings | 268.17 | 9856.99 | 2.72 |
| DK | Discards | 1.37 | 951.71 | 0.14 |
| DK | Landings | 367.73 | 9856.99 | 3.73 |
| NLD | Discards | 904.87 | 951.71 | 95.08 |
| NLD | Landings | 8828.92 | 9856.99 | 89.57 |
| UK-Eng | Discards | 3.60 | 951.71 | 0.38 |
| UK-Eng | Landings | 392.13 | 9856.99 | 3.98 |

| Landing Country | Catch Category | Weight by country (t) | Overall weight of stock (t) | National Percentage in relation to total weight |
|---|---|---|---|---|
| UKS | Discards | 0.00 | 951.71 | 0.00 |
| UKS | Landings | 0.04 | 9856.99 | 0.00 |

## 3. Sampling summaries

*Percentage of the total volume covered by the sampled domains.*

The domains with the highest proportion of landings and discards are from Dutch beam trawlers, followed by Belgium beam trawlers. The remaining domains from other countries, gears and quarters contribute with less than 1% of the total volume for discards and landings.

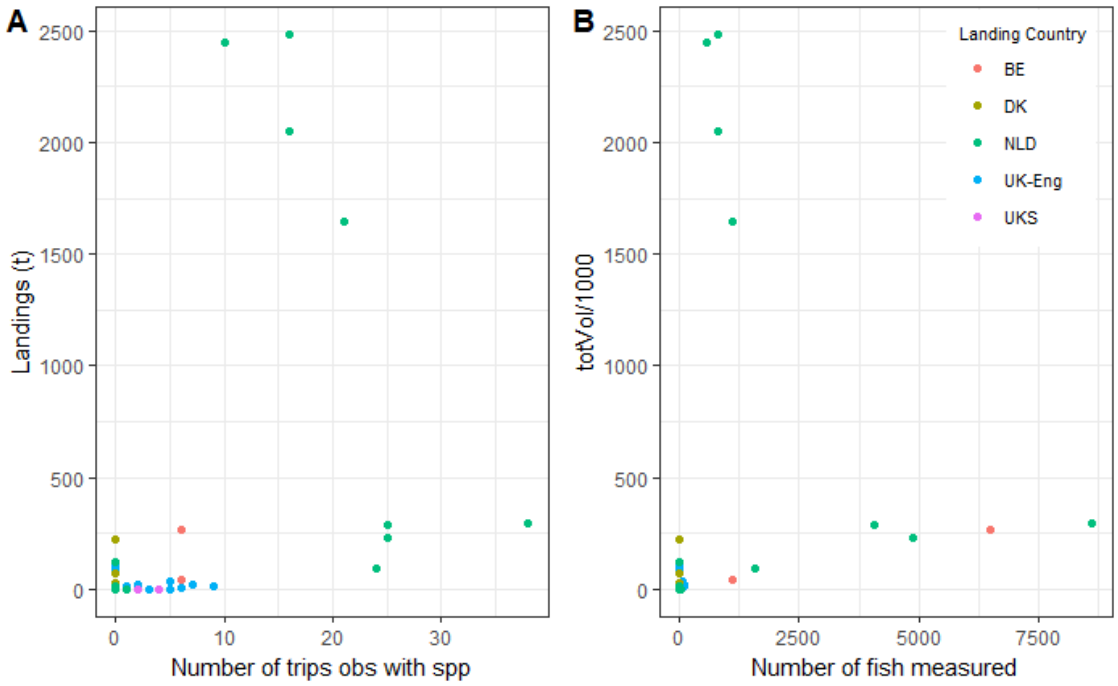
**Table 3.12. Percentage of the sampled trips with the stock.**

| domain | Total No. trips sampled | Number of trips with spp | Percentage of landings being sampled |
|---|---|---|---|
| BE-sol.27.4-TBB_DEF_70-99_0_0_all-2018-Discards | 6 | 6 | 4.400 |
| DK-sol.27.4-TBB_CRU_16-31_0_0_all-2-Discards | 4 | 1 | 0.144 |
| NLD-sol.27.4-OTB_CRU_70-99_0_0_all-1-Discards | 1 | 0 | 0.000 |
| NLD-sol.27.4-OTB_CRU_70-99_0_0_all-3-Discards | 8 | 0 | 0.000 |
| NLD-sol.27.4-OTB_CRU_70-99_0_0_all-4-Discards | 3 | 0 | 0.000 |
| NLD-sol.27.4-OTB_DEF_100-119_0_0_all-2-Discards | 1 | 0 | 0.000 |
| NLD-sol.27.4-OTB_DEF_100-119_0_0_all-3-Discards | 2 | 1 | 0.120 |
| NLD-sol.27.4-OTB_DEF_70-99_0_0_all-1-Discards | 1 | 0 | 0.000 |
| NLD-sol.27.4-OTB_DEF_70-99_0_0_all-2-Discards | 5 | 0 | 0.000 |
| NLD-sol.27.4-OTB_DEF_70-99_0_0_all-3-Discards | 5 | 0 | 0.000 |
| NLD-sol.27.4-OTB_DEF_70-99_0_0_all-4-Discards | 3 | 0 | 0.000 |
| NLD-sol.27.4-TBB_DEF_>=120_0_0_all-1-Discards | 1 | 0 | 0.000 |
| NLD-sol.27.4-TBB_DEF_>=120_0_0_all-2-Discards | 2 | 1 | 0.131 |
| NLD-sol.27.4-TBB_DEF_100-119_0_0_all-1-Discards | 1 | 0 | 0.000 |

| domain | Total No. trips sampled | Number of trips with spp | Percentage of landings being sampled |
|---|---|---|---|
| NLD-sol.27.4-TBB_DEF_100-119_0_0_all-2-Discards | 1 | 0 | 0.000 |
| NLD-sol.27.4-TBB_DEF_100-119_0_0_all-3-Discards | 4 | 0 | 0.000 |
| NLD-sol.27.4-TBB_DEF_70-99_0_0_all-1-Discards | 31 | 25 | 24.012 |
| NLD-sol.27.4-TBB_DEF_70-99_0_0_all-2-Discards | 28 | 25 | 30.382 |
| NLD-sol.27.4-TBB_DEF_70-99_0_0_all-3-Discards | 26 | 24 | 9.866 |
| NLD-sol.27.4-TBB_DEF_70-99_0_0_all-4-Discards | 43 | 38 | 30.567 |
| UK-Eng-sol.27.4-OTB_DEF_70-99_0_0_all-3-Discards | 1 | 1 | 0.052 |
| UK-Eng-sol.27.4-TBB_CRU_16-31_0_0_all-4-Discards | 3 | 2 | 0.238 |
| UKS-sol.27.4-OTB_CRU_70-99_0_0_all-2018-Discards | 49 | 0 | 0.000 |
| UKS-sol.27.4-OTB_DEF_>=120_0_0_all-2018-Discards | 118 | 2 | 0.000 |
| BE-sol.27.4-TBB_DEF_70-99_0_0_all-2018-Landings | 6 | 6 | 2.721 |
| NLD-sol.27.4-TBB_DEF_70-99_0_0_all-1-Landings | 10 | 10 | 24.824 |
| NLD-sol.27.4-TBB_DEF_70-99_0_0_all-2-Landings | 21 | 21 | 16.717 |
| NLD-sol.27.4-TBB_DEF_70-99_0_0_all-3-Landings | 16 | 16 | 20.831 |
| NLD-sol.27.4-TBB_DEF_70-99_0_0_all-4-Landings | 16 | 16 | 25.202 |
| UK-Eng-sol.27.4-GNS_DEF_all_0_0_all-2-Landings | 26 | 9 | 0.092 |
| UK-Eng-sol.27.4-GNS_DEF_all_0_0_all-3-Landings | 10 | 7 | 0.237 |
| UK-Eng-sol.27.4-GNS_DEF_all_0_0_all-4-Landings | 15 | 6 | 0.083 |
| UK-Eng-sol.27.4-OTB_CRU_70-99_0_0_all-4-Landings | 42 | 5 | 0.011 |
| UK-Eng-sol.27.4-OTB_DEF_70-99_0_0_all-2-Landings | 13 | 2 | 0.202 |

| domain | Total No. trips sampled | Number of trips with spp | Percentage of landings being sampled |
|---|---|---|---|
| UK-Eng-sol.27.4-OTB_DEF_70-99_0_0_all-3-Landings | 22 | 5 | 0.334 |
| UKS-sol.27.4-OTB_CRU_70-99_0_0_all-2018-Landings | 157 | 0 | 0.000 |
| UKS-sol.27.4-OTB_DEF_>=120_0_0_all-2018-Landings | 393 | 4 | 0.000 |

*Summary of sampling effort by country*




*Testing different Thresholds*

Different thresholds (30, 10, 5 and 2 trips) were applied to the sampling to assess the impact on the data submitted to the North Sea assessment group.

Figure 3.20 shows the impact of applying different thresholds to the sampling data. Applying the 30 sampled trips threshold excludes all samples except one domain of the Dutch discards. On the other hand, applying two trips as a threshold would exclude three domains (country x quarter). Applying 10 trips thresholds, all Dutch samples, both landings and discards would be included for the assessment.

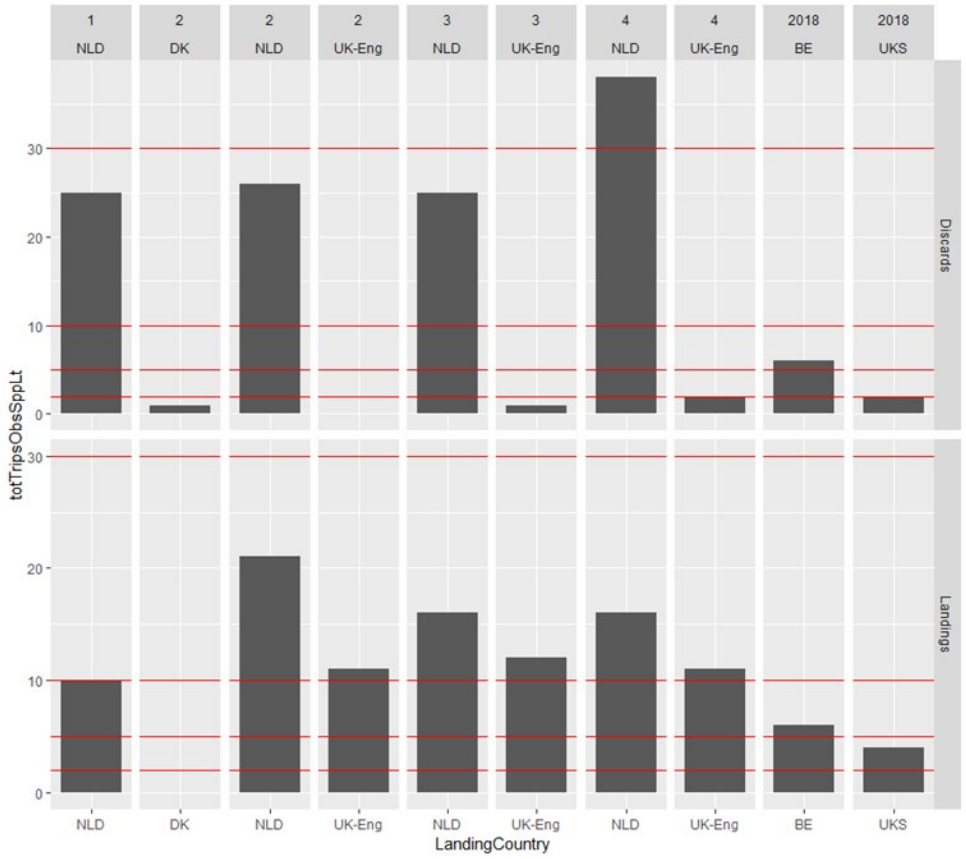



**Figure 3.20. Number of trips sampled with the stock (bar) and different thresholds applied to the sampling data (red lines, 30, 10, 5 and 2 trips).**

# 4 Review developments in sampling and estimation practices of catch, effort, length, and age distributions and other biological parameters of small-scale fisheries (ToR b)

WGCATCH continued to review developments in sampling and estimation practices for collection of fishing activity variables (landings by species and fishing effort) and biological data (discards, length and age distributions, other biological parameters) in small-scale fisheries (SSF), to ensure that the collection of fishing data from SSF across Europe are sufficient, harmonised and comparable and to improve their quality.

In 2019, WGCATCH SSF subgroup conceived a workplan to cover the following issues:

1. Discuss and review the main outputs from research projects focusing on SSF sampling and estimation (e.g. fishPi² and STREAM);
2. Continue to develop best practice guidelines on SSF data collection (quantitative analysis of the SSF data available in the WGCATCH 2018 questionnaire);
3. Continue to define quality indicators and quality checking methodologies on SSF data;
4. Develop a "stand-alone" document about best practices guidelines for SSF efforts and landings data collection and estimation;
5. Analyse different options to monitor SSF with new technologies based on end-user needs regarding previous WGCATCH reports and other recent significant reports (e.g. fishPi², IFOMC conference);
6. Presentation of a) RDBES core-group work on CL and CE tables and b) fishPi² advice on RDBES and SSF data. Discussion and opinion of WGCATCH to improve SSF data storing in RDBES;
7. Feedback from RCG EU MAP subgroup meeting focusing in SSF and from "STECF EWG 19-12 – Revision of the EU Multiannual Plan for data collection (EU-MAP) after 2020" meeting in light of the SSF data collection. Discussion and opinion of WGCATCH SSF subgroup;
8. Review the progress of the scientific paper that will detail the SSF work carried out by WGCATCH;
9. Elaboration of a template for 2020 WGCATCH to review and document sampling effort of biological data in SSF.

The work plan was covered during the week. The RDBES issues were discussed in plenary during the RDBES session and the main presentations (e.g. fishPi² and STREAM) were also done in plenary. The other points were discussed during WGCATCH SSF subgroup dedicated sessions. Small groups were also in charge to achieve points 2), 3) and 4) of the work plan.

The following presentations took place during the WGCATCH 2019 meeting:

- Estanis Mugerza: EU fishPi² Project. Main outputs from WP5 focusing on SSF sampling and estimation (Annex 6).
- Estanis Mugerza: EU STREAM Project. Main outputs from WP5 focusing on SSF monitoring (Annex 6).
- Josefine Egekvist: Main outputs from RDBES core-group suggestion and work on CL and CE tables (Annex 6).
- Lucia Zarauz: RDBES and SSF data. Advice from the EU fishPi² Project (Annex 6).

The presentations were followed by a discussion of the practical and theoretical aspects involved. A summary of the presentations and discussions can be found in Annex 6.

## 4.1 Discuss and review main outputs from research projects focusing on SSF sampling and estimation (e.g. fishPi² and STEAM) (ToR b.1)

The main outputs of the two EU research projects fishPi² and STREAM focusing on SSF sampling and estimation in the North-West Atlantic and the Mediterranean and the Black Sea were presented and discussed during a specific session. A summary of the two presentations can be found in Annex 6.

The results of the two projects were quite similar and following WGCATCH SSF subgroup opinion, reaffirming especially the importance of being able to calculate good quality SSF data estimates. Both projects highlighted that SSF is important in nearly all countries but seem to be trapped in a vicious cycle where due to incompleteness and lower quality of existing data, systematic lower importance is assigned to it relative to larger-scale fleets. As a consequence official statistics (from the current Control Regulation) are often incomplete or present poor quality data(missing catches due to exceptions in the regulation, low-quality effort information for the under 10m fleet, low quality on species composition of the catches …) and hence, potentially significant components of fishing mortality are not described or accounted for. All of that highlight the need for an assessment of the SSF data coverage/completeness, quality/reliability/representativeness and precision to limit their high uncertainty. Furthermore, SSF present specific features (highly diversified fleet, the importance of passive gears, multi-gear and multi-species fleet, geographically widespread fleet involving full time, seasonal or part-time activities in coastal areas …) and therefore have to be monitored differently by a census or a sampling approach adapted to them. There is also an experienced lack of SSF biological variables information (length and age distribution, discards, PETS bycatch).

Conclusion of the two research projects confirm the objectives and opinion of WGCATCH SSF subgroup and the need to continue to work on SSF monitoring improvement. According to its means, WGCATCH will continue to work on these different issues with the long-term goals 1) to ensure that the collection of fishing data from SSF across ICES countries are sufficient to cover main end-users needs, harmonised and comparable and 2) to improve their quality.

## 4.2 Continue to develop best practice guidelines on SSF data collection, standardize reporting and define quality indicators for sampling and census (ToR b.2)

In 2018, WGCATCH SSF subgroup work mainly on the analysis on a questionnaire' replies focusing on 1) the coverage/completeness and the accuracy/reliability of data collected in a census approach, 2) the quality indicators and data quality checking methodologies in place in ICES countries and 3) the standardisation/harmonisation of the SSF fishing effort calculation. 2019 WGCATCH SSF subgroup work begins with a summary of the 2018 principal outcomes (summary of the presentation could be found in Annex 6 when details could be found in 2018 WGCATCH report).

Questionnaires were completed by 21 countries/country regions and resulted in: 1) updating and finalizing the 2015 overview of the different fishing activity' data collection methods currently applied in ICES countries for SSF (summarizing table available in the 2018 WGCATCH report);

2) summarizing the methodologies used by MS to calculate SSF and passive gears fishing effort and the difficulties to apply the standard methodology, advice for SSF fishing effort estimates calculation standardization/harmonization; 3) first ICES countries' overview of the national legislation and associated control system in place and of the quality indicators and quality checking methodologies on-going in a census approach to assess SSF data 'quality (accuracy/reliability) and coverage/completeness ; and finally 4) compilation of quantitative information about SSF and SSF declarative data available in ICES countries and providing first graphical outputs on this basis to 1) present a detailed and complete knowledge on the structure of ICES SSF by country and precise vessel length ranges and 2) assess the coverage/completeness and accuracy/reliability of SSF data collected in a census approach.

Based on the 2018 questionnaire replies and the quantitative information available (which provide a great deal of material to handle), the first task identified for 2019 WGCATCH SSF subgroup (to address the second topic) was to continue the development of quality indicators and quality checking methodologies. The final goal is to define a risk assessment data quality methodology especially concentrated on the evaluation of the coverage/completeness of fishing activity data collected via a census approach. First intended indicators compare the number of vessels registered in the official national fishing fleet register (cf. EU fleet register) against the number of vessels with a minimum of one declarative data available. Second intended indicators concentrate on vessels with declarative data and investigate the completeness of their data regarding the number of trips they declared. Indeed, during the 2018 WGCATCH meeting, some first graphs were implemented but because of lack of time, it was not possible to discuss extensively the development of a data quality checking methodology on this basis. It was scheduled notably to discuss the following points: 1) how to complete/improve these first graphs and 2) how to assess/evaluate on this basis the SSF data quality (develop a risk assessment methodology). In particular, the objective was to determine a level of risk concerning SSF data quality regarding the different type of indicators which could be calculated (e.g. define patterns of indicators which present a low, medium or high risk of incomplete data issues).

The first step was to clean the 2018 questionnaire compiled data (e.g. convert data from Greece into precise vessel length ranges) and eventually update them when some issues were identified (e.g. double counting in the Norway data initially available). Second and third steps were to update the 2018 graphical outputs and to convert the data into a percentage matrix to implement factor analysis/classification.

To clean and validate the 2018 questionnaire compiled data, comparison with data coming from the official EU fleet register data maintained by the commission (https://ec.europa.eu/fisheries/cfp/fishing_rules/fishing_fleet_en) was also performed. It allowed either to validate them or to highlight some issues which require to update them (e.g. Germany, Cyprus, Lithuania data). On this basis, it was also possible to update the 2018 graphical outputs presenting the structure of ICES[5] EU fleets by country and precise vessel length ranges (Figure 4.1.).

These graphs confirm again that SSF is an important component of many fisheries in nearly all ICES EU countries (no particular north/south distinction). Around 73,000 SSF (less than 12 meters) operate in ICES EU countries which amounts to 85% of the total ICES EU fishing fleet (90% counting the 12-15 meters' vessels). The 2018' WGCATCH questionnaire data are available for almost all the ICES EU countries listed above except *BGR-Bulgaria*, *EST-Estonia*, *HRV-Croatia*, *ITA-Italy*, *MLT-Malta*, *ROU-Romania* and *SVN-Slovenia*.

[5] EU fleets data extracting from the 2017 official EU fleet register data completed with Norway data extracting from the 2018 WGCATCH questionnaire replies.

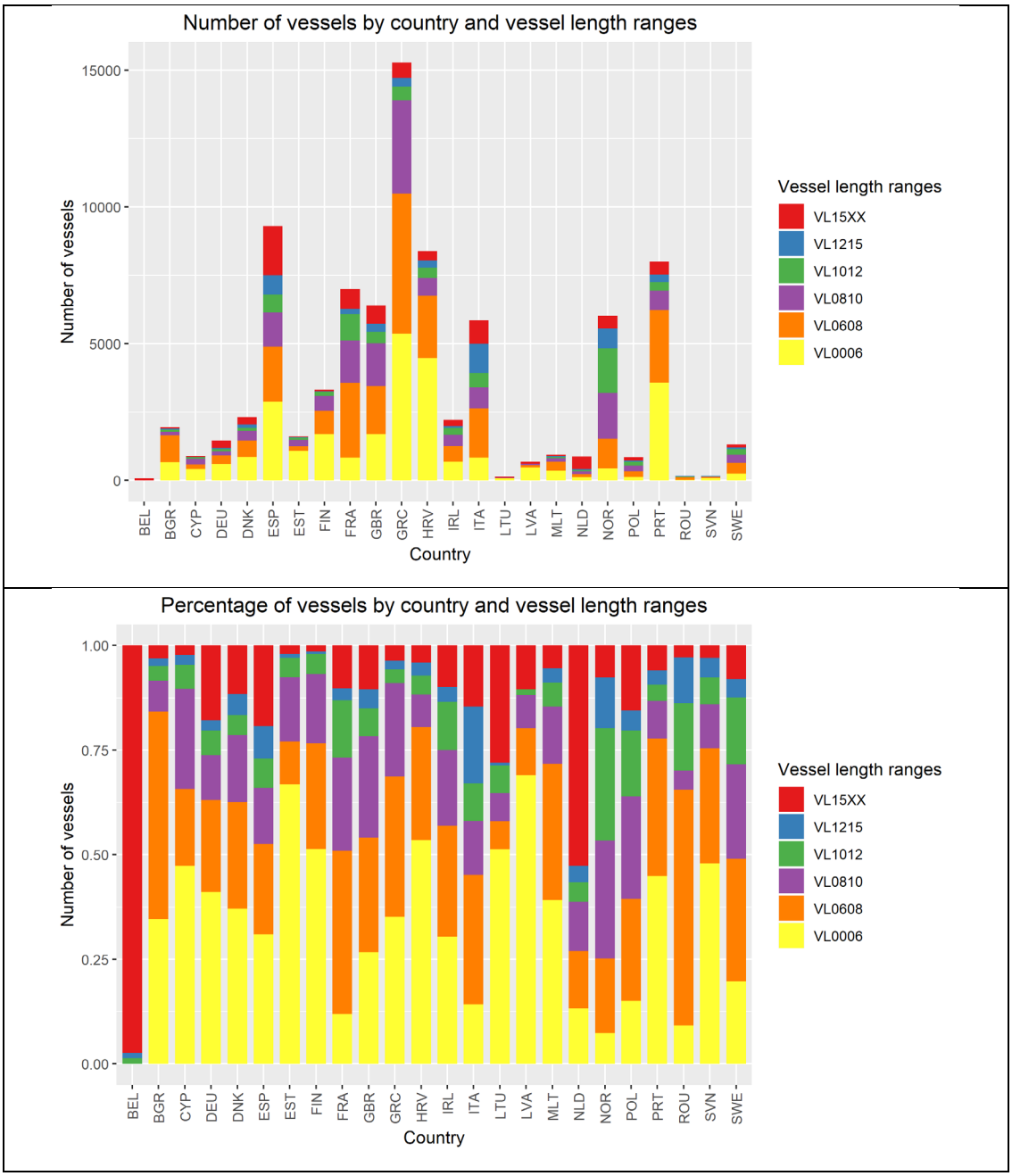



**Figure 4.1. Structure of ICES EU fleets by country and vessel length ranges (Source: EU fleet register).**

For some countries, data are available by country regions or partially. For France, data have been provided by FAO major fishing areas. The list of country*areas available are:

*Belgium (BEL_27), Cyprus (CYP_27), Denmark (DNK_27), Finland (FIN_27), Germany (DEU_27), Greece (GRC_27), Ireland (IRL_27), Latvia (LVA_27), Lithuania (LTU_27), Netherlands (NLD_27), Norway (NOR_27), Poland (POL_27), Sweden (SWE_27), Spain (ESP_27): Basque country region (EU_27S), Other Spain Atlantic regions (Cantabrian Sea and Gulf of Cadiz/Andalucía) (ESP (CB-AN_27)), Portugal continental area (PRT (CONT_27)) (without information from Madeira or Azores islands' vessels), United Kingdom England (GB-ENG_27), United Kingdom Scotland (GB-SCT_27), United Kingdom Wales (GB-WLS_27), United Kingdom Northern Ireland (GB-NIR_27), France Atlantic, Northeast (FRA_27), France Mediterranean and Black Sea (FRA_37), France Atlantic, Western Central (FRA_31) and France Indian Ocean, Western (FRA_51).*

### 4.2.1 Comparison of the number of vessels against the number of vessels with a minimum of one declarative data available

Following graphical output update those of 2018, presenting the number of registered vessels against the number of active vessels by vessel length ranges in number and percentages. Updated graphical outputs for these first intended indicators based on 2018 questionnaires replies are presented hereafter for the 24 country*area which provided data (Figure 4.2).

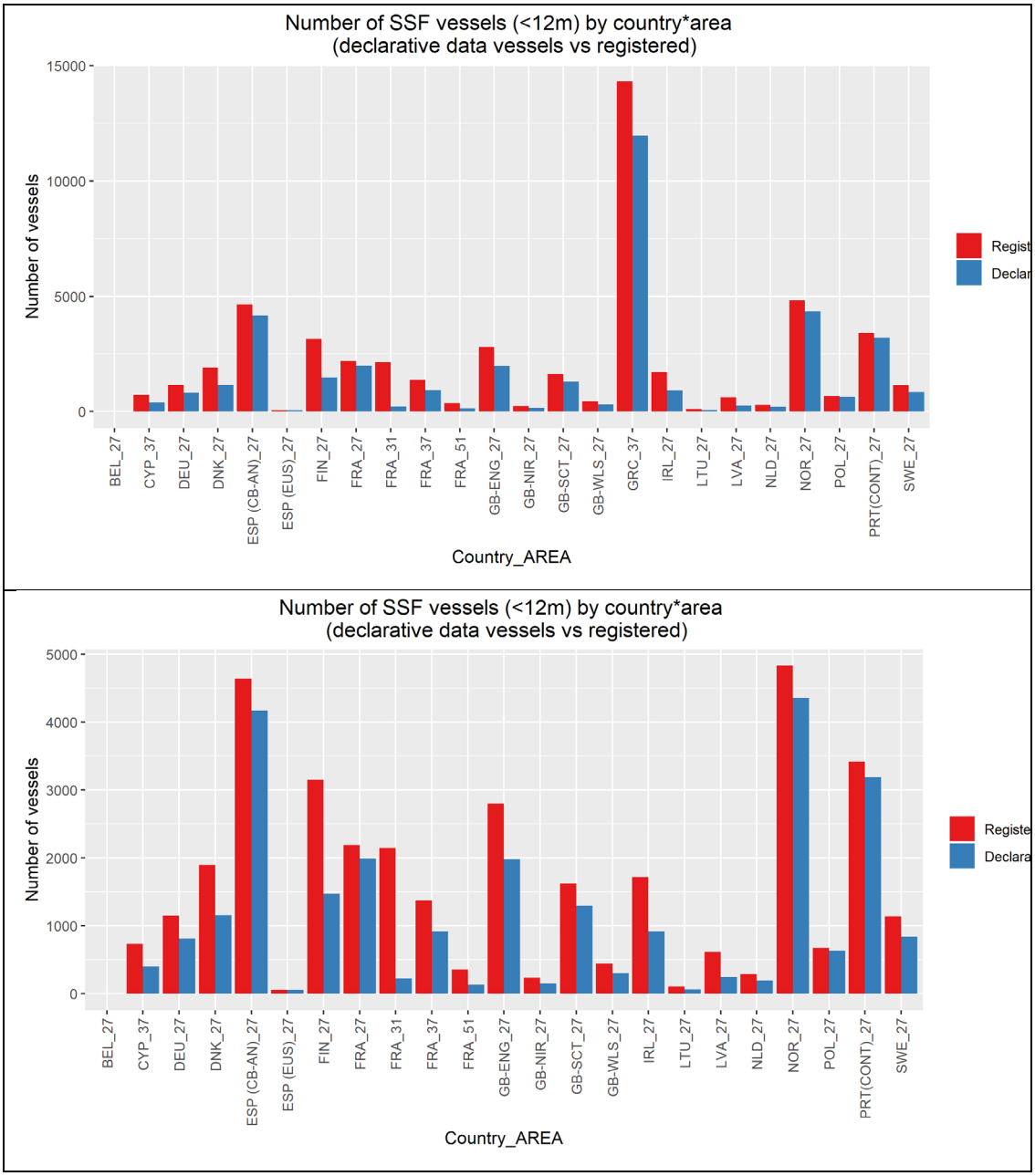



**Figure 4.2. Number of registered vessels (<12 m) and the number of vessels with declarative data, by country and area. In the bottom plot, Greek data was removed as SSF greek vessels (<12 m) account for more than 14 000 SSF vessels when the second-largest country*area (Norway–27 FAO fishing area) identified less than 5000 SSF vessels.**

Among the 24 country*area which provided data, the total number of SSF vessels (i.e. <12m) in the national fleet registers was around 55,000, whereas the total number of vessels with declarative data (at least once in the reference data) was around 46,000, with this difference representing potential inactive vessels – which overall represent circa 15% of the registered vessels. The size of the national SSF fleet (i.e. <12m) differs largely between the country*area (from very few vessels in Belgium to over 14,000 vessels in Greece). The percentage of vessels without any declarative data differs significantly from one country to another or from one vessel length range to another (Figure 4.22).

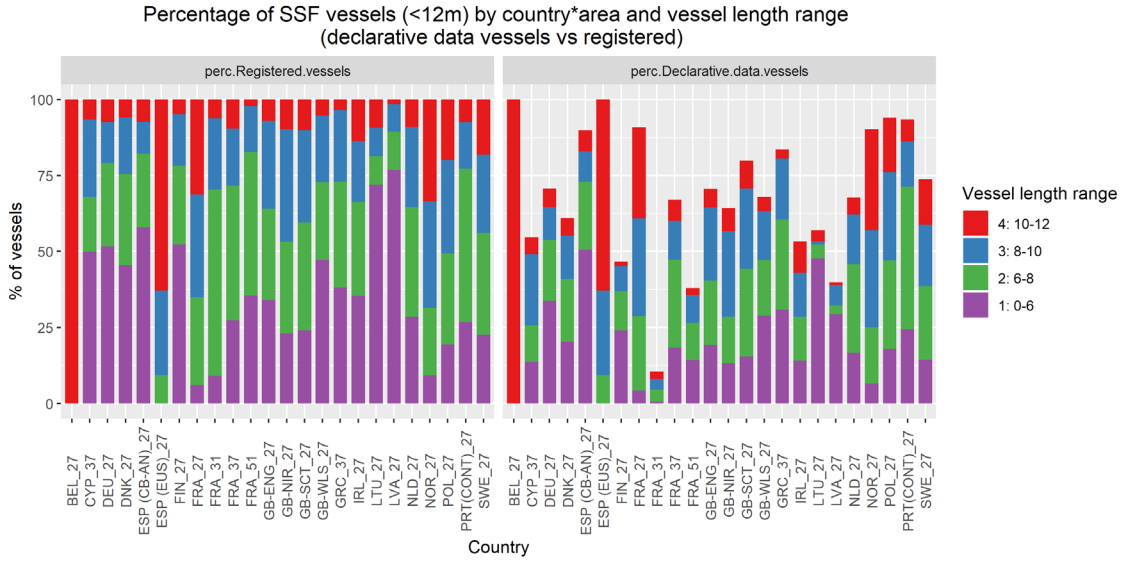



**Figure 4.22. Percentage of registered vessels (left) and percentage of vessels with declarative data (right), by country and vessel length range.**

Only 7 country*area (Basque country, Belgium, France (FAO area 27), Norway, Poland, Portugal (continental) and Spain (Cantabria and Gulf of Cadiz/Andalucía)) the percentage of vessels without any declarative data below 10%, whereas in 7 country*area (Finland, Latvia, Lithuania, Ireland, Cyprus and France (FAO area 31 & 51, outermost regions)) more than 1/3 of the registered vessels have no declarative data available and could be considered as potential inactive vessels. Other country*area present a percentage of vessels without any declarative data between 10% and 33%. The percentage of vessels without any declarative data could differ significantly for some countries from one vessel length range to another (Figure 4.22).

In many country*area the percentage of SSF vessels with declarative data increased from the smaller (<6 m) to larger vessel length category (10-12 m). Only 7 country*area (Cyprus, Finland, France (FAO area 37), Lithuania, Latvia, Netherlands and Poland) present a different distribution pattern, e.g. Finland and Lithuania present a distribution pattern where larger vessels are more impacted by a high percentage of vessels without any declarative data than smaller vessels. 6 country*area (Cyprus, Denmark, France (FAO area 51), GB-Northern Ireland, Ireland and Latvia) differs largely in percentage between smaller SSF vessels (<8 m) and larger (>8 m) (Figure 4.23).

Based on the available data the country*area SSF vessels present a large panel of distribution pattern for this first indicator by vessel length range. Based on the graphical outputs, it is difficult to resume for each country*area its position against the others and the potential level of risk (regarding this first indicator) of declarative data incompleteness. Factor analysis (PCA–principal component analysis) based on the indicator distribution pattern was performed to classify country*area to each other and to build a first risk' map where each country*area is positioned.

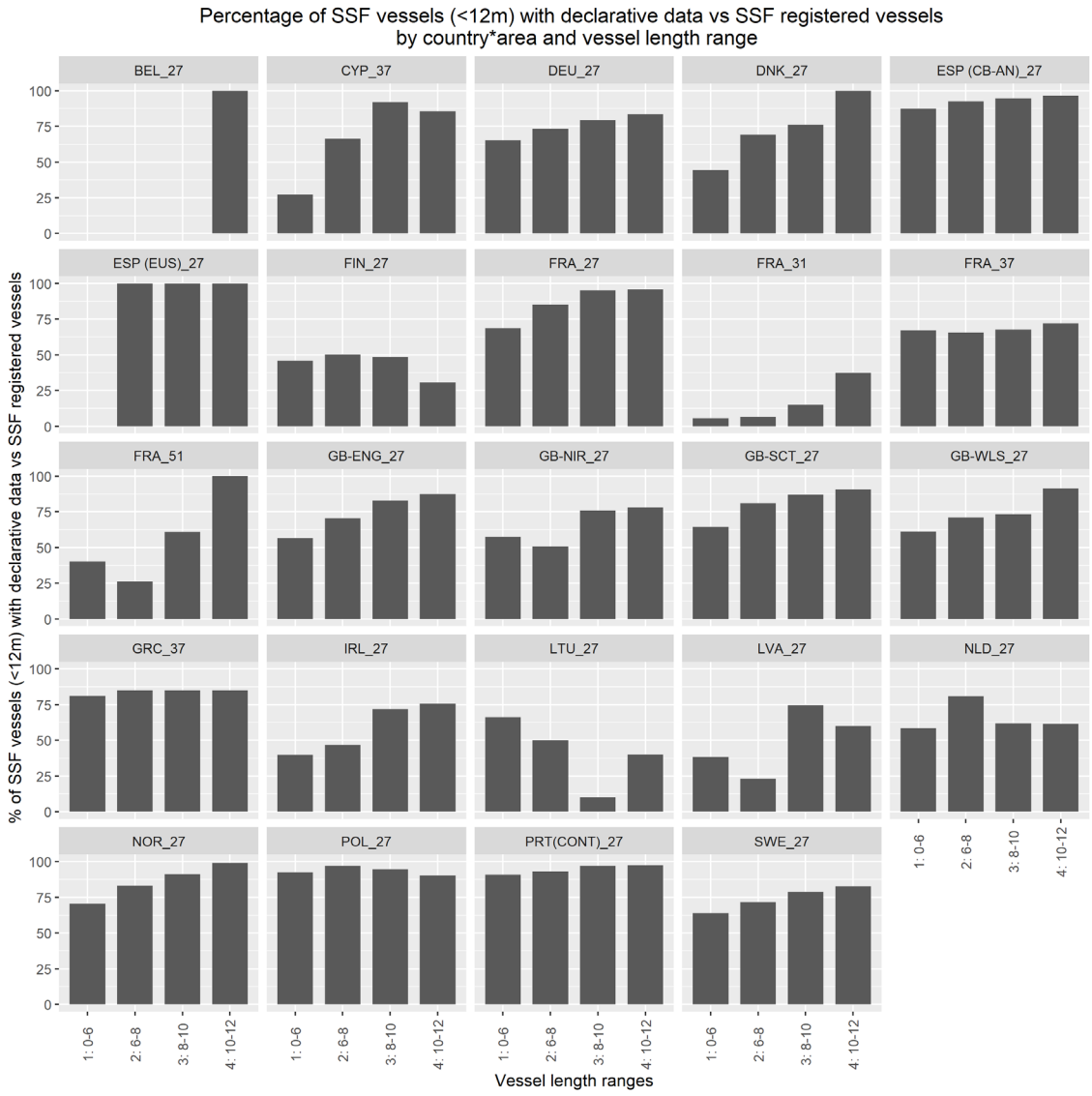
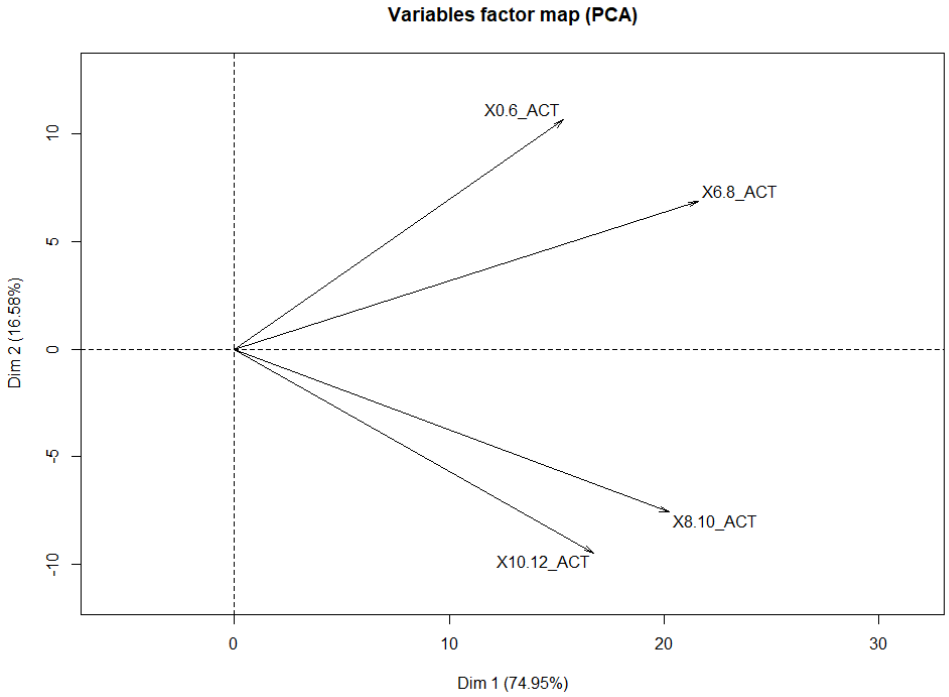
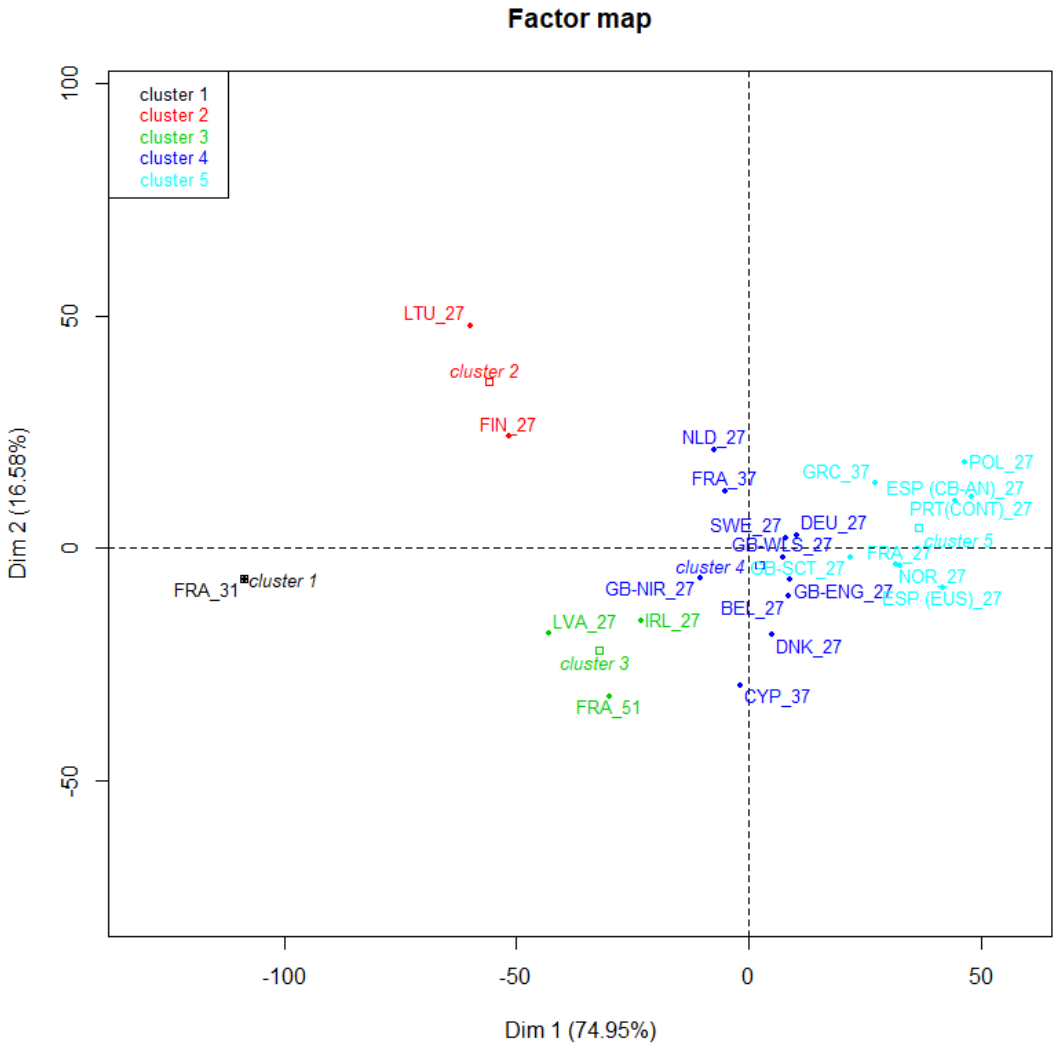



**Figure 4.23. Percentage of vessels with declarative data by vessel length range, in each country-area.**




The following active variables have been taken into account for the PCA: X0-6_ACT (% of less than 6 meters SSF vessels with declarative data against registered), X6-8_ACT (id. for 6-8 meters SSF vessels), X8-10_ACT (id. for 8-10 meters SSF vessels) and X10-12_ACT (id. for 10-12 meters SSF vessels).

First principal component (dim. 1 axis) explain the largest dataset variance (~75%) and constitutes a "size effect" axis opposing country*area with a large percentage of declarative data SSF vessels against country*area with a smaller percentage of declarative data SSF vessels. Second principal component (dim. 2 axis) explains ~16% of the dataset variance and oppose up country*area with higher percentage of declarative data SSF vessels for smaller SSF vessels (<8 m) (comparatively of all others country*area) than for larger (>8 m) and inversely down. Ascending Hierarchical Classification (AHC) associated to the PCA results have been then performed to classify the country*area in clusters presenting similar distribution pattern for this first indicator.




**Cluster 1** *(France (FAO area 31))*: present a very small percentage of declarative data SSF vessels with no distinction between smaller or larger one. Very high potential risk of data incompleteness issue.

**Cluster 2** *(Finland and Lithuania)*: present a small percentage of declarative data SSF vessels, more evident for the larger SSF vessels (>8m). High potential risk of data incompleteness issue.

**Cluster 3** *(France (FAO area 51), Latvia and Ireland)*: present a small percentage of declarative data SSF vessels, more evident for the smaller SSF vessels (<8m). High potential risk of data incompleteness issue.

**Cluster 4** *(Cyprus, Denmark, Belgium, England, Northern Ireland, Wales, Germany, Sweden, France (FAO area 37) and Netherlands)*: present a percentage of declarative data SSF vessels similar to the average of all countries together, more evident for smaller SSF vessels (<8m) for Cyprus, Denmark and Northern Ireland and for larger SSF vessels (>8m) for Netherlands and France (FAO area 37). Presented potential risk of data incompleteness issue.

**Cluster 5** *(Scotland, Basque country, Norway, France (FAO area 27), Greece, Portugal (continental area), Spain (Cantabria and Gulf of Cadiz/Andalucía) and Poland)*: present an adequate percentage of declarative data SSF vessels with no real distinction between smaller or larger ones. Low potential risk of data incompleteness issue.

A first classification of the country*area is therefore possible based on the first indicator. However, a high percentage of SSF vessels with a minimum of one declarative data during the year does not mean that no data incompleteness issues should arise. Second intended indicators concentrate on vessels with declarative data and investigate the completeness of their data regarding the number of trips they declared.

### 4.2.2 Analyses on vessels with declarative and completeness of their data regarding the number of trips they declared.

A balanced distribution between each range of number of trips is expected for the declarative data vessels. However, some country*area stand out for their high percentage of vessels with a low (<50 trips) number of trips declared per year (Cyprus, Denmark, England, Finland, France (FAO area 31&51), Latvia, Northern Ireland, Norway, Scotland and Wales). On the other hand, three country*area stand out for their very high percentage of vessels that have a very high (>150 trips) number of trips declared per year (Belgium, Germany and Netherlands). The other countries distribution patterns are more balanced except for five country*area (Basque country, France (FAO area 27), Greece, Poland and Spain (Cantabria and Gulf of Cadiz/Andalucía)), with a low percentage of vessels that declare few trips per year (Figure 4.24).

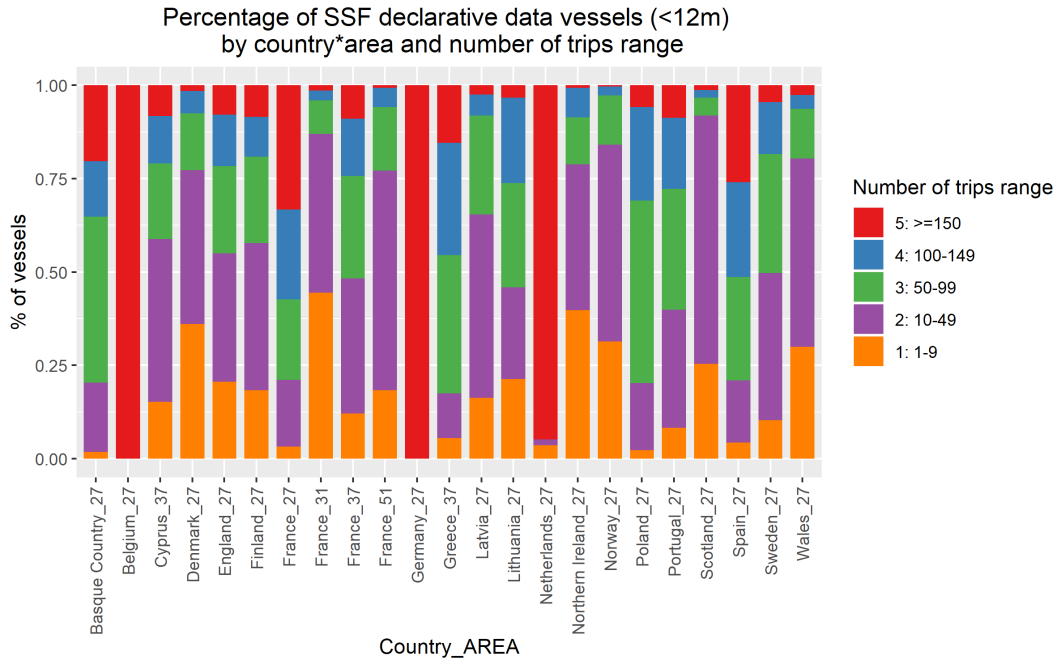



**Figure 4.24. Percentage of <12 m vessels declaring different number of trips range, by country-area.**

The following graphical output add the "vessel length range" dimension (Figure 4.25). Larger vessels are expected to perform more trips per year than smaller which must be highlighted in their declarations. The distribution patterns are very diverse from one country*area to each other and do not reflect always what was expected. Furthermore, within this large panel, it is difficult to resume for each country*area its position against the others and inferred about a potential level of risk (regarding this second indicator) of declarative data incompleteness issues. Factor analysis (PCA–principal component analysis) based on the indicator' distribution pattern calculated by vessel length ranges have been performed to better understand the dynamic of these distributions and to propose a classification of the "country*area", positioning them on a 2nd risk' map.

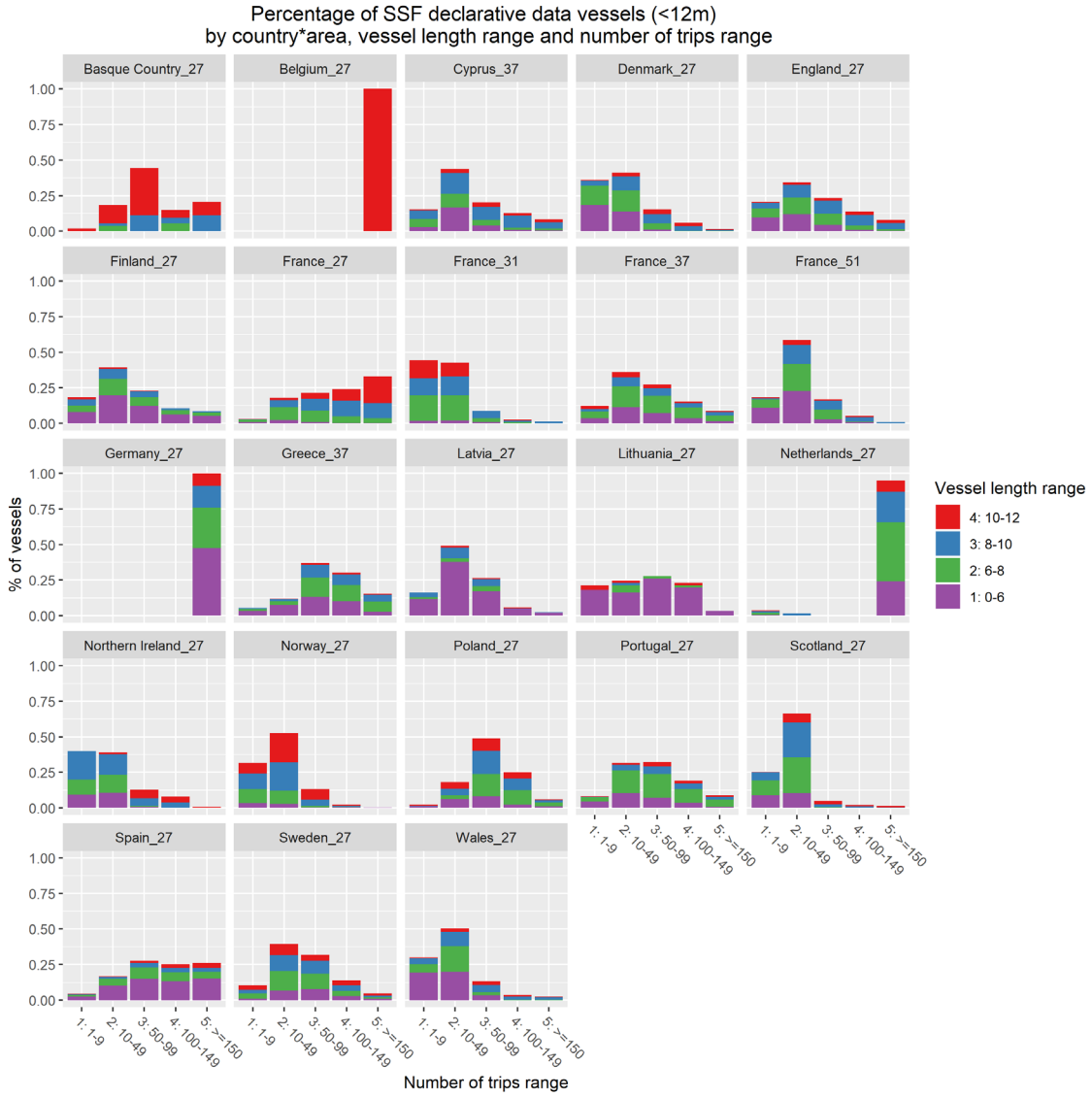
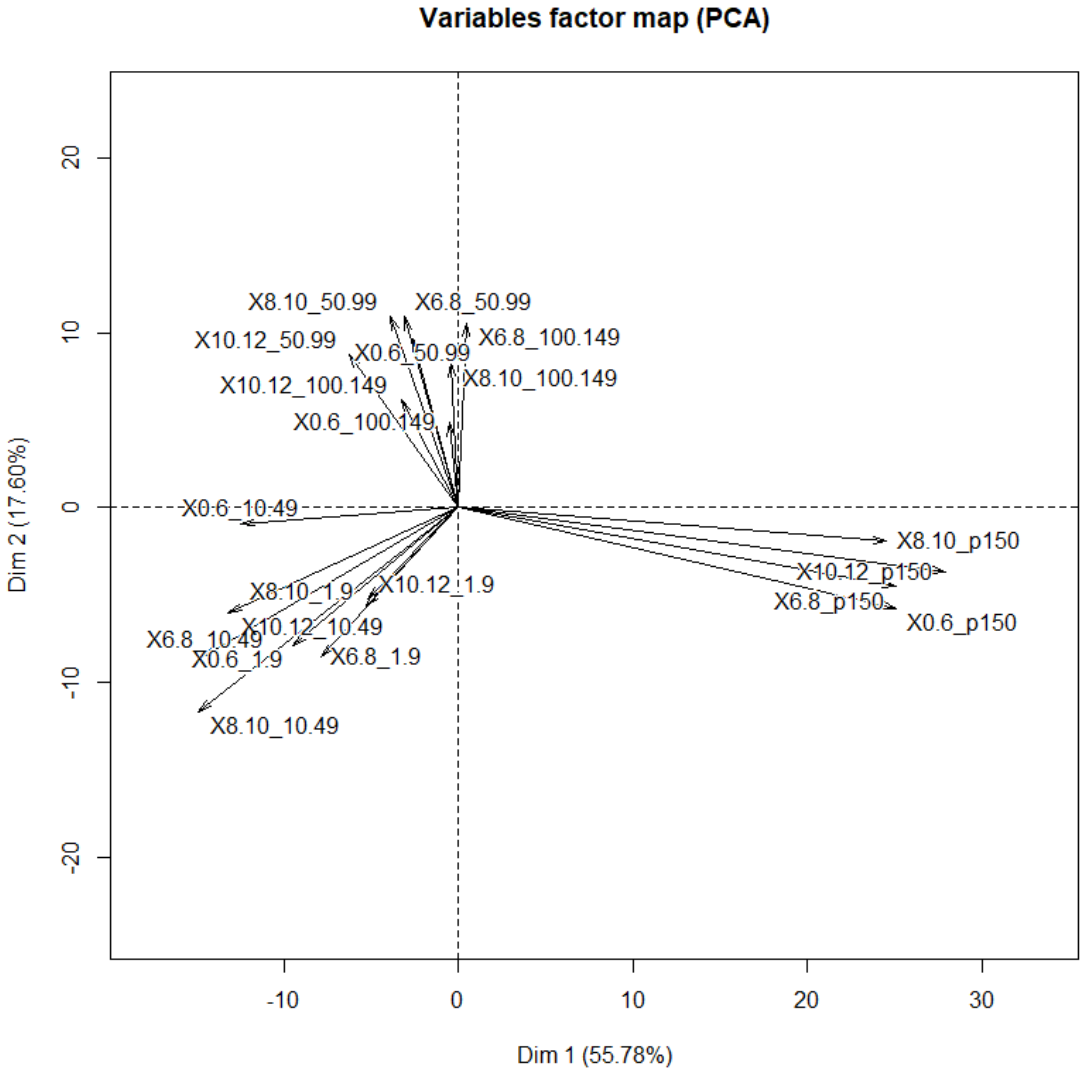
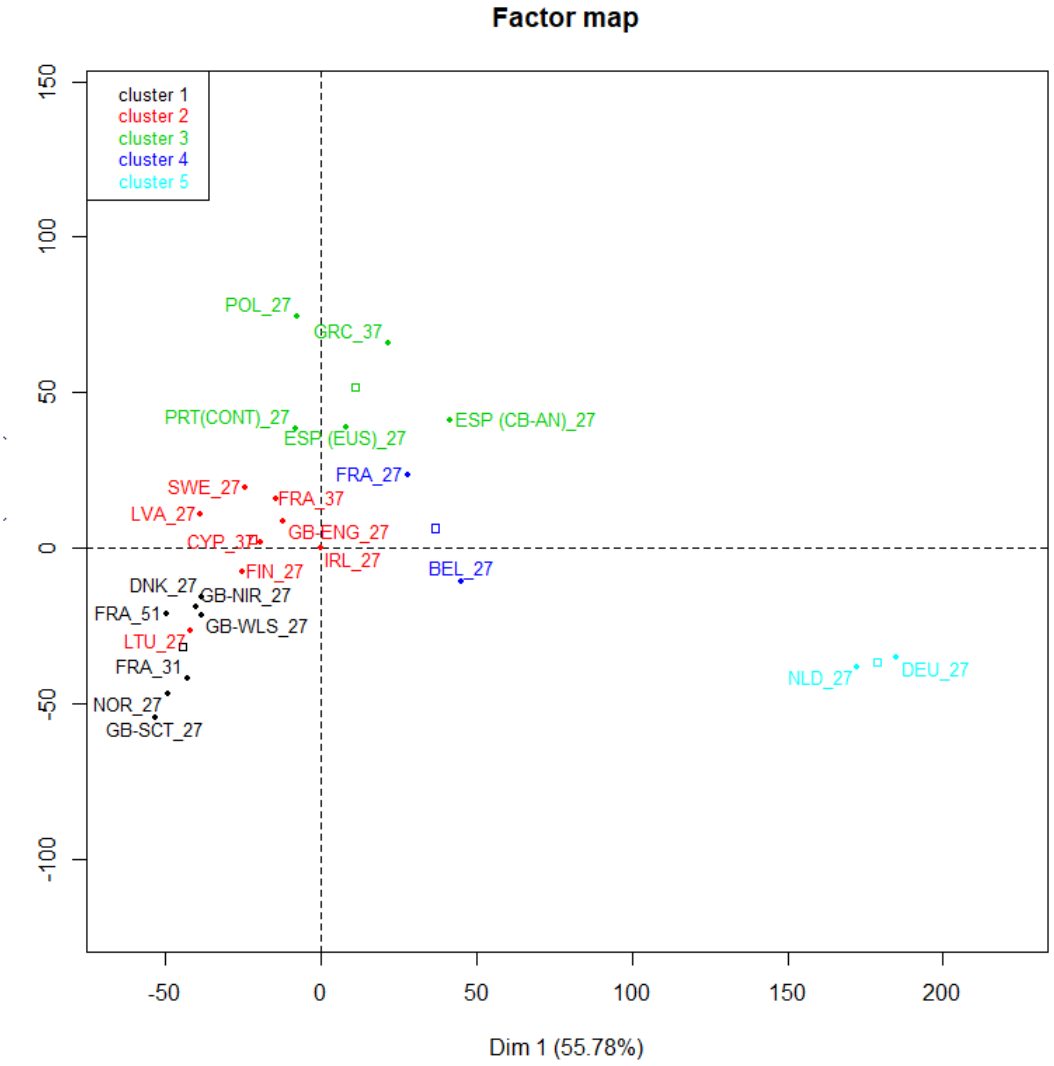



**Figure 4.25. Percentage of vessels with different number of trip range, by vessel length range.**




The following active variables have been taken into account for the PCA: X0-6_1-9 (% of less than 6m SSF declarative data vessels with less than 10 fishing trips performed), X0-6_10-49 (id. with 10-49 fishing trips performed), X0-6_50-99 (id. with 50-99 fishing trips performed), X0-6_100-149 (id. with 100-149 fishing trips performed), X0-6_p150 (id. with more than 150 fishing trips performed) and the same variables for the 6-8 m, 8-10 m and 10-12 m vessel length ranges.

Most of the variances explained by the two first principal components (dim1. and dim2. axis) is associated to the global difference observed in distribution pattern between vessels with a high percentage of vessels which declare a lot of trips against vessels that declare few trips during the year. The first principal component (dim. 1 axis) explains the largest dataset variance (~56%) opposing the country*area with a large percentage of declarative data SSF vessels with more than 150 fishing trips registered against country*area with a more widespread distribution. Second principal component (dim. 2 axis) explain ~18% of the dataset variance and oppose up country*area with higher percentage of declarative data SSF vessels with more than 50 fishing trips registered (comparatively of all others country*area) than vessels with less than 50 fishing trips registered and inversely down. Ascending Hierarchical Classification (AHC) associated with the PCA results have been then performed to classify the country*area in clusters presenting similar distribution pattern for this second indicator.




**Cluster 1** *(Germany and Netherlands):* aggregate two country*area for which declarative data SSF vessels registered to a great extent more than 150 fishing trips during the year. The distribution of the second indicator being largely non-symmetrical. High potential risk of over registered fishing trips.

**Cluster 2** *(Sweden, France (FAO area 37), Latvia, England, Ireland, Cyprus, Finland, and Lithuania):* aggregate declarative data SSF vessels with a balance distribution for the less than 100/150 number of trips ranges. Comparing to other country*area few vessels are observed with more than 100 fishing trips registered during the year. Presented potential risk of data incompleteness issue.

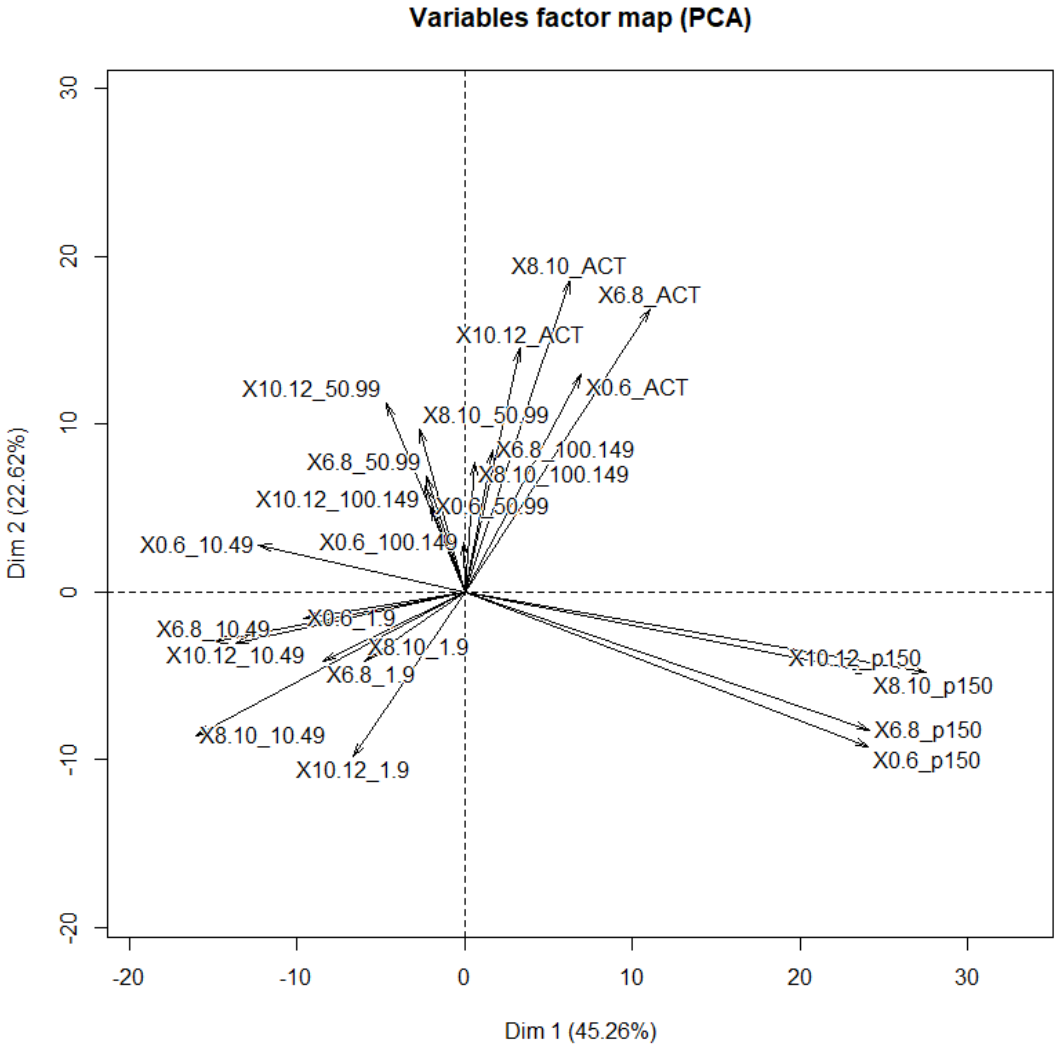
**Cluster 3** *(Poland, Greece, Portugal (continental area), Spain (Cantabria and Gulf of Cadiz/Andalucía) and Basque Country):* aggregate declarative data SSF vessels with a non-symmetrical distribution with more vessels with high number of trips ranges (more than 50 fishing trips) than the other country*area. Comparing to country*area from cluster 1 and 4, fewer vessels are observed with more than 150 fishing trips registered during the year. Low potential risk of data incompleteness issue.

**Cluster 4** *(France (FAO area 27) and Belgium):* aggregate declarative data SSF vessels with a balance distribution including the more than 100/150 number of fishing trips range. Very low potential risk of data incompleteness issue.

**Cluster 5** *(Denmark, Northern Ireland, France (FAO area 51), Wales, France (FAO area 31), Norway and Scotland):* aggregate declarative data SSF vessels with a non-symmetrical distribution with more vessels with low number of trips ranges (less than 50 fishing trips) than the other country*area. High potential risk of data incompleteness issue.

Classification of the country*area is therefore possible based on the second indicator. However, this indicator does not take into account the percentage of non-declarative data SSF vessels which could be in some cases high and be seen as an indicator of high potential risk of data incompleteness issue.

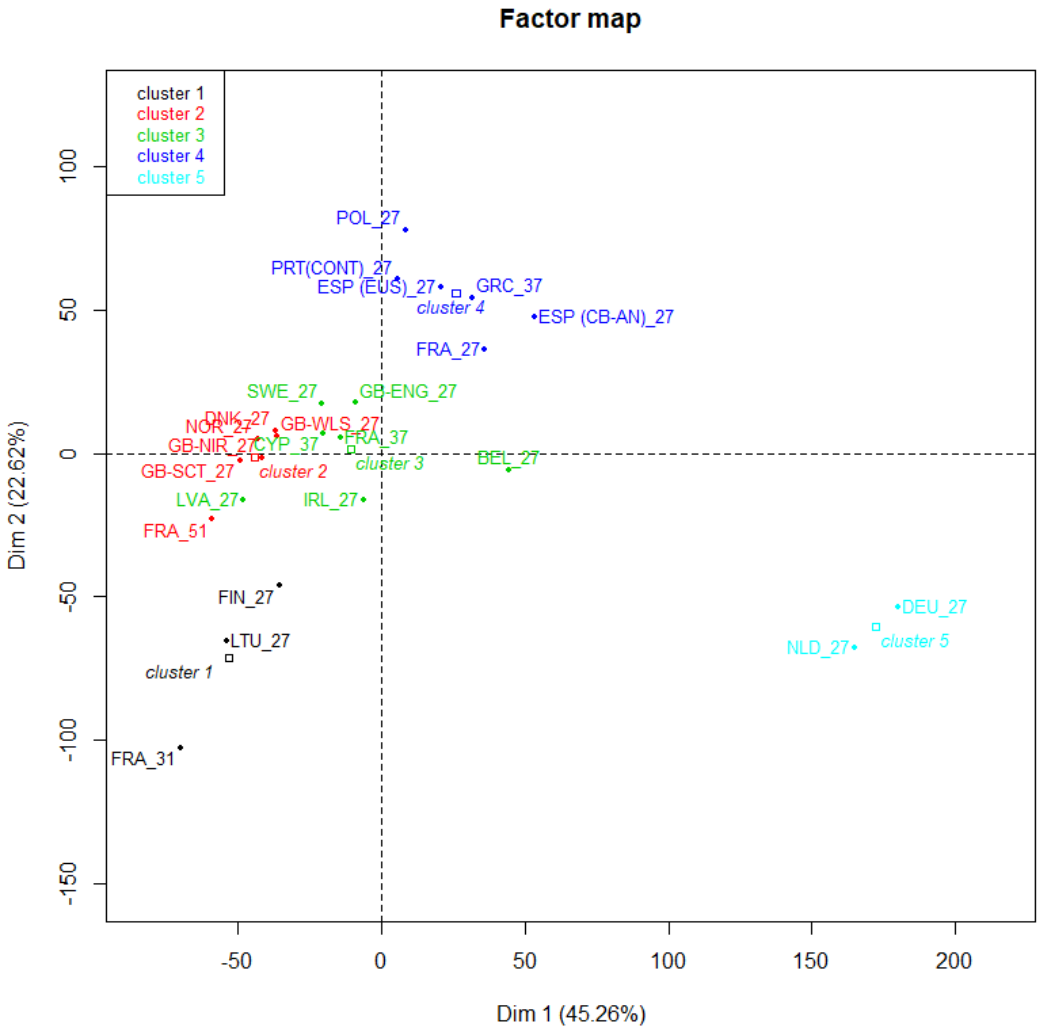
Factor analysis (PCA - principal component analysis) based on the two indicators have been then performed to combine the information coming from the two indicators and to propose a final classification of the "country*area", positioning them on a risk' map.




The variables considering the % of SSF vessels with declarative data against registered by vessel length ranges have been taken into account also the ones considering the % of vessels by the number of trips and vessel length ranges among the declarative data SSF vessels.

First principal component (dim. 1 axis) explain the largest data set variance (~45%) and combine the 1) opposition between country*area with a large percentage of declarative data SSF vessels with more than 150 fishing trips registered and country*area with a more widespread distribution and 2) the "size effect" axis opposing country*area with a large percentage of declarative

data SSF vessels against country*area with a smaller percentage of declarative data SSF vessels. This "size effect" contribute also strongly to the explained variance of the second principal component (dim. 2 axis) which integrate also the opposition between country*area with higher percentage of declarative data SSF vessels with more than 50 fishing trips registered against country*area with a higher percentage of declarative data SSF vessels with less than 50 fishing trips registered. Ascending Hierarchical Classification (AHC) associated with the PCA results have been then performed to classify the country*area in clusters presenting similar distribution pattern for these two indicators.




**Cluster 1** *(France (FAO area 31), Finland and Lithuania):* present a small percentage of declarative data SSF vessels combined with an over-representation of declarative vessels with few fishing trips registered (less than 50). Very high potential risk of data incompleteness issue.

**Cluster 2** *(Denmark, Wales, Norway, Northern Ireland, Scotland, France (FAO area 51)):* present a small percentage of declarative data SSF vessels combined with an over-representation of declarative vessels with few fishing trips registered (less than 100). High potential risk of data incompleteness issue.

**Cluster 3** *(Sweden, England, Cyprus, France (FAO area 37), Belgium, Latvia and Ireland):* present overall an average percentage of declarative data SSF vessels combined with an over-representation of declarative vessels with few fishing trips registered (less than 100). Presented potential risk of data incompleteness issue.

**Cluster 4** *(Poland, Portugal (continental area), Basque Country, Greece, Spain (Cantabria and Gulf of Cadiz/Andalucía) and France (FAO area 27)):* present a proper percentage of declarative data SSF vessels combined with a balance distribution regarding the number of trips declared by declarative vessels. Low potential risk of data incompleteness issue.

**Cluster 5** *(Germany and Netherlands):* present an average percentage of declarative data SSF vessels combined with a strong over-representation of declarative vessels with more than 150 fishing trips registered. High potential risk of over registered fishing trips.

### 4.2.3 Conclusion

Based on two basic indicators calculated by precise vessel length ranges, it is possible 1) to classify country*area to each other into groups and to attribute to each of them a potential risk of data incompleteness issue or over-declaration *(very high, high, presented, low and very low)* and 2) to build a risk' map where each country*area is positioned. In the case of confirmed potential risk of data incompleteness issue or over-declaration, country*area should assess their declarative system and eventually consider alternative methodology to improve their SSF data quality.

Possibly, each new country*area could be positioned on this map as soon as the distribution of the two indicators are calculated which easily allows to detect a potential risk of data incompleteness data issue or over-declaration.

Furthermore, in 2020 it is planned to update the data available and compare them with the same indicators calculated for the Large Scale Fishery (LSF) to confirm the potentiality of such indicators and risk' map associated to be used as a sensor to detect a possible risk of data incompleteness issue or over-declaration.

### 4.2.4 Stand-alone document with best practices guidelines for SSF effort and landings data estimation.

There is a need to provide a document which covers the main issues identified and best practice guidelines for SSF effort and landings data estimation. The idea was to summarise the main outputs from the precedent WGCATCH reports in a 'stand-alone' document. To achieve this task the subgroup reviewed and updated the guidelines drafted in 2016 this included editing the flowchart (Fig. 4.6) that defines the steps in collecting these data and subsequent sections in the guidance document. The subgroup updated the original guidance to include new details from subsequent WGCATCH work (e.g quality indicators from WGCATCH 2018), but also to make it stand alone as an independent document, for example, the references in the Annex are independent of the WG report. The document is presented in draft as work in progress. The aim is to publish this document after revision on the ICES website via the WGCATCH publications page (https://www.ices.dk/community/groups/SiteAssets/WGCATCH-publications.aspx).

Some countries will need to review the descriptions of their schemes in the Annex of the guidance for changes and there are also references to be included that are still dependent on the work yet to be published in the WGCATCH 2019 report.

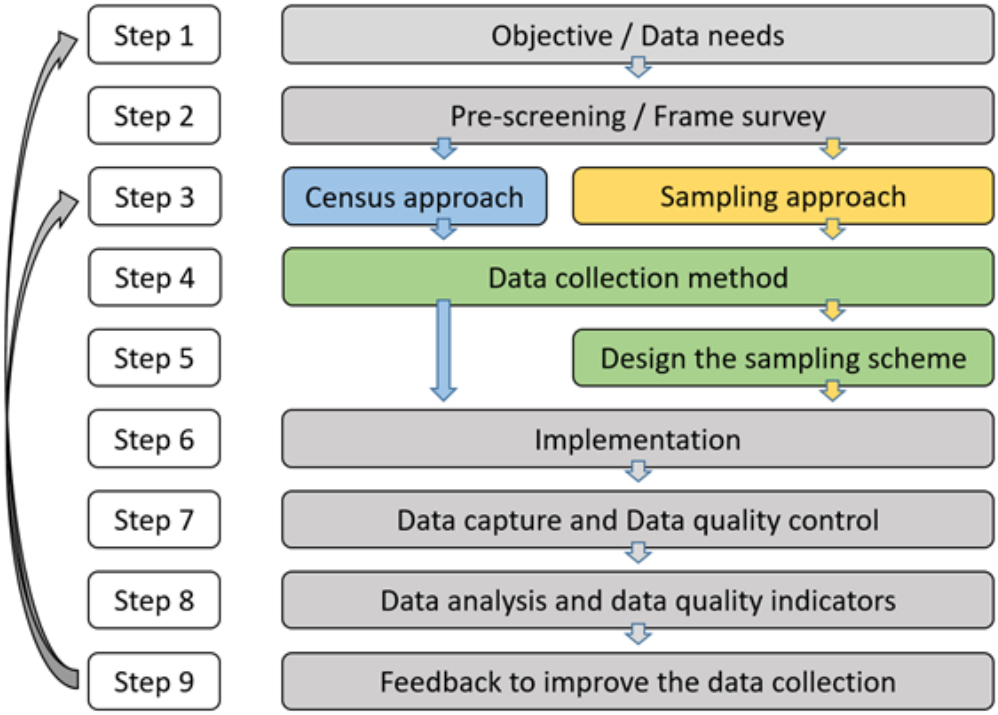



**Figure 4.7. Flowchart of steps proposed in best practice for SSF fishing activity data collection.**

## 4.3 Analyse different options to monitor SSF with new technologies based on end-user needs (ToR b.3)

Most of the SSF activity takes place in coastal areas and there is a need to collect appropriate spatial and temporal data to inform both fisheries management and marine spatial planning. Technical limitations of Vessel Monitoring Systems (VMS) together with exemptions within EU regulations determine that nearly 80% of the 12-15 m fleet segment operates without VMS (EU Special No 08/2017). Therefore, different approaches to monitor much of the under 15m fleet are required.

Whilst there are a variety of options for capturing highly spatially resolved data (some of which is implemented in the sub 15 m fleet), there is a need to consider and compare the utility of the range of systems and processes that could be used to capture fishing effort and catch data in SFF. New technologies are indeed a significant opportunity to improve Small-Scale Fisheries (SSF) monitoring and data collection.

Due to the importance of this topic, WGCATCH covered it in previous annual meetings. WGCATCH 2016 did a very first review of the different projects today ongoing in the ICES area. In 2017 and 2018 WGCATCH meeting this information was updated. A presentation of an ongoing study in the Basque country has been done in 2017. Another ongoing project related to the use of new technologies focused on the monitoring of the fishing activities of the German SSF in the Baltic Sea has been presented by the THUENEN institute in Rostock, Germany in 2018: first results of the use of the Smartphone App Mofi (Mobile Fisheries log).

In 2019 WGCATCH did a review and compilation of different Electronic Recording and Reporting Systems (ERS) used at European level focused in the SSF. With this aim in mind, three reports were considered where this topic was covered: 1) fishPi2 project (MARE/2016/22) WP5 report, 2) The report from the Workshop held in Brussels in December 2018 on digital tools for SSF and 3)

the report from the 9th International Fisheries Observers and Monitoring Conference (IFOMC) held in Vigo in June 2018. Main outputs from these reports are summarized below.

**i. fishPi² project (MARE/2016/22)**

In fishPi² under WP5, a review of different potential Electronic Recording and Reporting (ERS) and Electronic Monitoring (EM) system for the SSF was done. To review ERSs that can be installed on small-scale vessels manufacturers of systems currently available on the commercial market were interviewed. Initially, a list of manufacturers was drafted from broad Google searches using a combination of keywords: electronic reporting, electronic monitoring, recording, electronic, VMS, AIS, fishing, small scale fisheries, GPS, tracking, iVMS. Listed suitable manufacturers were then circulated and reviewed within the project coordination team and built on through recommendations and available online. After further review, 15 manufacturers were contacted and replied to the request to participate in an online or telephone interview about their systems. Eleven interviews were conducted with manufacturers of systems that recorded information on vessel position, catch and/or effort and biological data, and included questions about the general specifications of each system. Eight ERS feature in the described case studies in this review.

**Table 4.1. List of manufacturers interviewed and their ERS.**

| Manufacturer | Product | Mobile phone application or installed on-board system? | Used in a stakeholder case study? |
|---|---|---|---|
| Anchor Lab K/S | MOFI App | App | Y |
| Anchor Lab K/S | Black Box R2 | on-board system | Y |
| Marine Instruments | WatchMan Pro | on-board system | N |
| Marine Instruments | Electronic Eye | on-board system | N |
| Anon. 1 | Anon. 1 | on-board system | N |
| Archipelago Marine Research Ltd. | Observe hardware, Interpret software | on-board system | Y |
| SRT Marine Systems plc | VMS system – B300 AIS class transceiver | on-board system | N |
| AST Marine Sciences Limited | iVMS Guardian App | App | Y |
| AST Marine Sciences Limited | iCatch App | App | Y |
| AST Marine Sciences Limited | Autonomous VMS (aVMS) | on-board system | Y |
| SIFIDS - University of St Andrews | SIFIDS mobile phone App | App | Y |
| SIFIDS - SeaScope Fisheries Research | On-board Central Data Collection System (OBCDCS) | on-board system | Y |
| Anon. 2 | Anon. 2 | on-board system | N |

| Manufacturer | Product | Mobile phone application or installed on-board system? | Used in a stakeholder case study? |
|---|---|---|---|
| Vericatch | FisheriesApp | App | N |
| WWF-US | Electronic Fishing Logbook | App | N |

A detailed explanation of each of the devices/products mentioned in the table can be found in the final fishPi[2] report[6].

What is evident based on the results obtained from the interviews realized to manufactures and scientists was that there are potential technologies available to be installed in the SSF to improve the monitoring of these fisheries. But is also true that depending on the devices, the cost of them could be important (e.g. CCTV), there could be technical difficulties in the installation of them depending of the length of the vessel, the analysis of the data collected could be huge etc. Taking into account all these issues, in fishPi2 a possible approach to follow when considering which devices should be installed was proposed. This approach is based on a "Risk Assessment Evaluation". First of all, different gears used by this fleet are identified and their possible impacts detailed (e.g. impact on the seabed, bycatch rate, PETS bycatch etc.). Fleet operating areas or fishing grounds could be also identified (e.g. fishing grounds close to MPA or restricted areas etc.). Based on this, the fleet is classified by risk category from very low risk to high risk. Depending on the risk category, the level of compliance and data needed from the fleet will be different and consequently the devices to be installed, from very simple (simple track devices) devices to more complex devices (e.g. CCTV with track+ gear use sensor + catch information).

With the data collected from these devices and some analysis as the vessels tracks and speed profiles, high-resolution information about the effort as the estimates of the amount of gear used, soak time, areas fished etc. could be obtained.

**ii. Workshop on digital tools for Small Scale Fisheries (Brussels, 4-5 December 2018)**

The European Commission (DG MARE) organized in close cooperation with EU Member States (MS) a workshop on digital tools for small-scale fisheries (SSF) in Brussels on 4-5 December 2018. Representatives of DG MARE, MS, European Parliament, Council of the European Union, Advisory Councils and other EU stakeholders participated in the discussions. The workshop covered digital tools for vessel monitoring, catch reporting and a session focused on the European Maritime Fisheries Fund (EMFF) as a funding mechanism. The Workshop was dived in three different sessions. The first session was focused in tracking devices to monitor the SSF, the second session covered digital catch reporting tools for the SSF and the third one was focused in EU funding digital tools for monitoring and reporting.

In this workshop, some of the devices identified under fishPi2 project were also presented (e.g. MOFI App, Blackbox etc.). These devices are not explained in this section to avoid duplication with the section above.

Some pilot studies from several Members were presented in the mentioned sections:

1. **Spain**: Three pilots were presented. One from the Andalucía region, where a device called "green box" is used. This device is a tracking device and the information is collected by the Andalucía regional government. It´s similar to a VMS but adapted to the small-scale fleet. The resolution and frequency of the pings is higher compare to the VMS.

[6] Anon. (2019). Strengthening Regional Co-ordination in Fisheries Data Collection–The FishPi Project Summary report (MARE/2016/22).

The other device is used by vessels belonging to a specific fishermen association called ACERGA, and it's an app developed by them. It´s similar to an electronic logbook and it´s a catch reporting system. The last device is called "VMS Lite" and is used by 120 vessels in the Galician region. It´s a track position system and it´s also approved and used by the Marine Management Organization in the UK.

2. **Croatia**: A device called "M-Logbook app is used by 100 vessels and it´s planned to extend it in 2020. It´s an electronic or catch reporting system. The option of using drones for control purposes and detect illegal fisheries was also presented.
3. **Netherlands**: An electronic logbook/catch reporting system called "E-Lite app" was presented. This app is mandatory for all vessels under 12m total length.
4. **Estonia**: Similar to the Netherlands, a voluntary based electronic logbook/catch reporting "ERS Lite app" system is used.
5. **Greek**: A Greek company presented a "Pelagic Data System", a tracking device adapted for the SSF.
6. **France**: A French company called "Fishfriender" developed a monitoring and catch reporting system tool currently used in the recreational fishery of seabass. It´s a mobile app that combines passive GPS data with active catch data input.

The whole report and main discussions and conclusions from the workshop are detailed in the following link:

https://ec.europa.eu/fisheries/press/outcomes-workshop-digital-tools-small-scale-fisheries-brussels-4-5-december-2018_en

**iii. The 9th International Fisheries Observers and Monitoring Conference (IFOMC), Spain, June 2018**

The 9th International Fisheries Observer & Monitoring Conference took place in the Hotel Pazo de los Escudos, Vigo, Spain from 11th to 15th June, 2018. The overarching vision of this series of conferences is: To develop, promote and enhance effective fishery monitoring programs to ensure sustainable resource management throughout the world. The conference was the most successful of the series so far involving 279 participants from 39 countries including representatives from many observer programs from around the world, fishing industry groups, and end-users of the data that these programs collect. The conference format included three distinguished keynote speakers, presented papers and posters, panel discussion sessions, workshops and less formal settings, such as trade exhibits, poster sessions and several social events. As for recent conferences, the Vigo meeting had a major focus on the growing role that technology is playing in the monitoring of fisheries, through video, satellite and other high-tech means.

Under the different sessions, two case studies using new technologies to monitor the SSF:

1. **Indonesia**: The device used is called "Spot trace" and is a position tracking system and a Time Lapse Camera. This system is deployed on tuna hand line fishing vessels due to the lack of space for observers.
2. **Azores**: The system used is called MCS (Monitoring, Control and Surveillance system) and it´s used to track all professional fishing activity since 2010. There are also some surveillance cameras installed in some specific harbours.

The whole report from the conference can be found on the following link:

https://ifomcvigo.com/wp-content/uploads/2018/08/proceedings-9th-ifomc.pdf

It is evident that during the last years, companies are developing devices for SSF to improve their monitoring, data collection and management. These devices are adapted to this fleet characteristics, so in the short term is expected as an important alternative to improve the knowledge of this fleet.

ICES is aware of the importance of these devices for fisheries management, data collection etc. Thus, for the first time, The Working Group on Technology Integration for Fishery-Dependent Data (WGTIFD) met in Copenhagen, Denmark, 7-9 May 2019 for its first meeting in its three-year multi-annual cycle. WGTIFD has diverse membership including technology service providers, academic and governmental marine institutions, and non-profit environmental organizations, across a wide range of EU, US, and Canadian fisheries. The WGTIFD's primary objective is to examine the electronic tools and applications that are used to support fisheries dependent data collection, both onshore and at sea, including electronic reporting, electronic monitoring, positional data systems, and observer data collection. WGCATCH is also aware of the importance and inclusion of these technologies under the different National catch sampling programmes, where the SSF is not an exception. Strong communication and cooperation between both ICES groups will be essential in the following years to improve and achieve fisheries monitoring sampling programmes objectives keeping in mind for example that issues/data needs to be covered by these devices differ from SSF or Large Scale Fisheries (e.g. for SSF first principal objectives of such devices could be to update the control regulation so that positional data from SSF adapted devices (e.g. GPS system) could be set up as a first step to enhance knowledge of SSF especially accounting for the number of fishing trips performed).

### 4.3.1 Strengths, weaknesses, opportunities and threats of using ERS for monitoring and management of SSF

→ *Strengths and opportunities*

A key aspect to ERS for monitoring SSF is their reliability to log and report all collected data. In the 14 case studies, thirteen agreed that the devices were reliable for delivering their intended data outputs. Compared to traditional data recording methods such as manual logbooks, 13 scientists agreed ERS offered a more robust approach to collecting the same data. Improved time-efficiency and/or data accuracy were both mentioned by seven interviewees each. More detail, saving money and the technology's suitability for the trial were other stated benefits of ERS in 6, 2 and 1 case studies respectively. Indeed, ERS is now being used to assist current management decisions in four Member States through mandatory requirements of ERS use on some SSFs; all vessels in the Portuguese bivalve dredge fishery, all vessels in the Danish bivalve dredge fishery, all vessels <15 m in the Andalusian coastal waters, and for all Irish razor clam fishery.

The use of ERS to monitor the position of vessels assisted in fishing effort calculations, informing stock assessments and marine spatial planning (i.e. monitoring if vessels were fishing inside closed areas). Vessels that volunteered to participate in five case studies are informing management too: the German MOFI app, Danish marine mammal bycatch, Netherlands cod bycatch, Scottish razor clam electrofishing and Spanish AIS tablet trial. The monitoring of spatio-temporal fishing activities is helping to improve upon previous bycatch estimates which in turn has permitted management to focus effective control measures upon fishing activities in specific areas, for example, to protect cod spawning grounds from unsustainable fishing and highlight areas for future Natura 2020 designation. Three case studies stated that although the trial outputs were not being used for current management decisions at the time of interview the data collected was used to help draft future management plans.

Factors which make electronic reporting an appealing system for future management were highlighted by all interviewees. The most popular examples given were improved ability to locate fishing grounds, calculate fishing effort and the increased quantity of data. Other answers included ERS use to designate or protect established MPAs/conservation zones/closed areas, the improvement data accuracy and to improve the public's perception of fishing.

A further strength with ERS is the ease of sharing data to all interested stakeholders, in six cases fishers were granted free access to their data providing the opportunity for them to see the data they helped gather. Depending on the trial fishers could see a record of their vessel's spatio-temporal data, catch and/or effort data. Providing information back to fishers offers the chance to build relations with the organisation(s) implementing ERS as many fishers have often not had feedback before or the chance to visualise their impact. A total of five trials were facilitated by the member states' government and research institute, enabling researchers and management to both benefit from the data received. In only two cases was the data accessible to the government only.

→ *Weaknesses and threats*

A weakness to ERS covered in this study is the absence of integration of the data collected by reporting to statutory databases, the Danish bivalve fishery and <15 m Andalusian vessels are the only legally required ERS case studies to do so. In total, nine of the fourteen interviewees who reported case studies did not have a direct link between the system used for the case study and a statutory database. A consequence for management using commercial ERS manufacturers is data can only be processed by the manufacturer's internal systems and/or analytical software, which must be paid for. Thus, manufacturers can become an 'intermediary' between vessel data and management as shown in the both the Irish and Scottish Razor clam case studies. The fragmentation of ERS data collection and the lack of continuity between the collection of these data and the statutory of common databases that could be used for fisheries compliance and management purposes is a significant weakness. The lack of clear guidance on the requirements and technical specifications for ERS in SSF across the EU or at Member State level is a concern expressed by interviewees from the United Kingdom, Denmark, Spain and the Netherlands.

Although there was a general consensus among interviewees that ERS offers benefits to fisheries management if implemented effectively, the principle of using ERS is not universally welcomed by fishers, many of whom regard this technology as intrusive and unnecessary. The need for ERS and what its use entails for the fishers have, in some cases, not been properly communicated by those trying to trial or implement ERS. In the absence of legislative pressure, it is unlikely that fishers will voluntarily install and use ERS. Privacy of data remains a significant concern for many fishers who consider their fishing activity and more specifically fishing locations to be commercially sensitive information that should not be shared. The price of equipment was also said to be a contributing factor to limiting the uptake of ERS.

From a management perspective, two interviewees noted that ERS can also result in more time being spent analysing data, particularly where for compliance purposes these data needed to be cross-referenced with sales notes. Furthermore, six trials highlighted various technical issues with their ERS, such as loss of GNSS signal, power supply inconsistencies, device breakdowns and miscommunications with manufacturers causing further delays. Concerning the use of AIS (Class B), the ability of fishers to turn off or operate the AIS in silent mode is an additional confounding factor.

→ *Recommendations for a standardised approach to data collection*

There is a need to take a broad view of the diverse drivers and potential solutions for delivering ERS across EU SSF. Some common themes emerge around the need to collect data that can be used for compliance, stock assessment, fisheries management and marine planning. Compliance and stock assessment are principally driven by statutory requirements. Fisheries management can be viewed more broadly and has more obvious benefits to the fishers themselves where it leads to greater operational flexibility, fairer or more transparent access to fishing grounds or economic return for example. Marine Planning increasingly requires the users of the marine environment to be able to demonstrate and to some extent justify their use of marine space. SSF is one of many users of our coastal waters, and fishers will need to collect data that can be used to

support their case for continued use of this resource in the face of competing demands such as Marine Protected Areas and marine renewable energy developments for example.

ERS falls into several categories, summarised below:

- The use of GNSS usually coupled to GPRS/GSM or satellite communications to capture and transmit temporal and spatial data which can be used to track vessel movement (in near real-time if required), infer where fishing is taking place and potentially be used to estimate the amount of gear deployed and the time the gear is actively fishing.
- Gear sensors such as hydraulic sensors, and RFID tags which are used to identify when the gear is being shot or hauled and to identify individual pieces of gear.
- CCTV or similar video monitoring equipment designed to provide a visual record of gear use, and fishing practices. The use of artificial intelligence and machine learning is extending the use of both moving and static image capture by allowing computers to automatically detect, enumerate and measure catch and bycatch.
- Increasingly, Apps on mobile devices such as phones or tablets are being used to allow fishers to record catch or bycatch data at sea. Some of these Apps are also linked to GNSS providing a temporal and spatial reference for the catch or bycatch data. Connections via GPRS/GSM also permits the real-time reporting of these data.
- Other technology has either been developed or is in development to facilitate fishers to collect biological data to feed into stock assessment – these include, for example, electronic measuring callipers and tables, video and laser-based recognition systems for automatically identifying species, sex, and size of the catch.

## 4.4 Review the RDBES core group's suggestion for storing of and estimation with SSF data in the RDBES

The main outputs from the RDBES core-group suggestion for the RDBES CL and CE data formats were presented and discussed, including the advice coming from the EU fishPi² Project considering RDBES and SSF data. A summary of the presentations and discussions could be found in Annex 6.

The main recommendations coming from this work is to introduce 'scientific' estimates in the CL and CE tables to be compared against "official" estimates which is considered as a first step to highlight SSF data gaps or data deficiencies. At WGCATCH, there was a discussion about the transparency of such 'scientific' estimates and if the hierarchy developed for biological estimates (where raw data will be asked to be able to reproduce the estimates at any time) could be used also for the SSF fishing activity data 'scientific' estimates (e.g. coming from an additional sampling approach) which will be asked in RDBES. The group agreed about the need for transparency but highlighted also the need to have the possibility to upload 'scientific' estimates as a first step emphasising the SSF data quality deficiencies and the different options used by countries to propose better estimates than the ones issued from 'official' data (e.g. coming from the control regulation). One option could be to give countries the possibility to explain the methodology they used to calculate the 'scientific' estimates. Explaining and sharing the different methodologies used would also be the first step to explore the possibility of fitting SSF raw data in the RDBES structure and calculating the estimates as part of the estimation system. There is also a need for a tight collaboration with the core group who has already developed the RDBES for commercial fisheries (industrial) to benefit from their experience and explore if SSF data could fit in.

The discussion also emphasized the value of the sampling approach which could be a mean to improve SSF data quality when the census approach does not work well. The different approaches used in countries to update/improve SSF data quality (e.g. sampling approach, data re-evaluation) should be shared to give other countries means to improve their SSF data.

Finally, the group agreed that there is a need to test the new proposed format for CL and CE tables and consider the possibility to have a specific TOR about that in the following WKRDB-POP.

## 4.5 ToR b.5) Review the new EU-MAP tables and variables in light of the SSF

The current EU MAP set in Commission Implementing Decision (EU) 2016/1251 is in force for the years 2017–-2019 and should, therefore, be revised. In view of ensuring sufficient time for its revision, the current EU-MAP has been extended for two years through Commission Implementing Decision C (2019) 1001 of 18 February 2019 and Commission Delegated Decision C (2019) 1848 of 13 March 2019.

With this objective in mind, WGCATCH SSF subgroup reviewed main meetings carried out during 2019 and the available reports covering this revision and possible updates concerning the new EU MAP proposal. The subgroup focused on the sections related to the SSF. The meetings considered were the RCG EU MAP review subgroup, held in May 2019 in Gent and the STECF meeting held in Brussel in September 2019 "Revision of the EU Multiannual Annual Plan for data collection (EU MAP) after 2020".

Several points were identified as relevant for the SSF under these reports:

i. A separate section under the EU MAP specific for the SSF
ii. SSF official definition to be considered for data collection purposes
iii. Some modifications to be introduced in the National Workplan Tables (NWT)

Below, the conclusions of the subgroup for each of the points mentioned:

**i. A separate section under the EU MAP specific for the SSF**

The subgroup agreed with the conclusions coming from the RCG subgroup. It was considered that there is not a need to incorporate a new section specifically for the SSF, and keep the Decision text general and flexible to consider all kind of fisheries. However, it was highlighted the need to be able to identify under the NWT the sampling effort and coverage of this fleet under the National sampling programmes. Also, when there are evidences that the data collected from this fleet are not of sufficient quality or coverage for the intended scientific used based on end-users needs, RCGs should be the responsible to undertake the actions needed.

**ii. SSF official definition to be considered for data collection purposes**

In the final report of the STECF meeting held in Brussels, it´s mentioned in section 2.3.4 "fishing activity, economic and social data", to adopt the SSF definition coming from the Council Regulation (EC) No. 1198/2006 on the European Fisheries Fund and the EU Regulation (EU) No 508/2014 on European Maritime and Fisheries Fund. These regulations define the SSF as fishing vessels of an overall length of less than 12 meters and not using towed gears.

WGCATCH support that in the context of data collection for fisheries management, a more practical and precise definition of SSF by vessel length overall (LOA) ranges (<10m, 10-12m and 12-15m) should be considered. This definition is sustained by WGCATCH ensuring consistency in time-series and being in line with the view of various expert meetings (e.g. in particular, the Data Collection Framework (DCF) Nantes workshop on SSF –"Common understanding and statistical

methodologies to estimate/re-evaluate transversal data in small-scale fisheries"(Anon. 2013)). This definition does not regard the type of gear (active or passive) since the issues related to data collection and calculation of fishing activity variables (e.g. fishing effort, volume and value of landings or catches) and biological data are similar for both. Moreover, this definition is well adapted in this context as relates to the different sources of data available for the different fleet categories at EU level considering the Control Regulation (Regulation (EU) No 1224/2009).

The under-10 m fleet is considered as a separate fleet segment concerning data collection because there is no Control Regulation obligation to supply EU logbooks for vessels under 10m (this applies to under-8 m vessels in the Baltic). The LOA class 10–12 meters is retained as a separate fleet segment to ensure consistency in time-series and because they are not under Vessel Monitoring System (VMS) regulation (which is critical for mapping of fishing activities for marine spatial planning or other purposes needing data at specific spatial resolution). It should be also noted that many countries have put exemptions in VMS data requirement inside the 12–15 m fleet segment so full VMS coverage of >12 m vessels cannot be assumed in many cases and the 12–15 meters fleet segment might also need to be retained for proper consideration of such cases.

**iii. Some modifications to be introduced in the National Workplan Tables (NWT).**
Concerning the proposal discussed in the STECF meeting about introducing new tables specific for the SSF and in particular to insert two new columns in the WP template for SSF fishing activity data: 'Number of vessels not covered by the Control regulation' and 'Planned coverage of data collected under complementary data collection (% of the number of vessels)', WGCATCH comments that it seems to be redundant with the already existing two following columns: 'Expected coverage of data collected under control regulation (% of fishing trips)' and 'Planned coverage of data collected under complementary data collection (% of fishing trips)' and push forwards for clarification. In the end, the subgroup was confused, and the objectives of these modifications were not clear. What the subgroup concluded was that what is relevant in those tables is the possibility of checking the coverage and incompleteness of SSF by different sampling programmes under the National Workplan.

## 4.6 Review the progress of the scientific paper (ToR b.6)

During its 2019 meeting WGCATCH subgroup on SSF continue to discuss the writing of a scientific paper that details the SSF work carried out by WGCATCH and draft a work plan to accomplish that task.

Intersessional, a first draft based on 1) the structure (main chapters) elaborated during the 2018 WGCATCH meeting and 2) the extended abstract written for the 2018 IFOMC conference proceedings, was elaborated to put it in discussion during the 2019 WGCATCH meeting.

A core group responsible for the finalisation of the paper was identified and completed during the 2019 WGCATCH meeting. Based on the draft, a discussion emerged about the sections/topics we want to be covered and the following have been selected: 1) Small-scale fisheries (SSF) definition; 2) SSF status, situation, characterization and importance; 3) SSF data collection, data gaps, data quality issues; 4) Guidelines for data collection on SSF; and 5) Recommendations/conclusions (in particular the usefulness of the innovative/electronic reporting systems in monitoring SSF). The countries to be covered in the paper were identified retaining all the EU and/or ICES countries meaning that all countries for which data have been collected from WGCATCH will be used for the paper. This includes data from non-EU countries but ICES members as Norway or data from EU Mediterranean/other regions countries (not ICES member) as Cyprus, Greece, France Mediterranean (FAO area 37) and France other regions (FAO area 31, 41, 51). The target journal "FISH and FISHERIES" was chosen (they have recently edited a similar paper coming from the ICES Working Group on Recreational Fisheries Survey).

Finally, a workplan has been elaborated to finalize the SSF paper in the following year:

1. Finalization of the draft (before the end of the year 2019).
2. First round of comments by the core group (until March 2020).
3. Identification of sections/topics' responsible for the finalization of a second draft taking into account the first round of comments (March 2020).
4. Second draft including bibliography (April 2020).
5. Second round of comments by the core group (until June 2020).
6. Finalization and final proofreading of the paper, formalization, first journal submission (autumn 2020).

## 4.7 Review and document sampling effort of biological data on SSF (ToR b.7)

In the last 3 years, the WGCATCH SSF subgroup mainly focused on the collection of fishing activity variables (landings by species and fishing effort) with the objectives 1) to ensure that the collection of fishing data from SSF across Europe are sufficient for main end-users needs, harmonised and comparable and 2) to improve their quality.

One of the goals of the next few years will be to follow the same objectives for the collection of SSF biological data (discards, length and age distributions, other biological parameters). As a first step, the subgroup aims to make a complete review of the ongoing sampling program across Europe and the potential existing issues associated for SSF. To do that, the subgroup developed a biological data sampling template questionnaire to be populated and completed for WGCATCH 2020. A first draft of the questionnaire was produced, but it will be finalised and completed intersessionally, and will be analysed during the 2020 WGCATCH meeting. As for previous questionnaire, the vessel length ranges retained will be the following detailed ones for SSF: <6 m, 6-8 m, 8-10 m, 10-12 m, 12-15 m and also >=15 m to be able to compare SSF and LSF status in particular about the data coverage. The questionnaire will focus on eventual data gaps/data deficiencies and data quality issues on SSF' biological data sampling. One part of the questionnaire will collect quantitative information about the current sampling results: How many trips have been sampled? Is there some specific metiers/vessel length ranges without any data sampled or with low data coverage? A second part will focus on qualitative information about eventual issues raised in the sampling: Is there some specific SSF' biological data sampling or is SSF include in a large biological data sampling program? Is-there some specific issues for biological data sampling for SSF?

# 5 Review developments in sampling and estimation of incidental by-catch, including Protected, Endangered and Threatened Species (PETS) and rare fish species (ToR c)

In order to deal with the workload connected to the implementation of sampling of Protected species (Protected, Endangered and Threatened Species: PETS) under the DCF, the WGCATCH 2019 ToR "Review developments in sampling and estimation of incidental by-catch, including Protected, Endangered and Threatened Species (PETS) and rare fish species" was addressed in a subgroup which included members from WGCATCH and WGBYC.

The work agenda contained the following ToRs:

1. Look over RDBES database set up (New database design, taking collection of incidental catches of protected species into account).
2. To review gear specific definitions of sorting, hauling and slipping for the implementation in on board protocols and the inclusion in the RDBES documentation of the data model for guidance.
3. Detailed instruction on how to sample protected species. Review the work developed in FishPi[7] and fill in the gaps.
4. Define codes for Specimen State in RDBES table with the following codes; dead/alive/wounded/unknown/damaged/looks-like-it-will-die, etc.
5. Discuss the need and relevance of an historical data call on incidental bycatch.

## 5.1 Comparative review of the RDBES Documentation, Data Model (v 1.17) and the annual WGBYC data call (ToR 1 and 5 of the PETS sub group)

The WGBYC data acquisition template for obtaining data (reporting template here; https://www.ices.dk/sites/pub/Publication%20Reports/Forms/DispForm.aspx?ID=36451 ) on incidental catches of PETS was compared to the RDBES structure and format with regards to assessing if the RDBES can provide a suitable alternative route for data underpinning various bycatch risk estimates carried out by WGBYC. For example, in relation to some data fields being mandatory or optional for reporting to the RDBES. The subgroup carried out this comparison in the awareness that the current WGBYC database has some weaknesses. It was originally intended to fulfill requirements that followed solely from council regulation (EC) No 812/2004 (2004). However, due to the expanding remit of WGBYC in recent years the database structure has been gradually developed in an ad hoc way to ensure the group can undertake bycatch risk estimates of a wider variety of protected taxa. This means there are now several versions of the WGBYC database covering different historical time periods. For this reason, and because the 812/2004 regulation was recently repealed (in 2019), the WGBYC database design would have to be comprehensively reviewed in the near future. An alternative possibility is that the RDBES

[7] Anon. (2019). Strengthening Regional Co-ordination in Fisheries Data Collection – The FishPi[2] Project Summary report (MARE/2016/22).

might provide a suitable repository for future data on incidental bycatch assuming the structure and format are appropriate for WGBYCs needs.

Evaluating the RDBES the following points were discussed.

- The possibility of including a data field about the type of data collection programme for example EU-MAP, dedicated bycatch programme, pilot project, research project.
- Include information on which specific monitoring method has been used. There are several methods to collect data on incidental bycatches such as on-board observers, Electronic Monitoring (EM), fisher self-sampling/reporting, logbooks or even a combination of those methods.
- Reporting on the use of mitigation measures for decreasing bycatch or discards should be mandatory. Mitigation methods could be commercial species sorting grids (or other selectivity devices), acoustic deterrent devices (pingers), seal excluder devices, turtle excluder devices etc.
- Departure date and arrival date should be mandatory fields for all data collection programme types, for example for observer sampling but also for EM sampling and fisher self-sampling/reporting or any combination of the above. This information is needed to estimate total "*days at sea"* which is an important metric in bycatch assessments considering multiple métiers.
- The number of fishing operations (hauls) should be mandatory.
- Detailed information about fishing durations/soak times should be mandatory.
- Geographical position should be mandatory, preferably latitude and longitude
- Detailed information on the length of nets or number of hooks/pots should be mandatory.
- Mesh size should be mandatory.

Discussions were also held regarding the importance of collecting more detailed fishing effort data for all vessel types. Bycatch of protected species are typically rare events, and even within dedicated bycatch monitoring schemes with relatively high coverage and targeted protocols, the chance of observing bycatch occurrences of some types of PETS is generally low and may therefore not provide a complete picture. More detailed spatial and temporal data on fishing effort provides information on possible areas and/or periods of high risk of incidental bycatch and is also needed for carrying out robust assessments of the impact of bycatch on PETS. In many member states, there is no or very limited information on fishing effort from small fishing vessels. Gear usage (number of hauls, length of nets or number of hooks/pots) per métier, as well as fishing durations (*days at Sea* and *hours fished*) for all vessel sizes is basic information needed for full scale bycatch risk estimates. Ideally, data would be aggregated by month because many PETS, for example some seabirds, exhibit significant seasonal distribution changes that are important to consider in bycatch mortality assessments.

The PETS sub-group also suggested applying the following changes to the description and naming of these fields within the RDBES:

1. **Separate the term "slipping" into "slipping" and "drop-out**" to highlight the important distinction between intentional and unintentional releases, this will also make instructions to on board observers more straightforward. In addition, this distinction is expected to improve the accuracy of recording of visual observation-coverage of incidental bycatch.
2. **Change "hauling" to "pre-sorting":** The original intention behind the inclusion of the term "**hauling"** in RDBES was to include any in-board activities prior to **"sorting**" of the catch, including e.g., cod-end opening and specimens discarded or landing on the deck

immediately after being brought on-board and before the sorting stage. To avoid ambiguity in terminology, the term **"pre-sorting**" was proposed as an alternative to "hauling" which might be interpreted as only recovery of the gear itself.

## 5.2 Gear specific definitions for the recording of PETS sampling (ToR 2)

The group discussed the level of detail that the gear specific definitions should contain. The discussion took place based on an example protocol for observations of incidental bycatch. The main issue is that the instructions for observers during onboard sampling should match the available fields in the database. However, the descriptions in the manual for the database should not be too detailed: it is impossible to describe every possible situation in each National fishery. It was agreed that the most important purpose of dividing visual observations into different stages/processes was to record an accurate measure/level of the visual coverage of each part of the fishing operation rather than to describe the circumstances of individual bycatch incidents. Essentially, the three processes for visual observation cover (1) the part of the fishing operation that happens outside of the vessel (checking for "slipping" and "drop-outs"), (2) the part where the catch comes on board (observation of "hauling/pre-sorting" operations, e.g., cod-end opening) and (3) the part where the catch is sorted (i.e., the "sorting" operations taking place, e.g., on a sorting table or conveyor belt).

Table 5.2. provides preliminary definitions of the four processes. These are primarily to indicate the level of detail that is required in the documentation of the data model for the RDBES. They will be reviewed by WGBYC.

**Table 5.2. Preliminary definitions of the four processes per gear type.**

| gear code | gear | sorting<br>Inside vessel | hauling/presorting<br>Inside vessel | slipping<br>outside vessel | drop-out<br>outside vessel |
|---|---|---|---|---|---|
| GNS/GTR | Gillnet | Typically the operations at Conveyor Belt or some sort of sorting platform; in smaller vessels, could be the sorting of catch spread over the deck | the process of hauling the string of nets; fish falls inside the boat; fish immediately thrown back by fishers would be here | ´--- | Typically individuals that fall into the water while the net is being hauled |
| LLS | Longl ines | Typically the operations at Conveyor Belt or some sort of sorting platform; in smaller vessels, could be the sorting of catch spread over the deck | the process of hauling the line with hooks; fish falls inside the boat; fish immediately thrown back by fishers would be here | ´--- | Typically individuals that fall into the water while the longline is being hauled |
| PS | Purse-seine rs | Typically the operations at Conveyor Belt or some sort of sorting platform; in smaller vessels, could be the sorting of catch spread over the deck | Typically the process of emptying (collecting; pumping) the closed ring net | Intenionally releasing fish/XXX from fishing gear before that gear is fully brought on board a fishing vessel | ´--- |
| OTM/PTM | Midwa | Typically the operations at Conveyor Belt or some sort of sorting platform; | Typically the opening of the codend in the hold or<br>the process of pumping the catch on board; fish immediately thrown back by fishers would be here | Intenionally releasing fish/XXX from fishing gear before that gear is fully brought on board a fishing vessel | Typically individuals that are released/discarded<br>without having come on board |
| OTB/OTT | Bottor | Typically the operations at Conveyor Belt or some sort of sorting platform; | Typically the opening of the codend in the hold or<br>the process of pumping the catch on board; fish immediately thrown back by fishers would be here | Intenionally releasing fish/XXX from fishing gear before that gear is fully brought on board a fishing vessel | Typically individuals that are released/discarded<br>without having come on board |
| FPO | Pots | Typically operation of inspection of the pots | the process of hauling the string of pots; fish falls inside the boat; fish | ´--- | Typically individuals that are released/discarded |
| DRB | Dredg | ? | ? | ? | |
| SB | Beach | Typically sorting operations at the beach | Not defined | If net is open in water, Intenionally releasing fish/XXX from fishing gear before that gear is fully brought on board a fishing vessel | |
| FPN | Pound | Typically sorting operation when the poundnet/trapnet has been emptied in the boat | the process of hauling the pound-net/trapnet; fish falls inside the boat; fish immediately thrown back by fishers would be here | ´--- | ´--- |

## 5.3 Detailed description on how to sample protected species (ToR 3)

Typically, observers working on-board fishing vessels are engaged in routine sampling of commercial species catches following standardised sampling protocols, however, bycatch incidents of PETS are usually fairly rare events, and thus require additional sampling protocols and routines to improve the accurate quantification of those occurrences. Sampling procedures for monitoring incidental bycatch of protected species within dedicated or DCF sampling schemes have been developed by the FishPi2 WP5 workgroup (James, 2019[8]), and are succinctly reviewed here. These procedures include the direct visual observations of PETS bycatch by observers, the use of video cameras by observers (e.g. to monitor for bycatch while they are undertaking sampling of commercial catches) and the possibilities offered by EM systems installed on vessels.

Overall, the set of instructions in the FishPi2[9] report represent a solid basis for developing adequate procedures for sampling PETS bycatch at a national level. In this section, we point out a shortlist of additional points that require attention.

At a national level, detailed training procedures for additional PETS sampling within catch sampling programmes needs to be implemented, so that any non-commercial bycatch is captured by the data collection procedures. To that end, providing specifically designed species identification manuals for observers should be encouraged. An example of what these manuals could be is available online from the French observers programme[10].

Some terms in the FishPi2 sampling protocol for PETS sampling should be defined more clearly to avoid possible confusion. For instance, it might be necessary to define and describe what constitutes an "obstruction" during observation, and in which circumstances this may hinder the observation process. Likewise, the categories slipping/hauling/sorting need to be in line with the definitions established by WGCATCH.

In terms of communication with the vessels skipper/crew, and how to prepare observers for possible difficulties regarding the collection of PETS bycatch data, project leaders should prepare observers for potentially difficult and detailed discussions with the skipper or crew so that observers are informed about what happens with the data. In this regard, the addition of an easy to read folder or factsheet describing why this data is collected and how it is used would be useful. Ensuring good communication will help ensure that the crew are willing to assist the observer in gathering PETS data. Occasionally, there might be possibilities for observers to bring PETS samples to shore. The observers should be aware of these options and any licensing requirements. For sanitary reasons, and to avoid the contamination of the rest of the catch, handling carcasses of PETS must follow a strict protocol, which will have to be developed at national level, and be designed for specific fisheries if necessary.

The use of additional cameras by observers – while they are busy with other catch sampling tasks would be an important improvement. However, it is necessary to allocate sufficient resources to be able to handle and properly analyse the collected video data during or after the trip(s).

---

[8] James, M.A., 2019. STRENGTHENING REGIONAL CO-ORDINATION IN FISHERIES DATA COLLECTION The fishPi2 Project Summary Report Annexes. https://www.masts.ac.uk/media/36784/annexes-to-the-main-fishpi2-summary-report-final-clean-21-08-19.pdf

[9] EU MARE/2016/22. Strengthening regional cooperation in Fisheries data collection, Anon. 2019. 69 pp.

[10] http://sih.ifremer.fr/Description-des-donnees/Module-Ressources-exploitees/Demographie-des-captures/Obsmer-Observation-sur-navires-de-peche/Manuels-formulaires/Manuels-et-protocoles

Moreover, if a bycatch of PETS that cannot be confidently identified to species level photographs should be taken in a way that can allow later species identification (including age and sex when possible). It was suggested that the recorded pictures are stored on a "public" storage (e.g. at ICES). These pictures should not provide information on the vessel identity, and/or the fishing location. Such a picture database could be used in the future to help the development of automatic species identification algorithms (e.g. Neural Network), which could be made available at the EU level. However, it was also noted that photos of bycatch events can potentially be accessed under Freedom of Information (FOI) requests and could therefore potentially cause serious problems to the relationship of industry with science even if they cannot be tied to individual vessels.

## 5.4 Specimen state (ToR 4)

The group discussed the codes to describe the state of bycaught specimens - SpecimenState. The group agreed that the codes list should be as simple as possible, but capable of describing all specimens states important for the proper assessment of the impact of bycatch. The following six codes were proposed:

- Dead – the specimen is dead.
- Impaired – the specimen has some type of injury or lack of reflexes
- Alive - the specimen was released alive to the sea.
- Mixed - a mixture of dead, impaired and/or healthy specimens in unknown proportion.
- Unknown – the observer was not able to note the state of the specimen but was expected to (e.g. specimens dropped of gillnets to the sea, especially on video footage).
- Not determined - the observer did not try to determine the state of the specimen.
- Decomposed (dead before caught) – bycaught carcass has marks (such predator or fishing gear marks) or is in such a condition that confirm it was dead before this fishing operation.

WGCATCH recommends that the codes for specimen state and the definitions thereof are further discussed. As they stand, the criteria needed to assess the state of the specimen are not clearly defined, which can lead to miss interpretations and ambiguity and therefore limits how this information can be used. This is particularly important if this field could be used to assess the impact of fishery in the by-catch. Therefore, WGCATCH recommends WGBYC to revise and propose a detailed and clear description for each specimen state code.

## 5.5 Historical data call on Bycatch

The need of an historical data call on incidental bycatch was discussed. Information on bycatch of cetaceans has been collected by dedicated observer programs and other monitoring programs since 2004 due to the requirements of council regulation (EC) No 812/2004 (2004). Since the regulation 812/2004 only concerns cetaceans, the data collected and subsequently submitted to the WGBYC database has been mainly for cetacean species. Thereby data regarding other taxa (e.g. birds, seals, fish and elasmobranchs) have not been continuously collected by many member states over that period. Since bycatch of many protected species are quite rare, there is generally a need for relatively high monitoring coverage to produce reliable bycatch rates and total mortality estimates. Regulation 812/2004 was repealed in August 2019 so the 2020 WGBYC data call (which will be requesting 2018 data) will be the penultimate data call obtaining data collected under regulation 812/2004. A further data call will be required in 2021 to obtain 2019 data. Due to data collection and reporting requirements data have not been continuously and consistently obtained by WGBYC for all protected species taxa historically. Consequently, there is a proposal to prepare a historical data call asking for fishing effort, monitoring effort and bycatch data for

all relevant taxa in a consistent format that is compatible with the new RDBES structure and format.

Since the RDBES is being developed to include bycatch of protected species it will be important that any historical data obtained is submitted in a form closely compatible with the new RDBES data so that the historical data can be seamlessly combined with future data. Therefore, there is a need for competence from both WGCATCH and WGBYC when developing the historical data call. The importance and the need of a historical data call was discussed in plenary, however, there was no immediate consensus regarding how to proceed.

# 6 Review and suggest developments of the Regional Database (RDB) from a design-based sampling and estimation perspective (ToR d)

During the WGCATCH 2019 meeting, the following topics were presented concerning RDBES (abstracts and following discussions can be found in Annex 7):

- **RDBES 2019 for WGCATCH**Henrik Kjems-Nielsen. Presentation on the current development stage of the RDBES and the roadmap for the next few years.
- **"Nevermind the RDB, here is the ES"** – David Currie. The presentation from David Currie described the possible options on how the estimation work will be carried out in the RDBES.
- **Outputs of the Workshop on Populating the RDBES data model (WKRDBES-POP)** – Edvin Fuglebakk
- **Workshop on Estimation with the RDBES data model (WKRDB-EST) –** Nuno Prista
- **Accommodation of incidental by-catch in the new RDBES** – Bram Couperus, Nuno Prista and Sara Konigson.
- **RDBES effort and landings data format** – Josefine Egekvist
- **Small Scale Fisheries in the RDBES, WP5 in fishPi2** – Lucia Zarauz and Josefine Egekvist (summary can be found in Annex 6)

The work that we started developing this year under ToR a.2 - *Best practice guidelines for choosing methods and variables used to expand commercial sampling data* will contribute and feed into the development of the RDBES. The documentation of the current estimation procedures will contribute to the prioritization of the estimation methods to be implemented as standard methods in the RDBES system. The series of practical workshops, proposed by WGCATCH, on estimation procedures for the next 3 years to produce best practice guidelines for choosing methods and variables used to expand commercial sampling data will also contribute to the development of the RDBES, as they will focus on the best statistical methods to expand the commercial sampling data.

# 7 Liaise with other ICES groups (e.g. EOSG, WGBIOP, WGRFS, and PGDATA), RCMs/RCGs, the LM, and research projects that deal with commercial catch data (ToR e)

Before the meeting, the WGCATCH chairs requested presentations from the chairs of WGBIOP, PGDATA and WGTIFD. Accordingly, the following presentations took place during the WGCATCH 2019 meeting:

- **Planning group on Data needs for Assessment and Advice—PGDATA** (February 2019, Nantes, France). Laurent Dubroca (on behalf of chair of PGDATA).
- **Working Group on Biological Parameters—WGBIOP** (October 2019, Gent, Belgium). Uwe Krumme (on behalf of the chairs of WGBIOP).
- **Working Group on Technology Integration for Fishery-Dependent Data—WGTIFT** (May 2019, Copenhagen, Denmark). Brett Alger (co-chair of WGTIFT).

The presentations were followed by plenary discussions on improvements of communication and increased interaction between WGCATCH and these EGs. Summaries of the presentations can be found in Annex 8.

# 8 Collaborate in the advisory process by liaising with assessment groups and benchmarks on commercial catch issues (ToR f)

It has been recognized by WGCATCH and other ICES EGs, in particular the assessment EGs, the importance of commercial data quality which underpins stock assessment and advice.

During the last three years, WGCATCH has increased its role in the benchmark and data call process, which resulted in the format of WKCELTIC, with its three meetings (instead of two[11]). WGCATCH proposed to include additional ToRs in the WKCELTIC 2019–2020 benchmark on Celtic Sea haddock, cod, and whiting to cover the review on the national sampling programmes and estimation before data submission, and provide general guidelines for commercial data compilation at the regional level (i.e. stock). This benchmark included three meetings: 1) Data evaluation (Galway, February 2019); 2) Data compilation (ICES, Copenhagen, October 2019); 3) Assessment benchmark (Copenhagen, February 2019).

However, this process is not in place for all benchmarks and there is a need to create the mechanism, together with the assessment EGs and ICES, to develop a concrete means to incorporate the sampling and estimation procedures in the assessment, in particular during the benchmark process.

**WGCATCH recommends that the current benchmark process be reviewed to include a data evaluation workshop before the data compilation workshop to document and harmonize methodologies to commercial catch data (including revising thresholds, fleet definitions, ALK estimations, etc.) for national data submission.**

[11] Namely, data compilation and benchmark assessment.

# Annex 1: List of participants

| Name | Country |
|---|---|
| Maciej Adamowicz | Poland |
| Liz Clarke | United Kingdom |
| Anne-Sophie Counou | France |
| Bram Couperus | Netherlands |
| Jessica Craig | United Kingdom |
| Michiel Dammers | The Netherlands |
| Sébastien Demanèche | France |
| Laurent Dubroca | France |
| Josefine Egekvist | Denmark |
| Jon Elson | United Kingdom |
| Ana Cláudia Fernandes | Portugal |
| Edvin Fuglebakk | Norway |
| Karolina Molla Gazi | Netherlands |
| Giorgos Gitarakos | Greece |
| Gildas Glemarec | Denmark |
| Wlodzimierz Grygiel | Poland |
| Kirsten Birch Håkansson | Denmark |
| Tiainen Joni | Finland |
| Allen Kingston | United Kingdom |
| Henrik Kjems-Nielsen | Denmark |
| Sara Königson | Sweden |
| Maksims Kovsars | Latvia |
| Uwe Krumme | Germany |
| Kelly Macleod | United Kingdom |
| Ana Marçalo | Portugal |
| Estanis Mugerza | Spain |
| Nuno Prista | Sweden |

| | |
|---|---|
| José Rodriguez | Spain |
| Hanne W. Rognebakke | Norway |
| Ana Ribeiro Santos | United Kingdom |
| Sven Stötera | Germany |
| Sofie Vandemaele | Belgium |
| Rita Vasconcelos | Portugal |
| Jon Helge Vølstad | Norway |
| Adam Woźniczka | Poland |
| Lucia Zarauz | Spain |

# Annex 2: Resolutions

**2016/2/SSGIEOM23 -** A **Working Group on Commercial Catches (WGCATCH)**, chaired by Kirsten Birch Håkansson*, Denmark, and Ana Ribeiro Santos*, United Kingdom, will work on ToRs and generate deliverables as listed in the Table below.

**WGCATCH 3 Year Cycle Meetings**

| | Meeting dates | Venue | Reporting details | Comments (change in Chair, etc.) |
|---|---|---|---|---|
| Year 2017 | 06-10 November | Kavala, Greece | Interim report by 15 January to SSGIEOM | Ana Ribeiro Santos (UK) is new co-chair for 2017-2019; Nuno Prista (SWE) ends 3-yr term as chair; new co-chair will be appointed |
| Year 2018 | 05-09 November | Nicosia, Cyprus | Interim report by 15 January to SSGIEOM | Kirsten Birch Håkansson, Denmark new co-chair |
| Year 2019 | 05-08 November | Gdansk, Poland | Final report by 31 January to SSGIEOM | Ana Ribeiro Santos (UK) ends 3-yr term as co-chair; new chair will be appointed |

**ToR descriptors**

| ToR | Description | Background | Science Plan topics addressed | Duration | Expected Deliverables |
|---|---|---|---|---|---|
| a | Review current and emerging statistical and technical developments in sampling, estimation and quality control of commercial catch data, focusing on total catches, length and age distributions and other biological parameters of ICES stocks | WGCATCH is the most recent of a long series of EGs that have addressed the quantity and quality of sampling of commercial catches in ICES waters [e.g., WKACCU, WKMERGE, PGCCDBS, SGPIDS, and WKPICS]. Relatively less attention has been put by ICES into the estimation of catches. The recently approved EU MAUPs represent considerable progress towards statistically sound sampling and will significantly change biological data collection of landings and discards in many ICES member countries [WGCATCH 2016]. The generalized application statistical sound sampling and regional coordination is expected to improve accuracy and transparency of data received and is the right set-up for the implementation of up-to-date standardized methods of estimation within ICES; but guidance and training of staff, the monitoring of sampling levels and data quality, and the documentation of changes made to sampling design and estimation procedures, need to be increased, particularly | 25, 26, 27, 31 | 3 years | Templates for routine description of sampling designs and estimation methods (2017)<br>Documentation of sampling designs and estimation methods for selected stock(s) (2017)<br>Compilation of importance of national landings in foreign ports (2017)<br>Compilation of methods for evaluating quality of frequency data (2017)<br>R-Script for within-sample optimization of length and age sampling (2017)<br>Best practice guidelines for sampling national landings in foreign ports (2018)<br>Compilation of methods and variables used to expand commercial sampling data (2018)<br>Best practice guidelines in data request and |

| ToR | Description | Background | Science Plan topics addressed | Duration | Expected Deliverables |
|---|---|---|---|---|---|
| | | during the transition stage. Guidelines will also be needed to drive the calculation of expected number of samples for the new probabilistic designs and their appropriate communication to end-users of data alongside algorithms that facilitate definition of sampling targets in multi-purpose resource-limited labs. In 2016 a request to evaluate how national landings in foreign ports are being sampled was sent by LM 2016 to WGCATCH that will now be addressed. | | | provision for frequency data (2018)<br>Routine documentation of estimation methods (2018)<br>Guidelines for the choice of methods and variables used to expand commercial sampling data (2019)<br>Theme Session in ICES ASC (2019)<br>Annual chapter in report detailing work progress, next work-plan and deliverables<br>Annual update of list FAQs on best practice and guidelines for sampling, estimation and quality control.<br>Annual update of list of contacts involved in sampling, estimation and quality control.<br>Annual update list of references in commercial catch sampling and estimation issues |
| b | Review developments in sampling and estimation practices of catch, effort, length and age distributions and other biological parameters of small scale fisheries | Small-scale fleets (SSF) are an important component of ICES coastal fisheries which data collection is increasingly being regionalized. To date, the data of SSF are still plagued with biases (e.g., lack of coverage) and lack of standardised concepts (e.g., fishing day, see WKTRANSVERSAL2, 2016) that jeopardize recognition of their significance and use in stock assessments. WGCATCH has previously compiled information on SSF and drafted best practice guidelines for data collection on these fisheries [WGCATCH 2015, 2016]. WG effort is now needed in a) monitoring the implementation of those guidelines and advise on regionalization of data collection, b) standardize reporting and RDB formats, c) define quality indicators for SSF sampling and census, d) improve knowledge-sharing on | 25, 27, 28, 31 | 3 years | List of FAQs on implementation of best practices and guidelines (2017)<br>Documentation of fishing effort definitions used in ICES (2017)<br>List of quality indicators for SSF (2018)<br>Proposal for standardization of fishing effort (2018)<br>Annual update of list of FAQs on implementation of best practices and guidelines<br>Annual chapter in report detailing work progress, next work-plan and deliverables |

| ToR | Description | Background | Science Plan topics addressed | Duration | Expected Deliverables |
|---|---|---|---|---|---|
| | | new data collection technologies useful for SSF. | | | |
| c | Review developments in sampling and estimation of incidental by-catch, including Protected, Endangered and Threatened Species (PETS) and other rare fish species | The sampling and estimation of incidental catches of PETS and other rare species in commercial fisheries has been a long-term ICES concern and is now mandatory under the new EU MAUP. WGBYC and WGCATCH are two ICES EGs involved in data compilation and estimation of such rare events and impacts and have been collaborating closely to ensure that by-catch is properly sampled and estimated in DCF amd EU-MAUP at-sea programmes. Recent work by WGCATCH [WGCATCH 2016] has highlighted substantial additional margin for collaboration between the two groups, in the fields of sampling protocols and design and estimation of rare events like incidental by-catches. | 25, 27, 28, 31 | 3 years | Report from WK on sampling of incidental by-catch (2018)<br>Report from WK on estimation of incidental by-catch (2019)<br>Theme Session in ICES ASC (2019)<br>Annual chapter in report detailing work progress, next work-plan and deliverables |
| d | Document and review changes in legislation that affect data collection and data quality and evaluate their impacts | Regulation (EU) No 1380/2013 will progressively eliminate discards in many ICES fisheries through the introduction of a landing obligation for catches of species subject to catch limits. The regulatio has been phased-in since 1st January 2015 with full implementation expected for 1st of January 2019 and has brought about significant changes to the reporting of total commercial catches and the sampling of commercial catches in ICES waters [WGCATCH 2014-2016]. Furthemore in 2017 the first EU-MAUP will be implemented and the pace of transition to statistically sound sampling is expected to increase. The complexity of these processes has been followed up closely by WGCATCH through routine ToRs with the group meetings acting as fora where difficulties and changes can be reported, advice for sampling and estimation obtained and recommendations on best practice or data quality issues to both national laboratories and end-users. | 25, 27, 31 | Routine ToR | Annual chapter in report detailing routine support and recommendation of best practice to data collection, end-users and legislative bodies |

| ToR | Description | Background | Science Plan topics addressed | Duration | Expected Deliverables |
|---|---|---|---|---|---|
| e | Review and suggest developments of the Regional Database (RDB) from a design-based sampling and estimation perspective | The RDB is a fundamental tool to ensure the quality and transparency of commercial catch data used by ICES. WGCATCH has always been involved in the support of the RDB and advising its development. The ICES Data Center has recently been awarded significant funding for the RDB development in 2017-2018. The funding will ensure development of a new RDB that encompasses statistically sound sampling and estimation of commercial catches and can be used to provide data for assessment EGs. The ICES Data Centre and SC-RDB have requested WGCATCH to continue advising RDB development and ensuring the development encompasses statistically sound sampling schemes and proper methods of estimation. | 25, 31 | Routine ToR | Annual chapter in report detailing outcomes of RDB related WKs and routine liaison and support to SC-RDB and the ICES Data Center |
| f | Liaise with other ICES groups (e.g., WGBIOP, WGRFS, PGDATA and SSGIEOM), RCMs/RCGs, the LM and research projects | WGCATCH links with ACOM, SCICOM, SSGIEOM, EGs under SSGIEOM (e.g., PGDATA, WGBIOP) and the ICES secretariat to inform ICES policies and guidelines on quality and quantity of catch data. WGCATCH further links and obtains information from research projects that address sampling and estimation of commercial catches | 25, 26, 27, 28, 30, 31 | Routine ToR | Chapter in report summarizing liason initiatives and the main research project results |
| g | Collaborate in the advisory process, informing assessment groups and benchmarks on commercial catch data issues. | Commercial catch data is a major input to ICES stock assessments. The accuracy of commercial catch data is highly dependent on the quantity and quality of the sampling and estimation carried by at national level and stock coordinatation level. WGCATCH deals with sampling design, estimation and quality of commercial catch data that enters assessment and is therefore a key-player in informing on the quality of the time series used and suggesting improvements to sampling and estimation methods. Over 2017-2019, WGCATCH will phase-in a more active participation in the assessment and benchmark processes. | 25, 26, 27, 30, 31 | Routine ToR | Chapter in report summarizing collaboration initiatives |

| ToR | Description | Background | Science Plan topics addressed | Duration | Expected Deliverables |
|---|---|---|---|---|---|
| h | Identify research needs, amend work-plan and propose workshops, training courses and study-groups and review their outcomes | | 25, 27, 31 | Generic ToR | Chapter in report summarizing research needs;<br>Chapter in report detailing ToRs for of workshops, study groups and training courses |
| i | Respond to recommendations to WGCATCH from ICES expert groups<br>RCMs, liaison meetings or other groups. | | 25, 26, 27, 28, 30, 31 | Generic ToR | Chapter in report detailing work progress |
| j | Ensure, where appropriate, that systems are in place to quality assure the<br>products of WGCATCH. | | 25, 26, 27, 28, 30, 31 | Generic ToR | Chapter in report detailing work progress |

**Table 2 Summary of Workplan**

| | |
|---|---|
| Year 1 | ToR a)<br>Intersessional work on templates for description of sampling schemes and estimation methods; test the templates in selected stock(s) (note: in separate WK: WKSDECC I ) and discuss results at the meeting;<br>Compile information on the importance of national landings in foreign ports and discuss implications at the meeting<br>Compile information on methods for evaluating quality of frequency data and discuss implications at the meeting<br>Produce R-script for within-sample optimization of length and age data (note: in separate WK: WKBIOPTIM) and discuss results at the meeting<br>Compile list of FAQs on implementation of best practice and guidelines on data collection and estimation and quality control of commercial catches<br>ToR b)<br>Intersessional work quality indicators and data quality checks using case-studies; Compilation information of the quality indicators used in different member countries<br>Intersessional work on documentation of fishing effort definitions used in different member countries; discussion at the meeting<br>Compile list of FAQs on implementation of best practice and guidelines on SSF data collection<br>ToR c)<br>Intersessional liaison with WGBYC and draft ToRs for a WK that addresses sampling of incidental by-catches and rare species; discussion of ToR proposal at the meeting<br>ToR d)<br>Review changes and adaptations of sampling design and estimation methods caused by the implementation of the landing obligation<br>Review changes in data availability and quality, sampling plans, estimation methods and quality assurance procedures, caused by the implementation of the new EU-MAUP<br>ToR e)<br>Follow-up and review the outcomes of the RDB related WK |

| | |
|---|---|
| Year 2 | ToR a)<br><br>Intersessional drafting of best practice guidelines for the sampling of national landings in foreign ports; discuss guidelines at the meeting;<br><br>Create and circulate a questionnaire that compile methods and variables used to expand commercial sampling data; discuss results and implications at the meeting;<br><br>Intersessional draft of best practice guidelines for data requests and data provision of frequency data; discuss guidelines at the meeting;<br><br>Expand documentation of sampling designs and estimation methods to additional stocks (interessional or in separate WK);<br><br>Documentation and update of list of FAQs on implementation of best practices and guidelines on data collection and estimation and quality control of commercial fisheries<br><br>ToR b)<br><br>Intersessional drafting of proposal for quality indicators on SSF; discussion of proposal during the meeting<br><br>Intersessional drafting of proposal for definitions of fishing effort; discussion of proposal during the meeting<br><br>Documentation and update of list of FAQs on implementation of best practices and guidelines on SSF data collection<br><br>Discussion of new technologies and research projects involving SSF<br><br>ToR c)<br><br>Intersessional liaison with WGBYC and draft ToRs for a WK that addresses estimation of incidental by-catches and rare species; discussion of ToR proposal at the meeting<br><br>ToR d)<br><br>Review changes to data availability and quality, sampling plans, estimation methods and quality assurance procedures, motivated by the implementation of the landing obligation<br><br>Review changes to data availability and quality, sampling plans, estimation methods and quality assurance procedures, motivated by the implementation of the new EU-MAUP<br><br>ToR e) to l)<br><br>Other routine and generic ToRs that will be dealt with on a yearly basis by WGCATCH |
| Year 3 | ToR a)<br><br>Intersessional drafting of guidelines for the choice of methods and variables used to expand commercial sampling data; Discuss guidelines at the meeting<br><br>Intersessional drafting of proposal for theme session in ICES ASC 2020; discussion of proposal at the meeting<br><br>Expand documentation of sampling designs and estimation methods to additional stocks (interessional or in separate WK);<br><br>Documentation and update of list of FAQs on implementation of best practices and guidelines on data collection and estimation and quality control of commercial fisheries<br><br>ToR b)<br><br>Intersessional work on regional database requirements to hold and estimate SSF data; discussion of those requirements during the meeting<br><br>Documentation and update of list of FAQs on implementation of best practices and guidelines on SSF data collection<br><br>Discussion of new technologies and research projects involving SSF<br><br>ToR c)<br><br>Intersessional liaising with WGBYC and drafting of proposal for theme session in ICES ASC 2020; discussion of proposal at the meeting<br><br>ToR d)<br><br>Review changes to data availability and quality, sampling plans, estimation methods and quality assurance procedures, motivated by the implementation of the landing obligation<br><br>Review changes to data availability and quality, sampling plans, estimation methods and quality assurance procedures, motivated by the implementation of the new EU-MAUP |

| |
|---|
| ToR j)<br><br>Review the current status of issues, achievements and developments that fall under the remit of WGCATCH, identify future needs in line with the ICES objectives and Science Plan and the wider marine environmental monitoring and management within ICES and propose a future/alternative work plan<br><br>ToR e) to l) (except j)<br><br>Other routine and generic ToRs that will be dealt with on a yearly basis by WGCATCH |

**Supporting information**

| | |
|---|---|
| Priority | WGCATCH supports the development and quality assurance of regional and national catch sampling schemes and estimation procedures that can provide reliable quality input data to stock assessment and advice, while making the most efficient use of sampling resources. As catch data are the main input data for most stock assessments and mixed fisheries modelling and an essential component of analysis of ecosystem effects of fisheries, especially with regard to the application of the Precautionary Approach, these activities are considered to have a very high priority. |
| Resource requirements | The research programmes which provide the main input to this group are already underway, and resources are already committed. The additional resource required to undertake additional activities in the framework of this group is negligible.<br><br>WGCATCH builds extensively on experiences gained within PGCCDBS,<br><br>WKACCU, WKPRECISE, WKMERGE, WKPICS, SGPIDS, WGRFS and previous WGCATCH work in period 2014-2016. European countries are encouraged to provide the WG with any requested documentation of their sampling programmes and manuals, estimation methods, quality assurance procedures, for review and feedback by the WG, and to ensure that their national members of WGCATCH have sufficient resources to conduct the necessary intersessional work to address the ToRs. 1-2 top-level experts in the area of statistically sound sampling and estimation will be invited to attend the meeting and review the quality of final outputs of WGCATCH. |
| Participants | The Group is normally attended by some 30–40 participants, including members, invited guests and 1-2 external experts. |
| Secretariat facilities | None. |
| Financial | Member States may fund this through their EMFF programme. ICES funding (travel funds, per-diem) are required to ensure the participations of 1-2 external experts. |
| Linkages to ACOM and groups under ACOM | WGCATCH falls under the joint ACOM/SCICOM steering group on integrated ecosystem observation and monitoring (SSGIEOM), and supports the ICES advisory process by promoting improvements in quality of fishery data underpinning stock-based and mixed fishery assessments, and ecosystem indicators related to fishery affects, and in developing data quality indicators and quality reports for use by assessment EGs and benchmark assessments. |
| Linkages to other committees or groups | There is a very close working relationship with all catch-related EGs and end-users including WGBIOP (in relation to collection of stock-based biological variables from fishery catches), PGDATA (in relation to data requirements of stock assessment EGs and benchmark assessment groups, optimization of catch sampling programmes and communication of quality information on commercial catch data), WGBYC (in relation to the sampling design and estimation of PETS and other incidental by-catches), RCM/RCGs and the Liaison Meeting (e.g., in relation to data requirements and regional sampling designs), the SC-RDB and the ICES Data Centre (in relation to RDB issues), STECF EWGs dealing with EU-MAP and other legistalitive changes that impact catch sampling and JRC (in relation to data provision from commercial catch sampling programmes). |

| | |
|---|---|
| Linkages to other organizations | The work of this group is closely aligned with similar work in FAO, GFCM, CECAF, NAFO/NEAFC and in the Census of Marine Life Programme. |

# Annex 3: WGCATCH proposal for intersessional workshops in 2020/2021

**2019/2/EOSGXX** The **Fourth Workshop on Optimization of Biological Sampling (WKBIOPTIM 4)** chaired by Patricia Gonçalves (Portugal) and Isabella Bitetto (Italy) will meet in Bari-Italy, XX-XX XXX(TBD) 2020 to:

a) Continue research into quality indicators of length and age frequency data by i) testing the different indicators and quality thresholds using simulations and ii) preparing an R-package with the functions used to calculate them; (Science Plan codes: 3.3);
b) Continue developing open source code for generic use, packaging and documenting all tools, and assess compatibility of tools with use of standard data formats and sources; (Science Plan codes: 3.2);
c) Continue to provide support on the use of WKBIOPTIM tools with the aim of a future optimization at national/stock/regional levels. (Science Plan codes: 3.2 and 3.3).

WKBIOPTIM 4 will report by XX(TBD) September to the attention of the Ecosystem Observation Steering Group, ACOM and SCICOM.

**Supporting Information**

| | |
|---|---|
| Priority | This workshop is considered to have a high priority for already established and new commercial fishery and survey sampling programmes developed under the EU-MAP, or for any fisheries data collection schemes with similar scope. The expectation is that tools, in the form of R-scripts and packages, will help save sampling resources (time and costs) at the regional level, with implementation of schemes at the national level. The tools will provide insights into the impact of reduction in sample sizes on the quality of data from commercial and research surveys. Such data-informed approaches will be fundamental to free up and/or organise the use of resources to increase data provision on data-limited stocks, protected species and environmental variables. Basic scripts were developed in WKBIOPTIM and WKBIOPTIM2. WKBIOPTIM3 improved their documentation and started their implementation on case-studies of commercial sample data from different countries. There is now the need to further investigate the quality indicators used, create extensions on the scripts that allow them to run also with data from other sources (e.g. DATRAS), compile and document the work developed and, at the same time, continue to provide support on the use of WKBIOPTIM tools with the aim of a future optimization at national/stock/regional levels. WKBIOPTIM 4 proposes to fulfil these goals. |
| Scientific justification | Statistical sound sampling is a requirement of the new EU-MAP that specifies that "where data are to be collected by sampling, Member States shall use statistically sound designs" (COM IMPL DEC 2016/1701). Certainly, this is a requirement for any sampling scheme, also outside the EU. 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. There is an increasing demand 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 and biological information. This makes optimisation 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 variables. It is important that the national laboratories of MS have common tools to quantify the effects, advantages and disadvantages of different sampling intensities and sampling designs so they can optimise sampling in terms of time and costs savings. Several ICES EG's, including e.g. WKPRECISE 2009, PGCCDBS 2012, PGDATA 2015 and WKCOSTBEN 2016 have pointed out that clustering effects in multistage catch sampling programmes may lead to effective sample sizes much lower than the number of units sampled, e.g. fish caught during one trip or haul often have more similar characteristics than the general population of fish they came from. This effect highlights the likely existence of oversampling in the lower stages of many national catch sampling programmes (e.g. trips, hauls within trips, |

| | |
|---|---|
| | samples within hauls), where an excessive number of individuals may be sampled without accruing significant additional information to estimates provided to end-users.<br><br>The Workshops on Optimization of Biological Sampling (WKBIOPTIM 1, 2, and 3) developed, improved and tested a set of R-scripts (mostly based on the RBD exchange format) producing a range of statistical and graphical outputs to be used for discussion of appropriate levels of biological sampling of different stocks. Data quality indicators of the biological variables under the optimization procedures carried out at the workshops were discussed and a roadmap for future discussions with end-users outlined. Given the positive feedback both from national labs, RCG's and other WGs it is recommended that a fourth workshop takes place to develop further research on quality indicators, make the input formats more versatile (adapting them to DATRAS) and guide MS on the adequate use of the optimization tools. WKBIOPTIM4 is a joint workshop that aims to bring together experts from WGCATCH, WGBIOP and different survey WGs with the main results being brought back by participants to discussion in those WGs. WKBIOPTIM4 aims to: continue research into quality indicators of length and age frequency data by i) testing the different indicators and quality thresholds using simulations and ii) preparing an R package with the functions used to calculate them (ToR a); continue developing the code for generic use, packaging and documenting all tools, and assess compatibility of tools with use of standard data formats and sources (ToR b) and continue to provide support on the use of WKBIOPTIM tools with the aim of a future optimization of the national/stock/regional levels (ToR c). |
| Resource requirements | The data collection programmes which provide the main input to this group are already underway, and resources are already committed. All EU countries already have the commercial datasets required for analysis available in the RDB format. Survey data are readily available and a function was developed during WKBIOPTIM 1-3 to format those data to match the RDB outputs (or R-tools inputs) as required. Inputs from relevant experts for adapting the methodologies to surveys sampling design are envisioned. Preparation work on the development and documentation of the R-package(s) will be required prior to the meeting and it is expected that people involved can give the input from the case studies for the compilation of a guide with a set of rules for an adequate use of these optimization tools by national institutes. It is expected that the work proposed will only be finalised after the workshop and more time will be needed before reporting. |
| Participants | The Workshop is expected to attract wide interest from those involved in WGCATCH and WGBIOP and should include a subset of participants familiar with R-coding to the level of "loop coding" and "function building" and a subset of participants experienced in age and reproduction analysis. In view of its relevance to data collection within ICES, the EU-MAP and regional sampling designs, it should include those involved in the annual planning of sampling and laboratory analysis. Members of survey groups located under EOSG should also be among the participants. |
| Secretariat facilities | Some secretarial support will be needed. The WK should take place in 2020. Therefore it will need to be approved by ACOM and SCICOM in early 2020. |
| Financial | Member States may fund this through their EMFF programme |
| Linkages to advisory committees | ACOM and SCICOM |
| Linkages to other committees or groups | WGCATCH, WGBIOP, PGDATA, EOSG, Survey WGs (IBTS, IBAS, etc.) |
| Linkages to other organizations | RCGs. GFCM |

**2019/2/EOSGXX** The **Workshop on Estimation of Commercial Catches I – Ratio estimators (WKRATIO)** chaired by Liz Clarke (UK-Scotland) and Laurent Dubroca (France), will meet in XXX, 8–12 (TBD) February 2021 to:

*Note for reviewing: The purpose is not to recreate old national estimators that will be under the SCRDB. The purpose is to develop our present ratio estimators e.g. considering the design.*

d) Develop ratio estimator algorithms for length and age for landings and discards, that follow the sampling design, using RDBES exchange format.
e) Present outcomes at the next WGCATCH meeting

WKRATIO 4 will report by XX XXX(TBD) to the attention of the Ecosystem Observation Steering Group, ACOM and SCICOM.

**Supporting Information**

| | |
|---|---|
| Priority | This workshop is considered to have a high priority to support the development of the RDBES, by developing improved ratio estimatos methods that increase the transparency and the quelity of the estimates used in the assessment groups, and it will be used as estimation routines in the RDBES. |
| Scientific justification | Currently, most countries use ratio estimators for their national estimation of commercial catch data. Recent discussions at WGCATCH and other EGs have increasingly highlighted that estimation techniques currently used by many countries to process commercial catch data may not be the most up-to-date and/or ignore sampling design and/or are far from transparent and standardized and involve significant levels of ad-hoc decisions. One of the focus for the next 3 years is to produce best practice guidelines for choosing methods and variables used to expand commercial sampling data (algorithms, tools for analyzing the appropriateness of using the specific estimator: Ratio estimators; estimation of variance (e.g. design based, bootstrap). |
| Resource requirements | Participants are requested to document sampling designs and estimation methods ahead of the meeting according to a supplied format; and to bring to meeting a) commercial catch data: landings and sampling catch data stored in the latest RDBES exchange format.<br>Participants should have prior experience in statistically sound sampling and/or estimation and/or r-scripting. |
| Participants | The target attendance are participants from member countries involved in providing commercial catch data to the assessment groups and use ratio estimators for their discard and biological estimtes. 10-20 participants are expected to attend. |
| Secretariat facilities | Some secretarial support will be needed. |
| Financial | Member States may fund this through their EMFF programme |
| Linkages to advisory committees | ACOM and SCICOM |
| Linkages to other committees or groups | WGCATCH, PGDATA, SCRDB and associated RDBES group. |
| Linkages to other organizations | RCGs. GFCM |

# Annex 4: Summaries from the WGCATCH related workshops and projects (ToR a.1)

**Workshop on Optimization of Biological Sampling (WKBIOPTIM3)** *Ana Claúdia Fernandes*

The third Workshop on Optimization of Biological Sampling (WKBIOPTIM3) convened to discuss practical aspects of optimization of sampling and provide a compilation of methods so that this information is well documented and organized for end users. New optimization algorithms were presented alongside developments and improvements of the work carried out in the earlier 2017 and 2018 workshops. Six different approaches/tools were presented: code developed under WKBIOPTIM 1 and 2 for optimization at sample level (SampleLevelOptim), SampleOptim Rtool to optimize fish sampling for biological parameters, code for quantifying robustness of a length frequency distribution shape (SampleReferenceLevel), SDTool and BioSimTool as contributions from the STREAM Project to the optimization at sample-level and sampling design level, respectively, WKBIOPTIM code used for optimization at sampling design level (SimPop). Additionally, data exploration and biological simulation tools developed under the framework of fishPi2 (FishPi4WKBioptim). R-scripts for the different tools are available on the WKBIOPTIM3 GitHub (https://github.com/ices-eg/wk_WKBIOPTIM3).

Usability testing, including thorough instructions, were a focus of the workshop. As such, the group used a two-tiered system to evaluate the methods. The first subgroup tested the different scripts with their own data to see if they were of easy use. This first group also evaluated the documentation needed and whether it was clear how to interpret the results properly, how to decide on the best procedure according to their objectives, and how to compare results obtained using similar approaches. Based on this assessment, the second subgroup then cleaned and documented the code, discussing the approaches used in the different scripts and potential options for integration. In parallel, some participants developed a first draft of standardized notation aimed at harmonizing the documentation of simulation procedures used in the different codes, tested a new quality indicator for length frequency and developed scripts that demonstrate the effects of the common options of resampling 'with replacement' (wr) and 'without replacement' (wor) in the precision and bias of estimates. The workshop concluded with participants highlighting that specific documentation regarding quality indicators concepts and functions could also be very practical and useful for end users. Work of WKBIOPTIM will continue intersessionally towards a final discussion of methodologies and results in 2020.

**Workshop on Science with Industry Initiatives (WKSCINDI)** *Jon Elson*

*Jon Elson, co-chair ICES Workshop On Science With Industry Initiatives, presented the references covered at and key points arising from the meeting held at ICES over 3 days from the 24th June 2019. The executive summary of the report is reproduced here as a summary of both the presentation and the meeting. https://community.ices.dk/ExpertGroups/wgcatch/2019Meetingdocuments/05.Presentations/WKSCINDI.pptx*

The purpose of the Workshop on Science with Industry Initiatives (WKSCINDI) was to provide ICES with an up to date overview on the roles that industry can play in delivering scientific information relevant to ICES advice and marine research, and to develop a roadmap for taking measurable steps toward the inclusion and application of scientific data from industry. There were 50 participants, with good representation from industry, NGO, science, technology and policy, spanning 14 countries including the USA, Norway and Turkey.

Participants addressed the following questions: What's happening now, where is it heading, and why and how is it relevant to ICES? Does industry want to get actively involved in providing scientific information where it is needed, and are they able to do it? In order to allow industry to make useful and useable contributions relevant to ICES, what needs to happen and when?

Participants shared many recent examples of data collection initiatives with and by industry, and heard that there is a clear appetite, willingness and capability to collect and provide scientific data. This can be motivated by different reasons, including: to provide information for fisheries management, to use as business intelligence data and, to demonstrate to markets industry's responsibility and sustainability credentials.

While science-industry initiatives for data collection and provision creates opportunities for ICES science, they raise important questions about standards for scientific information; an issue discussed at length during the workshop. The valuable work already done by ICES WGCATCH and PGDATA on standardising approaches and by other projects working on guidelines specific for industry data collection are important here. The work has implications for survey planning groups, stock assessment groups, the development of the RDBES and Regional Coordination Groups. The clearest opportunities exist with current industry initiatives, which could be used as test cases for developing criteria and processes for reviewing and including these data in ICES assessments.

There is crossover with the work being carried out by WGTIFD which is looking at new technologies for collecting fishery-dependent data. Any practical application of these technologies will be heavily dependent on collaboration with the industry, even if required by legislation.

The road to inclusion and application of scientific data from industry in ICES is presently unclear, even though the institutional processes are there to make it possible. This includes both the social and practical process for a stepwise evolution of how the scientific community, the industry, and policy makers work together to determine: what science is needed to meet societal needs, about the way science is conducted, and how to ensure its credibility and quality. Co-design in the planning stage is essential to ensure that relevant needs are identified and are matched with workable plans to meet them.

Key recommendations highlight a need for actions that (1) establish standards and guidelines for industry data collection initiatives, their quality assurance process, and the pathway to making the data useful to ICES, (2) evaluate the utility of self-sampling data from industry for enhancing scientific knowledge and providing data for stock assessments, (3) provide a test case of the Regional Database and Estimation System using industry derived data, (4) consider specific applications of industry-derived data in current assessments and opportunities for continuous development of assessments based on new data streams.

Finally, there was consensus to reconvene a wider group in 2–3 years to review the progress in this rapidly evolving discipline.

*Research Projects*

**The fishPi² WP2 & WP3–Regional Sampling Schemes for Commercial Fisheries** *Liz Clarke*

The fishPi² project[12], considered the development of regional sampling designs, and the focus of work packages 2 and 3 (WP2 and WP3) was on sampling the landings of commercial fisheries.

WP2 considered how to determine if fisheries are suitable for regional sampling. Some simple criteria were developed to determine if a fishery was suitable for regional sampling, and an R-

[12] Anon. (2019). Strengthening Regional Co-ordination in Fisheries Data Collection – The FishPi2 Project Summary report (MARE/2016/22).

package – fishPiWP2 containing a suite of functions for exploratory analysis of the landings of a fishery to help determine if these criteria were met. These functions included: maps of landings by port; proportions of stocks by country; image plots of landings by stock and ICES division; landings by vessel flag country and landing country.

WP3 developed a framework and tools to develop regional sampling schemes through the simulation testing of sampling designs. This framework was developed and tested using two case studies, North Sea demersal fisheries, and Iberian demersal trawlers, using logbook and sales note data. The case studies confirm that regionally stratified sampling designs with proportional effort allocation perform better than the status-quo national designs.

The key outcomes of WP3 are: i) a clear framework to develop regional sampling designs; ii) tools for simulation testing of sampling designs, in the form of documented R-packages and scripts for both reported landings data and biological data; iii) proposals of regional on-shore sampling designs to take forward to RCGs for further consideration; and iv) proposed adaptations to the EU-MAP Annual Work-Plan templates which incorporate all aspects of a catch sampling designs in a self-contained set of tables.

The repository of tools, including R-packages etc. can be found here:

https://github.com/ices-tools-dev/FishPi2/tree/master/WP3

**ECA: A Bayesian Framework for Catch at Age Estimation** *Edvin Fuglebakk*

ECA is a Bayesian modelling framework for catch at age estimation used at the Institute of Marine Research in Norway (IMR). The framework is particularly suited to handle heterogeneity in biological parameters recorded. It is also designed to handle integration of sampling designs were sampling frames are not rigorously identifiable and selection methods are non-probabilistic, so that expert judgement is needed to assign samples to fishery-decompositions they represent. In recent years this framework has been developed to be more configurable and less dependent on particularities of IMR data formats, and resources are made available for adapting to other data models and tested with the RDBES data model v 1.17. This revised implementation is known as Reca.

ECA is also supported as a component in the StoX estimation system used at IMR for automating and documenting estimates. For fisheries-dependent data, StoX only supports data formats at IMR, but an overview of the system was provided in order to make WGCATCH aware of relevant estimation systems to study for providing input to the RDBES specification.

Availability of software:

- StoX: https://www.imr.no/forskning/prosjekter/stox/nb-no
- Reca: https://github.com/NorskRegnesentral/Reca
- Resources for data adaptation: https://github.com/edvinf/prepRECA

**French On-shore and Off-shore sampling programmes** *Anne-Sophie Cornou*

As part of the new Obsmer-Obsventes call for tenders (July 2020 to December 2023), the Obsmer and Obsventes sampling plans have been redesigned to create a single additional Obsmer-Obsventes sampling plan. The objective is to adjust an action (sea or land) in near-real time to the benefit of the other to avoid the absence of data due to the refusal of certain fleets, weather conditions, and boycotts of programmes or other reasons. The Obsmer program is prioritized, Obsventes is used as a complement. In this new plan: the stratification was modified and restricted, the random was added by imposing the vessels and auctions to be sampled. As the programme is still based on the voluntary nature of the fishermen, reserve samples will be offered to observers. The release estimates calculated with the new stratification were compared to the old one

and a priori there is a gain in variability. To fully validate these changes, it will be necessary to wait until the implementation of this new plan in July 2020.

# Annex 5: Working document: Proposal of decision-key to discuss and communicate minimum sample sizes for data provision of estimates of commercial fisheries in ICES stocks (ToR a.3)

**Author: Nuno Prista, SLU-Aqua Sweden**

*Note from WGCATCH: A version of this document was discussed during the WGCATCH meeting 2019, but its use did not gather consensus in plenary.*

**Introduction**

The following decision provides a framework whereby ICES assessment groups and benchmarks can consider the clarification of minimum sample size thresholds for data provision of commercial catch estimates in their respective stocks and to communicate them to data providers, interacting with them on data quantity issues.

**Instructions:**

In the decision-key, landings and discards are separated to accommodate the need to estimate the volume of the latter. Example provided respects to a putative stock where only the volume of discards and length structure needs to be determined but similar reasoning can be applied if landings volume and/or age structure are also being estimated.

Yellow fields need to be set for each individual stock based on the outcome of EG discussions, having considered aspects like the structure of the fishery, the sampling data available in the different countries and the relevance of the data for assessment. Additional aspects to consider are different variability in size (or age) of landings and discards.

| | Description |
|---|---|
| *Perc* | percentage of landings considered by EG as a significant stratum |
| *Wght* | volume of landings considered by EG as a significant stratum |
| $X_{L,LEN}$ | number of trips considered by EG to provide a reasonable sample size for estimates of length structure of landings |
| $X_{L,len}$ | number of trips considered by EG to provide a minimum sample size for estimates of length structure of landings |
| $X_{D,VOL}$ | number of trips considered by EG to provide a reasonable sample size for estimates of volume of discards |
| $X_{D,vol}$ | number of trips considered by EG to provide a minimum sample size for estimates of volume of discards |
| $X_{D,LEN}$ | number of trips considered by EG to provide a reasonable sample size for estimates of length structure of discards |
| $X_{D,len}$ | number of trips considered by EG to provide a minimum sample size for estimates of length structure of discards |

## Decision-key

**1. Landings**

1.1. Does the stratum represent > *Perc* % of the fishery and/or > *Wght* tonnes?

1.1.1. **Yes.** Stratum is important. Do you have > $X_{L,LEN}$ trips with length sampled you consider representative?

1.1.1.1. **Yes.** Upload length data to Intercatch.

1.1.1.2. **No.** Do you have $X_{L,len}$ to $X_{L,LEN}$ trips with length sampled you consider representative?

1.1.1.2.1. **Yes.** Upload length data to Intercatch. Inform SC of sample size.

1.1.1.2.2. **No**. You have less than $X_{L,\ len}$ trips with length sampled you consider representative, or >$X_{L,len}$ trips but do not think they are representative. Contact stock coordinator ahead of submission.

1.1.2. **No**. The stratum is not very important. Do you have >$X_{L,len}$ trips with length sampled you consider representative?

1.1.2.1. **Yes**. Upload length data to Intercatch.

1.1.2.2. **No**. You have less than $X_{L,len}$ trips with length sampled you consider representative, or >$X_{L,len}$ trips with length sampled but do not think they are representative. Contact stock coordinator before uploading data to Intercatch.

**2. Discards**

2.1. Do you have > $X_{D,VOL}$ trips observed you consider representative?

2.1.1. **Yes**. Estimate discard volume and upload to Intercatch. Do you have > $X_{D,LEN}$ trips with length sampled you consider representative?

2.1.1.1. **Yes**. Upload length data to intercatch.

2.1.1.2. **No**. Do you have $X_{D,len}$-$X_{D,LEN}$ trips with length sampled you consider representative?

2.1.1.2.1. **Yes**. Upload length data to intercatch. Inform Stock Coordinator of the sample size underlying estimates.

2.1.1.2.2. **No**. You have less than $X_{D,len}$ trips with length sampled you consider representative, or >$X_{D,len}$ trips with length sampled that you do not think are representative. Contact stock coordinator before uploading data to Intercatch.

2.1.2. **No**. Do you have $X_{D,vol}$-$X_{D,VOL}$ trips observed you consider representative?

2.1.2.1. **Yes**. Estimate discard volume and provide to Intercatch. Inform stock coordinator of your sample size. Do you have $X_{D,len}$-$X_{D,LEN}$ trips with length sampled you consider representative?

2.1.2.1.1. **Yes**. Provide length data to intercatch. Inform stock coordinator of your sample size

2.1.2.1.2. **No**. You have less than $X_{D,len}$ trips with length sampled you consider representative; or $>X_{D,len}$ trips with length sampled but do not think they are representative. Contact stock coordinator before uploading length data to Intercatch.

2.1.2.2. **No**. You have less than $X_{D,vol}$ trips; or $>X_{D,vol}$ trips that you do not think are representative. Contact stock coordinator before uploading volume or length data to Intercatch.

# Annex 6: Summaries of presentations relating to SSF (ToR b.1)

**Definition of quality indicators for SSF sampling and census fishing effort and landings data collection, main results from WGCATCH 2018** *Sebastien Demanèche*

In 2018, WGCATCH SSF subgroup work mainly on the analysis on a questionnaire' replies focusing on 1) the coverage/completeness and the accuracy/reliability of transversal data collected in a census approach, 2) the quality indicators and data quality checking methodologies in place in ICES countries and 3) the standardisation/harmonisation of the SSF fishing effort calculation. Summary of the 2018 principal outcomes *(presented at the beginning of the 2019 WGCATCH SSF subgroup work)* are summarized hereunder when details could be found in 2018 WGCATCH report. The main aim of the work was 1) to evaluate the SSF transversal data' quality *(e.g. landings, fishing effort)*, 2) move towards standardization and 3) to develop a list of data quality indicators and quality checking methodologies.

Questionnaires were completed by 21 countries/country regions. They were made up of eight questions, a template about SSF fishing activity data' sampling information and two Excel sheets with some quantitative information. They resulted in: 1) updating and finalizing the 2015 overview of the different fishing activity' data collection methods currently applied in ICES countries for SSF, 2) summarizing the methodologies used by ICES countries to calculate SSF and passive gears fishing effort and the difficulties to apply the standard methodology; advice for SSF fishing effort estimates calculation standardization/harmonization; 3) first ICES countries' overview of the national legislation and associated control system in place and of the quality indicators and quality checking methodologies on-going in a census approach to assess SSF data 'quality *(accuracy/reliability)* and coverage/completeness; and finally 4) compilation of quantitative information about SSF and SSF declarative data available in ICES countries and providing first graphical outputs on this basis to 1) present a detailed and complete knowledge on the structure of ICES SSF by country and precise vessel length ranges and 2) assess the coverage/completeness and accuracy/reliability of SSF data collected in a census approach.

Tables summarizing the different SSF fishing activity' data collection methods currently applied in ICES countries for SSF *(for vessels under logbooks requirement and not)* could be found in the 2018 WGCATCH report. Main findings for SSF fishing activity data collection were:

- **Census approach** is the **most common approach** used by MS to collect them (all vessels)
- **Different methodologies** and **data formats** exist which introduce **challenges** and **difficulties** for **standardization** of estimates
- **Common sources are the ones required under EU Control Regulation** *(i.e. Fleet register, Sales note and EU logbooks for vessels >=10m/8m in Baltic)*
- **SSF adapted declarative forms** could be used **to complete sales note** *(for vessels not under logbooks requirement)*
- **Census approach mainly based on sales notes** is used in some countries but remain **insufficient** to meet the needs and requirements *(e.g. no gear information, no spatial data)*
- **Sampling approach** is applied in **very few cases**
- **Cross-validation of control data and/or with complementary data** *(sometimes issued from innovative/new technologies)* are used in some cases to **improve data quality and completeness**, such methodologies have to be encouraged

A summary of the methodologies used by ICES countries to calculate SSF and passive gears fishing effort could be found in the 2018 WGCATCH report. It underlines some difficulties remaining to apply the standard methodology and conclude that even though methodologies applied in ICES countries are in line as far as possible with standard some difficulties remain which mean that it has to be adapted to take into consideration SSF' special features and ongoing data collection systems *(data available and the way to collect them):*

- **'Vessel fishing days'** have to be calculated on a **'day by day' basis** rather than on a 'trip by trip' basis
- **"24h period definition" for SSF' days at sea is not applied in most of the countries**. Following assumption *(and conversely)* is favoured: *'1 day at sea = 1 fishing day = 1 trip (= 1 sale note)'* as far as no other data contradict this hypothesis
- **Difficulties remain** to obtain **gear information** *(especially for multi-gear trips and countries using sales note or landings declaration to follow SSF)*
- Finally, it has been also underlined that for **passive gears fishing effort**, **gear-soaking time** and **gear-dimension** should be also **required** to accurately estimate the fishing effort.

First information about the **National legislation** and **associated control system** have been collected. At the same time, a first overview of the **quality indicators** and **checking methodologies** in place in ICES countries in census approach to assess **SSF data' quality** *(accuracy/reliability)* and **coverage/completeness** has been done concluding that most of the countries considered the SSF control data appropriate and reliable when at the same time few of them address these issues … Key findings about SSF data' incompleteness and quality issues were:

- **Checking the assumption** (applied in most of the countries) that **'a vessel without any declarative data is an inactive vessel'** is **needed** (by a continued or 'one-off' intensive survey especially in case of low level of enforcement/control regulation or no licence conditional)
- There is a necessity to **cross-validate data** and **develop data comparison tools** (e.g., as a first step, comparing declarative data and data coming from biological data sampling (on-shore/on-board))
- **Innovative/new technologies** constitute **significant opportunities to improve SSF' data** (e.g. completeness' assessment, geospatial information enhancement …). **Generalizing satellite-based monitoring system for SSF** should be encouraged.
- **Removing the 'catch <50kg rule' from the control legislation** is a preliminary step which could have a significant impact on SSF' data quality (great impact on catch composition and SSF data' completeness)
- **Sales note/landings declaration** is **insufficient** to meet the needs and the requirements. They have to be **completed with complementary/alternative data** (declared or sampled) notably to enhance **gear** (especially difficult for multi-gear trips, also for gear dimension) and **spatial information.**

Following that, WGCATCH reaffirmed its encouragement to develop such assessment and methodologies in order to identify potential issues and to overcome problems with reliability and completeness of SSF' 'declarative' data collected (*indeed, a first necessary step is to collect data but data quality is an issue that should be also necessarily taken into account. This should include the implementation of a validation scheme to evaluate these).*

Finally, 2018 WGCATCH SSF subgroup compile some of the quantitative information available in the questionnaires and provide some first graphical outputs: 1) detailing and completing the knowledge about the structure of the EU SSF by country and precise vessel length ranges and 2) making a first comparison of the declarative and register data by country *(comparing number of vessels registered against a number of vessels with at least one declarative data and investigating the completeness of the declarative vessels' data regarding the number of trips they have declared).*

Nevertheless during the 2018 WGCATCH meeting, due to lack of time, it was not possible to discuss extensively these graphs and on their basis the development of a data quality checking methodology to develop a risk assessment methodology determining a level of risk concerning SSF data quality regarding the different type of indicators calculated *(e.g. define patterns of indicators which present low, medium or high risk of incomplete data issues)*. This was planned for 2019 WGCATCH meeting.

**EU fishPi² Project and EU STREAM Project: Main outputs from WP5 focusing on SSF sampling and estimation** *Estanis Mugerza*

fishPi2 and STREAM WP5 "Small Scale and Recreational fisheries", main objectives and outputs concerning small scale fisheries were presented in WGCACTH. In both projects, it was highlighted the importance of this fleet, 80% of the EU total fleet. However, the lack of good quality data is still an important issue without major differences in this issue between the Atlantic and the Mediterranean and the Black Sea.

Both projects outputs under WP5 highlighted:

- The need and importance to calculate good quality estimates of the SSF fishing activity variables (effort, catches etc.)
- The need of an Assessment of the coverage/completeness and the quality/reliability representativeness/precision of the data collected
- SSF have to be monitored differently by a census or a sampling approach adapted to their specific features.
- Transversal (logbook, sale notes) data coming from the current CR is not well adapted or insufficient to the SSF.
- Missing catches due to exceptions in the regulation
- Low-quality effort information (under 10m fleet)
- Low quality on species composition of the catches (lower taxon codes use!!)
- Lack of or scarce information of other biological variables data (length, discards, PETS BYCATCH…)
- Considerable differences between official and scientific estimates (i.e. 2-40% catch and effort depending on the species, region…)
- Difficulties in the implementation of surveys

Based on these outputs, both projects concluded that in the case of the small-scale fisheries, there is still high uncertainty due to the quality of the data collected. Different methodologies were evaluated to improve this lack of data, analysing the pros and cons considering the quality of the data collected and the cost of them. Finally, the alternative of using electronic reporting systems were also analysed. With this aim on mind, different devices produced by main companies to monitor small scale fisheries were evaluated, based on interviews carried out to these companies. Also, the experience of researches using the data collected from these devices were considered.

In the case of STREAM WP3 main outputs, methodologies for exploring different sampling designs were also presented. Two tools developed were explained:

- the SDTool 2.04, to obtain the optimal number of trips and length measurements at different stratification levels.
- BioSim Tool, to obtain the optimal number of measurements by sex, maturity and age, and to estimating possible subsamples of length measurements (partly integrating the ICES workshop WKBIOPTIM2)

**Small Scale Fisheries in the RDBES, WP5 in fishPi2** *Lucia Zarauz and Josefine Egekvist*

The RDBES data model uses tables CL and CE to provide aggregated information on catch and effort. This information is taken from official logbooks and sales notes, which is a suitable source information for commercial fisheries, but is often incomplete for SSF.

In the forthcoming scenario of the RDBES providing estimates from raw sampling data, it is important that the total catch and effort values are as accurate as possible. For SFF this may imply to use alternative sources of information, such as dedicated sampling using monthly sheets, interviews, alternative logbooks, etc. The estimates coming from these alternative sampling programs should be incorporated in CL and CE tables if they are considered of better quality than the official data. A proposal of a Cl and CE format to store this information was presented. Basically, the proposed format includes a field to include the official weight (which comes from logbooks or sales notes) and another field for the scientific weight (which is an estimation coming from sampling or alternative data sources), together with a measurement of precision and bias In addition, it was highlighted that the use of sampling estimations implies the need for a description of the survey and an assessment of its quality (i.e. making reference to the DCF National Plans).

There was a general discussion about whether SSF sampling data could fit in the RDBES data format allowing the calculation of estimates from there. The main criticism is that we are working to achieve a very transparent and flexible frame (the RDBES data model for sampling data), and at the same time, we propose a CL file which includes estimates which are already calculated, with no information on the sampling design, sample size, estimation process, etc. On the other hand, it was argued that official statistics are not of enough quality for the SSF, and that this is a first step to put better estimates in the table and be able to use them (in an analogous situation than for recreational fisheries). The issue will be discussed more in-depth within the group dealing with CL and CE tables.

Additionally, the following suggestions were received:

- **Effort:** With regards to effort of passive and active. They are now two different variables that one fills in or not depending on the gear – it is suggested to consider replacing that with a variable "effort_type" (with values: "Vessel fishing time" or "soaking_time") and a variable "effort_hours". This would avoid filling in NAs.
- **RSE:** Should it be RSE = 0 in census data; and NA if n=1

# Annex 7: Summaries of presentations relating to RDBES and discussions thereof (ToR e)

**RDBES for WGCATCH 2019** *Henrik Kjems–Nielsen*

The RDBES Core Group have been doing a lot of work on specifying the data model further for the sample data CS. Since January the Core Group have had 12 Webex meetings and two 5-days workshops, WKRDB-POP and WKRDB-EST. One of the main additions to the sampling data this year was that the numbers of hierarchies was increased from 8 main hierarchies to 13 hierarchies. Several fields have been added, especially there have been added fields for the bycatch data. Another major change is that Vessel Detail table and the Species List will be moved out the hierarchies and should only be referred to.

The specifications of the landing CL and effort CE data models was also started this year. Since that is only one table for each it should not be difficult to finalise the landing and effort data models, the feedback from the countries is just needed. Several fields have been added to the CL and CE, like 'Data type of scientific weight/effort'; "Census" or "Estimate", 'Source of scientific weight/effort'; "Logbook", "Sales notes", "Other declarative forms", "Combination of census data". Other fields have also been added, and two fields have been added to be able to provide data for the FDI data call data from the RDBES.

The RDBES database and web application/system is now implemented on a test server. The countries can upload data for all sampling schemas (all 13 specified main hierarchies). There is implemented a security module, which ensures that data submitters can only upload data for their own country. The checks in the RDBES are at this point code check regarding standardisation of codes. The data can be exported in the same format as the uploaded RDBES format.

The source code for uploading the sampling data for the first 8 hierarchies was finalised and online in February 2019 according to the data model specification version 1.15. In September 5 extra hierarchies was added and the first 8 hierarchies was updated according to data model version 1.17. One of the main overheads in this project is the fact that the specifications of the RDBES, done by the Core Group, is not finalised, it is an ongoing process in parallel with the software development done by ICES Secretariat. New versions of the data model is continuously coming with changes. A system for automatic synchronisation of codes from ICES vocabulary to RDBES was implemented. There was created a program to generate test data for all 13 main hierarchies. Unit tests for all main functionalities e.g. to validate all 13 hierarchies have been developed. The application source code has been upgraded to .NET CORE v2.2 and the client application to angular v7.0. Checking of duplicate data in the uploaded file has been implemented. The Vessel Detail table, VD, and the Species List table, SL, are both at the moment being been moved out of the hierarchies to ease the upload process. That means that new checks have to be developed to check VD and SL fields against the specific VD and SL tables. In one hierarchy VD is mandatory for another hierarchy VD optional. The data export has been updated accordingly. Overwriting rule is almost implemented, it was changed and needed to be updated. The source code for uploading the Landing data, CL, and Effort data, CE, are being developed. The data models and documents on GitHub are constantly being updated.

The RCGs will identify 10 stocks, which will be requested in a data call to be uploaded into the RDBES in 2020.

From ICES perspective, WGCATCH should focus on statistical estimations from the national level to InterCatch import level or potentially all the way up, but the focus should be on the national level.

**Outputs of the Workshop on Populating the RDBES data model (WKRDBES-POP)** *Chairs: Edvin Fuglebakk and David Currie*

WKRDB-POP was arranged 18-22 Feb 2019 at ICES Headquarters, Denmark. The workshop was chaired by David Currie and Edvin Fuglebakk. Together with WKRDB-EST, WKRDB-POP is part of an effort to familiarise the community with the proposed data model for RDBES, and to test the compatibility of the data model to the formats at national institutes. The workshop contributed to spreading understanding of the data model well beyond the core group with 29 participants from 20 countries and 17 institutions. Most participants started preparations for adapting data from national formats to the RDBES data model. Some minor issues in the data model were identified, but no serious impediments to moving forward in the RDBES development was identified.

For a more detailed summary, consult the workshop report: http://www.ices.dk/sites/pub/Publication%20Reports/Forms/DispForm.aspx?ID=35491

**Workshop on Estimation with the RDBES data model (WKRDB-EST). Chairs: Nuno Prista and Kirsten Birch Håkansson**

WKRDB-EST met at the ICES headquarters, in Copenhagen, Denmark, from 31 September to 4 October 2019. The meeting was attended by 25 participants from 22 institutes and 15 countries. The terms of reference were a) develop and document R scripts for design-based estimation for each hierarchy in the RDBES data model and b) identify and document any problems with RDBES data model relating to design based estimation.

The RDBES is the new Regional DataBase and Estimation System. The RDBES is expected to replace the previous RDB and InterCatch by the end of 2021 and will bring about significant improvements and transparency in the provision of estimates from commercial fisheries to stock assessment and other end-uses. The developments of the RDBES meet the EU-MAP requirements of progress towards statistically sound sampling schemes. The RDBES data model and associated database can store, among other, sampling data alongside the elements required to describe the sampling design used in data collection. Upload of data to and estimation within the RDBES will require significant adaptation of the data collection processes of national institutes in several areas, including data storage, but also sampling design, field protocols, estimation and data provision to end-users. To secure a soft transition there is a need to intensify the internal planning of these adaptations already in 2020.

WKRDB-EST prepared data for 8 of the 13 upper hierarchies of the RDBES and developed a first set of R-scripts that handles design-based estimation in the RDBES data model. Developments and tests were positive and confirmed the usefulness of the data model for design-based estimation. These developments are publicly available in the ICES GitHub (https://github.com/ices-eg/WK_RDBES/tree/master/WKRDB-EST). The RDBES core group will continue the development and produce an R-package that aggregates a) a generic set of estimation functions and b) vignettes documenting design-based estimation in each type of sampling hierarchy.

WKRDB-EST examined and tested version v.1.17 of the RDBES model with feedback being obtained from 15 countries on 8 of the 13 upper hierarchies of the RDBES. The data model can now be considered relatively stable with mostly minor issues being identified. The RDBES core group will discuss these issues and incorporate in a future data model, v.1.18.

Finally, WKRDB-EST discussed the way forward in the development of the estimation component of RDBES. Participants set has priority for 2020 the finalization of the code of design-based estimators. That development should include domain estimation and post-stratification since these aspects are necessary to produce estimates at the spatial and temporal resolution required

by a variety of end-users. Development of script for model-assisted and model-based estimation based on the RDBES format should take place in other fora (e.g., SCRDB-coordinated data workshops, WKs spawned by WGCATCH). A new WKRDB-EST will be suggested to SC-RDB for late 2020 where the developments of design-based estimation will be finalized.

**Accommodation of incidental by-catch in the new RDBES** *Bram Couperus, Nuno Prista and Sara Königson.*

The incorporation in the Regional Database (RDB) of data derived from a variety of sampling programmes that target, directly or indirectly, incidental by-catches of commercial fisheries has been a long-standing need of ICES EGs such as the ICES Working Group on Bycatch of Protected Species (WGBYC). The recent development at the ICES Data Centre of a new Regional Database and Estimation System (RDBES) – that includes a more flexible and statistically rigorous data model than the previous RDB – offered the possibility of addressing such need.

Since the summer of 2018 the core group of RDBES development has been working together with members of WGBYC and ICES Working Group on Commercial Catches (WGCATCH) in identifying and implementing in the RDBES data model the specific requirements for data on incidental by-catches. The main requirements from WGBYC are that the RDBES data model i) can record positive incidental by-catch events (i.e., has the correct by-catch codes, etc.), ii) can distinguish between non-observations ( = missing values) and zero-observation (true 0s) taken from different places of the vessels, iii) can differentiate between the sampling of catches in volume (e.g., a basket) and by visual screening (e.g., visual observation of sorting activities at the conveyor belt) and iv) can record the state of individuals (dead, wounded, alive). From WGCATCH side it has been considered important that those adaptations are implemented without jeopardizing the recording of data from at-sea sampling of catches of the main commercial species (e.g., EU-level routine sampling programmes targeting landings and discards of the main commercial species).

In this presentation, we review progress made during 2019 with regards to the adaptation of the RDBES data model to incidental by-catch data. The progress includes the addition of several some new variables and their definition. This progress is put forward to a discussion of the joint WGBYC/WGCATCH subgroup on by-catches with feed-back expected to be discussed by the core group of RDBES development towards inclusion in an upcoming new version of the RDBES data model.

**RDBES effort and landings data format** *Josefine Egekvist*

There has been a need for updating the RDBES effort (CE) and landings (CL) data formats. The format was discussed at skype meetings with an extended RDBES core group. The future use of RDBES CE and CL data formats is to support the RCG's as well as ICES stock assessment and potentially it should be possible to export data from the RDBES to the STECF FDI data call. The format can be found at GitHub: https://github.com/ices-tools-dev/RDBES/tree/master/Documents.

New variables have been added, some optional and some mandatory. In some cases (e.g. small-scale fisheries), scientific estimates of landings and effort are different from the official records, so it has been made possible to add both official weight and scientific weight (which can be the same as the official weight) and a code to indicate if the weights are based on census or estimates. The data source of scientific weight and value should also be included and there are variables to include the relative standard error for estimated data, and a qualitative bias indicator. To allow for export to the FDI data call, variables indicating EEZ, Deep-sea fisheries and economic fishing technique have been added.

The effort calculations should follow Nicosia principles and the fecR package. Some extra effort variables have been added, as they are considered useful. The number of trips is problematic to assign to the disaggregated format, where one trip can be in several months, areas, rectangles and metiers, so the "Number of fraction trips "have been added, where the trip is split up into fractions following Nicosia principles, and it was also decided to add the "Number of dominant trips" to assign a trip to the dominant month, area, rectangle and metier within the trip. To match with the CL approach, the effort has been split up into official effort, following the official data, and scientific effort after reallocation (e.g. based on VMS analysis). The official and scientific effort can be equal. The "Vessel fishing time" indicates the hours the vessel is fishing for active gears, and the "Soaking time" indicates the hours that the gear is fishing for passive gears.

The next step is to test the format.

# Annex 8: Summaries of presentations by other EGs (ToR f)

**Working Group on Technology Integration for Fishery-Dependent Data (WGTIFD)** *Chairs Brett Alger and Lisa Borges*

Fisheries stakeholders around the world are looking to improve the timeliness, quality, cost-effectiveness, and accessibility of fishery-dependent data by integrating technology into monitoring programs. Electronic monitoring (EM) has clear potential to meet these challenges by incorporating cameras, gear sensors, positional data systems, and electronic reporting (ER) into fishing operations. ER is the use smartphones, computers, and tablets to collect, transmit, receive, and store fishery-dependent data, from fishing vessels and/or shoreside data collection such as biological samplers, dealers, and processers. These technology shifts pose new challenges, such as the integration of disparate programs and reporting requirements across States and Regions, and the effective implementation of technologies that complement traditional data collections.

In the first year, WGTIFD was able to examine the electronic tools and applications that are used to support fisheries-dependent data collection, both onshore and at sea, including ER, EM, positional data systems, and observer data collection. WGTIFD inventoried and reviewed the various national fisheries dependent hardware and software applications and approaches; defined consistent vocabulary on electronic technologies; reported on developments in machine learning and computer vision technologies and their applications in fisheries dependent data collection. WGTIFD also conducted a survey of WGTIFD participants on their experience in implementing technology for monitoring and reporting programs, and their views on strategies and incentives to engage stakeholders. In Year 2, WGTIFD will examine the risks and benefits of different technologies and look at how to integrate data from technologies.

# Annex 9: WGCATCH responses to recommendations made by other EGs (ToR i)

From: WGBYC

**Recommendation**: Best practice onboard sampling procedures for PETS need to be further developed and presented to the RCGs and/or national contacts leading sampling programmes under the EU-MAP. This would include further definition of sampling fields as asked for by WGCATCH. WGBYC consider this would be best achieved through a workshop.

**WGCATCH response**: This recommendation follows what was agreed at WGCATCH 2018 meeting. WGCATCH and WGBYC members and co-chairs met intersessional to define the best way forward to develop best practices on-board sampling procedures for PETS. It was decided that the work would be developed by WGBYC and presented and discussed at WGCATCH meeting. WGBYC members attended this year WGCATCH meeting, where protocols were finalized, and the guidelines produced (see WGCATCH, 2019, section 5).

---

From: WGBYC

**Recommendation**: WGBYC recommends that WGCATCH work with us to deliver estimates of fishing effort for the small-scale netting fisheries for 2018 before WGBYC 2020 meeting.

**WGCATCH response**: Since 2015, WGCATCH sub-group dealing with the small-scale fisheries have been documenting and developing the best practices to calculate transversal variables (landings and effort) for small-scale fisheries. This development is feeding into the development of the RDBES especially in respect to the commercial landings and effort statistic (CE & CL) (see WGCATCH, 2019, section 4.4 and 6). The suggested format can be found at https://github.com/ices-tools-dev/RDBES. Maybe the new RDBES will meet WGBYC needs, but some intersessional meetings between WGBYC and the leads of the small-scale fisheries subgroup may be beneficial, since the two groups are dealing with the same problematics.

---

From: WKSCINDI

**Recommendation:** WKSCINDI recommends that a Workshop on Standards and Guidelines for Industry – Science data collection is convened to review existing components, standards and guidelines on scientific data collection to provide a reference for Industry Science data collection to overlap with ICES work on developing a data accreditation system.

*Proposed ToRs:*

f) Review existing ICES documentation on data standards and synthesize elements necessary to provide guidance on data collection for industry derived data and its application in ICES.

g) Review other documentation on data standards and provide recommendations on how to adapt and apply them to the ICES system/process.

h) Inform participants of the plans and progress for a data accreditation system and define how and where it needs to align with a Science and Information Standards document (see Tor d).

i) Using outputs from ToR a-c, draft a Science and Information Standards document to guide data collectors and users on the requirements necessary for application of industry-derived data in ICES.

**WGCATCH response:** WGCATCH welcomes and recognizes the importance of developing standards and guidelines for industry – science data collection. However, to get WGCATCH involvement, the group suggest further work on defining and streamlining the current workshop proposal and its ToRs. We propose a co-chair from WGCATCH group to provide support on defining the ToRs that will fit WGCATCH remit.

WGCATCH documents national fishery sampling schemes and establishes best practice and guidelines on sampling and estimation procedures and provides advice on other uses of the fishery. WGCATCH remit is on commercial data collection and estimation (including biological parameters) that feed into the assessment. Therefore, the WK needs to distinguish fisheries independent and dependant fisheries data and the ToRs should reflect that. From the WGCATCH point of view, this WK should be narrowed and focused on commercial catches only. A separate workshop to include fisheries independent data (e.g. acoustic data and industry surveys) should be considered and the ICES surveys EG should be consulted.

Over the last 10 years, various WK, PG and WGCATCH have produced recommendations, guidelines and best practice and WGCATCH recognizes the need to consolidate the recommendations and guidance produced and set out key principles that apply to everyone involved in the commercial data provision. Recognizing the different backgrounds of those involved in data collection, the guidelines should be adapted and revised to accommodate different expertise and knowledge. But most importantly, the group emphasized the need for independent peer review to ensure the quality and relevance of the information.

We also recommend to call for collaboration with other ICES groups to be involved in this WK: PGATA is working for quality framework, ICES DATA centre, DIG.

---

From: WKSCINDI

**Recommendation:** WKSCINDI recommends that a specific Workshop to evaluate the utility of self-sampling data from industry for enhancing scientific knowledge and providing data for stock assessments is convened. It would be similar in concept to a data compilation workshop of the benchmark process.

*Proposed ToRs:*

a) Using specific case examples, compare industry self-sampling data with data collected from National Sampling Programmes to understand the added value in terms of quality, ecological understanding and utility for stock assessment and research.
b) Write a scientific publication based on the analyses from ToR a.

**WGCATCH response:** WGCATCH welcomes and recognizes the importance of a workshop to explore the current data collected by the industry and investigate its utility and how to combine with the data collected by national sampling programmes. However, due to the amount of work and other prioritizations WGCATCH is involved in, the group don't find it realistic to support more than one WK of this kind at the moment. WGCATCH understands that priority needs to be made for the first proposed workshop (Workshop on Standards and Guidelines for Industry–Science commercial data collection). The utility of this second workshop will be revised in 2020 and will be based on the progress of the first workshop.

---

From: WKSCINDI

**Recommendation:** To fit a test case of the Regional Database and Estimation System that uses industry-derived data.

**WGCATCH response:** *Overall, the suggested work is a bit vague. What is industry-derived data? WGCATCH supports the recommendation but it is not within WGCATCH remit to suggest test cases for the RDBES. The steering committee of the RDB/RDBES has suggested various stocks to be tested and uploaded to the RDBES in 2020. In 2021 all stocks will be tested, see roadmap p. 16 ICES. 2020. Steering Committee of the Regional Fisheries Database (SCRDB). ICES Scientific Reports. 2:24. 57 pp. http://doi.org/10.17895/ices.pub.5992, so the process is already on its way.*

---

From: WKRDBES-POP

**Recommendation:** Evaluate the code list for the "selection method" design variables in the RDBES data model and provide guidance on how to decide when each value should be used. This will be particularly useful to help national institutes decide whether their practical sampling techniques should be considered as, for example, simple random selection or expert judgement.

**WGCATCH response:** *The response is not ready for the report, but the recommendation will be answered intersessional.*

# Annex 10: Recommendations

| Recommendation | Addressed to | Communicated |
|---|---|---|
| WGCATCH recommends that the current benchmark process for data compilation of commercial catch data are reviewed and updated with contribution from WGCATCH to ensure documented and harmonised methodologies for commercial catch data (including revising thresholds, fleet definitions, ALK estimations, etc.) for national data submission. Solid guidelines will also be beneficial for the future migration of national estimation routines to the RDBES. | ACOM, PGDATA | |
| WGCATCH recommends that the codes for specimen state, and the definitions thereof, are further discussed. As they stand, the criteria needed to assess the state of the specimen are not clearly defined which can lead to misinterpretations and ambiguity; therefore limiting how this information can be used. This is particularly important if this field could be used to assess the impact of fishery in bycatch. WGCATCH recommends WGBYC revise and propose a detailed and clear description for each specimen state code. | WGBYC | |