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Report of the Working Group on Commercial Catches (WGCATCH)

9–13 November 2015

Lisbon, Portugal

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

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Conseil International pour l'Exploration de la Mer

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

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Executive summary

The Working Group on Commercial Catches (WGCATCH), chaired by Hans Gerritsen (Ireland) and Nuno Prista (Sweden), met in Lisbon, Portugal, 9–13 November 2015. WGCATCH is responsible for documenting national fishery sampling schemes, establishing best practice and guidelines on sampling and estimation procedures, and providing advice on other uses of fishery data. The meeting was attended by 30 participants from 15 countries.

The group addressed a large number of terms of reference and the meeting was conducted through presentations, discussions and analysis of questionnaires. The main terms of reference were addressed in subgroups. The report is structured directly along the terms of reference and the main outcomes are listed below.

Data collection schemes for small-scale fisheries

WGCATCH provided descriptions of national small-scale fisheries through questionnaires. An overview was obtained on the current data collection methods. Two major approaches were identified - census (e.g., sales, logbooks) and sampling methods (e.g., catch surveys) - and their main pros and cons were discussed. In most cases, specific sampling approaches are needed for these fisheries. The group developed a work plan to establish good-practice guidelines.

Analysis of case studies of commercial fishery sampling designs and estimation

Case studies of sampling designs and estimation involving megrim in divisions 7-8 were presented. A common theme is that issues with practical implementation of probability-based sampling remain. WGCATCH summarized the main issues and provided a set of possible solutions. The group also provided guidance on dealing with previous data collected under métier-based sampling designs.

Simulation models to investigate survey designs

Several simulation studies were presented, most of them outlining the work of fishPi project (funded under MARE/2014/19) in evaluating regional sampling designs. A critical review was carried out and WGCATCH produced general considerations and guidelines. WGCATCH recommends that these are taken into account when analysing the results of simulations of regional sampling design at RCM level.

The affect of the landing obligation on catch sampling opportunities

The affects on sampling and data quality of the current implementation of the landing obligation in the Baltic were reviewed. The group found that refusal rates for observer trips have increased to nearly 100% in at least one country, while in many other countries on-board observer programmes did not suffer noticeable changes. WGCATCH established that the catches below the minimum size cannot be accurately estimated by sampling the landings below the minimum size because an unknown proportion of the catches may be discarded. The group also reiterated that it is important that the logbooks distinguish landings below and above the minimum size.

Links with PGDATA

The remit of WGCATCH is closely linked to that of PGDATA. One of the relevant outcomes from PGDATA is the proposed workshop on cost benefit analysis of data collection in support of stock assessment and fishery management (WKCOSTBEN). WGCATCH endorses the need for such a workshop. WGCATCH also supports the

PGDATA recommendation that funding be made available for further development of the RDB including estimation and diagnostic routines.

Publication on statistically sound sampling schemes

WGCATCH drafted detailed plans to produce a peer-reviewed paper in 2016. The paper will provide a synthesis of the evolution of sampling design towards best practice, illustrated with a number of concise case studies.

Estimation procedures in the Regional Database (RDB)

The work of WKRDB 2015 presented alongside existing and planned estimation procedures in the RDB. Current work by Norway on a software package that will allow design-based estimation and optimization for stock assessment purposes was also presented. The advantages of ensuring compatibility of this new software with the developments currently planned for RDB-FishFrame are underscored.

Repository of resources relevant to catch sampling

WGCATCH initiated a repository with key resources; putting them into context with brief descriptions or review of each report, paper, book, website, software package etc. The intention is for this repository to be made available online by ICES.

Sampling of incidental bycatches

WGCATCH agreed to start routine documentation of sampling practices for bycatches of protected, endangered and threatened species (PETS) and rare fish species as well as routine evaluation of the limitations of current methods for collection and analysis.

Training course on Design and Analysis of Statistical Sound catch sampling programmes

WGCATCH considered continuous training and expertise on sampling design, estimation and simulation to be the basis for successful implementation of statistical sound catch sampling programs. A new ICES Training Course in Design and Analysis of Statistical Sound will take place at ICES HQ in Copenhagen, 12–16 September 2016. WGCATCH recommends that RCMs promote the attendance of these meetings among all MS involved.

1 Introduction

It is vital for ICES and other end-users to have confidence in the fishery data underpinning stock assessments and advice on sustainable fishing, and understand their limitations. Many ICES expert groups use data on fishery catches to describe fishing activities, show the development of fisheries, and evaluate the affects of fisheries on stocks and ecosystems. Data from fisheries often form the primary basis for reconstructing historical populations and estimating fishing mortality. These data are often treated as exact in fish stock assessments; however the data are frequently estimated (e.g., discards) and have variable quality (e.g., reported landings may be inaccurate to varying extents over time). This can translate into inaccuracies in advice.

One of the main responsibilities of WGCATCH is to ensure the quality of commercial catch data. In order to achieve this, the group documents national fishery sampling schemes, establishes best practice, guidelines, training courses and workshops on sampling and estimation procedures, and provides advice on the uses of commercial fishery data (e.g. estimating relative abundance indices based on fishery catch rates). The group also evaluates how new data collection regulations, or management measures (such as the landings obligation) may alter the way data needs to be collected and provides guidelines about biases and disruptions induced in time-series of commercial data.

1.1 Terms of reference WGCATCH 2015

The terms of reference of the meeting were as follows:

2014/2/SSGIEOM04 The **Working Group on Commercial Catches** (WGCATCH), chaired by Hans Gerritsen (Ireland) and Nuno Prista (Portugal), will meet in Lisbon, Portugal, 9–13 November 2015 to address the following specific and generic terms of reference:

Specific ToRs for 2015:

a) Document current as well as best practices for data collection schemes to estimate catch, effort, catch composition, biological parameters, demographic characteristics and spatial mapping of activities of small-scale commercial fisheries (under-10m vessels) with particular focus on European fleets. Evaluate approaches to data collection by census, surveys or self-sampling.

b) Further develop the work on sampling design and estimation through a detailed review of at least two contrasting case studies of commercial fishery sampling schemes, developed before the 2015 WGCATCH meeting, describing survey design, implementation, methods of data analysis, and derived estimates for end-users with quality indicators (e.g. standard errors). The case studies should include examples of sampling of at sea and onshore.

c) Develop examples of the use of a simulation modelling approach to investigate alternative survey designs and analysis methods for fishery sampling.

d) Review emerging information and analyses from commercial fishery sampling schemes indicating the effect of the landings obligation legislation, or other legislation that could bias the data and estimates.

e) Liaise intersessional with PGDATA to develop a standardized survey approach for European countries to document historical changes in sampling

design and availability of information on sampling achievements for commercial fisheries, and carry out a limited trial in 2015.

f) Review progress in developing the ICES Cooperative Research Report on statistically sound sampling schemes for commercial fisheries, which will also act as a reference document for implementation of the EU-MAP and provide material for a planned text book.

g) Review emerging statistical estimation procedures from ICES commercial fishery sampling schemes and comment on the implications for estimation in a regional context, in particular for the regional database to support the estimation procedures.

h) ToRs 2014–2016:

i) Develop and maintain a reference list of key publications or other available resources dealing with design and implementation of fishery sampling schemes and associated data analysis, and annually review new publications of relevance to WGCATCH. This should also include studies examining relationship between precision achieved and cost of sampling, and relationships between data quality and quality of fishery management advice.

j) Identify future research needs.

k) Respond to recommendations to WGCATCH from ICES expert groups RCMs, liaison meetings or other groups.

l) Develop the specific ToRs for the next WGCATCH meeting and a work plan identifying intersessional work that is needed, timelines and responsibilities.

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

1.2 Conduct of the meeting

The meeting was attended by 30 participants from 15 countries (Annex 1 and Figure 1.1)

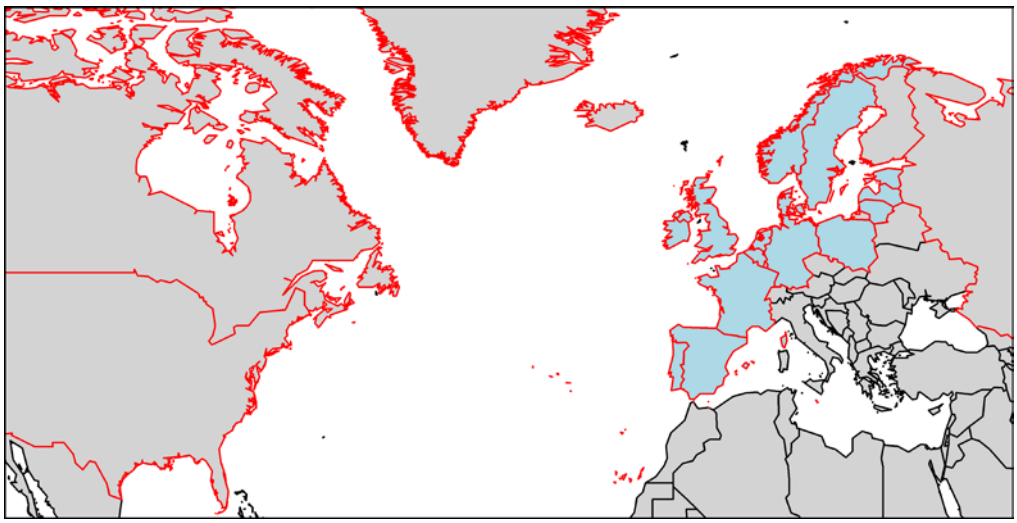

Figure 1.1 Countries participating in WGCATCH in blue; ICES countries are outlined in red.

The agenda of the meeting is given in Annex 2. The meeting was conducted through presentations, discussions and analysis of questionnaires. Most ToRs were addressed in plenary sessions involving all participants, additionally two large subgroups were formed, dealing with ToR A (small-scale fisheries) and ToRs B and C (case studies on estimation and simulation). The subgroups reported back in plenary each day. Report text completed at the meeting was reviewed in plenary alongside the ToRs for the next meeting (in 2016) and the associated work plan.

1.3 Report content

This report commences with the outcomes of the of the major ToRs: a) Small-scale fisheries; b) Case studies on sampling design and estimation; c) Case studies on simulation of alternative sampling designs; d) Review of the affects of the landing obligation and g) Discussion of estimation procedures within the present RDB. These are followed by the minor ToRs: i) E, F, H and L, which are grouped in a single chapter, ii) J that includes response to recommendations and iii) I and K that refer to future research and ToRs for the 2016 WGCATCH meeting.

Brief summaries of the working documents and presentations are given in Annexes 4 and 5. Full working documents are provided in a separate appendix to the report.

2 ToR a) Small-scale fisheries

Under ToR a) WGCATCH aimed to "*Document current as well as best practices for data collection schemes to estimate catch, effort, catch composition, biological parameters, demographic characteristics and spatial mapping of activities of small-scale commercial fisheries (under-10m vessels) with particular focus on European fleets. Evaluate approaches to data collection by census, surveys or self-sampling.*"

2.1 Chapter summary

Small-scale fleets are important in terms of the number of vessels involved and consequently employment. Although the total landings of small-scale fleets are often relatively minor; for a number of stocks they can be of considerable importance.

There are a number of census methods and sampling approaches available for these fleets but there is no clear guidelines for the design, implementation and quality assurance of such schemes. WGCATCH provided descriptions of small-scale fisheries from participating countries and provided an overview of appropriate data collection methods. Based on this, a work plan was developed to establish draft guidelines on good practice.

2.2 Background and WGCATCH approach

2.2.1 Definition of small-scale fisheries

There is no single definition of small-scale fisheries, as any definition is linked to the end-user needs such as stock assessment, marine spatial planning, socio-economic studies, MSFD, MPA, management regulation texts, etc. WGCATCH has adopted the view of the Nantes workshop ("Common understanding and statistical methodologies to estimate/re-evaluate transversal data in small-scale fisheries") on small-scale fisheries (Anon. 2013) which refers to fleet segments by vessel length (LOA) ranges: <10m; 10m–12m and ≥12m. The under-10m fleet is considered as a separate fleet segment in relation to data collection because there is no Control Regulation obligation to supply EU logbooks for vessels under 10m (this applies to under-8m vessels in the Baltic)[1]. The Nantes workshop recommended retaining the LOA class 10–12 meters as a separate fleet segment to ensure consistency in time-series and because they are not under 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 meters 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.

2.2.2 Data quality from small-scale fisheries

Detailed reviews exist of social and economic aspects of small-scale fisheries in Europe (Guyader *et al*. 2007, 2013). The focus of WGCATCH was on the collection of data of relevance for stock assessment and fishery management including spatial controls. WGCATCH consulted the report of the Nantes workshop on small-scale fisheries (Anon. 2013), and the responses of the 3rd Planning Group on Economic Issues

[1] See section 2.4.2 for details on the regulations

(PGECON 2014). The Nantes workshop had reviewed methods for collecting transversal data and referred to EC Study N° FISH/2005/10 on Small-scale Coastal Fisheries in Europe (Guyader *et al*. 2007, 2013). Based on information from 12 EU Member States (MS), the Nantes workshop identified that two types of data collection were in use - census methods and sampling approaches - and identified a need for an expert group to establish guidelines to MS on design, implementation and quality assurance of such schemes including the completeness and quality of declarative forms. In order to deal with high heterogeneity (in volume and value of fish landed, in species composition, in number of fishing days, in gears used, etc.), high spatial distribution and strong specificities of SSF fleet segment (multi-gears, multispecies fleet), the Nantes workshop also suggested that ICES or STECF should be consulted to give advice on how to distinguish fleet subpopulations to optimize precision and cost efficiency of the data collection. These topics are clearly within the remit of WGCATCH building on its current workplan and work done during WKPICS and other related workshops.

PGECON stated that the EU logbook format was not suitable for SSF due to their inherent special features, and that different data collection methods (e.g. coastal logbooks, monthly reports, monthly declarative forms, landing declarations, sales notes, etc.) should be considered. The choice between census and sampling methods for statistical treatment should be based on cost-efficiency, reliability, and data resolution needed. The Nantes workshop defined a core set of variables as a basic requirement for this fleet segment. The Nantes Workshop and PGECON noted regional differences in data collection methods and supported the need for a regional approach with more active end-user involvement to define data needs. Additional information could be related to the disaggregation level (spatial, technical and temporal) and/or to the collection of more detailed effort variables (soaking time, total length of nets, number of pots etc.). However, RCGs (or PGECON) should assess the feasibility to collect such additional information. The Nantes workshop concluded that techniques such as CCTV, mobile phone apps or geolocalization tools could be useful to improve data collection though PGECON envisaged possible difficulties caused negative attitudes towards these tools.

WGCATCH identified potential sources of uncertainty in data from small-scale fisheries. These are explored in more detail in subsequent sections and in the national fishery summaries:

- EU Control Regulation exemption of <10m vessels (<8m in Baltic) from mandatory EU logbook completion, and allowance under the regulation to dispose of small landings and discards without documentation. National approaches to estimate landings by census or sampling scheme, or reliance only on buyers and sellers documentation, have a range of design- and data quality issues related to bias and precision.
- Sales data and landings declarations typically do not capture information on fishing effort, details of gears used, or fishing location as given in EU logbooks, and vessels under 12m are not required to have VMS systems. Additional data collection is needed by census or survey but the accuracy and resolution of such data will vary depending on the coverage and methods used.
- Particular issues for small-scale fisheries include large uncertainty in measures of fishing effort for passive gears and the existence of considerable gear polyvalency in many vessels (both between and within trips).

- The sampling of small vessels to estimate discards or length and age composition of catches can be very challenging due to their large number and often remoteness of the landing sites, the frequent occurrence of part-time fishing, the lack of ability to take observers to sea, and the selling of many small landings directly to the public or businesses, in some cases without record, rather than through auctions or processors.

A range of census and sampling approaches are possible, and the development of guidelines for good practice can draw upon guidelines developed by ICES for commercial fisheries by WKPICS2 (ICES 2012) and recreational fisheries by WGRFS (ICES 2013). These need to account for the specificities of small-scale fisheries and the types of data that are required by end-users.

2.2.3 Approach adopted by WGCATCH

WGCATCH was not in a position to draw up detailed guidelines for good practice in the sampling of small-scale fisheries during its 2015 meeting but will use the national information obtained at the meeting to draft such guidelines intersessional for discussion at the 2016 WGCATCH meeting.

WGCATCH adopted the following approach:

i) Provide descriptions of small-scale fisheries for the countries represented at WGCATCH, including information from a national questionnaire circulated by WGCATCH to obtain data on the sizes of the fleets and their catches compared with larger vessels, and information on data collection methods in use for estimating transversal variables (landings, effort, gear, etc.), discards and fleet-based biological variables (length and age).

ii) Provide an overview of possible data collection methods according to specificity of small-scale fisheries, and identify the data quality issues that must be considered in the design and implementation of the schemes and analysis of results. In the case of sampling schemes, many of the issues are similar to those of recreational fisheries surveys and sampling of commercial fishery catches already dealt with in some detail by WGCATCH, WKPICS, SGPIDS, WGRFS and other expert groups within and outside the ICES area.

iii) Based on outcomes of (i) and (ii), develop a work plan to establish draft guidelines to Member States on design, implementation and quality assurance of data collection schemes for small-scale fisheries, for consideration at the WGCATCH 2016 meeting.

2.3 National descriptions of small-scale fisheries

Diversity and specificities of SSF are extensively highlighted in the EC Study N° FISH/2005/10 and the annexes of the Nantes workshop (Anon., 2013). Annex 6 provides national descriptions of small-scale fisheries presented during the WGCATCH meeting. A series of tables and figures in the Annex 6 summarize the content of the national questionnaires filled before and during the WGCATCH meeting.

The under 10m and 10–12m fleet segments are of high importance in all countries in terms of number of vessels and consequently in employment. SSF are generally composed by polyvalent fleets in terms of gears and target species (multi-gears, multi-species fleets), that develop a seasonal or part-time activity (see details in Annexes 5 and 6). Their contributions to total landings are often lower compared to other size

segments; however their share of TAC-quota or catches of regulated species can be significant and it must be stressed that underreporting of landings can give a truncated view of this contribution. The importance of SSF must be assessed by fishery, species and region because significant differences can occur between them. It should also be highlighted that the SSF fleet segments are of high importance for fishery spatial management because they usually operate in more coastal areas and probably more sensitive habitats (e.g., nursery grounds) and that socio-economic studies indicate that the large number of vessels involved corresponds to a large number of people employed and dependent on these fisheries.

2.4 Overview of possible data collection methods for small-scale fisheries (<10m and 10-12m)

2.4.1 Scope of methods available

Data collection methods fall into several clear categories:

- Census methods dependent on self-reporting of data by fishers, intended to have exhaustive coverage of the population (as far as is possible). Quality issues are related to actual coverage of the scheme, response rates, and accuracy of data and validation schemes to evaluate these.
- Sampling schemes that use similar data reporting methods as for a census, but are applied to random samples of fishers who self-report. Additional quality issues related to the statistical soundness of the sampling design, problems arising at the implementation stage (e.g., sampling departs from randomness; refusals to provide data; strata with no or inadequate samples), and errors introduced by inappropriate estimation procedures or inaccurate information used to calculate sample probabilities.
- Sampling schemes where the variables of interest (gear, fishing effort, fishing zones, catches etc.) are observed or surveyed directly on-site by trained survey staff (catch assessment survey) or recorded by CCTV. In such cases, inaccuracies in self-reporting are eliminated but similar quality issues remain for design, implementation and analysis.

Table 2.5.1 Summarizes a range of possible data collection schemes for landings, effort and other transversal variables, and fleet-based biological variables such as length compositions or discards. This is not exhaustive and other schemes may exist.

2.4.2 Census methods

In a fisheries context this usually refers to exhaustive coverage of the population from which data are required, for example fishing vessels. An example is the EU logbook which the Control Regulation (EC) No 1224/2009 requires to be submitted for all EU registered vessels of 10m and over, recording catches and associated effort, gear and area data by day for all fishing trips2. Vessels under 10m are not required to keep such logbooks, and for these vessels a sampling plan is required unless the MS has required such vessels to keep an EU logbook (Article 16–3) or if sales notes are supplied (Article 16–4). In the latter case, the supply of sales notes (or sales slips) and catch declarations

2 See example of logbook datasheets here:
http://www.bim.ie/media/bim/content/BIM_USERFRIENDLY-GUIDE_%20EU_LOGBOOK%20SECTION%202.pdf

could be considered as census data. The use of sales notes as census data for small-scale fisheries is common practice in countries where it is mandatory for all commercial landings (irrespective of vessel size) to be sold at specific places (generally auctions within ports) and centrally registered in national databases. This register generally allows for full discrimination of the composition in species and weight of the landings of individual vessels (see presentation WP.A3 in Annex 5)

Several exemptions and conditions in the Control Regulation result in incomplete landings data in the logbooks (Article 65), triggering a requirement for a sampling scheme. The relevant parts of the Regulation are extracted below:

COUNCIL REGULATION (EC) No 1224/2009

(17) Member States should monitor the activities of their fishing vessels in and outside Community waters. To facilitate effective monitoring masters of Community fishing vessels of 10 metres' length overall or more should be obliged to keep a fishing logbook and submit landing and transhipment declarations.

(…)

(19) For small fishing vessels of less than 10 metres' length overall an obligation to keep a fishing logbook or to complete a landing declaration would constitute a disproportionate burden in relation to their fishing capacity. In order to ensure an adequate level of control over such vessels, Member States should monitor their activities by the implementation of a sampling plan.

Article 14

Completion and submission of the fishing logbook

1 Without prejudice to specific provisions contained in multiannual plans, masters of Community fishing vessels of 10 metres' length overall or more shall keep a fishing logbook of their operations, indicating specifically all quantities of each species caught and kept on board above 50 kg of live-weight equivalent.

(…)

4. Masters of Community fishing vessels shall also record in their fishing logbook all estimated discards above 50 kg of live-weight equivalent in volume for any species.

Article 16

Fishing vessels not subject to fishing logbook requirements

1. Each Member State shall monitor, on the basis of sampling, the activities of fishing vessels which are not subject to the requirements specified in Articles 14 and 15 in order to ensure compliance by these vessels with the rules of the common fisheries policy.

2. For the purposes of the monitoring referred to in paragraph 1, each Member State shall establish a sampling plan based on the methodology adopted by the Commission in accordance with the procedure referred to in Article 119 and transmit it every year by 31 January to the Commission indicating the methods used for the establishment of this plan. The sampling plans shall be, as far as possible, stable over time and standardized within relevant geographical areas.

3. Member States requiring fishing vessels of less than 10 metres' length overall flying their flag to submit fishing logbooks referred to in Article 14, in accordance with their national law, shall be exempted from the obligation laid down in paragraphs 1 and 2 of this Article.

4. By way of derogation from paragraphs 1 and 2 of this Article, sales notes submitted in accordance with Articles 62 and 63 shall be accepted as an alternative measure to sampling plans.

Article 65

Exemptions from sales notes requirements

1. The Commission, in accordance with the procedure referred to in Article 119, may grant an exemption from the obligation to submit the sales note to the competent authorities or other authorised bodies of the Member State for fisheries products landed from certain categories of Community fishing vessels of less than10 metres' length overall or for quantities landed of fisheries products not exceeding 50 kg of live weight equivalent by species. Such exemptions may be granted only in cases where the Member State in question has installed an acceptable sampling system, in accordance with Articles 16 and 25.

2. A buyer acquiring products up to an amount of 30 kg which are not thereafter placed on the market but used only for private consumption shall be exempted from the provisions laid down in Articles 62, 63 and 64. Any amendment to this threshold shall be adopted in accordance with the procedure referred to in Article 119.

In what concerns sales notes, the fact that they are linked to commercial activity makes them one of the most widely available data sources, with registers several centuries back in time and benefiting nowadays of the increased proficiency of national registers of economic activity. Like the logbooks, the accuracy of sales notes is strongly dependent on the degree of compliance but where they are systematically registered they provide an additional set of data that can be used to validate and even improve logbook data: e.g., sales notes can be used to cross-check logbook records and associate to them commercial size categories and in Malta sales notes are used to determine which vessels were active in the absence of VMS data). WGCATCH notes that the implementation in late 2014 of the Regulation (EU) No 1379/2013 now establishes a set of conditions that may increase the usefulness of sales data, namely gear discrimination in multi-gear fleets (see presentation WP.A3 in Annex 5). However, WGCATCH notes that, at present, mandatory gear discrimination in sales is still relatively coarse when compared to the one used in the control regulations (which currently assumed of voluntary in sales).

REGULATION (EU) No 1379/2013 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

Article 35

Mandatory information

1. Without prejudice to Regulation (EU) No 1169/2011, fishery and aquaculture products referred to in points (a), (b), (c) and (e) of Annex I to this Regulation which are marketed within the Union, irrespective of their origin or of their marketing method, may be offered for sale to the final consumer or to a mass caterer only if appropriate marking or labelling indicates:

(…)

(c) the area where the product was caught or farmed, and the category of fishing gear used in capture of fisheries, as laid down in the first column of Annex III to this Regulation;

Article 39

Additional voluntary information

1. In addition to the mandatory information required pursuant to Article 35, the following information may be provided on a voluntary basis, provided that it is clear and unambiguous:

(…)

(c) more detailed information on the type of fishing gear, as listed in the second column of Annex III;

ANNEX III

INFORMATION ON FISHING GEAR

Mandatory information on the category of fishing gear	More detailed information on corresponding gears and codes, in accordance with Commission Regulation (EC) No 26/2004 (1) and Commission Implementing Regulation (EU) No 404/2011 (2)	
Seines	Beach seines	SB
	Danish seines	SDN
	Scottish seines	SSC
	Pair seines	SPR
Trawls	Beam trawls	TBB
	Bottom otter trawls	OTB
	Bottom pair trawls	PTB
	Midwater otter trawls	OTM
	Pelagic pair trawls	PTM
	Otter twin trawls	OTT
Gillnets and similar nets	Set (anchored) gillnets	GNS
	Driftnets	GND
	Encircling gillnets	GNC
	Trammel nets	GTR
	Combined trammel and gillnets	GTN
Surrounding nets and lift nets	Purse seines	PS
	Lampara nets	LA
	Boat operated lift nets	LNB
	Shore-operated stationary lift nets	LNS
Hooks and lines	Hand lines and pole lines (hand operated)	LHP
	Hand lines and pole lines (mechanised)	LHM
	Set longlines	LLS
	Longlines (drifting)	LLD
	Troll lines	LTL
Dredges	Boat dredges	DRB
	Hand dredges used on board a vessel	DRH
	Mechanised dredges including suction dredges	HMD
Pots and traps	Pots (traps)	FPO

(1) Commission Regulation (EC) No 26/2004 of 30 December 2003 on the Community fishing fleet register (OJ L 5, 9.1.2004, p. 25).
(2) Commission Implementing Regulation (EU) No 404/2011 of 8 April 2011 laying down detailed rules for the implementation of Council Regulation (EC) No 1224/2009 establishing a Community control system for ensuring compliance with the rules of the Common Fisheries Policy (OJ L 112, 30.4.2011, p. 1).

2.4.3 Sampling methods

Different sampling schemes could be designed for different purposes but they have to be linked with the end-users' data needs. For example, data needed for marine spatial planning may require a different design than data needed for stock assessment. The Control Regulation requires Member States to implement sampling plans for under-10m commercial vessels but there are exemptions from providing complete documentation of landings that are elaborated further in the Annexes XIX and XX of the Commission Implementing Regulation (EU) No 404/2011. The implementing regulation states that: "a selected number of landings of fisheries products, to be determined by each Member State on the basis of its risk analysis, are weighed in the presence of officials of the competent authorities" (Annex XIX); "Sampling of landings of fisheries products shall be at least as effective as simple random sampling and proportionate to the level of risk" (Annex XX) and that "Operators comply with established sampling levels" (Annex XX).

Appendix VIII of the EU Data Collection Framework Commission Decision 2010/93/EU also places a legal requirement for Member States to collect transversal variables including vessel numbers, fishing effort, landings and landings value, and states that "Wherever possible, transversal data shall be collected in an exhaustive way. Where this is not possible, Member States shall specify the sampling procedures within their national programmes. Member States shall include in their annual report information on the quality (accuracy and precision) of the data."

The combination of the Control Regulation and Data Collection Framework requirements for providing data on effort and landings using sampling schemes leads to a lack of clarity on what is acceptable as a sampling scheme. The following text on potential sampling schemes adopts a broader interpretation of how such schemes could be designed and goes beyond a narrow interpretation of the EU regulations.

Sampling schemes to estimate landings such as vessel intercepts onshore, or completion of logbooks by random samples of vessels, have similar analogies in recreational fishing where the methods have been well tested internationally. Methods and best practice guidelines for recreational fishing have been explored in detail by the ICES Working Group on Recreational Fisheries Surveys (e.g., WGRFS 2012) and related expert groups.

A major advantage for surveys of small-scale commercial fisheries relative to surveys of recreational fisheries is the frequent availability in the former of a more-or-less complete register of vessels with vessel details such as length. Such availability allows for the possibility of randomized selection of vessels for collection of data or for the possibility to estimate the number of active vessels per landings site useful to optimize the collection of fishery data directly on-site. On the contrary, for recreational fisheries without a license list, there is a need for separate and often expensive population surveys to identify the number of fishers and their characteristics, and to supply randomized panels of respondents to keep catch diaries.

Recreational catches can also be estimated from intercept surveys using an area frame where a clustered random selection of shore fishing sites or boat landing sites are visited and all recreational fishers completing their trips can be interviewed to determine their catches. The clustered random design allows unbiased estimation of the average catch per unit of effort for the full area and period of interest, and this is combined with the population survey estimate of total effort to give total catches. In principle the total recreational catches for shore or boat anglers could be estimated directly from the sampling probabilities in the area frame. This approach is also possible for small-scale commercial fisheries where the landings of all or a random sample of vessels landing at a site and day, recorded by interview on site, can be raised to all sites and days in the year using the hierarchical cluster sampling probabilities at each stage. An example of this is given by Vølstad *et al.* (2014) for small-scale commercial fisheries in Mozambique. In Europe, on-site surveys of catches of small-scale fishery vessels have been conducted by France in Mediterranean Sea and Overseas regions (Demanèche *et al.*, 2013) and in Malta (presentation WP.A.2, Annex 5). Possibilities also exist for other combination of methods such as the use of aerial surveys to estimate effort combined with intercept surveys to record catches and other data. Examples for recreational fishery surveys are given by ICES WGRFS (WGRFS 2015) for surveys in New Zealand and by Vølstad *et al.* (2006) for surveys in the Delaware River.

In all cases where sampling schemes are dependent on self-reporting by fishers, quality assurance schemes are needed to validate the supplied information. The use of technology such as CCTV can be used to validate that reported data matches what was

caught, and may even allow independent estimates to be derived. Self-reporting of fishing activity, landings, discards or size-frequencies of catches present particular logistic difficulties for small vessels, and the reporting burden may have to be reduced as far as possible and technological solutions found to minimize the work needed. Strong incentives may be required to ensure continued supply of data.

Implementation of geo-localization data for a sample of under-10m vessels (see test in place in France within the Recopesca projects: Leblond *et al*., 2010) could be a solution to minimize the work needed. The Nantes workshop agreed that technical instruments (electronic devices) could provide detailed information on effort with high spatial resolution and could be useful to assess reliable transversal data (Anon., 2013). It suggested that such collection of data should be supported in the future through an incentive approach encouraging member states to work together in developing tools to process such data specially geo-localization data.

2.5 Development of guidelines for good practice in data collection from small-scale fisheries

WGCATCH will carry out intersessional work to develop an initial draft of generic and specific guidelines for good practice in collection of transversal and biological data from small-scale fisheries in Europe, and review these during its 2016 meeting.

Small-scale fisheries present many specific features (multi-gears, multispecies fleet, high spatial distribution, high seasonality, part-time activity in some cases, direct sales, etc.) that distinguish it from the Large Scale Fleets (LSF). Hence, SSF often have to be monitored differently and specifically by a census or a sampling approach adapted to their special features.

- Sampling methods as well as census methods will be evaluated during the drafting of these guidelines. The Nantes workshop recommended that the choice between the two options should be based on cost efficiency including level of reliability/quality of data assessed to be reached by each approach envisaged and this recommendation will be considered: In data collection schemes of census type, the assessment of the completeness and quality of declarative forms and sales notes is an issue that requires particular attention. WGCATCH will develop guidelines for a proper methodology to help to overcome this specific issue. WGCATCH will also develop guidelines concerning the best way to collect such data by a census approach (by using specific declarative forms and/or sales notes with complementary surveys) as SSF present a lot of specificities highlighted during the meeting and require adapted declarative forms.
- Concerning sampling approaches, WGCATCH will develop guidelines to develop appropriate sampling schemes to survey SSF and deal with their special features.

WGCATCH will deal with the key issues to estimate discards or length and age composition of catches from SSF because of their specificities namely high spatial distribution, difficulty to have an observer on-board, etc., and discuss the necessity (or not) to survey specifically fleet-based biological variables (e.g., length and age composition). At present it is not clear if there are sufficient differences in length/age distribution of catches between large-scale fleets and small-scale fleets that justify they are sampled separately for these variables (but see WP.A3 in Annex 5).

Table 2.5.1 Examples of methods and quality issues for data collection from small-scale commercial fisheries, for purposes of stock assessment and fishery management. Quality assurance and control schemes to detect errors in recorded data are assumed and not mentioned specifically.

	Census		Sampling schemes	
Type of data	Method	Quality issues to address in guidelines	Methods	Quality issues to address in guidelines
List of vessels by LOA	EU register National fleet activity database	Accuracy and completeness of registers and databases.		
Spatio-temporal activity by gear type	Exhaustive logbook	Actual coverage; Refusals; Non-response; accuracy of self-declared information; low spatial resolution	Randomized vessel intercept scheme using a site x day area frame.	Design; implementation error1; refusals; accuracy of declared information during interviews; estimation method; accuracy of variables needed for sample raising; precision estimation
	Exhaustive use of VMS or other electronic sensors.	Actual coverage; Refusals; Reliability	Randomized issue of logbooks or other recording systems using a vessel list frame.	Design; implementation error; refusals; accuracy of declared information; estimation method; accuracy of variables needed for sample raising; precision estimation
	Exhaustive sales data	Actual coverage; Low aggregation level of gears used; Reliability	Randomized telephone survey of vessel owners.	Design; implementation error; refusals; accuracy of declared information; estimation method; accuracy of variables needed for sample raising; precision estimation
			Detailed data supplied by observers	Design; coverage; number of trips; refused access or permission by owner; estimation method; accuracy of variables needed for sample raising; precision estimation
			Data from CCTV, VMS or other electronic sensors fitted to samples of vessels.	As spatial fishing patterns can vary from vessel to vessel, it is difficult to extrapolate to the whole fleet.

	Census		Sampling schemes	
Type of data	Method	Quality issues to address in guidelines	Methods	Quality issues to address in guidelines
List of vessels by LOA	EU register National fleet activity database	Accuracy and completeness of registers and databases.		
			Data from at-sea vessel inspection by patrol vessels and/or overflight data by enforcement agencies2	Frequency and coverage of observations; ability to extrapolate to whole fleet; availability of gear information
Catches (landings, discards and other bycatch, e.g. PETs)	Exhaustive logbook	Actual coverage Non-response Accuracy of self-declared information Absence of 0-landings trips where effort may have occurred	Randomized vessel intercept scheme using a site x day area frame, with fisher interviews and direct recording of catches on board.	Design; implementation error; refusals; accuracy of declared information such as discards; estimation method to raise from samples to full area and period; accuracy of variables needed for sample raising; precision estimation
	Exhaustive sales data	Actual coverage; Landings only; Accuracy of species identification	Randomized issue of logbooks or other recording systems using a vessel list frame.	Design; implementation error; refusals; accuracy of declared information; estimation method to raise from samples to full area and period; accuracy of variables needed for sample raising; precision estimation
			Randomized telephone survey of vessel owners.	Design; implementation error; refusals; accuracy of declared information; estimation method to raise from samples to full area and period; accuracy of variables needed for sample raising; precision estimation
			Randomized observer scheme using vessel list frame	Design; coverage; number of trips; refused access or permission by owner; estimation method to raise from samples to full area and period; accuracy of variables needed for sample raising; precision estimation

	Census		Sampling schemes	
Type of data	Method	Quality issues to address in guidelines	Methods	Quality issues to address in guidelines
List of vessels by LOA	EU register National fleet activity database	Accuracy and completeness of registers and databases.		
			CCTV cameras on random vessel selection	Design; coverage; number of trips; refused access or permission by owner; equipment resolution; estimation method to raise from samples to full area and period; accuracy of variables needed for sample raising; precision estimation
Length/age compositions	Exhaustive sales data with size categories	Actual coverage; Reliability of size categories reported; Accuracy of species identification	Port sampling scheme, e.g. using a site x day area frame.	Design; implementation error; refusals; estimation method to raise from samples to full area and period; accuracy of variables needed for sample raising; precision estimation
			Randomized observer scheme using vessel list frame	Design; coverage; number of trips; refused access or permission by owner; estimation method to raise from samples to full area and period; accuracy of variables needed for sample raising; precision estimation
			Self-sampling schemes for vessels selected from list frame.	Design; coverage; refusal; accuracy of declared information; estimation method to raise from samples to full area and period; accuracy of variables needed for sample raising; precision estimation

[1] e.g. departure from randomness; incomplete coverage. "Design" includes intended coverage.

[2] e.g. Vanstaen and Breen, 2015.

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3 ToR b) Case studies of commercial fishery sampling schemes

Under ToR b) WGCATCH set out to "*Further develop the work on sampling design and estimation through a detailed review of at least two contrasting case studies of commercial fishery sampling schemes, developed before the 2015 WGCATCH meeting, describing survey design, implementation, methods of data analysis, and derived estimates for end-users with quality indicators (e.g. standard errors). The case studies should include examples of sampling of at sea and onshore.*"

3.1 Chapter summary

A number of case studies of commercial fishery sampling designs were presented. A common theme was that issues with practical implementation of probabilistic sampling designs remain problematic. WGCATCH summarized the main issues and provided a set of possible solutions. WGCATCH also provided some guidance on dealing with data collected under métier-based sampling designs, which are commonly over-stratified.

3.2 Implementation of probabilistic sampling designs

The group discussed a number of case studies (summaries of the working documents and presentations are given in Annex 4 and 5). All cases studies suffered from problems with the practical implementation of probabilistic sampling designs. These problems were discussed and a summary is presented below alongside possible solutions.

SAMPLING	PROBLEM	POSSIBLE SOLUTION
At-sea	Trips need to be organized centrally. This means that observers cannot plan when they go to sea and it leads to inefficient use of their time and poor work-life balance. Observers have to wait until the selected vessel is leaving and that increases costs because the observer is paid to be on stand-by.	Systematic sampling of trips may make tips more predictable. In Portugal, observers are systematically allocated to go to sea in an annual calendar. Within each of these weeks, observers find the best date to go on board. In Denmark, observers can book time blocks when they are unavailable
At-sea	Trips need to be organized centrally. This can lead to higher refusal rates then when observers contact skippers directly.	Regional vessel lists may be a workable compromise.
At-sea	No contact details for skippers/owners	Contact producer organizations; contact local authorities (phone numbers frequently associated to licensing regime)
At-sea and onshore	Probabilistic sampling designs are more expensive (more effort involved; inefficient use of (human) resources).	There is little basis for the adoption of ad-hoc sampling plans that compromise final estimates. It is better to have a small number representative samples than a larger number of biased samples.

SAMPLING	PROBLEM	POSSIBLE SOLUTION
At-sea	Small vessels may not be able to take observers	Conduct self-sampling programme; voluntary logbook schemes; CCTV. It should be noted that the data from these schemes should be validated in some way because they are not directly observed.
At-sea	Refusals may depend on fishing practice; skippers may be willing to take observers on trips targeting one species but not when they target other species.	Post-stratification (adjusting weights) can compensate for this bias.
At-sea	Refusal rate may be so high that only a small number of vessels will take observers.	If this is documented properly it is still an improvement. This information can help estimate the bias but also can be used in a political way to demonstrate lack of cooperation. The need for MSC certification may help to enforce reduction in refusals
At-sea	General problem of high refusal rates	Skippers can be obliged to take observers – this has worked in some countries (New Zealand, USA, Canada) but may not be desirable in Europe because it could undermine the trust on which the relationship between skippers and samplers is based (i.e. the data are confidential and not used for enforcement).
Onshore	Access to samples (fish not available for sampling in landing port)	Work with authorities to improve the situation
Onshore	Travel to distant ports is expensive or large number of small ports	Select small number of representative ports. Consider the cost/benefit of hiring some local staff.
Onshore	Incomplete information on the landings that are sampled (e.g. total landings of a vessel may be unknown)	Work with authorities to improve the situation
Onshore	Market days can be selected randomly but not possible to take a random sample of trips within market days.	Fishing trips do not have to be the primary sampling unit. Market days can be PSU but the sampling design and estimation should reflect this.
Onshore	Random selection of market days may lead to missed opportunities	For species that need to be sampled but only appear infrequently in the ports, the protocol could be to sample them whenever they are landed.
Onshore / at sea	Trips are often the PSU but there is no sampling frame of trips available in real time.	NOAA has a system of checking in trips before they leave and when they come in. Or: use a different sampling frame, e.g. Vessel * time.

3.3 How do we deal with data collected under métier–based sampling programmes?

WGCATCH received a request from the inter-benchmark protocol (IBP) on Megrim to provide guidance on how to provide estimates from data that were not collected using probabilistic sampling schemes, in particular for the meg78 stock. From 2009 onwards, the DCF sampling programmes were based on targets per métier so there is a time-series of data that is highly over-stratified and highly influenced by quota sampling. France, Spain and Ireland provided presentations on the landings and discard data for the meg78 stock.

Observations and suggestions:

- Métier-based sampling generally leads to a very large number of strata while there is usually little benefit to having more than 6 strata (Cochran, 2007). In practice there are often a small number of strata that are responsible for the vast majority of catches. These strata are often well-sampled making it possible to provide reasonable estimates for those strata. WGCATCH does not recommend filling-in data from missing strata, which in many cases do not contribute much to the national or stock estimate. In cases where non-sampled strata do contribute considerably to the final estimates, the working group cannot recommend best-practice – this will have to be judged on a case-by-case situation.
- Métier-based sampling can lead to biased samples: e.g. the distribution of vessel lengths in the samples may be different from that of the population due to an interaction between métier and vessel size. This can also happen in a probabilistic sampling design due to non-random refusals. The solution is the same for both sampling designs: post-stratification (Survey weights can be adjusted so that the number of sampling units (e.g. trips) or size of estimation (e.g. landings) is equal to known population totals in each stratum; the resulting weights are then used in forming estimates of means, totals, or ratios of variables collected in the survey for the target population, or for domains).
- It should also be noted that in a single realization of a probabilistic sampling event, the samples may not appear to be very representative, especially if the number of samples is small. However, if samples were selected at random (i.e. not biased due to non-random refusals etc.), there should be no need for post-stratification.
- Data exploration (e.g. checking for outliers; checking if the data are representative; addressing biases and data gaps) is generally done in individual labs. However a regional approach to data exploration may be useful. If the relevant experts attend data compilation workshops, this could be done there.

4 ToR c) Modelling and simulation

Under ToR c) WGCATCH aimed to "*Develop examples of the use of a simulation modelling approach to investigate alternative survey designs and analysis methods for fishery sampling.*"

4.1 Chapter summary

Prior to the meeting WGCATCH, members were consulted to provide case-studies of simulation models to investigate survey designs for fishery sampling. Much of this work overlaps with the fishPi project (funded under MARE/2014/19). At the WGCATCH meeting, a number of case studies were presented outlining the simulation work made under fishPi in addition to other "independent" simulation studies carried out at national labs. These demonstrated the wide range of applications simulations can address in the design of commercial fisheries sampling schemes. A critical review was carried out by WGCATCH participants on the results presented. The discussion yielded general considerations and guidelines that are expected to improve the usage of simulation studies in investigations of survey design of commercial fisheries across the ICES area.

4.2 Overview of fishPi project

The fishPi project, funded as part of EU grant number MARE/2014/19 for "Strengthening regional cooperation in data collection", is a collaboration of 13 scientific institutions form 12 member states based on the RCM North Sea and Eastern Atlantic (NSEA) region. Members of the RCM North Atlantic (NA) and RCM Baltic have prominent roles within the project. There are two external experts with particular statistical and survey design experience involved. The fishPi project is running in parallel with a project with similar aims and objectives in the Mediterranean and Black Sea region. The project started in April 2015 and is scheduled to run for one year. The project comprises 4 work packages (WPs) covering: regional coordination; regional sampling designs for 4 case study commercial fisheries in the NSEA and NA regions; sampling programmes to collect data on fisheries affects on the ecosystem, small-scale and recreational fisheries; data quality. The work pages are described in more detail below.

WP 1 Regional coordination

The main aims of this work package are to propose a regional work programme for the data collection proposed in the other work packages, then carry out and present the results of a consultation with the Member States within the NSEA and NA regions regarding the work programme and other results of the project. The work package builds heavily on the results of the other work packages in the project.

WP2 Regional sampling programme for commercial fisheries

This work package comprises three parts: guidelines for data collection, management and analysis, formats and code-lists for the data collected, and the development of regional sampling designs for 4 case study fisheries: herring, mackerel and sprat (CS1); North Sea demersal fisheries (CS2); North Sea flatfish fisheries (CS3); and Northern & Southern hake (CS4).

The guidelines are currently being developed in collaboration with the statistical consultants to the project.

The data format for the sampling data builds on the format developed at WKRDB 2014 and discussed at WKRDB 2015, and has defined as an R object ("csPi") and stored in an R package "fishPiFormats". The code lists for WoRMS species list, the FAO ASFIS species lists, the revised métier table, the UNLOCODE table, and the DCF vessel type codes have been compiled into an R package "fishPiCodes".

Each case study has collated a fine scale dataset, based on logbook and sales note data, provided by the 13 scientific institutions operating in the regions. For each case study, the datasets have been used in simulation studies to test alternative sampling designs for at-sea and onshore sampling schemes. This process was facilitated by the generation of software tools, scripts and functions which have been disseminated within the core team of the work package.

Work in WP2 during the first part of the project has facilitated greater understanding of the statistical principles and applications underlying the sampling, the regional fisheries, and the statistical language R, in all members of the WP2 core teams.

WP3 Sampling programs for ecosystem indicators, small-scale and recreational fisheries.

One of the main objectives under this work package is to contact and have a real feedback with the main end-users (mainly ICES expert Working Groups) during the duration of the project. Taking this into account, the most relevant end-users have been identified and contacted in the first months of the project, either through ICES expert groups (e.g. WGRFS & WGCATCH) or via online meetings with relevant experts.

The WP will define a possible future regional sampling plan for these new ecosystem variables (bycatch, stomach contents and RF/SSF fisheries). This regional sampling plan should define the stages in design and implementation of a regional data collection scheme defined in STECF-13-06. These may include definition of: regional objectives and estimates needed; type of data needed; data collection methods and design; sampling intensity; data archiving; quality evaluation; analysis & estimation; reports & statistics required.

Within the time-scale of the project it will not be possible to make an in-depth analysis of the sample size, precision, and number of samples required by Member States for these new sampling plans. The team agreed to start by providing guidelines and examples explaining how the different stages in the sampling plan should be covered.

Online meetings are planned between the WP leaders of both the Mediterranean and Black Sea Project and the fishPi Project to ensure that both project teams are aware of progress within the parallel projects and information can be exchanged as appropriate.

WP4 Data quality

This WP aims to develop a set of data quality checks, an annual calendar for their implementation, and an R package containing functions to carry the checks out on data in a format suitable for probability-based sampling designs ("csPi format"). The constraints on these quality checks are that they have to be conducted on national and regional data and be consistent with the annual timeline of the data submission process to ICES expert groups and data calls to the RDB. A framework to build an automatic reporting system for the data quality procedures related to a given dataset has now been implemented, to be released after the WKRDB 2015 meeting, when the csPi format will be completed.

The WP is collaborating closely with the Mediterranean and Black Sea consortium: 2 experts participated in the face-to-face meeting and the minutes of the meeting will be shared by the two consortiums.

4.3 General considerations on simulations of regional sampling designs

The first results from simulations carried out under each of case studies of fishPi were presented and reviewed during the WGCATCH meeting. A summary of working documents and presentations can be found in Annex 4 and 5. Full working documents are provided in a separate Appendix to this report.

Simulation results presented at WGCATCH highlighted a range of different scenarios that can be tested in the context of simulation studies of regional sampling designs. Among these scenarios, it is of particular importance to specify the baseline scenario against which alternative survey designs are to be compared and evaluated. One possibility for such scenario is the *status quo*, i.e., the sampling design currently being implemented, as it would allow direct measurement of the improvements obtained with alternative settings. However, such design is frequently subjected to numerous adjustments to meet logistics and budgetary constraints and specifics of individual fisheries rendering comparison to theoretical alternatives less interesting (albeit still important). For that reason, baseline scenarios based on simple random sampling (SRS) are generally used to assess the improvement in variance achieved by implementing survey design alternatives, with the *status quo* survey design being one among various alternatives possible.

Most simulation case studies presented at WGCATCH involved simulations of relatively simple designs, e.g., stratification into major/minor ports, compared against a SRS design. In general, these designs performed better than the baseline SRS design but it was found that more complicated designs did not necessarily improve the estimates. This observation was, however, confounded by large variability across case-studies with regards to the choice of the baseline SRS scenario used in the computation of design effects and in the choice of the alternative scenarios being tested.

4.4 Variances used in assessing design effects

The Design Effect (*Deff*) of a sampling design B (e.g., a design involving stratification) against a simple random sample alternative is given by

$$Deff(design\ B) = \frac{\mathrm{var}_{design\ B}(\hat{\mu})}{\mathrm{var}_{srs}(\hat{\mu})}$$

Where $\mathrm{var}_{design\ B}(\hat{\mu})$ is the variance obtained under sampling design B and $\mathrm{var}_{design\ B}(\hat{\mu})$ is the variance obtained from simple random sampling. If Deff = 1 no gain is obtained from the alternative design B when compared to SRS alternative. If Deff << 1 then the alternative design B provides for a significant improvement in the variance relative to the one of SRS design.

Although *Deff* is a relatively simple formula it is important to standardize its inputs. In the discussions held at WGCATCH it became apparent that different institutes could be using different ways for calculating the variances, including the variance of simulated totals, the mean of variances of simulated totals and/or analytical values based on textbook formulas. WGCATCH underscores that variability of the calculation of *Deff* will affect results and comparability across CS and that aspects like the skewness of distributions and availability of theoretical expressions (e.g., in SRS scenarios) should be considered in evaluations of design effects. Additionally, WGCATCH identified two types of scenarios were being used in the denominator of the *Deff* expression: Simple random sampling of trips (SRS) and Two stage sampling with random sampling of trips (SSUs) within port-days (PSUs). Both these scenarios have advantages and disadvantages that were briefly outlined during the group's work:

- Simple random sampling of trips – it is true baseline scenario from a statistical point of view since it provides simple random sampling of the population units (trips). However, such complete list of units as that present in the simulation datasets does not generally exist in the real world. Rather, the total trip number is frequently unknown at the start of the year and trips are assessed through market days (e.g., onshore sampling) or some kind of temporal distribution of contacts with fisher (e.g., randomly selected from trips starting in a given week). As such, it may be unfair to evaluate results from alternative scenarios against a simple random sampling of trips alternative.
- Two stage sampling with random sampling of trips (SSUs) within port-days (PSUs) – this is a more practical alternative in evaluating relative design effects as it directly mimics a most frequent reality, i.e., the annual choice of the port-days to be sampled and simple random sampling of trips within the ones available in each port-day. However it requires a prior specification of the number of trips to be selected in each PSU (e.g., market day, vessel) which may still vary depending on logistics and the national realities, particularly in what concerns the need to sample a few or all species in each event and the time constraints involved in that sampling (see WP.C6. in Annex 5).

4.5 Scenarios tested in simulation of regional sampling designs

WGCATCH reviewed the scenarios tested in the simulation studies of regional sampling designs. The following scenarios were identified:

Spatial stratification:

Port stratification is frequently carried out mainly for logistic reasons. It also allows rapid inspection of the country-wise distribution of samples in regional sampling designs. Two types of stratification by port were used in the case-studies presented:

- **Major and minor ports:** in this case, ports are groups into two strata depending on their relative contribution in terms of trips and/or landings on the stock(s). This stratification requires a priori definition of a criteria to distinguish major and minor ports that should be defined at regional level. One example of one such stratification was shown in CS2 (see presentation WP.C2 in Annex 5).
- **Individual ports as strata:** in this case ports are hierarchized based on their relative contribution to the total number of trips and/or landings. A cut off criteria is then used to determine what ports are to be individual strata and what ports are to be grouped in a "all-other" stratum. An example of such stratification where 75% landings was used as criteria was provided by CS4 (see presentation WP.C4 in Annex 5).

WGCATCH welcomes scenarios that consider all ports in the sampling design. As mentioned by previous WK on sampling design (e.g., WKPICS 2014), it is important that all ports are given some probability of being sampled. Additionally the major objective of stratification is to split the population into homogenous components that can be independently sampled. Alternative stratifications could be used to create more homogeneous strata and better partition variability (e.g., based on regression trees, based on clustering methods) but these may not be logistically feasible.

Time stratification:

One case study addressed time stratification by testing quarter and port*quarter stratification while others relied on simple random sampling of market days with no time stratification. WGCATCH emphasizes that Quarterly stratification can be used, but it is not strictly necessary to obtain quarterly estimates (e.g., samples may be allocated systematically in a way that ensures all quarters are covered). If simple random sampling is a requirement, simulations can be used to determine the annual sample size needed to achieve specific sampling targets at quarterly level with reasonable (and quantifiable) probability.

Other types of stratification:

- **Vessel-size stratification:** In onshore sampling designs, vessel size stratification should be carried out *within* market day. Stratification by vessel size prior to selecting market days is not realistic unless the exact market days of each vessel size stratum are known a priori.
- **Country stratification:** Two stage stratification, with country as primary strata and port and/or quarter within country being the second stage strata can be used to ensure that regional sampling effort allocation still provides for adequate national coverage. For regional sampling at stock-level, country is not necessarily needed as a stratification variable, but it is a valuable variable to create a realistic design and ensure adequate spatial coverage of all MS involved.

4.5.1 Current sampling designs

In moving forward from national to regional sampling schemes, the consideration of current national sampling schemes is necessarily a part of the process. However, frequently the later are considerably more complicated to implement in simulations than the simpler scenarios that are now being tested. This is because they reflect the numerous practical challenges faced in designing national sampling plans over the years. Simulating at such high level of complexity will probably be unfeasible and regional guidelines may have to be derived to simplify such exercises. However, from a quality-control perspective, there will always be immense advantage if actually sampled events are flagged on the population data used in simulations and post-stratification obtained from simulations are compared to current estimates.

4.5.2 Single speciesvs.multiple species

Current National Sampling Programmes co-funded under DCF and national budgets are multi-purpose. They serve multiple end-users needs from single-species stock assessment to multispecies analysis of affects of fisheries in ecosystems, passing by characterization of fisheries and many results used in the daily management of fleets and fisheries at national level. Optimization of such multi-purpose sampling programmes is therefore extremely complex. The present national designs are probably not optimal and are still to have their efficiency and cost/efficiency properly analysed. However, they do have the advantage of already having been tested in practice, having known design and readily available outputs that already meet end-users needs. Regional schemes must therefore be able to deliver at least similar results and this is quite a challenge from a simulation point of view.

Simulations presented at WGCATCH have started addressing some of these multipurpose issues, providing first results on the efficiency of trip-level and regional-level sampling at individual species and multiple species level (WP.C2 and WP.C6 in Annex

5). However, there is still a long way to go to the development of regional sampling plans for which efficiency for multiple end uses can be evaluated. Similar precision levels will not be obtained for all species and regional decisions setting specific species/objectives will have to be adopted. Evaluations of the number of samples in domains of interest will provide input on this. It must be emphasized that under design-based statistically sound regional designs it will be possible to estimate totals even if some domains are not sampled and that this contrasts with the former sampling schemes where this was not possible without 'filling-in' unsampled strata.

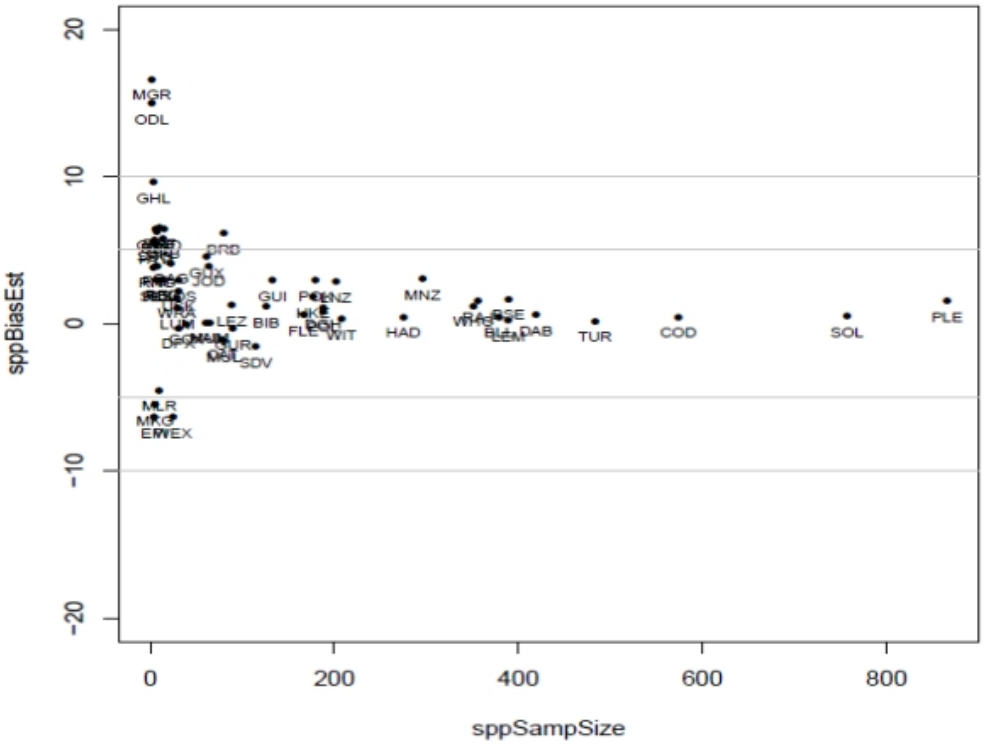

Figure 4.6.2.1. Results of the simulations for the simple random scenario of onshore sampling under fishPi CS2 (see presentation WP.C2 in Annex 5). Y-axis displays the relative bias attained in estimates of different taxa; X-axis displays the number of samples obtained. Results of all species were obtained under the same number of simulations.

4.5.3 Sampling effort allocation

Spatial and temporal mismatches between the number of trips landing and landed weight is a common problem. This mismatch commonly arises in cases where number of trips and landings do not correlate well (e.g. due to the influence of small-scale fleets). Results of effort allocation distribution based on landings and on number of trips are quite different and influence both the perception of the efficiencies of different types of stratification tested. Decisions may have to be made at regional level on how effort should ultimately be allocated. These are likely to depend on the final objectives, fleet composition, etc. WGCATCH notes that sampling effort allocation to the different strata may be carried out by Neyman allocation based on data from prior years. One case study (see presentation WP.C3 in Annex 5) presented one example of this. WGCATCH advises that allocation is tested over several years to ensure that optimal allocation is indeed attained and that variability between years does not render scenarios logistically impossible (e.g., drastic variations of sampling effort allocation between

years). It is generally recommended to use Neyman allocation, but the effect when setting up sampling programs based on previous years landings should be evaluated.

4.5.4 Additional comments on the simulations of regional sampling designs

Case studies tested should be as realistic as possible, i.e., they should be possible to implement not only in theory but also in practice. In some instances, this may mean that the optimal allocation (e.g. based on variance) or stratification may not be possible to adopt. For example, it is frequent that MS can only sample their own vessels leaving landings from other flag countries un-sampled which may effectively bias final estimates. Additionally, to emulate reality, the population datasets should be divided into two periods: one used to derive the stratification and allocation and one used to simulate/test the options. For example in the fishPi project (that used population data from 2013 and 2014), the data from 2013 would be used in setting up the sampling program and the data for 2014 used in evaluating of the sampling designs.

Tested datasets should include all 0 values if they occur, i.e., all market days should be included, not only the ones that register positive landings. Such 0-cases and how many of them are present in the final samples obtained from simulation are important because they represent an outcome that will be present at time of implementation. It is important to consider this in evaluating sampling designs.

The tables and graphs with the simulation results for different sampling designs should be standardized in order to allow study comparison (i.e., a standard format for simplified tables and/or graphics should be developed that summarize the results of simulations in a way that allows straightforward and objective evaluation of the results attained under the different sampling designs/scenarios).

Final regional survey designs are likely to be relatively complicated and it may be time consuming to obtain sufficient number of replicates in simulations to explore some of the logistic realities posed and the biases and variance they implicate. A workshop/study group dedicated to optimization of sampling designs under different logistic and budgetary specifications will ultimately be necessary to address some of these issues in the future as full designs involving multiple fisheries are increasingly searched for and tested at regional level.

Simulations made so far on regional sampling designs are centred on landings but frequently it is length and age distributions and discards that sampling programmes intend to target. Landings are a useful, readily available variable to test such designs and develop simulation algorithms. However, WGCATCH underscores that they are not necessarily a good proxy for some of the variables that may ultimately have to be delivered to end-users, such as length structure, age structure, or discard estimates. Future simulations may be carried out on population data similar to the one used in fishPi by using available length/age frequencies and discard estimates to the trip population data.

Overall, WGCATCH welcomed the simulations made under fishPi project. They have brought together, and under a common and very practical format an impressive amount of data with extreme usefulness for Regional sampling design. Ongoing work at WKRDB series and in the fishPi project has achieved valuable progress towards a common data and exchange format that can be used in design and estimation at regional level. It is recommended that this work is continued and eventual uncertainties in description of data fields are clarified.

4.6 Recommendation

WGCATCH recommends that the guidelines formulated in section 4.6 of the WGCATCH2015 report are considered in analyses of simulations of regional sampling designs.

Addressed to RCMs

4.7 References

Cochran, WG (2007) Sampling Techniques, 3rd Edition. Wiley India Pvt. Limited, 21 Nov 2007– 452 pages

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

5 ToR d) Landing Obligation

Under ToR d) WGCATCH aimed to "*Review emerging information and analyses from commercial fishery sampling schemes indicating the effect of the landings obligation legislation, or other legislation that could bias the data and estimates.*"

5.1 Chapter summary

The introduction of the landing obligation provides a considerable challenge for data collection from commercial fisheries in ICES waters. WGCATCH discussed how the phased introduction of the landing obligation has affected catch sampling so far. The group focused on the fisheries for cod in the Baltic (to which the landing obligation applies since Jan 1st 2015) and found that the most serious affect on sampling was that in at least one MS fishers have become very reluctant to accept scientific observers on board, which will have implications for the quality of the catch data and the stock assessments which rely on these data. However, in many other MS observers could continue to sample as normal at sea and onshore sampling opportunities did not appear to be affected (see also RCMBA report: Anon, 2015). WGCATCH concluded that commercial catches are best sampled by the existing at-sea and onshore sampling programmes and that sampling of landings below the minimum size is unlikely to improve catch data. The group also reiterated that it is important that the logbooks distinguish landings Below the Minimum conservation reference Size (BMS landings) from the normal landings to ensure consistency in the existing time-series of landings used for assessment.

5.2 Introduction

As a consequence of the landing obligation (LO), fleet dynamics will change, new fleets will be defined, and new categories of catch will exist (e.g. Fig 5.2.1). Control agencies are still formulating how they will monitor compliance and manage these new data. Data exchange formats are still being agreed EU wide and within MS and as a consequence there are still uncertainties as to how these data might be available to and interpreted by scientific staff.

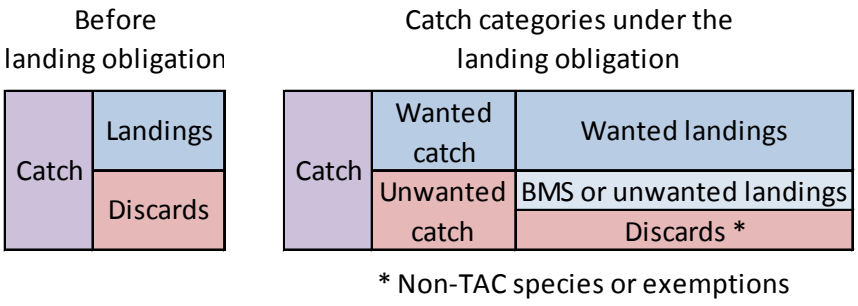

Figure 5.2.1. Terminology of the catch categories under the landing obligation.

Access to these different categories of the catch for sampling will vary onshore and at sea. Protocols and procedures will need to be adapted to ensure industry sorting processes and landing practices are captured and are adequately sampled. Databases will need to be adapted to ensure these new categories of catch can be sampled, recorded and ultimately related to control data. The different categories of catch will affect how these data are raised to catch estimates.

At a practical level each institute should be asking themselves:

- Are we prepared?
- How will we interpret, account and accommodate the additional data being created by the landing obligation?
- How will we deal with the additional data collected or missed, while sampling landings and catches?
- How will the change in the structure of the control data affect the way we derive catch estimates (BMS landings; Official discard data; Fleets – as defined in the discard plans; Additional gear parameters)?
- How will we incorporate new ways of data collection like CCTV, self-sampling into our databases and estimates?
- Are scientific observers under specific obligation required to report any illegal activity they may observe?

5.3 What can we learn from the introduction of the landing obligation in the Baltic?

Since the beginning of 2015, the Landing Obligation (LO) is partially implemented in the Baltic Sea. From 1st of January 2015 fisheries for herring, sprat, salmon and cod are included in the discard ban. Some fisheries on cod and salmon that are assumed to have a high survival rate are exempted from the LO. This applies to trapnets, pots, fykenets and poundnets. All such cod and salmon may be released back into the sea. The landing obligation legislation introduced the concept of the Minimum Conservation Reference Size (MCRS) which is not necessarily the same as the 'old' Minimum Landing Size (MLS). For cod in the Baltic Sea the MCRS is 35cm (from 1 Jan 2015) while the MLS was 38 cm total length.

As 2015 is the first year with the LO in place, it is a transitional period to evaluate the reliability of the landed fraction Below Minimum conservation reference Size (BMS) which previously was discarded at sea. MS are evaluating whether to sample BMS landings and which methods of sampling and estimation are appropriate.

The RCM Baltic 2015 (Anon, 2015) analysed problems and shortcomings both in official landing statistics (such as sales notes, landings declarations and logbook entries) and sampling of the BMS fraction. These problems were also addressed by WGCATCH 2015.

- In most MS there is no consistent way to determine the BMS fraction from the official catch statistics. However in Denmark and Sweden this will be changed with a new logbook version that will be implemented in early 2016. In some cases it is possible to distinguish the BMS landings in the sales notes by their low price or by their size sorting category but this does not appear to be recorded in a consistent way.
- Observation data from the first half of 2015 indicate that the landed volumes of BMS cod (<35 cm) and the estimated proportions of BMS obtained from at sea observer trips differed significantly. In some cases the official BMS landings were lower than the observed BMS by orders of magnitude. The reasons for these differences could be exemptions in the regulation (like *de minimiz* exemptions and high survivability). In addition, incentives to continue discarding are likely to remain strong while illegal discarding will not

be treated as a serious infringement until 1 January 2017 (http://ec.europa.eu/fisheries/cfp/fishing_rules/landing-obligation/index_en.htm). This legal detail may also explain the continued willingness of skippers to accept observers on board.

Currently, BMS data obtained from harbour sampling cannot be regarded as indicative of the unwanted fraction of the catch and should not be used to estimate the catch when preparing data for stock assessment in a raising procedure. In the Baltic region most of the MS do not, for this reason, sample discards from landings in ports. Germany and Sweden are the only two countries that have reported that they are sampling BMS on-shore.

5.4 Landing obligation in the Baltic Sea, Denmark

5.4.1 Sampling

Denmark has not changed the observer sampling programme in the Baltic in 2015. However, the refusal/non response rate for the Danish cod trawl fishery has increased since the implementation of the landing obligation. The landings of cod are in addition to observer trips also sampled for biological data by market sampling, including the landed fraction of BMS cod.

Table 5.4.1.1. Refusal rates from the Danish observer program in Subdivision (SD) 25-29 for the years 2012-2015. *In 2015 only the first 9 months have been registered until now.

DANISH REFUSAL RATES IN THE BALTIC SEA	
Year	SD 25-29
2012	16%
2013	17%
2014	18%
2015*	28%

5.4.2 Recording of BMS cod

The landed BMS cod has in Denmark in 2015 been included in the landed weight in the logbook and is therefore currently not possible to distinguish from the landings above MCRS. However, this will be changed with a new logbook version that will be implemented at the beginning of January 2016. In the sales notes the sold BMS fish is recorded as presentation "Z", in same level as both gutted and whole fish. Landings of BMS fish that are not sold will not appear in sales notes.

During first half of 2015, only 2% of the total Danish cod landings in SD 25 have been landed as BMS cod. From the observer program the BMS fraction is estimated to be around 15% in SD 25. In SD 24 this level is smaller, only 9% estimated in the observer program but close to 0% has been registered in the sale notes. As the difference is apparent between sale notes estimates and scientific observer programs, Denmark will use the data from the observer programs for the estimate to be used by the assessment working group. Official landings of BMS cod will not be used for stock assessment catch estimates.

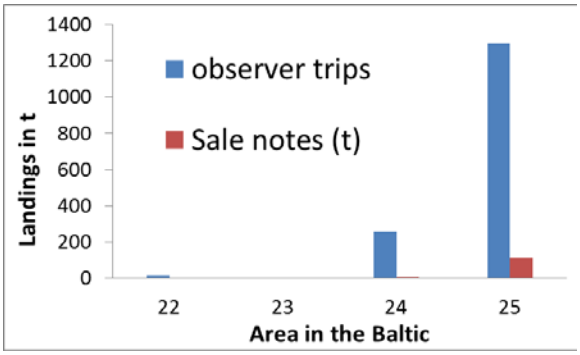

Figure 5.4.2.1. Comparison between estimates of BMS cod from observer program and sales notes.

5.4.3 Reduction of MLS

Reduction of MLS (38cm) to MCRS (35cm) has reduced the discard fraction particularly in SD 25. However, very low prices on sorting fraction 6 (35–38 cm) have probably increased the incentive for highgrading. There has been a difference across SDs as to how much this new reduced MCRS has been used, which could be caused by the difference in stock size structure in the different areas.

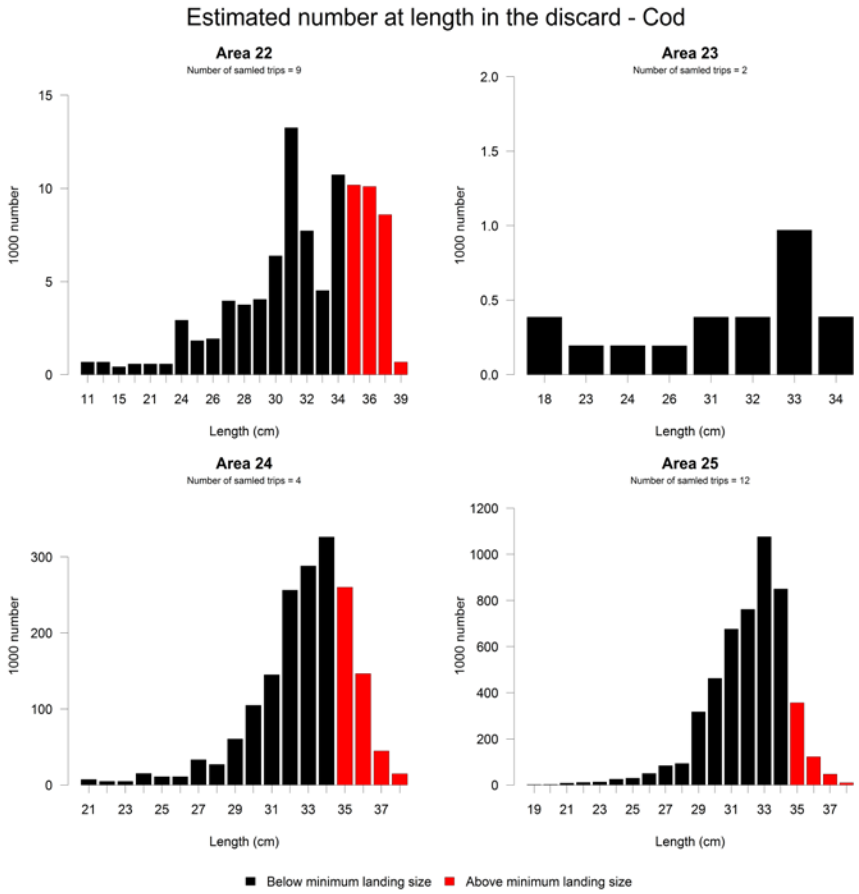

Figure 5.4.3.1. Length distribution in the Danish observer program for the BMS fraction on commercial vessels by SD. Red bars indicate fish above MCRS (35cm).

5.4.4 Data quality

The quality of Danish catch data (BMS) for the cod trawl fishery in the Baltic has probably decreased after the introduction of the landing obligation as the refusal rates has increased significantly. However, the observer estimate is still considered to have a higher quality than the sale notes data on the BMS fraction.

5.5 German BMS harbour sampling programme

Below is a brief summary of the German sampling programme and some of its preliminary findings. These are described in more detail in working document WD.D1 (Annex 4; the full working document is provided in a separate Appendix to this report).

5.5.1 BMS sampling programme

With the implementation of the landing obligation, TI-OF (Germany) started a harbour sampling program on the landed "BMS" fraction of the cod landings (BMS: below minimum size). Here, the landed BMS fraction is directly measured in the port, length distributions and weights are taken and otoliths are removed (two otoliths per length-class and sample).

The BMS sampling method is conducted during the main fishing season of Baltic cod (1st, 2nd and 4th quarter) each year. In 2015, a total of five harbour samples were taken. These samples were compared to the BMS fraction gained by observer trips on the same vessel (same trip or +/- one week) or similar strata of the same year to evaluate the structure and reliability of the BMS samples.

An additional source for the estimation of BMS fraction is the self-sampling program of TI-OF. A self-sample is provided by the vessel and contains an unsorted part or the entire haul from a trip. The BMS fraction is determined in the laboratory (knife-edge distribution, length-/weight composition) and this fraction is compared with the declared BMS fraction from the landing declaration of the respective trip.

Beside these comparisons, a total of five self-samples from 2015 were compared to six self-samples from 2014 (mainly from the same vessels and period) to see if discard ratios have changed between years.

5.5.2 Results from the German BMS harbour sampling program:

The main results obtained from the German BMS harbour sampling program were as follows (see also WD.D1. in Annex 4 and appendix to this report):-

- The minimum landing size (MLS) of 38cm (valid until end 2014) was reduced to 35cm with the introduction of the minimum conservation reference size (MCRS) at the start of 2015. About 50% of the historic discards were of the size classes between 35–38cm. No consistent change in fishers' response was noted when these are contacted asking for observer trips and self-samples;
- Comparisons of observer trips vs. self-samples vs. BMS harbour sampling suggest that 1) discarding of BMS cod still takes place, small cod being only partially landed, 2) cod of 35–38 cm total length is also partly discarded, especially in western Baltic cod (highgrading);
- BMS fraction of landed cod (by sampling or landing declaration) is often unreliably low (<1%);

- Comparison of self-samples from 2014–2015 show similar discard fractions (2-5% for western Baltic cod and 10-50% for eastern Baltic cod) when applying MCRS 35cm to the 2014 samples;
- BMS samples enhance biological data and ALK for the <35cm fraction, but must not be used for assessment or calculations related to discard amounts.

5.6 References

Anon (2015) Report of the Regional Coordination Meeting for the Baltic Sea region (RCM Baltic) 2015. Fish Resources Research Department of Institute BIOR Daugavgrivas str. 8, RIGA, LATVIA 24–28 August, 2015. https://datacollection.jrc.ec.europa.eu/docs/rcm/2015

6 ToR g) Estimation procedures in the Regional Database

Under ToR g) WGCATCH aimed to *"Review emerging statistical estimation procedures from ICES commercial fishery sampling schemes and comment on the implications for estimation in a regional context, in particular for the regional database to support the estimation procedures."*

6.1 Chapter summary

The work of WKRDB 2015 was presented alongside existing and planned estimation procedures for the RDB-Fishframe. Current work by Norway on a software package that will allows design-based estimation and optimization for stock assessment purposes was also presented and the need for its integration with the developments currently planned for RDB-FishFrame was underscored.

6.2 Workshop to develop the RDB data format for design based sampling and estimation with particular emphasis on population data (WKRDB2015-1)

A Workshop to develop the RDB data format for design based sampling and estimation with particular emphasis on population data [WKRDB 2015–01] took place in Sète, France, 26–30 October 2015 (Chairs: Kirsten Birch Håkansson, Denmark, and Liz Clarke, Scotland).

The main outcomes of the workshop were the following:

- The changes to the CL and CE data formats suggested by WKRDB III and previous RCMs were reviewed, and it was proposed to incorporate those which did not require trip-level data into the current RDB CL and CE formats. Changes which required trip-level data were considered separately as described below.
- A trip-level data (CT) format for use in the statistical environment R code-sharing and work within countries was proposed. This format is based on a data-sharing format used in the EU-funded project fishPi (MARE/2014/19). Scripts can easily be written to streamline several tasks for logbook and sales slip data at a National level, for example: to convert data in this format into the CL and CE formats required for submission to the RDB; to aid population of the proposed design-based CS format (which is still in development); to aid quality checking of sampling data; to standardize the calculation of effort. The workshop reviewed the current requirements for CL and CE data and confirmed that all fields to provide these data were available in the proposed trip-level data. The workshop also reviewed trip-level data changes suggested by WKRDB III and confirmed these were incorporated in the proposed CT data format.
- The design-based CS format proposed by WKRDB 2014–01 (and slightly modified intersessional) was reviewed in detail, in particular the new SE table and revisions to the HH table, and the format was accepted in principle. The current proposed format was considered suitable for concurrent sampling and species-focused sampling, but some modifications might be required for non-concurrent multispecies sampling. Some minor modifications were proposed for consideration by the current CS format development team in the fishPi project. A preliminary draft of a design table, to

incorporate information about the sampling design, and which reduces repetition in the CS format, was proposed.

- A preliminary version of proposed CT data format has been populated by 15 institutes as part of the fishPi project mentioned above, and the CS data format has been populated by Scotland Originally it had been intended that participants at this workshop would populate the CS format with real data so that estimation scripts could be tested. However, the length of time required for the above tasks precluded this, and it was concluded that a trial implementation workshop focusing almost exclusively on populating the CT and CS data formats and running test scripts for data checking, visualization exploration and checking should be held in 2016.

6.3 Current estimation procedures within the Regional Database

The current estimation procedures existing in RDB-FishFrame were presented and discussed in plenary (see WP.G1 in Annex 5 and full presentation in Appendix). Slides for the presentation are available in a separate appendix to this report.

6.4 StoX and R-ECA software

The StoX software (including R-ECA module) currently being developed in Norway was presented during WGCATCH (see WP.G2 in Annex 5 and full presentation in Appendix).

6.5 WGCATCH discussion

Time for discussion of RDB issues during the WGCATCH meeting was limited. The plenary maintains its strong endorsement of the RDB as a fundamental tool for:

a) Storage of DCF data and checking of annual and regional reports related to MS sampling activities;

b) Quality assurance and transparency on estimates provided to end-users,

c) Regional coordination of sampling activities,

d) Optimization of the data flow and answers to data calls from ICES EGs,

e) Standardization of estimates provided to different types of end-users.

The development by Norway in the near future of the StoX software, that includes an R-ECA module related to catch sampling surveys, opens yet another possibility of use of RDB data, extending it to simulations on stock assessment and optimization of data collection for such purpose (see WP.G2 in Annex 5 and full presentation in Appendix). For this cooperation to be possible, a common exchange format is necessary. The integration of R-scripts into the current RDB may provide a means for rapid information exchange across platforms, avoiding funding bottlenecks.

A common exchange format will be valuable in future regional work and it is strongly recommended that data submitted to the RDB also contains information on specifics of the designs adopted during sampling including stratification details and the population numbers/values necessary to calculate inclusion probabilities at all relevant levels. WGCATCH notes that pre-calculated inclusion probabilities may be difficult to interpret and standardized across MS and therefore should be avoided. Trips actually sampled should be flagged in the population dataset to allow direct comparisons of MSE between implemented and simulated designs. Current estimation procedures

within the database are limited and not yet adequate for design-based estimation. However, it was noticeable from discussions in plenary that many of the data providers (and possibly end-users at some ICES EGs) may lack proper knowledge of the tools the currently existing RDB already provides for.

6.6 Recommendation

WGCATCH recommends to the European Commission to make available the funding required to continue the development of the exchange format and improve the estimation procedures in the Regional Database (RDB). This includes procedures to deal with historic sampling designs, post-stratification, and other aspects that are fundamental for adequate interpretation of sampling data obtained from probability based sampling schemes.

7 ToRs e), f), h), and l)

7.1 Chapter summary

Several ToRs that could be dealt with in a small section of the report are grouped together in this chapter.

- The remit of WGCATCH is closely linked to that of PGDATA which met for the first time in 2015. One of the outcomes from PGDATA 2015 that is relevant to WGCATCH is the proposed workshop on cost benefit analysis of data collection in support of stock assessment and fishery management (WKCOSTBEN). WGCATCH endorses the need for such a workshop. WGCATCH also believes the RDB is a fundamental instrument for regional coordination of commercial fisheries sampling, evaluation of national and regional data collection programmes, quality assurance of results and estimates provided to end-users and the overall transparency of ICES advice. As such, WGCATCH supports the PGDATA recommendation that funding be made available for further development of the RDB including estimation and diagnostic routines.
- WGCATCH drafted detailed plans to produce a peer-reviewed paper in 2016. The paper will provide a synthesis of sampling design evolution towards best practice, illustrated with a number of concise case studies.
- WGCATCH initiated a repository with key publications and other available resources dealing with design and implementation of fishery sampling schemes and associated data analysis; putting them into context with brief descriptions or review of each report, paper, book, website, software package etc. The intention is for this repository to be made available online by ICES.

7.2 ToR e) Links between WGCATCH and PGDATA

7.2.1 Role of PGDATA

The ICES Planning Group on Data Needs for Assessments and Advice (PGDATA) falls under the ICES Steering Group on Integrated Ecosystem Observation and Monitoring (SSGIEOM), which is the parent steering group for Expert Groups dealing with surveys (e.g. IBTSWG), fishing technology, fishery data (WGCATCH and WGRFS) and biological data (e.g. WGBIOP). The SSGIEOM has its own terms of reference and work plan, and this is also reflected in terms of reference for its component expert groups. A difference between PGDATA and many of the other EGs is its particular focus on the end use of data, and for this role it requires strong links and communication with EGs dealing with design, implementation and analysis of surveys and other data collection schemes.

7.2.2 2015 PGDATA meeting

The ICES Planning Group on Data Needs for Assessments and Advice (PGDATA) met for the first time in Lysekil, Sweden, 30 June–3 July 2015. The main focus for the group in its first year was the end-use of data and information on data quality by the ICES stock assessment process, particularly the benchmarking of singe-species stock assessments. The PG reviewed previous benchmark stock assessment meeting reports going back to 2009, and also the responses of ICES stock assessment expert groups to data-

quality questionnaires for discards estimates supplied by Member States in the 2015 ICES data call, and found an extremely variable approach to evaluating and acting upon the quality of data available for the assessments. PGDATA drafted, using this background, detailed guidelines for the data compilation and evaluation stage of ICES benchmark stock assessments to encourage a more consistent, transparent and objective approach for data evaluation. The guidelines will be tested using a full data evaluation process for Irish Sea whiting in the forthcoming Irish Sea benchmark assessment (WKIRISH).

The three year programme for PGDATA included (for its second year) the planning and running of a workshop to develop tools for evaluating how the quality of individual datasets affect the precision of stock assessment estimates, and how data improvements would affect the quality of assessments and advice. To address this, PGDATA has planned to conduct a Workshop on Cost Benefit Analysis of Data Collection in Support of Stock Assessment and Fishery Management (WKCOSTBEN), which will take place at ICES HQ, 28 June–1 July 2016. The proposed terms of reference are given in Annex 9 of this report.

PGDATA discussed its role in relation to InterCatch, the Regional Databases (RDB) and the ICES Data Group. The PG recognized the huge potential of the RDB as a tool for end-users to scrutinise the coverage and quality of fishery sampling data, including the evaluation and documentation of data quality for benchmark and update assessments at ICES. PGDATA recommends that funding be made available for further development of the RDB including routines to provide estimates needed for stock assessments or other end uses together with diagnostics of the quality of data and estimates.

The PG addressed a European Commission request on the needs for recreational fishery data, and supported the detailed response of the 2015 ICES Working Group on Recreational Fishery Surveys (WGRFS), but further emphasizing role of RCG / ICES in defining regional needs and sampling plans.

Feedback on the role and work programme of PGData were sought at the meeting from the chairs of ICES Expert Groups (WGBIOP, WGCATCH) and regional coordination meetings (RCMs), and the work programme for 2015/16 was reviewed and adapted.

7.3 ToR f) Publication on statistically sound sampling schemes for commercial fisheries

It has been an aspiration of the ICES Workshop on Practical Implementation of Statistical Sound Catch Sampling Programs (WKPICS) to produce a textbook on fishery sampling design. As a first step towards this goal, it was decided to publish key findings of the WKPICS/SGPIDS/PGCCDBS/WGCATCH series in ICES Cooperative Research Reports (CRR) and peer-reviewed publications. Due to time constraints, this work did not take place in 2015. However, WGCATCH 2015 established a firm workplan to produce a peer-reviewed publication with a first draft written by the end of April 2016.

The paper will be aimed at a non-technical audience and will provide a synthesis of sampling design evolution towards best practice, illustrated with a number of concise case studies.

7.4 ToR h) Repository of resources

The combined expertise of WGCATCH members includes a considerable knowledge of key publications and other resources that deal with the design and implementation of catch sampling schemes and estimation procedures. The group made a start at compiling a list with key resources putting them into context by providing brief descriptions or reviews of each report, paper, book, website, software package, etc. The final goal is for this repository to be available online at the ICES website (similar to the PGCCDBS data quality assurance repository).The work to build this repository is ongoing at the WGCATCH SharePoint (WGCATCH SharePoint > 2015 Meeting docs > Report > ToR H). A sample of its present content is shown below and in more detail in Annex 7.

ICES groups

There have been a number of ICES groups that have dealt with catch sampling, below is a brief summary of the main aims and outputs of each group:

- **Workshop on Methods to Evaluate and Estimate the Accuracy of Fisheries Data used for Assessment** (WKACCU, 2008).
  This was the first in a series of workshops aimed at quantifying and improving the accuracy of fisheries data. The report provides some useful information on detecting and avoiding bias. The workshop also produced a scorecard for bias detection which was further developed into quality assurance tables by subsequent groups.
- **Workshop on Methods to Evaluate and Estimate the Precision of Fisheries Data used for Assessment** (WKPRECISE 2009).
  This workshop focused on sources of variability and estimation procedures for fisheries data. The report outlines best practice in fishery sampling programmes and provides a list of key parameters and statistics used in stock assessment with their main sources of error.
- **WKSMRF, WKMERGE, WKPICS123, SGPIDS123, WGCATCH etc.**

Other reports

- **The European Self-Assessment Checklist for Survey Managers** (DESAP).
  EuroStat has developed this comprehensive checklist that forces you to consider all aspects of your survey. Some sections might not be relevant to catch surveys but most of it is generic enough to be useful.

Books

- **Sampling Techniques**, WG Cochran (2007).
  A classic reference on sampling methods. It does demand a fairly sound statistical background but the main ideas are well explained in English as well as in mathematical notation.

Papers, Websites, Software, Glossary, Contact list

7.5 ToR l) Quality assurance of the products of WGCATCH

The working group did not produce any data outputs, the main output from WGCATCH is the current report. All ToRs were fully discussed directly in plenary or in subgroups and then in plenary. The final draft of the report was provided to all WGCATCH members for scrutiny and error checking. WGCATCH chairs made every effort to ensure that the content of the report is accurate and reflects the opinions of the WG. Sufficient time was given to all participants for review of both report sections and the final draft.

Pending outputs like peer-reviewed publications and the repository of resources (ToR h) will also be scrutinised by WGCATCH members and chairs before publication.

8 ToR j) Response to recommendations

8.1 Chapter summary

The main recommendation that WGCATCH addressed was from WGBYC, which requested WGCATCH to implement collection of data on incidental bycatches of protected, endangered and threatened species and rare fish species. WGCATCH agreed to start routine documentation of sampling practices for these bycatch species as well as routine evaluation of the limitations of current methods for collection and analysis. The other recommendations to WGCATCH were discussed in plenary and found not to require a detailed response.

8.2 Response to recommendations

From: WGBYC

To: WGCATCH

Recommendation: WGBYC recommends that WGCATCH implements the collection of data on incidental bycatch of Protected, Endangered and Threatened Species and rare fish species in the sampling protocols of national catch- and discards sampling schemes, including incorporation of appropriate fields in National databases, data processing, data validation and synchronization with the regional database.

Response: WGBYC chair Marjorie Lyssikatos and participant Bram Couperus were approached to obtain a clarification of this recommendation prior to the WGCATCH meeting. WGBYC requests WGCATCH to ensure that the needs for monitoring bycatch, including PETS, are considered when developing and implementing best practice in the sampling design of commercial fisheries across the ICES area. Several possibilities for cooperation between the two WGs were analysed, namely the inclusion of bycatch sampling and estimation as a long-term ToR of WGCATCH (this would require direct involvement of a WGBYC participant in WGCATCH) and a joint session between the two WGs on bycatch estimation to take place at a future WG meeting in 2016 or 2017. It was also discussed the possibility that a WGCATCH chair or participant could attend the next WGBYC meeting (to be held at ICES in Copenhagen in February 2016) in order to strengthen information flow between the two WGs. The discussion on these possibilities was carried out in a plenary session held during WGCATCH 2015 where WGBYC was invited to make a presentation of its work and discuss these possibilities of collaboration.

WGBYC work was presented at WGCATCH by Bram Couperus (WD.J1. in Appendix to this report). The presentation highlighted the need for improvement in data collection of bycatch under DCF-related at-sea sampling programmes. Final discussion in plenary focused on the best way to integrate WGBYC need into WGCATCH work. The following conclusions were reached:

- WGCATCH members recognize the importance of recording bycatch of PETS during DCF-related sampling made on board commercial fishing vessels. In some cases this information is already recorded but not always logged into the national databases because their format does not account for these data.
- WGCATCH agreed to start routine documentation of sampling practices for Protected, Endangered and Threatened Species (PETS) and rare fish species by means of a specific ToR. Such documentation will provide an annual check-

point on whether MS have implemented some of the best practices for PETS sampling previously proposed (SGPIDS, 2013) and would provide a reference that allows the tracking of sampling methodologies applied at MS-level and their evolution through time.

- Some WGCATCH members are involved in the current EU project on Strengthening Regional Cooperation in the Area of Fisheries Data Collection (fishPi), specifically in Work Package 3 which deals with developing proposals on how regionally coordinated data collection schemes to estimate bycatches of PET species and other rare species could be designed and implemented. These WG members therefore have a particular interest in the bycatch issues.
- WGBYC currently makes extensive use of estimates from DCF-related on-board sampling to evaluate the bycatch risks of different types of gears in use in different areas. This is in addition to specific monitoring of certain gears for marine mammal bycatch, as required by EU legislation. WGCATCH members expressed concern that DCF-related on-board sampling programmes mainly target the fleets and fisheries responsible for the largest catches of the main commercial stocks, with frequent emphasis on trawls, and these fleet components are not necessarily the fleet components responsible for the largest bycatch of PETS. The sampling protocols may also not be optimal for PETS, for example if there is no specific requirement to record PETS such as mammals, birds or turtles that may fall from gears as they are being brought on board, or are discarded before the catch reaches the observer's work area, or where there is a very low probability of recording very rare fish species due to sampling of small fractions of each catch. Furthermore, national on-board sampling schemes often sample a very small fraction of the total number of trips of a fleet, further reducing the likelihood of observing rare events such as catches of PETS and leading to many zero observations. In combination, the raising of such sparse and suboptimal bycatch data to fleet level may lead to biased estimates with very low precision, which may trigger inappropriate management and stakeholder reactions on such a 'hot topic' as PETS bycatch. To keep all this in discussion, WGCATCH members decided that in parallel with the routine documentation of current fishery sampling practices they should also carry out a routine evaluation of the limitations of current methods for collection and analysis of bycatch data under the DCF or other EU legislation, and liaise with WGBYC to identify the best way to communicate these limitations to end-users and advise on how such schemes could be improved.

A questionnaire on sampling practices and logging of PET information into the databases was developed by WGBYC during the WGCATCH meeting (Annex 8). This will be circulated intersessional and results compiled before WGCATCH 2016, and by WGBYC 2016 if available by then (see workplan, section 9.3). A ToR on the documentation of sampling practices and end-user expectation management was included in the ToRs for WGCATCH 2016 (see 2016 ToRs, section 9.1).

From: WGHANSA

To: PGDATA; WGCATCH; RCMs

Recommendation: The WGHANSA recommends that anchovy catches in the western part of Division IXa are sampled whenever an outburst of the population in the area is detected.

The WGHANSA considers each of the survey series directly assessing anchovy in Division IXa as an essential tool for the direct assessment of the population in their respective survey areas (Subdivisions) and recommends their continuity in time, mainly in those series that are suffering of interruptions through its recent history.

The WGHANSA recommends the extension of the BIOMAN survey to the north to cover the potential area of sardine spawners in VIIIa. This extension should be funded by DCMAP.

The WGHANSA recommends a pelagic survey to be carried out on an annual basis in Autumn in the western Portuguese coast to provide information on the recruitment of small pelagics (particularly sardine and anchovy) in that region.

The WGHANSA recommends a pelagic survey to be carried out on an annual basis in spring in the English Channel (VIId, VIIe) to provide information on the status of small pelagics (particularly sardine and anchovy) in that region.

Response: The WGHANSA chair clarified that only the first sentence is relevant to WGCATCH and that the group did not expected a response from WGCATCH.

From: WGRFS

To: MIACO; RCMs

Recommendation: The types of surveys being conducted for the successful management of shared stocks need to cover the stock area and thus need to be agreed at a regional level. Precision targets should be set at the overall stock level for combined international estimates, and bias in data collection and estimates should be documented. Data collection requirements should be evaluated by regional coordination groups and WGRFS before being ratified by the European Commission. This approach mirrors regional coordination of commercial fishery sampling.

Where recreational fishing surveys exist, multispecies data should be collected as the costs are not significantly greater than for single species data collection.

To facilitate the inclusion of recreational fishery data in stock assessments, an annual frequency of data collection is needed over a number years to develop time-series of recreational mortality that comprises of both kept and released components of the catch.

Biological data on catches (size or age composition) are required both for caught and released components if catch-at-size or age is needed for an assessment model.

Response: This was not a recommendation to WGCATCH but the last sentence was deemed relevant to the group. WGCATCH acknowledges this statement.

8.3 References

SGPIDS (2013) Report of the Study Group on Practical Implementation of Discard Sampling Plans (SGPIDS), 24 June–28 June 2013, Lysekil, Sweden. ICES CM 2013/ACOM:56. 142pp

9 ToR i) and k) Proposed ToRs for next WGCATCH meeting and future research needs

9.1 Proposed terms of reference for the next WGCATCH meeting

The **Working Group on Commercial Catches (WGCATCH)**, chaired by Hans Gerritsen (Ireland) and Nuno Prista (Sweden), will meet in **Oostende, Belgium, 7–11 November 2016** to address the following terms of reference:

Specific ToRs

a) Compile and evaluate approaches to estimate fishery-dependent CPUE and LPUE using case studies. Discuss conclusions of recent workshops and EGs that addressed effort-related issues.

b) Review current and emerging sampling and estimation procedures of commercial catches, focusing on total catch, length and age distribution.

c) Document recent changes in sampling design and data availability from commercial fisheries, particularly changes due to the introduction of the landings obligation and other legislation that can affect data collection and estimates.

d) Liaise with other ICES groups (PGs, WG, WK, SSGIEOM) and research projects that deal directly with commercial catch data, and collaborate with PGDATA in the support to Benchmark process.

e) Continue to document current as well as best practices for data collection schemes to estimate catch, effort, catch composition, biological parameters and spatial mapping of activities of small-scale commercial fisheries (under-10m vessels) with particular focus on European fleets. Evaluate approaches to data collection by census, surveys or self-sampling.

f) Document current sampling and estimation practices for Protected, Endangered and Threatened Species (PETS) and rare fish species. Evaluate limitations of current data and communicate them to main end-users

g) Review developments of the Regional Database (RDB) and exchange formats from a design-based sampling and estimation perspective.

Generic ToRs

h) Foster regional cooperation on publications related to the work of WGCATCH.

i) Develop and maintain a reference list of key publications and contacts dealing with design and implementation of fishery sampling schemes and associated data analysis.

j) Respond to recommendations to WGCATCH from ICES expert groups RCMs, liaison meetings or other groups.

k) Review the work of WGCATCH 2014–2016, identifying present and future research and training needs. Develop work plan for 2017–2019 and the ToRs for the next WGCATCH meeting, identifying intersessional work, timelines and responsibilities.

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

9.2 Supporting information

PRIORITY	**WGCATCH SUPPORTS THE DEVELOPMENT AND QUALITY ASSURANCE OF REGIONAL AND NATIONAL CATCH SAMPLING SCHEMES THAT CAN PROVIDE RELIABLE 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 ASSESSMENT AND MIXED FISHERY MODELLING, THESE ACTIVITIES ARE CONSIDERED TO HAVE A VERY HIGH PRIORITY.**
Scientific justification	Tor a): Fishery-dependent abundance indices are used in many stock assessments, and for some species where fishery-independent surveys do not provide reliable information, these indices can be the only source of information on stock trends. There is no design-base for fishery cpue (i.e. the data are not collected according a sampling design), and various methods are applied worldwide to get round this problem, for example using species composition data to exclude trips considered to have a very low probability of catching the species (Stephens and MacCall, 2004: Fish Res 70(2)), and delta-lognormal models to provide relative abundance signal after factoring out the influence of area, season, vessel/gear characteristics etc. WGCATCH will analyse these different methods and identify the limitations and biases of CPUE and LPUE data from a commercial catch perspective. If case studies are available, This can include the use of detailed spatial information from VMS and the use LPUE/CPUE data from small-scale fisheries data which suffer less from technological creep. ToR b): WGCATCH provides a forum for the discussion of design - based sampling and estimation of catch data. WGCATCH and previous EGs (e.g., WKPICS, SGPIDS, PGCCDBS) provided guidelines for best practice in sampling at sea to estimate discards and the length or age compositions of landings and discards, and sampling onshore to estimate length/age compositions of landings, and reviewed the sampling practices in European countries. As probability-based sampling expands to more MS, more detailed national case studies are needed to demonstrate the performance of such schemes in practical applications covering different operational conditions and types of fishery. WGCATCH will continue to review and advice on progresses in this implementation. ToR c): The landing obligation will expand to the North Sea and North Atlantic waters in 2016 and will involve many more MS and fleets. Fisheries labs will be monitoring the effects of the implementation of the landing obligation on sampling opportunities and will need to adapt their sampling designs to meet the new challenges sampling under the landing obligation poses. WGCATCH will continue to compile and evaluate the implementation of the landing obligation from a commercial catch sampling and estimation perspective as well as to document and inform on other legislation that can affect data collection programmes from ICES fisheries. ToR d): WGCATCH pools knowledge of MS sampling programmes and estimation of commercial catches all across ICES waters. It also pools statistical expertise on commercial catch sampling. It is therefore a WG which may support the interpretation of patterns in the data that may result from changes in sampling or estimation procedures. WGCATCH will meet intersessional by video conference if requests arise from data compilation and benchmark groups, continuing to foster the collaboration and information flow between data collection and stock assessment teams.

	ToR e): Small-scale commercial fisheries (SSF) pose particular challenges due to large numbers of vessels operating from many harbours, and lack of exhaustive data on activities and catches. Such fisheries can contribute to a significant amount of the landings in some areas. WGCATCH 2015 made considerable progress in documenting the importance of SSF and existing sampling approaches. In 2016 the work will be extended to definitions of best-practice guidelines for sampling and estimating commercial catches from small-scale fisheries. ToR f): WGCATCH 2015 enhanced its collaboration with WGBYC and agreed to start routine documentation of sampling practices for Protected, Endangered and Threatened Species (PETS) and rare fish species by means of a specific ToR. Such documentation will provide an annual check-point on whether MS have implemented some of the best practices for PETS sampling previously proposed and would provide a reference that allows the tracking of sampling methodologies applied at MS-level and their evolution through time. Alongside this, WGCATCH will communicate to end-users the current limitations in the sampling data from rare events with the aim of managing the expectations from these end-users. ToR g): WGCATCH provides a forum to discuss ideas on exchange formats that aim to provide design-based estimates. The RDB is developing one such format but at WGCATCH 2015 other formats were presented that are in development (e.g. Norwegian StoX / R-ECA software). WGCATCH will continue to monitor the development of these formats and foster coordination and integration among them. ToR h): WGCATCH and other ICES groups dealing with sampling design have made considerable progress that is of interest to the wider scientific community. WGCATCH 2014 planned an ICES cooperative research report (CRR) but WGCATCH 2015 decided a peer-reviewed paper would be more appropriate. Other work that is ongoing in WGCATCH is also expected to lead to publications, for example a review of SSF sampling approaches across Europe/world (along the lines of recreational fisheries group paper) would be a useful deliverable of the group. ToR i): The combined expertise of WGCATCH members includes a considerable knowledge of key publications and other resources that deal with the design and implementation of catch sampling schemes and estimation procedures. A reference list of key publications and resources with a short reviews of each has started to be developed and will be a valuable output for future research and implementation of these designs. ToR j, k and l): These are mainly administrative ToRs that will be dealt with by the chairs on an ongoing basis.
Resource requirements	The WG builds extensively on experiences gained within PGCCDBS, WKACCU, WKPRECISE, WKMERGE, WKPICS, SGPIDS and WGRFS. European countries are encouraged to provide the WG with any requested documentation of their sampling programmes, updated manuals and protocols 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.
Participants	The Group is normally attended by around 30–40 members and guests.
Secretariat facilities	None.

Financial	No financial implications.
Linkages to advisory committees	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	WGCATCH links with: • WGBIOP in relation to collection of stock-based biological variables from sampling of fishery catches • PGDATA, stock assessment EGs and benchmark assessment groups by providing input on the data quality of commercial catches. • WGBYC to provide input on sampling design and estimation of PETS • Regional Coordination Groups, the Regional Database Steering Group, STECF EWGs dealing with EU-MAP and the Liaison Meeting.
Linkages to other organizations	The work of this group is closely aligned with similar work in FAO and in the Census of Marine Life Programme.

9.3 Work Plan 2016

ToR a) Compile and evaluate approaches to estimate fishery-dependent CPUE and LPUE using case studies. Discuss conclusions of recent workshops and WGs that addressed effort-related issues.

Task	By when	By whom
Contact chairs of other WG and WK and others who have done previous work on standardizing LPUE and CPUE indices from fishery-dependent sources.	January	Chairs
Literature review. Inventory of where commercial CPUE and LPUE are used– identify case studies (data-poor as well as data-rich). This can include information on spatial coverage of these tuning series and/or information on how to combine series	March	Chairs, Mike Armstrong
Identify contributions for case studies, including experts outside WGCATCH	June	Chairs, Mike Armstrong

ToR b) Review current and emerging sampling and estimation procedures of commercial catches, focusing on total catch, length and age distribution.

Task	By when	By whom
Literature review on current and emerging estimation procedures	March	Chairs
Seek contributions for case studies describing survey design, implementation, methods of data analysis, and derived estimates for end-users with quality indicators.	March	Chairs
Start to develop a standardized questionnaire that summarizes recent changes in MS sampling plans and estimation methods	May 2015	Chairs
Deadline for WD	October	Chairs

ToR c) Document recent changes in sampling design and data availability from commercial fisheries, particularly changes due to the introduction of the landings obligation and other legislation that can affect data collection and estimates.

Task	By when	By whom
Identify task leader(s) and contributors	January 2016	Chairs
Develop a standardized questionnaire to collect specific information from MS on the landing obligation and circulate.	End of June 2016	Chairs and task leader(s)
Compile results	Before the meeting	Task leaders(s)

ToR d) Liaise with other ICES groups (PGs, WG, WK, SSGIEOM) and research projects that deal directly with commercial catch data, and collaborate with PGDATA in the support to Benchmark process.

Task	By when	By whom
Identify groups and contact chairs	January 2016	Chairs
Contact benchmark and data-compilation chairs and demonstrate availability to discuss intersessionally patterns they may detect	January 2016	Chairs
Discuss intersessionally requests obtained	Continuous	All participants

ToR e) Continue to document current as well as best practice for data collection schemes to estimate catch, effort, catch composition, biological parameters and spatial mapping of activities of small-scale commercial fisheries (under-10m vessels) with particular focus on European fleets. Evaluate approaches to data collection by census, surveys or self-sampling.

Task	By when	By whom
Identify members who can work intersessionally at developing draft best-practice guidelines (to be evaluated during WGCATCH 2016)	December 2015	Chairs and task leaders
Identify contributions for case studies on small-scale fisheries comparing census (logbook/sales notes) data with survey data		Chairs

ToR f) Document current sampling and estimation practices for Protected, Endangered and Threatened Species (PETS) and rare fish species. Evaluate limitations of current data and communicate them to main end-users.

Task	By when	By whom
Circulate questionnaire among WGCATCH members	May, 2016	Chairs and task leader
Compile results and elaborate first analysis of sampling protocols. Define good practice.	June 2016	Chairs, task leader, WGBYC member
Circulate analysis among WGCATCH members prior to meeting	October 2016	Chairs
Communicate results of WGCATCH 2016 discussions, including limitations of the data, to main end-users	End of November 2016	Chairs

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

Task	By when	By whom
Formalize WGCATCH commitment to continue to review and comment on the progress in the development of the different formats and the RDB. Communicate this WGCATCH ToR to SC-RDB.	SC-RDB meeting	Chairs
Request contributions on developments for the next WGCATCH	May 2016	Chairs

ToR h) Foster regional cooperation on publications related to the work of WGCATCH.

Task	By when	By whom
First draft sampling design paper	End April 2016	Task leader, contributors
Evaluate the possibility of submitting a paper with results of WGCATCH work on Small-scale Fisheries to ICES ASC 2016, defining authorship	January 2016	Chairs, task leaders for 2016 ToR a)
Submit abstract to ICES ASC 2016	April 2016	Authors
Review progress in SD and SSF work and define roadmap for final paper submissions	April 2016	Chairs, Authors

ToR i) Develop and maintain a reference list of key publications and contacts dealing with design and implementation of fishery sampling schemes and associated data analysis

Task	By when	By whom
Seek contributions	Continuous	Chairs
Update the reference list presented at WGCATCH 2015	Continuous	Chairs

ToRs j, k and l) These are mainly administrative ToRs that will be dealt with by the chairs on an ongoing basis.

9.4 Training Courses

In 2014 ICES held the Training course on Design and Analysis of Statistically Sound Catch Sampling Programmes (23–27 June 2014). The course was attended by 19 participants from Denmark, Belgium, UK, Germany, Sweden, Portugal, Poland, Seychelles and Spain, and was, alongside WKPICS and SGPIDS series, an important point on the creation of a new generation of sampling design statisticians working on commercial catches in ICES waters. The knowledge obtained in the course has led to substantial improvement in the quality of discussions held on sampling design (not only in WGCATCH, but also at RCM level and many other EGs) and the gradual implementation of statistically sound catch sampling programmes in many MS.

WGCATCH discussed the progress achieved and the need for further training:

- - On the one hand, having ICES provided training at intermediate level and having much of the acquired knowledge been tested and implemented at national level, there are now conditions and considerable participant interest in a more advanced training course. Aspects like simulation (e.g., see fishPi project), uncertainty and optimization of sampling programmes are of increasing importance in everyday management of national fisheries sampling schemes under DCF, in discussions of the new EU-MAP, and for the design of regional plans of fisheries sampling (e.g., fishPi, WKCOSTBEN).
- - On the other hand, WGCATCH feels it is particularly important to continue the capacitation of ICES MS in fisheries statistics as larger and more qualified critical mass is necessary to strengthen the current top level discussions being held at RCM level and to foster the implementation of statistical sound sampling necessary in all MS involved in data supply for the different ICES EGs. Such need has been advocated strongly by, e.g., RCM Med 2015 (Anon, 2015), which states "*The information on design-based sampling is scarce at Mediterranean and Black Sea level*" and recommended MS to "*should improve their knowledge on the design-based sampling and other statistical sampling tools used in others EU regions*" by participating "*in the EU Working Groups and Workshops relative to sampling designs and methods like WGCATCH.*"

Accordingly, discussions held during the WGCATCH meeting led to the identification of both a need and a group of prospective participants for two training courses:

a) A repetition of the intermediate level course that was held in summer 2014.

b) A more advanced training course in statistical sound sampling, covering simulation, estimation and optimization of DCF programmes.

WGCATCH chairs approached the instructors of the previous ICES 2014 training course – Mary Christman, USA, and Jon Helge Vølstad, Norway – to learn their opinion on the best training strategy the group should adopt. It was concluded that option a) should be the priority for 2016 as it would allow the growth of critical mass for future discussions of statistical sound sampling schemes and it would meet the interest of RCM Med countries. Subsequent contacts with ICES secretariat and RCM Med members, resulted in a proposal to run the second edition of the training course 12–16 September 2016 at ICES HQ. Option b) [advanced course in statistical sound sampling design] was remitted for consideration at WGCATCH 2016 meeting. At present the course is schedules to take place in 2017.

9.5 Future research needs

The following sections outline some of the ideas brought forward at WGCATCH 2015 for future terms of reference for the group.

9.5.1 Historic catch reconstruction

Review inaccuracies in historic landings data and methods adopted to estimate them, and advise on best practice where needed. An initial survey would be needed to document the extent of the challenges and methods already adopted at national level to meet them.

Justification: The accuracy of reported landings data during various historical periods is often in doubt due to suspected or known misreporting, mixed-species catch reporting, dispensations from reporting small catches, and methods of recording landings where no logbooks are kept. Changes in legislation, e.g., introduction of buyers and sellers regulations, can cause step changes in accuracy that may affect stock assessment. In some cases, scientists post-process official data or use surveys to try to improve the accuracy of the data they report to EGs and the RDBs. Often these are not well documented or reviewed. Reconstruction of historical catches is quite a challenge and the group should try to review previous collaborations and results obtained the 'Sea around us' project (http://www.seaaroundus.org/catch-reconstruction-and-allocation-methods/) and http://www.seaaroundus.org/doc/publications/wp/2015/Nedreaas-et-al-Norway.pdf) and in the California Historical Catch Reconstruction project (https://swfsc.noaa.gov/).

9.5.2 Document changes in sampling designs

Through time, sampling designs have evolved significantly, adapting to regulations, end-users' needs and advances in sampling theory. It is important to develop an approach that collects information on such changes and is able to integrate anecdotal information (e.g., we changed the way we deal with mixed-species landings, the industry withdrew cooperation affecting the availability of samples) with quantitative information (we sampled x-amount of vessels, sampled ports x, y and z, etc.). Many of these changes are known stock-specific, while others are specific to whole programmes, and this should be taken into account when collecting such information. WGCATCH could develop an approach to document recent changes and then extend it to historic changes. It should also liaise with PGDATA on data issues that are useful to assessment EGs, e.g., helping to explain trends, step-changes, outliers, etc.

9.5.3 Combining age or length distributions from two surveys

If two surveys sample the same population, a combined estimate can be produced for single parameters. However in most cases the estimates from fishery surveys are age or length distributions and there is no straight-forward way to combine these. WGCATCH should focus on ways to properly combine existing data collected under different frames (e.g., on-board and onshore sampling frames), helping ICES to make better use of existing data and improve precision and accuracy of estimates. For example it is not possible to estimate the effective sample size of a distribution; it is only possible to do this for a single size or age class in a distribution. This makes it difficult to find appropriate weights that allow two or more distributions to be combined.

9.5.4 Length samples without age data

In many cases length samples are available without associated age data. There is no agreed approach on how the information from these samples can be used in a design-based estimate. Developing such an approach would be a valuable improvement.

9.5.5 Other research needs

Spatial mapping of catches, methods for dealing with mixed-species landings, and sampling catches of data-poor fisheries, among others.

9.6 References

Anon. 2015. Report of the 2015 Regional Coordination Meeting Mediterranean and Black Sea, Large Pelagic Fisheries. 09–11/09/2015, Rome, Italy.

Annex 1: List of participants

NAME	INSTITUTE	E-MAIL
Ana Claudia Fernandes	Instituto Português do Mar e da Atmosfera, Departamento do Mar e Recursos Marinhos	acfernandes@ipma.pt
Ana Ribeiro Santos	Centre for Environment Fisheries and Aquaculture Science (Cefas), Lowestoft Laboratory	Ana.ribeirosantos@cefas.co.uk
Bram Couperus (by correspondence)	Wageningen University, IMARES	bram.couperus@wur.nl
Chun Chen	Wageningen University, IMARES	chun.chen@wur.nl
Dália Reis	Universidade dos Açores, Departamento de Oceanografia e Pescas	dreis@uac.pt
Deividas Norkus	Fisheries Service under the Ministry of Agriculture, Division of Fisheries Research and Science	deividas.norkus36@gmail.com
Edwin van Helmond	Wageningen University, IMARES	edwin.vanhelmond@wur.nl
Estanis Mugerza	AZTI-Tecnalia, AZTI Sukarrieta	emugerza@azti.es
Gjert Dingsør	Institute of Marine Research (IMR)	gjert.endre.dingsoer@imr.no
Hans Gerritsen (Chair)	Marine Institute	hans.gerritsen@marine.ie
Jens Ulleweit (by correspondence)	Thünen Institute, Institute of Sea Fisheries	jens.ulleweit@ti.bund.de
Joël Vigneau (by correspondence)	Institut Français de Recherche pour l'Exploitation de la Mer (Ifremer), Port-en-Bessin Station	joel.vigneau@ifremer.fr
Jon Elson	Centre for Environment Fisheries and Aquaculture Science (Cefas), Lowestoft Laboratory	jon.elson@cefas.co.uk
Jon Helge Vølstad	Institute of Marine Research (IMR)	jon.helge.voelstad@imr.no
José Rodriguez	Instituto Español de Oceanografía, Centro Oceanográfico de Santander	jose.rodriguez@st.ieo.es
Josefine Egekvist	National Institute of Aquatic Resources (DTU Aqua), Section for Fisheries Advice	jsv@aqua.dtu.dk
Kirsten Birch Håkansson	National Institute of Aquatic Resources (DTU Aqua), Section for Fisheries Advice	kih@aqua.dtu.dk
Lauri Saks	University of Tartu, Estonian Marine Institute	slauris@ut.ee
Liz Clarke	Marine Scotland Science, Marine Laboratory	e.d.Clarke@marlab.ac.uk
Maciej Adamowicz	National Marine Fisheries Research Institute, Department of Logistics and Monitoring Databases	madamowicz@mir.gdynia.pl
Maksims Kovsars	Institute of Food Safety, Animal Health and Environment	maksims.kovsars@bior.lv
Marie Storr-Paulsen (by correspondence)	National Institute of Aquatic Resources (DTU Aqua), Section for Fisheries Advice	msp@aqua.dtu.dk
Marijus Spegys	Fisheries Service under the Ministry of Agriculture, Division of Fisheries Research and Science	marijus.spegys@zuv.lt

NAME	INSTITUTE	E-MAIL
Mary Christman (by correspondence)	University of Florida, Department of Biology & Department of Statistics	marycchristman@gmail.com
Mike Armstrong	Centre for Environment Fisheries and Aquaculture Science (Cefas), Lowestoft Laboratory	mike.armstrong@cefas.co.uk
Nuno Prista (Chair)	Swedish University of Agricultural Sciences (SLU), Institute of Marine Research	nuno.prista@slu.se
Patrik Börjesson	Swedish University of Agricultural Sciences (SLU), Institute of Marine Research	patrik.borjesson@slu.se
Sarah Schembri	Ministry for Sustainable Development, the Environment and Climate change, Department of Fisheries and Aquaculture	sarah.a.schembri@gov.mt
Sébastien Demanèche	Institut Français de Recherche pour l'Exploitation de la Mer (Ifremer), Centre Bretagne	sdemanec@ifremer.fr
Sofia Carlshamre	Swedish University of Agricultural Sciences (SLU), Institute of Marine Research	sofia.carlshamre@slu.se
Sofie Nimmegeers	Institute for Agricultural and Fisheries Research (ILVO)	sofie.nimmegeers@ilvo.vlaanderen.be
Sofie Vandemaele	Institute for Agricultural and Fisheries Research (ILVO), Institute for Agricultural and Fisheries Research (ILVO)	sofie.vandemaele@ilvo.vlaanderen.be
Sven Stötera	Thünen Institute, Baltic Sea Fisheries	sven.stoetera@ti.bund.de
Włodzimierz Grygiel	National Marine Fisheries Research Institute (NMFRI), Department of Fisheries Resources	wlodzimierz.grygiel@mir.gdynia.pl

Annex 2: Agenda

	Mon	Tue		Wed		Thu		Fri			
	09-Nov	10-Nov		11-Nov		12-Nov		13-Nov			
9:00-11:00	Introduce ToRs, finalise agenda.	Sub-group A (3 Presentations, A)	Sub-group B-C (3 presentations of ToR B)	Sub-group A (compile, summarise and discuss questionnaires)	Sub-group B-C (3 presentations of ToR C)	Joint Discussion on best practices and research needs for SSF		Sub-group A (finalize report)	Sub-group B-C (finalize report)	Landing Obligation (finalize report)	RDB (finalize report)
11:00-11:15	Coffee break										
11:15-13:00	PGDATA / WKRDB / CRR / Review of recomendations / Future research / Literature	Sub-group A (3 Presentations, A)	Sub-group B-C (3 presentations of ToR B) - **Skype Ane**	Sub-group A (compile, summarise and discuss questionnaires)	Sub-group B-C (rest presentations of ToR C + Discuss and report on Tor	Sub-group A (Discuss and report)	Sub-group B-C (Discuss and report on Tor B and C)	Tors and place of next meeting; review of executive summary; Identify remaining tasks and deadlines			
13:00-14:30	Lunch break										
14:30-16:45	PGDATA / WKRDB / CRR / Review of recomendations / Future research / Literature **Skype Bram 15:30**	Sub-group A (rest of Presentations) + formulate feedback and report	Sub-group B-C (rest of presentations of ToR B + Discussion) **Skype Ane**	Landing obligation (presentations and discussion)		RDB (presentations and discussion) FishPi overview presentations Paper on SSSS subgroup					
16:45-17:00	Coffee break										
17:00-18:00	PGDATA / WKRDB / CRR / Review of recomendations / Future research / Literature	Plenary	Plenary	Plenary	Plenary	Plenary	Plenary				
20:00		Social									

Annex 3: Recommendations

RECOMMENDATION	ADDRESSED TO
1. WGCATCH recommends that the guidelines formulated in section 4 of the WGCATCH 2015 report are considered in the analyses of simulations of regional sampling designs held at RCM/RCG level.	RCMs
2. WGCATCH recommends to the European Commission to make available the funding required to continue the development of the exchange format and improve the estimation procedures in the Regional Database (RDB). This includes procedures to deal with historic sampling designs, post-stratification, and other aspects that are fundamental for adequate interpretation of sampling data obtained from probability based sampling schemes.	EU Commission
3. WGCATCH endorses WKCOSTBEN and the new ICES the Training course on Design and Analysis of Statistically Sound Catch Sampling Programmes and advises all MS to attend them. These two meeting will be important to enhance the experience levels at MS level and open way to the implementation of both statistically sound and efficient sampling programmes at RCM level. As such, WGCATCH requests the RCMs to promote the attendance of these meetings among all MS involved	RCM

Annex 4: Working Documents

Titles and summaries (where available) for the working documents presented at WGCATCH are given below. (*) Full working documents can be consulted in the Appendix that is published as a separate document to this report.

ToR A) Small-scale Fisheries

*WD.A1.

Title: Analysis of the small-scale fleet's coverage under two sampling strategies: from the DCR stock-based to the DCF concurrent sampling in the Northern Spanish coastal gillnets fleet
Authors: José Rodríguez-Gutiérrez, Eva Velasco, José Castro, Juan J. Acosta, Hortensia Araujo
More details: see Appendix to this report

*WD.A2.

Title: Monitoring artisanal fisheries in the Basque Country
Authors: Estanis Mugerza, Lucia Zarauz, Arantza Murillas, Luis Arregi, Nekane Alzorriz and Iñaki Artetxe
More details: see Appendix to this report

*WD.A3.

Title: German Small-scale fisheries
Authors: Sven Stoetera
More details: see Appendix to this report

*WD.A4.

Title: French small-scale fisheries data collection.

Authors: Sébastien Demanèche

More details: see Appendix to this report

ToR B) Sampling Design and Estimation

*WD.B1.

Title: French historical (2003-2014) discards estimates of megrim (L. whiffiagonis) in Sub-area VII and Divisions VIIIa,b,d

Authors: Joël Vigneau

More details: see Appendix to this report

*WD.B2.

Title: French at-sea observations Quality Control procedures and sampling coverage

Authors: Joël Vigneau, Vincent Badts, Anne-Sophie Cornou, Joel Dimeet, Marion Quinio-Scavinner, Marie-Joelle Rochet

More details: see Appendix to this report

***WD.B3.**

Title: Spanish onshore sampling of *Lepidorhombus spp.*

Authors: José Rodríguez-Gutierrez, Lucia Zarauz, Estanis Mugerza, José Luis Cebrían, Iñaki Artetxe

More details: see Appendix to this report

***WD.B4.**

Title: Spanish discards estimates of megrim (*Lepidorhombus whiffiagonis*) in Subarea VII and Divisions VIIIabd

Authors: Nélida Pérez, Hortensia Araújo, Jon Ruiz and Jose Castro

More details: see Appendix to this report

***WD.B5.**

Title: Commercial Fishery Sampling Scheme in Poland (an Overview)

Authors: Włodzimierz Grygiel

More details: see Appendix to this report

ToR C) Simulation

***WD.C1.**

Title: Developments in the "Northern and Southern Hake" Case Study of fishPi

Authors: José Rodríguez-Gutiérrez, Nuno Prista, Lucia Zarauz, Manuela Azevedo and José Castro

More details: see Appendix to this report

***WD.C2.**

Title: Case study 3: Southern North Sea flatfish fisheries

Authors: Chun Chen, Sieto Verver, Edwin van Helmond, Jon Elson, Ana Ribeiro Santos, Els Torreele, Sofie Nimmegeers, Julia Wischnewski, Alastair Pout, Liz Clarke

More details: see Appendix to this report

ToR D) Landing Obligation

***WD.D1.**

Title: Implementation of the landing obligation in the Baltic Sea – first sampling results from the German cod fishery

Authors: Sven Stoetera

More details: see Appendix to this report

Annex 5: Presentations

Titles and summaries (where available) for the presentations at WGCATCH are given below. (*) Slides can be consulted in the Appendix that is published as a separate document to this report.

ToR A) Small-scale Fisheries

WP.A1.

Presentation title: Overview of the Nantes DCF workshop: "Common understanding and statistical methodologies to estimate/re-evaluate transversal data in small-scale fisheries". Nantes, 21–23 May 2013.

Author: Sébastien Demanèche

Summary:

The workshop was held following:

- Proposition of the 5th meeting of the PGMED 2012 to organize a workshop on statistical methodologies to estimate/re-evaluate transversal variables, with a special focus on the small-scale fisheries and output of the PGMED & PGCCDBS 2013
- RCM Baltic 2010 recommendation for a workshop on transversal variables confirmed by the Liaison Meeting 2010
- The conclusion of the evaluation of the DCF made for the DGMare about Artisanal fleets (generally regarded as being difficult to get data for and for which requirements have to be adapted to its context)
- In line with one of the objectives of the CFP reform concerning the way to protect the small-scale vessels sector
- The conclusion of STECF 12–15 and 13–06 meetings regarding the next new DC-MAP about collection of transversal variables and the need of distinction between vessels which are subject to logbooks (>=10m.) and vessels which are not (<10m.). Need of proving the completeness and reliability of declarative forms used to follow <10m vessels, otherwise monitoring program could be promoted
- Guidelines for preparation of the Annual Report of the DCF who reaffirmed that MS are reminded of the fact that the DCF has no provisions for the exclusion of any part of the vessels population from data collection
- EU Project N°FISH/2005/10 on SSCF in Europe
- Workshop on Small-Scale Fisheries, Kavala (Greece), September 12–16, 2005

The workshop met in Nantes 21–23 May 2013. 19 experts (7 biologists, 4 economists, 5 statistician, and 3 managers) from 9 Member States (Denmark, Finland, France, Germany, Italy, Latvia, Lithuania, Portugal, and Sweden) attended the meeting. The principal aim of the WK was to investigate methodological approaches for collecting transversal data for small-scale fisheries and provide useful input for the implementation of the new DCMAP.

The group discussed the definition of the SSF. For the data collection purposes, the group agreed to focus on vessels less than 10 meters as they are not under logbooks requirement. The group also suggested keeping the class 10–12 meters in order to ensure consistency in time-series, as they are not under VMS regulation and as some recommendations proposed for less than 10 meters vessels should be profitably applied to this fleet segment.

The group discussed the different following regulations: *CFP (protect small-scale vessels sector), Control Regulation, Management Plan in the Mediterranean Sea, Marine Strategy Framework Directive (MSFD), Natura 2000, Marine Protected Area (MPA), Water directive.* The group agreed that it can be essential to estimate the fishing activities of SSF in terms of annual fishing days, volume and value of catches as a minimum requirements of data to answer these different regulations. The group noted that affect on ecosystem and spatial distribution of effort of SSF can be of major importance and should be monitored, that SSF could not be ignored in bioeconomic analysis and that there could be differences among regions which have to be investigated by RCGs.

The group completed an overview of European small-scale fisheries and practices used to collect transversal data, 12 MS are presented in the report (*Belgium, Denmark, Finland, France, Germany, Italy, Lithuania, Latvia, Malta, Slovenia, Spain and Sweden).* The overview underlined the relative importance of such fisheries in each Member State, the potential of SSF, although they are in general less harmful to stocks, to create overcapacity and to have adverse affects on costal species and functional areas (e.g. nurseries) and the specificities of the SSF *(large numbers of vessels, high geographical dispersion of operating harbours, high inactivity, high heterogeneity in terms of fishing activity (gears, equipment used, areas of operation) and lack of exhaustive declarative effort and catches data).*

On the basis of this overview, the group concluded that the collection of transversal data for vessels <10m requires a regional approach associated with more active end-user definition of needs through more active and influential RCG. The overview showed that two types of data collection are available sampling or census approach. Great heterogeneity in terms of landings (volume and value) or annual fishing days in SSF fishing sector was also noted.

The group discussed the two type of data collection available within the SSF fishing sector to estimate the transversal variables. The group concluded that sampling approach could be more cost-effective in some cases and allow the assessment of reliability of final estimates through the application of sampling techniques. The group noted that census approach need to use a declarative form adapted to the specificity of the SSF (logbooks are generally not adapted) possibly combined with cross-validation tool and non-response statistical treatments. The group recommended that the choice between the two options should be based on cost efficiency including level of reliability/quality of data assessed to be reach by each approach envisaged. The group highlighted that in data collection of census type, the assessment of the completeness and quality of declarative forms is an issue which would require much attention by MS. Lastly, the group considered that guidelines for appropriate sampling schemes should be developed by an expert group and made available to MS and the group suggested that the issue of heterogeneity needs to be analysed more thoroughly by an expert group to give advice on how to distinguish subpopulation to optimize precision and cost efficiency of the data collection.

The group discussed what will be the requirements of the new EU Regulation DCMAP and made a proposal for a core set of transversal variables (including capacity, fishing effort and landings variables) to monitor SSF. The group discussed the input of modern techniques to improve estimated statistics and agreed that these technical instruments (electronic devices) provide detailed information on effort with high spatial resolution and will be useful to assess reliable transversal data. The group suggested that such collect of data should be supported in the future through an incentive approach encouraging member states to work together to develop tools to process such data specially geo-localization data. Finally, the group considered that an indicator of the spatial distribution of the effort deployed by SSF could be of high interest for scientific and management purposes.

Finally, the group discussed under which regulation the transversal data should be collected to avoid duplication of collected data in different regulations and readdressed the conclusions of the STECF EWG 13-02 meeting about transversal variables avoiding duplication of data collection but if the data collected under other regulation (in particular control regulation) does not meet the requirement in the DC-MAP, specific data collection including sampling approach could be set up in the DC-MAP framework.

The complete report was made available on: https://datacollection.jrc.ec.europa.eu/documents/10213/891472/2013-10-17_Final_report_WK_SSF_May_2013.pdf

Presentation title: French Small-scale Fisheries data collection.

Author: Sébastien Demanèche

Summary:

Key Points: The French fleet present a large spatial distribution all around the world. Special features and differences appear between regions, especially for the fleet segment of vessels less than 10 meters. The way to follow them differs therefore from one region to another.

Composition: Under-10m fleet represent a large part of the total fleet in term of number of vessels and consequently in employment in all regions (**~50%** of the total number of vessels in North Sea and North Atlantic, **~80%** in Mediterranean Sea and **~90%** in Overseas Regions).

The reality of the activity of this fleet is well assessed through the exhaustive "Activity Calendar Survey" applied every year in all regions which cover the whole of the reference population. Such survey provide input each year for the typological classifications of vessels (inactive/active vessels and classification by métiers), makes also possible the definition of sampling plans to structure the routine data collection program and is used for checking the completeness and reliability of declarative data available.

Landings and effort data: Two approaches are used to follow the under 10m fleet: i) a census approach in North Sea and North Atlantic based on a monthly declarative form adapted to their special features. These data are crossed with sales notes through the SACROIS tool to get validated and qualified landings per species and fishing effort dataseries. ii) a sampling approach is used in Mediterranean Sea and Overseas Regions as the coverage and precision of the available declarative data have been assessed to be insufficient to meet the DCF requirements. Therefore on-site sampling of trips surveys have been implemented in these regions to estimate fishing effort and landings

per species dataseries. Sampling scheme combine a cluster weighted sampling of the fishing trips (spatial*time sampling) with a complementary stratified phone sampling to estimate the number of fishing trips.

Port sampling: Biological parameter estimation are included into a general sampling scheme in North Sea and North Atlantic when a specific sampling scheme combined with the catch assessment survey is applied in Mediterranean Sea and Overseas regions.

Observer data: Draw lists to do the random sampling include under-10m fleet in France. Nevertheless, only vessels large enough to take observers safely are surveyed. Health and safety regulations in place could be a supplementary limit to survey them.

WP.A2.

Presentation title: Maltese Biological Sampling – At Market and Onboard

Author: Sarah Schembri

Summary:

Composition: Under 10m; 87% of vessels, 78% of days at sea, 25% of landings. Under 12m; 92% of vessels, 85% of days at sea, 35% of landings

Landings and effort data: Vessels over 10 m have a logbook and VMS; Data for vessels under 10 m is collected via a Catch Assessment Survey based on questionnaires on randomly selected vessels.

Market sampling: Stratified random sampling of the whole fleet (PSU: trip, stratum: métier)

Onboard sampling: Stratified random sampling of the whole fleet (PSU: trip, stratum: métier - except for trawling métiers that are all sampled in the same trawling stratum)

Biological Sampling of Maltese SSF

The Department of Fisheries and Aquaculture in Malta does not have a universal definition of SSF, but in most cases SSF are understood to be vessels under 12 m that do not used towed gear as defined in the EMFF. 92% of the Maltese fishing fleet is under 12 m (87% are under 10 m) and vessels under 10 m do not have logbooks or VMS installed. Vessels under 10 m with special licenses (i.e. lampara, dolphin fish FADs, swordfish and tuna longlines) have an AIS and are obliged to fill in paper logbooks when using these gears, but this only constitute a minority of the vessels under 10 m. SSF account for over 80% of the effort (hours at sea) but only for a third of the total landings by weight. Vessels might have up to 15 licenses for different gears and the fish caught are varied and of high quality, therefore they are considered important to the local economy. Fishing operations are carried out in coastal waters and generally trips do not last for more than one day.

Transversal data for vessels under 10 m is collected via a Catch Assessment Survey (CAS) to collect data on landings, effort and discards. A questionnaire survey is carried out on fisher of vessels that are randomly chosen each quarter stratified by whether they are full-time or part-time, by length segment and by DCF economic segment. The CAS survey has yielded good quality data on transversal variables and has resulted in reliable population data on SSF.

Biological data are collected to fulfil DCF obligations, and since most of the fleet is small-scale, it is all sampled under the same sampling programme. Stratified random

sampling is carried out from Monday to Saturday at the only fish market in Malta, where the trip is the PSU and the strata are the métiers. A target number of trips per métier to be sampled are set for each month. When possible the catch from a trip is measured at the market otherwise the whole catch or a subsample is purchased. This plan does not include trips that have used more than one gear in the trip and randomness is compromised when hawkers are unwilling to sell us fish and when larger fish (such as swordfish) are exported. Furthermore, a lot of fisher are not using the fish market to make a sale and instead are selling directly to the buyer. Comparing market sales notes and direct sales notes shows that 48% of the sales values were from direct sales for vessels over 12 m and 55% of the sales values were from direct sales for SSF. It is very difficult to sample direct sales that could be taking place at restaurants, supermarkets, tuna penning companies etc. This large proportion of direct sales sometimes results in a poor choice of fish at the fish market especially in bad weather. Very few catches from gears that need to be targeted for the DCF might be present so when the first catch by a métier that needs to be sampled is at the fish market it is sampled. When a gear has not been seen at the fish market during a specific month, the sample is transferred to the following month to reach the target of the DCF obligations. A possible measure to improve the randomness of the market sampling could be to change the PSU from the trip to the vessel and then post-stratify the data into métiers. Simulations, however, show that the probability of selecting a vessel for sampling that would have sold fish at the fish market during that month and that the fish would have been caught by the gear intended for sampling are 18%. By these scheme trawlers would be sampled at the fish market 54% of the time that they are selected and this raises the average to 18% because the chance of sampling other gears such as pots and traps could be as low as 7%. Changing the sampling plan from being trip-based to vessel-based would therefore result in big shortfalls from DCF obligations.

Onboard sampling is carried out under a similar stratified random sampling frame where each stratum is the métier. A target number of trips per métier to be sampled are set for each month. For trawlers the gear does not correspond to the métiers since hauls within the same trip might have three different target assemblages, therefore, post-stratification into métiers is done only for data from trawling onboard observations. Additionally, since there are three métiers for trawlers, there is an annual target of 36 trips to be sampled when there are only 14 vessels in the trawling fleet putting a high burden on a few vessels. Biases are introduced when fishers are unwilling to welcome onboard observers, when the vessels are too small to accommodate onboard observers and when landings are done in a foreign port. During winter it could also be difficult to find which vessels are making any trips since many of the fishers use winter for onshore work, this means that sometimes the whole fleet that falls in the métier needs to be contacted which is burdensome both for the onboard observers and the fishers.

In conclusion, by stratifying the fleet by gear the fleet is segmented into very small groups that are difficult to sample making the DCF obligations very difficult to reach. A design based approach such as concurrent sampling at the fish market could be a more efficient way to collect data on a large number of species.

WP.A3.

Presentation title: Length composition species landings in two vessel size segments: small-scale (<12m) & large-scale (>=12m) fisheries.

Authors: Ana Cláudia Fernandes, Manuela Azevedo, Nuno Prista, Cristina Silva.

Summary: Small-scale fisheries (SSF) represent 70–80% of the Portuguese fleet in number of vessels. These fisheries operate mainly inshore (< 6 Nautical miles from coast) and target a high variety of species with multiple gears. In Portugal, it is mandatory to land and sell at specific auctions so Portuguese fleet landings (including SSF vessels) are recorded into a national database. According to the landings statistics, SSF represents 15-20% of Portuguese landings in weight and near 30% in value.

Portuguese onshore sampling carried out under the DCF (PNAB/DCF) is distributed in 18 main ports that cover the entire continental coast. Fleets are currently defined in the sampling programme, with their basis being the vessels licenses and their historical landing patterns, and each vessel is classified into a single fleet. Systematic sampling within each fleet is carried out to evenly distribute sampling effort throughout the weeks of each quarter. Visit days to each port are coordinated across the different fleets with observers being scheduled to sample, e.g., X random trips of fleet1 and Y random trips of fleet2 in each auction visit. The particular combination of fleets to sample each day is set based on known temporal overlap of the different fleets at port and expectations on the time needed to sample each fleet. Trip sampling consists in observers identifying and measuring at least one box from each commercial size grade of all commercial species present in the landings from each selected vessel. During estimation, the length composition of the samples is raised to commercial species*size category and then to trip level. Finally the several trips are combined within port and raised to port level (based on landings).The raising of the length composition of landings to national level is performed separately for trawl, purse-seine and multi-gear fleet segments. The estimates are obtained quarterly.

A preliminary study on the analysis of differences in length distribution of the landed species between two vessel size segment (<12m and >=12m) was carried out for presentation at WGCATC 2015. The port of Peniche was selected for analysis on basis of its good sampling coverage. Three main species (hake, pouting and axillary seabream) were selected for analysis. Data analysis was performed in separate for each vessel size segment (VSS) and fishery (gillnet & trammelnets – GNS_GTR and pots & traps - FPO). Length distributions by trip were raised to total VSS/métier and Kolmogorov-Smirnov tests of significance were used to compare distributions between VSS. Because differences in the length distribution across VSS and fisheries does not necessarily implicate differences in the final length distribution used for assessment, when significantly different length distributions were found two raising procedures were carried out and their results compared: one combining the results of each VSS raised to port, and the other, raising length distributions of sampled trips directly to port, ignoring VSS post-stratification. Finally, statistical differences in the resulting distributions were evaluated.

The results obtained showed no significant differences in length distributions for pouting (both GNS_GTR and FPO fleets) and axillary seabream (GNS_GTR fleet). In the case of hake, significant differences were found between the two vessel size segments but when testing the results of the two raising methods to port level, those differences

were not significant. Overall, the combination of analyses performed revealed interesting patterns and we suggest it should constitute a routine procedures when decisions on the need to sample SSF separately from Large Scale Fisheries (LSF) need to be made.

The first important result from our preliminary study is that some species show differences in size distribution across VSS but not all. This means that the existence/non-existence of differences across VSS is strongly species dependent (depends on the spatial distribution of the species - ontogenic migrations, growth, reproduction, etc. - and gears vessels used to target each species) and therefore there is no "one fit all" solution for the need to sample (or not) SSF as a separate strata within national sampling programmes. The second important result is that the species that showed differences in length distribution across fleet size segments (hake) did not necessarily reflect those differences at total fleet level (it really depends on the proportion of landings registered in each VSS). Therefore, the existence of differences in the length distribution of VSS does not necessarily imply that those differences are significant for stock assessment and sampling plans should necessarily accommodate for them. We emphasize however, that if SSF are sampled very disproportionally relative to large-scale fisheries (LSF), results could be different and it may not be adequate to pool their results even in the hake case. In fact, sampling trips randomly and without VSS stratification, at each market day, does lead to many more SSF trips being sampled because SSF vessels are much more numerous (not necessarily involving larger weight) at each sampling occasion.

WP.A4.

Presentation title: Commercial small-scale fisheries in the UK

Authors: Mike Armstrong and Jon Elson

Summary:

Composition: Under-10m fleet compared with total fleet: 75% of vessels nos; 50% of days at sea; 2% of finfish landings & 22% of shellfish landings (reported). All vessels on EU register; 33% are inactive.

Landings and effort data: i) logbook scheme attached to England & Wales shellfish (crab, lobster) licenses; ii) other species landings only from sales slips required by Buyers and Sellers scheme. Sales data can be incomplete due to Control regulation exemptions. Effort and gear data inferred by control agencies; Iii) 1985-2010 (discontinued) seabass logbook scheme using stratified random sampling of vessels from a list frame of vessels known to catch seabass.

Observer data: draw lists include <10m trawlers in Scotland & England; netters and liners in England; only vessels large enough to take observers safely.

Port sampling: can be sampled if sold at auction sites; many small landings disposed of directly to public at landing site and not available for sampling.

United Kingdom small-scale fisheries

Around 3,300 vessels under 10m operate in Scotland, England and Wales, comprising 75% of vessels numbers and 50% of days at sea for the entire fleet, but they are responsible for only 2% of the total reported finfish landings and 22% of total shellfish landings (Table 1). Around 33% of under-10m vessels on the EU register were inactive in recent years. The contribution of under-10m vessels to total fish and shellfish reported landings varies around the coast and is greater in England and Wales than in Scotland.

The contribution is highest for species that are most common in inshore waters - for example, the bulk of the UK seabass landings is by under-10m net and line vessels operating from England and Wales. The UK under-10m fleet operates from a large number of sites, including haul-out sites on beaches in some areas. Many vessels are polyvalent, using a variety of gears according to season and target species, and many also operate on a part-time basis.

Landings that are transported to auction sites are included in port-sampling schemes, but many small landings are sold directly to the public or local businesses at or near the point of landing and are not available for sampling. Many landing sites are in remote locations limiting sampling opportunities. At-sea observer schemes include under-10m vessels using specified gear types (trawls in Scotland, and trawls, nets and lines in England) in the vessel selection draw lists, but exclude vessels with insufficient capacity to take observers safely. In England all vessels under 7m are excluded. Options for self-sampling of small vessels in England were recently trialled by Mangi *et al* (2014) for around 30 boats but are not yet implemented at a larger scale.

Vessels under 10m are not required to submit EU logbooks, and official landings statistics in the UK are derived from sales slips as required by the Registration of Buyers and Sellers scheme since 2006. In England and Wales, an exception is the separate shellfish licensing scheme which requires submission of daily activity and catch records for specified crab and lobster species. Sales data may not be an exhaustive record of catches for all species due to EU Control Regulation exemptions from reporting small catches below the limit specified in the Regulation. Sales data also do not capture detailed information on effort, gear and area fished for each transaction, and for vessels with no specific additional reporting requirements such as in the shellfish scheme, this information is usually input by the control agency for each reported landing based on local knowledge of typical activities of the vessel. Due to the polyvalent nature of many under-10m vessels, the gear type recorded for a landing may therefore not be accurate in every case.

In England and Wales, a number of other schemes have been carried out to collect more detailed data on under-10m fisheries. This included a voluntary logbook scheme run by Cefas (England) from 1985–2010 to estimate sea bass and mullet catches (Pickett, 1990). This involved a biennial port census to develop a progressively updated list frame of vessels that catch sea bass, and a stratified random selection of vessels to complete an activity and catch logbook for an indefinite period of up to a year or in some cases for several years. High-resolution spatial mapping of under-10m fleet activities was carried out during a project in 2008/09 (Elson *et al*. 2010) involving a sample of 31 under-10m vessels in SE England fitted with portable GPS recorders and providing detailed catch and effort reports and observer data. Other attempts at high resolution mapping around England and Wales have included the use of vessel inspection data combined with lower-resolution data from the fleet activity database.

A new project in 2015 has been using vessel intercepts at some selected ports in England where there is substantial under-10m vessel activity, to record more detailed information on vessel activity and catches alongside the sales data. This will help inform a review of methods to improve the completeness and accuracy of data for the under-10m fleet.

Table 1. Statistics of the UK Scotland, England and Wales fleet in 2012-13.

	Vessel LOA (m)		
	<10m	10-11.99m	>=12m
No. vessels EU register	4951	420	991
No. active vessels	3312	342	756
No. trips ('000)	143	28	51
No. days '000)	162	39	119
Fish ('000 Tonnes)	10	3	418
Shellfish ('000 Tonnes)	32	14	98

References

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Mangi, S., Smith, S., Armstrong, S. and Catchpole, T. 2014. Self-sampling in the inshore sector (SESAMI) Final Report. Cefas. 53pp. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/361558/SESAMI_final_report_Final.pdf

Pickett, G. D. 1990. Assessment of the UK bass fishery using a logbook-based catch recording system. *Fish. Res. Tech. Rep., MAFF Direct. Fish Res., Lowestoft 90: 30pp.*

WP.A5. (see also WD.A2)

Presentation title: Commercial Small-scale Fisheries in the Basque Country.

Authors: Estanis Mugerza and Lucia Zarauz

Summary:

The Basque Country artisanal fleet vessels monitored by AZTI institute represent the 60% of the total Basque Country fleet. As typical for many artisanal fisheries, the Basque artisanal fleet is polyvalent in terms of gears and target species, developing a seasonal activity which involves a large amount of species of high diversity and a variety of different names for the same species.

Different methodologies have been used to collect data of this fishery. From 2008 to 2012 specific logbooks were provided to skippers to obtain data on transversal variables: catches, effort and geospatial data. For socio-economic data questionnaires were carried out and in the case of discards, observers and self-sampling methodologies were used.

In 2015, the AZTI onshore sampling program moved towards a more probability based sampling design. The sampling scheme for the artisanal fleet is based on a multistage cluster sampling with monthly stratification, with harbour*day as primary sampling unite (PSU) and trips as secondary sampling unit (SSU).

To improve geospatial data on this fishery, different vessel monitoring devises have been installed in this fleet voluntary, to obtain high resolution geospatial data. 80% of the fleet installed these devices.

More complete information could be found in the respective WGCATCH working document.

WP.A6.

Title: Azorean Fishing is a Small-scale Fishery

Authors: Dália Reis

Summary:

DOP/IMAR is responsible for the provision of scientific advice for the fisheries sector of the Autonomous Region of the Azores and therefore responsible for the collection of scientific data under the Data Collection Framework.

Around 600 vessels operate in Azores. The fishery is clearly a typical small-scale one, predominating small vessels - 90% of the vessels has less than 12m. The Azorean fisheries have conventionally been typify as being of small-scale and artisanal nature since the great majority of the fleet are constituted by small vessel size with limited area of operation and use traditional gears that rely of intensive manual labour.

Table 1 shows the importance in terms of weight and value of landings for the small-scale vessels (less than 12m) and the rest of the Azorean fleet. Typically, the SSF assumes around 40% of the total landings in weight and around 50% of the value. In 2014, these values increased for 57% and 65%, respectively.

Table 1 – Percentage of landings weight and value, by the different vessels size segment, in Azores.

	% Landings Weight		% Landings Value	
	VL0012	VL12XX	VL0012	VL12XX
2010	39%	61%	49%	51%
2011	36%	64%	47%	53%
2012	41%	59%	50%	50%
2013	41%	59%	52%	48%
2014	57%	43%	65%	35%

Every Azorean fishing, data collection and sampling activity is concentrated in the ICES Subarea X, where vessels are committed to demersal, pelagic, deep-water, tuna and other highly migratory fish. Small-scale Fishing activities in the Autonomous Region of the Azores can be divided into 3 main categories:

- a fishery targeting horse and chub mackerel which uses small vessels, normally less than 12.5m in length, and which uses purse-seine nets – represents about 10% of the total fish landed;
- a fishery targeting demersal species, which uses vessels of less than 22m in length, and that uses bottom-set longline and various hand-held instruments – represents about 30% of total landings;
- and also a pole and line fishery which targets tuna (seasonal fishery).

These fisheries are all interrelated, since the same vessel can carry out two or more types of gears. Depending on the species availability, this fishery use also different gears by season. Often it is used several different gears in the same trip.

The collection of data of this small-scale fishery is incorporated in the Regional Sampling Programme. Transversal data are collected from census data or derived from sampling (in the case of fishing effort of SSF), Biological data derived from sampling.

Capacity: capacity data for all vessels are available through the official fleet register (Census system), regardless of the vessel size.

Landings: In Portugal all vessels landing fresh fish are obliged to sell it in auction markets, including small-scale vessels. The designated entities, electronically register all the data from 1st sale, and then send the information to the national administration. As no information about the gear/métier used is registered, an algorithm was constructed to detect the potential main fishing gear per landing trip, based on target species or species composition. This method intent to classify trips/landings, based on qualitative criteria using thresholds of target species' contribution to the catch of each trip – is used also to validate data from the logbooks.

Effort and Biological Data: Landings of the small-scale vessels are included in port-sampling scheme. The onshore sampling scheme is based on a multistage cluster sampling with monthly stratification, with harbour*day as primary sampling unit and trips as secondary sampling unit.

WP.A7.

Text title: Lithuania small-scale fishery summary

Author: Deividas Norkus and Marijus Spegys

Summary:

In Lithuania SSF is exceptionally done in the coast (about 91 km) by vessels that are <12m. In 2012 there are 40 active vessels that are <8m and 7 active vessels that are 10-12m (the total registered numbers are 73 and 32 respectively). These vessels are using only passive gears, such as gillnets (bottom and pelagic), longlining and traps for their catches. The data from these vessels (<8m) is obtained from monthly fishing journals and he data from 10-12m vessels is obtained from logbooks. The main species that are caught from these vessels are Baltic cod, herring, smelt, flounder, turbot and vimba. The landings from the SSF are about 524 tons per year and they make about 2.8% from the total landings. Comparing individual species, the landings of herring from SSF are about 2.7% from the total landings, flounder are about 3.8% and cod – about 20.3%.

Landings declarations are cross-checked (e.g. sampling-data and logbooks). Entries are checked before processing.

The data collection began in 2005 and it is collected in accordance with the Lithuania national program. The samples are obtained from the vessels that are chosen randomly from a list of fishers that are willing to cooperate with us. The data are collected using self-sampling method.

The market and onboard sampling are stratified by random sampling of the whole fleet (PSU: market day, stratum: métier and quarter).

WP.A8. (see also WD.A3)

Presentation title: German commercial small-scale fishery

Author: Sven Stötera

Summary:

The number of small-scale vessels (<12m, 'SSCF') is very high, but they are of minor importance in terms of weight and value of landings. They may, however, have a larger influence on a small-scale or regional level (in a certain harbour or on a certain ecosystem). Logbooks are available for all vessels > 8m. Vessels with a length <8m almost exclusively operate in the Baltic Sea and exclusively in the Western Baltic and Kattegat (ICES Subdivisions 21, 22 and 24). Almost all SSCF is using passive gears such as nets, pots and traps. They can use different types of gear at the same trip. This group of vessels accounts for less than 2% of both weight and value of the total national landings. Almost all landings are declared as "for private use"; no information about the size sorting or the revenue of the respective landings is available.

Capacity: capacity data for all vessels are available through the official fleet register, regardless of the vessel size. If the owner of the vessel wants to have the option to sell the catch, the vessel has to be registered.

Landings: all transversal variables under the heading "landings" are collected or calculated for all vessels. Reg. 2807/1983. Landing declarations are available at least on a monthly basis (vessel <8m).

Effort: all data for vessels >8m are available through logbooks, based upon Reg. 1098/2007, 404/2011. For vessels below 8m a survey (questionnaire) is conducted (sampling about 25% of the vessels and getting responses by about 25%), requesting per vessel the days at sea per gear and gear size information. This information is related to catch period length information derived from the landings declarations. The ratio between those two is applied to the catch period length of all vessels in order to estimate the days at sea and the gear information. The fishing days are set equal to days at sea. German fishing vessels <8m are almost exclusively in the PG (passive gear) segment.

This way the days at sea can be estimated per month. The gear, however, can only be assigned to the entire year. Using some background information on fishing seasons and gears used for certain species, it might also be possible to estimate data by métier. However, this has not been attempted yet.

Reliability: Landings declarations are cross-checked (e.g. with trip-summaries, sampling-data and logbooks, where available) in situ on a systematic basis. Entries are checked before processing. Feedback loops with federal agencies are established and allow feedback on data quality and short-term corrections.

For sampling in the Baltic Sea, vessels are selected randomly from a vessel list. There is a list for active and passive gear per stock and area (ICES Subdivisions), containing all active fishing vessels that contributed 90% or 60% of the total landings in the previous year, respectively. A vessel is chosen randomly, the fisher is contacted, the contact(s) are documented in a contact list and quality indicators are produced (e.g. contact summary list, response rate, rejection rate). Due to practical considerations, sometimes vessels still have to be selected by expert judgement.

Only few vessels < 10m are present in the selection list (due to their small landings), so that sampling intensity therefore is low. For example, in the Baltic Sea in 2012 about 134 trips were sampled by Germany (demersal fisheries: 79, small pelagics: 55). From

these sampled trips, only five trips were conducted on vessels <8m, covering the passive fisheries on small pelagic fish. Another 24 trips were sampled on vessels between 8m to 10m from which 15 were targeting demersal species and nine trips small pelagics. Transversal data are collected from census data or derived from sampling (e.g. economic questionnaire and on-board-sampling). Precision level and CV for effort/landings data are calculated and stated in the German Annual Report following Articles 3 and 4 of Council Regulation 199/2008.

Graphs and figures can be found in the respective WGCATCH working document.

WP.A9.

Presentation title: Estonian small-scale fisheries

Author: Lauri Saks

Summary:

Estonian Baltic Sea fishery is subdivided into the open sea fishery using trawlers, and the coastal fishery, the latter can be considered as small-scale fishery (SSF). The fishery is regulated on the basis of issued fishing permits (historical fishing right), which regulate the number of particular gears used. The number of different gears that can be used by SSF in Estonia is thus limited as historical fishing rights shares which are issued to individual fishers or companies and can be freely traded within Estonia. The number of allowed fishing gear (historical fishing rights) is regulated annually by the government of the Republic of Estonia. The number of fishers involved in SSF has been around 1850 during last years. 1000–1390 boats are used by the fishers with various lengths. While the majority of SSF fleet consists of <10m vessels also several >12 m boats are used (usually up to ten boats, mostly for pound-net fishing for Baltic herring). Therefore Estonian SSF cannot be defined on the basis of vessel length class. Coastal fishery uses predominantly passive gears (different trapnets, gillnets) and is directed to herring (during spring, the spawning season), flounder and several freshwater species, most importantly, to perch and pikeperch. Importance of recreational fishery in the coastal catch has an increasing trend. Annual landings are 8-10 K tons. The bulk of the catches comprises of Baltic herring, followed by perch, smelt, flounder, pikeperch and roach. However, perch may account for bigger share of revenue during some years. Generally, in terms of revenue, perch and Baltic herring are followed by pikeperch, smelt, flounder, sea trout, whitefish and pike. All landings have to be reported in logbooks which are issued together with historical fishing rights. Data on all landings of all fish species is recorded in logbooks and have to be reported monthly to the Ministry of Rural Affairs and stored in Estonian Fisheries Information System (since 2005). Biological data on fish stocks are collected under Estonian National Program for collection of data in the fisheries sector. This involves sampling of commercial catches concurrently on the sea and in the harbour, also test-fishing. The latter is used in case of local species currently at low stock level to follow the stock status. In Estonia, these coastal stocks are monitored in frames of regular (since 1993) test fishing in fixed sampling areas along the Estonian coastal zone. CPUE, year-class strength and other parameters indicating the stock status can be calculated from test fishing data.

WP.A10. (see also WD.A1)

Presentation title: Analysis of the small-scale fleet's coverage under two sampling strategies: from the DCR stock-based to the DCF concurrent sampling in the Northern Spanish coastal gillnets fleet

Authors: José Rodríguez-Gutiérrez, Eva Velasco, José Castro, Juan J. Acosta, Hortensia Araujo

Summary:

The Northern Spanish coastal small-scale fleet represents a major challenge for sampling due to the multispecies and multi-gear character and the complexity of the fleets' dynamics. Particularly, the small-scale gillnets called "beta" (GNS_DEF_60–79_0_0) represents a complex Spanish métiers in terms of catches, effort, geographical distribution and the number of exploited species. Comparison of data obtained in 2008, under a stock-based approach, vs. concurrent sampling realized in 2014 resulted in the increase of the information obtained and provided to ICES without detected failures in data quality. Concurrent sampling could represent a source of information for small-scale fisheries which often target a set of coastal species some of which are currently unassessed.

ToR B) Estimation

WP.B1. (see also WD.B5)

Presentation title: Commercial Fishery Sampling Scheme in Poland

Author: Włodzimierz Grygiel

Summary: Fish and fishery sampling in Poland is concerns three various modules:

- the Baltic Sea commercial fleet,
- the recreational (pleasure) seagoing angling of Baltic cod,
- long-distance commercial fishery.

In 2014, the "Métier Based", fish sampling strategy was applied to the commercial fleet. Métiers were selected by the ranking system. A quasi-opportunistic selection of fish sampling is implemented. The onshore sampling programme is based on ad-hoc selection of the vessels. Usually, sampling is based on the preliminary agreements with a part of vessels owners and particular skippers that cooperate with the Institute. The distribution of sampling of particular species over the year and selection of sampling is determined by intensity of the national fishing-quota utilization in given year.

Access to the part of landed catches, in 2014 was through:

- the list of 10 local first-sale centres located along a coast,
- directly from landing vessels in ports and harbours,
- the Institute scientific observers' appearance on board of surveying vessels,
- sporadically from the fish processing company and warehouses located along the seacoast

In 2014, sampling design of Baltic cod recreational angling and raising procedures for national estimates was performed according to the method described by the ICES WGRFS. A quasi-opportunistic selection of sampling is implemented, despite the fact that, for on-board observers' trips the large vessels are selected randomly, however

this is possible only for vessels above certain size, having enough space to take more than 8-10 anglers.

a) on yearly level - with cooperation of the Harbour Master Offices':
   - the number of recreational sea-going trips in given the ICES Subdivision,
   - the number of anglers participating at those trips,

b) on monthly level - with cooperation of Institute observers on-board:
   - weight of each fish caught in given the ICES Subdivision,
   - biological data (length, weight, sex, maturity and age).

Raising sample mean weight of the anglers catch from observed trips in a given stratum by the known number of trips at the population level, the annual catch of Baltic cod is obtained.

Sampling design in the distant fishery concerns:

- three fish stocks and partially concurrent sampling at sea is applied,
- 24 species from two métiers are sampled for the length measurements and ageing,
- at least two long-term trips, with participation of the Institute observers, is organized every year on one from three active factory vessels,
- sampling in 2014 was arranged through agreed joint sampling programme call "Multi-lateral agreement between Germany, Latvia, Lithuania, the Netherlands and Poland for biological data collection of pelagic fisheries in CECAF waters".

Fish sampling design implemented in the Polish long-distance fishery is typical opportunistic.

WP.B2. (see also WD.B4)

Presentation title: Spanish discards estimates of megrim (*Lepidorhombus whiffiagonis*) in Subarea VII and Divisions VIIIabd

Author: Nélida Pérez, Hortensia Araújo, Jon Ruiz and Jose Castro

Summary: The Spanish discards estimates of the megrim (*Lepidorhombus whiffiagonis*) stock of ICES Subarea VII and Divisions VIIIabd (mgw-78) are derived from data compiled by the Spanish on-board sampling program, developed by the Spanish institutes IEO and AZTI following the European Data Collection Regulation (DCR, DCF) guidelines since its implementation in 2003. A description of the Spanish fishery and the respective discards sampling program, as well as an analysis of the sampling level and the estimation process of mgw-78 discards are presented.

WP.B3. (see also WD.B3)

Presentation title: Spanish onshore sampling of *Lepidorhombus spp.*

Author: José Rodríguez-Gutierrez, Lucia Zarauz, Estanis Mugerza, José Luis Cebrían, Iñaki Artetxe

Summary: Results of *Lepidorhombus spp.* from the Spanish onshore sampling programme under the Data Collection Framework (2009–2014) are presented. Sampling

covers two species (*Lepidorhombus whiffiagonis and Lepidorhombus boscii*) in ICES Subarea VI, VII, Divisions VIIIabd and Divisions VIIIc-IXa. Fishery description shows the importance of five métiers for these species and the relevance of a small group of ports. A description of the sampling level, sampling design and sampling procedures in relation to landing practices are presented, as well as a brief discussion about further developments to improve the sampling.

WP.B4. (see also WD.B1)

Presentation title: French historical (2003–2014) discards estimates of megrim (L. whiffiagonis) in Sub-area VII and Divisions VIIIa,b,d

Author: Joël Vigneau

Summary: The objective of providing a time-series of age distribution of the discards could not be attained. None of the options of stratification taken for raising proved satisfactory, all of them lead to problematic un-sampled strata. Moreover, there may be a bias in the representatively of the samples as regards vessel length asking to be cautious about raising by effort. Two options have to be considered:

1) further grouping of métiers

2) interpolation of the empirical discards ratios.

The second option is unconventional but would have my preference, because the empirical discards ratios seem consistent and reliable (there is a need to filter out those figures derived from low sampling rates).

Proposing age structure of the discards for France will be possible, only when the gap filling exercise is done. Specific coding will have to be done to finalize the whole exercise, in consequence, the feedback from the IBPmegrim will be important in order to prepare this information for next year.

WP.B5.

Presentation title: Irish discards and landings estimates for Megrim in VII and VII

Author: Hans Gerritsen

Summary: The historic discard sampling programme is stratified by quarter, area and métier. However for estimation purposes the samples are assumed to be representative and the strata are combined into four 'meta-strata' (OTB VIIbcjk; OTB VIIgh; SSC VIIgj and TBB VIIgj). Discards in each of these strata are estimated as numbers-at-length per hour fished and raised to total effort from the logbooks.

The port sampling programme is not properly randomized but the numbers of port visits are approximately proportional to the landings of demersal species. The number of samples is based on quota sampling for otoliths with targets by quarter and division. Landings length data from observer trips are also used. Strata are combined to Métier level 6 métiers for divisions VIIbc, VIIefgh and VIIjk (all quarters combined). Data from similar métiers or areas are used to fill gaps. Landings length frequency distributions are estimated for the merged strata and raised to the total landings weight from the logbooks.

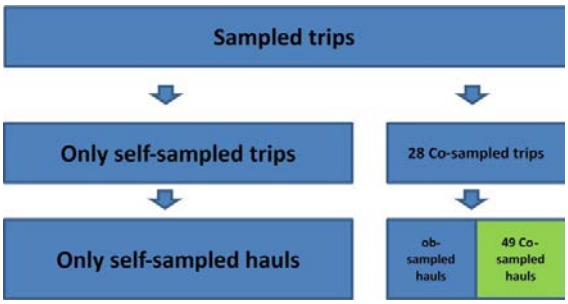
WP.B6.

Presentation title: Bias and hierarchical variance of different sampling strategies

Author: Chun Chen

Summary:

The discards sampling in Netherlands includes both self-sampling and observer trips. The composition of the sampled trips are Illustrated in the figure below. The sampling frame was based on trip-> haul -> box. Due to the cost and logistic reasons, around 120 trips were self-sampled every year, while only 10 observer trips were affordable. On the other hand, only 2 hauls per self-sampling trips were sampled, while approximately 10–20 hauls could be sampled on an observer trip. Furthermore, self-sampling takes a larger box (around 80kilo) from the haul, while the observer only samples 40kilo. Due to the varying settlement of sampling effort per sampling level, we are interested in an optimal allocation of number of sampled trips, hauls and boxes for both programmes. Therefore, variance estimation at each sampling level is needed. In this study, we proposed a mixed-model based method to estimate such variance. The study is still undergoing and results need to be further discussed.



ToR C) Simulation

WP.C1.

Presentation title: fishPi, Work Package 2, Case study 1: Pelagic Fisheries

Author: Kirsten Birch Håkansson

WP.C2.

Presentation title: fishPi, Work Package 2, Case Study 2 – NS mixed demersal

Author: Jon Elson, Alastair Pout, Liz Clarke, Ana Ribeiro Santos, Patrik Börjesson

Summary: The results of simulations carried out for Case Study 2 were presented to the subgroup.

The data used for CS2 were trip level landings of all finfish species and *Nephrops* from all vessels using demersal gear in the North Sea area (ICES IIIa, IV, VIId and VI) from 8 countries (Sweden, Denmark, UK-Scotland, UK-England&Wales, France, Germany, Belgium and Netherlands).

Three onshore sampling scenarios were presented and all simulations were of two-stage cluster sampling where the primary sampling unit, PSU, was location and date and the secondary, SSU, was the voyage given the site and date. The assumption for

this analysis was that for each SSU every species would be sampled – equivalent to a full concurrent sample. To date the sampling stratifications tested were random sampling 1) from the whole population; 2) from an eleven strata design based on country of landing; and 3) from two strata based on a major - minor port stratification.

The number of samples were based on the planned sampling effort by each country in terms of market days for 2015. For the first scenario the sampling effort was the sum of this effort (947 port days). The stratification assumed in affect a single sampling stratification from which the site and day PSU was selected, without replacement, from all possible site and day units available. The SSU was then a random selection of up to two voyages, again selected without replacement, from the total number of potential voyages available for selection from that site and day. In the second scenario the sampling effort for each country of landing was used. The landings data included landings 'abroad' and countries that currently do not sample onshore. To ensure all countries were included and that the simulation code worked, each of those countries was provided with a nominal two days effort. Using the country of landing as the sampling strata the PSU was then selected randomly from within the country strata. For the third scenario, ports of landing were classified as major or minor ports ignoring country of landing. The distinction between major and minor ports was made on the basis of the landed weight; the ranked ports that collectively accounted for the first 95% of the landed weight of the combined demersal species were grouped into the "major" ports stratum and the rest made up the "minor" strata. In total 43 ports in eight countries fell into the "major" criterion. All other landing locations, of which there were 312, were grouped as the "minor" port strata. The major port stratum was arbitrarily allocated 800 days sampling and the minor was allocated the remaining 147.

For each scenario 500 simulations were run. Preliminary results showed that while all scenarios appeared to generate largely unbiased estimates the RSE (Residual standard Error) differs considerably; stratification by country with the present effort allocation has the largest RSE, greater than the simple random simulation, while the major/minor port stratification, without country had the lowest relative bias and RSE.

Discussion surrounded the diagnostics and the calculated estimate of bias in this situation is dependent on the number of simulations so you have to be careful on how you use this estimate. The number and extent of the scenarios has been limited by the time frame for delivery of this project but simulations for scenarios relating to offshore sampling are currently in hand looking at flag country and allocations of effort.

WP.C3. (see also WD.C2)

Presentation title: Case study 3: Southern North Sea flatfish fisheries

Authors: Chun Chen, Sieto Verver, Edwin van Helmond, Jon Elson, Ana Ribeiro Santos, Els Torreele, Sofie Nimmegeers, Julia Wischnewski, Alastair Pout, Liz Clarke

Summary: This case study from fishPi project simulates and validates varying sampling designs on regional database for flatfish (plaice, sole, brill and turbot). A population data of all trips conducted between 2013 and 2014 were collected. Several sampling designs were applied to evaluate bias and precision of the estimated total landing: 1) simple random sampling; 2) vessel-length, quarter, area stratified sampling, with proportional or Neyman allocation; 3) quarter+vessel_length stratified two-stage sampling with landing harbour as cluster. Horvitz-Thompson estimator was applied to estimate the total landing and its estimated variance was computed empirically. As

a result, vessel-length stratification with Neyman allocation turned out to be the optimal unbiased sampling design, with an effective sample size of 0.35 as compared to a simple random sampling design. However, the feasibility of such sampling design in practice needs to be further discussed.

WP.C4. (see also WD.C1)

Presentation title: Developments in the "Northern and Southern Hake" Case Study of fishPi

Authors: José Rodríguez-Gutiérrez, Nuno Prista, Lucia Zarauz, Manuela Azevedo and José Castro

More details: see WD.C1 in Appendix to this report

WP.C5.

Presentation title: Swedish new onshore catch sampling program for Baltic cod

Author: Patrik Börjesson

Summary: In 2015 Sweden implemented a new design in the onshore sampling program of Baltic cod. The new design is based on the outcome from recent workshops on practical implementation of statistically sound catch sampling programs. In summary, the program follows a probability-based site×day design in the form of stratified four-stage cluster where the primary sampling unit (PSU) is a cluster of ports on a specified day. The ports are clustered based on geographic proximity and sampling availability. In some port clusters the landings are available at site, but from others the landings are directly transported to markets or processing sites, and need to be sampled in those locations. The sampling probability of a PSU is related to the total landings and landing patterns the previous year. Our goal was to obtain a final sample of 40 site×days per stock (western Baltic stock and eastern Baltic stock, respectively), and to get sufficient temporal coverage this resulted in a design where we randomly selected one site×day per week over the year, with exception of seasons when the fishery is closed (April in the western Baltic; July to August in the eastern Baltic). To maintain the sample size the effort from these periods were redistributed in connection to the closed seasons following the same procedure, resulting in some weeks with two sampling events per stock.

In advance of going to the sampling site the observers put together a list of vessels likely to land in the selected port cluster the actual day. The preliminary list is based on observer knowledge of previous landing patterns, through personal contact with fishers and real-time VMS/AIS observations. At the sampling site the observers finalize the list based on the latest information available from fishers and buyers. From the list of available vessel landings (including those vessels expected later that day), two landings within each fleet (active and passive) are selected for sampling. From each landing a random box from each commercial size category is selected. Fish are sampled for age directly, that is, no length-stratified sampling occurs. In practice, 15 individuals are randomly selected from each box and sampled for age, length and weight. The remaining fish in the selected boxes are counted and measured for length.

At the time of WGCATCH 2015 only data from the eastern Baltic stock quarter 1 and 2 were available for analyses and preliminary estimation was carried out using equal sampling probabilities. We are currently trying to incorporate the unequal sampling probabilities inherent in the design and are also evaluating the number of samples

need at different stages. The total number of sampled PSU's the first year of running the program was considerably lower than anticipated: in total 18 PSU's for the western Baltic stock (33 individual landings) and 26 PSU's for the eastern Baltic stock (60 individual landings). This was partly due to logistic reasons, i.e. lack of personnel, but also to poor weather conditions resulting in several site×days with zero landing. In a few cases the observers missed actual landings or did not get access to the catch. These issues needs to be handled differently from last year to make sure that more days with landings are sampled in 2016.

WP.C6.

Presentation title: Simulation study for species selection

Author: Liz Clarke

Summary: A simulation study was presented comparing 3 methods of selecting species when carrying out biological sampling of landings at markets. The species selection methods that were compared were: sampling all species landed on a (randomly selected) trip ("full concurrent sampling at a trip level"); randomly selecting up to 5 species on a trip; and randomly selecting species from 3 strata – major species, less common species, and species that are rarely landed.

The population data used were logbook data of UK landings into Scotland (the population used for ICES fisheries advice data calls) during 2014. To avoid confounding issues caused by sampling several fisheries, only otter trawls using a mesh-size of at least 100 mm were included. The population consisted of 2937 trips from 159 vessels, landing 60 species (32,072 species-trip combinations). On average, 10.92 species were landed per trip.

Scottish sampling of landings from these trips in 2014 consisted of 252 trips from 86 vessels, sampling 32 species in total, and 875 species-trip combinations, an average of 3.5 species sampled per trip.

The population data were used to define the species categories for sampling. The major species category comprised the 10 species landed most often: cod, haddock, whiting, saithe, monkfish, megrim, hake, ling, plaice and lemon sole. On average, 7 of these 10 species were landed per trip. The 17 less common species, but with more than 100 landings per year, were: witch flounder, squid, *Nephrops*, turbot, pollack, catfish, halibut, tusk, john dory, grey gurnards, conger eel, brill, and various skates and rays. On average 3.5 of these species were landed per trip. The rarely landed species, with less than 100 trips in total per species, included: various skates and rays, Greenland halibut, greater forkbeard, Sebastes, blue ling, mackerel, octopus, sole, black scabbardfish, roundnose grenadier, dab, scallops, herring, horse mackerel, crabs, European eel, roughhead grenadier, Atlantic wolf-fish, black-bellied rosefish, several species of dogfish, spider crab and lobster. On average one of these species was landed approximately every three trips.

For comparability, the simulations were set up so that each design resulted in approximately 1050 species-trips. To avoid confounding with stratification issues, landing location was ignored, and trips were randomly sampled without stratification from this population.

When species were concurrently sampled, the number of trips sampled for a particular species was, on average, directly proportional to the number of trips landing that species in the population, with the coefficient of proportionality being equal to the ratio of

the total number of trips sampled to the total number of trips (landing any species) in the population. On average, 41 of the available 60 species were sampled over the year, and 19 species were not sampled. The estimation of landed weight by species is simple to construct and unbiased, though variability is very large at small sample sizes.

When species were randomly selected from those available in the trip, the number of trips sampled for a particular species was also, on average, directly proportional to the number of trips landing that species in the population. The coefficient of proportionality was equal to the ratio of the total number of trips sampled to the total number of trips (landing any species) in the population, multiplied by the ratio of the average number of trips sampled over the year to number of trips landing species from in that group multiplied by chance of sampling a species which is equal to ratio the average number of species sampled in a trip to the number of species landed in a trip, i.e. the average chance of sampling a species from a trip. More trips were sampled, sampling fewer species on each trip, but on average the same number trips were sampled for each species as for concurrent sampling. On average, 41 of the available 60 species were sampled over the year, and 19 species were not sampled.

When species were randomly selected from those available in the trip, the number of trips sampled for a particular species was also, on average, directly proportional to the number of trips landing that species in the population. However this time, the coefficient of proportionality was different for each group, being equal to the ratio of the total number of trips sampled to the total number of trips (landing any species) in the population, multiplied by the ratio of the average number of those species trips sampled for the species in that group over the year to number of trips landing species from in that group, i.e. the average chance of sampling a species from that group from a trip. On average, 47 of the available 60 species were sampled over the year, and 13 species were not sampled. Thus more species can be sampled, reducing the sample sizes of the more common species, and increasing the sample sizes of the less common species, compared to concurrent or simple random sampling of species from a trip. However the sample sizes are still proportional to the number of trips for that species overall and so it difficult to achieve similar sample sizes across species without having a lot of different groups to sample from.

The population used in these simulations is not exactly the population that can be sampled by Scotland in a market sampling programme, as private sales were included in the population and landings from foreign vessels that are sold at auction in Scotland were not included in the population. These differences disproportionately affect some species, for example *Nephrops*, which is mainly sold privately. Similarly, sales location is not included either in the population or in the sampling design. Thus the simulations do not provide an exact sampling design, or species stratification for Scottish demersal market sampling, but do provide an example of the kind of results to expect for sampling species from fisheries that land many different species to varying degrees.

ToR G) RDB

*WP.G1.

Presentation title: RDB: Short Presentation on Current Estimation Methods

Author: Kirsten Birch Håkansson

More details: see WD.G1 in Appendix to this report

*WP.G2.

Presentation title: Software, models, and estimators for quantifying uncertainty in analytical stock assessments

Author: Gjert Dingør and Jon Helge Vølstad

More details: see WD.G1 in Appendix to this report

ToR J) Bycatch

*WP.J1.

Presentation title: Incidental Bycatch Sampling

Author: Bram Couperous

More details: see WD.J1 in Appendix to this report

Annex 6: Analysis of WGCATCH national questionnaires on small-scale fisheries

Information collected

A questionnaire about small-scale fisheries (SSF) was sent to WGCATCH members to obtain national information on numbers of vessels, fishing effort, landings weight and value for fish and shellfish for vessels in the length ranges <10m, 10- <12m and 12m and over. The questionnaire also asked for details on how transversal variables are collected for SSF, and how biological sampling is conducted onshore and at sea. Seventeen questionnaires were filled for 14 different countries. Some graphs and tables are presented below based on the responses. The national definition of SSF was not consistent for this and in some cases referred to vessels up to 10m or up to 12m.[3] Two tables are presented on collection of transversal variables for SSF, one for landings and one for other transversal variables related to gear and fishing effort. Landings by species are in some cases easier to estimate than other transversal variables as there is no requirement to submit effort or gear data with sales notes.

Two tables are presented on the collection of fleet-based biological variables for SSF (discards and length & age composition of the catches), one for onshore sampling and one for on-board-sampling.

A/ Transversal variables (Landings by species, Gears, Fishing effort data):

A1 / Landings by species:

Small Scale Fisheries					
Landings by species		Census approach by adapted declarative forms	Sales notes	Sampling Scheme (on-shore sampling)	Sampling Scheme (vessels sampling)
Country	BEL	No fleet	No Fleet	No Fleet	No Fleet
	DNK		All Fleet		
	ESP (Basque Country)	All fleet	All Fleet	Specific random sampling (2015)	
	ESP (IEO)	All fleet	All fleet		
	EST	All fleet		OK (2005)	OK (2005)
	FRA (Atlantic)	All fleet (Monthly declarative forms)	Partly		
	FRA (Mediterranean and Other regions)	Partly (incomplete data) (Monthly declarative forms)	Partly	Catch Assessment Survey (2007)	
	UK (England and Wales)	Specific logbooks for shellfish (crabs and lobsters) fisheries	All fleet		
	UK (Scotland)		All fleet		
	DEU	All fleet (landings declaration)			Few vessels <8m.
	IRL	Incomplete data			
	LTU	All fleet (monthly fishing journals)			
	LVA	All fleet (coastal logbooks)			
	MLT		All fleet	Catch Assessment Survey (2003)	
	POL	All fleet (monthly catch reports for vessels with length < 10 m and paper logbooks for vessels with length from 10 to 12 m).	All fleet	Within general sampling programme for commercial fisheries	Within general sampling programme for commercial fisheries (few vessels in lagoons only)
	PRT	All fleet	All fleet	Catch Assessment Survey (1980's)	
	SWE	All fleet			

[3] The small-scale coastal fishery Estonia is not defined through the boat length class. In case of Estonia the majority of SSF fleet consists of <10m vessels, but also several >12 m boats are used (usually up to 10 boats, mostly for pound-net fishing for Baltic herring). This is because the fishery is regulated on the basis of issued fishing permits (historical fishing right), which regulate the number of particular gears used.

Two different types of data collection methodologies are applied to estimate transversal data of vessels less than 10 meters (8m. in Baltic) for which Control Regulation do not require EU logbooks: A "census" type with a declarative form and a "sampling" type with a statistical approach to estimate transversal data.

A1 – 1 / Census approach:

For countries using "census approach" to estimate transversal variables for SSF, it could be concluded that the EU logbooks required for large-scale fisheries seem generally not well adapted to the special features of SSF and that adapted declarative forms have to be used. Approaches that have been adopted include coastal or specific logbooks (in Latvia and Estonia), logbooks attached to shellfish licenses (crab and lobster) recording daily effort and catch (in England and Wales), monthly fishing journals (in Lithuania and Sweden), landings declarations (in Germany) and monthly declarative forms (in France). A recommendation could be to define how national declarative forms should be adapted to ensure that key variables can be collected and recorded in a consistent way for SSF within the region considered to meet end-user needs and facilitate the work of the Regional Coordination Groups.

Sales notes are also used to collect landings data for SSF as required by the EU Control Regulation but may not be exhaustive due to exemptions in the Regulation (see for example the Article 14 of the COUNCIL REGULATION (EC) No 1224/2009 which states that vessels should mentioning only *all quantities of each species caught and kept on board* ***above 50 kg*** *of live-weight equivalent*). The completeness and coverage of such data have to be assessed because it is not guaranteed that sampling schemes have been implemented to cover those exemptions as required by the Control Regulation (see Section 2.4). A major limitation of sales notes is also that they do not record information on fishing gear, fishing ground, number of trips or number of days at sea, and separate surveys are needed to collect such information.

For example in Portugal it is mandatory for all vessels (including the SSF ones) to land and sell their catch at specific places (auctions) and the landings statistics are automatically registered into a national database. A separate survey was done to establish a correction factor per species/gear combination to account for basket trade. Future updates on these correction factors are being considered.

As a general comment and conclusion of the questionnaires, assessing the reliability/completeness of the data available from a census approach is an issue that has to be taken into account. If unreliable/incomplete data are a major issue, countries should implement a sampling approach to estimate transversal variables (see for example Basque Country artisanal fleet or French continental Mediterranean under-10m. fleet, Annex 4 and 5). Vessel-stratified sampling can also be used as an approach to assess the quality of the data available from other sources such as declarative forms.

A1 – 2 / Sampling approach:

For countries using a sampling approach to estimate landings for SSF, two approaches have been identified: stratified sampling of vessels from a vessel list frame and clustered sampling of fishing trips occurring on visits to landing sites (spatial/time sampling). Catch assessment surveys at landing sites appear to be the most common approach adopted, but it should be noted that only landings can be directly estimated on this basis (i.e., discards are not estimated and gear, fishing ground, effort estimates rely on additional questions asked directly to the fisher). A new sampling scheme in Basque countries involves simple random sampling of port * day primary sampling

units, where the sampling frame covers 90% of ports), and total landings for artisanal fisheries (coastal fisheries except trawlers and purse-seiners) can be estimated for each PSU and raised to all PSUs. In England and Wales, a seabass voluntary logbook scheme ran from 1985 to 2010 which involved identifying a stratified list frame of vessels that catch sea bass, and recruiting fishers in each stratum to complete catch and effort log-books. In France, a sampling approach is used in Mediterranean and Overseas regions to estimate fishing effort and landings per species dataseries. The sampling scheme combines a clustered weighted on-site sampling of the fishing trips (spatial/time sampling) with a complementary stratified telephone sampling to estimate the number of fishing trips.

A2 / Other transversal variables (Gears, Fishing effort data):

Small Scale Fisheries

Other transversal variables (gear, fishing effort, …)		EU Fleet register	Census approach by adapted declarative forms	Sampling Scheme (on-shore sampling)	Sampling Scheme (vessels sampling)	Others
Country	DNK	OK (gears)				
	ESP (Basque Country)		All fleet	Specific random sampling (2015)		
	ESP (IEO)		All fleet			
	EST		All fleet	OK (2005)	OK (2005)	
	FRA (Atlantic)		All fleet (Ifremer activity survey, Monthly declarative forms)			
	FRA (Mediterranean and Other regions)		All fleet (Ifremer activity survey). Partly (Monthly declarative forms)	Catch Assessment Survey (2007)		
	UK (England and Wales)		Specific logbooks for shellfish (crabs and lobsters) fisheries			Local knowledges (gears)
	UK (Scotland)					Local knowledges (gears)
	DEU	OK (gears)	All fleet (landings declaration to estimate fishing effort)			
	IRL		Incomplete data			
	LTU		All fleet (monthly fishing journals) Incomplete for fishing time			
	LVA		All fleet (Coastal logbooks)			
	MLT	OK (gears)		Catch Assessment Survey (2003)		
	POL	OK (gears)	All fleet (monthly catch reports for vessels with length < 10 m and paper logbooks for vessels with length from 10 to 12 m).	Within general sampling programme for commercial fisheries	Within general sampling programme for commercial fisheries (few vessels)	Within general sampling programme for commercial fisheries (few vessels in lagoons only)
	PRT		All fleet	Catch Assessment Survey (1980's)		
	SWE		All fleet			

Comments related to landings by species, could be repeated here, noting the issues raised for countries concerning the limitations of the use of sales notes as these do not capture other transversal data.

Two critical variables are the gear(s) used and the fishing effort deployed in each trip. Some countries that do not have specific logbook or declarations use the EU Fleet Register to obtain information on the gear used by trip for SSF. Information on the EU Fleet Register is updated quarterly by national authorities under Commission Regulation (EC) No 26/2004 of 30 December 2003 and provides a complete snapshot of national vessel registries, including a "main gear" column (defined as "Fishing gear considered to be the one most frequently used on board the vessel for a fishing period of a year or for a fishing campaign") and "subsidiary gear" column. The quality of gear information however need to be assessed, especially for SSF which can have licenses for several gears and may use two or more gears (e.g., pots and lines or nets) in the same trip or during the same month. In fact, EC Study N° FISH/2005/10 has demonstrated

that this information is often unreliable. Control agencies may use their local knowledge of individual vessel activities, and information on species landings on sales notes, to allocate gear, area and effort to trip records but this allocation remains imprecise and should also be validated with observations. Also, for countries using sales notes to assess fishing effort of SSF, assumptions have to be made on the number of trips that a sales note represents. One trip equals one day is the common assumption used but where other data collection exists, it is proved that this assumption lead often to an overestimated number of fishing trips.

B / On-shore sampling for length and age data

Small Scale Fisheries

On-shore sampling (length and age distribution)		Specific sampling scheme for SSF	Including in a general sampling scheme (no specific for SSF)	Not sampled	Quality
Country	DNK		OK		3
	ESP (Basque Country)	OK (2015)			2
	ESP (IEO)		OK		2
	EST	OK	OK		2
	FRA (Atlantic)		OK		2
	FRA (Mediterranean and Other regions)	OK			2
	UK (England and Wales)		OK		3
	UK (Scotland)		OK		2
	DEU	Only for BMS cods (linked with the discards ban, 2015)			NA
	IRL		OK		
	LTU		OK		2
	LVA		OK		2
	MLT		OK		2
	POL	SSF is under general sampling programme however in the case of lagoons freshwater species and herring are sampled specifically.	OK		NA
	PRT		OK		3
	SWE		OK		2

Figure 1 National qualitative estimate of data quality: 1 = poor; 2 = moderate; 3 = good

Most institutes have their SSF sampling included in a general shore sampling scheme where landings are sampled across all vessel sizes. E.g., in mainland Portugal at each port*day observers randomly select vessels from vessel lists that include both small and large-scale vessels and SSF vessels are frequently sampled. Some institutes also have specific sampling schemes for SSF that are used for particular cases. In the case of Basque country there is a separate sampling scheme for coastal artisanal fisheries and in Germany only part of the SSF catch is sampled on-shore. The quality of collected data are in most cases considered as "reasonable" with the exceptions of Denmark, Portugal and England & Wales with "good" quality data.

C/ On-board sampling – discards and length/age sampling:

Small Scale Fisheries

On-board sampling (length and age distribution, catches estimation including discards, ...)		Observers cover all fleet	Observers cover only a part of the fleet	Self sampling	No sample	Quality
Country	DNK				OK	NA
	ESP (Basque Country)		OK (only gillnets and trammel nets, 2005)	OK (only gillnets and trammel nets, 2005))		2
	ESP (IEO)		OK			2
	EST		OK (for vessels adapted to have an observer)			2
	FRA (Atlantic)		OK (for vessels adapted to have an observer)			2
	FRA (Mediterranean and Other regions)		OK (for vessels adapted to have an observer)			2
	UK (England and Wales)		OK for vessels >7m.			2
	UK (Scotland)		Only for otter trawlers and the largest vessels under 10m.			1
	DEU	OK		OK		2
	IRL				OK	
	LTU			OK		2
	LVA		OK (for vessels adapted to have an observer)	OK (for the other vessels)		2
	MLT	OK				1
	POL		OK (for vessels adapted to have an observer)	OK (in case of salmonids and whitefish).		NA
	PRT		OK (Beam trawler fleet)			2
	SWE		OK (Nephrops pots)	OK (Passive gears)		2

Figure 2 National qualitative estimate of data quality: 1 = poor; 2 = moderate; 3 = good

The difficulty in carrying out on-board observations on SSF is often that the number of people vessels can carry is limited. This makes on-board observations not only impractical but impossible with some countries having health and safety regulations in place preventing observers from going aboard small boats, for example where there is only one fisher on board. Even for countries that include all the vessels irrespective of size in the on-board observation sampling frame, small vessels are not often selected and refusal rates are high. The data quality from these sampling programs is generally considered as "reasonable" with the exceptions of Malta and Scotland with "good" quality data.

The number of years that SSF have been sampled varies between countries and between gears within countries. On average, for countries participating in WGCATCH, on-board observations and fishers self-sampling on the SSF have been carried out for 10 years but this varies between 21 years for Latvia and 1 year for the German Baltic fleet. Even without comprehensive data it is possible to see that SSF can contribute significantly to the overall discard rate and amount of bycatch of particular inshore species when taking into account the fact that these vessels are mostly concentrated in the coastal area. For some species, nursery areas are located mainly or entirely in coastal waters.

In some cases, the effect of the SSF could also be important in the bycatch of some PETS (Protected, Endangered and Threatened Species). There are some documented cases for some of these PETS species, turtles and seabirds in the case of gillnets and longlines in the Mediterranean, the case of the harbour porpoise (*Phocoena phocoena*) in the Atlantic. Different methodologies to collect this information are relevant in these cases.

A possible alternative to on-board observations could be fisher self-sampling and test-fishing as done in Estonia[4]. Port sampling is possible when the whole catch is brought and sorted on-shore. For any sampling schemes involving self-reporting by fishers, it is important to have a validation procedure to evaluate biases.

D. Numbers of vessels, landings and effort by vessel length class

Based on the SSF questionnaires and figures provided by country, the importance of the SSF fishing sector inside European countries is addressed.

It should however be stressed that where independent sampling of this fleet is not carried out, this picture is dependent on the quality of the data each country collects from SSF and the assumptions underlying some of the effort calculations. In the case of fleet size composition from the EU register, the data appears to be relatively standardized (but note that many vessels are inactive). But when analyses were carried out in terms of fishing activity (e.g., active vessels) it became noticeable that interpretations are likely to be very dependent on the completeness of sales/declarative forms records which are low in SSF in many countries. Such situation leads to a possible underestimation of SSF landed weight and value when compared to LSF with more complete sales/declarative forms (logbooks) records. It should be also noted that for countries where independent sampling of this fleet is carried out, the part of SSF landings compared to LSF is often higher.

Furthermore, when activity/effort measures like the number of days at sea or the number of trips are considered, it must be highlighted that even if the completeness of sales/declarative forms records is ensured, sales may not be a good proxy for number of trips or days at sea in the SSF component and even if so, SSF undertake trips with <12 hours (that are counted as 1 day at sea) are hardly directly comparable to the 24hr days at sea undertook by larger fleet segments.

[4] http://www.envir.ee/sites/default/files/akp_2014_rannikumere_kalad_aruanne.pdf

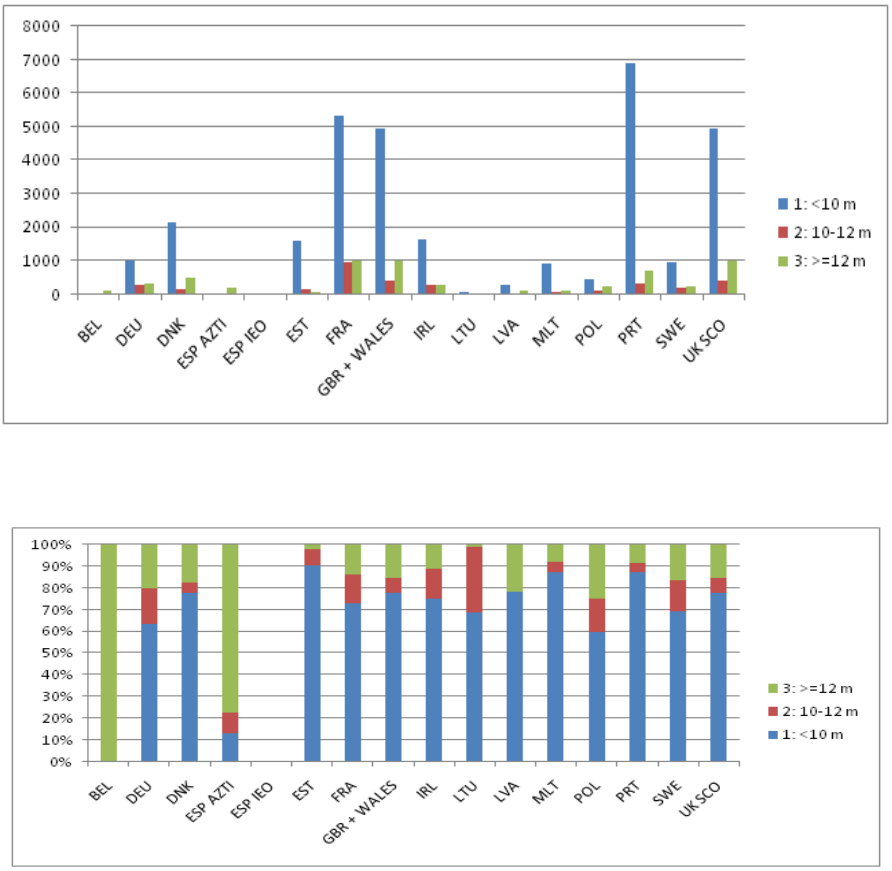


Figure 3 Number of vessels (EU register) per country in number (upper graph) and percentage (lower graph):

Note that UK SCO and GBR + WALES are combined in the EU fleet register, and therefore the same values are shown for UK SCO and GBR + WALES

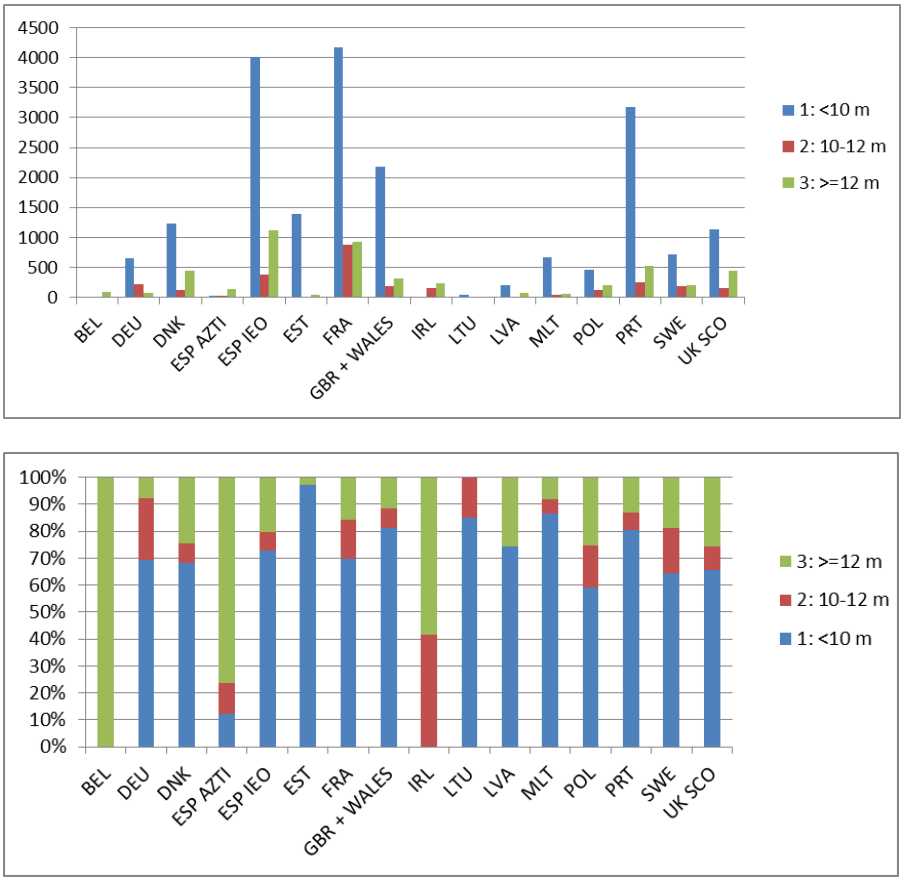
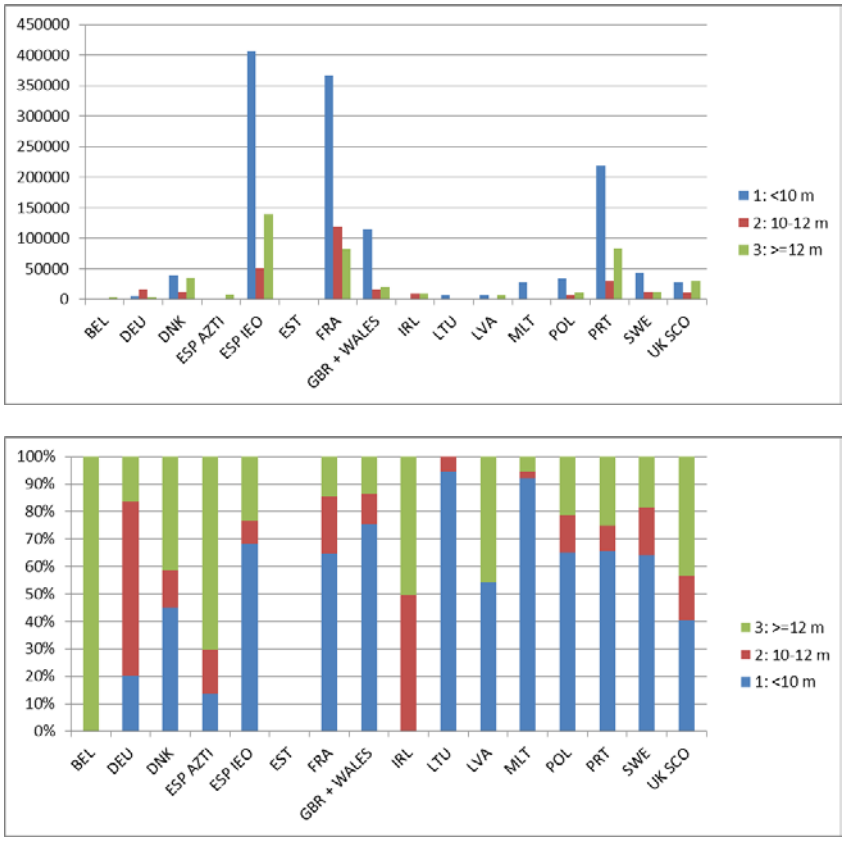
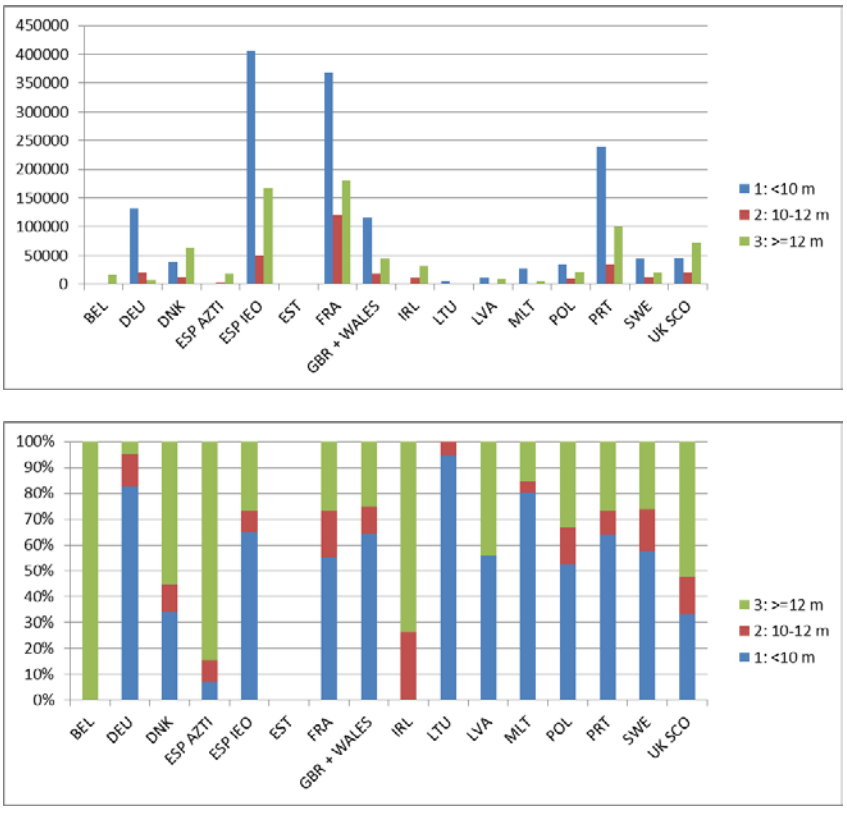


Figure 4 Number of active vessels per country in number (upper graph) and percentage (lower graph):

Under 10m and 10–12m fleet segments are of high importance in all countries in terms of number of vessels and number of active vessels (between 60% and more than 90% of the total active fleet) and consequently in employment. No small-scale fisheries are reported in Belgium and the number of active under-10m vessels in Ireland is not available to the national research institute. In the Basque country (ESP-AZTI) small-scale vessels under 12m represent only 20% of the total fleet but the fleet segment between 12-15 meters, which is assumed as an artisanal fleet or SSF, represent 60% of the total fleet (indeed as typical for many artisanal fisheries, the Basque artisanal fleet is polyvalent in terms of gears and target species, and is developing a seasonal activity, see Annex 4, WD.A2). It should also be noted that many countries have exemptions in VMS data inside the 12-15 meters fleet segment so VMS full coverage of >12 m vessels may not be assumed in many cases.

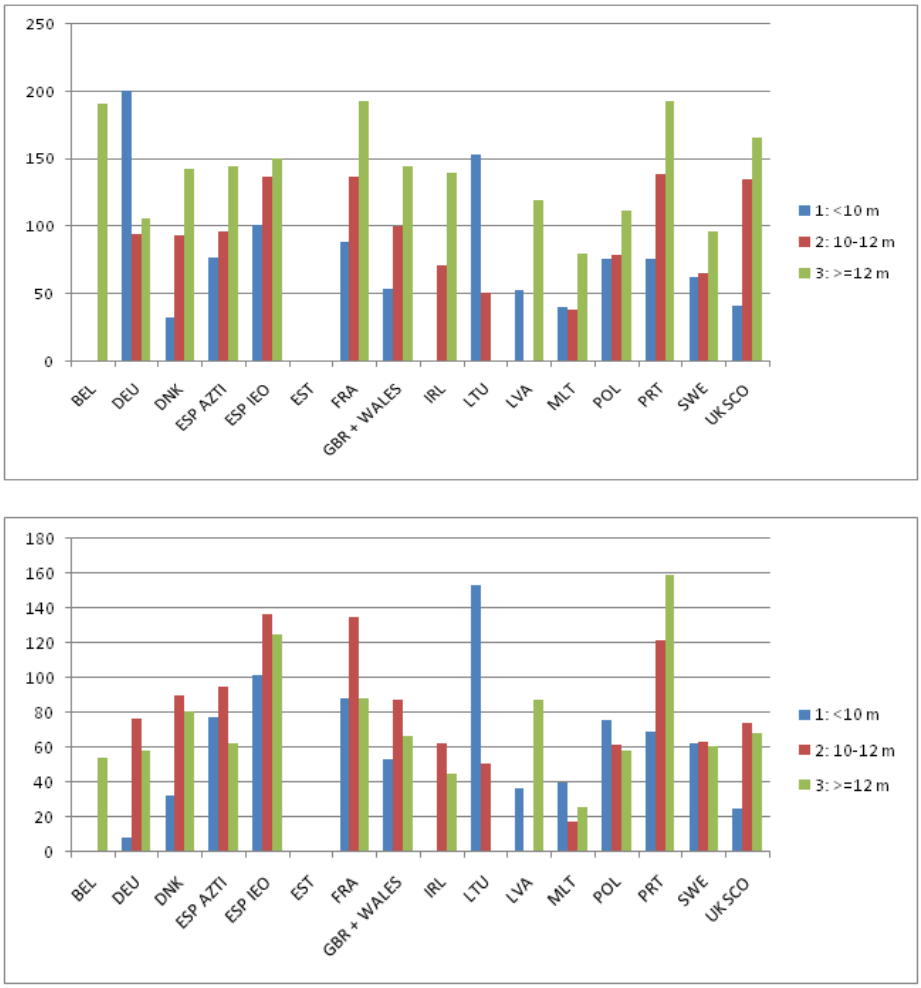


Figures 5 Number of trips per country in value (upper graph) and percentage (lower graph):



Figures 6 Number of days at sea per country in days (upper graph) and percentage (lower graph):

In terms of number of trips and number of days at sea, the picture remains quite similar as in terms of the number of vessels, with the high importance of SSF fleet segment being obvious, even if data may be incomplete or have different sources and quality across fleet segments.



Figures 7 Days at sea (upper graph) & Number of trips/Number of active vessels (lower graph) per country:

The two graphs represent the number of fishing trips or the number of days at sea spent by each active vessel in average. Despite its large number of vessels and trips, SSF fleet segment is generally less active than Large Scale Fisheries in terms of number of days at sea. Where LSF vessels spend ~150 days at sea every year, SSF vessels spend ~80 days at sea. Exceptions occurs nevertheless in Germany and Lithuania but could be linked with the data available to estimate days at sea and assumptions done to estimate fishing effort based on sales notes declaration.

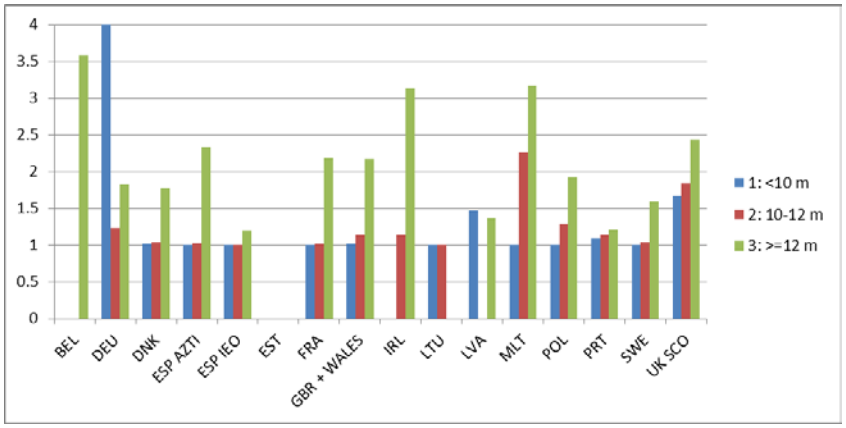


Figure 8 Average days at sea per trip per country:

SSF fleet segment trip duration is generally one day trip (exception of Germany but probably linked with the data available to estimate days at sea and assumptions done to estimate fishing effort based on sales notes declaration) when for over 12m fleet segment generally trips lasted on average 1–3 days (but it could be assessed that it is very heterogeneous as some big vessels like tuna target fisheries or over 40m fleet segment could have trip of more than 30 days).

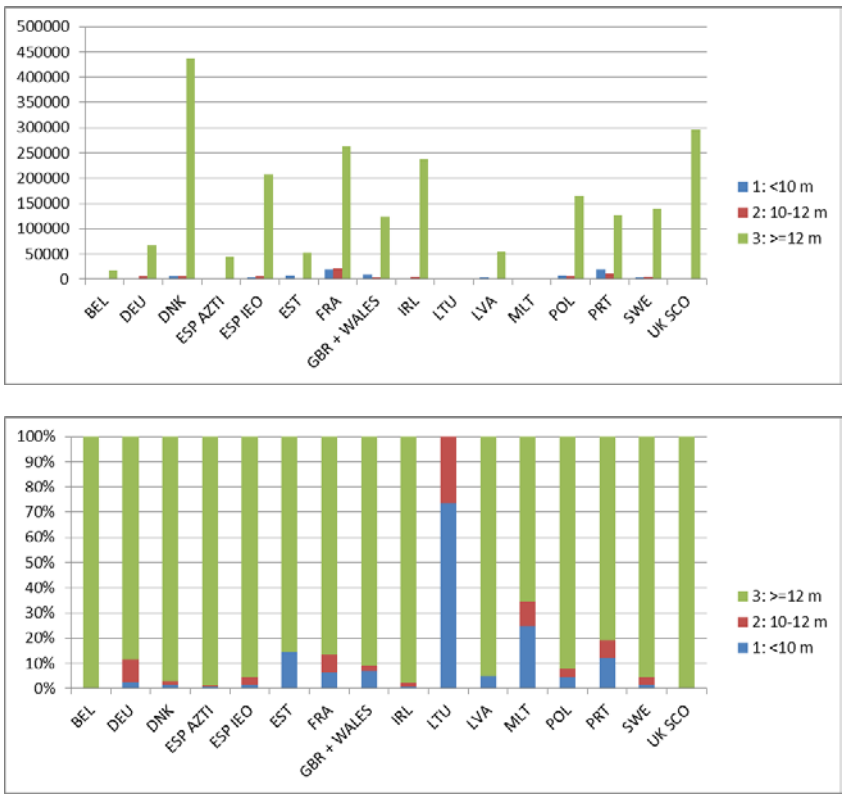


Figure 9 Total fish landings per country in tons (upper graph) and percentage (lower graph):

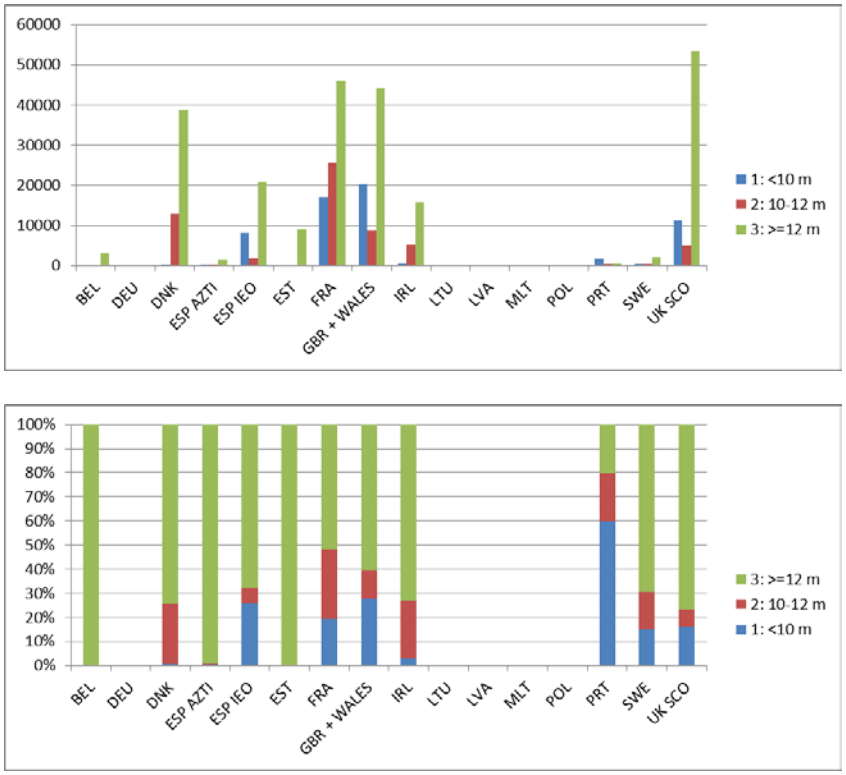


Figure 10 Total shellfish landings per country in tons (upper graph) and percentage (lower graph):

In what concerns to landings in tons, the picture is quite different with for most of the countries, higher percentages of fish landings associated to over 12m fleet segment vessels. SSF fleet segment contributes a bit more to total shellfish landings. However if their input to total landings remains generally low, it should be noted that these information may be incomplete or have different sources and quality across fleet segments (especially when independent sampling of this fleet is not carried out) and that this must be assessed by fisheries, by species and by regions because significant differences could occur between them. Furthermore, this fleet segment does not only target coastal species but also some other internationally assessed and/or important species that are targeted by large vessels. (e.g., European Lobster in Atlantic Ocean and North Sea).

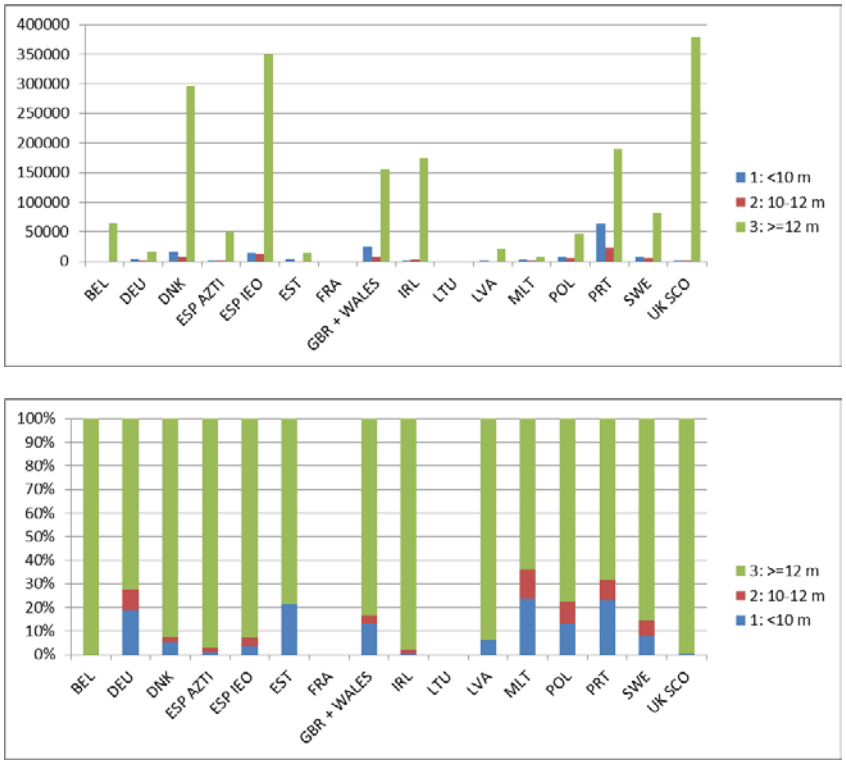


Figure 11 Total fish landings per country in value (euros*1000, upper graph) and percentage (lower graph):

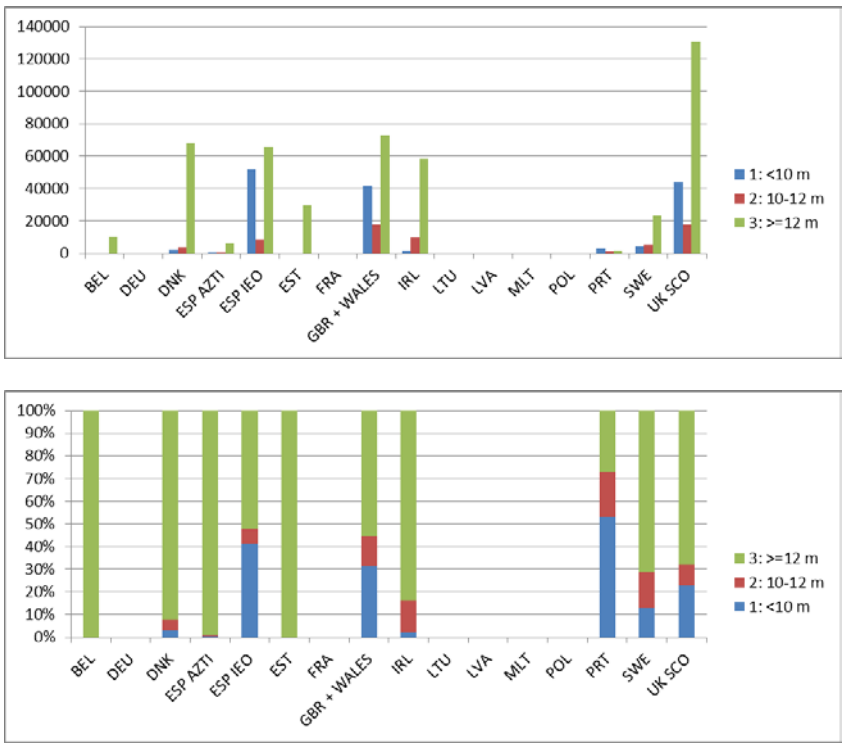


Figure 12 Total shellfish landings per country in value (euros*1000, upper graph) and percentage (lower graph):

In relation to landings in value, the overall picture is similar to the one obtained for weight. However, SSF fleet segment landings have generally a higher value which results in some of the observed differences in presented graphs (Figures. 11 and 12).

Once again, it should be noted that this information may be incomplete or have different sources and quality across fleet segments (especially when independent sampling of this fleet is not carried out) and that this must be assessed by fisheries, species or regions as important differences could appear between them (ex. line-caught sea bass vs. trawl-caught sea bass linked with the quality of the fish).

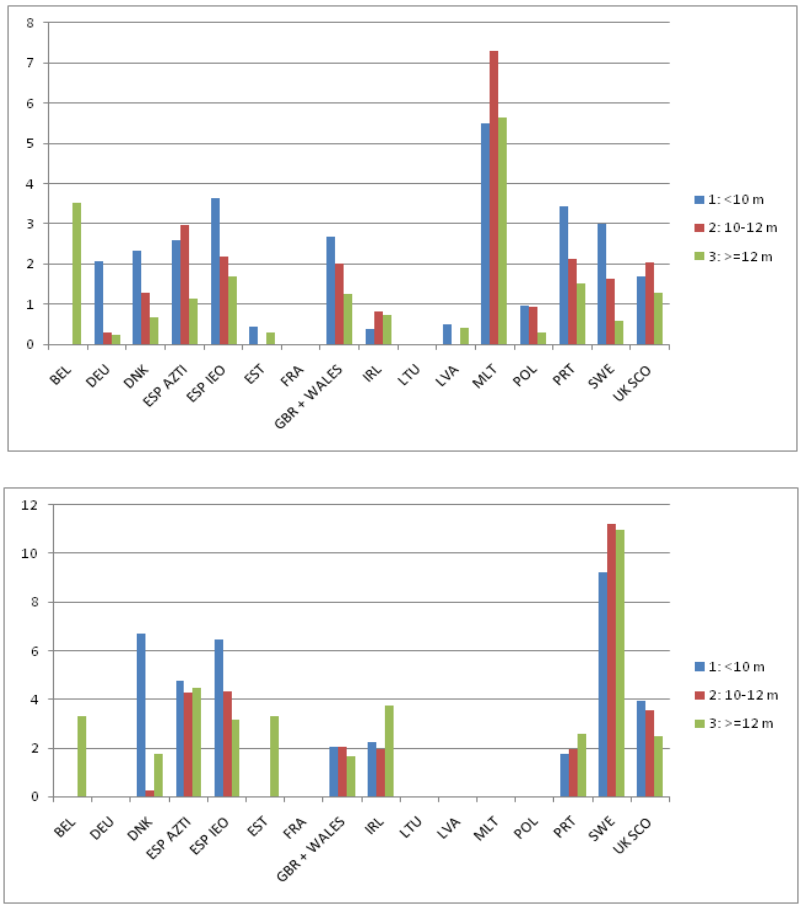


Figure 13 Fish euro / Fish ton (upper graph) and Shellfish euro/ Shellfish ton (lower graph):

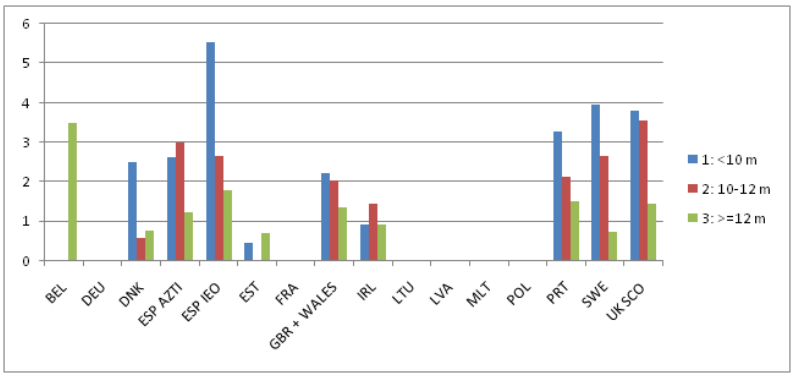


Figure 14 (Fish + Shellfish euro) / (Fish +Shellfish ton):

E. Compiled data and data sources of SSF questionnaires

Country		Vessel length	Number of					Landings		Value	
			EU Vessels	Licensed vessels	Active vessels	Days at sea	Trips	Fish (tons)	Shellfish (tons)	Fish (euros*1000)	Shellfish (euros*1000)
UK SCO	Values	<10 m	4951	1083	1134	46682	27911	660	11198	1109	44156
		10-12 m	420	150	150	20259	10990	23	4956	47	17615
		>=12 m	991	432	441	73104	30024	294820	53283	378548	130879
	Data source	<10 m	EU register		Buyers and sellers						
		10-12 m	EU register		EU logbooks						
		>=12 m	EU register		EU logbooks and ERS						
SWE	Values	<10 m	950	950	714	44126	43973	2524	455	7586	4214
		10-12 m	195	192	189	12313	11891	3921	467	6398	5230
		>=12 m	225	225	208	20000	12573	139830	2107	82927	23173
	Data source	<10 m	EU register		Monthly fishing journals					Sales tickets	
		10-12 m	EU register		Logbooks					Sales tickets	
		>=12 m	EU register		Logbooks					Sales tickets	
POL	Values	<10 m	470	470	460	34826	34664	8277	N/A	7865	N/A
		10-12 m	120	119	120	9367	7310	6042	N/A	5598	N/A
		>=12 m	199	199	196	21854	11358	165384	N/A	46631	N/A
	Data source	<10 m	EU register		Monthly catch reports				N/A	Calculated using avg price per kg	N/A
		10-12 m	EU register		Paper logbooks				N/A		N/A
		>=12 m	EU register		Electronic logbook				N/A		N/A
MLT	Values	<10 m	923	923	677	26922	26907	544	N/A	2995	N/A
		10-12 m	55	55	42	1589	701	218	N/A	1590	N/A
		>=12 m	82	82	65	5165	1628	1435	N/A	8087	N/A
	Data source	<10 m	EU register	ALL vessels in 2012 Fleet Register. Logbooks, CAS surveys, Market Sales Vouchers and Direct Sales vouchers are also used.		Logbooks and Catch Assessment Survey			N/A	Logbooks and Catch Assessment Survey. Market and Direct Sales vouchers are also used.	N/A
		10-12 m	EU register			Logbooks and Catch Assessment Survey			N/A		N/A
		>=12 m	EU register			Logbooks and Catch Assessment Survey			N/A		N/A
LVA	Values	<10 m	287	-	207	10891	7442	2849	N/A	1442	N/A
		10-12 m	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		>=12 m	79	-	72	8589	6271	54624	N/A	21933	N/A
	Data source	<10 m	LR register	Licensing occurs at the level of companies	Coastal Logbook	Coastal Logbook	Coastal Logbook	Coastal Logbook	N/A	Central statistical bureau Questionnaire "1-fishery" (The participation of the responders is obligatory)	N/A
		10-12 m	N/A		N/A	N/A	N/A	N/A	N/A		N/A
		>=12 m	LR register		Logbook	Logbook	Logbook	Logbook	N/A		N/A
BEL	Values	<10 m	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		10-12 m	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		>=12 m	88	88	88	16806	4700	18638	3199	65595	10587
	Data source	<10 m	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		10-12 m	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		>=12 m	EU register		Logbooks			Salesnotes			
DNK	Values	<10 m	2168	2140	1239	39457	39118	6793	320	15737	2141
		10-12 m	134	140	130	12095	11639	6202	12999	7940	3450
		>=12 m	482	462	448	63639	35938	437608	38759	297748	68030
	Data source	<10 m	EU register	License register	Danish Fisheries Analysis Database. A combination of sales notes, logbooks and vessel register						
		10-12 m	EU register	License register	Danish Fisheries Analysis Database. A combination of sales notes, logbooks and vessel register						
		>=12 m	EU register	License register	Danish Fisheries Analysis Database. A combination of sales notes, logbooks and vessel register						
ESP IEO	Values	<10 m		4546	4017	406021	406030	3811	8037	13823	51913
		10-12 m		388	374	51134	51120	6297	1901	13659	8224
		>=12 m		1150	1114	166861	139257	208426	20849	348975	65695
	Data source	<10 m	EU register	CFPO		Sales notes					
		10-12 m	EU register	CFPO		Logbooks + sales notes				Sales notes	
		>=12 m	EU register	CFPO		Logbooks		Logbooks + sales notes		Sales notes	
EST	Values	<10 m	1608	1387	1387			8729	0	3930	0
		10-12 m	133								
		>=12 m	42	42	42	4922	3493	51923	9000	14650	29550
	Data source	<10 m	EU register	Estonian Fisheries Information System							
		10-12 m	EU register								
		>=12 m	EU register	Estonian Fisheries Information System							
GBR + WALES	Values	<10 m	4951	2086	2178	115652	114812	9130	20386	24413	41352
		10-12 m	420	188	192	19126	16756	3409	8679	6840	17664
		>=12 m	991	311	315	45398	20939	123273	44304	155823	72681
	Data source	<10 m	EU register	Buyers and sellers							
		10-12 m	EU register	EU logbooks							
		>=12 m	EU register	EU logbooks and ERS							
DEU	Values	<10 m	990	990	655	131630	5117	2070	N/A	4278	N/A
		10-12 m	263	263	215	20171	16404	6900	N/A	1983	N/A
		>=12 m	313	313	72	7616	4174	68250	N/A	16428	N/A
	Data source	<10 m	EU register		Landing registry	Trip summary		Landing registry	N/A	Landing registry	N/A
		10-12 m	EU register		Landing registry	Trip summary		Landing registry	N/A	Landing registry	N/A
		>=12 m	EU register		Landing registry	Trip summary		Landing registry	N/A	Landing registry	N/A
IRL	Values	<10 m	1620	1677	Not recorded in logbooks database			3551	5578	2966	22970
		10-12 m	292	250	161	11437	10021	13466	29792	19959	53806
		>=12 m	245	280	228	31831	10152	1973247	141252	1524150	510838
	Data source	<10 m	EU register	Logbooks				Logbooks - incomplete data			
		10-12 m	EU register	Logbooks							
		>=12 m	EU register	Logbooks							
LTU	Values	<10 m	73	73	40	6142	6142	386	N/A	N/A	N/A
		10-12 m	32	32	7	352	352	138	N/A	173	N/A
		>=12 m	1	1	0	N/A	N/A	N/A	N/A	N/A	N/A
	Data source	<10 m	EU register		Monthly fishing journals				N/A	NA	N/A
		10-12 m	EU register		Logbook				N/A	Logbook	N/A
		>=12 m	EU register		Logbook				N/A	Logbook	N/A
FRA	Values	<10 m	5337	N/A	4166	368238	366929	19207	17118	N/A	N/A
		10-12 m	972	N/A	878	120280	118397	21888	25592	N/A	N/A
		>=12 m	997	N/A	933	179796	82390	262359	45818	556317	142017
	Data source	<10 m	EU register	EU register + Ifremer activity survey							
		10-12 m	EU register	EU register + Ifremer activity survey							
		>=12 m	EU register	EU register + Ifremer activity survey							
ESP AZTI	Values	<10 m	29	25	21	1609	1609	218	6	563	27
		10-12 m	21	24	20	1923	1890	289	9	859	38
		>=12 m	176	168	133	19199	8230	44620	1434	50509	6419
	Data source	<10 m	EU register	Spanish fleet reg	Azti db	Logbooks	Logbooks	Azti db			
		10-12 m	EU register	Spanish fleet reg	Azti db	Logbooks	Logbooks	Azti db			
		>=12 m	EU register	Spanish fleet reg	Azti db	Logbooks	Logbooks	Azti db			
PRT	Values	<10 m	6895	3632	3170	238775	218761	18808	1663	64295	2910
		10-12 m	316	267	252	34918	30586	11056	551	23582	1083
		>=12 m	690	596	523	100630	83369	126128	568	190361	1466
	Data source	<10 m	EU register	Fleet register	Sales notes						
		10-12 m	EU register	Fleet register	Logbook+sales notes						
		>=12 m	EU register	Fleet register	Logbook+sales notes						

Annex 7: WGCATCH Overview of resources related to catch sampling

There is a wide range publications and other resources dealing with the design and implementation of fishery sampling schemes and associated data analysis. The aim of the lists below is to provide an overview of key resources and to put them into context, so that people who are interested in certain aspects of catch sampling can quickly identify which resources are relevant.

ICES groups

There have been a number of ICES groups that have dealt with catch sampling, below is a brief summary of the main aims and outputs of each group:

- **Workshop on Methods to Evaluate and Estimate the Accuracy of Fisheries Data used for Assessment** (WKACCU, 2008).

  This was the first in a series of workshops aimed at quantifying and improving the accuracy of fisheries data. The report provides some useful information on detecting and avoiding bias. The workshop also produced a scorecard for bias detection which was further developed into quality assurance tables by subsequent groups.

- **Workshop on Methods to Evaluate and Estimate the Precision of Fisheries Data used for Assessment** (WKPRECISE 2009).

  This workshop focused on sources of variability and estimation procedures for fisheries data. The report outlines best practice in fishery sampling programmes and provides a list of key parameters and statistics used in stock assessment with their main sources of error.

- **Workshop on Sampling Methods for Recreational Fisheries** (WKSMRF, 2009).

  This workshop was set up to develop sampling methods for recreational fisheries, may of the issues carry over to catch sampling in general. The report provides a useful overview of survey methods with clear explanations of key concepts.

- **Working Group on Recreational Fisheries Surveys** (WGRFS2012, WGRFS2013, WGRFS2014, WGRFS2015).

  This working group is a forum for the planning and coordination of recreational fisheries data collection and analysis and for the sharing of knowledge and discussion of these fisheries worldwide.

- **Workshop on Methods for Merging Métiers for Fishery Based Sampling** (WKMERGE, 2010).

  This workshop addressed the need for estimating fisheries data at the métier level as required under the EU Data Collection Framework (DCF). The workshop provided guidelines for the design of sampling schemes that can provide these data. The report also contains an annex with some common formulae applied in design-based fishery surveys.

- **Workshop on Practical Implementation of Statistically Sound Catch Sampling Programmes** (WKPICS1, 2011, WKPICS2, 2012, WKPICS3, 2013).

  This series of workshops focused on several classes of catch sampling schemes for estimating variables such as quantities discarded, and length or age composition of catches, taking account of the many practical problems

that face people trying to obtain representative, randomized samples of catches. The Workshops have provided guidelines for good practice, and explored ways of documenting the quality of sampling designs and of the data that are collected in a way that is useful for different types of end-users. WKPICS3 produced a handy glossary of terms relevant to catch sampling designs.

- **Study Group on Practical Implementation of Discard Sampling Plans** (SGPIDS, 2011, SGPIDS, 2012, SGPIDS, 2013).

  During the first meeting, the study group identified potential sources of bias within discard sampling programmes. The second meeting focused on providing the practical tools to implement unbiased sampling frames, random vessel selection procedures and data quality indicators. The last meeting focused on practical aspects of implementing sampling plans with participants providing case studies, worked examples, and progress reports that covered three main themes: sampling frames based on vessel lists; random vessel selection procedures; on-board sampling and estimation. SGPIDS developed a range of quality indicators to highlight potential problems with sampling designs.

- **Working Group on Commercial Catches** (WGCATCH, 2014).

  Currently, an important task for WGCATCH is to improve and review sampling survey designs for commercial fisheries, particularly those for estimating quantities and size or age compositions of landings and discards and providing data quality indicators. However, the scope of WGCATCH is broader than this, covering many other aspects of collection and analysis of data on fishing activities and catches. This will be end-user driven, and coordinated with the work of other ICES data EGs such as the Working Group on Biological Parameters (WGBIOP), the Planning Group on Data Needs for Assessments and Advice (PGDATA) and the Working Group on Recreational Fisheries Surveys (WGRFS) to ensure synergy and efficiency. WGCATCH, 2014 produced best-practice guidelines for designing an onshore sampling survey. The report also contains an overview of the development and use of quality assurance tables by various other ICES groups.

Other reports

- **The European Self-Assessment Checklist for Survey Managers** (DESAP).
- EuroStat has developed this comprehensive checklist that forces you to consider all aspects of your survey. Some sections might not be relevant to catch surveys but most of it is generic enough to be useful.

Books

- **Sampling Techniques**, WG Cochran (2007).

  A classic reference on sampling methods. It does demand a fairly sound statistical background but the main ideas are well explained in English as well as in mathematical notation.

Papers

- **Probability-based surveying using self-sampling to estimate catch and effort in Norway's coastal tourist fishery**. J. H. Vølstad *et al*. (2011).
- A nice description of a survey design that explicitly goes through the steps of defining the target and study population, defining the sampling frame, running a pilot study and developing a sampling design.

Websites

- **NOAA Recreational Fisheries Statistics** website.
  This website has a wealth of information on their catch surveys and estimation. It is aimed at the public so it provides a high-level overview of the main concepts.

Software

- **RSurvey: Analysis of Spatially Distributed Data** (Rsurvey)
  This R package has a broad enough functionality to be used for estimating precision in the main design classes for catch data.
- **SUDAAN software**: An internationally recognized statistical software package that specializes in providing efficient and accurate analysis of data from complex studies. SUDAAN is ideal for the proper analysis of data from surveys and experimental studies, since SUDAAN procedures properly account for complex design features, such as correlated observations, clustering, weighting, and stratification. The package is available in a version that runs under SAS, effectively expanding the library of function in SAS for analysing complex survey data, including imputations. (http://www.rti.org/sudaan/page.cfm/About_SUDAAN)

Annex 8: Incidental bycatch questionnaire

An example of the questionnaire on incidental bycatch prepared during WGCATCH follows:

	Indicate: Y/N/NA*	Does the on board sampling protocol ask to record this information?									Is the National database designed to enter this information?								
	Member state	EE	FI	LV	LT	PL	BG	HR	CY	GR	EE	FI	LV	LT	PL	BG	HR	CY	GR
1	Does the protocol contain instruction to record catch of other vertebrate species than fish (i.e. turtles, birds, dolphins, seals)?																		
2	In gillnets - and hook and line fisheries: does the protocol instruct to indicate how much of the hauling process has been observed for (large) incidental bycatches which never came on board (because they fall out of the net)?																		
3	Does the protocol contain a check for rare specimens in the catch at opening of the codend or immediate removal during hauling in gillnets or hook and line?																		
4	If Yes: is the observer instructed to indicate if the codend was not checked in a haul or at how much of the hauling process has been checked for immediate removal?																		
5	Does the protocol instruct to check for rare specimens during sorting of the catch (i.e. at conveyor belt)?																		
6	If Yes: is the observer instructed to indicate how much of the sorting process has been checked on "haul level" (i.e. percentage)?																		
7	Does the protocol instruct to report specific handling or devices on board which may hide incidental bycatch?**																		
8	If Yes: is the observer instructed to report what effect this has on the sampling at "haul level"?																		
9	Does the protocol instruct to report of mitigation (i.e. Acoustic Deterrent Devices or "pingers")?																		
10	If yes for ADD's: is there a check for proper working (i.e. Battery check)?																		
11	In case of an incidental catch: is the observer instructed to indicate its state (dead and discarded, released alive, discarded in unknown state, collected for further research?																		

EE=Estonia; FI=Finland; LV=Latvia; LT=Lithuania; PL=Poland; BG=Bulgaria; HR=Croatia; CY=Cyprus; GR=Greece; IT=Italy; MT=Malta; RO=Romania; SI=Slovenia; PT=Portugal; ES=Spain; DE=Germany; FR=France; IE=Ireland; NL=Netherlands; SC=Scotland; EN=England; NI=Northern Ireland; BE=Belgium; DK=Denmark; SE=Sweden

***Indicate Y(yes)/N(no) or NA. NA if the question is not applicable for any fishery sampled under the national program.**

****For example: in the Dutch pelagic trawl fishery, in some cases netting is placed in the trawl in front of the codend in order to obstruct large catch items (like sea mammals or sharks) to enter the codend. The net in front of this barrier can be zipped open during the hauling process to discard large catch items outboard before the codend is opened. Incidental bycatches are thus difficult to record for observers.**

Annex 9: Terms of Reference of WKCOSTBEN

WKCOSTBEN – Workshop on cost benefit analysis of data collection in support of stock assessment and fishery management

2015/2/SSGIEOMXX

The **Workshop on cost benefit analysis of data collection in support of stock assessment and fishery management (WKCOSTBEN)**, chaired by Mike Armstrong*, UK and Jon Helge Vølstad*, Norway, will meet in ICES HQ, 28–1 July 2016 to:

a) Propose options and analytical methods for an objective framework to evaluate the benefitsvs.costs of datasets used to support stock assessment and fishery management advice, where the benefits are in terms of accuracy (bias and precision) of assessment results and derived management variables, and risks to stocks associated with management under uncertainty. This framework should be able to evaluate existing datasets, new data requests from end-users, and options for focusing elements of funding, survey design, spatial and temporal coverage, and sampling effort towards components of data collection that have greatest influence on quality of assessments and management decisions for particular stocks or groups of stocks.
b) Identify a range of stocks for detailed case studies, including those with full analytical age-based assessments and data-limited assessments, and contrasting stock status and biology. Describe the data used in the assessments, the design of fishery-dependent and fishery-independent sampling surveys providing the data, including hierarchical cluster sampling designs and analytical methods for quantifying precision reliably. Evaluate sampling rates and allocation for given survey designs that are required to derive estimates with adequate precision. Specify how simulations of the sampling schemes could be used to relate precision to sampling intensity and costs.
c) Develop a proposal for a longer-term (3-year) project to develop a general methodological framework and open-source software to carry out cost–benefit analysis and provide proof of concept using the case study stocks. Identify potential sources of funding.
d) Identify the need for follow-up workshops in 2017 onwards in the event of no funding for a dedicated project.

WKCOSTBEN will report by 7 August to the attention of the ACOM, SCICOM, and PGDATA.

Supporting Information

Priority	This workshop is considered to have a very high priority for establishing data requirements under the DCF and for ensuring the cost-effectiveness of data collection.
Scientific justification	International agreement to exploit all stocks at MSY means that a range of assessment methods is needed to determine MSY reference points and stock status relative to these, including for many data-limited stocks. This will lead to requests for improved or additional data that may not be feasible within existing DCF and national budgets for data collection. It is imperative that objective methods are developed to allow the most cost-effective use of data collection funds to help achieve these management goals. This may involve identifying areas of data collection that have relatively large influence on ability to assess the stocks and those that have relatively little influence, and the costs of collecting these data. Where new data are requested, it must be possible to make an informed judgement on the benefits these will bring to the assessments and management in relation to the feasibility and costs of data collection. Without such a decision framework, the ability to achieve MSY goals may be unnecessarily impeded. This framework will help the European Commission and its Regional Coordination Groups to make informed decisions on regional data needs under the reviewed DCF and help coordination between countries.
Resource requirements	The principal resource requirements are people with the skills needed for the workshop. Historical data needed for the case study evaluations are already collected and must be made available.
Participants	To be arranged
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	PGDATA, WGCATCH, WGRFS, WGBIOP, WGISDAA.
Linkages to other organizations	RCMs