ICES WGCATCH REPORT 2017

ACOM/SCICOM STEERING GROUP ON INTEGRATED ECOSYSTEM OBSERVATION AND MONITORING

ICES CM 2017/SSGIEOM:09

REF. ACOM & SCICOM

Report of the Working Group on Commercial Catches (WGCATCH)

6–10 November 2017

Kavala, Greece

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

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

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

Recommended format for purposes of citation:

ICES. 2018. Report of the Working Group on Commercial Catches (WGCATCH), 6-10 November 2017, Kavala, Greec. ICES CM 2017/SSGIEOM:09. 132 pp.

Contents

Executive summary

The Working Group on Commercial Catches (WGCATCH), chaired by Ana Ribeiro-Santos, United Kingdom, and Nuno Prista, Sweden, met in Kavala, Greece, from 6 to 10 November 2017. The meeting was attended by 35 members from 18 institutes and 16 countries.

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

This year the group carried out the following work:

Statistical and technical developments in sampling design, estimation, optimization and quality control of commercial catch data:

- Two templates for routine documentation of sampling programmes and estimation procedures were produced and tested. The templates expand the EU-MAUP tables and improve their efficiency for WGCATCH purposes. The final templates (and a few examples) are available in the WGCATCH repository.

- A set of R-scripts for sample-level and multi-level optimization of sampling was produced during the Workshop on Optimization of Biological Sampling at Sample level (WKBIOPTIM), an EG proposed by WGCATCH, and presented at the 2017 meeting. The scripts use the RDB exchange format as input and produce graphical and numerical outputs that allow the visualization of the consequences of length-measuring different number of fish per sample and/or sampling different numbers of hauls or trips to the precision of final estimates at sample or national level. Final scripts are available on the WGCATCH repository. A plan was established to extend them to other biological parameters during upcoming WKBIOPTIM2.

- Information was compiled on the importance of landings of national vessels in foreign ports both at national and regional level. Data supplied by 13 member countries and present in the CL table of the current RDB were used to identify a set of bilateral case-studies that will be used to investigate sampling practices used. A set of 28 bilateral case-studies will be further investigated during 2018. These case studies will be used to produce guidelines and recommendations that will improve the sampling of this component of landings in ICES stocks.

Developments in sampling and estimation practices of catch, effort, length and age distributions and other biological parameters of small-scale fisheries: WGCATCH started discussing the definition of fishing effort in small-scale fisheries and for passive gears (including the associated calculation methodologies) and quality indicators in small-scale fisheries data. Previous work on fishing effort definitions and calculation methodologies was revisited (e.g. PGECON DCF subgroup workshop on SSF, WKTRANSVERSAL I-II). Additionally a review of previous ICES WKs on quality issues was done and a questionnaire was drafted to compile information on effort calculation and data quality before next meeting. Additionally, the list of research projects using new technologies in the monitoring of SSF was updated and a path forward towards a joint publication was agreed (including the preparation of an abstract for the 9th 2018 IFOMConference).

Sampling of PETS by national programmes: WGCATCH continued the compilation of information on the sampling of PETS, with contribution from 21 member countries. A proposal for a joint Workshop on sampling of bycatch and PET species under EU-MAP programmes and directed bycatch studies (WKPETSAMP) was produced in collaboration with WGBYC.

Changes in legislation that affect data collection and data quality: WGCATCH continued the compilation of information on the effects of the landing obligation on commercial catch sampling and estimates provided to end-users. WGCATCH recommends that RCGs carry out this compilation on an annual basis and offers help to identify concerns and advice for the issues encountered. A set of suggestions was made on the new STECF's Fishery-independent Information Data Call (FDI) regarding: 1) the difference between the old and the new data call formats; 2) how the MS should report their discards under Landing Obligation; and 3) what would be the potential impacts for the data provided to ICES InterCatch for the stock assessments.

Follow-up on developments of the Regional Database (RDB): Progress on the new RDBES was reviewed and a subgroup formed that will follow-up and advise on its further development.

Collaborate in the advisory process: WGCATCH contributed to the 2017 ICES data call with a form aimed at documenting data quality and quantity provided for data limited stocks (DLS). A set of simple indicators was included that allows preliminary checking of the quality and quantity of length compositions available. WGCATCH set up subgroup that during 2018 will analyse the data retrieved and draft best practice for future data submissions of DLS. Additionally, WGCATCH promoted WKSDEEC I to address in more detail the specifics of sampling and estimation of commercial catch data of two stocks: Kattegatt Cod and North Sea Sole.

Respond to recommendations: WGCATCH answered 10 recommendations originated from both ICES Expert groups and RCM/RCGs.

WGCATCH Repository*: WGCATCH maintains a public repository with core literature in the area of statistically sound sampling and estimation methods for commercial catches* (http://www.ices.dk/community/groups/SiteAssets/WGCATCH-publications.aspx). *The repository was reviewed and a strategy outlined to maintain it and increase the efficiency of literature search during WGCATCH work.*

Intersessional workshops: WGCATCH proposes three workshops and one training courses for 2018: 1) Workshop on Optimization of Biological Sampling 2 (WKBIOPTIM2), 2) Workshop on methods for developing fishery-dependent indices of abundance for use in stock assessments (WKCPUE), 3) Workshop on Sampling of bycatch and PET species under EU-MAP programmes and directed bycatch studies (WKPETSAMP) and 4) ICES training course on Statistically Sound Inference for Commercial Catch Sampling Programmes.

1 Administrative details

Working Group name: Working Group on Commercial Catches (WGCATCH)

Year of Appointment within the current cycle: 2017

Reporting year within the current cycle (1, 2 or 3): 1

Chair(s): Ana Ribeiro-Santos **(**UK**),** Nuno Prista (Sweden)

Meeting venue: Kavala, Greece

Meeting dates: 6–10 November 2017

2 Terms of Reference

The following multi-annual ToRs were approved by ACOM/SCICOM for WGCATCH 2017–2019 work.

ToR	Description	Background	Science Plan topics addressed	Duration	Expected Deliverables
a	Review current and emerging statistical and technical developments in sampling, estimation and quality control of commercial catch data, focusing on total catches, length and age distributions and other biological parameters of ICES stocks	WGCATCH is the most recent of a long series of EGs that have addressed different aspects of sampling of commercial catches in ICES waters [e.g. WKACCU, WKMERGE, PGCCDBS, SGPIDS, and WKPICS], but less attention was put on estimation. The recast of DCF and implementation of EU-MAUP is intented to improve the quality of data collected. WGCATCH will provide guidance for monitoring the sampling levels and data quality, documentation of changes on sampling design and guidelines for estimation procedures. Guidelines also needed for development of the optimization methods for data collection that meet end-users needs and facilitate the multi-purpose and resource limited of the national insitutes. In 2016 a request to evaluate how foreign landings in national ports are being sampled was sent by LM 2016 to WGCATCH that will now be addressed.	25, 26, 27, 31	3 years	Documentation of sampling designs and estimation methods R-Scripts for within-sample optimization of length and age sampling Best practice guidelines for sampling national landings in foreign ports Best practice guidelines in data request and provision for frequency data Best practice guidelines for chosing methods and variables used to expand commercial sampling data Theme Session in ICES ASC Peer-reviewed publication on statistically sound sampling design

					Book on best practices for sampling commercial catches
b	Review developments in sampling and estimation practices of catch, effort, length and age distributions and other biological parameters of small-scale fisheries	SSF data are still highly biased(e.g. lack of coverage) and lacking on standardized concepts (e.g. fishing day, see WKTRANSVERSAL2, 2016) that jeopardize recognition of their significance and use in stock assessments. WGCATCH has previously compiled information on SSF and drafted best practice guidelines for data collection on these fisheries WG effort is now needed in a) monitoring the implementation of those guidelines and advise on regionalization of data collection, b) standardize reporting and RDB formats, c) define quality indicators for SSF sampling and census, d) improve knowledge-sharing on new data collection technologies useful for SSF.	25, 27, 28, 31	3 years	Best practice guidelines for standardized reporting of fishing effort Peer-reviewed publication on SSF
c	Review developments in sampling and estimation of incidental bycatch, including Protected, Endangered and Threatened Species (PETS) and other rare fish species	The sampling and estimation of incidental catches of PETS and other rare species in commercial fisheries has been a long-term ICES concern and is now mandatory under the new EU MAUP. WGBYC and WGCATCH have been collaborating to develop sampling protocols and design and estimation of rare events, to ensure that bycatch is properly sampled and estimated in DCF and EU-MAUP at-sea programmes.	25, 27, 28, 31	3 years	Report from WK on sampling of incidental bycatch (2018) Report from WK on estimation of incidental bycatch (2019) Theme Session in ICES ASC (2019)
d	Document and review changes in legislation that affect data collection and data quality	The landing obligation has brought changes in reporting all catches and have implications on sampling of commercial catches. . Furthemore in 2017 the first EU-MAUP will be implemented and the pace of transition to statistically sound	25, 27, 31	Routine ToR	Forum to discuss specific problems and find appropriate solutions and recommendations of best practice

	and evaluate their impacts	sampling is expected to increase. The complexity of these processes has been followed up closely by WGCATCH through routine ToRs with the group meetings acting as fora where difficulties and changes can be reported, advice for sampling and estimation obtained and recommendations on best practice or data quality issues to both national laboratories and end-users.			
e	Review and suggest developments of the Regional Database (RDB) from a design-based sampling and estimation perspective	WGCATCH have been involved in the support of the RDB and advising its development. The development of the new RDB will encompassstatistically sound sampling and estimation of commercial catches and can be used to provide data for assessment EGs. The ICES Data Centre and SC-RDB have requested WGCATCH to continue advising RDB development and ensuring the development encompasses statistically sound sampling schemes and proper methods of estimation.	25, 31	Routine ToR	Report to ICES Data Centre and SC-RDB.
f	Liaise with other ICES groups (e.g. WGBIOP, WGRFS, PGDATA and SSGIEOM), RCMs/RCGs, the LM and research projects	WGCATCH links with ACOM, SCICOM, SSGIEOM, EGs under SSGIEOM (e.g. PGDATA, WGBIOP) and the ICES secretariat to inform ICES policies and guidelines on quality and quantity of catch data. WGCATCH further links and obtains information from research projects that address sampling and estimation of commercial catches	25, 26, 27, 28, 30, 31	Routine ToR	Report liason initiatives
g	Collaborate in the advisory process, informing assessment groups and benchmarks on commercial	The accuracy of commercial catch data are dependent on the quantity and quality of the sampling and estimation carried by at national level and stock coordination level. WGCATCH can advise on the quality of the time-	25, 26, 27, 30, 31	Routine ToR	Report relevant findings to benchmark steering group.

catch data issues.	series used and suggesting improvements for sampling and estimation methods. Over 2017-2019, WGCATCH will phase-in a more active participation in the assessment and benchmark processes.

The following generic ToRs are also addressed routinely by WGCATCH

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

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

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

3 Summary of Work plan

The following multi workplan was approved by ACOM/SCICOM for WGCATCH 2017–2019 work.

Year 1

ToR a.1) **Draft templates for description of sampling schemes and estimation methods; test the templates in selected stock(s) (note: in separate WK: WKSDECC I) and review results at the meeting;**

ToR a.2) **Compile information on the importance of foreign landings in national ports and discuss and draft best practice guidelines for their sampling and estimation at the meeting;**

ToR a.3) **Produce R-script for within-sample optimization of length and age data (note: in separate WK: WKBIOPTIM) and review results at the meeting**

ToR b. 1) **Interssessional work quality indicators and data quality checks using case-studies; Compilation information of the quality indicators used in different member countries;**

ToR b. 2) **Interssessional work on documentation of fishing effort definitions used in different member countries; discussion at the meeting;**

ToR b. 3**) Compile list of FAQs on implementation of best practice and guidelines on SSF data collection.**

ToR c) **Intersessional liaison with WGBYC and draft ToRs for a WK that addresses sampling of incidental bycatches and rare species; discussion of ToR proposal at the meeting.**

Routine and generic ToRs that will be dealt with on a yearly basis by WGCATCH

Year 2

Topics planned include: **ToR a)** i) quality of length frequency data, ii) extension of historical documentation of sampling and estimation to additional stocks, iii) best practice and guidelines to improve their sampling and estimation**; ToR b**) proposals for quality indicators and definitions of fishing effort, and **ToR c**) sampling of incidental bycatches and rare species.

Routine and generic ToRs that will be dealt with on a yearly basis by WGCATCH

Year 3 Topics planned include: **ToR a)** i) choice of methods and variables used to expand commercial sampling data, ii) extension of historical documentation of sampling and estimation to additional stocks, **ToR b**) regional database requirements to hold and estimate SSF data, and **ToR c**) estimation of incidental bycatches and rare species.

Routine and generic ToRs that will be dealt with on a yearly basis by WGCATCH

4 List of Outcomes and Achievements of the WG in this delivery period

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

Documentation of sampling designs and estimation methods: Two templates – one for documentation of sampling programmes and one for documentation of estimation procedures - were produced intersessionally. The templates were tested and reviewed during the Workshop on Sampling Design and Estimation of Commercial catches (WKSDECC I) (in prep) where documentation of the sampling design and estimation procedures used in cod.27.21 and sol.27.4 was compiled. A final version of the templates was reviewed and further tested during the WGCATCH meeting. The final templates and a few examples are presented in **Annex 12** with excel files being available in the WGCATCH repository**.**

R-Scripts for optimization of length and age sampling: A first set of R-scripts for sample and multi-level optimization of sampling was produced in preparation of the Workshop on Optimization of Biological Sampling at Sample level (WKBIOPTIM). These outcomes of the workshop were presented at WGCATCH 2017. The scripts use the RDB exchange format as input and implement simulations of several types of sampling strategies (user defined), producing a set of graphical and numerical outputs. These outputs allow the visualization of the consequences of length-measuring different number of fish per sample and/or sampling different numbers of hauls or trips to the precision of final estimates obtained at sample or national level. During WKBIOPTIM a set of case-studies was tested and the scripts further improved. The final scripts are available on the WGCATCH repository and there is a plan to extend them to other biological parameters (e.g. age distribution) during upcoming WKBIOPTIM2 (see Annex 5).

Documentation of sampling of national landings in foreign ports. In 2015, the RCM NA recommended that analyses were conducted to evaluate the sampling of the landings of national vessels in foreign ports. A template was produced interssessionally that allows compiled data on the importance, sampling coverage and quality of sampling of this component of landings. During the WGCATCH meeting, data from 13 member countries were used to identify a set of bilateral case-studies that will be used to investigate sampling practices used. Subsequent to the meeting 2016 data present in the table CL of the RDB was used to identify the set of ICES stocks where foreign landings were most significant. The two sets of case-studies will be further investigated during 2018. These case studies will be used to produce guidelines and recommendations that improves the sampling of this component of landings.

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

WGCATCH continues to review developments for collection of transversal variables and biological data in small-scale fisheries (SSF) with the objective to improve data quality.

During its 2017 meeting WGCATCH discussed fishing effort (namely days at sea and fishing days) and the associated calculation methodologies that are adapted to the specific features of the SSF (including the ongoing data collection systems).The specific issues/difficulties of quantifying effort in passive gears were also discussed. WGCATCH 2017 drew some conclusions based on these discussions and reviewed the outcomes of previous DCF meetings (2015, Zagreb; 2016, Nicosia; 2017, The Hagues). WGCATCH 2017 also began discussing quality indicators (especially assessing the coverage/completeness of data collected in a census approach) and started reviewing the quality evaluation procedures developed in other ICES WKs. A questionnaire was elaborated that will provide the data needed for WGCATCH 2018 meeting to continue to debate these two specific issues (fishing effort and quality indicators). WGCATCH 2017 continued to document and review the different programs currently in development on new technology to monitor SSF. Finally an abstract for the 9th 2018 IFOM Conference was prepared and the aim is to write a scientific manuscript in the next few years.

ToR c) Documentation of the sampling of PETS by national programmes

Information was compiled on the sampling of PETS in 21 member countries. A proposal for a joint Workshop on sampling of bycatch and PET species under EU-MAP programmes and directed bycatch studies (WKPETSAMP) was produced in collaboration with WGBYC.

ToR d) Document and review changes in legislation that affect data collection and data quality and evaluate their impacts

WGCATCH continued to compile information and evaluate the effects of the implementation of the landing obligation on commercial catch sampling and estimates provided to end-users. During the meeting it was concluded that it was RGC's role to report on issues of such implementation on the sampling programmes and that WGCATCH should only help to identify concerns, provide advice on the issues and problems encountered, and develop methods to assess the quality of the data.

A set of suggestions was also made on the new STECF's Fishery-independent Information Data Call (FDI) regarding 1) the difference between the old and the new data call formats; 2) how the MS should report their discards under Landing Obligation; and 3) what would be the potential impacts for the data provided to ICES Intercatch for the stock assessments.

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

During the Workshop on Sampling Design and Estimation of Commercial Catches: Cod.27.21 and sol.27.4 (WKDSDECC I) a version of RDBES data model (RDB_CS_Data_Model_v1.3.xlsx) was populated and feedback given to ICES to support ongoing development process. During the WGCATCH meeting, a presentation was made on the progress achieved in the development of the new RDBES. It was decided to create a subgroup to follow-up on the RDBES development and provide advice on estimation methods. This subgroup will be supported by some of the members of WGCATCH that are also members of the RDBES steering group.

ToR g) Collaborate in the advisory process, informing assessment groups and benchmarks on commercial catch data issues.

A WGCATCH subgroup contributed to the 2017 ICES data call with a form that documented data quality and quantity provided for data limited stocks (DLS). The form was circulated with the data call and submitted by National institutes during upload. The set of simple indicators included was available to some ICES EGs (HAWG, WGHANSA, WGWIDE, WGBIE, WGNSSK, WGCSE, WGDEEP, WGEF and WGBFAS) so that they could carry out preliminary checking of the quality and quantity of length compositions available. Information collected prior to the meeting by WGCATCH chairs revealed that the indicators were used in some of these EG but only to a limited extent. During 2017-2018 a WGCATCH subgroup will carry out a more in depth analysis of the data submitted and draft best practice for data submissions of data limited stocks.

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

Ten recommendations from 8 Expert groups and RCGs were answered

Other:

One of the goals of WGCATCH is to provide a forum for training, exchange of knowledge, ideas, and recent developments in sampling and estimation of commercial catches (WGCATCH, 2016). During the WGCATCH 2017 meeting, a decision was taken to maintain the WGCATCH public repository in its current format and strengthen it with a directory on the SharePoint that will harbour a wider array of references needed for WGCATCH work. Additionally, four presentations were made of sampling programmes and their designs. Follow-up discussions and exchange of thoughts addressed specific national concerns and provided general ideas as to how to keep improving the statistical soundness of those programmes.

5 Progress report on ToRs and workplan

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

5.1.1 ToR a.1) Discuss sampling and estimation methods, including results from intersessional WKs and training courses.

The following presentations took place during the WGCATCH 2017 meeting:

- **Maciej Adamowicz, Ireneusz Wójcik, Tomasz Nermer, Rafał Adamski and Włodzimierz Grygiel**: Baltic commercial fisheries catch sampling scheme in Poland - the evolutionary changes.
- **Hans Gerritsen:** The Irish observer scheme: Implementing 4S.
- **Michiel Dammers and Ruben Verkempynck**: The Practical Challenges of Catch Sampling in the Netherlands.
- **Eirini Mantzouni, Aggeliki Adamidou & Manos Koutrakis**: On the Greek National Fisheries Data Collection Programme.

The presentations were followed by a plenary discussion of the practical and theoretical aspects involved. A summary of the presentations and discussions can be found in **Annex 7.**

Additionally, the outcomes of a set of intersessional workshops spanned by WGCATCH 2016 were presented and reviewed during the meeting; abstracts can be found in **Annex 8**.

- **Workshop on Optimization of Biological Sampling at Sample Level (WKBIOPTIM),** chaired by Ana Cláudia Fernandes, Portugal, and Julie Coad Davies, Denmark, in the IPMA headquarters (Lisbon, Portugal), between 20 and 22 June 2017;
- **Workshop on Sampling Design and Estimation of Commercial Catches: cod.27.21 and sol.27.4 (WKSDECC I),** chaired by Katja Ringdahl (Sweden) and Kirsten Håkansson (Denmark), in the ICES Headquarters, (Copenhagen, Denmark), between 9 May and 02 June 2017.

5.1.2 ToR a.2.) Compile information and define best practice on sampling and estimation of national landings in foreign ports.

In 2015, the RCM NA recommended WGCATCH to produce guidelines and best-practices for sampling landings of national vessels in foreign ports.

A subgroup was established (see Annex 10). Each participant was asked to:

1) Analyse its country data for completeness and uncertainties;

2) Identify the main combinations of species * fishing area * gear landed abroad and if they are being sampled;

3) Choose a set of combinations of species * fishing area * gear that could be considered bilateral case-studies in future work of identifying issues and best practice in the sampling of the foreign landings component.

A short summary of the analyses done by each member country can be found in Annex 10 alongside a set of analyses at stock level that was ran on 2016 Commercial Landings data (CL) of the RDB (Annex 9). An array of case-studies was selected for further analysis during 2017-2018 (Table 5.1.2). These case-studies are not exhaustive (data were not available from all countries) and balance the need to characterize the sampling and estimation of landings of national vessel abroad in some major stocks at Marine Region level with national/participant interests as identified in Annex 10.

Table 5.1.2. Case-studies selected for further analysis of the sampling and estimation of landings of national vessels in foreign ports.

Geographical Area	Species	Flag Country	Landing Country
Baltic	Cod	DNK	POL
	Herring	SWE	DNK
	Herring	FIN	SWE
	Sprat	SWE	DNK
	Sprat	FIN	SWE
	Sprat	POL	DNK
North Sea	Atlantic mackerel	SCT*	NOR
	Herring	DEU	NLD
	Herring	DNK	DEU
	Herring	SWE	DNK
	Herring	SCT*	NOR
	Herring	ENG	NLD
	Plaice	ENG	NLD
	Northern shrimp	DNK	NOR
	Northern shrimp	EST*	NOR
	Plaice	BEL	NLD
	Sandeel	SWE	DNK
	Sea bass	NLD	BEL
	Sea bass	NLD	FRA*
North Atlantic	Atlantic mackerel	SCT*	NOR
	Atlantic mackerel	PRT	ESP
	Atlantic mackerel	DNK	NOR
	Blue Whiting	SCT*	DNK
	Boarfish	DNK	IRL
	Boarfish	ENG	NLD
	Boarfish	IRL	FRO*
	Hake	ESP	ESP

*** Country not represented at the meeting.**

The case-studies identified in table 5.1.2 will conduct intersessional work on the ToRs detailed in Annex 11.

5.1.3 ToR a.3) Review templates for routine description of the national sampling designs and estimation methods.

Among WGCATCH's remits is to ensure the documentation and quality of commercial catch sampling programmes and estimates used by ICES EGs. To achieve that goal, the WGCATCH 2016 meeting made a decision to produce and test a set of forms/templates that allowed the compilation "database style" of the main characteristics of the national sampling schemes and estimation procedures. To render these forms more useful and efficient, it was decided that they should be, to the extent possible, an extension of the EU-MAUP tables currently requested by EU data collection legislation. More precisely, in WGCATCH 2016 concluded that the EU MAUP tables could, after some adjustments, provide for such documentation in a format that could be made available routinely, in a centralised and user-friendly format, accessible to not only WGCATCH participants but also the end-users of such estimates (WGCATCH, 2016).

During 2017, a set of forms/templates for both the description of sampling programmes and the estimation procedures used by member countries was produced intersessionally by WGCATCH chairs, Jon Helge Vølstad (IMR, Norway) and Mary Christman (Univ. Florida, USA), Katja Ringdhal (SLU, Sweden) and Kirsten Birch Hakansson (DTU-Aqua, Denmark). Those forms were tested during WKSDECC I (in prep) and reviewed. During its 2017 meeting, WGCATCH participants further tested and updated the tables producing a final version considered useful both for routine document the sampling design and estimation procedures at national level and in the documentation of commercial catch data during the benchmark process (Details and description of the templates in Annex 12).

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

WGCATCH continues to review developments for collection of transversal variables and biological data in small-scale fisheries (SSF) with the objective to improve data quality. In particular, the 2017-2019 Multi-Annual plan of WGCATCH aims to discuss fishing effort (namely days at sea and fishing days) and the associated calculation methodologies that are adapted to the specific features of the small-scale fisheries (including the ongoing data collection systems), also the specific issues/difficulties raised for passive gears. Some conclusions have been drawn based on discussion and reviewing of outcomes of previous DCF meetings: 1st and 2nd DCF ad-hoc workshops on transversal variables (2015, Zagreb and 2016, Nicosia) and the PGECON subgroup DCF workshop on small-scale fisheries (2017, The Hagues). The overall goal was to follow as close as possible the agreed methodology developed during the DCF workshops on transversal variables 1&2. WGCATCH also aims to discuss quality indicators and first discussions on this topic took place during the meeting (especially on assessing the coverage/completeness of data collected in a census approach) alongside a review of quality evaluation procedures developed in other ICES WKs. The EG elaborated a proposal questionnaire for WGCATCH 2018 meeting in order to continue to debate these two specific issues (fishing effort and quality indicators). The usefulness of new technologies such as remote electronic monitoring by CCTV and vessel position recording by AIS/GPS in monitoring SSF is also to be further evaluated with the EG continuing to document and review the different programs currently in development. Finally the EG discussed the writing of a scientific manuscript that details the SSF work carried out by WGCATCH and drafted a work-plan to accomplish that task. The first step to

achieve this objective has been the preparation of an abstract for the 9th 2018 IFOM Conference during the meeting.

The following presentations took place during the WGCATCH 2017 meeting:

- **Sébastien Demanèche**: Main results from PGECON subgroup DCF workshop on small-scale fisheries
- **Sébastien Demanèche:** DCF WKs Transversal variables 1&2 and Small-scale Fisheries
- **Maciej Adamowicz, Ireneusz Wójcik, Włodzimierz Grygiel:** Changes in the Polish fisheries legislation concerning SSF. Method of catch estimation – a proposal.
- **Kevin Williamson**: Assessment of use of sales notes as data source for 10m and under vessels in England.
- **Sebastien Demanèche:** Some considerations about assessment of coverage/completeness of data in a census approach and the use of sales note (French case study), 1st figures.
- **Estanis Mugerza:** New technologies to monitor SSF (Basque Country SSF case study)

The presentations were followed by a plenary discussion of the practical and theoretical aspects involved. A summary of the presentations and discussions can be found in Annex 13, 15 and 18.

A working document on "**SSF in Greece: Characteristics and particularities**" was also produced during the meeting in order to complete the compiled information on SSF and ongoing data collection done during the previous WGCATCH meeting. It can be found in Annex 21.

5.2.1 ToR b.1) Compile information on how different labs calculate effort for small-scale fleets and passive gears

The main results from the PGECON subgroup DCF workshop on small-scale fisheries, and from the two workshops on Transversal variables (with a special focus on the small-scale fisheries' issues and discussions held during them) were presented during the meeting (summaries of the presentations in Annex 13). The group reviewed and discussed the methodology for calculation of fishing effort estimates, as agreed in the Nicosia meeting, with particular focus on the SSF. During the discussions conclusions were drawn regarding the estimation of effort for passive gears (gillnets and entangling nets, pots and traps, handlines, longlines, etc.) and the data needed to estimate fishing effort of SSF. Details of the discussions are in Annex 14.

The main conclusions were:

- Fishing effort estimates and CPUE have to be linked with the '**gear soaking time**'. The group recommended that the need of these additional variable is regionally agreed in the RCGs now operative under the new DCMAP while being mindful that difficulties could occur in collecting it and that data collection should be adapted to the specific features of SSF and ongoing data collection systems. **'Vessel fishing days'** remains a necessary effort measure, even in that case, to ensure comparison with the other gears (active gears).
- **Gear dimension** (total length of nets, total number of pots/traps and total number of hooks) are variables of high importance, especially concerning

passive gears. Countries are encouraged to collect and improve the quality of such data even if they are optional. The **effort calculation** should be preferentially calculated on a *"day by day"* basis" rather than on a *"trip by trip"* basis to take into consideration the specific features of SSF and ongoing data collection systems.

Due to time constraints, WGCATCH 2017 was not able to draw up detailed compilation on how different labs calculate effort for SSF and passive gears with the task being scheduled for 2018. For the latter purpose, a questionnaire will be produced and completed intersessionally that will drive compilation of the information required for discussions at the WGCATCH 2018 meeting.

5.2.2 ToR b.2) Using case-studies develop a list of quality indicators for sampling and estimation of small-scale fleets

WGCATCH 2016 meeting established best practice guidelines for collection of transversal variables and biological data in small-scale fleets and highlighted the need of additional work to develop a list of quality indicators for sampling and estimation of small-scale fleets in order to assess/evaluate the bias and to be able to calculate the precision of the fishing activity estimates. During the WGCATCH 2017 meeting, the SSF subgroup discussed this issue and the results of a first set of three presentations on quality indicators for sampling and estimation of SSF. A summary of the presentations and outcomes of discussions can be found in Annex 15. The subgroup also conducted a first review of previous scientific bodies dealing with the issue of quality indicators (e.g. *fishPi EU project, ICES workshops on data quality, etc.)* and assess to what extend findings from these meetings could be useful in the context of SSF. A summary of the findings is provided in Annex 16. WGCATCH SSF subgroup will continue its work on quality indicators intersessionnaly and during the 2018 meeting. A more complete range of case studies will be compiled and put to discussion during the WGCATCH meeting in 2018. A questionnaire has been produced that will further support the discussions at the meeting. The questionnaire template can be found in Annex 17.

5.2.3 ToR b.3) Compile information on the importance of new technologies for the monitoring of small-scale fleets.

New technologies are a significant opportunity to improve Small-Scale Fisheries (SSF) monitoring and data collection. WGCATCH 2017 underscores that the utility of such information should not be ignored, and research on these technical instruments must be supported. Member countries should work together in future on extension/improvement of open source applications and development of tools to process such data.

New technologies could provide detailed information on effort with high spatial resolution data, which will be very useful to assess reliable fishing activity (in particular fishing effort estimates as number of trips or fishing days of SSF vessels). In particular, new technologies constitute a good way to improve knowledge of spatial mapping activity of SSF which is a key issue receiving growing attention within the Common Fishery Policy (CFP) reform and Marine Spatial Planning initiatives in particular. New technologies constitute also a good opportunity to collect catch (landings + discards + Protected Endangered and Threatened Species (PETS)) data and calculate estimates for SSF. In some cases, due to the size of many of these vessels and for safety reasons, it could be the only way to collect this information. More generally, new technologies constitute a way to improve SSF data collection. The last EU special report "EU fisheries control: more effort needed" (EU 2017) highlighted the need to improve the data

collection of the SSF and their reliability using these new technologies, due to the weakness in the current reporting systems (paper based catch reports, sale notes incomplete, etc.).

As a first input to this specific feature and to illustrate these aspects, WGCATCH 2016 did a very first review of the different projects today ongoing in the ICES area. In 2017 this information has been updated and a presentation of an ongoing study in Basque country has been done. The summary of that presentation and a compilation of new projects ongoing in the ICES area (not previously described in WGCATCH 2016 report) can be found in Annex 18 and Annex 19, respectively.

5.2.4 ToR b.4) Discuss the writing of a scientific manuscript that details the SSF work carried out by WGCATCH and draft a work-plan to accomplish that task.

During its 2017 meeting WGCATCH subgroup on SSF discussed the writing of a scientific manuscript that details the SSF work carried out by WGCATCH. A workplan was drafted to accomplish that task. The first step to achieve this objective will be to prepare an abstract for the 9th International Fisheries Observer and Monitoring Conference which will be held in Vigo-Spain from 11 to 15 June 2018. The proposed abstract is in Annex 20.

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

WGCATCH continues to collaborate with WGBYC in order to improve fishery-dependent on-board sampling of PETS (Protected, Endangered and Threatened Species) during at-sea sampling of commercial fisheries. Bram Couperus is the liaison for WGBYC in coordinating with WGCATCH.

In 2015, WGCATCH agreed to start routine documentation of sampling practices for protected species during DCF-related sampling made on-board commercial fishing vessels. A questionnaire on sampling practices and logging of PETS information into the databases was developed by WGBYC for use in WGCATCH (ICES, 2017). This year's answers (respecting to data collection in 2017 are displayed in Annex 22. The table contains the feedback of 21 national institutes. Compared to 2016, very little progress has been made. It appears that approximately half of the institutes have implemented monitoring of PETS (in common practise: rare species in the catches) in their at-sea monitoring protocols, but fewer have designed their respective institute database to hold these data.

In response to WGCATCH's concern of the treatment of data where WGBYC estimated bycatch much higher in dedicated surveys compared to bycatch rates derived from DCF sampling (see two examples in ICES, 2017), WGBYC explained that the intend of the comparison was not rigorous quantitative assessment. The aim was simply to demonstrate differences in reported bycatch events given the raw uncorrected frequency of occurrence and effort data collated from Reg. 812 and DCF data made available to WGBYC by Member States.

Currently, WGBYC receives data from a limited number of small-scale local studies and from data collected under the Reg. 812. This resolution covers only cetaceans in a few specific métiers which are not always the ones where bycatch most is expected. In addition, dedicated surveys are too expensive for most Member States (ICES, 2014; ICES, 2015). Therefore long-term monitoring on a larger scale is required. This can be

realized under EU MAP which now includes monitoring of protected species (EU, 2016/1251). Although WGCATCH recognizes the need for Member states to record data on incidental bycatch of all birds, mammals and reptiles and protected fish species, the DCF sampling programmes were not designed with that specific purpose in mind, and for this reason it may not be statistically valid to provide estimates of catch for these species based on data collected by these programmes. The raising of such sparse and suboptimal bycatch data to fleet level may lead to biased estimates with very low precision. WGCATCH recognizes the need to develop directed studies to monitoring PETS bycatch and the need to develop statistically sound sampling programmes with the objective of monitor catches of PETS bycatch. WGCATCH and WGBYC both agree that the finer details associated with proper sampling design of métiers and at-sea observing protocols relevant to monitoring bycatch of PETS are important topics in need of further guidance and implementation if EUMAP is to be carried out as intended.

WGBYC endorsed the proposal to organize a joint workshop on sampling design and at-sea protocols in 2018 and commented on draft ToRs that were provided by the chairs of WGCATCH. These TOR's were presented to, and adapted by the WGCATCH. The proposed time and date for the workshop is Lysekil, 24-26 April 2018 (see Annex 5).

5.3 ToR d) Document and review changes in legislation that affect data collection and data quality and evaluate their impacts.

5.3.1 Landing obligation

Among the recent legislative changes, the landing obligation recently put in place in EU waters is probably the most significant for ICES assessments and its impacts on commercial catch sampling and estimates provided to end-users are therefore a major current focus of WGCATCH. To achieve this WGCATCH aimed to keep documenting and informing MS and/or staff yet-unfamiliar with the practical consequences of that legislation on how to meet the new challenges it poses and keep the quality of end-estimates available for assessment.

WGCATCH 2017 reviewed the impact of the landing obligation (LO) on the sampling programmes and on the quality of stock assessment data. In Annex 23 the results are summarised by region and conclusions taken from questionnaire 1. All MS have the facility for collecting and managing the transversal data collected by control agencies or biological data collected by fisheries institutes for the different catch fractions.

There appears to be more issues in compliance and the implementation of the LO than there are in the collection of data itself. Where access is straightforward and the different components can be easily identified then samples are continuing to be collected. However, the transition by means of a partial implementation and the current exemptions based on certain conditions make the interpretation of the samples collected onshore and offshore and the estimation complex. The industry might be recording the different components when necessary, but when the control regulation only requires a vessel to record the weight of discarded species exceeding 50kgs on each fishing event then recorded discard figures are likely less than those recorded by observers.

The compilation of these questionnaires has been led by the RCM/RCGs and WGCATCH considers they are the best place to keep a watching brief on the impact of the LO on the sampling programmes. WGCATCH role is more that identifying possible issues and providing advice on the issues and problems encountered, developing

methods to assess the quality of the data retrieved and estimates produced. WGCATCH recommends members of all RCGs to fill in the questionnaires on an annual basis.

5.3.2 New STECF-FDI data call

During WGCATCH 2017 meeting a session was allocated to the discussion of data providers concerns with regards to some specifics of the new STECF – FDI data call. In particular, the following aspects were discussed: 1) the difference between the old and the new data call formats; 2) how the MS should report their discards under Landing Obligation; and 3) what would be the potential impacts for the data provided to ICES Intercatch for the stock assessments. Details about the discussion and main recommendations are in Annex 24.

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

During WGCATCH 2017 work on this ToR was mostly carried out within The Workshop on Sampling Design and Estimation of Commercial Catches: Cod.27.21 and sol.27.4 (WKDSDECC I) which populated the latest version of RDB-exchange format and provided feedback to ICES to support the development process (ICES, in prep). Additionally, previous to the 2017 meeting, WGCATCH chairs requested from the SC-RDB a presentation of the recent developments of the RDB and its future development plan.

During WGCATCH 2017 meeting the ICES Data Centre presented the underlying concept and progress so far achieved in the development of the data model of the new Regional Data Base and Estimation System (RDBES). It is the view of the ICES Data Centre that WGCATCH has an important role in supporting the development. WGCATCH has had the development of the RDB as one of its ToRs since its inception in 2014. The development of the RDB is also included in the focal areas planned for WGCATCH development during 2017-2019 (ICES, 2017). As such during the 2017 meeting WGCATCH created a subgroup to follow the RDBES development and recommends the ICES Data Centre and SC-RDB that subgroup is consulted and asked for opinion prior to the finalization of the data model of the upcoming RDBES. It was also decided that WGCATCH would continue to support and advise the ICES Data Centre on the development of RDBES through continued documentation of sampling and estimation procedures (done in the intersessional WKSDECCs), advice and training of national staff in statistically sound practices and increase its emphasis on the estimation procedures. The kick-off for that increase will be a training course in 2018 (see Annex 5) to be continued by a specific ToR on estimation in WGCATCH 2019 meeting (see Annex 3 and Annex 4).

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

Previous to the meeting, WGCATCH chairs requested a presentation from the chairs of EOGS, WGBIOP, and PGDATA. A request was also considered for presentation of the upcoming EU funded projects within the area of "Strengthening Regional Co-Operation in Fisheries Data Collection" but later postponed to 2018 as these had not yet been fully decided by DGMARE. Accordingly, the following presentations took place during the WGCATCH 2017 meeting:

- **Sven Kupschus:** Ecosystem Observation Steering Group
- **Uwe Krumme** (on behalf of the chairs of WGBIOP)**:** Working Group on Biological Parameters (Cagliari, October 2017 meeting)

The presentations were followed by plenary discussions on improvements of communication and increased interaction and liaison between WGCATCH and these EGs.

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

The accuracy of commercial catch data are dependent on the quantity and quality of the sampling and estimation carried by at national level and stock coordination level. As EG responsible for the quality of commercial catches, WGCATCH as the objective for 2017-2019 of strengthening its collaboration in the advisory process, namely the benchmarks (WGCATCH report 2016). The main vehicle considered to achieve this goal are intersessional workshops on sampling design and estimation of commercial catches (WKSDECC). The WKSDECC are planned annually depending on ICES needs (e.g. the list of stocks to be benchmarked on year+2) and the availability of participants from the core countries fishing the stocks and have a set of pre-established generic ToRs (see Annex 6). Their goal is to ensure progress in the documentation of the present and historical sampling design and estimation procedures that underlies the commercial catch estimates provided for assessment (WGCATCH ToR a), providing a collaborative environment for joint discussion and conclusion on important biases and imprecisions that affect estimates of commercial catches. To increase the consideration of WKSDECC results in the assessment process, the end-product of the WKSDECC series are working documents on data quantity and quality delivered and presented directly at meetings of assessment working groups, data compilation workshops and benchmarks.

In 2017 a first WKSDECC was realized addressing Kattegat cod (cod.27.21) and North Sea sole (sol.27.4) (see summary in Annex 8). The results of this workshop were presented and discussed during the WGCATCH meeting and considered successful by participants. Two working documents are currently being prepared with results of WKSDECC, one on each stock, with planned submission for presentation at WGBFAS and WGNSSK meetings of spring 2018. The array of stocks to be benchmarked in 2019 was used as a starting point for the discussion of a new WKSDECC. After pondering the list and availability of national staff for participation, it was decided that it would be useful to hold the next workshop (WKSDECC II) in 2018 to address Western and/or Eastern Baltic cod (cod.27.22-24 and cod.27.25-32, respectively). A final decision on a proposal for WKSDECC II will be taken during spring 2018.

5.7 Routine ToRs

5.7.1 Identify research needs, amend work-plan and propose new workshops, training courses and study-groups, reviewing their outcomes

WGCATCH discussed current research needs in plenary. The work lines previously affirmed for 2017-2019 (ICES, 2017) remain valid. To fulfil its goals, WGCATCH has identified a need for intersessional WKs and training courses that ensure intersessional progress and training in areas of relevance for WGCATCH, RDBES development and ACOM/SCICOM in general. The outcomes of these will be reviewed annually during the WGCATCH meeting. The following workshops and training courses are proposed for 2018: 1) Workshop on Optimization of Biological Sampling (WKBIOPTIM2), 2) Workshop on methods for developing fishery-dependent indices of abundance for use in stock assessments (WKCPUE), 3) Workshop on Sampling of bycatch and PET species under EU-MAP programmes and directed bycatch studies (WKPETSAMP) and 4) ICES training course on Statistically Sound Inference for Commercial Catch Sampling Programmes (see Annex 5). A proposal for a Workshop on Sampling Design and Estimation of Commercial Catches (WKSDECC II) addressing Western and/or Eastern Baltic cod (cod.27.22-24 and cod.27.25-32, respectively) was also drafted during the meeting. The submission of the latter proposal is pending the results of ongoing pre-benchmark meetings.

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

WGCATCH received ten recommendations. Prior to the meeting the chairs of some of the EGs issuing the recommendations were contacted for clarifications. The recommendations were then discussed during the meeting and a response issued. The responses to the recommendations can be found in **Annex 25.**

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

The working group did not produce any data outputs, the main output from WGCATCH being the current report and its annexes. Additional outputs from WGCATCH work can be found in the reports, scripts and working documents produced by intersessional workshops WGCATCH spanned in 2017. 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 participants of WGCATCH meeting and WGCATCH members for scrutiny and error checking. WGCATCH chairs made every effort to ensure that the content of the report was accurate and reflects the opinions of the WG. Sufficient time was given to all participants and members to review the different report sections and the final draft.

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

5.7.4 Other: WGCATCH repository

The WGCATCH repository (http://www.ices.dk/community/groups/SiteAssets/WGCATCH-publications.aspx) is a public resource on commercial catch documents and reports maintained by WGCATCH members. The content of the repository has a clear emphasis on references needed to implement statistically sound sampling

and estimation of commercial catch data used by ICES Assessment Groups, each reference cited being accompanied by a short summary that details its content and relevance. The repository *does not* aim to be an exhaustive inventory of references on catch sampling and estimation; rather, it highlights only the core literature sources in the field of commercial catches, i.e. those more routinely used and cited by WGCATCH and, most importantly, those more relevant for new participants in the EG and other national staff interested in statistically sound sampling and estimation methods. As such, the WGCATCH repository avoids literature overload and acts as an important instrument in linking participants to the history of WGCATCH and some preceding EGs, avoiding duplication of work already done and speeding up integration of new WGCATCH members in the EG work.

In its 2017 meeting WGCATCH analysed the objectives, content and format of the WGCATCH repository and carried out a brief comparison between it and the Data Quality Assurance Repository. It was considered that the two repositories serve quite different objectives and both should be maintained. Furthermore, the WGCATCH repository should keep its current form and be annually updated before the annual meeting of WGCATCH. To avoid information overload and keep the efficiency of WGCATCH work, it was discussed that a specific folder/repository could be created in the WGCATCH SharePoint and host a wider array of publications useful for routine EG work (e.g. Assessment Groups Reports, publications of EG members, other recent scientific publications within the remit of WGCATCH). Software such as Mendeley (www.mendeley.com) will also be considered in facilitating WGCATCH work.

6 Revisions to the work plan and justification

No significant changes were made to the ToRs and workplan approved by ACOM/SCICOM for WGCATCH work during 2017–2019. Detailed ToRs and workplan for 2017-2018 are presented in Annex 3 and 4.

7 Next meetings

The WGCATCH meeting for 2018 will be held in Nicosia, Cyprus, between 5 and 9 November 2018. Venue and dates of WGCATCH meeting in 2019 will be decided during previous year's meeting.

8 References

ICES. 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.

ICES. 2014. Report of the Working Group on Bycatch of Protected Species (WGBYC), 4–7 February 2014, Copenhagen, Denmark. ICES CM 2014/ACOM:28. 96 pp.

ICES. 2015. Report of the Working Group on Bycatch of Protected Species (WGBYC), 2-6 February 2015, ICES Headquarters, Copenhagen, Denmark. ICES CM 2015\ACOM:26. 82 pp.

ICES. 2016. Report of the Working Group on Commercial Catches (WGCATCH), 9-13 November 2015, Lisbon, Portugal. ICES CM 2015/SSGIEOM:34. 111 pp.

ICES. 2017. Report of the Working Group on Commercial Catches (WGCATCH), 7-11 November 2016, Oostende, Belgium. ICES CM 2016/SSGIEOM:03. 142 pp.

Annex 1: List of participants

NAME	ADDRESS	E-MAIL
Ana Cláudia Fernandes	Instituto Português do Mar e da Atmosfera (IPMA), Rua Alfredo Magalhães Ramalho, nº6, 1495-006 Lisboa, Portugal	acfernandes@ipma.pt
Ana Ribeiro Santos (co-chair)	Centre for Environment Fisheries and Aquaculture Science (Cefas), Pakefield Road, Lowestoft, United Kingdom	Ana.ribeirosantos@cefas.co.uk
Angeliki Adamidou	Fisheries Research Institute, Nea Peramos, Kavala, Greece	adamidou@inale.gr
Bram Couperus	Wageningen UR, PO Box 68, IJmuiden, Netherlands	bram.couperus@wur.nl
Eirini Mantzouni	Fisheries Research Institute, Nea Peramos, Kavala, Greece	emantzo@inale.gr
Esha Mohammed	Swedish University of Agricultural Sciences (SLU), Turistgatan 5, Lysekil, Sweden	esha.mohamed@slu.se
Estanis Mugerza	AZTI-Tecnalia, Txatxarramendi ugartea z/g, Sukarrieta (Bizkaia), Spain	emugerza@azti.es
Giorgos Gitarakos	Fisheries Research Institute, Nea Peramos, Kavala, Greece	geogitar@yahoo.gr
Hans Gerritsen	Marine Institute, Rinville, Oranmore, Ireland	hans.gerritsen@marine.ie
Henrik Kjems-Nielsen (skype presentation)	International Council for the Exploration of the Sea (ICES), H. C. Andersens Boulevard 44-46, 1553 Copenhagen V, Denmark	henrikkn@ices.dk
Håkon Otterå	Institute of Marine Research (IMR), POB 1870 Nordnes, 5817 Bergen, Norway	haakon.otteraa@imr.no
Ioannis Thasitis	Department of Fisheries and Marine Research, Nicosia, Cyprus	ithasitis@dfmr.moa.gov.cy
Jon Elson	Centre for Environment Fisheries and Aquaculture Science (Cefas), Pakefield Road, Lowestoft, United Kingdom	jon.elson@cefas.co.uk
Jon Helge Vølstad	Institute of Marine Research (IMR), POB 1870 Nordnes, 5817 Bergen, Norway	jon.helge.voelstad@imr.no
José Rodriguez	Instituto Español de Oceanografía (IEO), Promontorio San Martín s/n, Santander, Spain	jose.rodriguez@ieo.es
Julia Wischnewski	Thünen Institute, Palmaille 9, Hamburg, Germany	julia.wischnewski@ti.bund.de
Kevin Williamson	Marine Management Organizations, Newcastle, UK	Kevin.Williamson@marinemanagement.org.uk
Kirsten Birch Håkansson	National Institute of Aquatic Resources (DTU Aqua), Lyngby, Denmark	kih@aqua.dtu.dk
Maciej Adamowicz	National Marine Fisheries Research Institute (NMFRI), ul. Kollataja 1, Gdynia, Poland	madamowicz@mir.gdynia.pl
Maksims Kovsars	Institute of Food Safety, Animal Health and Environment, Lejupes Street 3, Riga, Latvia	maksims.kovsars@bior.lv

Manos Koutrakis	Fisheries Research Institute, Nea Peramos, Kavala, Greece	manosk@inale.gr
Michiel Dammers	Wageningen Marine Research, PO Box 68, IJmuiden, Netherlands	michiel.dammers@wur.nl
Mira Šuštar	Natural Resources Institute, Turku, Finland	mira.sustar@luke.fi
Nuno Prista (co-chair)	Swedish University of Agricultural Sciences (SLU), Turistgatan 5, Lysekil, Sweden	nuno.prista@slu.se
Perttu Rantanen	Natural Resources Institute, Turku, Finland	perttu.rantanen@luke.fi
Rita Vasconcelos	Instituto Português do Mar e da Atmosfera (IPMA), Rua Alfredo Magalhães Ramalho, nº6, 1495-006 Lisboa, Portugal	rita.vasconcelos@ipma.pt
Ruben Verkempynck	Wageningen Marine Research, PO Box 68, IJmuiden, Netherlands	ruben.verkempynck@wur.nl
Sara-Jane Moore	Marine Institute, Rinville, Oranmore, Ireland	sara-jane.moore@marine.ie
Sébastien Demanèche	Institut Français de Recherche pour l'Exploitation de la Mer (Ifremer), RBE/STH/LBH - ZI de la Pointe du Diable - CS 10070 Plouzané, France	Sebastien.Demaneche@ifremer.fr
Sofie Nimmegeers	Institute for Agricultural and Fisheries Research (ILVO), Ankerstraat 1, Oostende, Belgium	sofie.nimmegeers@ilvo.vlaanderen.be
Sofie Vandemaele	Institute for Agricultural and Fisheries Research (ILVO), Ankerstraat 1, Oostende, Belgium	sofie.vandemaele@ilvo.vlaanderen.be
Sotiris Kiparissis	Fisheries Research Institute, Nea Peramos, Kavala, Greece	skipariss@inale.gr
Sven Kupchus (skype presentation)	Centre for Environment Fisheries and Aquaculture Science (Cefas), Pakefield Road, Lowestoft, United Kingdom	sven.kupschus@cefas.co.uk
Uwe Krumme	Thünen Institute, Alter Hafen Süd 2, Rostock, Germany	uwe.krumme@ti.bund.de
Wlodzimierz Grygiel	National Marine Fisheries Research Institute (NMFRI), ul. Kollataja 1, Gdynia, Poland	wlodzimierz.grygiel@mir.gdynia.pl

Annex 2: Recommendations

RECOMMENDATION	ADRESSED TO
WGCATCH established a subgroup to advise on RDBES development and requests the upcoming Data Model Specification Document of the RDBES to be circulated among the members of this subgroup for comments on the variables and their format	SC-RDB and ICES Data Centre
WGCATCH recommends that additionally to a core set of scripts outlining main estimation methods the new RDB also allows their case-by-case tunning and configuration.	SC-RDB and ICES Data Centre
WGCATCH recommends all RCGs to annually compile documentation on the implementation of the landing obligation using the currently available questionnaires	RCGss
WGHANSA expressed a need that "length distributions and biological parameters of catches are collected for sardine in area 7 by countries operating in those waters". In response to a WGHANSA request, WGCATCH investigated the sampling of sardine in area 7. The sampling coverage appears to be quite variable with some countries sampling the stock and some countries not. Some countries indicated that they are potentially able to improve their sampling but that there is currently no obligation for EU MS to sample sardine in that area in the data collection regulation. The issue is recommended for further discussion between WGHANSA and RCG North Atlantic.	WGHANSA
WGCATCH or PGDATA to review datacall on what concerns commercial catch data	ICES Secretariat
3. WKCPUE (see Annex 5)	ACOM, SCICOM, Secretariat
4. Training Course (See Annex 5)	ACOM, SCICOM, Secretariat
5. WKBIOPTIM2 (see Annex 5)	ACOM, SCICOM, Secretariat
6. WKPETSAMP (see Annex 5)	ACOM, SCICOM, Secretariat

Annex 3. WGCATCH terms of reference and summary work-plan for 2017–2018

The Working Group on Commercial Catches (WGCATCH), chaired by Ana Ribeiro Santos (United Kingdom) and Kirsten Birch Håkansson (Denmark), will meet in Nicosia, Cyprus, 5– 9 November 2018 to:

a) Review current and emerging statistical and technical developments in sampling design, estimation, optimization and quality control of commercial catch data, focusing on total catches, length and age distributions and other biological parameters of ICES stocks.
    1. Discuss sampling and estimation methods, including results from intersessional WKs and training courses.
    2. Define best practice and guidelines on sampling and estimation of national landings in foreign ports.
    3. Analyse the outcomes of the "Data Quality And Quantity Information" questionnaires on 2016 data on Data Limited Stocks and define best practice and guidelines on data request and data provision for frequency data (age and length).

b) Review developments in sampling and estimation practices of catch, effort, length and age distributions and other biological parameters of small-scale fisheries.
    1. Continue the definition of guidelines for standardized reporting of fishing effort from small-scale fleets based on case-studies
    2. Compile information on quality indicators useful for sampling and estimation of small-scale fleets
    3. Continue the compilation of information on the importance of new technologies for the monitoring of small-scale fleets.
    4. Continue the writing of a scientific manuscript on the work carried out by WGCATCH Small-scale Fleet subgroup.

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

d) Document and review changes in legislation that affect data collection and data quality and evaluate their impacts.

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

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

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

Generic ToRs

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

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

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

Summary of the work-plan

Year 2 (2018)	ToR a.1) Review the outcomes of intersessional workshops (WKBIOPTIM2, WKCPUE, WKPETSAMP, WKSDECC) and ICES training course on Statistically Sound Inference for Commercial Catch Sampling Programmes; ToR a.2) Carry out intersessional work of analysis of bilateral and multilateral case-studies of the sampling and estimation of national landings in foreign ports and draft best practice and guidelines to improve their sampling and estimation; Discuss and approve the drafts during the meeting. ToR a.3) Carry out intersessional work on quality indicators for age and length samples and estimates (note: related to WKBIOPTIM 2); Carry out interssesional work and draft best practice (e.g. sample size thresholds) for data request and data provision of length data from data-limited stocks; Discuss results and approve the drafts during the meeting. ToR b. 1) Interssessional on definition of guidelines for standardized reporting of fishing effort from small-scale fleets; Discuss results and approve the guidelines during the meeting. ToR b. 2) Intersessional work on quality indicators and data quality checks for small-scale fleets data; Keep compiling a list of FAQs on implementation of best practice and guidelines on SSF data collection; Discuss results and approve the guidelines during the meeting. ToR b. 3) Discuss additional case-studies on the usefulness of new technologies for the monitoring of small-scale fleets. ToR b. 4) Intersessional presentation of WGCATCH work on small-scale fleets at the 9th International Fisheries Observer & Monitoring Conference (IFOMC); Discussion of roles and workplan for manuscript writing during the meeting. ToR c) Intersessional liaison with WGBYC and draft ToRs for a WK that addresses estimation of PET bycatches and rare species; discussion of ToR proposal at the meeting. Routine and generic ToRs that will be dealt with on a yearly basis by WGCATCH
Year 3 (2019)	Topics planned include: **ToR a)** i) choice of methods and variables used to expand commercial sampling data, ii) extension of historical documentation of sampling and estimation to additional stocks, **ToR b**) regional database requirements to hold and estimate SSF data, and **ToR c**) estimation of incidental bycatches and rare species. Routine and generic ToRs that will be dealt with on a yearly basis by WGCATCH

Annex 4 WGCATCH detailed workplan for 2017–2018

ToR	Task	By when	By whom
A.1	Review of Interssional Workshops (WKPETSAMP, WKCPUE, WKBIOMPT2)		
A.1	Refine ToRs and select Case-studies, chairs, dates and venues for WK(s): WKBIOPTIM2. WKCPUE and WKPETSAMP and training course	dec-17	Chairs
A.1	Advertise WKs and training course within ICES community and other fora	mar-18	Chairs
A.1	Ask participants for presentations for 2018 meeting	sep-18	Chairs
A.1	Presentations and discussion	Meeting -2018	WGCATCH 2018
A.2	Foreign landings		
A.2	Foreign landings - Contact the RCG chairs in relation to the potential stocks for case studies for 2018 meeting	mar-18	Chairs
A.2	Foreign landings - Contact the main players for each stock for constituting subgroups on foreign landings; Send subgroup "ToR" to produce working document in relation to the selected stocks (deadline June 2018)	mar-18	Chairs
A.2	Compile Working documents	jun-18	Chairs, subgroup on foreign landings
A.2	Ask participants for presentations for 2018 meeting	sep-18	Chairs
A.2	Analyse WD and draft best-practice guidelines for sampling	sep-18	Chairs, subgroup on foreign landings
A.2	Circulate draft guidelines	oct-18	Chairs
A.2	Presentations and discussion	Meeting -2018	WGCATCH 2018
A.2	Discussion and approve guidelines	Meeting 2018	WGCATCH 2018
A.3	Best practice guidelines in data request and provision for frequency data		
A.3	Identify lead and participants for this group	mar-18	Chairs
A.3	Analysis of the length data provided for DLS in 2017 ICES general data call, including identification the criteria used by member countries	apr-18	Chairs, subgroup participants
A.3	Development of criteria for quality of frequency data (age and length)	may-18	Chairs, subgroup participants
A.3	Draft best-practice guidelines for data requests and provision of frequency data	sep-18	Chairs, subgroup participants
A.3	Circulate draft guideline to participants	oct-18	Chairs, subgroup participants
A.3	Discussion and approve guidelines	Meeting 2018	Chairs, subgroup participants
B.1-2.	Effort measures and quality indicators for small-scale fleets		
B.1-2.	Draft a questionnaire for documentation of fishing effort definitions and quality indicators used in different member countries and circulate	to be defined	Chairs, Sebastien and Estanis
B.1-2.	Circulation of the questionnaire	to be defined	Chairs
B.1	Request for case-studies comparing the fishing effort estimates calculated on the both standard "trip by trip" basis and "day by day" basis	may-18	Chairs, Sebastien and Estanis, SSF subgroup
B.1-2.	Compile questionnaires and draft guidelines	jun-18	Chairs, SSF subgroup
B.1-2.	Draft guidelines	sep-18	Sebastien and Estanis, SSF subgroup

B.1-2.	Circulate draft guideline to participants	oct-18	Chairs
B.1-2.	Discussion and approval of guidelines	Meeting 2018	WGCATCH 2018
B.3	New technologies on small-scale fleets		
B.3	Request for presentations on new technologies	sep-18	Chairs
B.3	Presentations and discussion	Meeting -2018	WGCATCH 2018
B.4	Manuscript on small-scale fisheries		
B.4	Drafting of IFOMC presentation	may-18	co-authors
B.4	Manuscript writing	Meeting 2018	co-authors
C	Sampling and estimation of PETS		
C	Follow-up on WGBYC meeting (feedback on WKPET-SAMP)	apr-18	Chairs, Bram Couperus and Chair of WGBYC (24-26 Apr 2018)
C	Draft Tor for estimation WK on PETS estimation	jun-18	Bram to draft, WGCATCH Chairs to review
C	Circulate the drafted ToR to WGEF and WGBYC chairs	jun-17	Chairs
C	Circulate PETS questionnaires	sep-18	Chairs
C	Compile questionnaires	oct-18	Chairs, partici-pants
C	Discussion at the meeting	Meeting 2018	Chairs, partici-pants
D	Impact of legislative changes in commercial catch sam-pling		
D	Request presentations on Landing obligation and other legislative changes	sep-18	Chairs
D	Presentations and discussion	Meeting -2018	WGCATCH 2018
E	Review and suggest developments of the Regional Data-base (RDB)		
E	Contact ICES data centre for data model	jan-18	Chairs
E	Identify participants to be part of the subgroup. Contact people in the list	jan-18	Chairs
E	Circulate data model to subgroup. Ask feedback by the end February 2018.	feb-18	Chairs
E	Contact ICES data centre request presentation	sep-18	Chairs
E	Progress evaluation; drafting of estimation ToRs and WKs	Meeting -2018	WGCATCH 2018
F	Liaise with other groups		
F	Request presentations from other groups (WGBIOP, PGDATA and EOGS) /projects (FishPi2, etc.)	sep-18	Chairs
F	Presentations and discussion	Meeting -2018	WGCATCH 2018
G	Collaborate in the advisory process		
G	Follow-up on WKSDECC I impact	After benchmark 2018	Chairs
G	Finalise drafting and submission to ACOM/SCICOM of WKSDECC II proposal (to be confirmed)	apr-18	Chairs, Chairs of WK
Other			
Other	Contact ICES secretariat and compile recommendations from other ICES EGs	sep-18	Chairs
Other	Contact ICES secretariat for draft recommendations of Li-aison Meeting	oct-18	Chairs
Other	Update WGCATCH repository and SharePoint repository	sep-18	Chairs, Hans, Nuno,
Other	Feedback on repository update	Meeting -2018	Chairs, Hans, Nuno

Annex 5. WGCATCH proposals for intersessional workshops and training courses in 2018

Proposal: The Joint WGBYC/WGCATCH Workshop on sampling of bycatch and PET species (WKPETSAMP) under EU-MAP programmes and directed bycatch studies, co-chaired by Bram Couperus (The Netherlands) and Katja Ringdahl (Sweden), will meet in Lysekil, Sweden, 24–26 April to 2018 to:

a. Develop an inventory of existing sampling programs that currently provide data on PETS bycatch at national level, including both DCF at-sea catch sampling programs and studies that target primarily PET bycatch (directed studies). In each sampling program identify the target population, the sampling units, sampling frames, stratification schemes and sample selection methods for the different levels of the sampling hierarchy (primary, secondary and lower level sampling units).
b. Compare the designs, assumptions, advantages and limitations of existing at-sea catch sampling programs to those of directed studies carried out in the same country. Highlight concrete adaptations to the sampling design of DCF at-sea catch sampling programs that can improve data collection on PETS and other incidental bycatch without jeopardizing the overall objectives of those programs.
c. Develop criteria to determine when at-sea catch sampling programs cannot provide sufficient data on incidental bycatch for end-user needs and provide guidance on what other types of studies and methodologies could be used.
d. Prepare guidelines for at-sea sampling programs, listing best practices and relevant parameters for PETS sampling for specific fisheries.
e. Define proper mechanism(s) for storage, maintenance and dissemination of both the PETS monitoring program inventory and monitoring data.

WKPETSAMP will report by 1 May 2018 for the attention of the ACOM, SCICOM, WGBYC and WGCATCH.

Supporting Information

Priority	This workshop is considered to have a high priority to ensure statistically sound and consistent sampling designs of routine DCF at-sea catch sampling programmes, DCF pilot programmes and national and international fisheries monitoring schemes directed at bycatch of protected species in ICES countries.
Scientific justification	With the implementation of sampling of protected species in the EU-MAP, member states in the EU have to adjust their on board sampling protocols to improve their coverage of bycatch of protected species or initiate (pilot) studies that specifically monitor this group of species. At the same time, significant differences have been identified between the bycatch estimates obtained from DCF at-sea data collection programme that aim to determine discard of the main commercial fisheries and those of national and international projects that aim specifically at determining bycatches of protected species [e.g. WGBYC 2015, WGCATCH 2016]. There is need to ensure that statistically sound practices are followed by both types of programmes and that consistent designs and assumptions are used by all members states that allow for consistent analyses of bycatch rates. There is also a need for clear criteria to determine when existing on board sampling programmes of commercial fisheries cannot provide sufficient data for the evaluation of bycatch rates.
Resource requirements	The WK should principally be attended by scientist with experience in the on board sampling in fisheries: people with experience in the routine sampling of commercial species and people with experience in monitoring programmes on incidental bycatch of protected species (sea mammals, turtles, birds and protected fish). This includes people with statistical expertice on the analyis of data with a lot of zeros.
Participants	Participants should include members of WGBYC and WGCATCH and otherwise people involved in the execution of dedicated monitoring of protected species and EU-MAP sampling schemes.
Secretariat facilities	Some secretarial support will be needed. The WK should take place in 2018. Therefore it will need to be approved by ACOM and SCICOM if possible in late 2017 / early 2018.
Financial	Member States may fund this through their DCF funding.
Linkages to advisory committees	ACOM and SCICOM
Linkages to other committees or groups	WGBYC, WGCATCH, PGDATA, WGEF and JWGBIRD.
Linkages to other organizations	-

Proposal: The second Workshop on Optimization of Biological Sampling (WKBIOPTIM 2) chaired by Ana Cláudia Fernandes (Portugal) and Maria Teresa Facchini (Italy) will meet in Ifremer Nantes, 29–31 May 2018 to:

a) Further develop catch-sampling evaluation toolbox (following WKBIOPTIM 1): Improvements will be considered based on additional case studies (i.e. stocks or fisheries) and consideration of additional metrics (e.g. age and maturity) and considerations for methods to calculate effective sample size for these metrics.
b) Development of quality indicators: evaluate a second set of quality indicators.
c) Discuss progress achieved in implementation at national level since WKBIOPTIM 1.

WKBIOPTIM 2 is a joint WK of WGBIOP and WGCATCH and will report by 5 July 2018 for the attention of the ACOM, SCICOM, WGBIOP and WGCATCH

Supporting Information

Priority	This workshop is considered to have a high priority for already established and new commercial fishery and survey sampling programmes developed under the MAUP. The expectation is that the time and costs that will be saved by the development and implementation of the R-toolbox will be fundamental to increase data provision on data-limited stocks and environmental variables. The basic toolbox was developed by WKBIOPTIM and in order for the full potentail of this tool to be realised further testing and input are required under a wider range of scenarios.
Scientific justification	Statistical sound sampling is a requirement of the new EU-MAUP that now specifies that "where data are to be collected by sampling, Member States shall use statistically sound designs" (COM IMPL DEC 2016/1701). One important component of a "statistically sound design" is that sampling effort is optimized and fit for purpose, i.e. that time and costs spent in sampling can be effectively justified in terms of quality of the information finally provided to end-users.There is an increasing demand to determine MSY reference points for an increasing number of stocks, including many data-limited stocks, and, at the same time, to collect additional environmental and biological information. This makes optimisation of the number of length measurements, age and maturity estimation a priority since these tasks involve costs and time that could alternatively be spent in data collection of other stocks and/or variables. It is important that the national laboratories of MS have common tools to quantify the effects, advantages and disadvantages of different sampling intensities and sampling designs so they can optimise sampling in terms of time and costs savings. Several ICES EG's, including e.g. WKPRECISE 2009, PGCCDBS 2012, PGDATA 2015 and WKCOSTBEN 2016 have pointed out that clustering effects in multistage catch sampling programmes may lead to effective sample sizes much lower than the number of units sampled, e.g. fish caught during one trip or haul often have more similar characteristics then the general population of fish they came from. This effect highlights the likely existence of oversampling in the lower stages of many national catch sampling programmes (e.g. trips, hauls within trips, samples within hauls), where an excessive number of individuals may be being sampled and not accruding significant additional information to estimates provided to end-users. The Workshop on Optimization of Biological Sampling at Sample Level (WKBIOPTIM) developed and tested a set of simple R-scripts (based on the RBD exchange format) which produce a range of simple statistical and graphical ouputs to be used for discussion of appropriate levels of biological

	sampling of different stocks. Data quality indicators of the biological variables under the optimization procedures carried out at the workshop were discussed and a roadmap for future discussions with end-users outlined. Given the positive feedback both from national labs and RCM's it is recommended that a second workshop takes place to continue the work initiated. It is envisioned that WKBIOPTIM should be a joint workshop bringing together experts from WGCATCH and WGBIOP and that the main results will be brought to further discussion by these two groups. Case studies will be carefully selected and developed to calculate the effective sample size for length, age and maturity (ToR a); combine data from different on board and onshore sampling programs (ToR b) and discuss the consequences of pooling strata and low sample sizes under optimisation (ToR c). Outputs from these case studies will assist discussions on the objective selection of the biological parameters to optimise in view of the simulated distribution outputs, in line with end-users needs (ToR d). Testing and documentation of the code and the R-tool box will be ongoing and implemented via the case studies.
Resource requirements	The data collection programmes which provide the main input to this group are already underway, and resources are already committed. All EU countries already have the datasets required for analysis available in the RDB format. Some preparation of R-scripts and selection of case-studies will be required prior to the meeting. It is expected that a progress meeting will take place 6 months following the meeting where feedback from the national laboratories will be required.
Participants	The Workshop is expected to attract wide interest from those involved in WGCATCH and WGBIOP and should include a subset of participants familiar with R-code to the level of "loop coding" and "function building" and a subset of participants experienced in age and reproduction analysis. In view of its relevance to data collection within ICES, the EU-MAUP and regional sampling designs, it should include those involved in the annual planning of sampling and and laboratory analysis, including e.g. number of trips to be sampled and fish to be measured and aged/sexed. Members of survey groups located under SSGIEOM are also among the probable participants.
Secretariat facilities	Some secretarial support will be needed. The WK should take place in 2018. Therefore it will need to be approved by ACOM and SCICOM in early 2018.
Financial	Member States may fund this through their EMFF programme
Linkages to advisory committees	ACOM and SCICOM
Linkages to other committees or groups	WGCATCH, WGBIOP, PGDATA, EOSG
Linkages to other organizations	RCGs

Proposal: The Workshop on methods for developing fishery-dependent indices of abundance for use in stock assessments (WKCPUE), chaired by Mary Christman (USA) and Hans Gerritsen (IRL), will meet at the Marine Institute, in Galway, Ireland, 12–15 June 2018 to:

(a) Review statistical methods currently implemented in several countries for standardising fishing effort, filtering trip data for single species landed by mixed fisheries (e.g. Stephens and MacCall, 2004, Fisheries Research, 70, 299–310) and deriving abundance indices and associated measures of uncertainty in the index. Evaluate strengths and weaknesses of the different methods.

(b) Provide guidance on choice of methods for the inputs to stock assessments generally and where relevant specific caveats with regards to use in specific assessment models.

(c) Develop contrasting case studies from ICES EG to demonstrate the application and relative performance of a range of statistical modelling approaches design-based methods of developing relative indices of abundance. This should include some data-rich stocks which also have fishery-independent survey data known to accurately track stock abundance, stocks taken in mixed fisheries (i.e. not targeted) and some data-limited stocks for which fishery-dependent abundance indices could provide the main source of information on stock trends.

(d) Consider how abundance indices could be developed for specific data streams such as onshore sampling, at-sea-observers and landings & effort information or how theses could be integrated across data streams. Where possible, such developments should account for changes in fishery management over time. (e.g. gear restrictions, use of IFQs, etc.)

The Workshop needs a targeted data call for catch and effort data for case study stocks.

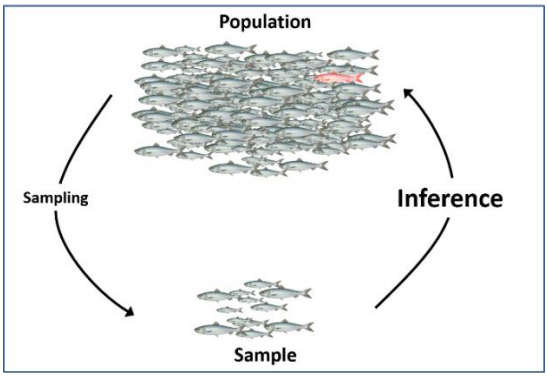
WKCPUE will report by XXXX for the attention of the ACOM, SCICOM, and WGCATCH.

Supporting Information

Priority	This workshop is considered to have a very high priority for improving the assessment of stocks, especially for those with no or inadequate fishery-independent abundance indices.
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. The absence of reliable abundance indices for a stock is a major impediment for providing advice on stock status, and is an issue with many data limited stocks. Fishery-dependent indices have fallen out of favour in many stock assessments due to issues with data quality and concerns over changes in fishing efficiency, selectivity and discarding. At the same time some aspects of data quality are improving, for example availability of VMS data and lengthening series of observer data. The workshop will document and demonstrate advanced methods to filter data to remove trips with very low probability of catching the species of interest, and to standardise the remaining trip data using statistical models such as delta lognormal. Performance relative to simpler methods will be evaluated.

Resource requirements	The principal resource requirements are people with the statistical and data collection skills needed for the workshop, including data analysts as well as stock assessors. Historical data needed for the case study evaluations are already collected and must be made available. One additional top-level expert in the area of standardization and analysis of catch-per-unit-effort and survey statistics will be invited to attend the meeting and review the quality of final outputs.
Participants	To be arranged. Participants should have a good background in statistics and programming and having been (or being currently) directly involved in the design and implementation of CPUE/LPUE time-series or their use in stock assessments.
Secretariat facilities	Some secretarial support will be needed. The WK should take place in 2018. Therefore it will need to be approved by ACOM early in 2018.
Financial	Member States may fund this through their EMFF programme.. ICES funding (travel funds, per-diem) are required to ensure the participations of co-chair Mary Christman and the additional external expert.
Linkages to advisory committees	ACOM and SCICOM
Linkages to other committees or groups	PGDATA, WGCATCH, stock assessment EGs.
Linkages to other organizations	Other RFMOs

Proposal: ICES training course on Statistically Sound Inference for Commercial Catch Sampling Programmes



Course title

Statistically Sound Inference for Commercial Catch Sampling Programmes

Context, objective and Level

Unbiased and precise estimates of commercial catch data such as discard volumes, length or age composition are essential inputs to many stock assessment methods. This training course is an applied statistical methods course, concerned almost exclusively with the estimation of commercial fishery data used in ICES assessments but is also relevant to member states needs for data reporting.

The course aims to provide national staff with the level of expertise required to improve data collection and provision at national and international levels in a way that meets ICES demands for both quantity and quality of catch information, while exponentiating progress towards statistically sound sampling of ICES stocks.

The course will examine common problems experienced by national scientists when designing and estimating commercial catch data for assessment. After a brief review of common sampling strategies and estimators used to characterize commercial catches, the course will focus extensively on more complex sampling designs (e.g. stratified multistage cluster designs with equal and unequal probability) and methods for comparing those designs in order to optimize the sampling effort. Methodologies used to correctly calculate inclusion probabilities, handle missing observations (missingness), for post sampling data usages (e.g. domain estimation), for extracting information from older datasets that have been collected in a statistically rigorous manner or for data-limited stocks, and non-parametric methods for obtaining confidence intervals for estimators will be covered. The latter includes modern approaches such as bootstrapping or Monte Carlo simulation and can also be used to assess bias in the estimators such as that due to incorrect specification of inclusion probabilities or for the older datasets obtained without probabilistic sampling. Alternative estimation approaches, such as model-assisted and model-based inference, will be reviewed and compared.

Dates and Venue

18–22 June 2018 at ICES Headquarters, Copenhagen, Denmark

Organisation

MCC Statistical Consulting, Gainesville, FL 32605

Admission and Registration

The target audience for the course are national scientists that routinely participate in the sampling design and estimation of catch sampling programmes developed in ICES waters. The course is advanced-level and follows on the previous ICES training courses in Design and Analysis of Statistically Sound Catch Sampling Programmes (2014 and 2016). It is recommended for those with previous statistical background and/or active in the design and estimation of relatively complex designs (e.g. stratified multistage designs involving selection with unequal probability). The core programming language of the course will be R so participants are expected to be familiar with the language and be able to independently write their own R functions and simulations. All code used to develop the examples in the course will be provided to the participants for their own use.

Fee

To be determined

Programme (*If long attached in separate file*)

1) Review of sampling designs currently in use for ICES stocks
    a. Alternative designs
    b. Calculating inclusion probabilities
2) Review of Inferential procedures for those designs
    a. Design-based
    b. Model-assisted
    c. Model-based
3) Missingness – dealing with missing data
    a. Loss of data within the sampling strategy
    b. Unplanned domain estimation
4) Methods for data-poor stocks
    a. Addressing the effects of non-probabilistic sampling on estimation of indices and their measures of uncertainty
        i. Diagnostics for size and direction of bias
        ii. Estimating and accounting for uncertainty
    b. Addressing the effects of data limitations on index development
5) Non-parametric approaches to estimating bias and precision
    a. Methods
        i. Bootstrapping
        ii. Monte Carlo simulation
        iii. Jackknifing
    b. Constructing confidence intervals
    c. Assessing and correcting bias
6) Comparing alternative designs for efficiency and optimization
    a. Examples
        i. Reduction in number of strata
        ii. Assessing sources of variability in multistage designs
        iii. Considering alternative estimators

Lecturers

Mary C. Christman, MCC Statistical Consulting, USA

Jon Helge Vølstad, Institute of Marine Science, Norway

Annex 6. Generic ToR of WKSDECC series

Workshop on Sampling Design and Estimation of Commercial Catches: Stock(s) (WKSDECC No) chaired by Name (Country) and Name (Country), will meet in PLACE, CITY (COUNTRY), from DATE to DATE YEAR, to:

a) Document national sampling designs of commercial catches of **Stock(s)** back to YEAR, commenting on their statistical soundness and the quality of data they can deliver.

b) Document national estimation methods of commercial catches of **Stock(s)** back to YEAR, commenting on their statistical soundness and the quality of estimates they deliver.

c) Produce a WD summarizing the findings, research needs and a roadmap for commonly agreed improvements in sampling and estimation that consider future needs of assessment of this stock.

d) Present outcomes at the next WGCATCH meeting

WKSDECC No will report by DATE to the attention of ACOM and SCICOM.

Supporting Information

Priority	This workshop is considered to have a high priority for documenting and evaluating the quality of past and current commercial data collection and estimates used by ICES assessments.
Scientific justification	The documentation of current and historical national sampling designs has been pointed out and promoted by several ICES EGs (e.g. WGCATCH, PGCCDBS, WKPICS, SGPIDS) as a fundamental aspect of the transparency and quality of sampling and estimation of commercial catches routinely carried out by ICES Member Countries and delivered to ICES Assessment Groups. Furthermore it is an important first step for the regional coordination of sampling programmes and discussions on the improvement of the startistical soundness of the sampling programmes that will also ensure that, in future, it will be possible to re-estimate historical data when new methods are developed and/or new end-users needs appear. Similar documentation of current and historical estimation practices is also fundamental for transparency and data quality but has received less attention, with many ICES stocks having estimation practices at present undocumented. This workshop will use cod-kat as a case-study for testing the historical documentation of national sampling designs and estimation methods on the stock back to 2002 (ToR a-b), and discuss the quality of past data and a road-map for future improvements (ToR c-d). Stock(s) was selected as a case-study because Indicate Motive.
Resource requirements	Participants are requested to document sampling designs and estimation methods ahead of the meeting according to a supplied format; and to bring to meeting a) historical commercial data on the stock (from Year onwards) stored in the latest RDB/RDBES exchange format, b) historical intercatch estimates from that stock (from Year onwards). Member countries not participating in the meeting but with a significant share in the fishery will also be requested to provide similar data in similar formats. Assessment Group will be consulted to identify their future needs of commercial data for assessment purposes.
Participants	The target attendance are participants from member countries involved in the fishery. 8-10 participants are expected to attend. Participants should have prior experience in statistically sound sampling and/or estimation and/or r-scripting.

Secretariat facilities	Some secretarial support will be needed.
Financial	Member States may fund this through their EMFF programme.
Linkages to advisory committees	ACOM and SCICOM
Linkages to other committees or groups	WGCATCH, WGBIOP, PGDATA, Assessment Group, SC-RDBES
Linkages to other organizations	RCM/RCGs

Annex 7: ToR a.1 Abstracts from the presentations on Sampling programmes

"Baltic commercial fisheries catch sampling scheme in Poland–the evolutionary changes". Maciej Adamowicz, Ireneusz Wójcik, Tomasz Nermer, Rafał Adamski and Włodzimierz Grygiel.

The aim of presentation entitled: "Baltic commercial fisheries catch sampling scheme in Poland - the evolutionary changes", linked with the ToR a), was to summarize the information about implemented in Poland in 2017 modification in the sampling program, dedicated for the collection of the Baltic commercial fisheries data. The presentation was divided on three parts – sampling design, sampling intensity and sampling management. The major improvement in comparison to the previously applied sampling program is the change from opportunistic- to random-selection of primary sampling units (PSU) and the stratification of sampling design was based on applied 15 PSUs groups. The sampling intensity remains at the same level that was performed in the previous years. The number of 208 commercial fishing trips to be sampled was split into PSUs groups and quarters proportionally to the fishing effort from the reference period (2013-2015). Based on the Baltic fish sampling design applied, a dedicated web application was developed to support sampling process management.

Discussion: The content of presentation was discussed and the main feedback registered. WGCATCH participants welcomed the improvements being considered in Poland to improve the sampling of its fisheries. The recommendation from the WGCATCH was to examine the stratification of the sampling program and consider lower number of PSUs groups in order to avoid having stratums with small number of samples. It was also mentioned that the stratum should have at least two samples in order to be able to calculate the variance. Another suggestion was to consider having one annual list of randomly selected PSUs instead of four quarterly lists. According to statistical principles, one vessel should be assigned to only one stratum. In the case when a vessel is fishing two neighbouring stocks, e.g. western and eastern Baltic cod, which are two different stratums in the Polish sampling design, it is worth to consider having one common stratum and then post-stratify the sampling results.

The Irish observer scheme: Implementing 4S. Hans Geritsen, Marine Institute, Ireland

Ireland has started to implement a probability-based sampling scheme for the demersal at-sea observer programme. The population of interest is the commercial catch of all demersal stocks caught by Irish vessels. The sampling frame is a list of vessels x time. However, the distribution of trips by vessel is highly skewed: half the trips are done on the top 15% vessels. The trips themselves are equally skewed in terms of their contribution to the landings: half the trips are on small vessels (<18m) but these trips only contribute 15% of the landings. Therefore, randomly selecting vessels or trips with equal probability will result in an inefficient sampling design. Instead, the selection probability was made proportional to the landings of each vessel in the same quarter of the previous year. This was shown to be a reasonable predictor of the landings (and presumably catches) in the current year. The sampling scheme was simulated using the landings from the logbooks. The basic scheme resulted in sufficient samples in 7bcgjk stocks but very low sample numbers in 6a and 7a, due to the lower landings from those areas. The area in which vessels operate can vary but it was decided to create three sampling frames: vessels with a track record in 6a, vessels with a track

record in 7a and the remaining vessels (7bcgjk). By selecting 10 trips per quarter from each of these lists, the simulation indicated that the samplings level for all stocks would remain similar to the present situation, which is considered sufficient.

Discussion: The content of presentation was discussed and the main feedback registered. WGCATCH participants welcomed the improvements being considered in Ireland to improve the sampling of its fisheries. A suggestion was made to explore the possibility of having selection probabilities proportional to effort (as opposed to landings) since there is not always a strict correlation between landings and discards. It was also suggested that sampling would be done without replacement as a means to avoid sampling the same vessel a number of times, which reduces the effective sample size. It was also noted that when sampling from a pool of trawlers and gillnetters there was a risk that only one of these would be present in the samples/estimates and that stratification into main gear might be explored as a means to avoid that. A few questions were left pending: If the age or length composition varies with the size of the catch, this scheme is less efficient (but not necessarily biased). E.g. it is possible that small, inshore vessels, with small landings per trip, will catch smaller fish than large vessels with large landings. I would be worth exploring this. Also, there is a need to target certain stocks when sample numbers collected with this new scheme are insufficient. How do we incorporate these samples in the (design-based) estimation?

The Practical Challenges of Catch Sampling in the Netherlands. Michiel Dammers, Harriet van Overzee, Ruben Verkempynck. Wageningen Marine Research, The Netherlands.

The Netherlands has four types of fisheries: pelagic, demersal, shrimp and passive (longline, crab traps, gillnets, hand/pole line). These types of fisheries are being sampled by Wageningen Marine Research with three methods: self-sampling, at-sea observer sampling and auction sampling. When self-sampling, fishermen take their own samples once every two weeks. When at-sea observer sampling, observers join the fish trip and do the research on-board. When auction sampling, observers sample the landings at the auction.

While working with sound statistical sampling methodologies, it became clear that there were doubts on how to deal practically with certain situations. For instance, the categorisation of the response rate and the number of trips. There are a lot of factors (weather, observer planning and availability, miscommunication and budget) that have an influence on the response rate. Not only do these factors make finding a vessel hard, it also results in different responses. In many cases it is hard to categorise these responses and to decide when a 'yes' is a 'yes' and a 'no' is a 'no'. Also, with the sampling obligation being decisive, often trade-offs need to be made when options for statistical sampling are limited. There is an obligation to commit to a prescribed number of trips to collect data, in order to suffice with our sampling obligation. The market sampling is steered by the sampling obligation. This obligation is based on historical data and it is crucial the sampling obligation is met, as the data feeds into the assessments. The most important species in the auction sampling are categorized in groups: 1) plaice and sole, 2) cod, 3) flounder, lemon sole, brill, dab, and turbot, and 4) another group of 12 species. When the sampling obligation is compared to the realised landings in the previous year, inconsistencies are found. The two most important species that need sampling are also the species that are mostly landed. However, the second most important group to sample is cod, and cod is not landed as frequent as the other species. This is also the case for brill and lemon sole. In other words, if we would apply a

weighted random sampling selection on the fleet according to the realised landings of the previous year, we would not meet the sampling obligation.

Besides the sampling obligation there is also a restriction on the ports where sampling is practically feasible. In practice, we focus sampling on the 6 most important ports where together 80% of the fish is landed. The other 20% of landings are scattered over the country and are mainly ports where there is no auction. The last restriction, is that the sampling is mainly limited to Fridays as most auctions take place on this day. Within these three restrictions (species, port and day) we need to build a statistically sound sampling method.

So, how do we sample? The first step is to determine via a species list (based on the sampling obligation) which species we want to sample in the auction. We then randomly select a port, where fish landings by species are incorporated as weighting factor in random selection. At the auction, two challenges arise. The first is time, as there is limited time between the landing of the fish and the auction sale, this is a restraint. The second challenge is the access to the fish, because permission from the skipper is required. Once at the auction, permission is granted and timing is optimal, a cold storage, that holds landings, is randomly selected. In that cold storage, a fish box is selected based on availability. In practice, this means one of the fish boxes on top or one of the boxes that requires minimal lifting is chosen because otherwise a forklift or more time to lift all the boxes is needed.

In summary, as illustrated by the previous examples the main challenges that are currently being observed in the Dutch market and at-sea sampling programmes are:

- How to characterize a response?
- Sampling obligation does not correspond to the reality.
- Practical challenges (communication, day of the auction, time at the auction, lifting of fishboxes)
- Cooperation of skipper (permission to sample landings).
- Budget: limits all the above.

What is needed **i**s a practical guide for statistically sound sampling. What is allowed, what isn't allowed under that sampling regime, keeping in mind the different factors that play a role during situations in the field?

Discussion: The content of the presentation was discussed and the main feedback registered. WGCATCH participants welcomed the efforts being considered in The Netherlands to address the difficulties of sampling its fisheries. WGCATCH participants formulated some practical suggestions including: a) subset the register list of small-scale fishing vessels by having those fishing vessels on there that are minimally active for a certain period during the year, and document this subset, estimating the potential under-coverage of such system, b) the usage of the no-response categories documented by SGPIDS 3 (ICES, 2013), c) explore the possibility of carrying out systematic sampling instead of random sampling of boxes, d) always keep documentation on what the monitoring programme can or cannot do (only active fishing vessels? Only vessels above 10 meters?) And thus, what the monitoring programme is sampling or is not sampling.

On the Greek National Fisheries Data Collection Programme. Eirini Mantzouni, Aggeliki Adamidou & Manos Koutrakis. Hellenic Agricultural Organization – Demeter Fisheries Research Institute (F.R.I.) and Agricultural Economics Research Institute (AGR.E.R.I), Hellenic Centre for Marine Research (H.C.M.R)

The Greek fishing fleet consists of a large number of vessels (the largest in the EU) of low tonnage and power. According to the National Fleet Register of 31/12/2016, the fleet consists of 15,183 registered fishing vessels with a total tonnage of 71,762 GT, total power of 430,812 KW and average age of 28 years. The great majority (~95%) of the fleet consists of small vessels (average length 7.5 m) exploiting the extensive coastline of the mainland and of the numerous Greek islands (15,000 km, covering more than 6,000 islands and islets, i.e. the largest in the Mediterranean, with 200 small and big ports), targeting the coastal fishing stocks. Greek fishing activities cover three GSAs: (a) Aegean Sea (GSA 22), (b) Ionian Sea (GSA 20) and (c) Cretan Sea (GSA 23).

The Greek fishing fleet is categorized in the following three major categories depending on the fishing activity:

- Trawl fishery, consisting of 258 vessels (1.7% of the Greek fishing fleet), while its production represents ~25% of total fisheries production. It t is a mixed fishery that targets demersal species and is only one métier (OTB_DES_>=40_0_0).
- Pelagic (purse-seine) fishery consisting of 245 vessels (1.6% of the Greek fishing fleet). It targets mainly small pelagic species (anchovy and sardine), mackerel and horse mackerel as well. It is only one métier (PS_SPF_>=14_0_0).
- Coastal fishery, which is the largest part (95.1%) of the Greek fishing fleet (14,443 vessels) consisting of inshore vessels fishing with static gears in the coastal zone. It has a multi-gear and multispecies character. A total of 6 métiers has been selected for sampling: Set gillnet for demersal fish (GNS_DEF_>=16_0_0), Set trammel net for demersal fish (GTR_DEF_>=16_0_0), Set longlines for demersal fish (LLS_DEF_0_0_0), Drifting longlines for large pelagic fish (LLD_LPF_0_0_0), Pots and traps for demersal species (FPO_DEF_0_0_0) and Beach and boat seine for demersal species (SB_SV_DEF_0_0_0).

The sampling scheme for the volume and length of the catch fractions (landings, discards and PETs) is based on the principles of stratified random sampling, employing the métier (level 6) as the basic stratum. The reference list of métiers that was agreed at Regional level during the RCM Med&BS 2009 has been used for the selection of the métiers that have to be sampled. The selection of métiers was based on the ranking system described in the Commission Decision 2010/93/EU, resulting in 8 métiers in total, as described above. The Hellenic coastline and marine area of the 3 aforementioned GSAs are divided in 12 major subareas which constitute the next level of stratification within each métier. The Primary Sampling Unit (PSU) is the fishing trip. The total number of trips to be sampled is defined proportionally to the effort (number of days at sea) for each métier during the reference year. The source of data is the official national fleet registry used to classify vessels by fleet segment and area, and the DCF data collection system of the reference year used for the effort data that were attained based on the sampling scheme. The target population is the number of trips of all commercial vessels per GSA, for the reference year. The frame population is the number of trips of the commercial vessels that fish in the selected by the ranking métiers, at GSA level. The PSU selection is performed through random-draw of a trip by métier and per GSA,

with the option to replace the trip in case that the vessel owner refuses the cooperation. Thus, the sampling scheme is based on the principles of stratified random sampling (8 métiers X 12 subareas), implemented through sampling trips performed by observers at sea and on shore (landing sites). The sampling trips are performed quarterly, taking into account the temporal distribution of the effort within each métier and area. For inshore vessels (~95% of total fleet), 1/3 of the sampling trips is performed at-sea and the 2/3 onshore. For purse –seine fishery, the sampling trips are divided equally at sea and on shore, while for trawlers and beach-seines, they are all performed at sea.

Biological data on weight, age distribution, sex ratio and maturity is collected for the stocks listed in Tables 1A, 1B, 1C of Com. Imp. Dec 2016/1251 and GFCM-DCRF Annexes A.1, A.2, A.3 (i.e. stocks that their landings are above 200 t or the share of the country in the EU Mediterranean landings is above 10%). The sampling scheme is stratified random sampling, with GSAs as the basic stratum while the PSU is the fishing trip. Métiers are not used as a stratum in this case, since the aim is to derive the biological data on the stocks level, irrespectively of the fishing gears. The sampling intensity for each species is currently based on previous year's knowledge, while from 2018 onwards it will be calculated using the tool devised by the MARE/2014/19 project in this regard, according the agreement N.3 of RCM MED&BS-LP 2016. The biological variables (age, weight, sex ratio, maturity) are collected quarterly to detect seasonal differences in the structure and composition of the species examined. Regarding age distribution, quota sampling is employed, with the aim to collect 5-10 specimens (depending on the species) for each size class. Data sources are the commercial samples collected through sampling at sea, and on shore per GSA. Samples obtained from scientific surveys can also be used supplementary, mainly for the non-marketable fraction of the stocks, and for the closed season of the trawl fishery. In addition, samples from the market or from discards can also be used, if the quota for each size group has not been achieved through the sampling trips, especially for the largest and the smallest specimens.

The sampling hierarchy is presented in Figure 1. Vessel trips are randomly selected within each stratum (i.e. for every métier within each of the 12-subareas, where it is relevant, thus 8 métiers X 12 areas) and then they are equally divided across the quarters. At sea, all hauls are selected (no stratification), and within each haul, samples are taken from the whole amount of landings. Regarding the discards, the 10% of the volume in each haul is used. On shore, the samples are taken from the whole volume of the landings. The species to be sampled for length composition or for biological data are selected as described above (based on the Tables 1A, 1B, 1C of Com. Imp. Dec 2016/1251 and GFCM-DCRF Annexes A.1, A.2, A.3.). Regarding length composition, a random sample of up to 50 individuals (depending on availability) per species is selected from the landings and from the discards (separately) per haul (at sea), while on shore the samples are taken from the total amount of landings. Concerning biological data, specimens for each species are sampled based on their size, so that eventually 5-10 specimens per size group of each species (in each GSA) will be selected annually (quota sampling).

Data on fishing capacity is collected through the National Fleet Register for the following quantitative aspects: number of fishing boats, gross registered tonnage, engine power, age. Data on fishing effort and landings, is collected through different sources, since different requirements derive from EU Legislation according to vessel size:

- Fishing vessels >12 m (~12% of total fishing fleet, accounting for ~50% of total landings) are required to use Vessel Monitoring System (VMS), and

electronic report system (ERS); both are used for the monitoring of fishing activity

- Fishing vessels of 10-12 meters are required to fill out paper logbooks, but there are no obligations to record catches below 50 kg per species
- Fishing vessels < 10 m are not obliged either to fill out any type of logbook or to present sales notes for catches below 50 kg per species

Thus, for the monitoring of fishing activity for vessels <12 m, as well as for the validation of the data reported by the vessels > 10 m, data are collected through a sample survey using face to face interviews and structured questionnaires (as also proposed by MARE/2014/19). In addition, the data derived from biological samples provide productivity parameters, such as the CPUE, that can be used both as a check-control for the information coming from the Control Regulation and those derived from sampling survey. The sampling method for the survey is simple random sampling, in each fleet segment of the Greek fishing fleet and within each of the 12 subareas. The sample unit is the vessel and it is selected from the Greek vessel registry (target population, coinciding with frame population). The sample size in each fleet segment is based on population size and variance. The number of inactive vessels is estimated from the selected sample, as there is no a priori information on inactivity. All fishing activity variables are collected monthly with the exemption of the capacity group variables.

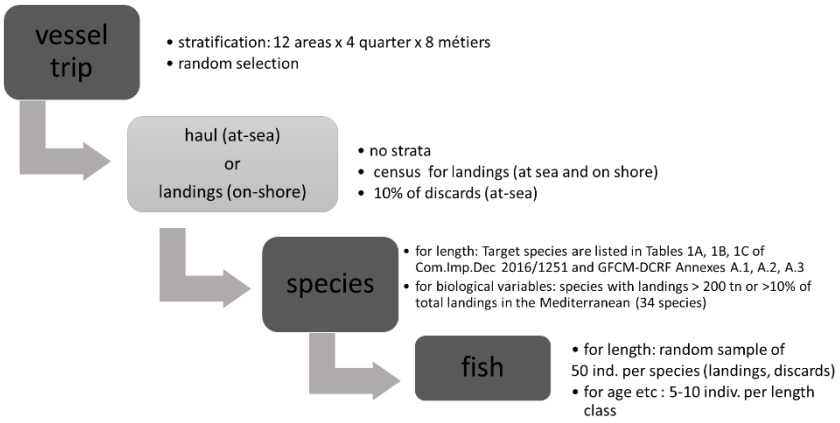


Figure 1 – Greek Nation sampling hierarchy.

Discussion: The content of presentation was discussed and the main feedback registered. WGCATCH participants welcomed the efforts made by Greece to sample its fisheries. Among other WGCATCH participants suggested that quota sampling is avoided as it is a non-probabilistic technique and can generate a spatial and temporal distribution of the samples that does not represent the actual fishery.

Annex 8: ToR a.1 Abstracts from WGCATCH-related workshops carried out during 2017

WKSDECC I – Workshop on Sampling Design and Estimation of Commercial Catches: Cod.27.21 and sol.27.4

The objective of this workshop was dual; 1) Document sampling designs and estimation of commercial catches back to 2000 and evaluate the statistical soundness and the quality of data/ estimates they deliver; 2) Populate the latest version of RDB-exchange format and develop R-scripts with present estimation that runs on the format.

For 1) two templates developed intersessional by WGCATH where populated, tested and further developed. The templates were useful for documentation, evaluating the statistically soundness of the sampling plan and to some degree the quality of data/ estimates. To further evaluate data quality there is a need to run simulations. In general, the templates were only populated with a single year at the WK and therefore it was not possible to come up with a full evaluation of the time-series, but the group are currently working on finalizing a time-series for at least one of the stocks.

The RDB-exchange format is currently under development, so the format used for 2) was still a draft version and not well documented. Further the format under development is quite different from the present format. Most participants managed to populate the format - Single samples, directly from national database, from present RDB format (+/- auxiliary data) – and valuable feedback was given to ICES to support the development process.

WKBIOPTIM - Workshop on Optimization of Biological Sampling at Sample Level

The Workshop on Optimization of Biological Sampling at Sample Level (WKBIOPTIM), chaired by Ana Cláudia Fernandes (Portugal) and Julie Coad Davies (Denmark) was held in Lisbon, Portugal, 20–22 June 2017. Twenty-two participants from 12 countries within the ICES and Mediterranean communities were represented

The workshop focused on practical aspects of optimization of sampling. Prior to the workshop, two sets of R-scripts were developed that used the current exchange format of the Regional Data Base (RDB) as input. The first set of scripts is useful for cases where there is considerable a priori evidence of oversampling (e.g. several hundreds of measurements per sample over a relatively short size/age-class range). The script implements simulations of several types of sampling strategies (user defined) and produces a set of graphical and numerical outputs that allow the visualization of the consequences of measuring different number of individuals per sample. The second set of scripts can be used to determine the number of fish, hauls and trips that should be taken without significant loss of precision in the final estimates. In both cases scripts were prepared to use “lengths” as the biological parameter to be analysed but can be extended to other biological parameters, like age distribution or discards.

Participants brought their own case-studies and three subgroups were formed: one that tested the first script (sample level), one that tested the second script (multilevel analysis) and one that discussed quality indicators for length/age frequency data. Workshop time was spent introducing participants to the analyses carried out in the scripts, adapting data inputs to different formats (e.g. length frequencyvs.length of individual specimens), debugging coding errors, and running simulations of the case-studies. The outputs of the case-studies were analysed during and after the workshop.

In what concerns to quality indicators, some possible indicators that can be used for biological parameters were discussed.

WKBIOPTIM identified considerable margin to reduce the sampling effort in some of the case-studies presented without compromising the quality of the data to be used by the end-users. In what concerns both sample-level and multi-level optimization, the R scripts developed can be used to simulate and analyse a range of different sampling scenarios with the outputs being useful in discussions of improvements to national and regional sampling plans. Following the workshop, concrete reduction in the sample sizes collected for some species have been achieved after dialog with data end-users. Such reductions resulted in time savings and facilitated data collection in other stocks. In what concerns quality indicators for other biological parameters and additional quality indicators for length frequency data, a request for advice was sent to WGBIOP and WGCATCH with the aim of including a large array of indicators in future updates of the R-scripts and better adapt them to a wider array of end-user's needs.

The expansion of the application of the R-scripts to other biological parameters (weights, ages and maturity) is considered of high importance since biological data collection is inherently multivariate and multi-purpose frequently extending far beyond collection of length data. Future developments of the scripts are expected to happen as part of WKBIOPTIM2 which will aim to, among other, include additional biological parameters in the analyses, the integration of additional quality indicators (e.g. effective sample size) and a discussion of the most appropriate balance between them (based on end-user's needs). It is envisioned that a harmonized toolbox of R-scripts and R-vignettes, possibly encompassed in an R package, will ultimately be produced and aid national labs in the planning of their work

Annex 9: ToR a.2 Analyses of RDB data on national landings in foreign ports

Analysis of RDB Commercial Landings (SL) data

A request was sent to the ICES Data Centre for access to aggregated data from CL. The data were received as a csv file, imported to R and preprocessed. The preprocessing involved a restriction to FAO Area 27.

Some limitations of the analysis of foreign landings using RDB data

The quality of analyses of RDB data is conditional to the quantity and quality of data uploaded by each country to the RDB and its completeness with regards to ICES stocks. Not all ICES countries upload data to the RDB (e.g. Norway, Iceland, Faroe Islands) and these constitute a significant fraction of landings of some ICES stocks. Furthermore, some major fishing countries from RCM NS&EA and RCM NA appear not to have uploaded landings abroad to the RDB and/or have uploaded sampling location/country instead of landing location. Finally, there was evidence that landings of EU countries in non-EU countries may not always be uploaded. These situations are likely to compromise the accuracy of (at least some) of the analyses done even if the overall patterns were judged correct enough for publication in the present report.

Interannual variability in proportion of foreign landings by RCM

In 2009–2016, about a quarter of all landings took place in foreign ports with small variations between years (<10% of variation) (Table 1).

Table 1. Proportion of landings abroad per year in fishing areas of the RCM/RCGs covering the ICES region.

RCM	2009	2010	2011	2012	2013	2014	2015	2016	Mean (09–16)
RCM Baltic	0,31	0,31	0,30	0,22	0,25	0,23	0,23	0,27	0,27
RCM North Sea and Eastern Artic	0,17	0,29	0,27	0,30	0,32	0,31	0,29	0,28	0,28
RCM North Atlantic	0,26	0,25	0,19	0,19	0,26	0,22	0,17	0,16	0,21
All three RCMs	0,24	0,28	0,25	0,24	0,28	0,26	0,23	0,23	0,25

Overview of species x areas per RCM (2016)

RCG Baltic

The volume and proportions of landings abroad of the species x areas combinations that register more than 2 000 tonnes annual landings are displayed in Figure 1 and table 2. It is noticeable that in some cases landings abroad constitute a large volume *per se* which can be quite significant for assessments (e.g. Central Baltic Herring her.27.25-2932; Baltic Sprat spr.27.22-32). In what concerns Central Baltic Herring and Baltic Sprat, landings of national vessels abroad represent over ¼ of total landings registered in the RDB (in fishing areas of this RCG), with landings of Swedish vessels in Denmark representing the largest fraction of the "landed abroad" component.

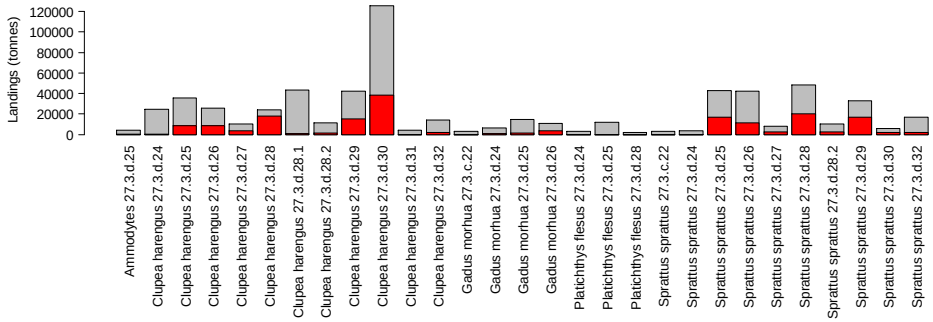


Figure 1. Total volume of all landings (grey bars) and volume of landings in foreign ports (red bars) registered for species*areas combinations in the Baltic Sea with over 2000 tonnes annual landings (source: RDB, year 2016, date of extraction: 2017-11-22)

Table 2. Total volume of landings and proportion of landings in foreign ports registered for species*areas combinations in the Baltic Sea with over 2000 tonnes of annual landings (source: RDB, year 2016, date of extraction: 2017-11-22)

Species*Area combination	Total landings in RDB (ton)	Proportion landings abroad
Ammodytes 27.3.d.25	4247	0,09
Clupea harengus 27.3.d.24	24624	0,02
Clupea harengus 27.3.d.25	35695	0,24
Clupea harengus 27.3.d.26	26030	0,34
Clupea harengus 27.3.d.27	10598	0,33
Clupea harengus 27.3.d.28	24017	0,76
Clupea harengus 27.3.d.28.1	43183	0,03
Clupea harengus 27.3.d.28.2	11621	0,12
Clupea harengus 27.3.d.29	42172	0,37
Clupea harengus 27.3.d.30	125351	0,31
Clupea harengus 27.3.d.31	4445	0
Clupea harengus 27.3.d.32	14101	0,13
Gadus morhua 27.3.c.22	3111	0
Gadus morhua 27.3.d.24	6304	0,11
Gadus morhua 27.3.d.25	14765	0,1
Gadus morhua 27.3.d.26	11026	0,33
Platichthys flesus 27.3.d.24	3081	0
Platichthys flesus 27.3.d.25	11809	0,01
Platichthys flesus 27.3.d.28	2354	0
Sprattus sprattus 27.3.c.22	3050	0
Sprattus sprattus 27.3.d.24	3604	0,03
Sprattus sprattus 27.3.d.25	42595	0,4
Sprattus sprattus 27.3.d.26	42215	0,27
Sprattus sprattus 27.3.d.27	7994	0,32
Sprattus sprattus 27.3.d.28	48361	0,42
Sprattus sprattus 27.3.d.28.2	10390	0,27
Sprattus sprattus 27.3.d.29	32704	0,52
Sprattus sprattus 27.3.d.30	5745	0,39
Sprattus sprattus 27.3.d.32	16830	0,11

RCG North Sea and Eastern Artic[1]

The volume and proportions of landings abroad of the species x areas combinations that register more than 2 000 tonnes annual landings are displayed in Figure 2 and table 3. It is noticeable that in some cases landings abroad constitute a large volume *per se* which can be quite significant for assessments (e.g. mackerel, plaice and herring). In what concerns mackerel, landings of national vessels abroad represent over 50% of total landings registered in the RDB (in fishing areas of this RCG), with landings of Scottish vessels in Norwegian harbours representing the largest fraction of the "landings abroad" component. With respect to plaice, landings of national vessels abroad represent ca 1/3 of total landings registered in the RDB (in fishing areas of this RCG), with landings of English vessels in Dutch harbours representing the largest fraction of the "landings abroad" component. Finally, landings abroad of herring represent ca 1/3 of total landings registered in the RDB (in fishing areas of this RCG), with landings of German vessels in Dutch harbours and landings of Danish vessels in German harbours assuming dominance of the "landings abroad" component.

[1] Note: The analyses are approximate since some major players in the fisheries of RCM NS&EA may not have uploaded their landings abroad to the RDB. The situation is further aggravated by the absence in the RDB of landings data of non-EU countries (e.g., Iceland, Norway).

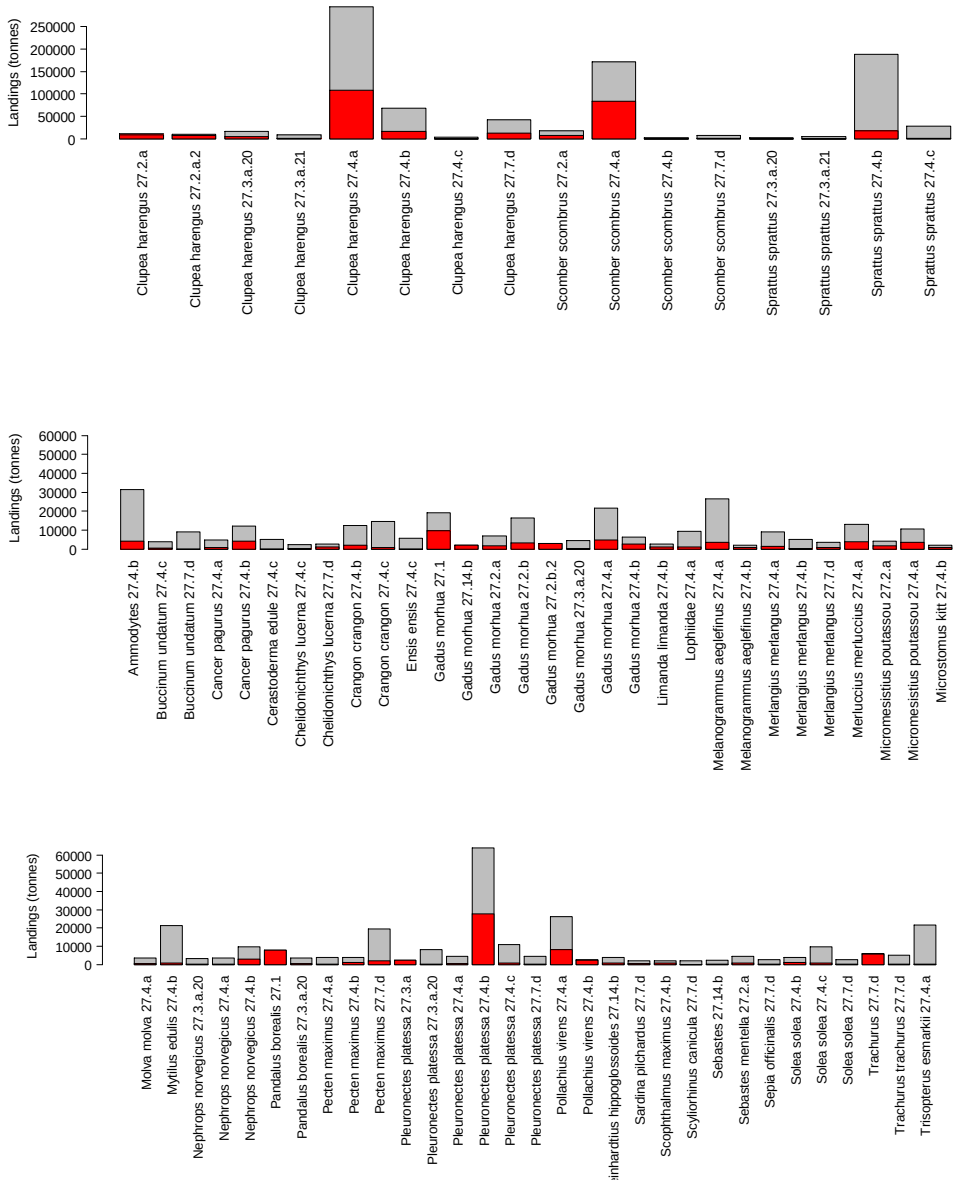


Figure 2. Total volume of all landings (grey bars) and volume of landings in foreign ports (red bars) registered for species*areas combinations in the North Sea and Eastern Artic with over 2000 tonnes annual landings (source: RDB, year 2016, date of extraction: 2017-11-22)

Table 3. Total volume of landings and proportion of landings in foreign ports registered for species*areas combinations in the North Sea and Eastern Artic with over 2000 tonnes of annual landings (source: RDB, year 2016, date of extraction: 2017-11-22)

Species*Area combination	Total landings in RDB (ton)	Proportion landings abroad
Ammodytes 27.4.b	31381	0,13
Buccinum undatum 27.4.c	3911	0,12
Buccinum undatum 27.7.d	9071	0
Cancer pagurus 27.4.a	4802	0,17
Cancer pagurus 27.4.b	12188	0,33
Cerastoderma edule 27.4.c	4996	0
Chelidonichthys lucerna 27.4.c	2380	0,12
Chelidonichthys lucerna 27.7.d	2718	0,42
Clupea harengus 27.2.a	11929	0,73
Clupea harengus 27.2.a.2	10166	0,71
Clupea harengus 27.3.a.20	16399	0,28
Clupea harengus 27.3.a.21	9018	0,06
Clupea harengus 27.4.a	293815	0,37
Clupea harengus 27.4.b	68657	0,23
Clupea harengus 27.4.c	3051	0,05
Clupea harengus 27.7.d	42949	0,31
Crangon crangon 27.4.b	12416	0,17
Crangon crangon 27.4.c	14608	0,06
Ensis ensis 27.4.c	5824	0
Gadus morhua 27.1	19226	0,5
Gadus morhua 27.14.b	2151	0,98
Gadus morhua 27.2.a	7011	0,24
Gadus morhua 27.2.b	16390	0,19
Gadus morhua 27.2.b.2	2941	1
Gadus morhua 27.3.a.20	4334	0,04
Gadus morhua 27.4.a	21485	0,22
Gadus morhua 27.4.b	6243	0,44
Limanda limanda 27.4.b	2646	0,36
Lophiidae 27.4.a	9504	0,13
Melanogrammus aeglefinus 27.4.a	26546	0,13
Melanogrammus aeglefinus 27.4.b	2087	0,45
Merlangius merlangus 27.4.a	9083	0,15
Merlangius merlangus 27.4.b	5158	0,04
Merlangius merlangus 27.7.d	3670	0,21
Merluccius merluccius 27.4.a	12932	0,29
Micromesistius poutassou 27.2.a	4188	0,43
Micromesistius poutassou 27.4.a	10469	0,34
Microstomus kitt 27.4.b	2097	0,39
Molva molva 27.4.a	3603	0,15
Mytilus edulis 27.4.b	21224	0,04
Nephrops norvegicus 27.3.a.20	3152	0,02
Nephrops norvegicus 27.4.a	3658	0,02
Nephrops norvegicus 27.4.b	9687	0,31
Pandalus borealis 27.1	7755	1
Pandalus borealis 27.3.a.20	3609	0,16
Pecten maximus 27.4.a	3702	0,07
Pecten maximus 27.4.b	3981	0,25
Pecten maximus 27.7.d	19617	0,11
Pleuronectes platessa 27.3.a	2444	0,91
Pleuronectes platessa 27.3.a.20	8177	0,02
Pleuronectes platessa 27.4.a	4346	0,09

Pleuronectes platessa 27.4.b	63811	0,44
Pleuronectes platessa 27.4.c	10845	0,09
Pleuronectes platessa 27.7.d	4560	0,05
Pollachius virens 27.4.a	26231	0,32
Pollachius virens 27.4.b	2700	0,9
Reinhardtius hippoglossoides 27.14.b	3707	0,25
Sardina pilchardus 27.7.d	2075	0,22
Scomber scombrus 27.2.a	18244	0,43
Scomber scombrus 27.4.a	171005	0,49
Scomber scombrus 27.4.b	2617	0,08
Scomber scombrus 27.7.d	7593	0,12
Scophthalmus maximus 27.4.b	2148	0,31
Scyliorhinus canicula 27.7.d	2070	0,01
Sebastes 27.14.b	2436	0,04
Sebastes mentella 27.2.a	4402	0,17
Sepia officinalis 27.7.d	2628	0,02
Solea solea 27.4.b	3748	0,3
Solea solea 27.4.c	9622	0,07
Solea solea 27.7.d	2506	0,01
Sprattus sprattus 27.3.a.20	2824	0
Sprattus sprattus 27.3.a.21	5374	0,04
Sprattus sprattus 27.4.b	187975	0,1
Sprattus sprattus 27.4.c	27765	0,04
Trachurus 27.7.d	6110	0,92
Trachurus trachurus 27.7.d	5088	0,03
Trisopterus esmarkii 27.4.a	21678	0

RCM North Atlantic[2]

The volume and proportions of landings abroad of the main species x areas combinations in the marine region of the RCM North Atlantic are displayed in Figure 3 and table 4. It is noticeable that in some cases landings abroad constitute a large volume *per se* which can be quite significant for assessments. The stocks where most of the landings are abroad are: mackerel, blue whiting and boarfish in the North Atlantic. In what concerns mackerel, landings of national vessels abroad represent ca 40% of total landings registered in the RDB (in fishing areas of this RCG), with landings of Scottish vessels in Norwegian harbours representing the largest fraction of the "landings abroad" component. With respect to blue whiting, landings of national vessels abroad represent ca 20% of total landings registered in the RDB (in fishing areas of this RCG), with landings of Scottish vessels in Danish harbours representing the largest fraction of the "landings abroad" component. Finally, landings abroad of boarfish also represent ca 20% of total landings registered in the RDB (in fishing areas of this RCG), with landings of Danish vessels in Irish harbours and landings of English vessels in Dutch harbours assuming dominance of the "landings abroad" component.

[2] The analyses are based on the data that is submitted by MS. Some of the major players in the fisheries of RCM NA may not have uploaded their landings abroad to the RDB. The situation is further aggravated by the absence in the RDB of landings data of non-EU countries (e.g., Iceland, Norway).

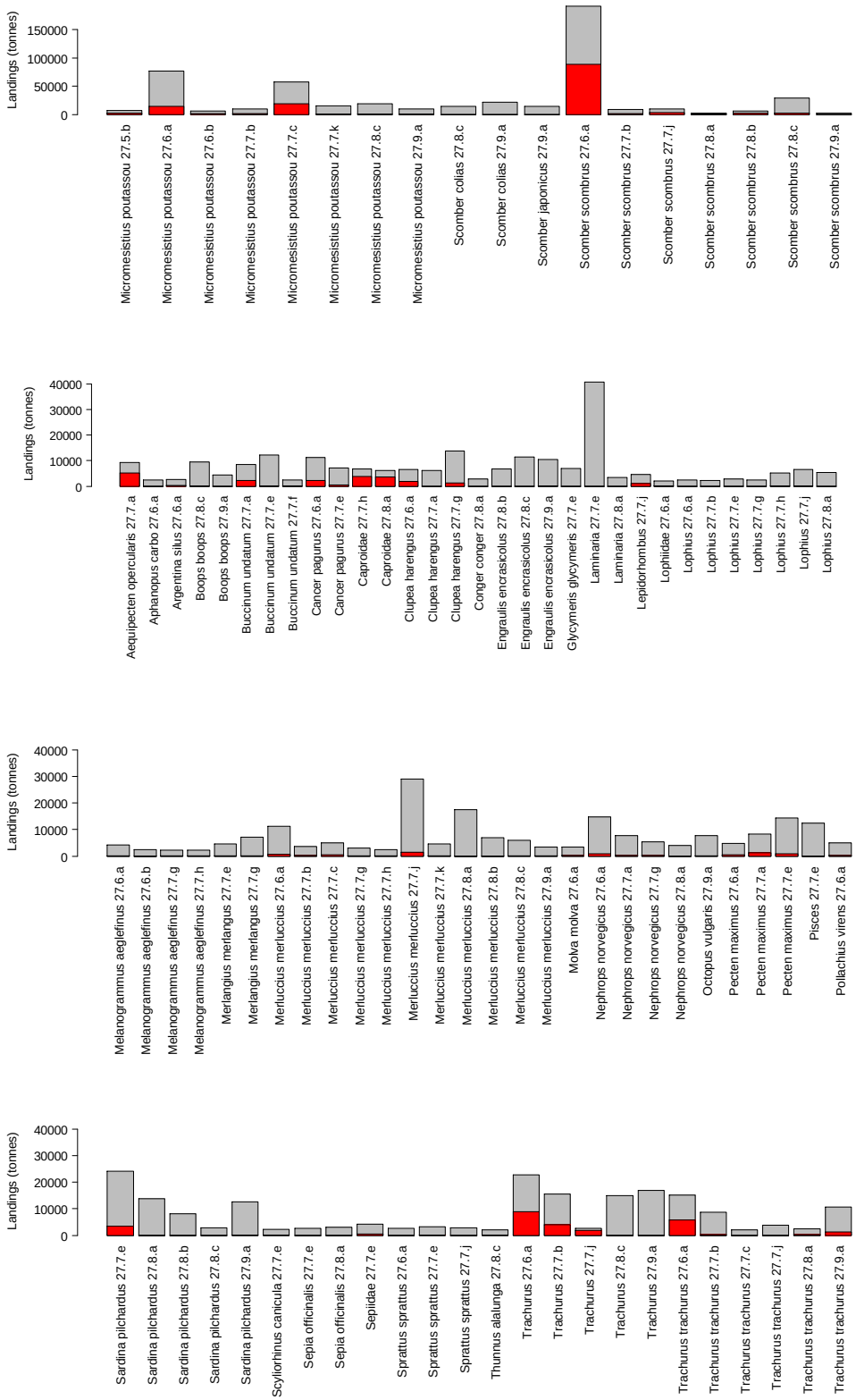


Figure 3. Total volume of all landings (grey bars) and volume of landings in foreign ports (red bars) registered for species*areas combinations in the North Sea and Eastern Artic with over 2000 tonnes annual landings (source: RDB, year 2016, date of extraction: 2017-11-22)

Table 4. Total volume of landings and proportion of landings in foreign ports registered for species*areas combinations in the North Atlantic with over 2000 tonnes of annual landings (source: RDB, year 2016, date of extraction: 2017-11-22)

Species*Area combination	Total landings in RDB (ton)	Proportion landings abroad
Aequipecten opercularis 27.7.a	9318	0,55
Aphanopus carbo 27.6.a	2429	0
Argentina silus 27.6.a	2717	0,08
Boops boops 27.8.c	9501	0
Boops boops 27.9.a	4441	0
Buccinum undatum 27.7.a	8585	0,27
Buccinum undatum 27.7.e	12231	0,01
Buccinum undatum 27.7.f	2551	0,05
Cancer pagurus 27.6.a	11173	0,19
Cancer pagurus 27.7.e	7140	0,07
Caproidae 27.7.h	6771	0,56
Caproidae 27.8.a	6174	0,6
Clupea harengus 27.6.a	6568	0,3
Clupea harengus 27.7.a	6220	0
Clupea harengus 27.7.g	13719	0,1
Conger conger 27.8.a	2862	0
Engraulis encrasicolus 27.8.b	6680	0
Engraulis encrasicolus 27.8.c	11441	0
Engraulis encrasicolus 27.9.a	10411	0,01
Glycymeris glycymeris 27.7.e	7025	0
Laminaria 27.7.e	40733	0
Laminaria 27.8.a	3527	0
Lepidorhombus 27.7.j	4610	0,23
Lophiidae 27.6.a	2143	0,06
Lophius 27.6.a	2539	0
Lophius 27.7.b	2335	0,01
Lophius 27.7.e	2773	0
Lophius 27.7.g	2534	0
Lophius 27.7.h	5114	0,01
Lophius 27.7.j	6501	0
Lophius 27.8.a	5312	0
Melanogrammus aeglefinus 27.6.a	4226	0,01
Melanogrammus aeglefinus 27.6.b	2522	0
Melanogrammus aeglefinus 27.7.g	2190	0,03
Melanogrammus aeglefinus 27.7.h	2210	0,02
Merlangius merlangus 27.7.e	4682	0,01
Merlangius merlangus 27.7.g	7135	0,01
Merluccius merluccius 27.6.a	11270	0,06
Merluccius merluccius 27.7.b	3675	0,09
Merluccius merluccius 27.7.c	5011	0,09
Merluccius merluccius 27.7.g	3017	0,02
Merluccius merluccius 27.7.h	2554	0,03
Merluccius merluccius 27.7.j	28971	0,05
Merluccius merluccius 27.7.k	4557	0,02
Merluccius merluccius 27.8.a	17460	0
Merluccius merluccius 27.8.b	6919	0
Merluccius merluccius 27.8.c	6061	0,02
Merluccius merluccius 27.9.a	3490	0,02
Micromesistius poutassou 27.5.b	7105	0,28
Micromesistius poutassou 27.6.a	77092	0,19
Micromesistius poutassou 27.6.b	5652	0,18

Micromesistius poutassou 27.7.b	9549	0,16
Micromesistius poutassou 27.7.c	57566	0,32
Micromesistius poutassou 27.7.k	15354	0,02
Micromesistius poutassou 27.8.c	19095	0,02
Micromesistius poutassou 27.9.a	9843	0,04
Molva molva 27.6.a	3474	0,08
Nephrops norvegicus 27.6.a	14757	0,06
Nephrops norvegicus 27.7.a	7709	0,04
Nephrops norvegicus 27.7.g	5320	0,07
Nephrops norvegicus 27.8.a	4009	0
Octopus vulgaris 27.9.a	7829	0
Pecten maximus 27.6.a	4740	0,12
Pecten maximus 27.7.a	8228	0,16
Pecten maximus 27.7.e	14312	0,06
Pisces 27.7.e	12497	0
Pollachius virens 27.6.a	5091	0,06
Sardina pilchardus 27.7.e	24085	0,15
Sardina pilchardus 27.8.a	13738	0
Sardina pilchardus 27.8.b	8136	0
Sardina pilchardus 27.8.c	2849	0
Sardina pilchardus 27.9.a	12679	0
Scomber colias 27.8.c	14505	0
Scomber colias 27.9.a	21632	0
Scomber japonicus 27.9.a	13987	0
Scomber scombrus 27.6.a	191613	0,46
Scomber scombrus 27.7.b	8766	0,2
Scomber scombrus 27.7.j	9615	0,38
Scomber scombrus 27.8.a	2168	0,24
Scomber scombrus 27.8.b	6037	0,33
Scomber scombrus 27.8.c	28970	0,08
Scomber scombrus 27.9.a	2524	0,01
Scyliorhinus canicula 27.7.e	2190	0,01
Sepia officinalis 27.7.e	2649	0
Sepia officinalis 27.8.a	3051	0
Sepiidae 27.7.e	4249	0,11
Sprattus sprattus 27.6.a	2605	0
Sprattus sprattus 27.7.e	3337	0,01
Sprattus sprattus 27.7.j	2916	0
Thunnus alalunga 27.8.c	2008	0,03
Trachurus 27.6.a	22867	0,39
Trachurus 27.7.b	15552	0,26
Trachurus 27.7.j	2713	0,67
Trachurus 27.8.c	14893	0
Trachurus 27.9.a	16980	0
Trachurus trachurus 27.6.a	15119	0,39
Trachurus trachurus 27.7.b	8668	0,04
Trachurus trachurus 27.7.c	2071	0
Trachurus trachurus 27.7.j	3797	0
Trachurus trachurus 27.8.a	2413	0,16
Trachurus trachurus 27.9.a	10577	0,13

Annex 10: ToR a.2 Analyses of landings of national vessels in foreign ports

List of participants in the subgroup

NAME	COUNTRY
Ana Claudia Fernandes	Portugal
Ana Ribeiro-Santos	U.K.
Angeliki Adamidou	Greece
Esha Mohammed	Sweden
Hans Gerritsen	Ireland
Irene Mantzouni	Greece
Jon Helge Volstad	Norway
Jose Rodriguez	Spain
Julia Wischenewski	Germany
Kirsten Birch Håkansson	Denmark
Maciej Adamowicz	Poland
Mira Sustar	Finland
Nuno Prista	Sweden
Perttu Rantanen	Finland
Rita Vasconcelos	Portugal
Ruben Verkempynck	The Netherlands
Sara-Jane Moore	Ireland
Sofie Nimmegeers	Belgium
Sofie Vandemaele	Belgium
Wlodzimierz Grygiel	Poland

Summary analyses of foreign landings from each member country

Belgium

The ILVO database only covers information on vessels flying the Belgian flag. This means that ILVO doesn't have access to data related to landings from foreign vessels in Belgium ports. The database uses a combination of sale slips and logbooks.

The sampling programme at ILVO is an at sea sampling programme covering a part of the Belgian fleet. Foreign vessels are excluded from the vessel lists used to sample trips by observers at sea.

In the table below an overview of the top three species-area-gear combinations sold abroad for 2014, 2015 and 2016 is presented.

top 3	year-species-area-gear combination	weight (kg) sold abroad
1	2014-Pleuronectes platessa_27.4.b_OTB	781377
2	2014-Pleuronectes platessa_27.4.b_TBB	710089
3	2014-Crangon crangon_27.4.c_TBB	623699
1	2015-Pleuronectes platessa_27.4.b_OTB	739842
2	2015-Pleuronectes platessa_27.4.b_TBB	623254
3	2015-Nephrops norvegicus_27.4.b_OTB	473308
1	2016-Pleuronectes platessa_27.4.b_TBB	3209351
2	2016-Gadus morhua_27.4.b_TBB	720191
3	2016-Nephrops norvegicus_27.4.b_OTB	685450

The *Pleuronectes platessa*_27.4.b_TBB combination pops up in the top 3 for 2014, 2015 and 2016. The other combinations popping up in the top 3 within the year range (*Pleuronectes platessa*_27.4.b_OTB, *Crangon crangon*_27.4.c_TBB, *Nephrops norvegicus*_27.4.b_OTB) represent Dutch-owned vessels flying the Belgian flag. The *Pleuronectes platessa*_27.4.b_TBB combination represents beam trawlers active in area IVb catching substantial amounts of plaice (and cod). In the most recent years, the fishermen get a higher price for plaice in the Dutch auctions compared to the price in the Belgian auctions so they prefer to land and sell their catch in the Netherlands. Furthermore, the stricter access regulations (e.g. badge control system, dress code and rules regarding food hygiene), introduced by FASFC (the Federal Agency for the Safety of the Food Chain) in the Belgian harbours in the end of 2016 were not welcomed by ship owners and resulted in a boycott of the Belgian harbours (again in favour of the Dutch harbours). In the table below a more detailed overview of the sales countries for plaice caught in IVb by the TBB fleet is presented.

year	sales country	weight (kg)	% of weight sold by country
2014	BEL	3683104	83.8
	DNK	14403	0.3
	NLD	695686	15.8
2015	BEL	2925547	82.4
	DNK	11988	0.3
	NLD	611266	17.2
2016	BEL	1454240	31.2
	DNK	2899	0.1
	NLD	3206452	68.8

The fact that a substantial amount of the plaice caught in IVb is sold abroad, is not really an issue as the beam trawl fleet (TBB) is sampled at sea. This means that also the vessels that land abroad are sampled and that the observers have access to the entire catch. Therefore setting up a regional coordination for this species-area-gear combination is less opportune.

Denmark

Denmark has bilateral agreements with Sweden and Germany, where Denmark sample sprat and herring landed in Denmark. Denmark never receives any samples from other countries, but in the Danish at-sea observer and self-sampling programs Danish vessels are sampled - no matter the country they land in. The Danish at-sea observer program only covers demersal and crustacean fisheries in the North Sea and the Baltic and the Danish self-sampling program currently only covers the sandeel and sprat fisheries in the North Sea.

For three of the pelagic stocks a considerable amount of the Danish landings are landed abroad; mac.27.nea, hom.27.2a4a5b6a7a-ce-k8 and her.27.1-24a514, where 83%, 100% and 71% are landed aboard respectively, see figure 1 and 2. Landings landed in Denmark are sampled in the Danish onshore program, but landings abroad are currently not sampled, since neither the self-sampling nor the at-sea observer programs cover these fisheries. Mac.27.nea is selected for further analyses. The majority of the landings abroad are from different areas than the ones landed into Denmark, see figure 3. The latter may lead to biases if other countries do not cover the landings in their harbours and the size and age compositions and different from the landings taking place in Danish ports.

Among the demersal stocks 41% of the Danish landings of cod.27.25-32 are landed abroad, see figure 1 and 2. As for the pelagic stock the landings are landed into Denmark are sampled in the Danish onshore program. Further the main fisheries targeting the stock are covered in our at-sea observer program, but we rarely get samples from area 27.3.d.26, where the majority of the landings also are landed abroad, see figure 3. So in conclusion area 27.3.d.26 is in general not well cover – and as above this may be a potential problem.

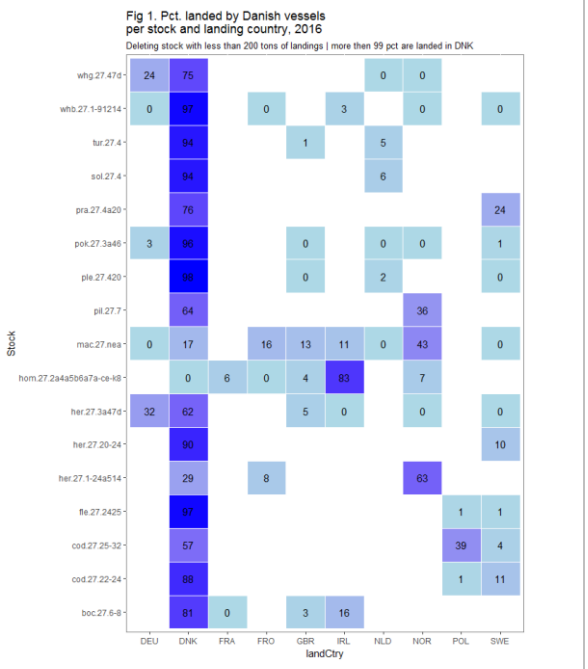


Fig 1. Pct. landed by Danish vessels
per stock and landing country, 2016
Deleting stock with less than 200 tons of landings | more then 99 pct are landed in DNK
Stock
whg.27.47d
whb.27.1-91214
tur.27.4
sol.27.4
pra.27.4a20
pok.27.3a46
ple.27.420
pil.27.7
mac.27.nea
hom.27.2a4a5b6a7a-ce-k8
her.27.3a47d
her.27.20-24
her.27.1-24a514
fle.2425
cod.27.25-32
cod.27.22-24
boc.27.6-8
DEU DNK FRA FRO GBR IRL NLD NOR POL SWE
landCtry

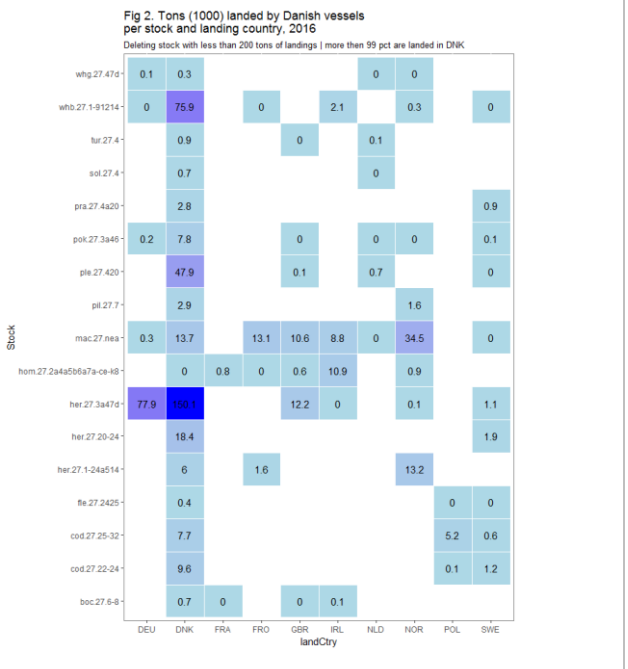


Fig 2. Tons (1000) landed by Danish vessels
per stock and landing country, 2016
Deleting stock with less than 200 tons of landings | more then 99 pct are landed in DNK
Stock
whg.27.47d
whb.27.1-91214
tur.27.4
sol.27.4
pra.27.4a20
pok.27.3a46
ple.27.420
pil.27.7
mac.27.nea
hom.27.2a4a5b6a7a-ce-k8
her.27.3a47d
her.27.20-24
her.27.1-24a514
fle.27.2425
cod.27.25-32
cod.27.22-24
boc.27.6-8
DEU DNK FRA FRO GBR IRL NLD NOR POL SWE
landCtry

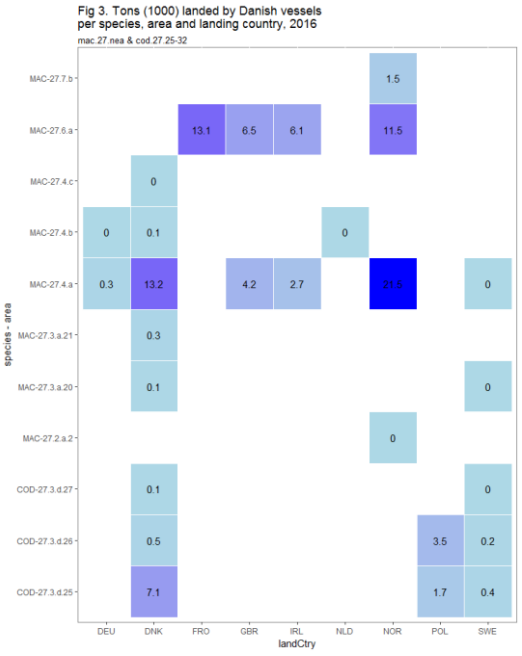


Fig 3. Tons (1000) landed by Danish vessels
per species, area and landing country, 2016
mac.27.nea & cod.27.25-32
species - area
MAC-27.7.b
MAC-27.6.a
MAC-27.4.c
MAC-27.4.b
MAC-27.4.a
MAC-27.3.a.21
MAC-27.3.a.20
MAC-27.2.a.2
COD-27.3.d.27
COD-27.3.d.26
COD-27.3.d.25
DEU DNK FRO GBR IRL NLD NOR POL SWE
landCtry

Finland

Finnish foreign landings in the year 2016 were studied using commercial landings (CL) data uploaded to the ICES Regional database (RDB). In the reference year, Finland had foreign landings to Denmark, Estonia, Poland and Sweden. Foreign landings covered 33,33% of the weight of the whole catch landed by the Finnish fleet. Most of the foreign landings included herring and sprat landed by pelagic trawls in Sweden.

Table 1- Landings weight (kg):

	Weight													
	Landing_country													
	DNK		EST		FIN					POL	SWE			
	Area		Area		Area					Area	Area			
	27.3.d.28.2	27.3.d.29	27.3.d.29	27.3.d.32	27.3.d.28.2	27.3.d.29	27.3.d.30	27.3.d.31	27.3.d.32	27.3.d.28.2	27.3.d.28.2	27.3.d.29	27.3.d.30	27.3.d.32
	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum	Sum
Species														
Other	81					7664	176088	106764	16556	75				
Herring	13199	84126	349524	1182274	25000	20247986	66169924	4285089	1762893		587874	4463314	37115065	21599
Sprat	272523	1150	378487	1375305	25988	3351942	3106268		1706965		836797	3363858	2203970	182362
Cod	365					55137	14	21	145	26636	2167	1857		
Merling										1283				
Smelt						8140	637673	21293	1911					
Flounder						1898	317	6	811	1567				
Turbot						21	4		2		8			
Vendace							813	203052	2					
Whitefish						73632	167618	235886	23745					
Rainbow trout						186	1381	3	168					
(Atlantic) Salmon						25200	28449	96359	42078					
Brown Trout						3081	7704	7997	5436					
Zander, Pikeperch						89001	87395	6826	62527					
Perch						128625	476461	76715	22845					
(Northern) Pike						28412	94706	39822	28021					
Bream						64516	213395	154406	72916					
Ide						2123	23805	10457	1189					
Roach						35436	392534	47834	18706					
Burbot						2273	15112	15191	6341					
All	286168	85276	728011	2557579	50988	24125273	71599661	5307721	3773257	29561	1426846	7829029	39319035	203961

Table 2- Landings weight (%)

	Weight													
	Landing_country													
	DNK		EST		FIN					POL	SWE			
	Area		Area		Area					Area	Area			
	27.3.d.28.2	27.3.d.29	27.3.d.29	27.3.d.32	27.3.d.28.2	27.3.d.29	27.3.d.30	27.3.d.31	27.3.d.32	27.3.d.28.2	27.3.d.28.2	27.3.d.29	27.3.d.30	27.3.d.32
	RowPctSum	RowPctSum	RowPctSum	RowPctSum	RowPctSum	RowPctSum	RowPctSum	RowPctSum	RowPctSum	RowPctSum	RowPctSum	RowPctSum	RowPctSum	RowPctSum
Species	0,03					2,49	57,3	34,8	5,39	0,02				
Other	0,03					2,49	57,3	34,8	5,39	0,02				
Herring	0,01	0,06	0,26	0,87	0,02	14,9	48,5	3,14	1,29		0,43	3,27	27,2	0,02
Sprat	1,62	0,01	2,25	8,18	0,15	19,9	18,5		10,2		4,98	20,0	13,1	1,09
Cod	0,42					63,9	0,02	0,02	0,17	30,8	2,51	2,15		
Merling										100				
Smelt						1,22	95,3	3,18	0,29					
Flounder						41,3	6,89	0,13	17,6	34,1				
Turbot						60,0	11,4		5,71		22,9			
Vendace							0,40	99,6	0,00					
Whitefish						14,7	33,5	47,1	4,74					
Rainbow trout						10,7	79,5	0,17	9,67					
(Atlantic) Salmon						13,1	14,8	50,2	21,9					
Brown Trout						12,7	31,8	33,0	22,4					
Zander, Pikeperch						36,2	35,6	2,78	25,4					
Perch						18,3	67,6	10,9	3,24					
(Northern) Pike						14,9	49,6	20,9	14,7					
Bream						12,8	42,2	30,6	14,4					
Ide						5,65	63,4	27,8	3,16					
Roach						7,17	79,4	9,67	3,78					
Burbot						5,84	38,8	39,0	16,3					
All	0,18	0,05	0,46	1,63	0,03	15,3	45,5	3,37	2,40	0,02	0,91	4,98	25,0	0,13

Germany – Baltic Sea

The issue of foreign landings in the Baltic region has been dealt with during the RCMs. For example the RCM Baltic report 2015, page 31-33, table 5.1 gives an overview of 2012-2014 average annual national landings and landings abroad exceeding 200t, by country.

In what respects Thünen Institut für OstseeFischerei (OF) there are only 3 stocks involved in major foreign landings and all bilateral agreements required for OF/Germany are in place. Moreover, for Baltic sprat, Germany has established a self-sampling scheme with the 2 vessels taking >90% of the German sprat quota in the Baltic Sea which works very well. For Central Baltic Herring, Germany is below the threshold. Eastern Baltic cod is often landed in Poland, but Germany can fulfil the number of

samples promised in the national programme with its observer and self-sampling schemes. The length distributions of the eastern Baltic cod catches are fairly homogenous so that potential bias is negligible.

Ireland

Ireland has bilateral agreements with Denmark, France and Scotland for 2017-2019. Previously there were bilateral agreements with UK and Spain. These bilateral agreements vary according to species.

The landings of Irish vessels abroad were interrogated for 2016. These landings accounted for 8% of total landings by Irish Flag Vessels. The highest percentage of species landed abroad was examined and any landings under 100t were excluded. The top 3 species landed abroad for 2016 are shown in the Table below.

Species	% landed abroad	Country of landing	Area	Gear	% of TAC
Caproide	47%	FRO	27.7.h, 27.8.a	OTB	69.10%
Pecten maximus	27%	GBR	27.7.d	DRB	~4% of international landings
Thunnus alalunga	19%	FRA	27.8.d	PTM	10.53%

Caproidae (Boarfish) were primarily landed in the Faroe Islands and self-sampled at sea (the samples were brought back to Ireland by the skippers). Ireland has the majority of the TAC for this stock and it is important that adequate sampling is maintained for this stock. *Pecten maximus* and *Thunnus alalunga* were not sampled for 2016. Around 4% of the international scallop landings are taken by Ireland whilst the majority are taken by the UK and France. Whilst the Irish quota for *Thunnus alalunga* accounts for 10% of the TAC this stock sampling for this species also takes place in Ireland.

Norway:

Foreign vessels landing in Norway

Main countries landing in Norway in terms of quantity and number of vessels are Russia (161't/60v), GBR (119't/20v), Faro Island (39't/9v) and Denmark (29't/13v). These landings are dominated by five species.

Species	Quantity landed (in 1000 tons)		
	Norwegian vessels	Foreign vessels	Most important foreign landings by country (1000 t)
Gadus morhua	410	127	RUS (105)
Scomber scombrus	210	107	GBR (81)
Clupea harengus	210	40	GBR (29)
Melanogrammus aeglefinus	110	34	RUS (32)
Micromesistius poutassou	227	30	FRO (30)

There is no specific routine sampling program that targets foreign landings in Norway. However, IMR samples mackerel from foreign catches in connection with a RFID chip tagging-recapture study initiated in 2016. Essentially all of the samples to date were from landings in Q1 (January and February) by GBR vessels. Although we do not deliver data to ICES on catch per age of RFID tagged fish from foreign catches, these data MAY be used to estimate the number of mackerels per age. We do not currently share these data with GBR.

The Norwegian coast guard inspect national and foreign vessels and sample catches at sea. Institute of Marine Research (IMR) receive length-data for selected species from samples of inspected catches, as well as otoliths from some of the inspections. If IMR receive such data from foreign vessel these are handed over to the respective nation's research institute. There are, however, no routine procedures for the data exchange, but more up to the involved scientists.

Norwegian vessels landing catches abroad

Norwegian landings outside Norway in terms of quantity and number of vessels is mainly to Denmark (109' t/95v) and Iceland (31't/41v). These landings are dominated by three species.

Species	Quantity landed (in 1000 tons)		
	In Norway	Abroad	Main country were catches are landed (1000 t)
Micromesistius poutassou	230	83	DNK (69)
Clupea harengus	329	22	DNK (22)
Mallotus villosus	36	22	ISL (21)

Poland

The Polish description concerning sampling of Baltic commercial fish landed in foreign ports (2016 as example).

Overall, seven main commercial fish species were exploited by the Polish fleet in 2016 and part of them was landed in Danish, Swedish and Latvian ports. In the case of plaice, turbot and sea trout no landings were noticed in 2016 in the foreign ports. The catches were realized in the ICES Subdivisions 27.3.d.24 - 27.3.d.29 (Table 3). In the Table 3 the share of the Polish landings abroad vs. total annual national landings per species is indicated. Moreover, the percentage of landings abroad by species and areas per landing country was calculated. The highest shares of national landings abroad are marked with the green colour and most of landings (11.6% by weight) was concentrated in the Danish ports. It should be underlined that the share of the total annual Polish landings in foreign ports was ranged from 0.02–14.3%. Sprat and herring dominated in the Polish landings abroad and both species originated from catches accomplished in the ICES Subdivisions 27.3.d.24–27.3.d.29. Although the maximum share of herring and sprat landed in the foreign ports by areas was 98 and 84%, respectively, in 27.3.d.27; and the share in the total Polish annual landings was 0.63 and 0.58%, respectively. Clupeids caught by the Polish fleet in 2016 and landed abroad were sampled by the Polish scientific observers.

Table 3. The Baltic main fish species landed by the Polish vessels; green cells reflect the highest shares of national landings abroad.

Year	2016						
Flag Vessel Country	POL						
		Landing Country					
Species	Area	DNK	LVA	SWE	POL	Share of the Polish landings abroad in the total annual national landings per species	Comments
Ammodytes spp	27.3.d.24	1%	0%	0%	99%		
Ammodytes spp	27.3.d.25	9%	0%	0%	91%		
Ammodytes spp	27.3.d.26	0%	0%	0%	100%		
Clupea harengus	27.3.d.24	5%	0%	0%	95%		
Clupea harengus	27.3.d.25	15%	0%	1%	85%	8.02%	Fish landed abroad are sampled by the Polish scientific observers.
Clupea harengus	27.3.d.26	2%	0%	7%	90%	3.83%	Fish landed abroad are sampled by the Polish scientific observers.
Clupea harengus	27.3.d.27	2%	0%	98%	0%	0.63%	
Clupea harengus	27.3.d.28	19%	77%	0%	4%	1.04%	Fish landed abroad are sampled by the Polish scientific observers.
Clupea harengus	27.3.d.29	43%	0%	57%	0%	0.21%	
Gadus morhua	27.3.d.24	0%	0%	0%	100%		
Gadus morhua	27.3.d.25	0%	0%	0%	100%		
Gadus morhua	27.3.d.26	0%	0%	0%	100%		
Gadus morhua	27.3.d.28	0%	100%	0%	0%	0.02%	
Platichthys flesus	27.3.d.24	0%	0%	0%	100%		
Platichthys flesus	27.3.d.25	1%	0%	0%	99%		
Platichthys flesus	27.3.d.26	0%	0%	0%	100%		
Pleuronectes Platessa	27.3.d.24	0%	0%	0%	100%		
Pleuronectes Platessa	27.3.d.25	0%	0%	0%	100%		
Pleuronectes Platessa	27.3.d.26	0%	0%	0%	100%		
Psetta maxima	27.3.d.24	0%	0%	0%	100%		
Psetta maxima	27.3.d.25	0%	0%	0%	100%		
Psetta maxima	27.3.d.26	0%	0%	0%	100%		
Salmo salar	27.3.d.24	0%	0%	0%	100%		
Salmo salar	27.3.d.25	1%	0%	0%	99%		
Salmo salar	27.3.d.26	0%	0%	0%	100%		
Salmo trutta	27.3.d.24	0%	0%	0%	100%		
Salmo trutta	27.3.d.25	0%	0%	0%	100%		
Salmo trutta	27.3.d.26	0%	0%	0%	100%		
Sprattus sprattus	27.3.d.24	5%	0%	0%	95%		
Sprattus sprattus	27.3.d.25	34%	0%	1%	65%	14.28%	Fish landed abroad are sampled by the Polish scientific observers.
Sprattus sprattus	27.3.d.26	4%	0%	3%	94%	3.13%	Fish landed abroad are sampled by the Polish scientific observers.
Sprattus sprattus	27.3.d.27	16%	0%	84%	0%	0.58%	
Sprattus sprattus	27.3.d.28	61%	21%	3%	14%	2.18%	Fish landed abroad are sampled by the Polish scientific observers.
Sprattus sprattus	27.3.d.29	76%	0%	24%	0%	0.92%	
Note: values marked with the green color reflect the highest shares of national landings abroad.							

Portugal

In summary, for Portuguese vessels landing abroad there is logbook data, but no sales notes.

For foreign vessels landing in Portugal only sales notes data are available and data on those landings don't necessarily match between the two countries, e.g. ESP vessels landings in PT (2014-2016) are 313 910 tons and 30 species according to PT data, but 295 582 ton and 11species according to ESP data.

Portuguese vessels land in 15 countries other than Portugal (total 169 941 315 kg 2014-2016) representing 31% of total landings by Portuguese vessels (total 555 322 612 kg 2014-206). Landings referring to area 27 (i.e. ICES) are landed in 2 countries (Spain –

the highest foreign landings by Portuguese vessels in Europe total 54 799 959 kg 2014-2016; Germany total 4 534 030 kg 2014-2016) and there are also landings in one Mediterranean European country (Italy total 187 377 kg 2014-2016). Concerning fishing in area 27, the species most landed abroad are mackerel *Scomber scombrus* (from 27.8.c, landed in Spain), horse mackerel *Trachurus trachurus* (from 27.9.a and 27.8.c, landed in Spain) and blue shark *Prionace glauca* (from 27.10.a.2, landed in Spain). For these three, only the latter is covered by the Portuguese sampling work plan (on-board sampling).

Portuguese vessels (OTB, OTM) fishing in areas 27.1 and 27.2 mostly land cod *Gadus morhua* and red fish Sebastes spp. (respectively 7 563 365 kg and 2 247 882 kg 2014-2016 which represents 74% and 22% of landings by Portuguese vessels from these areas). They land mostly in Portugal but also abroad especially in Germany. These species/areas are sampled at sea (total catch; volume and length and age structure; data are uploaded to RDB and Intercatch); and VMS and logbook information are available, but sales notes are not available when Portuguese vessels land abroad.

Outside ICES:

Portuguese vessels (OTB) fishing in NAFO 21.3L/M/N/O mostly land red fish *Sebastes* spp. and cod *Gadus morhua* (respectively 29 093 808 kg and 17 659 272 kg 2014-2016 which represents 56% and 34% of landings by Portuguese vessels from these areas). They also land in Portugal but mostly in Spain. These species/areas are sampled at sea (total catch; volume and length and age structure; data are provided to NAFO); and VMS and logbook information are available, but sales notes are not available when Portuguese vessels land abroad.

ICCAT and IOTC species (swordfish, tunas and tune-like species) are caught by Portuguese vessels (LLD_LPF), respectively operating in Atlantic (within and outside area 27) and Indian Oceans. These species/areas area sampled at-sea (total catch; length; data are provided to ICCAT and IOTC); and VMS and logbook information are available, but sales notes are not available when Portuguese vessels land abroad.

Mackerel, *Scomber scombrus,* landings from Portuguese vessels occurs mainly in Spain (90%; 27.9.a/27.8.c) but these trips are not sampled at-sea or at-market by Portugal or Spain. Spanish vessels operate in the same areas (27.9.a/27.8.c) and these landings are sampled (at-sea and at-market) by Spain. However, to validate if sampling of Spanish vessels is representative of landings (species composition and length) in 27.9.a/27.8.c, it is necessary to confirm if both fleets carry out the same métiers. To this end, it would be necessary to compare vessel/gear characteristics and logbook spatial data for vessels from the two countries.

In addition, the Northeast Atlantic stock of mackerel (mac.27.nea) is explored by Portugal and Spain in area 27.8.c and 27.9.a, and by many other countries in other parts of area 27. It is important to assess the proportion of landings of each region in relation to the remaining regions for the same stock, and the level of sampling in each region.

Spain, IEO

The data included in this analysis are data for fleets operating in ICES areas and based in all Spanish regions except the Basque country. The series of data 2014-2016 is complete based on Spanish logbook and sales notes data received from the National administration.

Merluccius merluccius, *Lophiidae* and *Lepidorhombus* spp. are the three most important species groups landed abroad by Spanish vessels. They account for the 82.6% of the total landings of all species, with hake accounting by its own for the 54.4% (Figure 1).

LLS and OTB gears fishing in the Celtic Seas and Bay of Biscay areas are mainly responsible for all the landings abroad, with GNS and PS showing some activity, but in a much lesser degree.

By ICES divisions those trips landing abroad show larger activity in Division 27.6.a and 27.7.j, corresponding mainly to LLS and OTB respectively (Figure 2).

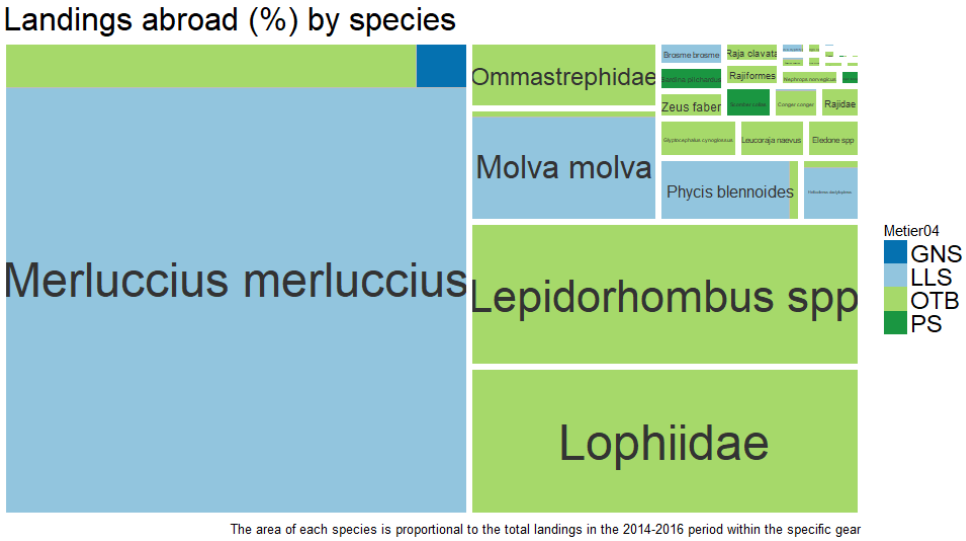


Figure 1: Proportion of species landed abroad by Spanish vessels.

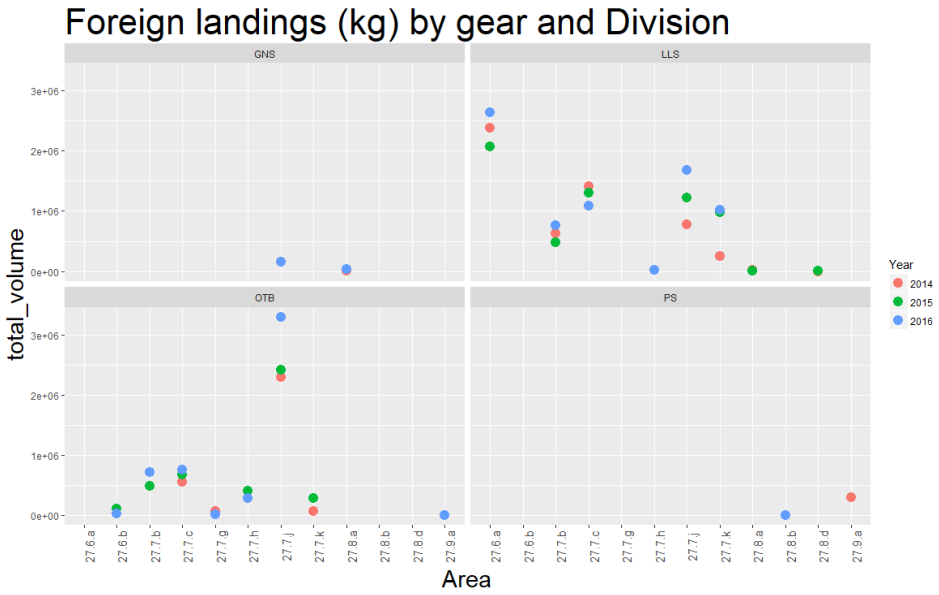


Figure 2: IEO coverage of landings abroad: the importance of the real accessible site for sampling onshore

IEO covers, under its on-board sampling programme, the OTB national fleet operating in these areas (ICES Divisions VI, VII and VIIIIabde) and, under the market sampling programme, all the landings. The key factor is not where landings occur, but where landings are accessible for sampling.

Some trips of vessels fishing on the Spanish register which operate in EU waters under ICES areas land into different countries (mostly Ireland and United Kingdom, but also France and Portugal). Nevertheless, most of these landings are transported to Spain for first point of sale where they are accessible for sampling.

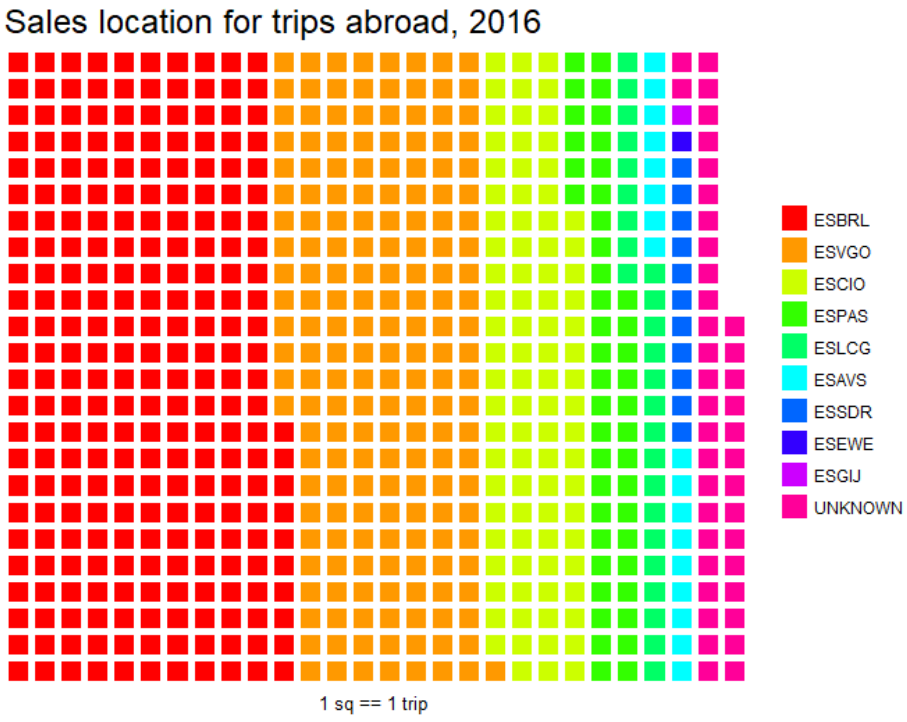
IEO crosschecks logbook and sales notes information to identify these trips. In 2016 the majority (>90%) of the trips landing abroad were arriving to Spanish auctions for the first sale, being transported by trucks. No information about the site for the first sale could be found for the remaining trips (they could be sold abroad –IEO doesn't have access to foreign sales notes- or IEO couldn't identify those trips through the crosscheck process between logbooks and sales notes).

FishPi project (EU MARE/2014/19) already identified this problem and advised for clear distinction between landing sites and sites where the landings are accessible for sampling. In the data format that the project used to work the following field was included:

> *onShoreSampLoc: The location in which an on-shore observer would be able to access the landed fraction of the catch from the trip*

The project recommended to use the sales notes as the sale location is often the best means of identifying a suitable onshore sampling location. This field is useful to indicate the country responsible for the sampling, which is fundamental to organize a regional sampling program. In fact, in one of the case studies (CS4, hake) stratification by country was developed using the country extracted from this field. It was showed that this information provided the same number of total countries (compared to the field where the country where landings took place was placed) but with different allocation of trips.

While this foreign landings seems to be covered a further analysis could involve a clear determination of the completeness of these trips before arriving to national sales locations. In case relevant parts of these trips were missing actions to determine those other accessible points should be taken.



Sweden

Throughout the 2014-2016 period the proportion of landings in foreign ports by Swedish vessels has remained quite stable (51% to 52% of landed weight) as did the countries where those landings took place (Table 4 and 5). (Denmark: 95-97%; Norway: 1-3%; Great Britain: 0-3%; Finland: <1%; Poland: <1%). Among the main pelagic species all the sandeel and a significant proportion of herring and sprat are landed in Denmark, but mackerel is landed mostly in Norwegian ports. (Table 4). Among the main demersal species significant proportions of saithe, pollack and plaice are landed in Denmark.

Table 4. Distribution of landings abroad in the main pelagic species landed by Swedish vessels (2016 data).

Species	National Landings (tonnes)	% of National landings	% of National landings abroad	% of National landings by country				
				DNK	FIN	NOR	POL	SWE
Clupea harengus	116 379	59,3	44,7	44,6	0	--	--	55,3
Sprattus sprattus	55 632	28,4	69,2	69,2	--	--	--	30,8
Ammodytes sp.	4 139	2,1	100,0	100,0	--	--	--	--
Scomber scombrus	3 663	1,9	89,4	18,5	--	70,9	--	10,6
Coregonus albula	1 655	0,8	--	--	--	--	--	100,0

Table 5. Distribution of landings abroad in the main demersal species landed by Swedish vessels (2016 data).

Species	National Landings (tonnes)	% of National landings	% of National landings abroad	% of National landings by country				
				DNK	FIN	NOR	POL	SWE
Gadus morhua	7 339	3,7	10,3	7,4	0	0	2,9	89,7
Pandalus borealis	1 959	1	8,4	7,4	--	1	--	91,6
Nephrops norvegicus	1 363	0,7	4,5	4,5	--	0	--	95,5
Pollachius virens	1 227	0,6	80,3	80	--	0,2	--	19,7
Pleuronectes platessa	392	0,2	37,9	37,9	--	0	--	62,1
Melanogrammus aeglefinus	247	0,1	57,3	57,3	--	0,1	--	42,7
Glyptocephalus cynoglossus	212	0,1	7,4	7,3	--	0,1	--	92,6

Analysis of Table 1 and 2 confounds differential proportions that landings abroad may assume at the level of individual stocks. To clarify that situation, the importance of landings abroad in 2016 was assessed stock-by-stock[3] by comparing the Swedish landings data with the total landings of the stocks as reported by the assessment groups and evaluating the existence of bilateral agreements. The stocks currently assessed by ICES where the landings abroad where >5% of national landings and >5% of the total

[3] species-by-area used in some stocks that mix within an area

landings of the stock were selected for future analyses alongside some stocks of national importance where bilateral agreements are already in place[4]:

Sandeel *Ammodytes* sp.:

- san.27.3a4
    - 100% of Swedish landings are landed in Denmark. The landings abroad (~ 4 139 tonnes) originate in the North Sea (27.4.b) and represent a small fraction (~6%) of the total landings of all countries (71 900 tonnes) (**HAWG, Table 9.1.1**). It is also possible that they constitute a more significant fraction in some of the specific assessment areas (**HAWG, Table 9.1.4**). At present, Sweden does not sample these landings.

Herring *Clupea harengus*:

- 27.4 (North Sea)
    - Herring caught in Division 27.4 are a mixture of North Sea Autumn Spawners (NSAS), Norwegian Spring Spawners (NSS) and in small proportion Western Baltic Spring Spawners (WBSS). In recent years, the Swedish fishery in this area has been catching almost exclusively NS Autumn spawners **(WGWIDE, Table 4.4.1.1)**. In 2016 80% of Swedish landings from the North Sea (27.4) were landed in Denmark. There were no Swedish landings in other foreign countries. Swedish landings in Danish ports (~ 13 300 tonnes) represented a very small fraction (~2%) of the total landings from the North Sea (~ 560 000 tonnes) (**HAWG Table 3.1.1**) so there appears to be little point in sampling these foreign landings.

- 27.3.a.20 (Skagerrak)
    - Herring caught in Division 3.a are a mixture of North Sea Autumn Spawners (NSAS) and Western Baltic Spring Spawners (WBSS). In 2016, 27% of Swedish landings were landed in Denmark and no Swedish landings were registered in other foreign countries. These landings (~ 3 676 tonnes) represent a significant fraction (~17%) of the 21 200 tonnes landed by all countries fishing in that area **(HAWG, table 2.1.1)** so there is a formal bilateral agreement with Denmark that covers these landings.
- 27.3.a.21 (Kattegat)
    - Herring caught in Division 3.a are a mixture of North Sea Autumn Spawners (NSAS) and Western Baltic Spring Spawners (WBSS). In 2016, 9% of Swedish landings were landed in Denmark and no Swedish landings were registered in other foreign countries. These landings (~ 544.8 tonnes) represent a significant fraction (~6%) of the 8 700 tonnes landed by all countries fishing in that area

[4] A more complete account of the importance of Swedish foreign landings will be given in a future WD.

(HAWG, table 2.1.1) so there is a formal bilateral agreement with Denmark that covers these landings.

- 27.3.25-29, 32

    - In 2016, 59% of Swedish landings from SD 25-29,32 were landed in Denmark and no Swedish landings were registered in other foreign countries. These landings (~ 32 900 tonnes) represent a significant fraction (~17%) of the catches of the stock (~192 000 tonnes) **(WGBFAS, Table 4.2.1) so** there is a formal bilateral agreement between Sweden and Denmark to cover these landings.

- 27.3.30,31

    - In 2016, 5% of Swedish landings from 30 and 31 were landed abroad and these are all from SD 30. A negligible proportion of landings abroad was registered in Finland (<0.5%). Landings in Danish ports (~ 1 135 tonnes) represent a negligible fraction (<1%) of the total landings from those areas (~130 000 tonnes) **(WGBFAS, Table 4.4.1)** so there is little point in specifically sampling this fraction of landings. However, there is a formal bilateral agreement with Denmark concerning the sampling of herring in the Baltic that may cover these landings.

Sprat *Sprattus sprattus*:

- spr.27.22-32

    - 62 % of Swedish landings from the Baltic (27.3.22-32) are landed in Denmark and no Swedish landings were registered in other foreign countries. Those landings (26 212 tonnes) are a significant proportion (~10%) of total catches from those areas (246 510 tonnes) **(WGBFAS, table 7.1)** there is a formal bilateral agreement between Sweden and Denmark to cover these landings.

UK–England

Overall, in 2016 landings from English flagged vessel occurred in Belgium, Denmark, France, Ireland, the Netherlands and other devolved administrations (Scotland, Northern Ireland, Guersney, Jersey and Isle of Man. 30% of the total landings from English vessels are in the Netherlands, 9% are in other devolved administrations, 6% in Norway, 2% in Ireland and 1% in France, Spain and Germany. The vast majority of the in the Netherlands are from Dutch owned vessels on the UK register.

The species with highest landings abroad are mackerel (mac.27.nsea 135,171 t) and herring (19,317 t) into the Netherlands and cod.27.1-2 (11,264 t) into Norway. Most of the mackerel are fished in the Northern North Sea (ICES Iva) and area VII. Herring is also mostly caught in the North Sea and VIId and cod is mostly fished in ICES areas I and II.

According with the ICES advice:

- Mac 27.nea total landings were 1,094,066 t and the landings from English vessels were only 2% from the total.
- cod.27.1-2 total landings in 2016 was 849,422t and the landings from the English vessels were only 1.3% from the total.

England has a bi-lateral agreement with the Netherlands, since 2000, where landings and discards by UK-NLD vessels fishing on UK register, landing for first sale in NLD, to be included within NLD National plan. Length and age of discards and landings, in accordance with NLD National plan. Levels and coverage of sampling to be as agreed at the annual RCMs NS&EA and NA. According with the agreement NLD is responsible for submitting the data to the respective end-users and to UK.

The Netherlands

Landings in 2016 by Dutch vessels, for species with more than 200 tons of landings and for species where less than 99 percent of the total catch are landed in the Netherlands, are shown on Figure 3–4. Dutch vessels land their catches in several countries around the North Sea (Belgium, Germany, Denmark, France, and the United Kingdom) and in Mauritania. These "landing countries" are determined from logbook data. But, in reality, these are the "ports of landing", which simply means where the landings are unloaded from the fishing vessel. Transportation (by freezer trucks) of the landings to a fish auction in the Netherlands is common practice in the Dutch demersal fleet. Catches from Dutch pelagic freezer trawlers are often unloaded in ports close to the fishing grounds and are then reloaded on another vessel and shipped to the Netherlands.

Wageningen Marine Research samples catches that are transported to the Netherlands through the market sampling (mostly from the Dutch demersal fleet) at the auctions and through samples obtained from the pelagic freezer-trawler association. Additionally, through bilateral agreements with other countries with fleets operating in the waters of Mauritania, sampling programs are set up where observers sample the catch on board of the trawlers.

Key species that are "landed" in foreign ports are *Sardina pilchardus* and *Scomber japonica*. These are caught by pelagic freezer trawlers in Mauritanian waters and landed in Mauritanian ports. Also catches of *Loligo vulgaris*, *Mullus surmuletus, Martialia hyadesi, Aspitrigla cuculus*, and, *Chamelea gallina* are landed in relatively high volumes in foreign ports. However, in absolute volumes these amounts are negligible (Figure 4). Considering the sampling programs described above, foreign landings of Dutch vessels are covered and access to these landings for biological sampling is ensured.

To be able to monitor the availability to sample the foreign landings, it would be good to compare the sales notes of these foreign landings to the logbook data every year.

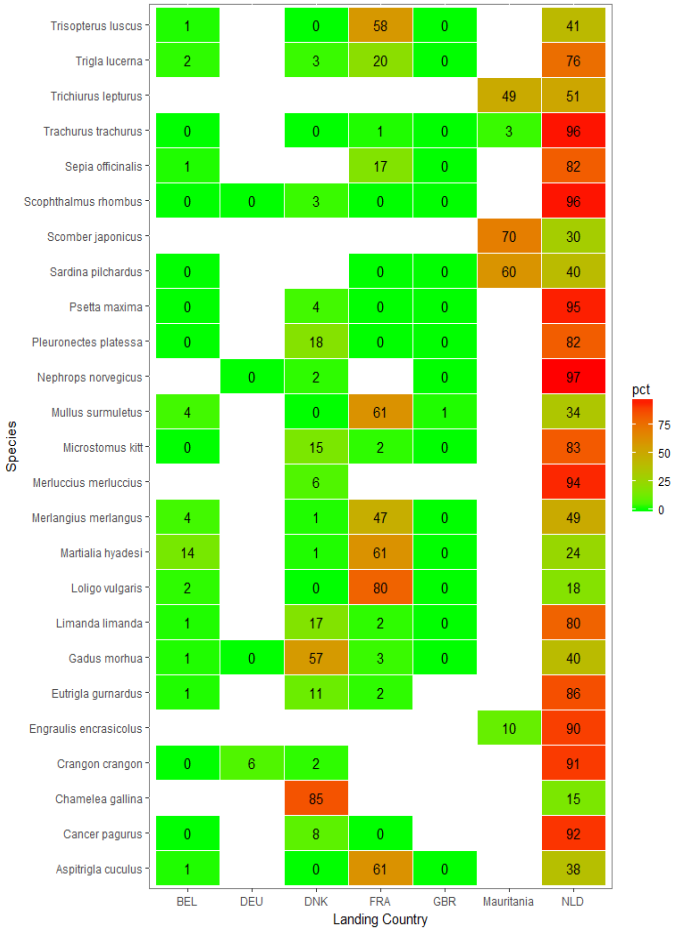


Figure 3: Relative landings of Dutch vessels in 2016

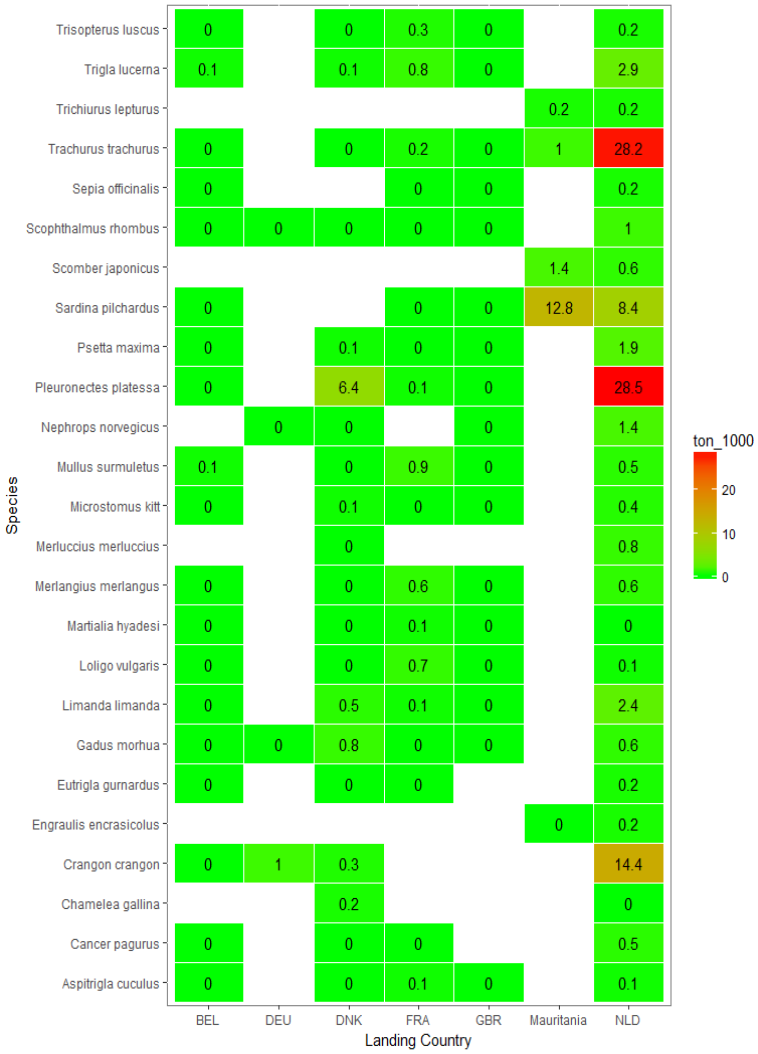


Figure 4: Absolute landings of Dutch vessels in 2016 (in thousand tonnes)

Annex 11: ToR a.2) Intersessional ToRs for subgroup work on case-studies of landings of national vessels in foreign ports

Subgroup work will be initiated in early 2018 and carried out intersessionally in subgroups. Subgroups will be formed by at least one participant from the flag country and one participant from the landing country involved in each case-study with the following ToRs:

Complete the MS Excel forms on landings of national vessels in foreign ports (flag country) and landings of foreign vessels in national ports (landing country) in what respects the species and areas involved in the case-study; Quantify the importance of the landings involved in each case-study relative to the total landings of the stock and/or stock component used in ICES assessments (e.g. *what percentage of the stock landings does the case-study represent?*);

Compile the bilateral agreement(s), sampling protocols(s) and estimation procedures (s) covering the case-study landings (if any)

Critically evaluate, quantitatively and qualitatively, the bilateral agreement, sampling protocols and estimation procedures covering the case-study landings (e.g. *what sources of data are available to the country of landings?- and are these complete?, how many samples were collected?, was the sampling protocol and intensity for those samples adequate? What potential biases exist* in sampling and estimates? *Are they important?, what difficulties are experienced during implementation?, is there a clear definition on who uploads the estimates to IC and RDB?*).

If needed, identify a set of analysis and/or actions for improving the sampling of the landed component

Annex 12: ToR a) Templates to document National sampling programmes and Estimation procedures

Progress during the meeting:

- The Member countries were able to populate the tables and provided comments to improve them.
- Overall, the participants of the WGCATCH meeting saw usefulness in these tables to document the sampling design and estimation methods.
- The possibility of developing r-scripts to evaluate and diagnosed the sampling design was suggested.
- The templates are constant work in progress: they should continue to be tested and improved both at national level and during workshops on Sampling and Estimation (WKSDECC) that feed into the benchmark process.

Specific comments on the Sampling Design Template:

- Eliminate redundancies between the sheets *"Sampling_scheme"* and *"Sampling_design"*: There is some repetition between these two sheets and a need to delete repeated fields.
    - Fields deleted from "Sampling_scheme":"Metier06_of_interest_expected_to_occur_in_sampling_scheme", "Areas_of_interest_expected_to_occur_in_sampling_scheme", "ICES Stocks expected to_be_length_sampled_in_sampling_scheme"; "ICES_Stocks_expected_to_be_biologically_sampled_in_sampling_scheme"
- There is a need to clarify the guidelines for completion of the templates. Guideline should be objective and clear about what information to include in the templates (e.g. unsampled strata should be included to evaluate the coverage of the sampling programme).
- Additional fields are useful in the *"Sampling_design"* sheet that provide for some (minimal) idea of coverage, degree of implementation of the sampling plan, and comparability with common sampling units (e.g. trip).
    - Fields added: "Exclusions_within_stratum", "Number of Expected Trips", "Number of PSU achieved"; "Number of trips achieved"
- Is essential that the *Method_of_selection_of_sampling_units* in table "S*ampling hierarchy"* have clear definitions that are reviewed and accepted by experts. There should be an option for expert-based judgment that not "ad-hoc" when selection is made following a protocol
    - Definitions added
    - Option "expert-based" added

Estimation procedures templates:

- In *EstimProc* add a field with clear mathematical formulas to describe the calculation of the input sampling data.

Sampling programme template:

SAMPLING SCHEME	
FIELD ID	***DESCRIPTION***
Year_data_collection	Year(s) when the sampling design was applied in data collection.
Sampling_Country	Country in charge of the sampling scheme
Sampling_Scheme_ID	Unique ID of the sampling scheme
Sampling_Scheme_type	Sampling scheme: 'at-sea', 'at market','self-sampling'. See Look-up
Stratification_of_sampling_frame	Describe the PSU stratification for each sampling scheme (e.g. 4 Quarter x 7 Areas x 2 vessel length x 5 Gears) .
ICES_Ecoregion	Regions defined by ICES (e.g.. Greater North Sea, Celtic Seas, etc.). If more than one ICES region, separate with coma (","). See look-up
RCG_region	Eco- regions defined by the RCGs. If more than one ICES region, separate with coma (","). See Look-up
Target_population	Definition/Identification of the population that will sampled. Description of all 'individuals' of interest from which biological samples need to be collected.
Exclusions	Describe and identify if there are exclusions to the sampling frame due to access problems or other situations that were not over seen (e.g.. Inaccessible ports, vessel size categories you don't sample, etc)
Metier06_of_interest_expected_to_occur_in_sampling_scheme	Comma separated list of metiers level 6, of interest in the sampling scheme. E.g., 'OTB_DEF_70-99_0_0, OTB_DEF_>=120_0_0'; 'GNS_DEF_80_99_0_0, GTR_DEF_>=100_0_0', etc
Areas_of_interest_expected_to_occur_in_sampling_scheme	Comma separated list of ICES areas of interest in the sampling scheme. e.g. '27.4.a, 27.3.a.20, 27.3.a.21'
ICES_Stocks_expected_to_be_length_sampled_in_sampling_scheme	You can use e.g. "all stocks" or comma separated list of ICES stocks that are expected to be length sampled in the sampling scheme. e.g. 'cod.27.47d20, dab.27.3a6'
ICES_Stocks_expected_to_be_biologically_sampled_in_sampling_scheme	Comma separated list of ICES stocks that are expected to be biologically sampled in the sampling scheme. e.g. 'cod.27.47d20, dab.27.3a6'

SAMPLING DESIGN	
FIELD ID	*DESCRIPTION*
Year_data_collection	Year(s) when the sampling design was applied in data collection.
Sampling_Country	Country in charge of the sampling scheme
Sampling_Scheme_ID	Unique ID of the sampling scheme
Stratum_ID	Unique code to identify each stratum
Stratum_description	Short description of the sampling strata (e.g Ports in NE area, west coast purse-seines)
Exclusions in stratum_ID	Describe and identify if there are exclusions to the each StratumID to access problems or other situations that were not over seen (e.g.. Inaccessible ports, vessel size categories you don't sample, etc).
Target_Catch_component	Target component to be sampled in stratum: Catch, discards, landings, landings+discards, landings+BMS+discards, etc
Stratum_Sampling_design	Description of the sampling design (e.g.. Probability-based multistage sampling, etc)
PSU	Primary sampling unit (PSU) within each stratum (e.g fishing trip, fishing vessel, vessel x trip)
Sampling_frame_(PSU)	List of PSU. Complete list of non-overlapping PSUs. Ideally should be the target population.
Total_PSUs_for_reference_year	Total number of PSUs in that stratum in the reference year
Sampling_effort_expected_(No._of_PSU_sampled_in_each_stratum_-_expected)	Number of expected samples (number of PSUs) per stratum.
Sampling_effort_achieved_(No._of_PSU_sampled_in_each_stratum_-acheived)	Number of achieved samples (number of PSUs) per stratum.
Total_landings (tonnes)_for_targeted_species_by stratum	Total landings (in tonnes) for targeted species for the sampling design (e.g demersal, crustaceans), by stratum
Total_value (EUR)_for_targeted_species_by stratum	Total value (in EUR) for targeted species for the sampling design (e.g demersal, crustaceans), by stratum
Total_trips_for_targeted_species_by startum	Total number of trips with targeted species for the sampling design, by stratum
Number_trips_sampled_by_stratum	Number of trips sampled, by stratum
Total_landings (tonnes)_by stock_and_ stratum (only to be filled in if there is table should be used for a stock specific purpose (e.g.. WK)	Total landings (in tonnes) for the stock of interest in each stratum (only to be completed if this is used for a stcok specific purpose).
Hierachical_structure_in_sampling	Description of all levels in the hierachical structure of the sampling scheme. Separate levels with a ~. Eg., 'PSU ~GearGroup~Trip~Species~Box~Fish~Length~Age'
Metier06_of_interest_expected_to_occur_in_sampling_strata	Comma separated list of métiers level 6, of interest that are expected to occur in the sampling strata. E.g., 'OTB_DEF_70-99_0_0, OTB_DEF_>=120_0_0'; 'GNS_DEF_80_99_0_0, GTR_DEF_>=100_0_0', etc
Areas_of_interest_expected_to_occur_in_sampling_strata	Comma separated list of ICES areas of interest that are expected to occur in the sampling strata. e.g. '27.4.a, 27.3.a.20, 27.3.a.21'

ICES_Stocks_expected_to_be_length_sampled_in_sampling_strata	Comma separated list of ICES stocks of that are expected to be biologically sampled in the sampling strata. You can use e.g. "all stocks" or comma separated list of ICES stocks that are expected to be length sampled in the sampling strata. e.g. 'cod.27.47d20, dab.27.3a6'
ICES_Stocks_expected_to_be_biologically_sampled_in_sampling_strata	Comma separated list of ICES stocks of that are expected to be biologically sampled in the sampling strata. e.g. 'cod.27.47d20, dab.27.3a6'

SAMPLING HIERARCHY	
FIELD ID	**DESCRIPTION**
Year_data_collection	Year(s) when the sampling design was applied in data collection.
Sampling_Country	Country in charge of the sampling scheme
Sampling_Scheme_ID	Unique ID of the sampling scheme
Stratum_ID	Unique code to identify each stratum
Target_catch_component	Target component to be sampled in stratum: Catch, discards, landings, landings+discards, landings+BMS+discards, etc
Sampling_level_ID	1SL = 1st sampling level (where the primary sampling units are selected), 2SL = 2nd sampling level in hierarchy (where secondary sampling unit are selected), 3SU = …
Sampling_unit	Define each sampling unit (e.g. Port x day, trip, species group)
Sampling_frame	Sampling frame with the units. List of non-overlapping units from the sampling level.
Stratification	Describe the stratification at each sampling level (e.g 4 Quarter x 7 Areas x 2 vessel length x 5 Gears) ; otherwise put "none". See Look-up
Method_of_selection_of_sampling_units	What is the selection method of the sampling units, at each stratum (e.g. systematic random, simple random, expert-based, ad-hoc). See look-up
Description of how is selected	Describe how is the selection (e.g.Sequential draw from randomised list, Random selection of day in scheduled week).
Sampling_effort	Number of sampling units you select (E.g., 3 trips, 4 market days). Note: in lower levels of the hierarchy it can be e.g. 2 otoliths per cm class; you can also use things like '2 otoliths per cm class in trip' to indicate that you quota sample within length class*trip

STOCKS SAMPLED	
FIELD ID	**DESCRIPTION**
Year_data_collection	Year(s) when the sampling design was applied in data collection.
Sampling_Country	Country in charge of the sampling scheme
Sampling_Scheme_ID	ID of the sampling scheme
Stratum_ID	Unique code to identify each stratum
Sampling_level_ID	1SL = 1st sampling level (where the primary sampling units are selected), 2SL = 2nd sampling level in hierarchy (where secondary sampling unit are selected), 3SU = …
Species	Species scientific name
Stock	Stock definited by ICES stock list
Catch_component	target component of biological variable: total catch, discards, landings, BMS
Biological_variables_sampled_from _individuals	Biological variable collected for the stock

Estimation procedures template:

ESTIMPROC	
Date_upload	Date when the last upload to Intercatch was made (or submission to Accessions)
Year_data	Year(s) when the sampling design was applied in data collection.
Country	Country in charge of the sampling scheme (three letter code)
Stratum_ID	Unique code to identify each stratum. If you use the same procedure for all strata, use "all strata".
Fleet	As submitted to EG (frequently InterCatch Fleet). If you used the same procedure for all fleets you reported, just put "all fleets"
FishingArea	Comma separated list of ICES areas of interest that are expected to occur in the sampling strata. e.g. '27.4.a. As submitted to EG (frequently InterCatch FishingArea). If you used the same procedure for all fishing area you reported, just put "all fishing areas"
Species	Scientific name
Stock	Stock code according with ICES code.
Catch Category	Catch component to be estimated: Catch, discards, landings, landings+discards, landings+BMS+discards, etc
Variable	What is the variable to be estimated (e.g. landings at age, length). Include all estimates supplied to EG. See list in Annex 1.
Step_#	Estimation Step number
Step_description	Describe the estimation step (e.g. Individuals to box, trips to port)

Input sampling data	**Type**	Describe the core input data
	temporal*fleet*spatial aggregation	describe the aggregation of the data
Calculation	**Type_of_calculation**	describe the type of calculation
	Auxiliary_variable	describe the type of auxiliary variable (if any)
	Source_of_auxiliary_variable	describe the source of auxiliary variable
	Raising_factor_or_operation	describe the raising factor or operation
	Weighing	Were weights applied? If Yes describe
Output data	**Type**	Describe the output data
	Temporal*fleet*spatial_aggregation	Describe the aggregation of the data
	Missing and atypical values	Describe the situation and how it was handled
	Confidence intervals	Describe how they were calculated in the relevant step

AgeLenKey	
Date_upload	Date when the last upload to Intercatch was made (or submission to Accessions)
Year_data	Year(s) when the sampling design was applied in data collection.
Country	Country in charge of the sampling scheme (three letter code)
Stratum_ID	Unique code to identify each stratum. If you use the same procedure for all strata, use "all strata".
Fleet	As submitted to EG (frequently InterCatch Fleet). If you used the same procedure for all fleets you reported, just put "all fleets"
FishingArea	Comma separated list of ICES areas of interest that are expected to occur in the sampling strata. e.g. '27.4.a. As submitted to EG (frequently InterCatch FishingArea). If you used the same procedure for all fishing area you reported, just put "all fishing areas"
Species	Scientific name
Stock	Stock code according with ICES code.
Catch_Category	Catch component to be estimated: Catch, discards, landings, landings+discards, landings+BMS+discards, etc
Variable	What is the variable to be estimated (e.g. landings at age, length). Include all estimates supplied to EG. See list in Annex 1.
Step_#	Estimation Step number
Type_of_ALK	Describe the type of ALK: e.g. quarterly; quarterly*fleet, annual, annual*sex, etc.
Type_of_length_used_in_ALK	Describe the type of length used in the relationship. Eg., total length to nearest cm; fork length to lowest cm; etc
Calcified_structure_used_and_age_processing	Otoliths, scales, illicia, vertebra, etc. ; sectioned, whole; read in transmitted or reflect light; etc
Origin_of_samples_used_in_ALK	Describe origin of samples used in the ALK. E.g., IBTS Q1, onboard samples from OTB_CRU fleet, port sampling of GNS vessels, bought at market, unknown origin, Mix (detail which)
Selection_of_samples_for_age_determination	Describe how you select samples from each origin. E.g., random sample from catch; 10 otoliths (random) per size class; 10 otoliths (random) per size class and sex, etc.
Total_number_of_samples	Total number of length-age pairs used in ALK
Weighing_in_ALK_building	Did you weigh the samples before pooling the ALK. E.g., weighing by fleet landings
Gap_filling	Did you fill in any ages for some lengths you had not sampled? If yes, detail procedure.
Date_of_last_ALK_and_frequency_of_update_of_ALKs	Describe the date of last ALK generation and the periodicity of update

WeightAtLen	
Date_upload	Date when the last upload to Intyercatch was made (or submission to Accessions)
Year_data	Year(s) when the sampling design was applied in data collection.
Country	Country in charge of the sampling scheme (three letter code)
Stratum_ID	Unique code to identify each stratum. If you use the same procedure for all strata, use "all strata".
Fleet	As submitted to EG (frequently InterCatch Fleet). If you used the same procedure for all fleets you reported, just put "all fleets"
FishingArea	Comma separated list of ICES areas of interest that are expected to occur in the sampling strata. e.g. '27.4.a. As submitted to EG (frequently InterCatch FishingArea). If you used the same procedure for all fishing area you reported, just put "all fishing areas"
Species	Scientific name
Stock	Stock code according with ICES code.
Catch_Category	Catch component to be estimated: Catch, discards, landings, landings+discards, landings+BMS+discards, etc
Variable	What is the variable to be estimated (e.g landings at age, length). Inclide all estimates supplied to EG. See list in Annex 1.
Step_#	Estimation Step number
Type_of_LWR	Describe the type of LWR: e.g. quarterly; quarterly*fleet, annual, annual*sex, etc.
Type_of_weight_and_length_used_in_LWR	Describe the type of weight and length used in the relationship. Eg., round weight and total length to lowest cm; gutted weight and fork length to nearest cm; etc
Origin_of_samples_used_in_LWR	Describe origin of samples used in the LWR. E.g., IBTS Q1, onboard samples from OTB_CRU fleet, port sampling of GNS vessels, bought at market, unknown origin, Mix (detail which)
Selection_of_samples_for_LWR	Describe how you select samples from each origin. E.g., random sample of weights and lengths from catch; 10 weights (random) per size class; 10 weights (random) per size class and sex, etc.
Total_number_of_samples	Total number of weight-length pairs used in relationship
Weighing_in_WRL_building	Is there any weighing of sample before estimating the LWR? E.g., weighing by fleet landings
Gap_filling	Did you fill in any gaps (e.g. a weight you were missing for a specific length)? If yes, detail procedure.
Model_fit	Describe the type of modelling: log-log relationship; non-linear model
Date_of_last_LWR_and_frequency_of_update_of_LWRs	Describe the date of last LWR generation and the periodicity of update

WeightAtAge	
Date_upload	Date when the last upload to Intercatch was made (or submission to Accessions)
Year_data	Year(s) when the sampling design was applied in data collection.
Country	Country in charge of the sampling scheme (three letter code)
Stratum_ID	Unique code to identify each stratum. If you use the same procedure for all strata, use "all strata".
Fleet	As submitted to EG (frequently InterCatch Fleet). If you used the same procedure for all fleets you reported, just put "all fleets"
FishingArea	Comma separated list of ICES areas of interest that are expected to occur in the sampling strata. e.g. '27.4.a. As submitted to EG (frequently InterCatch FishingArea). If you used the same procedure for all fishing area you reported, just put "all fishing areas"
Species	Scientific name
Stock	Stock code according with ICES code.
Catch_Category	Catch component to be estimated: Catch, discards, landings, landings+discards, landings+BMS+discards, etc
Variable	What is the variable to be estimated (e.g landings at age, length). Include all estimates supplied to EG. See list in Annex 1.
Step_#	Estimation Step number
Type_of_AWR	Describe the type of AWR: e.g. quarterly; quarterly*fleet, annual, annual*sex, etc.
Type_of_weight_and_length_used_in_AWR	Describe the type of weight and length used in the relationship. E.g.., round weight and otolith age; etc
Origin_of_samples_used_in_AWR	Describe origin of samples used in the AWR. E.g., IBTS Q1, onboard samples from OTB_CRU fleet, port sampling of GNS vessels, bought at market, unknown origin, Mix (detail which)
Selection_of_samples_for_AWR	Describe how you select samples from each origin. E.g., weights and ages sampled, derived from ALK via length-weight relationship; etc.
Total_number_of_samples	Total number of age-weight pairs used in relationship (if not via ALK)
Weighing_in_WRL_building	Is there any weighing of sample before estimating the AWR? E.g., weighing by fleet landings
Gap_filling	Did you fill in any gaps (e.g. a weight you were missing for a specific age)? If yes, detail procedure.
Model_fit	Describe the type of modelling: log-log relationship; non-linear model
Date_of_last_AWR_and_frequency_of_update_of_AWRs	Describe the date of last LWR generation and the periodicity of update

MaturOgive	
Date_upload	Date when the last upload to Intercatch was made (or submission to Accessions)
Year_data	Year(s) when the sampling design was applied in data collection.
Country	Country in charge of the sampling scheme (three letter code)
Stratum_ID	Unique code to identify each stratum. If you use the same procedure for all strata, use "all strata".
Fleet	As submitted to EG (frequently InterCatch Fleet). If you used the same procedure for all fleets you reported, just put "all fleets"
FishingArea	Comma separated list of ICES areas of interest that are expected to occur in the sampling strata. e.g. '27.4.a. As submitted to EG (frequently InterCatch FishingArea). If you used the same procedure for all fishing area you reported, just put "all fishing areas"
Species	Scientific name
Stock	Stock code according with ICES code.
Catch_Category	Catch component to be estimated: Catch, discards, landings, landings+discards, landings+BMS+discards, etc
Variable	What is the variable to be estimated (e.g landings at age, length). Include all estimates supplied to EG. See list in Annex 1.
Step_#	Estimation Step number
Type_of_MO	Describe the type of MO: e.g. quarterly; quarterly*fleet, annual, annual*sex, etc.
Type_of_length_used_in_MO	Describe the type of length used in the relationship. Eg., total length to nearest cm; fork length to lowest cm; etc
Origin_of_samples_used_in_MO	Describe origin of samples used in the ALK. E.g., IBTS Q1, onboard samples from OTB_CRU fleet, port sampling of GNS vessels, bought at market, unknown origin, Mix (detail which)
Selection_of_samples_for_maturity_determination	Describe how you select samples from each origin. E.g., 10 samples (random) per size class; 10 samples (random) per size class and sex, etc.
Total_number_of_samples	Total number of maturity-length pairs used in relationship
Weighing_in_MO_building	Is there any weighing of sample before estimating the MO. E.g., weighing by number of individuals
Model_fit	Describe the data you use to fit the MO and how you modelled it: e.g. raw data, proportions;
Date_of_last_MO_and_frequency_of_update_of_MOs	Describe the date of last MO generation and the periodicity of update

Annex 13: ToR b.1) Summary of DCF Workshop on Transversal Variables and PGECON meetings

DCF WKs Transversal variables 1&2 and Small-scale Fisheries

Sébastien Demanèche

In 2015 & 2016, two DCF workshop on transversal variables, bringing together experts from different regions (Baltic sea to Mediterranean) and different expertise (fisheries Economists, Biologists, Modellers and Data managers), were held (under the umbrella of the EU JRC) to devise a common standard methodology to encode and aggregate fisheries data to calculate fishing effort estimates. Indeed, data consistency and comparability need that same methods, criteria and principles are used across MS when preparing data for EU wide datasets. Rationalisation of data calls and ensuring that economic and biological data can be meaningfully merge to allow more generic implementation of bioeconomic modelling and inclusion of economic advice in fisheries management, were the other objectives pursued by the workshops.

The 1st workshop highlighted some inconsistencies in effort calculation across MS approaches and between data call, and advised the need for DCF standards (methods, codes, acronyms publicly available at DCF website) and the need to streamline STECF data calls and to provide clear guidance to MS' data provider.

The 2nd workshop completed and fine-tuned the work done during the WK1 providing a complete range of trip scenarios and how fishing effort should be calculated and apportioned between gears and areas for each of them (based on official data availability), editing and explaining agreed basic principles and methodology adopted for fishing effort calculation, preparing the documentation and developing the linked R-script and advising a proposal for rationalisation of STECF data calls (with the objective to have one unique STECF transversal variables data call).

During the 2nd workshop, there were some discussions focused on vessels without logbooks (SSF, as the basic principles adopted were mainly developed for vessels carrying logbooks) and on passive gears. For passive gears, the main conclusion was that Fishing Days was not a biologically meaningful effort measure as it has to be linked with the 'gear soaking time'. That situation stressed the issue that “gear soaking time” it is a not mandatory variable in logbooks. The group agreed nevertheless on metrics for passive gears fishing effort (based on official data availability). In what concerns SSF, the group agreed on a core set of fishing activity variables but could not find a consensus conclusion on a common methodology on calculation of fishing effort estimates based on data sources other than logbooks and fitted with the SSF specific features and suggested that additional work was needed on that. Indeed, for SSF, several data collection methods, data formats across MS with dataset stored in different ways creates challenges to the standardization of calculation of fishing effort when, in the same time, several concerns raised about the agreed calculation methodologies, especially for countries where such fleets represent an important share of their national fleet.

Among the basic principles adopted, the main concerns were for the two following: 1) apply the "24h period definition" to calculate Days at Sea and 2) separate fishing trips are always counted separately; as they could be both a major concern for SSF and are not adapted to number of ongoing SSF data collection procedures.

The latter issues were further debated during the PGECON subgroup DCF workshop on SSF (see below) which concluded that: 1) "24h period definition" could not be applied for SSF and consequently that Days at Sea have to be estimated differently, 2)

regards the possible great impact to consider each trip separately and considering the data available for SSF, it is advised that for them, the effort calculation will be better calculated on a 'day by day' basis instead of a 'trip by trip' basis and 3) finally that for all other principles SSF fishing effort measures calculation has to be in line as far as possible with the agreed methodology considering the data available and the way to collect them. The group agreed also on the fact that in general SSF has a daily activity (one fishing trip = one day at sea = one fishing day) but underlined the need to validate/assess this assumption especially in case of census type data collection based mainly on sales note.

Finally, the group concluded that there is a growing need for a DCF 'quality assurance reference framework' for use by MS, which should include a suite of standard methodologies, which prescribe how to calculate, encode and aggregate fisheries data so that they can be integrated to form a coherent EU dataset and which can serve to support DCF data end-users. In this context, agreed methodologies and concerns about them have to be shared and debated widely in order to ensure a global consensus (ToR of WGCATCH to further debate the SSF fishing effort calculation methodology based on findings of previous meetings).

Main results from PGECON Subgroup DCF workshop on small-scale fisheries

Sébastien Demanèche

In September 2017, a workshop on small-scale fisheries took place in The Hague, 25-29 September 2017 and was attended by 20 experts from 17 Member States. The proposal for the workshop stemmed from the Fisheries Data Collection Experts Subgroup of the 5th Planning Group on Economic Issues (PGECON, Zagreb 2016).

The group address the following tasks:

ToR1) Description of the small-scale fisheries and fishing habits per macro-area

ToR2) Management measures per macro-area

ToR3) Data needs in relation to peculiarities of small-scale vessels

ToR4) Methodologies for collecting socio-economic variables

ToR5) Suggested data collection procedures

The main objective of the workshop was to highlight peculiarities of small vessels in EU regions, to provide a comparison in terms of activity, social and economic profile and management measures, and to further investigate some findings and pending issues linked to SSF coming from previous meetings (SSF Nantes workshop in 2013, WGCATCH meeting in 2015 and 2016, 2nd DCF workshop on transversal variables in 2016, Socio-economic meeting on statistical issues and methodologies in 2016, fishPi research project in 2016).

The methodology adopted by the workshop was based on questionnaires on SSF (18 MS, ~85% of the total European fleet), presentations of SSF fishing activity data collection procedures, data issues and fishing effort measures calculation (17 MS), resume of management measures for SSF at a national and regional level (8 MS) and questionnaires on estimation of engaged crew, imputed value of unpaid labour and financial position (12 MS).

The workshop falls in line with several works, scientific bodies and concerns raised by the European Commission regarding the important role small-scale fisheries play in

Europe's fishing sector as they are an important component of many European fisheries; and the need to improve knowledge of small-scale fisheries in order to secure their sustainable development.

The workshop provided a description of the SSF per macro-area. Previous outcomes were reaffirmed (SSF is a large part of the EU total fleet which can contribute significantly to landings and effort, a highly diversified fleet, a multi-gear and multispecies fleet, importance of fixed gears and part-time activity) and some new findings were established (disparities of SSF levels of productivity, higher average prices and high importance in social terms, wholesalers, fishmongers and direct sales as main sales market channels). All of this needs to be assessed regionally by fisheries, species or areas as significant differences can occur between them.

The workshop reaffirmed that it is essential to estimate the fishing activities of SSF in terms of fishing effort, volume and value of catches as minimum requirements of data to answer the different ongoing regulations. Indeed, SSF could be, in certain areas/cases, a major concern for stock assessment, fishery spatial management, socio-economic studies, but are often underreported and difficulties arise to have access to this information (data poor fleet segment which seemed to be trapped in a vicious cycle where due to incompleteness and lower quality of data, systematic lower importance is assigned to it relative to larger scale fleets).

SSF data collection methodologies currently applied in EU were described (census and sampling approach) and summarised in a resume table describing also the fishing effort estimates calculation procedure and the major concerns raised regarding data quality/reliability. The group discussed notably the coverage/completeness of the estimates reached by the data collection and agreed that it is a specific issue that will require specific attention. The group advised also that validation by comparison with different sources represents a fundamental best practice to overcome problems with reliability and completeness of data collected and discussed the impact the new technology could have to improve the quality/reliability of SSF data in the future.

As suggested during the 2nd Transversal variables DCF workshop, the group continued also to debate a devise common methodology on calculation of Fishing Days and Days at Sea fitting with the SSF specific features and ongoing data collection and comes to some proposals/recommendations (especially moving from a "trip by trip" basis to a "day by day" basis).

Finally, the group advised a first description (although the data collected was not complete) of the variety of management measures in places in MS which reflects the heterogeneity and diversity of the SSF fleets across MS and agreed also on some proposals/recommendations on definitions and calculation procedures related to financial position, employment and value of unpaid labour for small-scale fisheries.

Annex 14: ToR b.1) Compilation of information on effort calculation

Background

In 2015 & 2016, two DCF workshop on transversal variables bringing together experts from different regions (Baltic sea to Mediterranean) and from different expertise (fisheries Economists, Biologists, Modellers and Data managers) were held (under the umbrella of the EU JRC) to devise a common standard methodology to encode and aggregate fisheries data to calculate fishing effort estimates[5], essential component of the fishing activities estimates and considered as one of the minimum requirements of data needed to answer all the different ongoing regulations (e.g. Common Fisheries Policy (with the objective to 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, ...) in particular in case of a fishing effort based management.

These workshops are an integral part of the work engaged by EU JRC to develop a DCF 'quality assurance reference framework' for use by MS, which should include a suite of standard methodologies, which prescribe how to calculate, encode and aggregate fisheries data so that they can be integrated to form a coherent EU dataset and which can serve to support DCF data end-users. Data consistency and comparability need in fact that same methods, criteria and principles are used across MS/fleets when preparing data.

This is particular true for shared stock between countries and/or fleets (large & small-scale fleets) and for some fishery management regulation (including spatial controls) which could involve many countries and/or fleets and which then should be based on standardized/normalised data.

In the 2nd workshop, some discussions focalised on vessels without logbooks and on passive gears were held but the workshop could not find a consensus conclusion on that and suggested that additional work was needed to devise common methodology on calculation of fishing effort estimates (Fishing Days and Days at Sea especially) based on data sources other than logbooks (agreed methodology, developed during the two workshops, is indeed mainly fitted for vessels carrying logbooks and has to be adapted to other data sources for SSF).

The focus of WGCATCH is on the collection of data of relevance for stock assessment and fishery management. One of the main responsibilities of WGCATCH is to ensure the quality of commercial catch data. Thus, it is completely in its scope of activity to discuss and have an input on the setting up of a DCF 'quality assurance reference framework' for SSF. Therefore, and as suggested during the 2nd Transversal variables DCF workshop, WGCATCH subgroup dealing with small-scale fisheries debate during the 2017 meeting the 'Nicosia' agreed methodology for fishing effort estimates calculation. The group discussed in particular its fitting with the specific features of SSF and the ongoing SSF data collection procedures.

To this end, first the main findings and outstanding questions arising from the two DCF workshops on transversal variables; with a special focus on the issues raised for SSF and passive gears; were presented and discussed (see resume of the presentation

5 The group advised that kwDays and GTDays are useful estimates only for trawlers or dredgers, no need to calculate these estimates for passive gears.

hereunder and complete presentation in the Annex 15). Then the subgroup analysed information provided in the report of the PGECON subgroup DCF workshop on SSF (held in September 2017), in particular the "resume table by country of data collection in used for SSF and fishing effort variables collected". And, finally, the group debated the recent conclusions reached by the PGECON subgroup DCF WK SSF on this specific topic.

WGCATCH considerations on effort calculation for passive gears

For passive gears (gillnets and entangling nets, pots and traps, handlines, longlines, etc.), the WGCATCH subgroup fully agrees with the main conclusion of the 2nd workshop on Transversal Variables which highlighted that Fishing Days are not a meaningful effort measure for passive gears. This particularly true for the cases of those gears in the water and fishing after the vessels come back to the harbour. In that case, the fishing effort estimates and CPUE have to be linked with the '**gear soaking time**'. However, this is not a mandatory variable in the logbooks and this information might be not asked or available in some ongoing SSF data collection systems. WGCATCH recommends that the need to collect this additional variable is regionally agreed in the Regional Coordination Groups (RCG) system of the new DCMAP but considers the difficulties involved in collecting this type of data and that data collection should be adapted to the specific features of SSF and ongoing data collection systems. Nevertheless, it is advised that "vessel' fishing days" keep being requested as an effort measure, despite their limitations, to ensure comparisons are possible with the other gears (active gears). The WGCATCH subgroup suggests that "**vessel' fishing days**" are calculated for all trips (as a basic effort measures linked with the "vessel' fishing effort" deployed[6]) even if it is not necessarily fully linked with the gear' fishing effort, in particular for passive gears.

With regards to gear dimension (total length of nets, total number of pots/traps and total number of hooks), WGCATCH 2017 emphasized the WGCATCH 2016 statement that these variables are of high importance, especially concerning passive gears, and encourages countries to collect and improve the quality of such data even in cases where they are optional for less than 10m vessels.

WGCATCH compilation of effort variables (based on the summary table produced by the PGECON subgroup DCF workshop on small-scale fisheries).

The WGCATCH subgroup analysed the information provided in the "summary table by country of data collection in used for SSF and fishing effort variables collected" of PGECON subgroup DCF Workshop on Small-scale Fisheries. In that table, data were provided by 18 Member States covering Baltic and North Sea, North/East Atlantic, Mediterranean and France other regions. The data collected covered 85% of the whole SSF European Fleet registered in 2015 and two different types of data collection methodologies are shown currently applied in EU to calculate fishing activity estimates of vessels less than 10 meters: 1) **Sampling approach** (stratified sampling of vessels or clustered sampling of fishing trips) and 2) **Census approach**. The census approach is

6 See definition of fishing day finalised in the 2nd workshop: ' ... the definition of a fishing day is: "Any day at sea with fishing operation" calculated as calendar days. In other words, Fishing Days equal Days at Sea minus days used to go and to come back from the fishing ground where the fishing operations take place.'

the most common way used for Member States with a relative limited number of vessels sampling approach is the primary data collection source used in countries with large and fragmented SSF segments.

For the census approach, most Member States are using adapted declarative forms (journal or monthly reports, coastal logbooks, etc.) and some of them use a data collection system based mainly on sales notes. In the latter case, the sales note data could be completed with data coming from surveys, questionnaires or on board sampling. Finally, most Member States report using alternative or supplementary data sources to verify the information or have in place a cross-validation procedure based on comparison of the different sources available (e.g. declarative data coming from adapted declarative forms, sales notes, landings declaration, geolocalization data, licenses register, etc.) to improve the reliability and completeness of the data collected. Some information on how the effort variables are collected and the assumptions applied were gathered. All countries except Portugal commonly applied the following assumption for SSF: 1 trip = 1 day at sea = 1 fishing day. Information about fishing hours is not collected in all MS (missing information especially in some Baltic and North Sea countries). Some MS estimate this information based on a calculation taking the number of fishing days multiply by the 'mean' estimated number of hours spent each day by vessel (24 hours, 16 hours, 8 hours, etc.).

The WGCATCH subgroup agrees with the commonly assumption that less than 10 meters vessels have generally a daily activity and that, for them, it could be assumed that 1 Trip is equivalent to 1 Day at Sea also equivalent to 1 Fishing Day as far as no other data contradicts this hypothesis. Nevertheless, the WGCATCH highlights that this assumption needs to be assessed both regionally and by fishery because significant differences can occur.

WGCATCH review of the methodology for effort calculation agreed in WKTRANSVERSAL II and adjustments proposed for SSF.

Concerning the 'Nicosia' agreed methodology (the detailed list of the basic principles of the agreed methodology and the reasons why they have been adopted could be find in the final report of the 2nd DCF workshop on Transversal Variables (2016)), the WGCATCH subgroup agrees that the principal concerns for vessels less than 10 meters are for the two following main basic principles adopted:

'... Days at sea is calculated by trip. It is the time between when a vessel leaves the harbor and the return to a harbor. The number of days at sea by a trip is calculated as commenced 24 hour periods expressed in whole numbers. This means for example that a trip of 26 hours will result in 2 days at sea. ... ("24h definition")

... That separate trips have to be always counted separately, regardless of whether they are by the same vessel or different vessels, meaning that the fishing trip is the basic unit of observation for effort calculation and that fishing trips are always seen independently regardless of the vessel(s) that has/have performed them. ... ("trip by trip" basis for fishing effort calculation)'

The WGCATCH subgroup discussed widely these basic principles for SSF and debated on their practical implementation for these fleets as well as the impact the agreed calculation methodology might have in future for them, especially for countries where such fleets represent an important share of their national fishing fleet. **In particular, the WGCATCH subgroup highlights that the principle "separate trips have to be always counted separately" can have a great impact in fleets that usually perform**

two fishing trips during the same day (the first one to set or put gears in the sea, the second one to take away the gears and catches from the sea).

Furthermore, the WGCATCH subgroup debated the following conclusions coming from PGECON DCF subgroup WK SSF on these specific issues:

1) **for SSF, "24h period definition" for days at sea calculation could not be applied in many cases as departure time and arrival time are not collected and days at sea have to be estimated differently.**

2) **for SSF and for fishing effort calculation the basic principle of "trip by trip basis" calculation could not be applied in many cases as data collection procedures often collect data on a "day by day basis" (especially in census approach based mainly on adapted declarative forms) and as it could also have a great impact for some of fleets (see above). Thus, the effort calculation should be preferentially calculated on a "day by day basis" rather than on a "trip by trip basis".**

For the first topic above about "24h period definition", the subgroup agreed on the PGECON conclusion and that in SSF the days at sea have to be estimated differently (taking also into consideration the fact that SSF have generally a daily activity).

For the second topic above about "trip by trip basis", after discussion (in subgroup and plenary) WGCATCH agrees that this methodology seem to be better adapted to the specific features of SSF and their ongoing data collection systems. As such, the subgroup suggests that this new standard is used in the future to calculate fishing effort estimates for SSF (under 10m' vessels) even if this methodology is not completely in line with the basic principles adopted during the 2nd DCF workshop on transversal variables (Nicosia, 2016). Nevertheless, WGCATCH advises that 10–12m'vessels are required to fill in logbooks and could have some similarity with the under 10m'vessels. Accordingly, before applying this new methodology extensively and it becomes a standard, it will be necessary to test the impact of this specific change of rules on the 10-12m'vessels fleet segment, i.e. comparing the fishing effort estimates calculated on the both standard "trip by trip" basis and "day by day" basis and evaluating the impact of a potential change in the rules applied. WGCATCH is scheduled to do this comparison intersessionnaly on some case studies and discuss them during the WGCATCH 2018 meeting.

WGCATCH also addressed other issues and difficulties of fishing effort calculation and application of the agreed methodology in the context of a census approach using a data collection system based mainly on sales notes. Sales notes may only provide information on the date of sale, vessel name and ID, port of sale/landing, fishing area, landings quantity and value by species. With the strong assumption "one sales note = one fishing trip = one fishing day = one day at sea", some fishing effort variables estimates can however be calculated. Nevertheless, WGCATCH stresses that 1) this assumption has to be assessed regionally and by fishery, as significant differences can occur where sale notes cumulate several fishing trips; and 2) that, in such case, there is also no possibility to calculate these estimates on a "trip by trip" basis or to apply the "24h definition" which strengthens the previous conclusions.

Furthermore, WGCATCH notes that sales notes lack some information (e.g. detailed area, detailed gear used,) and that raises challenges/difficulties in applying the agreed methodology. This takes places even if the regulation has evolved and now asks for the category of gear used (an 'aggregated' information, quality of whose need to be assessed). In particular, in the case of sales notes, information on precise gear, gear

mesh size, gear dimension and more precise location of the fisheries (e.g. ICES rectangle, level of detail reported for area in sales note is often very large) are missing. This information could be assumed based on catch composition or on local control agency records and known information or could be derived from information available in licenses, so might still be reasonable but remain imprecise. The missing or imprecise information regarding the gear used is particularly harmful in order to apply the following basic 'Nicosia' principle:

*'... The total Fishing Days of a trip requires consideration of passive and active gears. The total is the sum of the combined Fishing Days from passive and active gears on that trip. Every passive gear on a fishing date*area combination, counts as one Fishing Day. For active gears, it is calculated as the number of unique fishing dates with active gears in that trip, i.e. look at the fishing dates which have at least one active gear entry and count the number of unique dates. ... ("calendar day" definition with specific assumption adopted for passive gears which are assumed to be used in parallel)*

All the more so that SSF is commonly a typically multi-gear fishery (which can be used in combination in a fishing trip/day), which implies that, in that case, often fishing effort estimates have to be estimated differently. The example of Portugal SSF and how they are dealing with this issue is presented hereafter.'

As an example, in mainland Portugal, most vessels are under 12m (86%, i.e. small-scale fisheries) of which 97% are multi-gear (i.e. have licenses for several fishing gears, which can be used in combination in a fishing trip/day) and are responsible for an important percentage of landings in weight. Small-scale vessels are not obliged to have VMS or logbooks, therefore fishing effort for SSF can only be estimated from licenses and sales notes. A multi-gear vessel's catch in a day is landed with no discrimination by gears used, which limits the data resolution on these vessels. Moreover, currently SSF are essentially sampled only at-market. The current solution for assigning landings and fishing effort to gears in SSF is the following: trips from multi-gear vessels are assigned to a single gear/métier (i.e. through development of algorithms for segmentation of trips based on dominant landings/value of main species present in each trip). Moreover, for the combination of these two cases (multi-gear small-scale vessels; which are dominant in number in Portugal), it becomes especially difficult to quantify effort and catch or landings by gear/métier and consequently to apply the agreed 'Nicosia" methodology.

Finally, and as for the other "Nicosia" basic principles adopted ("to apportion days at sea and fishing days between gears and areas", "using calendar day basis for fishing day calculation", **...), WGCATCH advises that, for SSF, fishing effort measures calculation is kept in line, as far as possible, with the methodology established for vessels carrying logbooks considering the data available and the way to collect them.**

Table 1 summarises the adapted proposal of 'Nicosia' agreed methodology taking into account the specificities of SSF.

'Nicosia' agreed methodology	Proposed adjustments for SSF
'... Days at sea is calculated by trip. It is the time between when a vessel leaves the harbor and the return to a harbor. The number of days at sea by a trip is calculated as commenced 24 hour periods expressed in whole numbers. This means for example that a trip of 26 hours will result in 2 days at sea. ...' ("24h definition")	*'... for SSF, "24h period definition" for days at sea calculation could not be applied in many cases as departure time and arrival time are not collected and days at sea have to be estimated differently ...'*
	'... less than 10 meters vessels have generally a daily activity and that, for them, it could be assumed that 1 Trip is equivalent to 1 Day at Sea also equivalent to 1 Fishing Day as far as no other data contradicts this hypothesis. ... Nevertheless, ... this assumption has to be assessed ...'
'...That separate trips have to be always counted separately, regardless of whether they are by the same vessel or different vessels, meaning that the fishing trip is the basic unit of observation for effort calculation and that fishing trips are always seen independently regardless of the vessel(s) that has/have performed them. ...' ("trip by trip" basis for fishing effort calculation)	*'... for SSF and for fishing effort calculation the basic principle of "trip by trip basis" calculation could not be applied in many cases as data collection procedures often collect data on a "day by day basis" (especially in census approach based mainly on adapted declarative forms) and as it could also have a great impact for some of fleets. Thus, the effort calculation should be preferentially calculated on a "day by day basis" rather than on a "trip by trip basis ...'.*
*'... The total Fishing Days of a trip requires consideration of passive and active gears. The total is the sum of the combined Fishing Days from passive and active gears on that trip. Every passive gear on a fishing date*area combination, counts as one Fishing Day. For active gears, it is calculated as the number of unique fishing dates with active gears in that trip, i.e. look at the fishing dates which have at least one active gear entry and count the number of unique dates. ...' ("calendar day" definition with specific assumption adopted for passive gears which are assumed to be used in parallel)*	*'... Finally, and as for the other "Nicosia" basic principles adopted ("to apportion days at sea and fishing days between gears and areas", "using calendar day basis for fishing day calculation", ...), the group advised that, for SSF, fishing effort measures calculation has to be in line, as far as possible, with the methodology established for vessels carrying logbooks considering the data available and the way to collect the ...'*

Table 2: Major points regarding the methodology agreed in 'Nicosia' (WKTRANVERSAL II) and adjustments proposed for SSF.

Annex 15: ToR b.2) Abstracts from the presentations on data quality indicators for SSF

Changes in the Polish fisheries legislation concerning SSF. Method of catch estimation – a proposal.

Maciej Adamowicz, Ireneusz Wójcik, Włodzimierz Grygiel

The aim of presentation entitled: "Changes in the Polish fisheries legislation concerning SSF. Method of catch estimation – a proposal", linked with the ToR b), was to describe the assumptions of the estimation method of the Baltic fish catches realised by vessels' under 8-m length. This action can be considered as response to implemented on 13.07.2017 some changes in the Polish Marine Fisheries Act. According to the new national regulation, vessels of length less than 8-m are no longer obliged to report catch composition information in the monthly reports. However, the information on the fishing effort is still available in the a.m. reports. It should underline that the annual (2014-2016) share of vessels' <8-m length in the total national fish catches, originated from the Baltic, is around 2%.

The above-mentioned estimation method is based on the common fishing pattern of vessels of length less than 10-m, which was identified in the historic dataset from 2012 to 2016. Spatial stratification was also applied and three geographical areas, i.e. the Vistula Lagoon, the Szczecin Lagoon and the middle coast onshore waters, with different individual, hydrological and ecological conditions were identified. The estimation process was simulated for the first semester of 2017, as this was the last period under the previous regulations. The data analysis was performed for the most important commercial fish species exploited by the Polish SSF, taking into account vessels' length, catch weight, areas and seasons. Despite the fact that estimation results concern SSF catches are promising, it is planned to calibrate the estimation method by using the effort data and other datasets, e.g. sales notes, takeover declarations, etc. There is also a need to select appropriate statistical tool to validate the estimation results.

Discussion: The content of presentation was discussed and feedback registered. The general opinion from WGCATCH participants was that the estimation method risks becoming less precise in the future because the change of the legislation itself can be the factor that influence the fishing pattern of <10-m vessels. It was suggested to test the present method more extensively by removing some years of historic data from the test dataset (e.g. leave one year out and use the remainder to predict it) and/or to adjust the sampling program in the range of Small-scale Fleets, e.g. by establishing a reference fleet. It was also mentioned the need to keep monitoring the number of vessels <8m as there is a risk their number increase in response to the more favourable legislative framework. Finally, it was suggested that monthly journals are used to define an offsite survey that validates the estimation method and checks for changes in the fishery.

Assessment of use of sales notes as data source for 10m and under vessels in England.

Kevin Williamson

The collection of data on the small-scale fleet in the UK uses as its basis the common control data such as the UK fleet register and vessel licence systems that apply to all UK commercial fishing vessels. Information on activity by 10-12m vessels is collected via the EU logbook and landing declaration reported by the vessel operator and sales notes reported by buyers of fish, with these data cross checked to ensure consistency and accuracy in the declarations. For vessels 10m and under the key source of information is the sales note for the first sale of fish. The UK requires all such sales to be reported other than those below 30kg sold to private consumers, making it a census of activity with quality and completeness of data managed by inspection of the merchants. Around 90% of sales notes are reported electronically within 24 hours of the sale, making it suitable for use in near real time to inform management and enforcement decisions.

The sale date is used as a proxy for a landing event, with estimates of activity data (such as gear, area etc.) added to the sales species and quantity data to generate an individual landing declaration. Each 10m and under vessel has an allocated range of default options for gear, mesh size and gear dimension and fishing area based on local knowledge of the vessel. In Scotland, direct reporting by 10m and under vessels of a weekly landings summary is required as part of their vessel licence conditions, giving daily summaries of activity and landings data that are used instead of sales notes.

However, sales of fish below 30kg for use by private individuals are exempt from the requirements to have sales notes reported. As type of activity can be significant in some parts of the English coast and for some types of fishing activity an exercise was carried out to identify any issues with the use of sales notes using direct observation of landings - 415 individual landings by 10m and under vessels were sampled and compared to the official recorded activity data derived from sales notes for those vessels over the period involved (October 2015 to February 2016).

The results showed a problem in matching the dates of observed landings and that estimated from the sale dates – this was primarily due to reporting practices at merchants affecting the assumption that sale date was the same as the landing date, which led to a relaxation of the matching process (e.g. observed event being up to 3 days before the official recorded date), but even with this there were some observed landings that could not be matched to any official data. These were considered to possibly be due to "Phantom fishing" whereby the sale of the fish was attributed to a vessel other than the one that actually carried out the activity to avoid the limits on catch set at a per vessel level - so the correct total quantity of fish landed is recorded in the sales notes, but the monitoring of individual vessel activity is affected.

Matched landings were analysed to compare the observed and official quantities of fish recorded - a high level of correlation was seen in some cases, but there was a high degree of variability seen. For example, landings of Sole in all areas showed a high correlation between observed and official data ($R2 > 0.9$). However, Cod landed in the SE of England showed a much lower level of correlation – this is an area where catch limits per month are low and as such the phenomenon of "phantom fishing" may be occurring.

The high variability within results made it difficult to draw a rationale for deriving adjustments to official data, but it did identify a need for more information to be gathered. The UK is currently developing a direct reporting system to be applied to English 10m and under vessels – this is likely to take the form of a daily or weekly electronic declaration of fishing activity similar to the FISH1 summary form used in Scotland. This electronic declaration will be used to derive adjustments to official records where shown to be necessary. A final technical solution has yet to be decided on but it is likely to be an App for smartphones or a system for online reporting system. There are several in existence in the UK and also other systems in use in other countries that are being looked at as models for the development. This change will mean that c. 87% of the UK 10m and under fleet will have some form of direct reporting obligation in place.

Initial development of a UK solution is set to take place in Q1 2018, working with the fishing industry to develop a system that is easy for fishermen to use. The activity data collected will be compared to the sales note data at the individual vessel level to allow corrections to official data to be made when shown to be necessary. These will initially be on a vessel by vessel basis, but may eventually lead to overall correction factors being established depending on the results seen. The activity data will also be integrated with and checked against new data coming in from the introduction of low-cost VMS systems on-board English 12m and under vessels.

Discussion: WGCATCH participants welcomed the analyses made and improvements being considered to the sampling and reporting from SSF fisheries in the UK. A comment was made in plenary highlighting significant differences in small-scale fisheries among countries (mostly individually owned small-vesselsvs.existence of some companies that own several small-scale vessels.

Some considerations about assessment of coverage/completeness of data in a census approach and the use of sales note (French case study), 1st figures.

Sébastien Demanèche

One of the task of WGCATCH 2017 is to develop, using case studies, a list of quality indicators for SSF data. The 1st findings and figures of a work considering these specific issues in the context of the French case study (based on the data available) are presented in order to: 1) criticize the assumption "one vessel without any declarative data is an inactive vessel", 2) evaluate the assumption "(one sales note) = one fishing trip = one day at sea = one fishing day", 3) assess to what extend sales note could be sufficient to follow SSF fishing activity variables and 4) if not, compare inclusive declarative data (logbooks, monthly declarative forms for vessels under-10m and sales notes) with sales note data alone.

General global process to evaluate fishing activity data in French case study have been presented in WGCATCH 2015 (see report for a complete description). It is a part of the general Fishery Information System (FIS); permanent, operational and multidisciplinary national network for the observation of marine resources and their uses; which Ifremer, with a strong joint effort of the French Fishery ministry, has elaborated since 2000 (Leblond *et al*., 2008). FIS aim to cover all the French fleet including SSF with the same precision. One of the originalities of the FIS lies in the fleet monitoring procedure: a comprehensive (applied in all regions covering the whole of the reference population) collection of annual activity calendars aiming at characterizing the inactivity or activity of the vessels each month of the year and, in the latter case, the métiers practised (use of a gear to target one or several species) and the main fishing areas (Berthou *et al*., 2008) ; survey carried out on the basis of preliminary documentation provided

by available declarative data and direct and indirect survey done by a set of observers. This procedure provides a very useful tool to assess and check the completeness, reliability, accuracy and pertinence of declarative data available and in particular to get information on the part of fishing activity which is not included in the inclusive declarative data (logbooks, monthly declarative forms and sales notes).

Based on these data, it could be first concluded that, in the French case study, one vessel (or more precise one "vessel*month") without any declarative data is not inevitably an inactive vessel (even more accurate in terms of "vessel*month"). This is especially true when considering only the sales note or the smallest vessels. On the other hand, the assumption "one fishing trip = one day at sea = one fishing day" could be globally validated for SSF French vessels. All of that needed however to be assessed regionally by fleet segment as significant differences could occur between them. Regarding the use of the sales notes, completely different picture of the French fleet would be drawn considering only sales notes data (including species composition). Hence, in French case study, sales notes data are not sufficient to follow SSF fishing activity variables.

All of that confirms that a SSF data collection system will be not complete without quality control and quality indicators calculation procedures, in order to ensure a good data quality (assessing notably the potential for bias, potential part of the fleet not covered and representativeness of the estimates reached by the data collection).

Discussion: WGCATCH participants welcomed the analyses made and improvements being considered to the sampling and reporting from SSF fisheries in France. A comment was made in plenary about the comprehensive collection of annual activity calendars used to assess the coverage/completeness of data collected. The group recognize the usefulness of such a survey to improve data quality but anticipate also some difficulties to implement such survey in all the countries. Nevertheless, the group reaffirm the need to better evaluate the coverage/completeness of data reached by the data collection especially when census approach is used to survey SSF. A comment was made also in plenary highlighting the significant differences in small-scale fisheries and the ongoing data collection systems and regulations in place for them among countries.

Annex 16: ToR b.2) WGCATCH considerations on quality indicators for SSF

WGCATCH 2017 made some considerations about the assessment of the coverage/completeness of the estimates reached by the data collection especially when census approach is used to survey SSF and discussed specificities and difficulties experienced when using census approach based mainly on sales notes. The subgroup conducted a first review of previous scientific bodies dealing with the issue of quality indicators (e.g. *fishPi EU project, ICES workshops on data quality, etc.)* and assess to what extend findings from these meetings could be useful in the context of SSF. Finally, and to go further on this topic, WGCATCH proposed a questionnaire for its 2018 meeting which will address explicitly these issues.

Some considerations regarding the coverage/completeness of the estimates assessment.

Thus, WGCATCH 2016 considered that the assessment of the coverage/completeness of the estimates reached by the data collection is an issue that will require much attention by MS especially when census approach is used to survey SSF. In particular, WGCATCH 2016 stressed the fact that fishing fleet registers include SSF vessels and, as quality insurance, concluded that first step will be the calculation of the percentage of vessels covered by the declarative data available. WGCATCH advised, in particular, a specific check on vessels without any information or with part-time information to verify the completeness of their data and assess the reality of their inactivity.

PGECON subgroup workshop on SSF further debates this issue and discusses notably the following assumption "one vessel without any declarative data is an inactive vessel" applied in almost all countries but which need to be tested/verified in order to ensure good SSF data quality. Furthermore, PGECON SSF subgroup discusses the key issues identified in case of a data collection system based mainly on sales notes/landings declaration and debates also the following assumption "(one sales note) = one fishing trip = one day at sea = one fishing day" mainly applied to calculate fishing effort estimates.

Some of the statement coming from WGCATCH 2016 could be thus reaffirmed here.

"... Frame survey outcomes (in particular level of active/part-time and inactive vessels inside the SSF fishing sector) constitute a good input to evaluate potential bias. It is noticed that frame survey outcomes have to be updated regularly as it could be changed year to year. Cross-validation of data available (when different sources of data exist) constitutes also a good procedure to verify the completeness of the information received and to calculate quality indicators associated. Specific coverage' validation surveys could be also implemented. ...

... The aims of this analysis are the following: (i) define which part of the total fleet is surveyed or not, (ii) estimate the share of activity not covered by the declarative forms and (iii) constitute a basis to apply some statistical techniques to treat the non-respondents ... and then limit the potential bias of the estimates.

WGCATCH notes that some countries use annual preliminary survey (annual frame survey) to assess, among other things, the global inactivity of the vessels following which is particularly useful for checking the completeness/coverage of the declarative data collected and encouraged others to develop such approach. ..."

Proposal questionnaire for WGCATCH 2018 meeting will address explicitly this issue. In particular, the WGCATCH subgroup advised that EU fishing fleet registers include

SSF vessels and, as quality insurance, concludes that first step will be the calculation of the % of vessels covered by the declarative data available. The WGCATCH subgroup advises then a specific check on vessels without any information or with part-time information to verify the completeness of their data and assess the reality of their inactivity.

Specificities and difficulties raised of census approach using a data collection system based mainly on sales notes

The WGCATCH subgroup discussed the specificities and difficulties involved in the use of a census approach based mainly on sales notes. The WGCATCH subgroup agreed that while they could be seen as similar to a census approach based on adapted[7] declarative forms (e.g. coastal logbooks, monthly fishing report, national fishing forms), they are not the same regarding, among others, 1) the different exemptions in place and the possibility of 'direct sales', both affecting the coverage/completeness of the data collected and 2) the missing information within (e.g. detailed area, detail of the fishing trip associated, gear/mesh size/dimension used, ...) affecting the precision/accuracy of the data collected. Issues and difficulties linked with this missing information have been described in the previous section for fishing effort estimates calculation and could be expanded to all the fishing activity estimates calculation (e.g. landings, fishing effort, spatial mapping of activity). Some alternative methodologies based on catch composition, local control agency records, known information or licenses system to evaluate the missing information have been described but even if data might be reasonable they still remain imprecise. So irrespective of the fishing estimates calculated, the WGCATCH subgroup advises end-users to be aware of where the data comes from and the possible effects on the data' quality (potential biases).

First review of previous scientific bodies dealing with the issue of quality indicators

Data collected for SSF are intended to serve different purposes (stock assessment, marine spatial planning, marine strategy framework etc.). End-users are interested in a relatively high-level overview of data quality, particularly the precision, the potential level and impact of bias, and how quality varies between the countries providing the data.

With multiple countries contributing to these estimates, one of the roles of the different bodies dealing with the issue of quality indicators (i.e. WGCATCH, WGRFS, RCGs etc.) will be to ensure these combined estimates can be quality assured. To this end, a Quality Assurance Framework (QAF) for documenting and archiving data quality is required at a national and regional level. Several ICES WKs (WKACCU, WKPRECISE, WKPICS) were carried out last years with the aim of improving these quality issues.

Quality evaluation procedures for small-scale fisheries data would follow the same principles as for LSF and recreational fisheries for data collected by sampling (e.g. discards, age and length composition):

- Evaluation of survey design and analysis methods against guidelines for good practice documented by ICES expert groups and EuroStat.

[7] As EU logbooks are not suitable with the specific features of SSF.

- Documentation of quality issues at implementation stage, e.g. refusal and non-response; coverage problems, and evaluation of potential for bias arising from these.
- Quality control of archived data.
- Development of quality indicators related to bias and precision.
- Peer review of sampling survey designs.

For census approach, applied in many countries to collect SSF fishing activity data by adapted declarative forms, similar quality evaluation procedure has to be applied but has to be made suitable to its specificities and differences comparing to a sampling approach. Thus, quality indicators and scoreboard described hereunder based on results of previous ICES WKs dealing with quality issues of sampling program, have to be adapted to the specificities of a census approach. In particular such quality evaluation procedure will have to assess the coverage/completeness of the estimates reached by the data collection when a sampling approach, by definition, do not aim to collect complete/exhaustive data but a representative sample.

Quality indicators for sampling programs

A range of QIs can be used in the overall quality evaluation procedure, to deal with 1) aspects of bias related to design; 2) aspects of bias related to implementation, and 3) precision. Design-related indicators are a direct indicator of quality of the sampling program, whilst implementation bias and precision are aspects of data accuracy (uncertainty). This distinction must be clear in the quality evaluation process.

Quality indicator type 1 – Target and sampled population:

This indicator serves to evaluate the coverage of a sampling scheme in relation to the total population (e.g. catch), and how representative the vessels/ports in the frame are of the total population of vessels and ports, if there is a significant component of catch not accessible for sampling (e.g. at minor or inaccessible ports not included in the frame).

- The **Number of ports** is the total number of onshore access points (e.g. ports or port groups), by major stratum (e.g. port size) where commercial landings occur. This metric indicates from how many ports could theoretically have been sampled.
- The **Number of sampled ports** indicates how many of the possible ports were in fact visited.
- The **Number of visits records** the number of sampling trips during the last year (days, where the PSU is port x day). This indicates the amount of effort applied based on the sampling design given in the description.
- The **Number of vessels sampled** records the number of total number of vessel landings that were sampled during the port visits in the given year.
- The **Number of unique vessels sampled** is the number of vessels from which landings were sampled only once in the given year. This number cannot be larger than the number of vessel landings sampled.

Quality indicator type 2 – Response rates:

If components of the landings are barred or inaccessible due to some intervention by the industry or by other landing practices, this causes a departure from the design of the program.

Skippers or port master may refuse access to landings to sample. This should be recorded and **refusal rates** calculated. This also needs to be backed up with documentation of reasons, and any analysis to indicate if these vessels or sites have different characteristics and activities to those sampled.

Quality indicator type 3 – "Goodness of fit":

The **goodness of fit** indicators consists of metrics that illustrate the spatial and temporal coverage of the sampling relative to fleet activity and catches as a whole, and indicates whether the selection process leads to non-representative coverage of vessel size classes etc. These metrics are likely stock specific. Some examples of indicators type 3 are:

- a comparison between landed weight against sampling weight (by fishing gear, quarter, or area).
- a comparison between the total number of trips can also be compared against the number of sampled trips (by fishing gear, quarter, or area).
- The proportion of total landings in strata with missing samples (a problem of over-stratification).

Quality indicator type 4 – Precision estimates:

The advantage of a probability-based sampling design is that estimators of precision can be developed.

Quality indicators related to precision could include:

- **Relative standard error (RSE)** or **Coefficient of variation of the mean (CV).** The advantage of RSE/CV values is that they are a direct measure of precision, and can easily be incorporated into statistical assessment models.
- **Effective sample sizes** (ESS). ESS provides a meaningful index of precision, having accounted for cluster sampling effects. The alternative common practice of reporting actual numbers of fish measured or aged is highly misleading. The downside of ESS as an indicator is that it is not widely used and would require development of skills and software in each lab to carry out the estimation.
- **Numbers of primary sampling units sampled**, ideally by stratum. Numbers of PSUs sampled can be considered as a proxy for ESS. It is likely to be smaller than the ESS, but much closer to ESS than to numbers of fish sampled.

Estimators of precision for key parameters must take into account clustering effects that are caused by multistage sampling.

The statistical estimation of precision requires that representative catch sampling be conducted using probability-based methods (to the extent possible within logistical constraints). Ad-hoc sampling rules out the estimation of precision and should be avoided.

Scorecard for a sampling program

This approach consists in developing simple indicators of bias in key parameters that could be summarized in a table with a scorecard of green (minimal or no risk of bias), yellow (some risk of bias), and red (established sources of bias). The strength of scorecards is that they can be used as a comprehensive list for fisheries institutes to screen

their sampling schemes for a wide range of potential biases, identifying steps in the data collection process that must be improved. This is important, as bias is in general harder to quantify than precision. However, it must be noted that scorecards are qualitative, and that without complex weighting of each of the measures at the lower levels it is difficult to come up with an overall higher-level score.

A list of indicators and scorecards can be found in ICES WKACCU 2008 report.

WGCATCH considerations on 'Scientific estimates'vs.'official estimates'

The WGCATCH subgroup advised an issue between 'scientific estimates' aiming to calculate the best possible estimates and taking into account all the data available (including for example additional scientific sampling data) and 'official estimates' based only on 'legal' required data coming, for example, from the control regulation.

There are an increasing number of sources for the information on the activity and potential impact of SSF. France presented a comparison between Sales Notes, Monthly declarative forms, Geolocalisation data, Annual activity calendars exhaustive survey (data sometimes completed with some additional on-site sampling data) which feeds into the MS official "estimate". Spain demonstrated a number of initiatives that also provided different sources of information all for the same fisheries that complemented each other but did not represent any source for Spain' official "estimate". The reference to multiple sources is often because existing procedures for collecting 'official' landings and effort data for the sector is inadequate considering only the 'legal' requirement mainly coming from the control regulation. Where a MS control agency are improving the collection of the transversal data from this sector there may be less of an issue, but when scientific agencies independently improve the information for this sector to meet their needs and provides this information in international data exchanges then there could be consequences.

This becomes an issue if the 'scientific estimates' contradicts a MS perceived compliance (based on 'official data') with a regulation on catch and effort limits for example. MS need to provide the best data or estimates for assessments and analysis is requested by International bodies like ICES and the JRC.

Indeed, existing control measures are based on TACs and effort limitations – publishing different data, particularly quality controlled 'scientific data', that may conflict with 'official data' could lead to infractions for non-compliance if any of the limits are exceeded.

This issue is similar to those discussed in section 5.4.1 in relation to the impact of the landing obligation where now MS have another 'official estimate' for discards and other catch components as reported by the fishing industry which could differ with the 'scientific estimate' calculated on the basis of the on-board sampling data.

Annex 17: ToR b.2) Proposed template for questionnaire on SSF effort calculation and data quality

Based on cross-validation of the declarative data (e.g. sales notes, landings declaration, logbooks, adapted declarative forms) available in your country on SSF (less than 12m' vessels), the fishing fleet register and your expertise, answer the following questions:

Introductory questions

Country - Supra Region - Region

Sources of declarative data collected (sales note, landings declarations, logbooks, adapted declarative forms, etc.)

Additional sampling data collection (Yes/No, if yes description of the sampling data collection system)

Type of data collection used for 'official' fishing activity estimates calculation (Census, Sampling, Combined)

Comments

Main questions

1) Number of vessels by vessel length ranges (0–6, 6–8, 8–10, 10–12) in your EU FFR

2) Number of your EU FFR vessels with a minimum of one declarative data available in your dataset by vessel length ranges (0–6m, 6–8m, 8–10m, 10–12m)

3) For these vessels => Nb vessels by Nb trips ranges (<10 trips, 10–50 trips, 50–100 trips, 100-150 trips, >=150 trips)

4) Could you resume the legislation in place for SSF data collection and the associated control system

5) Do you consider that one vessel without any declarative data is an inactive vessel?

6) Do-you have any tool/mean in used in your country to assess the reality of the inactivity of the vessels without any declarative data (used of a complementary survey, cross-validation with other sources of data, ...)? If not, do-you think that this assumption is correct based on your expertise?

7) Have-you ever done a complete census or a sampling survey of your SSF fishing fleets to assess/qualify these assumptions? If yes, what were the main results of it?

8) Do you have some 'scientific' survey to assess the reality/quality of the declarative data collected under the legal requirement mainly control regulation (comparison of CPUE, landings per trip, etc.)?

9) Could you assess the quality of the declarative data collected under control regulation, especially on gear, gear mesh size, gear dimension, distribution, landings and catch data?

10) Finally do you think that declarative data collected under control regulation is appropriate for scientific use? If not, do you perform complementary sampling survey to improve the estimates' quality?

11) For fishing effort estimates calculation, could you resume the methodology applied for this calculation for SSF and passive gears? Is it in line with the

methodology developed during the 2nd DCF workshop on transversal variables (Nicosia, 2016)? If, not what are the main concern/difficulties you meet to apply it?

Annex 18: ToR b.3) Summary of presentation on new technologies to better monitor SSF

New technologies to monitor SSF (Basque Country SSF case study)

Estanis Mugerza

The SSF in the Basque Country is a multi-gear, multispecies fishery where the main impact and effort is concentrated in the inshore waters. As it is common for this fleet, the data collected from official transversal data (logbooks, sale notes etc.), it´s not good enough for a good management and governance of this fleet.

To improve the knowledge of this fleet, AZTI is carrying out different projects where the use of new technologies and devices will provide high resolution data from this fleet. Three different devices have been installed in different vessels. The selection of the vessels was done trying to get a good coverage of the fleet (gears, target species, harbours etc.). The objective with the data obtained is to improve the characterization of the fleet, high resolution geospatial and biological data, identification of different fishing grounds and the interaction between the small-scale fleet but also with other fleets (industrial and recreational) and with other marine space end-users (aquaculture, MPA etc.). This will allow to improve the management and governance of this fleet.

The three devices installed are a fuel consumption device (installed in 5 vessels), where the main objective is to inform the skipper about the vessels fuel consumption in real time. Furthermore, as the device is connected to the vessel GPS, geospatial data are recorded. This geospatial information is used to obtain effort data of these vessels (number of trips, days at sea, number of fishing operations etc.). The second device is the AIS B (installed in 40 vessels), and this device will also provide high resolution geospatial data, that is used as the previous device for effort analysis of the fleet. Finally, the third device, the fishing events and monitoring platform tablet (installed in 10 vessels), will allow to collect geospatial data as the device is connected to the vessel GPS but also information about the catch (landings+discards+PETS bycatch) in haul bases. This tablet is an app/software which runs in on a low-cost data processing unit. Catch data are introduced on the app by the touch screen interface after every fishing event where catch species and associated global position and fishing gear are combined for further assessments.

Data transfer unit consists of a router and a 3G modem assembled in the case of the fuel consumption and the tablet device. Data are logged and uploaded to AZTI`s ftp server (time configurable) if the system is under GSM 3G coverage. In the case of the AIS B, the information is collected by the antennas installed by the Basque Government in the coastal area and then this information goes to AZTI servers.

Main outputs obtained from these devices are effort and catch information data by haul. Then all this information is also introduced in GIS software (QGIS in AZTI´s case) and get maps to see all the interactions of this fleet, identification of main fishing grounds, impact on benthic habitats etc.

Many of the analysis of the data are done using the "Vmstools" R package. The code has been adapted to our objectives specially to link the geospatial data with catch data. Vmstools uses VMS and logbook data but in this case due to the length of some vessels (under 10m), which don´t have to fill in logbooks, other sources of catch information have been used.

Annex 19: ToR b.3) Update on current projects that use new technologies for monitoring small-scale fleets

Webcams

The data collection of the SSF is notoriously struggling with reliable effort data. The use of remote cameras offers a potentially accurate and cost-efficient way of continuously monitoring levels of fishing effort, particularly recreational fishing effort Hartill *et al*., 2012; Smallwood *et al*., 2012; Hartill *et al*., 2016; Keller *et al*., 2016). This approach has already been successfully utilised in different fishing locations, including freshwater (Patterson and Sullivan, 2013) and coastal marine fisheries (Parnell *et al*., 2010; Smallwood *et al*., 2012) and has been under constant improvement ever since (Van Poorten, *et al*., 2015).

Preliminary results showed that only costs of the data analysis are high when using cameras as monitoring tools (Smallwood *et al*., 2011). Although, interactive database software can lower these costs by a considerable amount (Greenberg and Godin, 2015), selecting a suitable frequency at which images are taken and then subsampled for interpretation is still crucial to the effectiveness of the survey (Hartill *et al*., 2016). Only a few studies have been conducted testing the long-term use of remote cameras. This methodology is still relatively new and the involved components should be improved to produce viable and cost-effective data (Ryan *et al*., 2013). If camera monitoring is optimised, it has the potential of providing accurate fishing effort estimates at comparatively low cost. One case study was presented from Germany. Please refer to the report of the WGRFS (2017, p. 36) for another example from New Zealand.

In the following text, WGCATCH summarises additional developments and progress in countries that participated in WGCATCH 2017:

Web camera monitoring in Germany

The German recreational Atlantic salmon (*Salmo salar*) trolling fishery in the Baltic Sea is a small, but, in terms of stock exploitation, important and highly specialized fisheries. Due to a very small number of panelists for a standard survey, the Thünen Institute of Baltic Sea Fisheries tested the long-term use of remote cameras in harbours to monitor boat fishing effort.

Remote cameras have been installed in three important salmon trolling harbours to count boats leaving for fishing with recording time restricted to the period in which trolling boats are known to leave the harbour. Depending on location, the cameras took 12–30 pictures per minute. Picture analysis and boat counting was conducted via visual inspection of the pictures in quick motion. The camera monitoring was complemented by on-site interviews to estimate catch per unit of effort and to collect biological catch data and socio-economic information.

Preliminary results revealed that remote cameras proved to be a cost-efficient method providing accurate fishing effort estimates helping to reduce bias in recreational catch estimates. Several potential advantages and disadvantages of using cameras to monitor recreational fisheries have been identified. **Advantages** include time- and cost-efficiency, low bias (census possible), high temporal resolution of data, broad application range, storage of data allows reanalysis, and easy installation with little infrastructure needs. **Disadvantages** comprise legal issues (e.g. potential violation of privacy rights), weather, theft, and vandalism related outages and accumulation of large amounts of data that need to be handled and analysed hampering the use of cameras for broad-

scale monitoring at present. The results help to increase the accuracy of the Baltic salmon stock assessment, and the methodology may also help to monitor other recreational boat fisheries or small-scale commercial fisheries, which operate like recreational boat fisheries.

Inshore Vessel Monitoring System – Ireland

VMS is a low-cost vessel monitoring system for inshore vessels. The system transmits the position of the vessel over a mobile phone network at defined frequencies (usually five minutes when the boat is moving, hourly when in the port). The vessel positions can be viewed in real time on a web page and a comprehensive database is maintained at the Marine Institute. Since 2015 reporting positions through iVMS is notably mandatory for vessels fishing for razor clams in Ireland.

The resulting data are used for:

1) 1. Mapping fishing activity and providing estimates of total fishing effort by a given fleet each year.

2) 2. Providing traceability and food safety assurance for bivalve shellfish products exported to Asia and Europe.

3) 3. Controlling fishing activity in areas of sensitive habitats. This is necessary to demonstrate implementation of the Habitats Directive.

4) 4. In the case of accidents at sea the last position of the vessel is known to the nearest minute.

Smartphone App – Thünen–Institute (Germany, Baltic Sea)

In the Baltic Sea, the Thünen Institute of Baltic Sea Fisheries (TI-OF; Germany) has recently started a 3–year project (project acronym: STELLA) on alternative management approaches to minimize conflicts between gillnet fisheries and unwanted bycatches (i.e. marine birds and mammals). Currently, the available effort data of the small-scale fleet are highly uncertain because the data entry by fishers is not standardized and key parameters such as soaking time and area of net set are not obligatory as logbook entries. This and other issues hamper our understanding of the dynamics of the small-scale fisheries and the uncertainty related to the available effort estimates does not warrant any reliable extrapolations of bycatch events.

During the STELLA project a smartphone application (App) is being developed for collection of better data on effort (gear type used, time at sea, spatio-temporal distribution of fishing locations, net length and height, soaking time) and events of unwanted bycatches of gillnetters. On the mid-term basis, the development of a smartphone-based e-logbook for small-scale fisheries is envisaged.

The App involves the use of smartphones with a GPS receiver. The App will be multilingual (at the beginning English, German, Danish, Swedish and Polish), multi-platform and supplied free of charge, however with minimum requirements for the type of smartphone. Development of the App will take place in cooperation with an enterprise.

The TI-OF attempts to test the suitability and feasibility of the App during the spawning closure of western Baltic cod (ICES Subdivision 22-24) covering the period February-March 2018. During these two months the cod fisheries are closed in water deeper than 20 m because cod mainly spawn deeper than 20 m water depth in the area. However, vessels <12m (including vessels <8m) will be allowed to fish if they can document where they are fishing. The reason for this exemption is that the larger, more mobile

vessels can fish in other areas while the smaller, more sedentary vessels cannot. Vessels <12m that want to fish for cod during the spawning closure must document that they are fishing in waters shallower than 20 m. This can be achieved e.g. using VMS, or the smartphone App provided by TI-OF. Thus, in terms of the reversal of the burden of proof, the Smartphone App will offer the fishers a possibility to proof that they fish outside the 20 m line by continuously logging position and activity of their vessel.

Simultaneously, the use of the App will be linked to the collection of additional data. This involves data on soaking time, length of nets and height of nets. To improve the use of the App, it will be accompanied by a questionnaire to take account of the user concerns. The data collected by the App will be compared with logbook data (vessels of 8-12m) and with the monthly landing declaration of vessels <8m.

REM system in <10m vessels – Wageningen Marine Research, the Netherlands

At the end of 2012 Wageningen Marine Research and Marine Science and Communication (MS&C) from the Netherlands, started a Remote Electronic Monitoring (REM) project. The REM system consisted of a PC with a removable hard drive, CCTV cameras (1 or 2 depending on the size and layout of the vessel) and several sensors (GPS, winch/rotation and hydraulic). Depending on the settings, the system started recording data when one or several of these sensors were triggered. Cameras were installed and positioned on the vessel to ensure that the line of sight of the catch process is guaranteed at all times.

The objective of this project was to monitor the bycatch of harbour porpoises in gill- and trammelnet fisheries, targeting sole, cod, turbot, brill, dab, grey mullet and sea bass. During the first year (2013) the project dealt with various issues, including difficulties in finding fishermen to participate due to several reasons. In several cases there was too little electrical power to operate the REM systems on board of these small vessels (<10m). Grief with respect to management measures concerning quota issues that were implemented at the same time interfered with the project severely. From 2014 onwards, 7–9 vessels were running the REM system. This number is less than the intended (10 and ideally 12 boats) as a result of shortage of funding. A scientific quota for participating fishermen contributed to an increase in fishermen volunteering to participate. Besides harbour porpoises no other species were recorded after reviewing the tapes. The project ended in December 2016, a final report is expected at the end of 2017. The use of REM technology for monitoring catches in the <10m fleet in the Netherlands provided objective assessment of catches of marine mammals.

Experimentation of a sample of small-scale fishing vessels in the EU outermost regions with GPS devices to follow the distribution of their fishing activity (ORFISH project), France (Ifremer)

The ORFISH project aims at providing a platform for exchange of knowledge of low-impact offshore fishing techniques among fishers from the outermost regions (ORs) with a view to developing and optimizing these techniques and with the principal objective of alleviating fishing pressure on coastal fish resources (https://orfish.eu/). It focuses on small-scale fleet under 12 meters. In many European fisheries and particularly ORs, small-scale vessels are often multipurpose targeting different species using different gears. Given the narrow island shelves in ORs, vessels may develop their activity in coastal areas, on the edge of the continental shelf or offshore in deep-water or large pelagic fisheries but it is currently difficult to quantify the distribution of fishing effort between the different fishing gears and between the different areas. It is an important issue to better quantify the fishing effort, its spatial and temporal distribution with the principal objective of alleviating fishing pressure on the coastal fishing resources.

In this study, we propose to experiment the equipment a sample of voluntary fishing vessels with geo-tracking devices in different ORs in order to follow the distribution of their fishing activity, only for knowledge purposes. In 2017, 6 vessels are already equipped with GPS sensors in Guadeloupe in line with an Ifremer research project (TURFF).

Based on the data collected, the project will process the different datasets in order to provide each voluntary fisher a restitution including fishing trips and maps by trip at the convenient scale (grid de 1' of latitude by 1' of longitude). An application allowing the interactive analysis of the GPS tracking will also be provided to the fishers. In order to ensure data collection in relation to fishing experiments, a software application for tablets or computers will be developed to allow entry of declarative forms by fishermen or experiments observer. The objective of this application is to allow and standardize the entry of data collected through experimental fishing. The application will be optimized for small screens and the ergonomics allow the entry at sea.

Outermost Regions (Guadeloupe, Martinique, Guyane, Azores, Madeira, Canary Islands, La Réunion, Mayotte)

Spain, Basque Country (AZTI):

The SSF in the Basque Country is a multi-gear, multispecies fishery where the main impact and effort is concentrated in the inshore waters. As it is usual with this fleet, the information collected from official transversal data, is not good enough for a good management and governance of this fleet. This is the reason why AZTI is carrying out different projects where the use of new technologies will allow to collect high-resolution data from this fleet.

Three different devices are installed in different vessels covering a representative fraction of the fleet. The main objectives are to collect high resolution geospatial data and with one of the devices (fishing events platform tablet) high resolution information on biological data too.

A presentation was provided in the WGCATCH meeting with detailed information about these projects (see Annex 18).

Scotland (MASTS)

As part of the project funded by the 2014/15 European Fisheries Fund 'Evidence Gathering in Support of Sustainable Scottish Inshore Fisheries', Class B Automatic Identification System (AIS) (Vespermarine XB8000 transponder and associated GPS and VHF antenna) were installed in 274 12 meters and under inshore fishing vessels in June/July 2015. This represents approximately 18% of the 1524 sub12 m fishing vessels registered in Scotland. The majority of vessels (84%) are static gear operators that predominantly fish using creels. Mobile gear operators that utilise trawls and/or dredges comprise only 14% of the vessels. The majority of vessels (47%) operate on the East coast, followed by the West coast (22%), Outer Hebrides (16%), Shetland (14%) and East & North Coast (2%).

The feasibility of using AIS data as a tool for assessing aspects of the activity of inshore fishing vessels with a view to informing both fisheries management and marine spatial planning was the motivation for the project. It is important to note that there is currently no legal requirement for sub 12m vessels operating in Scottish coastal waters to carry Vessel Monitoring Systems or AIS. The project showed that AIS coverage around the Scottish coastline was extensive and that it was possible to easily harvest high res-

olution temporal and spatial activity data from AIS equipped vessels. With appropriate filters, these data can be used to provide information that can, in combination with other metrics, be used for fisheries management purposes and to provide valuable information to marine planners. However, several issues should be addressed in order for the methodology to be widely applicable for statutory fisheries management and marine planning purposes. Further research is taking place under the auspices of the EMFF-funded project "Scottish Inshore Fisheries Integrated Data System (SIFIDS)". A cost-effective On Board Central Data Collation System (OBCDCS) is being designed to harvest, store and forward a wide range of data streams from vessels operating in the Scottish inshore fisheries fleet. This unit will combine automated acquisition of temporal and spatial data from inshore vessels (not necessarily using AIS), with operational and catch data. These data will be automatically uploaded to a centralised relational database for subsequent processing and analysis.

References

Greenberg, S., Godin, T. 2015. A Tool Supporting the Extraction of Angling Effort Data from Remote Camera Images. Fisheries, 40: 276–287.

Hartill, B.W., Cryer, M., Lyle, J.M., Rees, E.B., Ryan, K.L., Steffe, A.S., Taylor, S.M., West, L., Wise, B.S. 2012. Scale- and Context-Dependent Selection of Recreational Harvest Estimation Methods: The Australasian Experience. North American Journal of Fisheries Management, 32: 109–123.

Hartill, B.W., Payne, G.W., Rush, N., Bian, R. 2016. Bridging the temporal gap: Continuous and cost-effective monitoring of dynamic recreational fisheries by web cameras and creel surveys. Fisheries Research, 183: 488–497.

Keller, K., Steffe, A.S., Lowry, M., Murphy, J.J., Suthers, I. M. 2016. Monitoring boat-based recreational fishing effort at a nearshore artificial reef with a shore-based camera. Fisheries Research, 181: 84–92.

Parnell, P.E., Dayton, P.K., Fisher, R.A., Loarie, C.C., Darrow, R. D. 2010. Spatial patterns of fishing effort off San Diego: implications for zonal management and ecosystem function. Ecological Applications, 20: 2203–2222.

Patterson, W.F., Sullivan, M.G. 2013. Testing and Refining the Assumptions of Put-and-Take Rainbow Trout Fisheries in Alberta. Human Dimensions of Wildlife, 18: 340–354.

Ryan, K.L., Wise, B.S., Hall, N.G., Pollock, K.H., Sulin, E.H., Gaughan, D.J. 2013. An integrated system to survey boat based recreational fishing in Western Australia 2011/12. Fisheries Research Report No. 249, Department of Fisheries, Western Australia. 168 pp.

Smallwood, C.B., Pollock, K.H., Wise, B.S., Hall, N.G., Gaughan, D.J. 2011. Quantifying recreational fishing catch and effort: a pilot study of shore based fishers in the Perth Metropolitan area. Fisheries Research Report No. 216. Final NRM Report - Project No. 09040. Department of Fisheries, Western Australia. 60 pp.

Smallwood, C.B., Pollock, K.H., Wise, B.S., Hall, N.G., Gaughan, D.J. 2012. Expanding Aerial–Roving Surveys to Include Counts of Shore-Based Recreational Fishers from Remotely Operated Cameras: Benefits, Limitations, and Cost Effectiveness. North American Journal of Fisheries Management, 32: 1265–1276.

Van Poorten, B.T., Carruthers, T.R., Ward, H.G.M., Varkey, D.A. 2015. Imputing recreational angling effort from time-lapse cameras using an hierarchical Bayesian model. Fisheries Research, 172: 265–273.

Annex 20: ToR b.4) Abstract submitted to the 9th IFOMC conference

Title: Small-scale, size isn´t everything: Issues and progress in monitoring European small-scale fleets.

Authors:

Demanèche S., Mugerza E., Armstrong M., Adamowicz M., Carlshamre S., Clarke E.D., Couperus B., Dammers M., Dingsør G., Egekvist J., Elson J., Fernandes A.C., Gitarakos G., Kiparissis S., Kovsars M., Krumme U., Nimmegeers S., Norkus D., Otterå H., Reis D., Rodriguez J., Saks L., Schembri S., Spegys M., Stoetera S., Vandemaele S., Vasconcelos R., Vølstad J.H., Thasitis I., Williamson K., Włodzimierz G., Gerritsen H., Prista N., Ribeiro-Santos A.

IFOMC Abstract proposal:

Small-scale Fleets (SSF) is a diverse, multi-gear, multispecies, geographically widespread fleet, involving full time, seasonal or part-time activities into coastal areas. Their ecological and socio-economic impacts are often little understood mainly due to limited data. Preliminary results suggest those impacts are largely underestimated and stress the need to improve data collection. However, SSF appear to be trapped in a vicious cycle where due to incompleteness and low quality of existing data, systematically lower importance is assigned to their characterization and sampling when compared to larger scale fleets. The European Commission stressed the intention to provide support to this sector under the Common Fishery Policy (CFP). Within Europe, the multitude of SSF vessels and the localized issues contrast to the complex multi-levels governance set up of regulatory and monitoring bodies covering national and shared fish stocks and often overlook their potential impact. Across Europe, the wide diversity of methodologies used in monitoring SSF introduces challenges to harmonize and standardize data and quality indicators across countries. Ensuring that the collection of transversal, socio-economic, and biological data from SSF across Europe are sufficient, harmonized and comparable has been the focus of ICES Working Group on Commercial Catches (WGCATCH) since 2015. In this review we present some of the work developed in WGCATCH over the last 3 years: 1) progress in monitoring SSF and their contribution to the total catches (including incidental bycatches of protected species) and fishing effort in some areas; 2) regional variability in SSF in terms of species, gears, métiers or fisheries; 3) description of the different methodologies used by ICES member states to monitor SSF and addressing some of the technical and logistical issues (sampling approach and census approach); 4) best practice guidelines for the collection of transversal variables and biological data in SSF, and 5) evaluation of the usefulness of some new technologies such as remote electronic monitoring by CCTV and vessels position recording by AIS/GPS in monitoring SSF. At the end, upcoming developments of WGCATCH work in SSF are outlined.

Keywords:

Small-scale fisheries (SSF), coastal and artisanal fisheries, Europe, Data collection methodologies, fishing activity estimates (capacity, effort and landings data), discards and fleet based biological variables, best practices guidelines, new technologies.

Annex 21: ToR b) Working document: SSF in Greece, Characteristics and particularities

Small-scale Fishery (SSF) in Greece is exercised all year-round only with a limited number of restrictions. It represents by far the largest portion of the professional fishery conducted in the country in terms of the number of vessels and personnel involved, employing over 21000 professionals and contributing with 55% by quantity to the total catch which corresponds to the 61% of the total value. It involves 15182 registered vessels smaller than 12m of which 91% are less than 10m (data from the 2016 Greek National Fleet Register). Greek SSF vessels contribute with the largest percentage (23%) to the total EU SSF fleet (DG for Internal Policies -IPOL 2011). These vessels are usually operated by one person or occasionally two, frequently another family member. Small-scale fishery is exercised usually in close distance to the shore, where fishermen will go to overnight fishing trips. Larger fishing trips by fishermen are not unusual; however they are not the most commonly applied practice (Tzanatos 2006a). Small-scale fishery in Greece does not include trawl or purse-seine vessels, which in that case are ranked as "middle scale fishery".

SSF in Greece presents a number of important operational and managerial particularities in comparison to the corresponding fishery in other European countries. These particularities spring basically from the large heterogeneity of the marine environment along the Greek coastline where the SSF is applied and also from the socio-economic characteristics of the country. The extensive length of the convoluted Greek coastline (16300 km, 9th in the world), (CIA World Factbook), surrounding both mainland and island territories, the large number of islands and islets (9835 according to the Hellenic Navy Hydrographic Service) grouped in distinct and separate from each other geological and ecological entities, the different weather conditions in North, Central and South marine regions, configure a largely heterogeneous and complex marine environment in which the small-scale fishery in Greece operates (Tzanatos 2005). This environmental complexity inevitably affects the number and type of the exploitable organisms as well as the type of applied fishing practices. Although heterogeneous environments generally support rich faunas providing a large number of exploitable targets for the professional fishery, oligotrophy – which characterizes the Greek seas – contains low levels in their abundances and as such, they cannot sustain a viable income taken alone. So, although fishermen generally aim in certain highly priced species, multispecies catches are the rule, with the target species constituting only a part of the total catch even in cases where specialized fishing gears, such as longlines, are used (Tzanatos *et al*. 2006b). Eventually, small-scale fishery in Greece involves the exploitation of more than 100 species.

The second characteristic of the SSF in the Greek seas is the large variety of fishing gears used (Tzanatos 2005). This practice aims to the best exploitation of a wide range of target species which require different techniques and tools in order to be captured. Although the most commonly used gears are the nets and the longlines, there are about 40 different fishing gears used by the Greek professional fishermen on various occasions and for different target species. Quite often a fisherman will deploy more than one gear during the same fishing trip.

The actual size of the fleet in SSF in Greece is another issue that requires special attention and more elaborate investigation. The problem lies in the number of undefined, yet registered, vessels which, although they exist in the official records as professional vessels, their activity or even their existence remains ambiguous. As a result, the actual

capacity of the Greek SSF fleet remains vague to a certain extent and it will be so until the issue is fully clarified, a daunting task considering the size of the fleet and the size of the geographical area over which it is distributed. This task calls for extra effort and specialized investigation schemes and/or even legislative measures that for instance, could demand proof of factual professional activity of the vessels and their owners.

Another particularity of the Greek SSF springs from the morphology of the country, with a largely extended and convoluted coastline in the mainland and the island territories. Along this long coastline there are numerous cities and larger or smaller villages where fishery is an important social component. This topography provides a plethora of landing sites, frequently in small rural areas (small harbours, marinas, havens or even bays) where no monitoring or surveillance is feasible by any authority, rendering the effective monitoring of the landings and consequently, the precise estimation of the catch, as challenging tasks. This difficulty is more striking in the island component of the country, where the numerous small islands fall under the stewardship and surveillance of central authorities established in other larger proximate islands. This intensifies the difficulty of recording fishing activity, which eventually will have to rest only on the reliability of the fishermen's reports.

This problem scales up considerably during the summer months when tourism boosts the demand for fresh fish, which the fishermen often shell directly to the local taverns and hotels and thus, a large portion of their catch would go unrecorded (Tzanatos *et al*. 2005). While taking this practice as a fact in small islands where monitoring is almost impossible, quite often this would also be the case in larger islands where monitoring of the catch is properly and regularly practiced. Considering also that the largest portion of the annual fishing activity in SSF takes place during the summer months, when the weather conditions are more favourable, it is easily understood that such practices are exercised over the largest part of a fisherman's yearly catch. Ultimately, a portion of the total landings would not be recorded, and up to date, even an approximation of the size of this portion is not feasible.

Such practices may also be encountered by the fishermen in other countries with island territories, however, the considerably larger area over which these are exercised in Greece, sets the problem in another, larger scale, unique among all European countries, that actually calls for more regionalized monitoring and administrative actions.

References

Directorate General for Internal Policies, Policy department B: Structural Cohesion Policies, Fisheries. Characteristics of small-scale coastal fisheries in Europe. IP/PECH/IC/2010-158, 21/07/2011.

Tzanatos E., Dimitriou E., Katselis G., Georgiadis M., Koutsikopoulos C. (2005): Composition, temporal dynamics and regional characteristics of small-scale fisheries in Greece. Fisheries Research, 73: 147-158.

Tzanatos E., Dimitriou E., Papaharisis L., Roussi A., Somarakis S., Koutsikopoulos C. (2006a): Principal socio-economic characteristics of the Greek small-scale coastal fishermen. Ocean & Coastal Management, 49: 511-527.

Tzanatos E., Somarakis S., Tserpes G., Koutsikopoulos C. (2006b): Identifying and classifying small-scale fisheries métiers in the Mediterranean: a case study in the Patraikos Gulf, Greece. Fisheries Research, 81: 158-168.

Annex 22: ToR c) Results of the questionnaire on the sampling of incidental bycatch of protected species in the on board sampling protocol.

	BEL	CYP	DEU_NS	DEU_B	DNK	ESP_AZTI	EST	FIN	FRA	GBR_ENG	GRC	ESP_IEO	IRL	LTU	LVA	NLD	NOR	POL	PRT	PRT_AZ	SWE	#YES	#NO	#NA	no entry
Does the protocol contain instruction to record catch of other vertebrate species than fish (i.e. turtles, birds, dolphins, seals)?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	20	1	0	0
In gill nets - 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)?	NA	N	Y	Y	N	NA	N	NA	Y	N	Y	N	Y	N	N	Y	N	Y	Y	Y	NA	9	8	4	0
Does the protocol contain a check for rare specimens in the catch at opening of the codend or immediate removal during hauling in gill nets or hook-and-line?	N	Y	-	N	N	Y	Y	NA	N	N	N	N	N	N	N	Y	Y	Y	Y	Y	N	8	11	1	1
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?	NA	-	-	NA	-	Y	Y	NA	-	NA	Y	NA	-	N	-	Y	Y	Y	N	Y	NA	7	2	6	6
Does the protocol instruct to check for rare specimens during sorting of the catch (i.e. at conveyor belt)?	N	NA	Y	Y	N	Y	Y	NA	Y	N	Y	Y	Y	N	Y	Y	Y	Y	N	Y	N	13	6	2	0
If Yes: is the observer instructed to indicate how much of the sorting process has been checked on "haul level" (i.e. percentage)?	NA	-	Y	Y	-	N	N	NA	Y	NA	N	N	Y	N	Y	Y	Y	Y	-	Y	NA	9	5	4	3
Does the protocol instruct to report specific handling or devices on board which may hide incidental bycatch?*	N	N	N	N	N	NA	N	NA	N	Y	N	Y	N	N	NA	Y	-	Y	N	NA	N	4	12	4	1
If Yes: is the observer instructed to report what effect this has on the sampling at "haul level"?	NA	-	NA	NA	-	NA	-	NA	-	N	-	-	-	N	-	Y	-	-	-	NA	NA	1	2	7	11
Does the protocol instruct to report of mitigation (i.e. Acoustic Deterrent Devices or "pingers")?	N	N	Y	Y	N	NA	Y	NA	Y	Y	N	N	N	N	NA	Y	N	N	N	NA	NA	6	10	5	0
If yes for ADD's: is there a check for proper working (i.e. Battery check)?	NA	-	N	N	-	NA	N	NA	N	N	-	NA	-	N	-	N	-	N	N	NA	NA	0	9	6	6
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?	N	Y	Y	Y	N	Y	Y	NA	Y	Y	Y	Y	Y	N	N	Y	N	Y	Y	Y	N	14	6	1	0

	BEL	*CYP*	DEU_NS	*DEU_B*	DNK	ESP_AZTI	EST	*FIN*	FRA	GBR_ENG	GRC	ESP_IEO	IRL	LTU	LVA	NLD	*NOR*	POL	PRT	PRT_AZ	SWE	#YES	#NO	#NA	no entry
Does the protocol contain instruction to record catch of other vertebrate species than fish (i.e. turtles, birds, dolphins, seals)?	**Y**	***Y***	**N**	***N***	**Y**	**Y**	Y	***N***	**Y**	**Y**	**Y**	**Y**	**Y**	**N**	**Y**	**Y**	***Y***	**Y**	**N**	Y	**N**	15	6	0	0
In gill nets - 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)?	**NA**	***N***	**N**	***N***	**-**	**NA**	N	***NA***	**Y**	**N**	**N**	**NA**	**Y**	**N**	**N**	**Y**	***N***	**NA**	**N**	Y	**NA**	4	10	6	1
Does the protocol contain a check for rare specimens in the catch at opening of the codend or immediate removal during hauling in gill nets or hook-and-line?	**N**	***Y***	**N**	***N***	**-**	**N**	Y	***NA***	**N**	**N**	**N**	**NA**	**N**	**N**	**N**	**N**	***Y***	**Y**	**N**	Y	**N**	5	13	2	1
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?	**NA**	**-**	**NA**	***NA***	**-**	**Y**	Y	***NA***	**-**	**NA**	**N**	**NA**	**-**	**N**	**-**	**N**	***Y***	**Y**	**-**	Y	**-**	5	3	6	7
Does the protocol instruct to check for rare specimens during sorting of the catch (i.e. at conveyor belt)?	**N**	***NA***	**N**	***N***	**-**	**N**	Y	***NA***	**Y**	**NA**	**N**	**Y**	**Y**	**N**	**Y**	**Y**	***Y***	**Y**	**N**	Y	**Y**	10	7	3	1
If Yes: is the observer instructed to indicate how much of the sorting process has been checked on "haul level" (i.e. percentage)?	**NA**	**-**	**N**	***N***	**-**	**N**	N	***NA***	**Y**	**NA**	**N**	**NA**	**Y**	**N**	**Y**	**N**	***Y***	**Y**	**-**	Y	**-**	6	7	4	4
Does the protocol instruct to report specific handling or devices on board which may hide incidental bycatch?*	**N**	***N***	**N**	***N***	**-**	**NA**	N	***NA***	**N**	**Y**	**N**	**Y**	**N**	**N**	**NA**	**N**	**-**	**Y**	**-**	NA	**Y**	4	10	4	3
If Yes: is the observer instructed to report what effect this has on the sampling at "haul level"?	**NA**	**-**	**NA**	***NA***	**-**	**NA**	-	***NA***	**-**	**N**	**-**	**-**	**-**	**N**	**-**	**N**	**-**	**Y**	**-**	NA	**-**	1	3	6	11
Does the protocol instruct to report of mitigation (i.e. Acoustic Deterrent Devices or "pingers")?	**N**	***N***	**N**	***N***	**-**	**NA**	Y	***NA***	**Y**	**Y**	**N**	**NA**	**N**	**N**	**NA**	**N**	***N***	**N**	**-**	NA	**-**	3	10	5	3
If yes for ADD's: is there a check for proper working (i.e. Battery check)?	**NA**	**-**	**N**	***N***	**-**	**NA**	N	***NA***	**N**	**N**	**-**	NA	**-**	**N**	**-**	**N**	**-**	**N**	**-**	NA	**-**	0	8	5	8
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?	**N**	***Y***	**N**	***N***	**-**	**Y**	Y	***NA***	**Y**	**Y**	**Y**	**Y**	**Y**	**N**	**N**	**N**	***N***	**NA**	**N**	Y	**N**	9	9	2	1

Annex 23: Routine ToR d) Questionnaire on the Landing Obligation

The Landing Obligation (LO) questionnaires were developed to assess the impact of the LO, in relation to the sampling programmes, changes in quality of the data and the fishing behaviour. Below the results by region and conclusions taken from questionnaire 1 (see questionnaire in ICES WGCATCH report 2016) are summarized.

Baltic Sea

In the Baltic Sea, the landing obligation was implemented in 2015, for the pelagic and cod trawl fisheries and salmon. There were no changes in 2016 but in 2017 plaice from plaice fisheries were added to the list of species under the LO. Eight countries (Denmark, Germany, Estonia, Lithuania, Latvia, Sweden, Poland, and Finland) fishing and collecting onshore and offshore commercial catch data responded to the questionnaire.

Onshore and at-sea sampling programme modifications - Overall, where sampling programmes are in place the Member States (MS) have the infrastructure and procedures for sampling the different components of the catch and landings (Landings Below Minimum Conservation Reference Size (MCRS), BMS landings, discards) of all these fractions. The databases and sampling sheets for these fisheries are often generic and so all MS are prepared for further implementation.

Impact on access to vessels and all components of the landings – Two of the countries with an at-sea sampling programme, reported an increase of refusal rates from the cod trawl fishery in the Baltic Sea. One country reported a 100% refusal rate from the cod fishery in 2016. To resolve this in 2017 the MS implemented a new system for at-sea sampling making it mandatory for the randomly selected vessels to accept observers. In relation to the onshore programme, most of the countries have difficulties accessing the BMS landings, due to their low volume and/or the way this component is landed (in a communal container with landing from multiple vessels, or directly to transportation to other locations). An increase in refusal rates in Poland was down to the change in their sampling programme rather than an industry refusal due the landing obligation.

BMS data collection by control agencies - Countries have a range of answers on BMS recording by control agencies, from "no evidence" to "yes there is some evidence of BMS landings being recorded". The most common answer was that control agencies collect catch composition data at sea from some inspected trips ("last haul-data"). However, the sampling methods and data quality are still to be checked. In 2017 Denmark, Germany and Latvia introduced a more detailed logbook where the BMS fraction is more clearly recorded and interpreted. This should improve the data once LO implementation problems are resolved.

Impacts on data quality - Most countries have not yet tested their data for any changes in quality. Due to the nature of the pelagic fisheries (low discard rates), there is a sense that the data quality from those fisheries was not affected. However, for cod trawl fishery, two countries collected evidence that quality of the data collected by the control agencies (landings data: sales and logbook) were affected, due to the misreporting of BMS landings. Discard data used in cod stock assessment was derived from observer programmes, indicating that higher refusal rates will have an impact on the data quality. Discards estimates from control agencies appear consistently lower than the ones obtained from at-sea sampling... The general perception is that discard figures reported in logbooks were already seriously misreported before the Landing Obligation.

Impact on fishing behaviour - There has been no perceived change in fishing behaviour since the introduction of the landing obligation. No MS have tested for any change in the fishing behaviour.

Analysis for observer effect - Two MS have performed spatial analyses to check the behaviour of demersal trawlers on observed trips compared to non-observed trips. The analyses did not show any significant change in behaviour when observers were present. No other analyses for observer effect were reported in the questionnaire.

North Sea, Eastern Arctic and North Atlantic

In 2015, the landing obligation was implemented for Pelagic and Industrial fisheries in the North Sea-Eastern Arctic region (NSEA) and the North Atlantic region (NA) and most of the MS were affected by the landing obligation. Since then, different demersal species and *Nephrops* and fisheries have been introduced in the LO list annually. To date, the number of species, fisheries and fleets continues to be limited and often under exemptions (*de minimis* or high survivability). The discard plans for each of these regions are independent: the NSEA plan covers all vessels in defined fisheries while the NA plan covers only vessels with a track record of landing the key species. Despite this they are considered together here as the issues for MS fishing in both regions are common. Eight countries (Denmark, Ireland, Belgium, Germany, England, Scotland, Spain and Portugal) fishing and collecting on shore and at-sea commercial catch data in both the North Sea-East Arctic and North Atlantic regions answered the questionnaire.

Onshore and at-sea sampling programme modifications – All MS sampling in the NSEA region have changed and implemented the modifications to their sampling sheets and databases, where necessary. Sampling programmes are in place to sample the new catch categories if and when they occur.

Impact on access to vessels and all components of the landings - From the MSs with an at-sea sampling programme, only three observed an increase in refusal rates but not necessarily related to the landing obligation - TAC restrictions and closed areas and other management issues were quoted as reasons. However, there is a sense of general feel of distrust from the fishing industry. In relation to access all components of the landings, the BMS landings have been low and in most cases not easy to access or not visible to the sampler.

BMS data collection by control agencies – Although landings analysed at the RCGs suggest there are no BMS landings from the NA recorded on the RDB all the questionnaires suggest the control agencies do have the possibility to collect these data.

Impact on data quality - The general perception is that the BMS fraction is not fully reported and accounted for in logbooks and sales notes. For discard estimates the increase in refusal rates will likely have an impact on the data quality. In addition, the complexity of the exemptions and confusion within the industry affects how observers might record the different components of the catch.

Impact on fishing behaviour - None of the MS noticed any change in fishing behaviour associated with the implementation of the landing obligation, nor an observer effect. However, comprehensive tests or analyses have not yet been conducted.

Annex 24: Routine ToR d) WGCATCH recommendations to STECF-FDI new data call

STECF-FDI NEW Data call

The participation of the European Commission's Joint Research Centre (JRC) at the WGCATCH 2016 meeting provided an opportunity to communicate some concerns of WGCATCH participants coming from EU Member States (MS) with the use of the data from 'Fishery Dependent Information' (FDI) data calls. The outcome of this discussion was a proposed new data format for the data call which accounts for the limited resolution of sampling data. The STECF – FDI new data call was released in September 2017 and an STECF expert working group was held the JRC headquarters in October 2017.

During this year's WGCATCH meeting, EU MS participants evaluated progress in the new STECF – FDI data call regarding: 1) the difference between the old and the new data call formats; 2) how the MS should report their discards under LO; and 3) what would be the potential impacts for the data provided to ICES Intercatch for the stock assessments. The following conclusions were issued:

1) WGCATCH welcomes and endorses the STECF-FDI decision of requesting MS to provide sampling data in different tables, reflecting the resolution of the sampling data (using Domains), and the need for standardization between the Economic and Biological data calls. Also, WGCATCH acknowledges that the level of disaggregation of the different catch components may need to be different between STECF-FDI and ICES data calls. However, the new STECF-FDI data call still requires the MS to provide sampling and biological data (namely length and age) at high levels of disaggregation (Tables A and B) that cannot be currently supported by data collection schemes in place. In particular, MS are expected to partition discards and numbers-at-age/length found in a domain into those categories (in tables A & B) contained within the domain. In effect, Tables A and B from the new STECF-FDI data now require the partitioning of the discards estimates and biological data into an even higher level of disaggregation than the previous data calls. Similar to last year, WGCATCH 2017 maintains the emphasis on the need to manage expectations of end-users based on the resolution of the sampled data (discards and catch-at-age distributions): to request data at such high levels of aggregation requires an estimation procedure that respects the sampling design and the samples available in the targeted aggregation level. Under most (all?) present sampling designs and sampling efforts currently in place, the quality of the estimates uploaded cannot be ensured for the high level of disaggregation STECF-FDI is requiring.

2) The New-FDI data call requested MS to supply data according to catch fractions, following EUMAP implementing decision EU 2016/1251 ([1]). All MS were asked to separate total catch into components, referred to as 'catch fractions', such as the part of the catch landed above the minimum conservation reference size (MCRS), the part landed below the MCRS, the part discarded below the MCRS, *de minimis* discards and discards. As long as the landing obligation is not fully implemented, discard information from official logbooks is likely unreliable and substantially different from the discard estimates derived from the sampling programs. Therefore, WGCATCH strongly suggests that "scientific" estimates are provided in responses to the

STECF-FDI data call instead of "official" statistics available in logbooks. However, WGCATCH is concerned that as discards have to be provided for exemptions, legal consequences may arise, if MS provide scientific discard estimates (illegal discarding) under specon LO. The EWG 17-12 proposed to replace all discard catch fractions – including landings below MCRS – by a single 'unwanted catch' field. This term is in line with the ICES term "unwanted catches" used in ICES stock assessment and advice sheets. According with ICES Technical Guidelines: "Unwanted catch" refers to the part of the catch that would be discarded in the absence of a discard ban or landing obligation". WGCATCH supports the expert group suggestion to provide "scientific discard estimates".

3) The use of scientific data for control purpose must be avoided by all means possible because it would be strongly detrimental to the final quality of assessments and ICES advice on the main commercial stocks. Therefore, if the goal of the STECF-FDI data call is to obtain detailed information for assessments of the status of implementation and the enforcement of the landing obligation, that information should be requested directly from control agencies. WGCATCH recommends that provision of data for stock assessment purposes is kept independent from provision of data for monitoring and compliance to the LO to prevent the risk of inputing severely biased total removals into assessment models. Similar to landings, accurate values of "*Discards*", that reflect a best possible estimate of the effective discard behavior of the different fishing fleets and fisheries, are needed in response to the ICES data call. Only by having those definitions, ICES can maintain reliable scientific estimates and advice on total catches, landings and discards.

Annex 25: Routine ToR i) WGCATCH response to recommendations from other EGs

From: WGNSSK

To: WGCATCH

Recommendation (ICES reference #24):

Currently it is not easy to perform sensitivity analyses in Intercatch to check the effect of alternative assumptions made when raising data, because of the way Intercatch has been designed (menu- and choice-driven through a series of clicks, instead of script-based). Given that ICES has indicated that it will be focussing its resources on a successor to Intercatch instead of developing Intercatch much further (apart from handing relatively minor issues), WGNSSK strongly recommends that any successor to Intercatch facilitate the ability to easily and quickly perform sensitivity analysis to input data and raising assumptions

WGCATCH response:

Previous to the meeting, WGCATCH chairs e-mailed WGNSSK chair Jose Oliveira for a clarification of this recommendation. Jose answered that "This was more aimed at ICES data centre and the people developing the successor to Intercatch. If WGCATCH has some influence on the successor tool to Intercatch, then you should be aware of the current short-comings (expressed below), and the need for easier tools that support a more transparent and robust approach, allowing for an environment where it is easy and straight-forward to conduct a range of sensitivity tests (not possible right now in Intercatch without wasting half your life doing it)."

During the meeting, participants of WGCATCH discussed the recommendation and issued the following response: WGCATCH agrees with WGNSSK and recommends ICES Data Centre that the new RDB has a core set of scripts that outlines the main estimation methods but also allows their manual expert-based tuning and configuration during the estimation phase. Aspects like what samples from what countries are used in estimation must be possible to select at estimation level. There should also be an experimental module that allows the trial of different options. Finally, benchmarks will benefit from having a range of time-series of catch generated with different options to be tested. The production of such datasets should also be an option of RDBES. WGBIOP 2016 has made a similar comment.

From: WGNSSK

To: WGCATCH

Recommendation (ICES reference #30):

There was confusion in 2016 about how to treat BMS when raising discards. WGNSSK recommends that a coordination meeting be held to involving experts from WGCATCH, the ICES data centre (for Intercatch), ACOM and selected EG groups. Guidance is also need on how to report BMS in an unambiguous and unbiased manner.

WGCATCH response: WGCATCH agreed and endorse the need for a coordination meeting with the stock assessment groups, ACOM and WGCATCH on the need to report all catch components, particularly the new components under the Landing Ob-

ligation. WGCATCH recommends ICES secretariat to arrange this meeting on estimation of BMS samples and this group should be involve and contribute and provide advice on how BMS fractions should be reported and raised.

From: WGFAST

To: WGCATCH

Recommendation (ICES reference #40):

Develop terms of reference for a joint session in 2020. We further recommend that WGFTFB investigate 'improved methods to refine survey gear, and quantify trawl selectivity across a broad range of species and sizes'. This may lead to improved estimates of species and size distributions, which is a key source of uncertainty in acoustic-trawl surveys. The joint session should review existing knowledge and recent developments in this area, with a focus on trawls used to sample pelagic organisms, and methods to estimate trawl selectivity. A subset of WGFTFB and WGFAST members and others from outside the group have expertise that is relevant in this area. WGFAST proposes Stéphane Gauthier (Canada) as co-chair of the joint session.

WGCATCH response: WGCATCH discussed this recommendation and concluded it did not require a formal response.

From: WGHANSA

To: WGCATCH

Recommendation (ICES reference #43)**:**

The WGHANSA considers each of the survey series directly assessing anchovy in Division 9.a 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 8.a. 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 (7.d, 7.e, 7.h) to provide information on the status of small pelagics (particularly sardine and anchovy) in that region.

The WGHANSA recommends that length distributions and biological parameters of catches are collected for sardine in area 7 by countries operating in those waters.

WGCATCH response: Prior to the meeting WGCATCH co-chair Ana Ribeiro-Santos plotted graphs with Landings per country. In the last 3 years, the main countries fishing sardine in 27.7 include, UK, France, Ireland, Netherlands. Questions on the sampling were sent to all these countries with the following answers.

UK- England: This year, England started a self-sampling trial on ringnetters targeting sardine to collect biological data (length and age) from the landings. A pelagic sampling programme is currently being design a pelagic sampling programme targeting large pelagic vessels, due to start in 2018.

Ireland (Hans Gerritsen): "As far as I can tell we do not sample them. We have no DCF obligation to do so and our landings are generally small although we have sporadically reported large landings in the past."

Germany North Sea (Jens Ulleweit): "In general sardines are only caught occasionally and only by the German pelagic freezer trawler fleet (currently four trawlers). These vessels are at sea for several weeks and sort and process the catch on board, storing the catch in frozen 20 kg blocks. Depending on season, they are operating mostly in ICES-divisions IIa/b, IVab, VIa, VIIb, VIIe, VIIh and VIIIa, targeting mainly herring (North Sea herring - June to September, Downs herring - December, Atlantoscandian Herring – September/October), blue whiting (March to May), Northeast Atlantic mackerel (January, February and 4th quarter) and horse mackerel (mostly 4th quarter). During an individual trip often more than one species is targeted. Sardines as well as argentines are only targeted very occasionally and mostly only caught as bycatch.

This fleet is sampled by German observers within the data collection framework. With regards to the German national work plan it is planned to sample at least 5 trips in this segment all together per year. The sampling comprises the reporting of the catch composition, the measuring and weighting of subsamples on board as well as age (by otoliths) and maturity determinations. If sardines are caught they are included in the sampling."

France (Laurent Dubroca): "For France, there are samples of length distribution of sardine for VII in our database and some sampling effort are dedicated to the sampling of small and large vessel for this area."

Denmark (Kirsten Birch Håkansson): "Denmark is in the process of setting up a self-sampling program for all the big pelagic trawls above 40 meters – these are also then ones targeting sardine in area 7. The program should hopefully be in place 2018. We have included sardine on the list, so hopefully we should be able to get some samples, but it is a 'rare' fishery – in 2015 we had one trip targeting sardines and 3 in 2016."

The Netherlands (Chun Chen): "In Netherlands, Sardine landings are almost negligible (appx 1000t on average but declining over the years). Also, sardine is not listed for the DCF in that region for sampling. So hardly any biological market samples of landings were collected. When found, sardine is covered under the discard sampling."

Based on these answers WGCATCH considers that there is no obligation to sample the species in that area. However, some countries do it and some countries may potentially be able to improve their sampling. The issue is recommended for discussion at RCG level.

From: WGBYC

To: WGCATCH

Recommendation (ICES reference #109)**:**

WGBYC recommends that WGCATCH implement the collection of data on incidental bycatch of protected and other species at risk (i.e. rare bycatch events) in the sampling protocols of national catch and discards sampling schemes and design pursuant to EU

implementing decision 2016/1251 Chapter III, Section 3.; including incorporation of appropriate fields in National databases, data processing, data validation and synchronization with the regional database.

WGCATCH response: WGCATCH role is not to implement any sampling programmes, but to advise ICES countries with guidelines and best practices. WGCATCH routinely updates a questionnaire that documents improvements of MS with regards to this topic. Furthermore, a Joint Workshop between WGCATCH and WGBYC on sampling of bycatch and PET species under DCF programmes and directed bycatch studies is being planned. This workshop can be a starting point for increased sampling and registration of incidental bycatch and other species at risk. Among other topics, the WK will evaluate the extent to which current EU MAUP data collection schemes (onshore, at-sea, etc.) can increase data collection on specific species and how effective pilot programmes and directed studies can be designed that provide reliable estimates on their catch composition without jeopardizing already existing data collection programmes needed for ICES stock assessments. It will also define proper mechanism(s) for storage, maintenance and dissemination of both the PETS monitoring program inventory and monitoring data (see more details in **Annex 5**)

From: WKSHARK3

To: WGCATCH

Recommendation (ICES reference #114)**:**

It is recommended to do more targeted sampling for these species in the data collection and to agree on a registration protocol.

WGCATCH response: WGCATCH keeps a close collaboration with WGBYC whereby a participant of WGBYC routinely participates on WGCATCH and questionnaires on data collection of bycatch species are annually collated. This collaboration will be made more effective in 2018 with the joint organization of WKPETSAMP between the two EGs. As some PETS are sharks, WGCATCH invites participants of WKSHARK3 and members of WGEF to participate in WKPETSAMP. Routine participation of WGEF participants in WGCATCH can also be considered. However, WGCATCH underscores that RCGs and the institutes of non-EU MS are the ones effectively deciding on the sampling needs and effort for specific species. Therefore, if an increase in sampling of some specific shark species is required a recommendation should be addressed to those entities.

From: WKSHARK3

To: WGCATCH

Recommendation (ICES reference #114)**:**

It is suggested that WGEF consider a recommendation to WGCATCH for procedures in sampling programmes: e.g. species, sex, length, weight, fate (retained, discarded dead, discarded alive), which may require an additional field in observer data. There is a possibility that this has been addressed already as "WGCATCH now formally recognizes the need to address sampling protocol deficiencies for rare event species in the DCF by incorporating an explicit ToR to address this issue at their annual meetings and have expanded their membership to include WGBYC" (ICES, 2016).

WGCATCH response: The work in WGCATCH in bycatch and protected species is largely ensured by the routine participation of a WGBYC participant in the WGCATCH meetings. WGCATCH would welcome a similar member from WGEF to participate in its meetings and push forward the issue. WGCATCH further informs that together with WGBYC it is pondering a workshop on estimation of PETS which ToRs can easily be adapted to the estimation of rare catches in general. WGCATCH is open to suggestions of WGEF with regards to the ToRs of this workshop.

From: RCG NS&EA 2017

To: WGCATCH

Recommendation (LM/RCG NS&EA 2017 #4)**:**

RCG NS&EA recommends that ICES/WGCATCH considers the development of quality evaluation tools based on InterCatch and other available outputs. Missing to provide the information on sample intensities requested in the data call should be considered a data transmission failure.

Justification:

As long as InterCatch (IC) is the main tool to document data used for stock assessment it is crucial to the for the stock assessor to have information on the data quality and currently the only source of information that can be used in the IC format is sampling intensity and numbers of ages and lengths. However, not all MS provided this information in 2017 although it was made mandatory in the data call.

WGCATCH response: InterCatch is only able to contain data at a much aggregated level. Current indicators requested for such aggregated data are useful for stock coordinators but WGCATCH underscores they relate more to data quantity than to data quality. The latter is more dependent on e.g. level of coverage, implementation of randomness in sample selection, No. of PSUs for age and length samples, etc. with the reports of SGPIDS 2-3 and WKPICS 2-3 constituting core references with regards to such quality measures.

From: RCG NS&EA 2017

To: WGCATCH

Recommendation (LM/RCG NS&EA 2017 #5)**:**

RCG NS&EA recommends WGCATCH to set-up a process to develop summary reports from RDB data, together with the R code in support; PGDATA should be tasked to feed into the process with a list of analyses of interest to the benchmarks. Finally it would be important that the R functions developed for the analyses would be shared in open repositories so that they can be considered by the RCG NS&EA Data group in the production of its own fishery overviews and reports. Such exploration should be carried out in full respect for the RDB data policy and involve a pool of data providers that is able to reflect main concerns on data quality and sampling design into the elaboration of these reports.

Justification: The present RDB, is at an early stage of development and already demonstrates largely unexplored potential for both RCGs and ICES community. As a current storage place for all commercial sampling, landings and effort data from EU countries,

the RDB has the capacity to feed routine summary reports of the data available that can be useful to both RCGs and Assessment Working Groups.

WGCATCH response: Some of these standard outputs are being developed in RCM/RCGs. However, they appear to not answer all needs of benchmarks and the quality of the data makes for much checking to be needed. Until this is solved, WGCATCH can only look at RCG reports, comment on them, and suggest some complementary analysis. WGCATCH is aware of a present effort on one stock to be addressed at WKPELA whereby RDB data will be tested for use at benchmark level. WGCATCH suggests the results of that effort (and similar future ones) are presented and discussed at the WGCATCH meetings where feedback on the reports carried out can be obtained.

From: RCG NA 2017

To: WGCATCH

Recommendation (LM/RCG NA 2017 #1)**:**

The RCG NA strongly recommends that: processes and methods are developed that can use the data currently available on the RDB in simulations and analysis to test regional sampling designs.

Justification: The current structure of the RDB limits what simulations might be used to test sampling designs. The analysis carried out in the fishPi study was dependent on a separate data exchange and detailed disaggregated transversal data outside the limits of the RDB and the current data exchange agreement. This should not stop any further development of regional sampling plans and time and effort needs to be spent looking at developing alternative methods and simulations that can help optimise regional sampling but using the information, basic structure and data already supplied to the RDB. Work must be done to ensure RDB data exchange format contains the information needed. This may be limited by aggregated transversal data but additional fields or alternative aggregations might be more appropriate.

WGCATCH response: WGCATCH strongly supports the development of the new RDBES. From a point of view of regional sampling designs, the new RDBES is expected to provide data at highly disaggregated level that, alongside increasingly statistically sound sampling practices such data, will ultimately allow the quantification of variance of different designs and levels within each design, rendering simulations and optimizations more accurate. However, the development of the RDBES is quite complex and will necessarily be a long-term goal. Accordingly, like RCG NA, WGCATCH agrees that the potential of the present RDB for regional work should continue to be further explored. As an example of this, WGCATCH recently suggested the present RDB format to be used in the WKBIOPTIM series that is currently dealing with optimization at national level. WGCATCH is also using the CL format as the basis for its recent data compilations and analysis of the sampling of foreign landings. Such efforts aim to use the RDB format to its full potential and are envisioned to continue over the coming years.