ICES WKISCON2 REPORT 2015

ACOM/SCICOM STEERING GROUP ON INTEGRATED ECOSYSTEM OBSERVATION AND MONITORING

ICES CM 2015/SSGIEOM:36

REF. ACOM & SCICOM

Report of the Workshop on implementation studies on concurrent length sampling (WKISCON2)

16–19 June 2015

Sukarrieta, Spain

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CIEM Conseil International pour l'Exploration de la Mer

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Recommended format for purposes of citation:

ICES. 2015. Report of the Workshop on implementation studies on concurrent length sampling (WKISCON2), 16-19 June 2015, Sukarrieta, Spain. ICES CM 2015/SSGIEOM:36. 84 pp. https://doi.org/10.17895/ices.pub.8633

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Executive Summary

The Workshop on Implementation Studies on Concurrent Length Sampling (WKISCON2), chaired by Liz Clarke, Scotland, and Nuno Prista, Portugal, met 16–19 June 2015 in Sukarrieta, Spain. The meeting was attended by 12 experts from nine institutes, covering seven member countries.

WKISCON2 originated from a request from RCM NA and the 11th Liaison Meeting to ICES WGCATCH to set up a workshop that would evaluate the utility of the data being collected by concurrent sampling. The aims of the workshop were to review the implementation of concurrent sampling for lengths by Member States (MS), identify current uses and benefits of data collected in this way, consider the statistical arguments for carrying out concurrent sampling of landings, and evaluate the implications of discontinuing current at-sea and onshore concurrent sampling. In the preparation for the workshop, two questionnaires and a data call were sent to 23 DCF National Correspondents (with replies from 17 institutes) and 45 ICES Expert Groups (30 replied). This evidence was analysed in subgroups and complemented with plenary discussions throughout the week.

WKISCON2 concluded that:

a) Stock assessment and discard estimation and management are the major current uses of concurrent sampling data. Other uses like scientific catch estimation, advice to local, national and international authorities, research on MSFD descriptors, mixed fisheries and gear interactions and on mortality of rare species, data-poor stocks and PETS also take place in ICES EGs and national institutes. WKISCON2 notes that many of these uses do not specifically require length data that have been sampled concurrently on a trip and that models have not been developed yet to make full use of concurrent data at trip-level.

b) Concurrent sampling for lengths of discards and landings at-sea is a long-established practice in most MS and haul-level and trip level data are already available for current and future uses albeit sometimes limited by the lower sample size of these programmes.

c) Fewer MS carry out concurrent sampling of landings onshore, those that do not citing increased costs and workload as the main practical issues. Where it was applied, concurrent sampling of fishing trips onshore resulted in substantial increases in the number of species sampled for lengths without jeopardizing the main uses of the data.

d) Concurrent sampling of landings onshore is a simple and effective way to estimate species composition (in weight and length) of landings. However, it is prone to bias caused by incomplete sampling and can be an inefficient method of obtaining length distributions of specific stocks when officially reported species compositions (e.g. from logbooks) are considered accurate. Other statistically sound methods of selecting species to sample are not yet fully developed or tested in the field but may provide useful alternatives in these cases.

e) Increased information on bycatch species, general catch composition, and improved data on mixed-fisheries were considered by EGs to be the major benefits of concurrent sampling.

f) Full species concurrent sampling of the catch at a haul-level is the best way to provide data to measure the interactions between all species caught and evaluate the impacts of fisheries on marine biological resources and on the ecosystem. WKISCON2 considers sampling at-sea is the ideal way of sampling commercial fisheries. At-sea sampling is generally more costly and displays lower fleet coverage than onshore sampling, but currently, it is not usually possible to sample the discarded component of the catch onshore.

g) To take full advantage of the benefits of concurrent sampling, both at-sea and onshore, full-species concurrent sampling should be implemented without resort to species lists such as the current G1 and G2 lists. Incomplete sampling events need to be flagged in national and international databases. The sampling should be regionally coordinated to ensure implementation is consistent and data are comparable at a regional level.

Overall, WKISCON2 concludes that the implementation of concurrent sampling of landings onshore and at-sea has provided benefits in terms of provision of data for more species. However, more than concurrent sampling itself, statistically sound sampling of the full range of species caught should be the overall aim of future revisions of the DCF and a return to strict stock based sampling should not be an option. To achieve statistically sound sampling of commercial catches various statistical approaches may be valid, concurrent sampling being one among them.

1 Opening of the meeting

The workshop started at AZTI - Tecnalia in Sukarrieta, Spain, on Tuesday, 16 June at 09:00 and closed on Friday, 19 June at 13:00. A total of 12 representatives from nine member countries attended the workshop (Annex 1).

2 Adoption of the agenda

The agenda of the meeting is included in Annex 2.

3 Introduction

The collection of data on fisheries variables at EU level has evolved significantly through time in response to changing fisheries, new data demands from end-users and evolving knowledge of sampling practices. One of the major changes in data collection took place during 2008-2009 and involved the adoption of the EU Data Collection Framework (DCF; Council Regulation No 199/2008 of 25 February 2008; Commission Decision 2010/93/UE of the 18 December 2009) that substituted the former EU Data Collection Regulation (DCR; Council Regulation (EC) No. 1543/2000 of 29 June 2000; Commission Regulation (EC) No. 1639/2001 of 25 July 2001).

3.1 Overview of DCR-DCF evolution

The EU Data Collection Regulation (DCR) drove EU fisheries sampling between 2002 and 2008. Among other things, data collection under the DCR was based on a stock-based approach establishing that MS should carry out biological sampling in order to evaluate the composition in length/age of the landings for specified stocks (Figure 1). Under this regulation, the implicit sampling units were the landings/catches of specific stock, namely those that at the time were evaluated by ICES, NAFO, ICCAT and other scientific and management bodies.

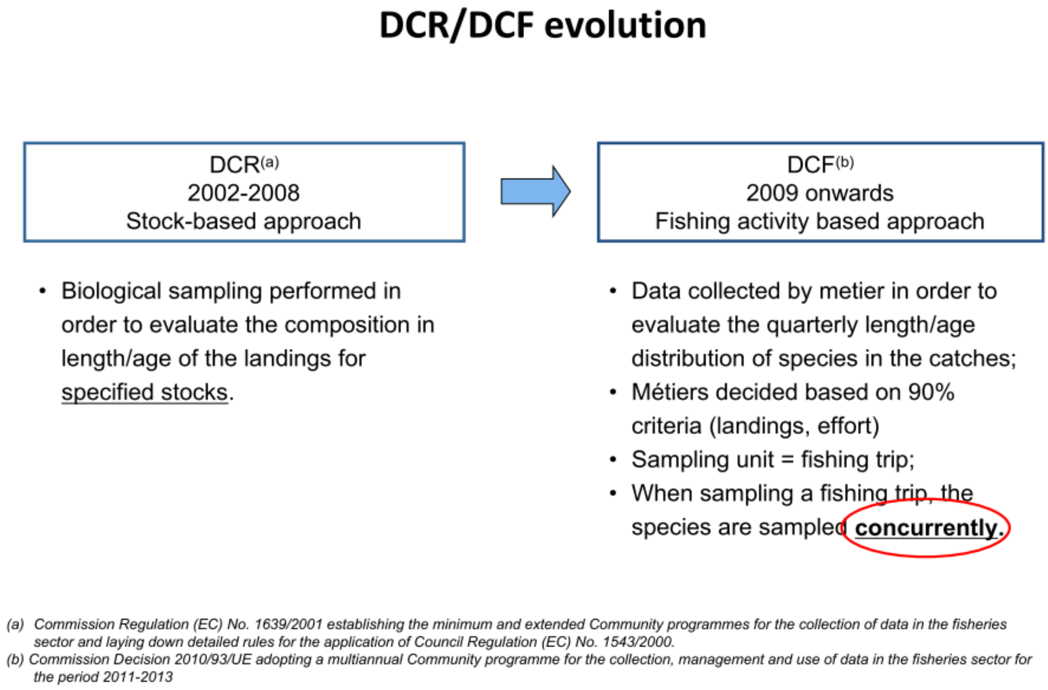

Figure 1. Summary of the main changes in the evolution from DCR to DCF.

The EU Data Collection Framework (DCF) replaced the DCR and has guided fisheries sampling in EU waters from 2009 until the present. The overall aim of this replacement in what concerns the collection of biological data were underscored in the preamble of Council Regulation No 199/2008 that stated the need to "take due consideration of a fleet-based approach towards fisheries management, the need to develop an ecosystem approach, the need for improved quality, completeness and broader access to fisheries data, more efficient support for provision of scientific advice and the promotion of co-operation among Member States" (Council Regulation No 199/2008 of 25 February 2008). As a consequence of this, relatively to the DCR, sampling under the DCF became centered on characterization of fishing activity, through the introduction of objectives by métier and establishing fishing trip as the sampling unit. The DCF hence shifted focus from stocks themselves to the range of species captured within a trip. In doing so, the DCF introduced in legislation several new concepts among which that of concurrent sampling for lengths (Figure 1, see annex 6), i.e. the sampling of lengths from all species (or a predefined list of species) from a trip, for both landings and discards (Commission Decision 2010/93/UE of the 18 December 2009).

3.2 Background for DCR-DCF changes in sampling for lengths of commercial catches

In the background for the changes made to EU sampling during the DCR-DCF evolution was the aim of obtaining the data required by existing single species stock-based assessments while at the same time improving data availability for other purposes, namely fleet-based approach to fisheries management and the ecosystem approach to fisheries management.

The need for such changes was reviewed by SGRN-06-03 (STECF, 2006) where it was noted that this amounted to a complete reshape of the DCR *so that it meets the data requirements of both the existing, stock-based assessments and the fishery-based management* *systems that are likely to be implemented in the foreseeable future* while ensuring *the integration of the ecosystem approach to fisheries management in the data collection framework, and the inclusion of eel (Anguilla anguilla) and the associated data collection programmes in support of the eel management plans* (STECF, 2006).

Among the main points SGRN-06-03 referred needed change in the new DCF were the need to address all removals from fish and shellfish stocks, regardless who or what is at their origin and the need to collect length composition data on such removals by métier (STECF, 2006). In what concerns "removals", SGRN emphasized that these respected to the entire catch, i.e. both landings and discards of both commercial and recreational fisheries activities. In what concerns métiers, SGRN-06-03 stated that *the main difference between the métier-approach and the current approach to fleet-based data collection (where Member States more or less independently define their fleet segments) is that the métiers attempt to harmonize the stratification of fishing operations at the regional level. In so doing, they ensure that all countries use the same groupings and that national datasets can much more easily be compared and pooled at the regional level.*

Following up on this, SGRN-06-03 noted that *in order to be able to fully appreciate and model the interactions between the different species taken by a métier, it is also essential to organize sampling in such a way that all species are sampled concurrently, actually meaning that all sampling for catch and length composition data are done simultaneously on all species in a vessel's catches or landing*. While stating this SGRN-06-03 was aware *that it would be totally unrealistic to expect direct estimates of the quantities discarded and their species composition for all cells in the métier matrices* as *this would require a multiplication of the number of sea-going observer trips and a substantial increase in the cost of at-sea sampling* and appears to have acknowledged that landings were still (and would still be within the foreseeable future) among the main drivers of stock assessment models and management. Consequently, SGRN underscored that the concurrent sampling approach would have to be extended to all length sampling programmes, both at sea and at the market. It did however acknowledge that if *in the case of at-sea sampling, concurrent sampling should not pose major logistic problems. To SGRN's understanding, it was a common practice already in most, if not all at-sea sampling programmes* (...) *in the case of port or market sampling, however, the time-window for taking length samples is usually rather short, and concurrent sampling may not be feasible for all species* (STECF, 2007). SGRN stated however that the obligation for fishing activity based sampling should be restricted to the collection of length composition data of the removals and did not find need to extend it to data on growth, sexual maturity and fecundity data unless in very specific circumstances (STECF, 2007).

PGCCDBS 2007 acknowledged that the implementation of the proposed shift in the EU data collection framework from species-based to métier-based sampling and, above all, the requirement on concurrent length sampling of the landings was likely to cause significant problems for the institutes involved in length sampling (ICES, 2007). To ease the shift, PGCCDBS suggested that each national laboratory which had problems with the implementation, carried out implementation studies, selecting two or three métiers that can be regarded as typical and test sample them concurrently for the period of one month. The objective of the implementation studies was to gain experience with the logistic and practical aspects of implementing concurrent métier-based sampling. Their results should form the basis for designing best practice sampling schemes that fulfil the demands of the new DCR with regards to métier-based market sampling (ICES, 2007). Protocols for such studies were presented together with a proposal for an ICES Workshop.

Many member states carried out an implementation study in 2007 or early 2008, as proposed by PGCCDBS. These results were presented and discussed at Joint STECF/ICES Workshop on Implementation Studies on Concurrent Length Sampling (WKISCON), where 16 MS identified implementation problems such as restricted access to specimens (e.g. due restricted access to facilities themselves or to fragile and valuable species), time restrictions (time window not sufficient to complete sampling), commercial grades (too many size categories made sampling very time consuming), higher costs (increase in costs due extra sampling, need of buying fish or need to increase at-sea sampling) and data issues (difficulties in random selection, in sampling polyvalent vessels and trips over multiple areas; ICES, 2008). Overall, WKISCON concluded that *sampling at sea is the preferred way of concurrent sampling and length sampling of landings on shore can be considered as a complement to at-sea sampling. Onshore sampling can be combined with at-sea sampling where appropriate* while stating that *future concurrent sampling is foreseen to be a mixture of concurrent sampling at sea and concurrent sampling of landings in harbours/at markets, adapted to deal most* effectively with local sampling difficulties and the resource implications. *Each source of data has specific issues for best practice and data quality*. A range of advantages and disadvantages for both onshore and at-sea concurrent sampling were enumerated (see ICES 2008a, Section 6). Following the results of these implementation studies, common problems were discussed and advice was given on a new proposed sampling scheme. These sampling schemes relied on a distinction between three groups of species – Group 1: Species that "drive" the management process and for which the data requirements are highest (target species of the fishery and species under a recovery plan), Group 2: Other TAC-regulated species and major non-regulated bycatch species and Group 3: All other bycatch species – established for different regions (ICES, 2007; ICES 2008a). PGCCDBS 2008 reviewed the outcomes of WKISCON2 making no further comments (ICES, 2008b).

3.3 Concurrent sampling in the DCF

The proposals and suggestions of SGRN-06-03 (STECF, 2006), PGGCDBS (ICES, 2007) and WKISCON (ICES 2008a) were largely taken into account in the DCF (Commission Decision 2010/93/UE of the 18 December 2009) that came to establish the need to sample on a métier-based approach and established concurrent sampling as a general sampling practice in EU fisheries.

As defined in the DCF:

- **Concurrent sampling** is the sampling all or a predefined assemblage of species, simultaneously in a vessel's catches or landings.
- The sampling unit is the fishing trip.
- Within each region (as defined in DCF Appendix II), the species should be classified within a group according to the following rules[1]:
    - **Group 1**: Species that drive the international management process including species under EU management plans or EU recovery plans or EU long-term multi-annual plans or EU action plans for conservation and management based on Council Regulation (EC) No 2371/2002 (3).
    - **Group 2**: Other internationally regulated species and major non-internationally regulated bycatch species.

[1] An allocation of species to Group 1 and 2 was specified in Appendix VII of the DCF.

- **Group 3**: All other bycatch (fish and shellfish) species. The list of Group 3 species shall be established at the regional level by the relevant regional coordination meeting and agreed by STECF[2].

Furthermore, the DCF recognized *the sampling design per métier must consider both the periodicity of the sampling events and the sampling scheme to apply.* As possible sampling schemes for the sampling of landings, the DCF indicated:

- **Scheme 1**: comprehensive sampling of all species.
- **Scheme 2:** within each time stratum, the sampling events are split in two parts. One part of the sampling events (x %) considers sampling of all species on shore whereas the other part of the sampling events (100 – x %) considers only sampling of all Group 1 species.
- **Scheme 3**: within each time stratum, the sampling events are split in two parts. One part of the sampling events (x %) considers sampling of all Group 1 and Group 2 species on shore, whereas the other part of the sampling events (100 – x %) considers only sampling of Group 1 species. In this scheme, Group 3 species have to be sampled at sea.

Summary of the schemes to be used for concurrent sampling

Sampling scheme	Frequency	Group 1	Group 2	Group 3
Scheme 1	Every sampling event	✓	✓	✓
Scheme 2	x % of sampling events	✓	✓	✓
	(100 – x) % of sampling events	✓		
Scheme 3	x % of sampling events	✓	✓	Sampling at sea
	(100 – x) % of sampling events	✓		

Figure 2. Summary of schemes to be used for concurrent sampling according to the DCF (Commission Decision 2010/93/UE of the 18 December 2009).

3.4 Recent discussions and motivations for WKISCON2

In 2009, PGCCDBS noted that *the new Data Collection Framework from 2009 onwards has resulted in changes to national sampling programmes that could potentially impact the continuity of dataseries used in stock assessments*. Among the factors that could potentially impact such continuity was concurrent sampling which *considerable additional time would be required to concurrently sample species-rich landings ashore was thought that might result in fewer landings being sampled unless additional resources are allocated. It could also result in over-sampling of vessels that habitually land well in advance of a market (perhaps because they fish closer to port) to ensure adequate time to complete the concurrent sampling* (ICES 2009). This concern was also voiced in PGCCDBS 2011 that advised ICES Expert Groups to be aware of the *potential deterioration in data quality for individual species or fleets caused by laboratories diverting resources to meet more complex sampling requirements*

[2] As far as participants of WKISCON2 are aware, the allocation of species to Group 3 was never carried out at regional level.

such as métier-based concurrent length sampling and consider the likely effects on stock assessments and projections (ICES, 2011a).

Recent compilations of information on at-sea sampling indicated some differences in the degree of concurrency adopted by different member stats evidencing that the discard fraction was not sampled fully concurrent in some fleets and countries (ICES 2011b, table 4.3). The report of STECF 12-07 (STECF, 2012) also noted "*that concurrent sampling of different fish stocks in the same catch is carried out differently in different Member States leading to inconsistent estimates of catch compositions from sampling schemes. There is a need to explain and define concurrent sampling in order to ensure consistent sampling by MS.*"

Such recent discussions were brought to the attention of RCM NA 2014 (Anon., 2014), among other, that noted that concurrent sampling of different fish stocks could be being carried out differently by different MS, while at the same time recognized both pros and cons to the adoption of concurrent sampling. In particular the RCM NA 2014 stated that "*It is unclear whether the significant resource needed to carry out concurrent sampling provides benefits that outweigh the costs. Some ICES working groups have benefited from concurrent sampling data collected however, there is no empirical evidence to support this. In order to decide if concurrent sampling should continue, more feedback from end-users is required*". To follow-up on this, RCM NA and the 11th Liaison Meeting (Anon., 2014b) requested that ICES WGCATCH (ICES, 2015) set up a workshop to evaluate the implications of stopping concurrent sampling and the benefits concurrent sampling is providing (or can provide) considering the new and broader scopes of the revised DCF, such as the evaluation of impacts of fisheries on marine biological resources and the ecosystem.

4 Methodology and information sources

Prior to the WKISCON2, the chairs produced two types of questionnaires and a data call that were sent by the ICES Secretariat to DCF National Correspondents (see Annex 7 and 8) and to a selection of ICES Expert Groups (see Annex 10). Both questionnaires consisted of open-ended questions with few options being provided. The aim was to provide larger freedom in answering to DCF National Correspondents and ICES chairs. The questionnaires and data-call were accompanied by a PDF that briefly described concurrent sampling and exemplified some effects that might be noticeable in the datasets as a consequence of the implementation of concurrent sampling (see Annex 6). Institutional reminders were sent regularly both by the ICES secretariat and WKISCON2 chairs in order to increase response rates.

The questionnaire and data call destined to DCF Data Correspondents (see Annex 7 and 8) was sent to 23 Member States (Annex 4). Fifteen replies (corresponding to 19 institutes) were obtained. From these, one MS sent a Working Document that was presented during the workshop and three MS supplied partial answers to the questionnaire and/or data call (see Annex 12). The replies cover both Northern and Southern European countries, and both Western and Eastern European countries. The answers were considered to adequately reflect the situation of NE Atlantic waters but not the Mediterranean and Black-Sea where most non-replies (6 out of 8) originated. Answers to the questionnaires are displayed in Annex 9.

The questionnaire destined to ICES Expert Groups (EGs) was sent to the chairs of 45 EGs (Annex 5). The EGs were selected by WKISCON2 chairs and the ICES Secretariat among those that could potentially have used, be using, or find it useful to use in future, data from concurrent sampling of commercial catches and included both past and present PGs, WGs and WKs, from both ACOM (n = 27) and SCICOM (n = 17) and a large diversity of focuses, including stock assessment, environmental assessments and ecosystem assessments. The answers to questionnaires should be considered to reflect the chairs perspectives on the questions asked because time constraints and workload burdening did not permit all EGs participants to be consulted. Thirty replies were obtained that covered both ACOM groups (n = 20) and SCICOM groups (n = 10). Three EGs did not answered the questionnaire but sent a message to WKISCON2 expressing their overall views on concurrent sampling (WGHIST, WGNARS and WGMIXFISH) that were considered but not included in formal questionnaire analyses (limited to n = 27). Answers to the questionnaires are shown in Annex 11.

5 Current use of length sampling data collected onshore and at-sea by countries and ICES EGs (ToR a)

ToR a) of WKISCON2 aimed to "*Identify the current use of concurrent length sampling data by end-users*" To answer this ToR, the WKSCON2 participants carried out summary analyses of the replies to questionnaires sent out by DCF National Correspondents and by the chairs of ICES Expert Groups. These analyses were supplemented with discussions among the participants carried out throughout the week in several plenary sessions (Section 9).

5.1 Uses mentioned by DCF National Correspondents

To investigate the usage of concurrently length sampling data by end-users at national level, the answers of DCF National Correspondents to the question "*1. Please specify the current uses of catches sampled concurrently at your institute*" were analysed.

A variety of uses of commercial catch data sampled concurrently were mentioned by National Correspondents of DCF (Table 1). The vast majority of countries mentioned that data are being used for stock assessments, mostly at international level (within ICES, GFCM and/or ICCAT working groups) but also at national and local level (by the institutes themselves or local authorities). The data used for this purpose includes information on length, weight, age, maturity, discards and cpue of the main national fisheries (target and bycatch) and is frequently provided through data calls. Data from catches sampled at-sea is also being used in discard estimation and management plans. In more specific cases data are also used for other purposes like scientific catch estimation (e.g. through improvements in the taxonomic identification of species contained within commercial names and categories), in advice to local, national and international authorities (e.g. on gear analysis, gear interaction), investigation of MSFD descriptors, support for fisheries certification (MSC), various research projects and in providing information on mortality of rare species, data-poor stocks and PETS.

Table 1. Summary of current uses of concurrent sampling data reported by DCF National Correspondents. In parentheses is the number of countries reporting the each usage. Only countries that reported carrying out concurrent sampling were considered in this analysis.

CURRENT USES OF CONCURRENT SAMPLING DATA BY DCF COUNTRIES
Stock Assessment and other international data calls (12)
Discard estimation and discard management plans (10)
Research projects (3)
Analysis of rare species, data-poor stocks and PETS (3)
Development of MSFD descriptors (2)
Other uses (e.g. Gear analysis, gear interactions, logbook validation, mixed fisheries, scientific catch composition, support MSFD certification, development of MSFD descriptors; 7)

5.2 Awareness and need of concurrent sampling data reported by chairs of ICES Expert Groups

To investigate the awareness and usage of concurrently length sampling data by end-users at international level, the answers of the chairs of ICES EGs to the questions *"1. Are you aware of the availability of concurrently sampled multispecies landings and discard data?"* and *"2. Does the work of your WG/WK specifically require concurrently sampled data? If yes, please describe the variables of interest / stocks involved"* were analysed.

The majority of chairs replied positively to the question *"1. Are you aware of the availability of concurrently sampled multispecies landings and discard data?"* (n = 17), 7 chairs not being aware of the existence of this type of data (AFWG, NIPAG, WGCOMEDA, WGEEL, WGINOR, WGNEW, WGRECORDS) and 2 chairs finding the question not to be applicable to their EGs (WGNARS, WGHIST; Table 2). Among the chairs that were not aware of the existence of concurrent data, four chaired ACOM EGs and three chaired were SCICOM EGs. These numbers indicate that awareness of this type of data may be larger among the ACOM EGs contacted (15 out of 19 replies) than among the SCICOM EGs contacted (4 out of 7 replies), possibly because ACOM experts deal more directly with the sampling and estimates of commercial catch and the advisory process and the work of SCICOM EGs frequently relied mostly on survey data.

On the question *"2. Does the work of your WG/WK specifically require concurrently sampled data? If yes, please describe the variables of interest / stocks involved"*, many chairs of EGs that were aware replied that their work did not require specifically concurrent sampling data (11 out 19) with the remaining half of EGs indicating these data to be necessary (n = 4) or nor specifically necessary but useful, namely discards (n = 4; Table 2). This is an expected answer considering that in many of these groups work is based on assessments of single stocks and/or use survey trends (so quality data from specific stock/species generally suffices their needs) and discards are being increasingly incorporated in estimates of commercial catches.

Table 2. Summary of awareness and need of concurrent sampling by ICES EGs.

AWARENESS OF CONCURRENT SAMPLING DATA AND REQUIREMENT OF CONCURRENT DATA FOR EG WORK
Aware (19)
Concurrent data not specifically required (11)
Concurrent data specifically required (4)
Concurrent data not specifically required but useful (4)
Not aware (7)

6 Implementation of concurrent length sampling by DCF countries and changes in quantity and quality of data collected before and after 2009 (ToR b)

ToR b) of WKISCON2 aimed to "*Review information on types and extent of concurrent sampling carried out on shore or at sea by Member States as part of national DCF programmes, the practical issues encountered, the additional costs involved, and the quality of concurrent length data from each source. Evaluate the difference in the data collected before and after implementation of concurrent sampling*." To answer this ToR, the WKISCON2 participants carried out summary analyses of the replies to questionnaires sent out by DCF National Correspondents and by the chairs of ICES Expert Groups.

Summary tables of onshore and at-sea sampling in the different countries produced during the WK are displayed in Table 3 and Table 4, respectively.

Table 3. Summary of onshore sampling in EU waters.

onshore sampling										
MS	Concurrent?	Species	catch definition	trip/haul	Litter	PETS	degree of implementation	degree of success	year of implementation	
DK	No (a)	National list (b)	landings	box	NA	NA	NA	NA	NA	MS present at meeting
ES - AZTI	Yes (Scheme 1)	All fish and shellfish	landings	trip	NA	NA	Everytime	High	2009	
ES - ICES	Yes (Scheme 1)	All fish and shellfish	landings	trip	NA	NA	Everytime	High	2009	
ES - MED	Yes (Scheme 1)	All fish and shellfish	landings	trip	NA	NA	Not everytime (only pots, nets, hook, purse seiners)	100%	2009	
IE	Yes (Scheme 2)	All fish and shellfish	landings	trip	NA	NA	Not everytime (target number of fishing trips in NP)	Variable	2009	
LT	Yes (Scheme 1)	National list	landings	trip	NA	NA	NA	NA	NA	
PT - IPMA	Yes (Scheme 1)	All fish and shellfish	landings	trip	NA	NA	Everytime	High (difficult in larger landings, e.g., OTB)	2009	
UK - E+W	Yes (Scheme 2)	All fish and shellfish	landings	trip	NA	NA	Not everytime (target number of fishing trips in NP)	Variable	2011	
UK - SCO	No	All fish and shellfish	landings	trip	NA	NA	NA	NA	<2009	
BG	No									Information inferred from questionaires
CY	Yes									
DE - TI-OF	MS do not mention any on-shore sampling									
DE - TI-SF	No on-shore sampling									
EE	Ms do sample concurrent, but it is not clear if it is on-board or on-shore									
FI	Ms do sample concurrent, but it is not clear if it is on-board or on-shore									
FR	Yes									
LV	MS do not mention any on-shore sampling									
NL	No									
SE	No									
BE										No answer from MS
EL										
HR										
IT										
MT										
PL										
RO										
SI										

(a) - Denmark carries out concurrent sampling of its pelagic fleet with high sucess rate

(b) - List includes fish and shellfish used for human consumption

Table 4. Summary of at-sea sampling in EU waters.

at-sea sampling										
MS	Concurrent?	Species list	catch definition	trip/haul	Litter	PETS	degree of implementation	degree of success	year of implementation	
DK	Yes (Scheme 1)	All fish and shellfish	landings+discards	haul	yes	yes	Everytime	High	<2009	MS present at meeting
ES - AZTI	Yes (Scheme 1)	All fish and shellfish	landings+discards	haul	yes	yes	Everytime	High	<2009	
ES - ICES	Yes (Scheme 1)	All species	catch or landings+discards depending on fleet	haul	yes	yes	Everytime	High	<2009	
ES - MED										
IE	Yes (Scheme 1)	All fish and shellfish (*)	landings+discards	haul	no	yes	Everytime	High	<2009	
LT	Yes (Scheme 1)	All fish and shellfish	landings+discards	haul	no	no	Everytime	High	<2009, data in RDB from 2013	
PT - IPMA	Yes (Scheme 1)	All species	catch or landings+discards depending on fleet	haul	yes	yes	Everytime	High	<2009	
UK - E+W	Yes (Scheme 1)	All fish and shellfish (*)	landings+discards	haul	no	yes	Everytime	Every time	<2009	
UK - SCO	Yes (Scheme 1)	All fish	discards	haul	no	yes	Everytime	Every time	<2009	
BG	No									Information inferred from questionaires
DE - TI-OF	Yes									
DE - TI-SF	Yes									
EE	Ms do sample concurrent, but it is not clear if it is on-board or on-shore									
FI	Ms do sample concurrent, but it is not clear if it is on-board or on-shore									
FI	Yes									
FR	Yes									
LV	Yes									
NL	No									
SE	Yes									
BE										No answer from MS
EL										
HR										
IT										
MT										
PL										
RO										
SI										

6.1 Types and extent of concurrent sampling carried out as part of national DCF programmes

Two countries reported not performing concurrent sampling at all. All other countries reported at least one form of concurrent sampling, namely concurrent sampling at-sea. In what concerns concurrent sampling at-sea most countries have had a concurrent sampling scheme in place long before the DCF (2009) and are carrying it out at present for the fleets and métiers covered. In what concerns concurrent sampling onshore about half the countries implemented concurrent sampling schemes implemented after 2009, with the remaining carrying out alternative sampling strategies or only sampling concurrently at-sea.

6.2 Practical issues encountered during the implementation of concurrent sampling

The vast majority of countries reported some sort of difficulties in the implementation of concurrent sampling with only two countries reporting no difficulties in implementation. The main difficulties reported by countries can be grouped into three main groups and concerned mostly (but not only) the implementation of concurrent sampling onshore:

1) Time constraints: concurrent sampling was reported to imply the sampling of many more species in fisheries with high diversity of captures and/or landings causing time constraints in sampling operations. This situation is reported mainly for sampling onshore, in métiers with a large numbers of species and different grades within species (e.g. trawlers and gillnetters) and when all species have to be sampled according to the sampling scheme, but two country mentioned difficulties in sampling both retained and discarded catch at-sea (having given higher priority to discards in order to work up all hauls or opted for sampling different species in different hauls). Depending on the métier a sampling event can take between ½ and several hours and that may conflict with fish landing/auctioning procedures (onshore) or fish

sorting procedures (at-sea) leading to quality issues such as incomplete sampling of species within hauls or trips, preferential sampling of smaller (or less diverse) landings, lower sample sizes for length distribution in target stocks, and a reduced number of trips sampled each day. Some of these situations may generate biases in trip and sampling-day estimates of species and length composition.

2) Access to samples:

a) Incomplete access: Some countries reported that as soon as the catch is landed onshore, some of its species/categories might be rapidly sold and shipped way immediately causing them to be impossible to sample and leading to incomplete sampling of species composition of commercial size-categories.

b) Mixed trips: Some countries reported that some of the landings from different vessels might be mixed on the auction floor thus making it impossible to sample completely and individualize trips onshore.

c) Concerns over damage of valuable landings: Some countries reported that processors/owners/buyers did not like their landings to be handled once they has been landed. This is especially true for the more valuable or fragile elements of the landed catch and does not impact discard sampling at sea.

d) No access to some on-board components: Some countries reported difficulties in accessing vessels for on-board sampling due to direct refusals or no space to accommodate observers on-board some fleet components, namely the smaller vessels. In such cases, sampling may only be made onshore.

3) Resource implications (personnel and infrastructure): Onshore the implementation of concurrent sampling is reported to have required an increase in the number of market visits and onshore observers in order to compensate for the smaller number of trips sampled each day and the more time consuming sampling of each individual trip. At-sea some countries also report the need of two in the number of observers in order to complete sampling of both retained and discarded catch. One country noted that they had an increased need for transportation, refrigeration and waste disposal.

Measures put in place to tackle some of the problems range from increasing the number of market visits and observers, improving databases to make resulting data easier to enter, generalizing the usage of electronic data capture equipment (e.g. electronic calipers) and increased communication efforts with the industry to try to enable concurrent sampling of all catch/landing components both at-sea and onshore.

6.3 Additional costs brought about by the implementation of concurrent sampling

Countries were asked if the implementation of concurrent sampling brought about significant increases or decreases in sampling costs at their institutes and to give a rough estimate of the changes. There was a range of answers from no increase to a 25% increase in costs. Most countries stated that costs of sampling stayed the same because there was a unit cost in sending people sampling that is not dependent on whether the sampling is (or not) concurrent (many countries have staff based near the major ports and/or their number of sampling-days stayed roughly the same). Some countries that reported not carrying out concurrent sampling onshore mentioned cost increases as a main reason for not having adopted that sampling strategy. No statement was made regarding changes in the costs of concurrent sampling at sea where concurrent sampling is a widespread practice.

6.4 Changes in quality and quantity of data after implementation of concurrent sampling

6.4.1 Comments obtained from DCF data correspondents

No country reported a decrease in quality of data after the implementation of concurrent sampling. Countries that started sampling concurrently onshore reported no changes or an increase in the capability of institutes to supply data for ICES WGs, national and international management purposes and research projects, mainly resulting from an increase in the sampling of species not previously assessed, resources of national importance (G3 species) and/or low valued species, and an increase in taxonomic identification and quality of landings composition. Sampling at-sea has largely been concurrently and was sometimes reported as fundamental for management. Similar to sampling onshore, countries report improved availability through time of some types of data collected at-sea (e.g. PETS) that reflects in improved data supply for some purposes (e.g. WGBYC) but such improvements seem to reflect gradual changes in onboard sampling protocols rather than to reflect concurrent sampling itself since sampling at-sea has been carried out concurrently by the majority of countries much before the its requirement was established in the DCF. Most countries report no increase in the capability of supplying data for MSFD descriptors since these are currently most dependent on survey data.

6.4.2 Comments obtained from ICES Expert Groups

From the 27 ICES EGs that replied the questionnaire, 9 commented that they did not directly work with commercial catch data and so question did not apply to them, 10 groups noticed no difference in data availability or quality that could be related with the implementation of the revised DCF, 4 noticed some differences and 4 were unsure whether differences exist or not. Among the groups that reported no difference, two were under SCICOM and eight under ACOM. All groups that noticed some difference were under ACOM, with three groups reporting the difference to be an improvement (WGBFAS indicated to have more flatfish data; WGNSSK indicated to have more information on age and length of bycatch species albeit still insufficient; WGEF indicated to have more elasmobranch species sampled in Division IXa) and 1 group reporting the difference to be a reduction in quality and quantity (WGBIE indicated a drastic drop in anglerfish sampled that affected length distribution and the split of catches among species in anb-8c9a and anp-8c9a). The majority chairs of the groups that were unsure whether differences took place or not (HAWG, WGCRAN, WGIAB and WGBIOP) pointed out for increases in sampling coverage in recent years but were generally unsure they could be directly attributed to the DCF since other changes took place simultaneously with its implementation (e.g. improvements in collaboration among scientists, agreements to sample foreign vessels in national waters, improvements in InterCatch).

6.5 Changes in the data collected before and after the implementation of concurrent sampling

Analyses of the data submitted by DCF correspondents indicated that:

- In the countries that implemented concurrent sampling onshore the number of gears and number of divisions sampled onshore remained stable (Figure 3 and Figure 4). A slight decrease was noted in the total number of days*auctions sampled (Figure 5 and Figure 6). The total number of trips sampled onshore by Portugal (PT – IPMA), Spain (ES – IEO/ICES) and Ireland (IE) decreased but not those sampled by Estonia (EE; Figure 7). Member States that did not implement concurrent sampling onshore largely maintained the number of trips they sampled onshore (Figure 7). Similar situation happened in Latvia (LT) that reported having reduced number of species in the fisheries it sampled and always having been able to sample them all (Figure 7).
- The number of trips sampled at-sea remained relatively stable through time with mostly "random" variations, indicating this indicator did not suffered systematic changes with the implementation of concurrent sampling (Figure 8). However, the number of gears and divisions sampled at sea was generally lower (or equal) than the number of gears sampled onshore, with exception of Germany that only samples on board (Figure 9 and Figure 10).
- Onshore the number of species sampled for length increased significantly with the implementation of concurrent sampling, with countries with more diverse fisheries like Portugal (PT – IPMA) and Spain (ES) more than tripling the number of species sampled onshore (Figure 11). This effect is largely attributed to the implementation of concurrent sampling that provided reasonable sampled size for many species that previously were not in DCR objectives. Countries like Finland (FI) and Estonia (EE) did not register similar variation (Figure 11). The number of species sampled at sea is increased slightly through time but suffered no similar variations (Figure 12).
- The proportion of species sampled onshore which samples comprised less than 500 individuals and occurrence in less than 6 trips was comparatively larger at-sea than onshore (Figure 11 and Figure 12). Both at sea and onshore the percentage of lengths taken from species that ultimately were present in low sample size (this being considered having less than 500 individuals measured and occurrence in less than 6 trips in a year) was relatively reduced demonstrating efficiency in concurrent sampling (Figure 13 and Figure 14).

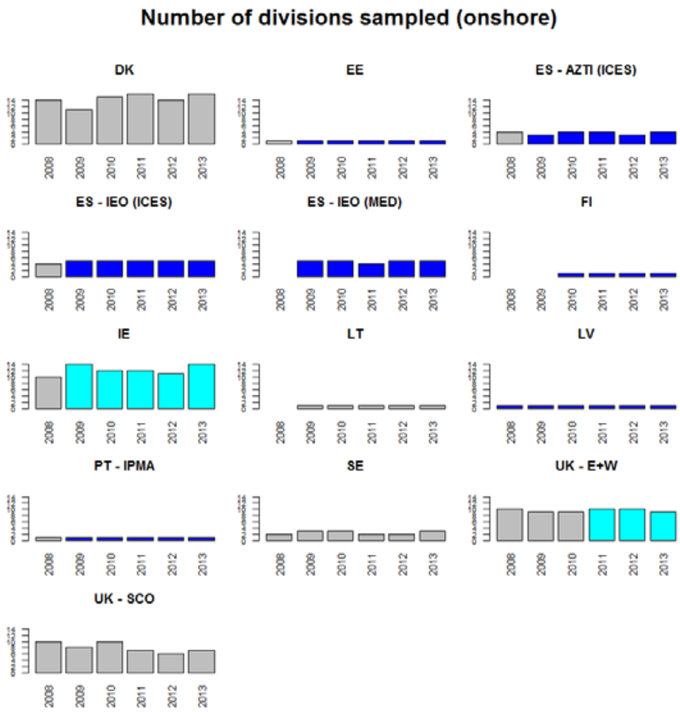

Figure 3. Number of ICES Divisions sampled onshore (2008–2013). Grey bars are years with non-concurrent sampling, cyan bars are years where partial implementation of concurrent sampling took place and blue bars are years where concurrent sampling was fully implemented. LV values encompass divisions IIIb-d.

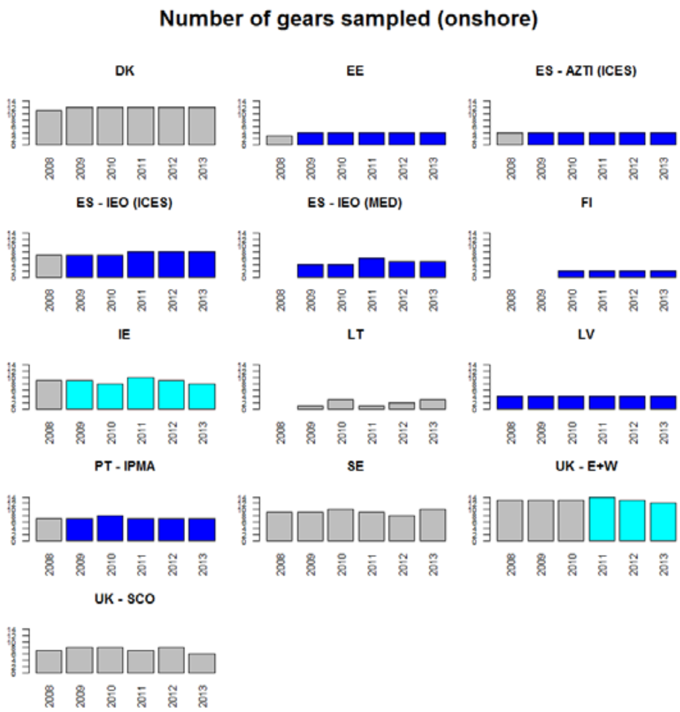

Figure 4. Number of gears sampled onshore (2008–2013). Grey bars are years with non-concurrent sampling, cyan bars are years where partial implementation of concurrent sampling took place and blue bars are years where concurrent sampling was fully implemented. Gears included in analysis: DRB, FPN, FPO, FYK, GND, GNS, GTR, LHM, LHP, LLD, LLS, OTB, OTM, OTT, PS, PTB, PTM, SB, SDN, STM, and TBB.

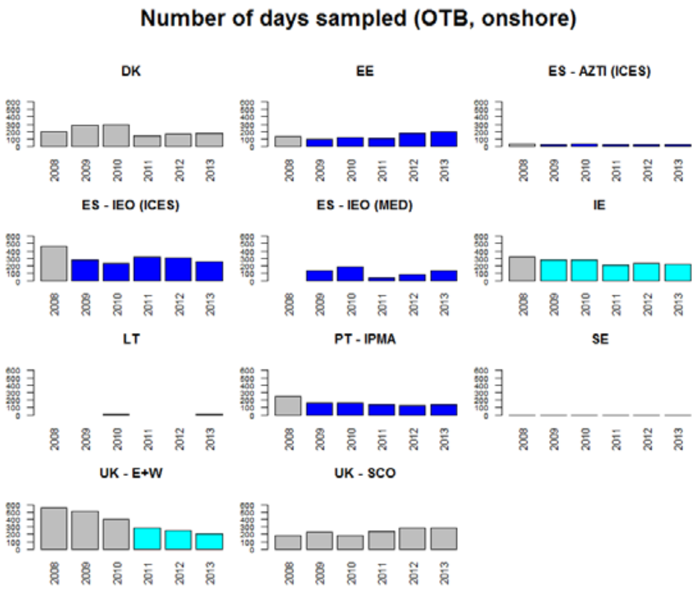

Figure 5. Number of days when the OTB gear was sampled onshore (2008–2013). Grey bars are years with non-concurrent sampling, cyan bars are years where partial implementation of concurrent sampling took place and blue bars are years where concurrent sampling was fully implemented.

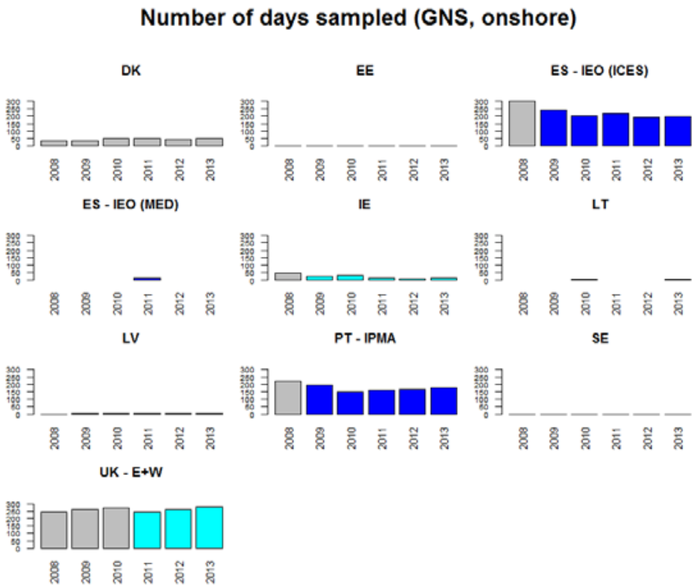

Figure 6. Number of days when the GNS gear was sampled onshore (2008–2013). Grey bars are years with non-concurrent sampling, cyan bars are years where partial implementation of concurrent sampling took place and blue bars are years where concurrent sampling was fully implemented.

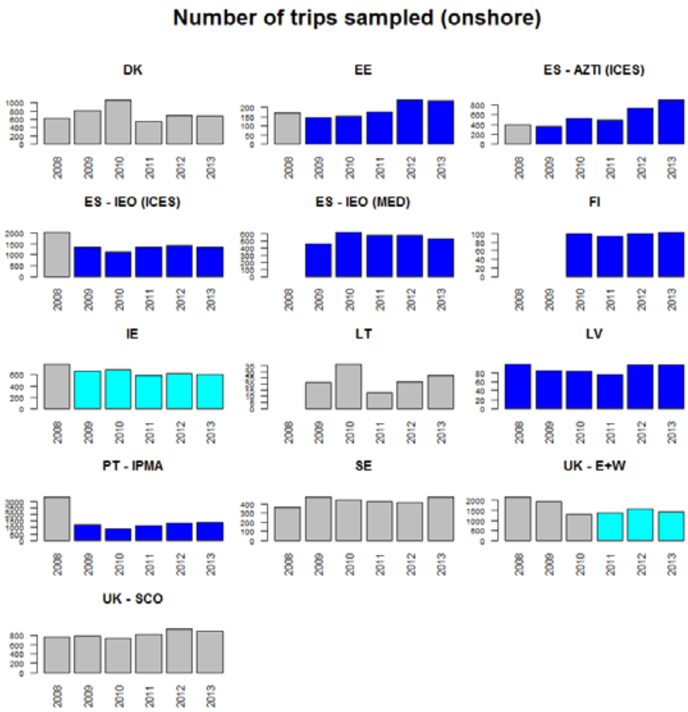

Figure 7. Number of trips sampled onshore (2008–2013). Grey bars are years with non-concurrent sampling, cyan bars are years where partial implementation of concurrent sampling took place and blue bars are years where concurrent sampling was fully implemented.

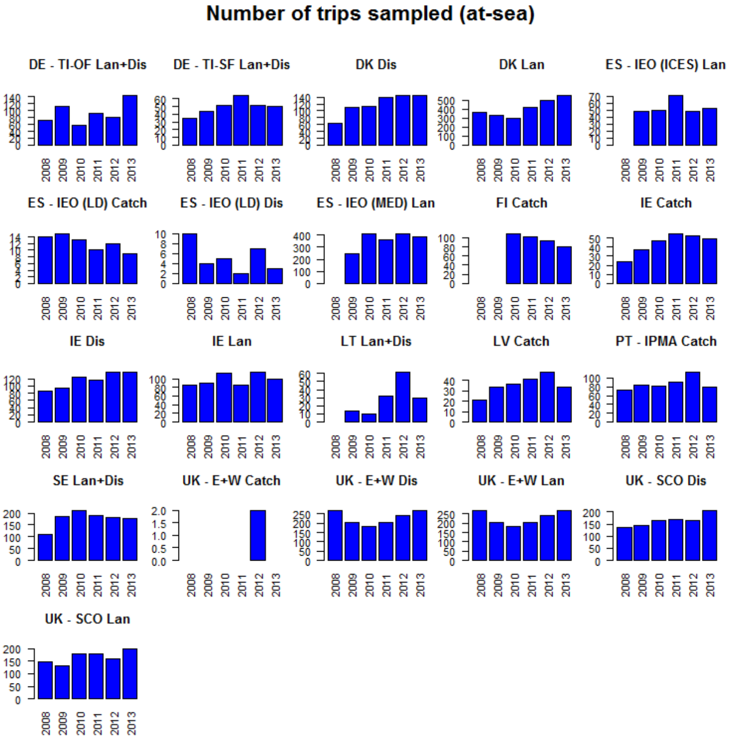

Figure 8. Number of trips sampled at-sea (2008–2013). Grey bars are years with non-concurrent sampling, cyan bars are years where partial implementation of concurrent sampling took place and blue bars are years where concurrent sampling was fully implemented (compare to correspondent figure for onshore sampling).

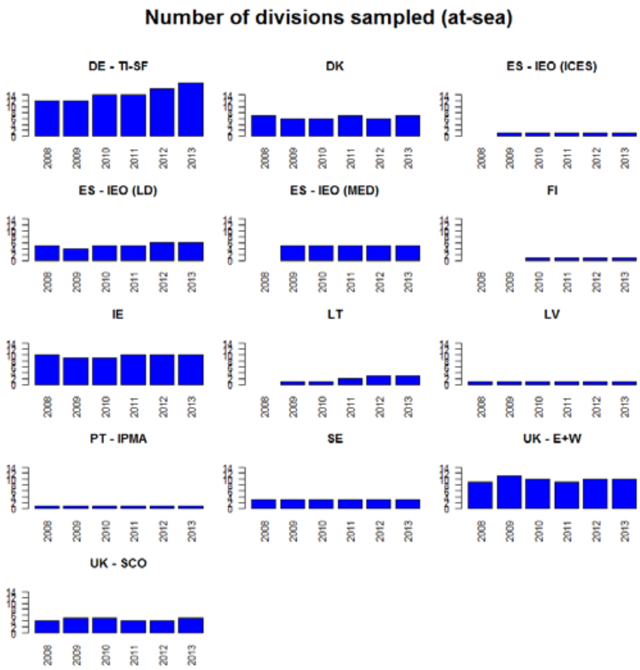

Figure 9. Number of ICES Divisions sampled at-sea (2008–2013). Grey bars are years with non-concurrent sampling, cyan bars are years where incomplete implementation of concurrent sampling took place and blue bars are years where concurrent sampling was fully implemented (compare to correspondent figure for onshore sampling). LV values encompass divisions IIIb-d.

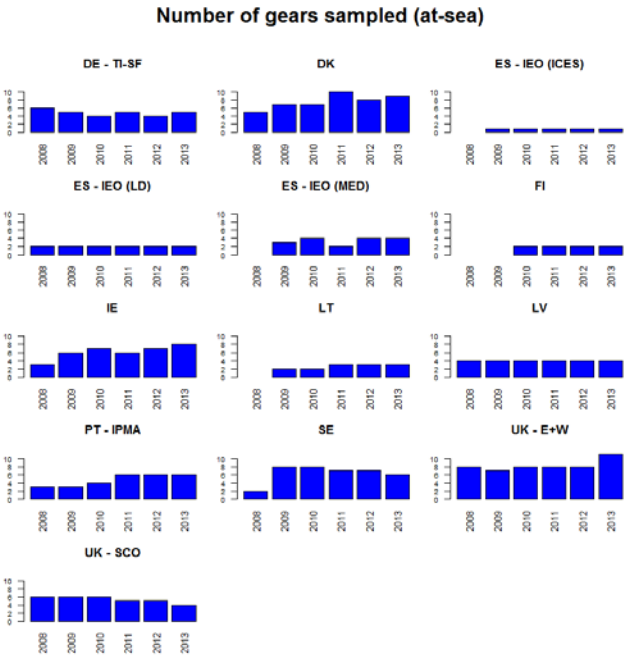

Figure 10. Number of gears sampled at-sea (2008–2013). Grey bars are years with non-concurrent sampling, cyan bars are years where partial implementation of concurrent sampling took place and blue bars are years where concurrent sampling was fully implemented (compare to correspondent figure for onshore sampling). Gears included in analysis: DRB, FPN, FPO, FYK, GND, GNS, GTR, LHM, LHP, LLD, LLS, OTB, OTM, OTT, PS, PTB, PTM, SB, SDN, STM, and TBB.

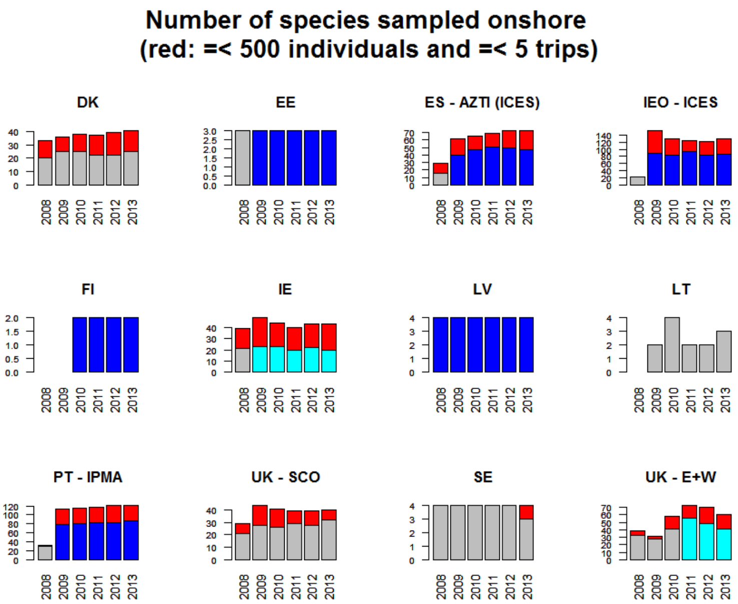

Figure 11. Number of species sampled onshore (2008–2013). Grey bars are years with non-concurrent sampling, cyan bars are years where partial implementation of concurrent sampling took place and blue bars are years where concurrent sampling was fully implemented. Red bars are superimposed in the previous patterns to indicate the proportion of rare species (here defined with an arbitrary criteria of less than 500 individuals measured and occurrence in less than 6 trips).

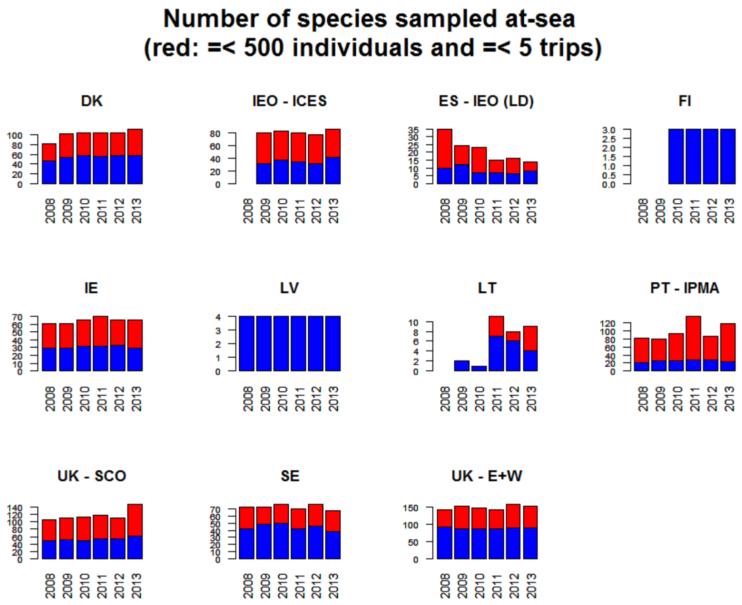

Figure 12. Number of species sampled at-sea (2008–2013). Blue bars are years where concurrent sampling was fully implemented. Red bars are superimposed in the previous pattern to indicate the proportion of rare species (here defined with an arbitrary criteria of less than 500 individuals measured and occurrence in less than 6 trips).

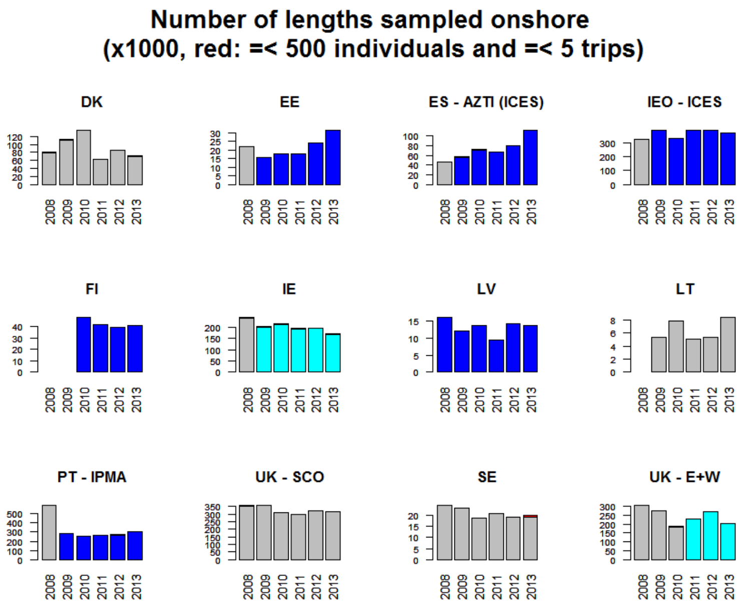

Figure 13. Number of individuals with lengths sampled onshore (2008–2013). Grey bars are years with non-concurrent sampling, cyan bars are years where partial implementation of concurrent sampling took place and blue bars are years where concurrent sampling was fully implemented. Red bars are superimposed in the previous patterns to indicate the proportion of rare species (here defined with an arbitrary criteria of less than 500 individuals measured and occurrence in less than 6 trips).

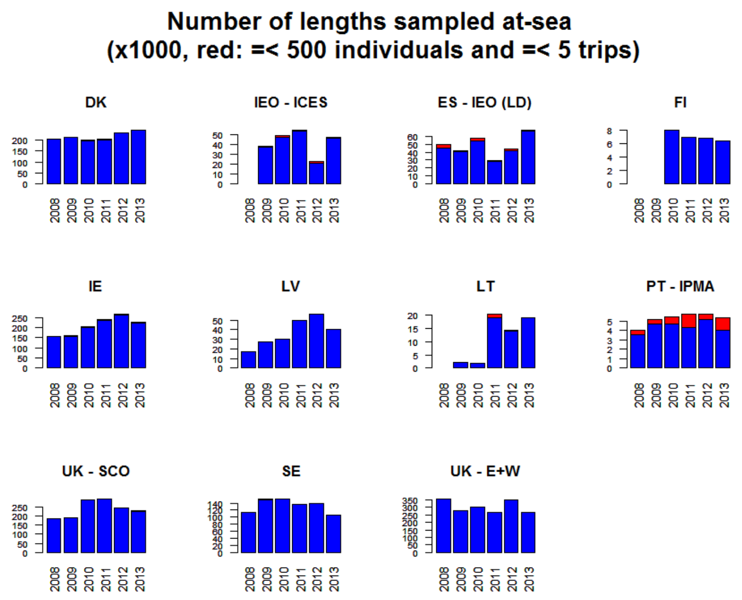

Figure 14. Number of individuals with lengths sampled at-sea (2008–2013). Blue bars are years where concurrent sampling was fully implemented. Red bars are superimposed in the previous pattern to indicate the proportion of rare species (here defined with an arbitrary criteria of less than 500 individuals measured and occurrence in less than 6 trips).

A summary table of the changes in numbers of lengths collected in MS that implemented concurrent sampling indicates significant increases in data providing for many main stocks with EU importance alongside improvements in the numbers of length frequencies already collected, few reductions taking place (Table 5 and 6).

Table 5. Overview in changes in lengths measured in selected species upon implementation of concurrent sampling. "New!" = species not previously collected; Decrease: behaviour of total length measurements after concurrent sampling has been implemented; High: >10000 lengths measured per year; Moderate: between 1000 and 10000 lengths measured per year; Low: <1000 measurements per year.

Species	EE	FI	IE	LV	PT - IPMA	ES - AZTI	ES - IEO (ICES)	UK - E+W
Chelidonichthys cuculus			(Stable, Low)		**New! (Moderate)**	**New! (Low)**	**New! (Low)**	(Stable, Low)
Clupea harengus	(Stable, High)	(Stable, High)	(Stable, High)	(Stable, Moderate)				(Increase, moderate)
Conger conger			**New! (Low)**		**New! (Moderate)**	(Stable, Low)	**New! (Moderate)**	(Stable, Low)
Dicentrarchus labrax					**New! (Moderate)**	**New! (Low)**	**New! (Low)**	(Decrease, Moderate)
Eutrigla gurnardus			**New! (Low)**		**New! (Low)**	**New! (Moderate)**	**New! (Moderate)**	(decrease, Low)
Gadus morhua			(Stable, Moderate)				**New! (Low)**	(Decrease, Moderate)
Glyptocephalus cynoglossus			(Decrease, Moderate)			**New! (Low)**	**New! (Moderate)**	**New! (Low)**
Lepidorhombus boscii			**New! (Low)**		(Decrease, Moderate)	(Stable, Low)	(Increase, High)	---
Lepidorhombus whiffiagonis			(Stable, Moderate)		(decrease, Low)	(Increase, moderate)	(Increase, High)	(Stable, Moderate)
Leucoraja naevus			(Stable, Low)			**New! (Low)**	**New! (Low)**	(decrease, Low)
Lophius budegassa			(Decrease, Moderate)		(Decrease, Moderate)	(Stable, Moderate)	(Stable, Moderate)	---

Species	EE	FI	IE	LV	PT - IPMA	ES - AZTI	ES - IEO (ICES)	UK - E+W
Lophius piscatorious			(Decrease, Moderate)		(decrease, Low)	(Decrease, Moderate)	(Stable, High)	**New! (Moderate)**
Melanogrammus aeglefinus			(Decrease, Moderate)			**New! (Low)**	**New! (Low)**	(Decrease, Moderate)
Merlangius merlangus			(Decrease, Moderate)		**New! (Low)**	(Stable, Low)	**New! (Low)**	(Decrease, Moderate)
Merluccius merluccius			(Decrease, Moderate)		(Decrease, High)	(Stable, Moderate)	(Stable, High)	(Stable, Moderate)
Micromesistius poutassou			(Stable, Moderate)		(Decrease, Moderate)	(Stable, Moderate)	(Stable, High)	---
Microstomus kitt			(Decrease, Moderate)					(Increase, High)
Molva molva			(increase, Low)			(increase, Low)	**New! (Moderate)**	(Increase, moderate)
Mullus surmuletus			**New! (Low)**		**New! (Moderate)**	(Increase, moderate)	**New! (Moderate)**	(Increase, moderate)
Nephrops norvegicus			(Stable, High)		(Stable, Moderate)		(Decrease, Moderate)	(Decrease, Moderate)
Phycis blennoides					**New! (Low)**	**New! (Low)**	(Increase, moderate)	**New! (Low)**
Pleuronectes platessa			(Decrease, Moderate)		**New! (Moderate)**		**New! (Low)**	(Decrease, Moderate)
Pollachius pollachius			(Stable, Low)		**New! (Low)**	**New! (Low)**	**New! (Low)**	(Increase, moderate)

Species	EE	FI	IE	LV	PT - IPMA	ES - AZTI	ES - IEO (ICES)	UK - E+W
Pollachius virens			(decrease, Low)				**New! (Low)**	(Stable, Low)
Psetta maxima			(increase, Low)		**New! (Low)**	**New! (Low)**	**New! (Low)**	(Increase, moderate)
Raja brachyura			(decrease, Low)		(increase, Low)		**New! (Low)**	(decrease, Low)
Raja clavata			(decrease, Low)			**New! (Low)**	**New! (Moderate)**	(decrease, Low)
Raja montagui			(decrease, Low)		(increase, Low)	**New! (Low)**	**New! (Low)**	(decrease, Low)
Scomber scombrus			(Stable, Moderate)		(Decrease, Moderate)	(Decrease, Moderate)	(Decrease, Moderate)	(Stable, Moderate)
Scophthalmus rhombus			(increase, Low)		**New! (Low)**	**New! (Low)**	**New! (Low)**	(Increase, Moderate)
Solea solea			(Decrease, Moderate)		(Stable, Moderate)	(increase, Low)	**New! (Moderate)**	(Stable, Moderate)
Sprattus sprattus	(Increase, High)	(Stable, High)	(Increase, moderate)	(Stable, Moderate)				**New! (Low)**
Trachurus trachurus			(Stable, Moderate)		(Decrease, Moderate)	(Stable, Moderate)	(Stable, High)	(decrease, Low)
Trisopterus luscus					(Decrease, High)	(Increase, moderate)	(Increase, High)	(Increase, High)
Zeus faber			(increase, Low)		**New! (Moderate)**	(Increase, moderate)	(Increase, moderate)	(Stable, Low)

Table 6. Summary of changes in the number of species sampled for lengths upon implementation of concurrent sampling (note: species and categories as in Table 5).

	EE	FI	IE	LV	PT – IPMA	ES – AZTI	ES – IEO (ICES)	UK – E+W
Started providing data on species	0	0	4	0	12	12	20	4
Improved numbers measured in species (within high and moderate)	1	0	14	0	9	8	7	14
Remained stable in numbers measured in species	1	2	10	2	2	7	5	8
Decreased numbers measured in species (to low levels)	0	0	4	0	2	0	0	5

7 Identify the statistical arguments for concurrent sampling to characterize the length composition of species in mixed-species landings rather than the use of independent (non-concurrent) sampling for this purpose. (ToR c)

Comparative analysis of the statistical arguments for concurrent sampling for length composition in mixed-species landings against non-concurrent sampling methods consider different scenarios that could make concurrent sampling specially recommended, for example, whether or not there is a simultaneous need of estimation of the species composition of the landings for example because species appear mixed under very generic commercial names (e.g. rays , monkfishes), or misassigned under commercial names that correspond to a different species. Additionally, the following discussion focuses mostly on the most prevalent sampling situations for concurrent sampling of lengths of commercial landings in European waters, i.e. concurrent sampling of landings for lengths onshore at trip-level, and leaving aside concurrent sampling of landings at-sea that generally targets landings as part of a whole catch characterization at haul-level3. We emphasize however that the latter shares many of the statistical comments made on the former.

It is clear that if length data on landings of all species at either the trip or haul level is required then full-species concurrent sampling must be carried out at that level. It is

[3] The introduction of landing obligation is likely to facilitate the sampling of the entire catch onshore at trip level but for the time being the obligation is restricted only to some European fleet and major target species.

only when length data is not required concurrently and/or at haul or trip level and for all species that other methods of selecting species to sample could potentially be used.

In what concerns concurrency itself, full-species concurrent sampling avoids the need of agreement of list of species and the risk of losing length information on new species that appear in the fishery during the year that would only be inserted in the lists a posteriori. However, when species composition can be considered stable over time and accurate and length data on all species in the haul or trip are not required, list-based concurrent sampling or non-concurrent sampling may be sufficient. It must however be noted the importance of selecting the type of sampling (be it full-species concurrent, list-concurrent, single species or any other) as part of the survey design before the trip and of always flagging sampling type and incomplete concurrent sampling events. An analysis of general (non-statistical) benefits and disadvantages of concurrent sampling is presented in Section 9 of this report, but this kind in-depth analysis has not been done for the rest of the methods.

Sampling of landings, particularly onshore, often takes place after scientific species have allocated to the commercial species names used in markets. Observers sample boxes from commercial names, measuring all fish within each box and recording the lengths and scientific species encountered. This means that commercial names comprise an additional stage of sampling that must be taken into account in the estimation process, and that in order to correctly record the sampling probability for a fish of a biological species, information about the commercial names must be recorded. This is the case regardless of the method of species selection (concurrent or non-concurrent) and is also especially important when sampling is carried out with the aim of obtaining data on scientific species proportions within each commercial name to improve the accuracy of estimates derived at fleet-level. Note also that under full-species concurrency if all the commercial species on a trip or haul are sampled then all the biological species on that trip or haul are sampled, and so concurrency applies regardless of whether commercial species or biological species are encountered by the sampler. Because of this, we do not distinguish between full-concurrency at scientific species level and commercial name level in the text below.

Situations when trip-level data is required

For many uses reported by ICES EGs (see Section 5) trip-level data on the full species composition is required. In such situations, full-species concurrent sampling provides a simple and effective sampling strategy that uses trip as sampling unit to access landings and is able to provide data on the landed bycatch from the different métiers, allowing e.g. the identification of fleet components, analyses of species-to-species interactions at landings level, etc. In some fleets and situations, like the small-scale fleets unsuitable for self-sampling or CCTV, concurrent sampling of landings onshore is the only proxy available for the length structure of total removals of mixed species, even if a biased one because of its constraining to the landed fraction.

Full-species concurrent sampling

Full species concurrent sampling of landings provides a simple, effective and statistically sound method for the unbiased estimation of the full species composition in weight and length of landings.

This is because under concurrent sampling, observers sample all species, recording the weights and lengths of all species encountered (and effectively recording zero landed weight and no lengths for all species not landed). This allows the unbiased estimation of both landed weight and length distribution by species. However, it should be noted that, whereas all species landed have a chance of being sampled, exactly which species are sampled depends on the species composition of units actually sampled. Consequently, as for all random sampling strategies, the final species composition will always be an estimated species composition that is subjected to variability. Only in the rare cases where a census of the landings is achieved can species composition be assumed 100% accurate and always under the assumption that observers do not perform identification errors.

Furthermore, it should also be noted that it under full-species concurrent sampling it is not possible to control the number of trips sampled for a particular species by simply controlling the number of trips sampled. This attribute allows for the unbiased estimation of species composition and so is not a disadvantage but it means that species landed frequently will be sampled more often than rarer species. This can be explained by considering a simple example where a fishery lands only 3 species on 1000 trips in a year. The first species is landed on every trip, the second on every other trip, and the third once in every five trips. If a sample of 100 trips is taken, the first species will be sampled 100 times, the second approximately 50 times, the third approximately 20 times. Because of the differences in frequencies of occurrence, it is unlikely that sample size for all three species can be optimized simultaneously.

Because full species concurrent sampling of landings enables estimation of the full species composition in weight and length of landings, it is particularly useful when species composition cannot be assumed. However when species composition can be assumed with high degree of confidence, i.e. if there are no supra-specific commercial names and biological species match well the commercial names used, it is not necessary to sample all commercial names to make sure specific species are appropriately sampled. In such cases, concurrent sampling becomes inefficient unless data on the lengths of all species in the trip's landings are required. If that is not the case, alternative sampling protocols could be employed (see below).

List-based concurrent sampling of landings

This is when all species in a prespecified list of species are sampled concurrently. This method was recommended by SGRN 06-03 (STECF, 2007) as a sensible method to proceed and is carried out by several countries both at-sea and onshore. It allows for faster processing of a sample and aims to ensure that complete sampling for lengths is achieved more often but does not provide for all the uses of full species concurrency. From the point of view of the characterization of mix-species landings, when the lists of species are long, such as the currently defined G1 and G2 species lists, the list-concurrency becomes nearly as impractical as full-concurrency while not providing its major benefits in cases when full-concurrency can be successfully achieved. Furthermore, if species composition cannot be assumed then only in very specific cases (e.g. when all species found within the boxes of mixed-species landings are in the lists of species to be sampled) will list-based concurrency allow for the unbiased estimation of species composition of mixed-species landings. This issue can however be resolved by establishing list-based concurrency at the level of commercial names and then sampling of all scientific species within. As in full-concurrent sampling, under list-based concurrent sampling it is also not possible to control the number of trips sampled for a particular species by simply controlling the number of trips sampled.

Situations when trip-level data is not required

Stock assessment is currently among the main uses of length data from landings sampled under the DCF. The vast majority of stock assessment models currently used do not require trip-level data as an input but rather use data aggregated at larger spatial and temporal levels (division, port, region, country; month, quarter, year). In such situations, collection of mixed-species data at-trip level is not strictly necessary and concurrent sampling of landings at trip-level may be an inefficient method of collecting length data.

Non-concurrent species-focused sampling of landings

This method was a general practice in onshore sampling of landings at the trip-level from EU waters before the DCF. To be appropriately carried out, it requires a sampling plan for each species, which can be very complex for large numbers of species such as the ones currently required. When combined with pre-established objectives such as number of fish from a particular stock to be sampled for length in a year it has been shown to lead to quota sampling (e.g. WKPICS (ICES, 2012)). Furthermore, it cannot be used to estimate species composition in weight and length of the landings unless the number of trips on which each species was landed is known. This method was not considered a good option by WKISCON2.

Simple random sampling of all landed species

Here the (commercial) species to be sampled are selected randomly from the list of commercial species landed. Full species length composition of landings at the trip or haul level will not be determinable, and this limits some of the usages compared to those obtained by concurrent sampling, namely those that require characterization at trip or haul-level. However, this method has the advantage of reducing the workload of observers and thus increasing the probability of completing the sample and allowing for more trips to be sampled and concomitant gains in effective sample size. As such it will reduce biases associated to the incomplete sampling events under concurrent sampling and may provide improved estimates when trip or haul-level data is not necessary.

Simple random sampling of the species on a trip ensures that all species on the trip have a chance of being sampled. However less common species are sampled less frequently than would be the case with full species concurrent sampling of the same number of trips because even when a species is encountered on a trip it might not be sampled. For this method, the number of trips on which species were landed is required for correct estimation of species composition and length distribution.

This method is grounded in well-established statistical literature but has not been fully developed and tested in the field in EU waters.

Simple random sampling of a list of species of landings

Here the (commercial) species to be sampled are selected randomly from a list of commercial species such as all species expected to be landed that year. Theoretically, it will have the same benefits and issues as simple random sampling (e.g. less time per trip, more trips sampled per auction day; low sample size of rare species) except that zero landed weights are effectively recorded when a species in the list is not present in the landings of the sampled trip (or haul), allowing for the correct estimation of species weight and length composition of the landings, as for concurrent sampling. Species which emerge in the landings cannot be sampled until they are added to the list the following year but these new species are unlikely to cause significant issues for data provision and will rapidly become incorporated in next year's sampling if they become sustained bycatch of specific fisheries.

This method makes sense from a theoretical point of view but has not been fully developed and tested in the field being only briefly analysed in WKISCON2. Similar to simple random sampling of species at trip level, it will not provide for information on all species landed in the trip but as mentioned previously those data are not required/used by many end-users.

Stratified sampling of all (or a list of) landed species

Here the (commercial) species to be sampled are selected randomly from strata that encompass all (or a list of) commercial species. This method has not been fully developed but an ad-hoc method of stratification is currently carried out for onshore sampling of landings in Scotland. Again it has all the benefits and issues of random sampling, with the exception that the probability of sampling rare species can be controlled by stratifying species into, say, very common, common and rare species and varying the sample sizes of these strata. If all species on the trip (or haul) have a chance of being sampled, then the issue of emerging species can be addressed by the "rare species" stratum being defined as any species not listed in the other strata. Alternatively, species could be selected from a list of species expected to be landed that year, with zeros being recorded to allow for estimation of species composition, and emerging species would be sampled the next year.

Complementary concurrent and non-concurrent sampling schemes

At WKISCON2 preliminary results obtained by IPMA during the "Workshop on Sampling Design and Optimization (WKSDO)" (Azevedo *et al.*, 2014) were presented. These include a sampling design for onshore sampling that complements concurrent sampling with species focus sampling directed at commercial grades/names that are a priori expected to contain mixed species. The overall aim was to evaluate the feasibility of accommodating both regular full-species concurrent sampling onshore and sampling directed at trips that landed monkfish (ANF) or skates and rays (SKA), increasing the capability of discriminating species involved in supra-specific groups when these are rare relative to the target species being landed. The main conclusions of this study with respect to WKISCON2 were that a) extra sampling effort directed to the studied groups of species (ANF and SKA) can be made compatible with present concurrent sampling to improve the precision of species composition and length composition, and b) the estimation procedure adopted to estimate the variables at trip level needs to take into consideration the sampling strategy adopted in those two sampling procedures: simple random sampling of all trips (concurrent sampling) and simple random sampling of trips registering a specific species.

This method has not been fully developed and tested in the field. Theoretically it appears to provide a possible solution to the need to increase sample size of rare groups when their species composition must be determined while maintaining some of the advantages of concurrent sampling (namely a baseline number of concurrent samples which species and length composition are fully characterized). The combination of the estimates obtained from concurrent sampling and species-focused sampling carried out simultaneously within each market day is however complex and if not properly dealt with may yield biased results. WGCATCH 2014 (ICES, 2015) advised against such complex sampling designs unless overseen by experienced survey statisticians.

Other statistical considerations

Sampling designs implemented both at-sea and onshore must obey statistically sound sampling principles. This is valid both for species focused sampling, for multispecies sampling, for full-species concurrent sampling or any other sampling strategy. In all cases, proper randomization of trip selection is required. Selection of trips and species should not be subjectively determined by the sampler as this could result in biased data, as discussed in WGCATCH 2014 (ICES, 2015). For example, the decision to sample should not be subjectively based on predefined targets on the number or weight of individuals of a species nor on the number of species landed on that trip.

Several MS noted that the time-window to sample the catch or landings can be limited in various ways, both at-sea and onshore, and these are currently addressed with different solutions on a national basis. Furthermore, WGs are increasingly advising (WKPRECISE (ICES, 2009), PGCCDBS (ICES, 2011a) and WGCATCH 2014 (ICES, 2015)) that ages are sampled directly from the landings and discards. If that is the case, it is likely that sampling concurrently for lengths would have to be performed concurrently with age sampling, further increasing time limitations and the number of trips sampled incompletely where and when age samples cannot simply be bought and processed in the lab a posteriori.

In any such case, the result is that the catch/landings/discards are sometimes not concurrently sampled despite the intentions of the observers. When so, this should always be recorded so that the data are not used under the assumption that they were collected concurrently. The national and international databases must therefore be able to identify whether or not a sampled was collected concurrently, regardless of the sampling intentions, because it causes potential biases in both the species and length compositions if a certain type of trip or haul is consistently not successfully sampled concurrently. Similarly, databases should distinguish between what was a fully implemented concurrent sampling design (even if with some incomplete samples) and results from stock-based sampling designs that just happen to yield concurrent trips because species diversity was sometimes low. In other words, the databases require a field to indicate method of species selection, and a field to indicate complete or incomplete concurrency.

SGRN 2006-03 implicitly stated that the collection of biological data such as growth, sexual maturity and fecundity could be carried out independently from the concurrent length data when there was no evidence of fishery-dependence of these variables. However the statistical implications of this have since been considered at ICES WGs (WKPRECISE, WGCATCH, 2014), with advice (WGCATCH, 2014) and the recommendation (RCM NS&EA, 2011) that the focus for age-based assessments should be on ages not lengths. WKISCON2 focused solely on the concurrent sampling of lengths and did not consider how this might affect the collection of age data for age-based assessments.

There is always a trade-off between sampling all species on a trip and sampling more trips for a particular species, between sampling more species for lengths or obtaining more age samples. These trade-offs emphasize the need to set clear goals to the regional sampling plans: it is difficult to adequately meet all end-user requirements with a single catch sampling programme.

Summary

Full species concurrent sampling of landings onshore is a simple, effective and statistically sound method for sampling fisheries landings and allows for the unbiased estimation of species composition (by length and weight) of the landings WKISCON2 endorses the use of concurrent sampling of landings onshore where it is considered practicable, particularly where reported species weights of the landings are not considered accurate.

However, there are sometimes practical issues with concurrent sampling that can potentially lead to biased estimates and there is the potential for oversampling of common species or undersampling of rarer species. Alternative statistically sound methods of non-concurrently sampling mixed-species landings, for example, those involving randomly selecting species to sample, could theoretically be applied which would avoid these issues. However these alternative methods each have their own disadvantages (such as not providing full-species trip-level data, sampling from lists, or requiring further information about the landings) and most of them are still in development and will need to be evaluated further before being applied.

8 Benefits and disadvantages of carrying out concurrent length sampling onshore and at-sea (ToR d)

ToR d) of the present workshop aimed to *"Identify any benefits concurrent sampling can provide considering the new and broader scopes of the revised DCF, such as the evaluation of impacts of fisheries on marine biological resources and on the ecosystem, and if these benefits can be achieved more cost-effectively from non-concurrent sampling of all species of interest"*. To answer this ToR, the WKISCON2 participants carried out summary analyses of the replies to questionnaires sent out by DCF National Correspondents and by the chairs of ICES Expert Groups. These analyses were supplemented with discussions among the participants carried out throughout the week in several plenary sessions (see Section 9).

8.1 Benefits and disadvantages identified by DCF National Correspondents

To investigate the benefits currently brought about by the implementation of concurrent sampling for length of commercial catches the following questions were asked to DCF National Correspondents: *"3. Please specify the main benefits obtained from the implementation of concurrent sampling at your institute (e.g. data that could not be previously obtained)"* and *"10. Can you identify future benefits that can be obtained from concurrent sampling under the new and broader scopes of the revised DCF, such as the evaluation of impacts of fisheries on marine biological resources and on the ecosystem? Can these benefits be achieved more cost-effectively from non-concurrent sampling of all species of interest?"*. WKISCON2 participants have found the answers to vary according to the degree of implementation of concurrent sampling onshore and at-sea, ranging from reporting no benefits to the reporting a full lists of benefits.

A summary of the main present benefits obtained from concurrent sampling onshore and/or at-sea follows:

- Five countries reported the sampling of more species (CY, ES, DE, PT, UK) at each sampling event as a benefit. This increase is a consequence of the increased sampling of the whole catch, including non-TAC stocks, data-poor stocks, bycatch and less commercial species that frequently were not being sampled before concurrent sampling was introduced;

- Three countries (ES, DK, PT) reported an increased ability of researching on species and gears interactions and/or biodiversity and community indices after concurrent sampling was implemented onshore and/or at-sea;
- Two countries (ES, PT) reported an increased ability of documenting the exact species composition behind the commercial names reported in landings. This benefit is a consequence of concurrent sampling demanding the sampling of all commercial categories present in landing thus allowing the estimation of proportions of species landed together and the detection of misclassified species within some categories.
- Two countries refer optimization and cost-effectiveness as a benefit obtained from concurrent sampling. This optimization is a consequence of more sampling effort being exerted in each sample, sampling event, and sampling day without increased costs because under concurrent sampling observers now sample the whole catch when they are at-sea (DE) and more species and lengths per trip when they are onshore (CY).

  One country (DE) reports concurrent sampling to have improved its information on catches of trips that land in foreign ports;
- One country (FI) refers concurrent sampling saves time and expenses in travelling to remote sites;
- Three countries did not report any present benefits from the implementation of concurrent sampling (SE, IE, EE).

A summary of the main future benefits from concurrent sampling onshore and/or at-sea identified by DCF National Correspondents follows:

- Four countries (CY, ES, FI, PT) listed ecosystem modelling and evaluation of the impact of fisheries as being a key benefit and 5 countries (DK, ES, IE, UK, PT) listed the increase in the number of species sampled as a benefit which would include new species, invasive, introduced species and PETS species. There was no indication as to whether this was dependent on concurrent sampling at-sea (sampling the catch) or concurrent sampling onshore (sampling the landings) but that is likely to depend on the species.
- Two countries (ES, LT) highlighted the benefit of concurrent sampling at-sea for monitoring and evaluating the discard ban. 1 country (NL) that currently does not find need to carry out concurrent sampling onshore noted that future concurrent sampling of discards, former discards (now landed ashore) and actual landings will be necessary to arrive to good catch estimates.
- Three countries (CY, FI, PT) indicated concurrent sampling to be more cost-effective and one country that it would only be so when carried out at-sea (SE). One country (EE) considered non-concurrent sampling to be more cost-effective than concurrent sampling in evaluation of impacts of fisheries on marine biological resources and on the ecosystem.
- One country (ES) indicated that it was an efficient way of sampling their small-scale or mixed fisheries providing estimated landed weights by species for fisheries where individual species are not identified in reported landings.
- Additional future benefits referred by some of the countries included: improved characterization of mixed fisheries (CY, UK), increased ability to

supply consistent data and historical time-series for future uses not yet-foreseen (ES, PT), improved characterization of non-organic materials such as litter (DK), increased ability to collect stomach samples for feeding studies and genetic samples to support population studies (ES), increased ability to assess climate change and support fisheries certification (PT).

- One country (IE) emphasized that concurrent sampling was not strictly necessary for stock assessment and that separate monitoring programmes could be established that encompass of birds, marine mammals, PETS (Protected, endangered and threatened species), and indicator species for Vulnerable Marine Habitats (that include benthic invertebrates) with the advantage of circumventing difficulties in providing widely multi-purpose scientific training to at-sea observers. One country (DE) indicated concurrent sampling to be "the first choice to obtain information on commercial catches for all purposes" but it is noted that this country only carries out concurrent sampling at-sea.

To investigate the disadvantages brought about by the implementation of concurrent sampling for length of commercial catches the following questions were asked to DCF National Correspondents: "*11. Can you identify disadvantages of carrying out concurrent sampling in commercial catches? If yes, please specify those disadvantages and how sampling non-concurrently might improve the situation.*" A summary of the main answers follows:

- All countries reported some kind of disadvantage associated to carrying out concurrent sampling in commercial catches, except CY and FI that reported no disadvantage.
- The main disadvantages highlighted by the countries were the increased time, workload and costs associated to the sampling of more species. Some countries (ES, DE) indicated solutions to circumvent such disadvantages. In general the disadvantages appear to be more related to concurrent sampling onshore than to concurrent sampling at-sea and to fisheries that are more species diverse than to less diverse ones.
- Several countries questioned the cost efficiency of collecting concurrent data when much of it is not being used nor requested at the present moment indicating better quality for less money could be achieved by targeting only the species of interest (NL, SE, UK).
- Other issues raised included: small sample sizes for some species/stocks (ES) and increased industry saturation (as a consequence of more species being sampled; PT) and biases in data (if only smaller landings or hauls are completely sampled this could result in biased data; UK).

The text table below summarizes the responses and the figure in the bracket is the frequency of that response (Table 7).

Table 7. Benefits and disadvantages of concurrently sampling for lengths identified by DCF National Correspondents.

CURRENT BENEFITS (a)	FUTURE BENEFITS (a)	DISADVANTAGES (a)
No benefits (3)	No benefits (1)	No disadvantage (2)
More species sampled. (5)	Ecosystem modelling and assessments and evaluation of the impacts of fisheries. (4)	With disadvantages (10)
Increased research on species/gear interactions and/or biodiversity and community indices. (3)	Way of sampling more species which include invasive species, PETS and new species (5)	Time/workload/resources. (10)
Improved documentation of the exact species composition of landings. (2)	Discard ban or landing obligation monitoring and evaluation. (3)	The data are not currently used in this form. (3)
Optimization and cost-effectiveness of sampling programmes. (2)	Improved characterization of mixed fisheries. (2)	Small sample size in some species/stocks (1)
Improved information on landings on catches of trips that land in foreign ports. (1)	Improved data and historical time-series for uses not yet-foreseen. (2)	Biases in data (1)
Lower time and expenses in travelling to remote sites. (1)	Other (3)	Not doing any concurrent sampling. (1)
Not doing any concurrent sampling. (1)	Not doing any concurrent sampling. (1)	

(a) Some additional benefits and disadvantages were reported as current uses of the data (see Section 5.1) and practical difficulties in implementation of concurrent sampling (see Section 6.2)

8.2 Benefits and disadvantages identified by ICES Expert Groups

To investigate the benefits brought about by the implementation of concurrent sampling for length of commercial catches the following question was asked to the chairs of ICES Expert Groups: *"4. Can you identify benefits that can be obtained in the context of your WG/WK from the use of concurrent data, such as the evaluation of impacts of fisheries on marine biological resources and on the ecosystem? If yes, please specify if those benefits require the sampling of all species in a trip or if a predefined list of species would be enough."* A summary of the main answers is given below and displayed in Table 8:

- The large majority of the EGs points out benefits of concurrent sampling but recognize that the data obtained is not necessarily being used.
- The main benefits include getting data on bycatch species (WGBAST, WGCRAN, WGEEL, WGINOR, WGNAS, WGNSSK, WGBYC, WGEF, and NWWG) and discard composition (SGPIDS, WGBAST, WGCRAN, WGINOR, and WGHANSA) and/or catch composition (HAWG and WGBAST) alongside the possibility to evaluate ecosystem impacts (i.e. changes by analysis of species composition over time, new warm-water species in the system; HAWG, PGDATA, WGFBAS, WGBIE, WGNARS, and WGBIOP).
- Availability of data on Protected, Endangered, Threatened and Sensitive species (PETS) was referred as a benefit by several EGs (HAWG, PGDATA, and WGBYC). PETS by definition are not commercial species and so are likely to only be sampled on-board. WGBYC, although primarily concerned

with PETS stated that concurrent data is crucial to their work and for the rarer species are advocating all hauls need to be sampled.

- Increased availability of data on mixed-fisheries was reported as a benefit by three EGs (PGDATA, WGBIE, and WGNARS).
- Other benefits specified by EGs include: more information available on species with no assessment and TAC and quota (WGCEPH) and on correlations of catchabilities within fisheries (WGNEW), and increased availability of information for spatial/temporal mapping of fisheries and fish (WGINOSE) and scientific validation of commercial data (WGCRAN). WGSAM pointed out the ability to develop and operationalize models for use in providing advice on and evaluation of management options consistent with an ecosystem approach. Three EGs expect benefits but did not specify which they will be (WGECOMEDA, WGRECORDS, and WGIAB).
- Most EGs emphasize benefits related to increases in information on total catch composition including bycatch species and its relevance for current and future assessments and evaluation of ecosystem impact of fisheries activities. EGs related to data provision emphasize that collecting full species composition for at-sea sampling of discards is the only way to document the discard composition (SGPIDS) and underscore the usefulness of concurrent sampling of landings for evaluating the size-selectivity of impacts on co-occurring species by individual métiers for evaluating the size- (gear, mesh, etc.; PGDATA) albeit considering that the DCF does not clearly specify such objectives and emphasizing the need to consider how the cost–benefit of concurrent sampling could or should be evaluated. One group identified no benefits (WGCATCH).

To investigate the disadvantages brought about by the implementation of concurrent sampling for length of commercial catches the following question was asked to the chairs of ICES Expert Groups: *"5. Can you identify disadvantages to your WG/WK from carrying out concurrent sampling in commercial catches? If yes, please specify those disadvantages and how sampling non-concurrently might improve the situation."* A summary of the main answers is given below and displayed in Table 8:

- The chairs of most EGs (16) reported no disadvantages from carrying out concurrent sampling (NIPAG, SGPIDS, WGBAST, WGCEPH, WGCRAN, WGEEL, WGHANSA, WGINOR, WGINOSE, WGNARS, WGRECORDS, WGIAB, WGNEW, WGBYC, NWWG, and WGSAM).
- Among the chairs of EGs that reported disadvantages (8), the risk that sampling effort reduction on some species has effects on precision was emphasized by chairs of 7 EGs (HAWG, WGBFAS, WGBIE, WGBIOP, WGEF, PGDATA, and WGCATCH). The chairs of five EGs pointed out additional workload and time consumption during sampling (HAWG, WGCATCH, PGDATA, WGBIOP, and WGFBAS). The chairs of HAWG further expressed concerns over a rise in refusal rates and changes in the behaviour of fishers owing to reputation damage of fishing companies when reporting on bycatch / PETS become available.
- The chairs of five EGs did not reply or indicated the question not to be applicable to their EG (AFWG, WGCOMEDA, WGHIST, WGNAS, and WGRFS).

Table 8. Benefits and disadvantages identified by ICES Expert Groups.

FUTURE BENEFITS (a)	DISADVANTAGES
Information on bycatch species (9), Discard composition and/or estimation (5) and general catch composition (2)	No disadvantages (16)
Assessment of ecosystem status (6)	Has disadvantages (8)
Data on mixed-fisheries (3)	Decrease in sampling levels and potential loss of quality and precision for key stocks (7)
Other benefits (specified; 5)	Additional costs and time (5)
Other benefits (unspecified; 3)	Rise in refusal rates (1)
Not applicable (3)	Not applicable (5)
No benefits identified (1)	

(a) Some additional benefits were reported as current uses of the data (see Section 5.2)

9 General implications of not carrying out concurrent sampling onshore and/or at-sea, in relation to costs and provision of fishery management advice (ToR e)

ToR e) of WKISCON2 aimed to "*Evaluate the implications of not carrying out existing concurrent sampling at-sea and/or on shore, in relation to costs and provision of fishery management advice*". To answer this ToR, the WKSCON2 participants relied on the results of analyses of questionnaires (to DCF data Correspondents and to chairs of ICES Expert Groups) carried out under the remaining ToRs (a-d; Sections 5 to 8) that were thoroughly discussed in several plenary sessions that took place throughout the week.

9.1 General analyses and remarks from plenary

9.1.1 Remarks about WKISCON2 methodology and concurrent sampling implementation

From WKISCON2 discussions it became clear that:

- Despite the presentation sent to respondents, the exact concept of concurrent sampling might not have been equally understood for the ICES EG chairs. This happened because the questionnaires sent did not made a clear distinction between the uses and benefits from data sampled concurrently at-sea and onshore, concurrent sampling of landings and discards, and full-species concurrent sampling and list-based concurrent sampling (e.g. of G1 and G2 groups). As a consequence, some usages, benefits and advantages/disadvantages reported for concurrent sampling in general may only reflect some particular circumstances of its implementations (e.g. without landing obligation, full-species discard estimation is not a usage nor a benefit obtained from concurrent sampling onshore).
- Despite questionnaires specifically addressing concurrent sampling and questionnaires emphasizing the need to answer on its results independently of other regulatory changes, not always were National Correspondents for DCF and chairs of ICES EGs able to distinguish between the benefits and uses of concurrent sampling and those obtained by other changes to sampling designs (e.g. métier-based sampling).
- The usages, benefits and advantages/disadvantages obtained from concurrent sampling (Table 7) provide a comprehensive view on these topics but interpretations on the absolute number of times they are referred to or even their absence from the answers of specific DCF National Correspondents questionnaires or ICES EGs questionnaires must be interpreted cautiously due to the open-ended characteristics of the questions posed. This is that somewhat different results would be obtained if National Correspondents and EG chairs were confronted with a finite list of answers. The latter option was however avoided on basis of the risk it creates of biasing the results towards the specific usages, benefits and advantages/disadvantages that would be suggested.
- Some of the uses and benefits reported for concurrent-sampling approach come from the fact that more species are now being sampled compared to the DCR situation when only a selection of species was being sampled and not from concurrent sampling itself. Many end-users have scarce

knowledge of sample collection practices and may not have fully understood the difference between the two types of sampling approaches.

- It became clear from WKISCON2 discussions that few present current uses take advantage of the information about a species composition and length composition of all species sampled concurrently on a haul/trip, be it onshore or at-sea.
- The results of the implementation of concurrent sampling onshore cannot be fully appreciated at European level because the degree of implementation has varied.
- Some MS – Namely, those, which were, implemented the concurrent approach on shore— saw improvements in their data after introduction of concurrent sampling onshore in 2009, while others - namely those that did not implement concurrent sampling on shore - responded that it does not influence their capability to supply data.
- The fact that the degree of implementation of concurrent sampling onshore was not full across MS and took place differently depending in the MS (PT and ES implemented it in 2009, IE and UK partially and more gradually) and that concurrent sampling at-sea has been an established practice since before DCF-implementation concurrent sampling onshore were implemented differently and may have causes some EG chairs not to be able to fully appreciate the advantages/disadvantages of its implementation as these are masked (for the better or for the worse) by data that originates from non-concurrent sampling.

9.1.2 Benefits of concurrent sampling

- The vast majority of countries identified present and future benefits in concurrent sampling. The benefits were mostly related with more species from the whole catch being sampled for length and the possibilities having this kind of data available opens: analysis of species/gear interactions, integrated ecosystem analyses, improved monitoring and management of discards, improved characterization of mixed-fisheries, improved data on rarer species, data-poor stocks and PETS, improved biodiversity analyses and wider array of research opportunities.
- It is clear that by incorporating concurrent sampling into the objectives of data collection, the DCF provided for an increase in data collection of many species that are important resources at national and local level even is small bycatch and rarer species at regional level. Under the DCF, EU countries are therefore collecting an array of information that transcends that of typical end-users (ICES EGs, EU Commission, etc.) extending into an array of national and local end-users that is extensive and hard to quantify.
- The major consensual benefit takes place when sampling length concurrently at-sea. In nearly all countries at sea programmes provides some sort of concurrent data and countries are increasingly relying on them to obtain data on discards (for discard management plans) and catch (for stock assessment purposes). Some countries specifically reported in their answer to questionnaires their dependence on this type of concurrent data and alluded to its high quality and multi-purpose objectives it achieves. Concurrent sampling for lengths at sea allows, among other, a) the quantification of both retained and discarded parts of all species in the catch, including target species, bycatch species, PETS, and rarer and more-data-poor species and data-

poor stocks of both managed (TAC, quotas) and non-managed resources, b) geo-located analyses of interaction between species, between gears and between species and gears, c) a better understanding of discard and general fishing practices (see also SGPIDS reports for additional advantages of sampling at sea). Data collected concurrently at-sea is already being used by ICES EGs and other local, national, and regional end-users.

- In some countries, the perception is that an onshore concurrent programme can supplement at sea data for any Ecosystem modelling and analysis of inter species effects. It is clear to see how the at-sea data might be used to evaluate ecosystem impacts and used in discard management plan but whether the onshore data alone would provide sufficient data for that is not clear. In areas where many discards take place, it certainly does not but it may approximate reality when in species and areas where discards are reduced with the benefit of lower costs (at expense of haul-by-haul resolution). It may however become increasingly accurate as discard ban is implemented and a more significant part of the catch is brought onshore. Furthermore in many places it is not feasible to do any at sea sampling for some fisheries (e.g. small-scale) so the onshore concurrent data provides the best available data for catch and other methods might be needed to infer discard or collect discard data. However, some countries cannot carry out concurrent sampling onshore because it is made impossible by established landing practices, the large size of the landings from individual trips and/or time, workload, transportation costs associated to this type of sampling.
- Clarifying the species composition and validating reported landings is of considerable benefit in Spain and Portugal particularly in relation to their fisheries, namely those more artisanal and small-scale. Among the examples given are those of monkfish, rays and gurnards where national institutes use concurrent data to split national statistics (frequently aggregated), significantly improving the accuracy of stock assessment of some ICES groups (e.g. WGBIE, WGEF). Concurrent data has also been fundamental in resolving taxonomic identification issues and misclassification of some TAC stocks (e.g. in some regional markets of Portugal the common name of pollock and whiting are used somewhat interchangeably leading to uncertainty in landings - concurrent sampling carried out by National Institute has recently allowed to resolve them and improve the accuracy of national statistics).
- Overall, the response of the chairs of ICES EGs was positive towards concurrent sampling and its potential uses. The assessment EGs or end-users of the data tended to focus on single species and the potential for more or less data for their species of interest. EGs that focus or relate to data collection and/or processing were among the most concerned about the practical implications.
- Some of the EGs expressed concern about the deterioration of the sampling of particular species. It became clear from a review of the temporal plots that the numbers of trips and lengths sampled by some MS implementing concurrent sampling decreased over time (Section 6.4) but WKISCON2 could not conclude if such decline in sampling numbers was strictly related to the introduction of concurrent sampling, as it was not corroborated by all countries practicing it. The fact that many EGs chairs did not perceive changes in

quality might indicate that over sampling of many resources was being carried before and/or that uncertainty related to other aspects of stock assessment modelling surpasses that of length frequently obtained from commercial catches. Equally, though many countries carrying out concurrent sampling experienced an increase in the number of species sampled, the WK could not conclude this to be a direct consequence of strictly carrying out concurrent sampling as enlarged species lists could have produced similar results and data demands from ICES WGs have been increasing of recent years.

- In some countries (PT, ES) the implementation of full species concurrent sampling onshore and the fleet based approach was the cause of significant structural changes to national sampling programmes. These changes are reported to have led to optimizations in the National sampling programmes that brought about significant improvements to data available to both local, national and regional end-users. PT implemented full-species concurrent sampling and that has led to lower sampling levels in target species and a redirection of its sampling effort to other important bycatch species. Such changes are reported by PT to have brought about significant cost/benefit improvements to its plan and to currently allow data provision to a wider array of end-users.
- Some MS remarked that from the scientific point of view, concurrent sampling has facilitated the leap from the single-stock approach to the ecosystem approach. Information on length composition and catches by species is starting to be used for ecosystem approach to fisheries management (multi-species and ecosystem assessment models). Concerning the ecosystem approach, it is mentioned that the information obtained by concurrent sampling covers a large range of species which can be used for the calculation of indicators that can help to analyse the state of the resources at an ecosystem level. Size-based indicators (like biomass, abundance and size spectra or mean maximum length) can be used to assess the impact of fisheries on the ecosystem.
- In the answers, it was noted that concurrent sampling for lengths may provide an important source of information to manage data poor stocks and mixed fisheries. Some key end-users on this matter did not however reply (e.g. WKLIFE) or did it only briefly (WGMIXFISH) thus requiring further consultation. The exploitation of stocks without analytical assessment can be parameterized in mixed fisheries management analyses, in order to provide scenarios to managers on which decide appropriate harvest control rules. New models are being developed by some ICES groups (e.g. WKLIFE) that will make use of length data for deriving harvest control rules to be applied in ICES 2016 advice season. Uses regarding artisanal fleet are also mentioned for which concurrent sampling of landings onshore appears to be the only effective way of sampling these fleets and to be improving the available data. On-board sampling cannot be performed on many such fleets due to lack of safety or space onboard for observers to carry out their tasks. Some countries specified the information is relevant to different kind of research projects as gears selectivity ones.
- Some MS remarked that the concurrent approach on shore is providing length information of more species than before, thus concurrent sampling

has led to collection of commercial catch data on numerous species not previously sampled.

- Some EGs show an interest in information compiled concurrently but it does not seem they are currently exploiting the fact of having length information taken concurrently.

9.1.3 Disadvantages of concurrent sampling

- It became clear from WKISCON2 discussions that concurrent sampling at-sea is the preferred way to sample commercial fisheries. It is however more costly (each observer only samples one trip and a trip may take several days to sample) decreasing sample size. It is also difficult to implement in some fleets (e.g. small-scale) and prone to some biases in vessel/trip selection that are sometimes (ICES, 2011b)
- Until landing obligation is fully in-place, concurrent sampling onshore is limited cannot characterize discards. 1 country (NL) that currently does not find need to carry out concurrent sampling onshore noted that future concurrent sampling of discards, former discards (now landed ashore) and actual landings will be necessary to arrive to good catch estimates.
- Concurrent sampling onshore yields data at trip-level that is frequently not used by end-users and might be obtained some other way with potentially less biases. In some countries, sampling onshore is troubled by the impossibility of distinguishing trips while at markets

9.1.4 Current usage of concurrently sampled length data

- Some countries remarked that concurrent sampling allows them to improve the taxonomic identification of the species composition of the landings, increasing their capability to supply commercial catch data. Detailed information on species usually landed together is needed to calculate the share of the different species in the landings (relevant species as monkfish, megrim, sharks, rays and also species becoming object of assessment e.g. triglidae, cephalopods…). Further species identifications have proven to solve problems on misidentification. Concurrent sampling allows the confirmation of null or negligible landings for many ICES stocks that are rarely fished in some métiers or closer to their distribution limit. A MS point out this information can be of interest for assessing changes related to climate change. IEO is the only institute making their own estimations of the landings. The current IEO methodology to estimate landings benefits from concurrent sampling implementation.
- Some of the Expert Groups appear to be profiting of the sampling strategy in place since 2009 having more information and length data for more species. Some groups show an interest in information compiled concurrently but it does not seem they are currently exploiting the fact of having length information taken concurrently.
- In many instances, it is apparent that some EGs have not seen any benefit or are not aware of the additional data that may have been collected on their species of interest and therefore may not have asked for this in their data calls. In other cases, EGs are unaware of the methodological changes that their data suffered through time and how it may have impacted positively (or negatively) the quality of their results. A similar situation appears to

happen at national level where many data available may not be being used (e.g. for ecosystem modelling, for data-poor stock assessments). Albeit research projects and other usages have been identified, it is possible that sampling coordinators for each MS who compiled the response might not necessarily be informed on the many potential usages of the data they collect. Having information available that is required by others and is not being requested or provided is not cost-effective. The WK urges both ICES and National authorities to close the gap between data-collection programmes and end-users of the data.

9.1.5 Alternatives to concurrent sampling

- A number of MS have stated that concurrent sampling of some of their fleets is the most cost-effective way of collecting the data and improving species compositions. Most MS perform concurrent sampling on board, and is agreed that it is necessary to quantify discards and species composition.
- There may be other ways of collecting sufficient data for Ecosystems assessments but until these processes are known then full concurrent data appears to provide what is required whether collected at sea or onshore. The clear implication of not collecting concurrent data onshore or at sea is the potential of not being able to deliver on some of the descriptors required under the MSFD on biodiversity and sustainability of populations of <u>all</u> commercially exploited fish. Additionally, historical time-series on catch and length composition may not be available for assessing new fisheries and fisheries that may still be off the radar of end-users
- A fore shortened list of species sampled concurrently might provide information on the relationship between the species on that list (species of interest), however it does then limit you to the current species and cannot account for potential changes in fisheries and changes to the species of interest overtime and limits what information you can provide on bycatch and PETS. It also affects how you might combine those data with samples from other countries if the list are national. Where countries have already and successfully implemented this approach full concurrent sampling of artisanal and small-scale fisheries is the most cost-effective way of sampling for species composition as well as offering single species data for these fisheries. The WK cannot recommend the most cost-effective approach for collecting similar data.
- Some countries are maintaining that for some stocks it is important to have non-concurrent sampling in place together with a concurrent sampling scheme. Both approaches are complementary and non-exclusive for ES.

9.1.6 Other remarks

- According to the current CFP (Council regulation 1380/2013) and to the rules adopted in the area of data collection, data collected for fisheries management needs to meet a number of key requirements (Article 25). Concurrent sampling seems to meet these needs enabling the assessment of the state of exploited marine biological resources, the level of fishing and the impact that fishing activities have on the marine biological resources and on the marine ecosystems. Concurrent sampling is also of particular interest to the contribution of the CFP on management decisions relating to maximum sustainable yield in mixed fisheries (preamble 8); to the Good Environmental

Status by 2020 (preamble 11); and to assure that multi-annual plans cover, where possible, multiple stocks where those stocks are jointly exploited (preamble 24). Concurrent sampling is a way to ensure fisheries management is based on the best available scientific advice (preamble 46), harmonized, reliable and accurate datasets are required. The fact that during RCM NA 2014, questions were raised about the history and utility of concurrent sampling and, throughout WKISCON2, it became evident that not all MS shared views on the need to carry out sampling in this manner deserves particular attention. Member States should cooperate with each other and with the Commission to coordinate data collection activities. Regional fisheries sampling designs must be a balance between local and regional realities and objectives and funding and resources made available. All the latter may have to adapt in order to better contribute to the total. Local realities and objectives may need to be changed somewhat in order to obtain improvements in the accuracy of data supplied to regional management. Regional realities and objectives may have to encompass some degree of suboptimality in order to ensure that all countries involved partners collaborate and collect data in the most transparent and consistent way possible. Funding and resources must be adapted and allocated to meet local and regional needs and requirements for improvement, ensuring cost-efficiency and optimization but also warranting the long-term strategic needs of both local and regional partners and end-users.

10 Conclusions

WKISCON2 concluded that:

- Stock assessment and discard estimation and management are the major current uses of concurrent sampling data. Other uses like scientific catch estimation, advice to local, national and international authorities, research on MSFD descriptors, mixed fisheries and gear interactions and on mortality of rare species, data-poor stocks and PETS also take place in ICES EGs and national institutes. WKISCON2 notes that many of these uses do not specifically require length data that have been sampled concurrently on a trip and that models have not been developed yet to make full use of concurrent data at trip-level.
- Concurrent sampling for lengths of discards and landings at-sea is a long-established practice in most MS and haul-level and trip level data is already available for current and future uses albeit sometimes limited by the lower sample size of these programmes.
- Fewer MS carry out concurrent sampling of landings onshore, those that do not citing increased costs and workload as the main practical issues. Where it was applied, concurrent sampling of fishing trips onshore resulted in substantial increases in the number of species sampled for lengths without jeopardizing the main uses of the data.
- Concurrent sampling of landings onshore is a simple and effective way to estimate species composition (in weight and length) of landings. However, it is prone to bias caused by incomplete sampling and can be an inefficient method of obtaining length distributions of specific stocks when officially reported species compositions (e.g. from logbooks) are considered accurate. Other statistically sound methods of selecting species to sample are not yet

fully developed or tested in the field but may provide useful alternatives in these cases.

- Increased information on bycatch species, general catch composition, and improved data on mixed-fisheries were considered by EGs to be the major benefits of concurrent sampling.
- Full species concurrent sampling of the catch at a haul-level is the best way to provide data to measure the interactions between all species caught and evaluate the impacts of fisheries on marine biological resources and on the ecosystem. WKISCON2 considers sampling at-sea is the ideal way of sampling commercial fisheries. At-sea sampling is generally more costly and displays lower fleet coverage than onshore sampling, but currently, it is not usually possible to sample the discarded component of the catch onshore.
- To take full advantage of the benefits of concurrent sampling, both at-sea and onshore, full-species concurrent sampling should be implemented without resort to species lists such as the current G1 and G2 lists. Incomplete sampling events need to be flagged in national and international databases. The sampling should be regionally coordinated to ensure implementation is consistent and data are comparable at a regional level.

Overall, WKISCON2 concludes that the implementation of concurrent sampling of landings onshore and at-sea has provided benefits in terms of provision of data for more species. However, more than concurrent sampling itself, statistically sound sampling of the full range of species caught should be the overall aim of future revisions of the DCF and a return to strict stock based sampling should not be an option. To achieve statistically sound sampling of commercial catches various statistical approaches may be valid, concurrent sampling being one among them.

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Annex 1: List of participants

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Annex 2: Agenda

Day	Time	Proposed Work plan
Tuesday 16/06	9:00 – 13:00	Welcome Overview of ToRs and Questionnaires Presentation Jöel Vigneaux (FR - Ifremer, via skype)
	14:00 – 18:00	Subgroup work
Wednesday 17/06	9:00 – 13:00	Subgroup presentation and plenary discussion ToR a) Subgroup presentation and plenary discussion ToR b)
	14:00 – 18:00	Subgroup presentation and plenary discussion ToR d) Subgroup presentation and plenary discussion ToR e)
Thursday 18/06	9:00 – 13:00	Subgroup presentation and plenary discussion ToR c) Subgroup work all ToRs Presentation José Rodriguéz Gutiérrez (ES - IEO) Presentation Nuno Prista (PT - IPMA)
	14:00 – 18:00	Subgroup work all ToRs + plenary
Friday 19/06	9:00 – 13:00	Subgroup work all ToRs + final plenary

Annex 3: Some definitions on concurrent sampling[4]

Concurrent / non-concurrent sampling:

Concurrent sampling for lengths*: sampling all or a predefined assemblage of species, simultaneously in a vessel's catches or landings (Commission Decision 2010/93/UE of the 18 December 2009).

Non-concurrent sampling for lengths: sampling of all or a predefined assemblage of species, not necessarily simultaneously, from vessel's catches or landings.

Full-scope concurrent sampling: concurrent sampling that involves the simultaneous sampling of lengths and weight from all species present, litter and PETS (i.e. protected, endangered and threatened species). Litter and PETS may be censured (all hauls) or sampled (only some hauls are dedicated to their observation).

Full-species concurrent sampling for lengths: concurrent sampling that involves the simultaneous sampling of lengths from all species present.

List-based concurrent sampling for lengths: concurrent sampling that involves the simultaneous sampling of lengths from a predefined list of species. Depending on the number of species in the list of species, list-based concurrent sampling will approximate more or less full-species concurrent sampling. If a single species is in the list, list-based concurrent sampling is equal to single-species sampling. Common examples of lists are the G1 and G2 species groups defined for the different regions in Annex VII of Commission Decision 2010/93/UE of the 18 December 2009, but other lists with more or less species are also possible.

Single-species sampling or species-focused sampling for lengths: sampling of lengths of one species from vessel's catches or landings. The sampling frame during onshore sampling (at-sea sampling) are the trips that register (target) a species. Concurrency/non-concurrency does not apply because a single species is involved.

Multispecies non-concurrent sampling for lengths: sampling of lengths of two or more species, not necessarily simultaneously, from vessel's catches or landings. A separate sampling frame is established for each species, encompassing the trips that register (or target) each species. MS NC sampling is distinguished from list-based concurrent sampling by the existence of different sampling frames, one for each species.

Sampling Schemes:

Sampling schemes: particular combinations of full-species concurrent sampling and list-based concurrent sampling as proposed in Commission Decision 2010/93/UE of the 18 December 2009.

***Sampling Scheme 1:** comprehensive sampling of all species in all occasions (Commission Decision 2010/93/UE of the 18 December 2009). **Note from WKISCON2:** this sampling scheme equates to a full-species concurrent sampling both at-sea and onshore.

[4] Definitions taken from the DCF are signalled with "*". The remainder are responsibility of WKISCON2.

***Sampling Scheme 2:** within each time stratum, the sampling events are split in two parts. One part of the sampling events (x %) considers sampling of all species on shore whereas the other part of the sampling events (100 – x %) considers only sampling of all Group 1 species. **Note from WKISCON2:** this sampling scheme equates to a mixture of full-species concurrent sampling onshore in x% of sampling events and G1 (list)-based concurrent sampling in the remainder (100 – x % sampling events).

***Sampling Scheme 3:** within each time stratum, the sampling events are split in two parts. One part of the sampling events (x %) considers sampling of all Group 1 and Group 2 species on shore, whereas the other part of the sampling events (100 – x %) considers only sampling of Group 1 species. In this scheme, Group 3 species have to be sampled at sea. **Note from WKISCON2:** this sampling scheme equates to a mixture of full-species concurrent sampling onshore in x% of sampling events and G1 (list)-based concurrent sampling in the remainder of events sampled onshore (100 – x %). G3 species are to be sampled at-sea. However, they were never defined at regional level.

Place of sampling:

At-sea sampling or on-board sampling: sampling for lengths during the fishing trip. In the vast majority of cases, sampling is carried out on a haul basis (e.g. every haul, every other haul). Sampling may be carried out on unsorted catches, discards or landings, with the latter two being frequently sampled independently at haul-level, i.e. landings+discards.

Market sampling or onshore sampling: sampling for lengths at the end of the fishing trip at port or market. In the vast majority of cases sampling is carried out on a trip basis (e.g. randomized sample of trips present at port/market when observers arrive). Until the implementation of discard obligation, sampling is carried out only on the landed fraction because discards generally take place at sea.

Level of sampling:

Haul-level sampling: samples are selected using a list of hauls as the sampling frame. Generally applies to at-sea sampling.

Trip-level sampling: samples are selected using a list of fishing trips as the sampling frame. Generally applies to onshore sampling.

Level of final estimates required for end-usage:

Haul-level estimates required: estimates calculated for individual hauls are required for final usage of the data. Final usage requires information on between-haul variability.

Trip-level estimates required: estimates calculated for individual trips are required for final usage of the data. Final usage does not require information on between-haul variability.

Trip-level estimates not required: estimates required for final usage of the data do not require information on between-trip variability. E.g., port-level, area-level, quarter-level, etc.

Annex 4: National Correspondents for DCF contacted

MS	Name	DCF contact	Answer
BE	Belgium	Ms Els Torreele	No
BG	Bulgaria	Ms Simona Vasileva Nicheva	Partial (a)
CY	Cyprus	Mrs Myrto Ioannou	Partial (b)
DE	Germany	Mr Christoph Stransky	Yes
DK	Denmark	Mr Jørgen Dalskov	Yes
EE	Estonia	Mr Andrei Baikov	Yes
EL	Greece	Mr Apostolos Karagiannakos	No
ES	Spain	Ms Maria del Pilar Vara del Río	Yes
FI	Finland	Mr Heikki Lehtinen	Yes
FR	France	Ms Marie-Bénédicte Peyrat	Partial (c)
HR	Croatia	Ms Ivana Vukov	No
IE	Ireland	Ms Leonie O'Dowd	Yes
IT	Italy	Ms Evelina Carmen Sabatella	No
LT	Lithuania	Ms Vilda Griuniene	Yes
LV	Latvia	Mr Georgs Kornilovs	Yes
MT	Malta	Ms Roberta Mifsud	No
NL	Netherlands	Mr C.J.M. Verbogt (Kees)	Partial (b)
PL	Poland	Mr Zbigniew (Steve) Karnicki	No
PT	Portugal	Ms Emilia Batista	Yes
RO	Romania	Mr Constantin Stroie	No
SE	Sweden	Ms Anna Hasslow	Yes
SI	Slovenia	Mr Jernej Švab	No
UK	UK	Mr Mathew Elliott	Yes

(a) Questionnaire and data call not responded but e-mail sent to WKISCON2 chairs.

(b) Table 1 and Table 2 not submitted.

(c) Working Document sent and presented during the workshop.

Annex 5: Chairs of ICES Expert Groups (EGs) contacted

EG	Name	Chair(s)	EG Type	Answer
AFWG	Arctic Fisheries Working Group	Bjarte Bogstad	ACOM	Yes
CSG MSFD	Council Steering Group on the Marine Strategy Framework Directive	Eugene Nixon	ACOM - SCICOM	No
HAWG	Herring Assessment Working Group for the Area South of 62 deg N	Niels Hintzen, Beatriz Roel, Lotte Worsøe Clausen	ACOM	Yes
NIPAG	Joint NAFO/ICES Pandalus Assessment Working Group	Peter Shelton, Brian Healy	ACOM	Yes
NWWG	North Western Working Group	Rasmus Hedeholm	ACOM	Yes
PGCCDBS	Planning Group on Commercial Catch, Discards and Biological Sampling	Mike Armstrong, Gráinne Ní Chonchúir	ACOM	No
PGDATA	Planning Group on Data Needs for Assessment and Advice	Marie Storr-Paulsen, Mike Armstrong	ACOM	Yes
SGPIDS	Study Group on Practical Implementation of Discard Sampling Plans	Marie Storr-Paulsen, Alastair Pout	ACOM	Yes
WGBAST	Baltic Salmon and Trout Assessment Working Group	Tapani Pakarinen	ACOM	Yes
WGBIE	Working Group for the Bay of Biscay and the Iberian Waters Ecoregion	Michel Bertignac	ACOM	Yes
WGBIOP	Working Group on Biological Parameters	Francesca Vitale, Lotte Worsøe Clausen	ACOM	Yes
WGCATCH	Working Group on Commercial Catches	Hans Gerritsen, Mike Armstrong	ACOM	Yes
WGCEPH	Working Group on Cephalopod Fisheries and Life History	Marina Santurtún, Jean-Paul Robin	SCICOM	Yes
WGCOMEDA	Working Group on Comparative Analyses between European Atlantic and Mediterranean marine ecosystems to move towards an Ecosystem-based Approach to Fisheries	Hilmar Hinz, Manuel Hidalgo, Marta Coll	SCICOM	Yes
WGCRAB	Working Group on the Biology and Life History of Crabs	AnnDorte Burmeister	SCICOM	No
WGCRAN	Working Group on Crangon fisheries and life history	Marc Hufnagl	SCICOM	Yes
WGCSE	Working Group for the Celtic Seas Ecoregion	Colm Lordan	ACOM	No
WGDAM	Working Group on Data Poor Diadromous Fish	Erwin Winter, Karen Wilson	SCICOM	No
WGDEEP	Working Group on the Biology and Assessment of Deep-sea Fisheries Resources	Pascal Lorance, Gudmudur Thordarson	ACOM	No

EG	Name	Chair(s)	EG Type	Answer
WGEAWESS	Working Group on Ecosystem Assessment of Western European Shelf Seas	David Reid, Enrique Nogueira, Maria de Fátima Borges, Pascal Laffargue	SCICOM	No
WGECO	Working Group on Ecosystem Effects of Fishing Activities	Anna Rindorf	ACOM	No
WGEEL	Joint GFCM/EIFAAC/ICES Working Group on Eels	Alan Walker	ACOM	Yes
WGEF	Working Group on Elasmobranch Fishes	Ivone Figueirdo, Jim Ellis	ACOM	Yes
WGFBAS	Baltic Fisheries Assessment Working Group	Marie Storr-Paulsen	ACOM	Yes
WGHANSA	Working Group on Anchovy, Sardine and Horse Mackerel	Lionel Pawlowski	ACOM	Yes
WGHIST	Working Group on the History of Fish and Fisheries	Georg Engelhard, Ann-Katrien Lescrauwaet	SCICOM	Yes (a)
WGIAB	Working Group on Integrated Assessments of the Baltic Sea	Christian Möllmann, Laura Uusitalo, Lena Bergström	SCICOM	Yes
WGIBAR	Working Group on the Integrated Assessments of the Barents Sea	Edda Johannesen, Yuri A. Kovalev	SCICOM	No
WGIMT	Working Group on Integrated Morphological and Molecular Taxonomy	Ann Bucklin	SCICOM	No
WGINOR	Working Group on the Integrated Assessments of the Norwegian Sea	Geir Huse, Gudmundur J. Oskarsson	SCICOM	Yes
WGINOSE	Working Group on Integrated Assessments of the North Sea	Andrew Kenny, Christian Möllmann	SCICOM	Yes
WGMIXFISH	Working Group on Mixed Fisheries Advice	Paul Dodler	ACOM	Yes (a)
WGNARS	Working Group on the Northwest Atlantic Regional Sea	Robin Anderson, Sarah Gaichas	SCICOM	Yes (a)
WGNAS	Working Group on North Atlantic Salmon	Ian Russell	ACOM	Yes
WGNEW (extinct)	Working Group on Assessment of New MoU Species	Jan Jaap Poos	ACOM	Yes
WGNSSK	Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak	Alexander Kempf	ACOM	Yes
WGRECORDS	Working Group on the Science Requirements to Support Conservation, Restoration and Management of Diadromous Species	Niall Ó Maoiléidigh, Atso Romakkaniemi	SCICOM	Yes
WGRFS	Working Group on Recreational Fisheries Surveys	Harry Vincent Strehlow, Kieran Hyder	ACOM	Yes
WGSAM	Working Group on Multispecies Assessment Methods	Daniel Howell, Steve Mackinson	SCICOM	Yes

EG	Name	Chair(s)	EG Type	Answer
WGVHES	Working Group on the value of Coastal Habitats for Exploited Species	Romuald Lipcius, Håkan Wennhage	SCICOM	No
WGWIDE	Working Group on Widely Distributed Stocks	Katja Enberg	ACOM	No
WKLIFE IV	Workshop on the Development of Quantitative Assessment Methodologies based on LIFE-history traits, exploitation characteristics, and other relevant parameters for data-limited stocks	Carl O'Brien, Manuela Azevedo	ACOM	No
WKLS	Workshop on Lampreys and Shads	Pedro Raposo de Almeida, Eric Rochard	SCICOM	No
WKMEDS	Workshop on Methods for Estimating Discard Survival	Mike Breen, Thomas Catchpole	ACOM	No
WKSHARKS	Workshop to compile and refine catch and landings of elasmobranchs	Maurice Clarke	ACOM	No

(a) Questionnaire not answered but e-mail sent to WKISCON2 chairs.

Annex 6: Outline of concurrent sampling of commercial catches under DCF

Outline of concurrent sampling of commercial catches under DCF

Nuno Prista and Liz Clarke
(WKISCON2 Chairs)

January 2015

DCR/DCF evolution

DCR[a] 2002-2008 Stock-based approach	DCF[b] 2009 onwards Fishing activity based approach
• Biological sampling performed in order to evaluate the composition in length/age of the landings for <u>specified stocks</u>.	• Data collected by metier in order to evaluate the quarterly length/age distribution of species in the catches; • Métiers decided based on 90% criteria (landings, effort) • Sampling unit = fishing trip; • When sampling a fishing trip, the species are sampled **<u>concurrently</u>**.

(a) Commission Regulation (EC) No. 1639/2001 establishing the minimum and extended Community programmes for the collection of data in the fisheries sector and laying down detailed rules for the application of Council Regulation (EC) No. 1543/2000.

(b) Commission Decision 2010/93/UE adopting a multiannual Community programme for the collection, management and use of data in the fisheries sector for the period 2011-2013

What is concurrent sampling?

concurrent sampling[(a)]: sampling all or a predefined assemblage of species, simultaneously in a vessel's catches or landings

What predefined assemblages?

Each species within a region shall be classified within a group according to the following rules[(a)]:

Group 1 (G1)
Species that drive the international management process including species under EU management plans, EU recovery plans, EU long term multi-annual plans, EU action plans for conservation and management.

Group 2 (G2)
Other internationally regulated species and major non-internationally regulated by-catch species.

Group 3 (G3)
All other by-catch species. List established at regional level.

(a) Decision 2010/93/UE adopting a multiannual Community programme for the collection, management and use of data in the fisheries sector for the period 2011-2013

What sampling schemes could MS adopt?

Sampling scheme 1: comprehensive sampling of all species

Sampling scheme 2: within each time stratum, the sampling events are split in two parts. One part of the sampling events (x %) considers sampling of all species on shore whereas the other part of the sampling events (100 – x %) considers only sampling of all Group 1 species

Sampling scheme 3: within each time stratum, the sampling events are split in two parts. One part of the sampling events (x %) considers sampling of all Group 1 and Group 2 species on shore, whereas the other part of the sampling events (100 – x %) considers only sampling of Group 1 species. In this scheme, Group 3 species have to be sampled at sea;

Table 1

Summary of the schemes to be used for concurrent sampling

Sampling scheme	Frequency	Group 1	Group 2	Group 3
Scheme 1	Every sampling event	✓	✓	✓
Scheme 2	x % of sampling events	✓	✓	✓
	(100 – x) % of sampling events	✓		
Scheme 3	x % of sampling events	✓	✓	Sampling at sea
	(100 – x) % of sampling events	✓		

Effects you may have noticed in your data after the introduction of concurrent sampling in 2009(a)

Changes to availability of data
- increases in the numbers of species sampled for length and/or age
- increases in availability of discard data for secondary species
- overall improvement in the data avaliable from data-limited stocks
- improved characterization species assemblages at trip/haul level (e.g., mixed fisheries)
- lower number of individuals and/or trips sampled

Changes to quality of data
- lower precision in length and/or age composition of the main target species
- higher precision in length and/or age composition of some secondary species
- oportunistic sampling of some data-limited species
- incomplete sampling of species within trips

Changes to operational costs
- higher sampling costs
- more time spent sampling

Other?

(a) sources:
ICES. 2008. Joint STECF/ICES Workshop on Implementation Studies on Concurrent Length Sampling (WKISCON), 29 - 31 January, 2008, ICES, Copenhagen, Denmark. ICES CM 2008/ACOM:31. 134 pp.
RCM North Atlantic 2014. Report of the Regional Co-ordination Meeting for the North Atlantic 2014. 186 pp.

Annex 7: Questionnaire sent to National Correspondents for DCF: part 1

Reply to advice@ices.dk by 5th June 2015

One of the major changes in the EU Data Collection Framework (DCF) that came into force in 2009 was the introduction of concurrent sampling, i.e. the sampling of all species (or a predefined list of species) from a trip, for both landings and discards. With this strategy the DCF aimed to facilitate the data demands of the existing stock-based assessments as well as serving the revised needs for the ecosystem approach to fishery management. Recent discussions in STECF (STECF, 12-07) and RCM NA (2014), among other, have noted that concurrent sampling of different fish stocks is carried out differently by different MS, while at the same time recognizing both pros and cons to the adoption of concurrent sampling. In particular the RCM NA (2014) stated that "*It is unclear whether the significant resource needed to carry out concurrent sampling provides benefits that outweigh the costs. Some ICES Working groups have benefited from concurrent sampling data collected however there is no empirical evidence to support this. In order to decide if concurrent sampling should continue, more feedback from end-users is required*". To follow-up on this, RCM NA, and the Liaison Meeting requested that ICES WGCATCH set up a workshop to evaluate the implications of stopping concurrent sampling and the benefits concurrent sampling is providing (or can provide) considering the new and broader scopes of the revised DCF, such as the evaluation of impacts of fisheries on marine biological resources and the ecosystem. You are requested to provide feedback to the Workshop on implementation studies on concurrent length sampling (WKISCON2).

Note: In your reply please consider only the effects that can be directly attributed to the adoption of concurrent sampling (understood as data not available previously to 2009) excluding other data changes (such as those brought about by the adoption of sampling by *métiers* and other changes brought about by the implementation of DCF).

Institution Name:
Respondent(s) name(s):
Respondent(s) email address(es):
Institution role under the DCF:

Please fill in the spreadsheet with summary information regarding sampling levels for your national schemes. (Please include data for both concurrent and non-concurrent sampling.) **Table A** is regarding overall realised gear-specific sampling levels, whilst **Table B** is realised stock-specific sampling levels.

1. Please specify the current uses of catches sampled concurrently at your institute.

2. Please specify the main difficulties you have felt in the implementation of concurrent sampling at your institute and how you have tackled them.

3. Please specify the main benefits obtained from the implementation of concurrent sampling at your institute (e.g. data that could not be previously obtained).

4. Did the implementation of concurrent sampling bring about significant increases or decreases in sampling costs at your institute? If yes, please provide a rough % of change.

5. Did the implementation of concurrent sampling increase or decrease the capability of your institute to supply commercial catch data for a wider array of species and/or ICES WG's? If yes, please detail which species or WGs.

6. Did the implementation of concurrent sampling increase or decrease the capability of your institute to supply commercial catch data for MSFD descriptors? If yes, please detail descriptors.

7. Did the implementation of concurrent sampling increase or decrease the capability of your institute to supply commercial catch data for other assessment or management purposes (e.g. discard ban evaluations, advice to national or international authorities)? If yes, please detail which purposes.

8. Did the implementation of concurrent sampling increase or decrease the capability of your institute to supply commercial catch data for other purposes (e.g. research projects)? If yes, please detail examples.

9. Did your institute upload commercial catch data sampled concurrently in the period 2009-2013 to the RDB? If your institute did not upload these data or has carried out a partial upload (e.g. some *métiers*, some years or some species), please specify the reasons and which data (if any) was uploaded.

10. Can you identify future benefits that can be obtained from concurrent sampling under the new and broader scopes of the revised DCF, such as the evaluation of impacts of fisheries on marine biological resources and on the ecosystem? Can these benefits be achieved more cost effectively from non-concurrent sampling of all species of interest?

11. Can you identify disadvantages of carrying out concurrent sampling in commercial catches? If yes, please specify those disadvantages and how sampling non-concurrently might improve the situation.

12. If you have any additional comments on concurrent sampling of commercial catch that you would like to provide WKISCON2, please state them here.

Annex 8: Questionnaire sent to National Correspondents for DCF: part 2 (data call)

Header of Table A

MS	ICES Division	Location	Info type	Year	Gears (level 4)	No of days sampled	No. trips sampled	No of hauls sampled

Header of Table B

MS	Species	ICES stock code (if any)	Species Group	Location	Info type	Year	No Trips	No Lengths	No Ages

Annex 9: Answers from National Correspondents for DCF to part 1 of questionnaires

MS	Institution Name	Respondent(s) name(s)	Institution role under the DCF
CY	Department of Fisheries and Marine Research (DFMR), Ministry of Agriculture, Rural Development and Environment	Charis Charilaou, Myrto Ioannou	Institution role under the DCF: DFMR is the national authority of Cyprus responsible for the implementation of the Data Collection Framework. Being the only beneficiary for the data collection, it is engaged with all DCF activities i.e. planning of National Programme, collection, processing and analysis of DCF data, transmission to end users, and participation to DCF-related meetings.
DE - TI-OF	Thünen Institute of Baltic Sea Fisheries (TI-OF)	Dr. Uwe Krumme, Sven Stötera	sampling of the German commercial fisheries in the Baltic Sea
DE - TI-SF	Thünen Institute of Sea Fisheries (TI-SF)	Jens Ulleweit, Kay Panten, Dr. Christoph Stransky	coordinating biologist (JU, KP), National Correspondent (CS)
DK	DTU Aqua	Marie Storr-Paulsen, Kirsten Håkansson	data submitter and national correspondence.
EE	Estonian Marine Institute, University of Tartu	Toomas Saat, Silver Sirp, Tiit Raid, Tiiu Tõrra, Heli Špilev, Tenno Drevs	data collection, management, reporting
ES - AZTI	AZTI	Lucía Zarauz	Data collection, management and use of data corresponding to the Basque Country fisheries. Execution of scientific surveys. Participation in elegible working groups.
ES - IEO (ICES)	IEO (ICES fisheries)	Jose Castro and Jose Rodriguez	---
ES - IEO (LD)			---
ES - IEO (MED)	Spanish Institute of Oceanography (IEO)	Pedro Torres, Beatriz Guijarro, Maria Gonzalez	Participant of the Spanish Data Collection: collection of biological data, assessment and carry out the scientific surveys.
FI	Natural Resources Institute Finland (Luke), (Finnish Game and Fisheries Research Institute before Jan 1 st 2015)	Ari Leskelä, Jukka Pönni, Jari Raitaniemi, Perttu Rantanen, Timo Myllylä	Implementation of the NP's under the DCF in Finland
IE	Marine Institute	Leonie O'Dowd	Natinal Correspondent
LT	Division of fishery research and science Fishery service under MoA	Romas Statkus	Sampling of the Lithuanian commercial fisheries
LV	Institute of Food Safety, Animal Health and Environment BIOR	Georgs Kornilovs	implementation of Latvian National DCP
NL	IMARES	Sieto Verver	Data collector and provider
PT	Instituto Português do Mar e da Atmosfera, I.P.	Marina Dias	IPMA is the Portuguese Institute responsible for on-shore and at-sea sampling for the Mainland fleet operating in the Iberian Fishing Ground and exploiting stocks assessed by ICCAT as well as on-board sampling (unsorted catches) for NAFO Areas and North Sea and Eastern Artic. IPMA is also responsible for conducting scientific surveys in the Iberian Fishing Ground and participates on the Flemish Cap Groundfish Survey.
SE	SLU-Aqua	Katja Ringdahl	Planning and carrying out sampling, compile and transmit data to users
UK - E+W	Cefas	Jon Elson	UK E (&W) representatives for biological sampling coordination, collection, supply and use.
UK - SCO	Marine Scotland Science	Liz Clarke	---

MS	1. Please specify the current uses of catches sampled concurrently at your institute.
CY	Through the concurrent sampling of catches, the length distribution of the catches of the stocks sampled is estimated, and further used for estimating the age distribution of catches (with the use of ALKs). Information on the length (and age) distribution of stocks is provided to the end users (GFCM, ICCAT, STECF EWGs through Official Data Calls) and also to the RCM Med&BS-LP. This information is also used by the DFMR for performing stock assessments and for evaluating the "performance" & impact of fishing gears.
DE - TI-OF	Sampling of fish species for stock assessment and discard estimations; presence/absence of rare fish species in time and space and gear type. TI-OF is responsible for the German fisheries in the Baltic Sea. TI-OF carries out concurrent sampling at-sea (length distributions, discard ratios) and purchases self-samples from fishing vessels; the self-samples are analysed in our laboratory (length distributions, discard ratios, biological parameters).
DE - TI-SF	Sampling of fish species for stock assessment and discard estimations. TI-SF is responsible for the German fisheries in the North Sea and North Atlantic. TI-SF carries out exclusively concurrent sampling at-sea due to the fact that the majority of German catches for the North Sea and North Atlantic is landed in foreign harbors and that there are almost no local auctions at the German North Sea coast.
DK	1- concurrent at-sea/survey – concurrent on weight on all species the sampling a priorities the following way: Weight and length on all species Weight on all species – only length on the discarded catch Otoliths are only collected for some species and only for the discarded catch – length stratified sampling 2 - Non-concurrent on-shore – sampling boxes per stock and only selected species
EE	Most of the Estonian sampling has been based on test fishing and has been concurrent all the time. Herring and sprat pelagic mixesd trawl fishery has a major role in overall Estonian commercial fishery. Therefore concurrent sampling of trawl fishery has taken place throughout the sampling history ad is the natural choice. Tha data are used to prepare the required information for assessment purposes and reporting on data collection activties.
ES - AZTI	To calculate of scientific catch estimates To provide biological data for stock assesment WG: length, weigth, age, maturity, discards To answer data calls and requests made by European, national and local authorities To advice local, national and international authorities To develop other projects
ES - IEO (ICES)	Due to the implementation of concurrent sampling IEO is providing length information to different ICES working groups. In addition to the target species of the Spanish fleet, assessed by WGBIE (formerly WGHMM), WGCSE, WGHANSA and WGWIDE, it has begun to provide data to other WGs as WGDEEP, WGNEW, WGCEPH or WGEF . In 2014, length information of more than 30 species has been sent to ICES. Other projects and requirements (mixed fisheries, ecosystem interactions, etc) are profiting from the concurrent data, mostly due to the improvements in the estimation of catch composition (explained below). Particularly, this sampling strategy provides an important source of information to manage poor-data stocks. Note: It has to be clarified that IEO has always done concurrent sampling on board. Answers of this questionnaire refer to market sampling.
ES - IEO (LD)	LEJANAS: The unit of sampling is the trip (average duration: 2-3 months). The sampling scheme is concurrent sampling at-sea (Scheme 1). Sampling is type b: random sampling. The biological data are collected only by observers on board because all catches are processed at sea. Once an observer is on-board, the entire trip is sampled without any additional costs. On-board observers collect data on catches and discards for all species, effort and position of vessels. They carry out lenght concurrent sampling of the unsorted catches and discards following criteria of significance and quantity to choose the sampling species . Besides weight and lenght data, sex, macroscopic maturity and biological samples (otoliths) are collected. Data are used mainly for these goals: Quantify catches and discards. Quantify cpue/lpue by species and effort level. Calculate the length composition of the main species catched. Calculate the age composition of species (G1, G2 and G3). Biological studies of maturity and growth for DCF. Calculate conversion factors. Used to provide advice by both stock and fishery in the assesment (analytic and/or trends) for WGs and others end-users.
ES - IEO (MED)	Currently, most of the information is used to perform stock assessments, both at GFCM and STECF level. The information can potentially be used to help the MSFD.
FI	Catches from trawl fishery for pelagic G1-species (length distributions for herring and sprat catches, age- and other stock related variables for herring). Gill net-, pound net, fyke net and trap net fisheries for G1 herring, coastal G2-species as pike-perch, perch, whitefish, pike (length distributions, age- and other stock related variables) and length distributions for by-catches of several G3-species. Rare G1 species as Flounder and Cod are recorded whenever they are present in catches of any métier.
IE	The primary use is to provide length or age compositions of the catches for stock assessment working groups. A further use is the monitoring of cetacean and sea bird bycatch as well as bycatch of PET fish species. Other uses (eg in relation to MSFD) are still opportunistic and exploratory. So far, they have not influenced the sampling design and have not formally been adopted in the Irish MSFD monitoring programme other than for Descriptor 3 on commercial fish and shellfish. Research projects, which are using the time series of sampling at sea programme, have led to several publications, but data used has gone back pre-concurrent sampling in the majority of cases.
LT	Currently we do not use data for our internal needs. Sampling of fish species are performed and submitted to stock coordinators, data calls and requests from European and national authorities. Only discard data are used for estimates and technical reports at national level
LV	There are two main fisheries where concurrent sampling takes place. 1. Fishery targeting cod in which there could be by-catch of flounder of different magnitude and in some cases some small by-catch of plaice. All species are sampled concurently (length sampling) both in the retained catch and discard; since 2015 only in the retained catch and unwanted catch. The data are used for the catch estimate for cod, flounder and plaice. 2. Pelagic trawl fishery which is targeting sprat but usually has some by-catch of herring. The sampling of length and other biological parameters is performed for both species. The data are used for the catch estimate of sprat and herring. Besides the proportion of herring in the sampled catches are compared with the log-book data.
NL	No concurrent sampling at auctions is carried out at the moment. The 2007 pilot study clearly indicated that given the time constraints, concurrent sampling was not possible in The Netherlands as this would require a very expensive programme. During on-board sampling trips all species are sampled as good practice for many year, not concurrent per se. On board and landings site sampling are completely independent.
PT	Sampling of fish species for stock assessment; Discard estimation; Response to data requests (national and international); Other research projects.
SE	Our institute only sample concurrently at sea (discards and landings all species). Data and information is submitted to STECF, ICES and used for advice to support national authorities. Data is also of interest for MSC. Data used within the preparation of discard plans under the landing obligation (application for de minimis exemptions etc)
UK - E+W	Onshore and offshore data collected for required species or assessed stocks are processed and provided, following data calls, to ICES EWGs. Offshore concurrent data is used for catch composition information, analysis and advice to government STECF and EU on gear selectivity; potential impact of discard ban and other requirements.
UK - SCO	Catches sampled concurrently are used for provision of catch data to ICES and for fisheries management in the same was as non-concurrently sampled data. I am not aware of uses of catches sampled concurrently specifically because they are concurrently sampled.

MS	2. Please specify the main difficulties you have felt in the implementation of concurrent sampling at your institute and how you have tackled them.
CY	No difficulties encountered.
DE - TI-OF	Concurrent sampling has been carried out in Germany since the 1990ies. At sea on board of trawlers, the processing of the catches by the crew is often very fast so that sometimes we have time constraints to measure enough specimens of each species (sub-sample size) and thus, end up with incomplete length distributions of a bycatch species (usually flatfishes). We try to account for this by changing the focus on different bycatch species between hauls.
DE - TI-SF	Concurrent sampling has been carried out in Germany since the 1990ies. The main difficulty is to reach a wide participation of vessels in the observer programme and to include vessels that have not been sampled by observers before. Although it is partially successful to address new vessels, there are always vessel owners, of smaller vessels in particular, which are not willing to allow observers onboard. Based on the present situation, random sampling of the fleet is yet not fully implemented.
DK	We implemented concurrent sampling at-sea in 1996 when we started the at-sea sampling program, so we haven't faced any new difficulties in 2009. Time constrain: Concurrent length sampling of both retained and discarded catch – before 2013 we always collected a length distribution on both discard and landings, which meant a lot of the hauls were not worked up due to limited time. In 2013 we changed that and gave a higher priority to the discarded part of the catch.
EE	Mostly financial restrictions
ES - AZTI	Concurrent sampling for length at the landing ports entails a number of difficulties related with the access to the fish: Sampling is limited by the duration of the time window when the catch is available (between the sale and the removing of the fish by the buyer). In the case of very mixed fisheries (ie OTB), this time window is often not enough to complete the concurrent length sampling of all species landed. Some shipowners fear of a potential degradation of the quality and the value of the fish landed, especially for highly valued and fragile species (red mullet, small squids, etc). Sometimes part of the landings (hake, monkfish) made in Ondarroa goes directly to a processing industry (POSA). This may be the whole landings of one boat or only part of the landings. Sometimes the sampler can identify this situation, but not always. If the sampler identify that the catch of one species is not complete, we don't sample that vessel With concurrent sampling, more time is needed to sample each vessel, mostly in the OTB fleet. This should result in fewer vessels being sampled, but this effect is difficult to estimate due to the decrease in the size of the fleet during last years, and the difficulties to sample some of the vessels (whose ship-owners don't allow us sample) We have regular communication with ship-owners to explain them the importance of sampling and try to make the sampling easier (larger time window, access to all fishes..). The sampling of the landing fraction which is sent directly to the processing industry is a complex issue which we haven't been able to solve yet. Sampling on board has always been concurrent, and therefore no major changes were introduced with the new DCF
ES - IEO (ICES)	1/ Number of samplers. The previous Spanish sampling protocol considered one sampler by sampling operation. Since the concurrent sampling implementation, it was necessary to organize sampling teams of two or three people to cover mixed-species trawl metiers (bottom otter trawlers and bottom pair trawlers) due to the amount of species and the short time available. 2/ Increase of sampling time. The increase of species entails an increase of the sampling time depending on the métier. While concurrent sampling of purse seines or fishing pots does not show significant differences compare to the old stock-based approach, the sampling time increase in other métiers as trawlers and gillnetters. Landing, auctioning and removal of fish can be performed very quickly, so the implementation of concurrent sampling obliged to adapt the sampling methodology, as the use of digital voice recorders or the prioritization of species. 3/ Physical access to some species. Before the implementation of concurrent strategy, sampling at the market already entailed some difficulties related with the access to the fish. These problems increased with concurrent sampling. Problems specially arose concerning some species of greater commercial value. These species are perfectly laid out on trays and even covered with plastic sheets. The aim is to make catches' presentation more attractive to improve their economic value. Sampling these species once they have been arranged is seen as an interference in fishermen's/auction's work. This problem persists in some cases although fishermen are getting used to the sampling. 4/ Storage and management of the fisheries data base. The original data base had been designed for a number of target species. The shift to concurrent sampling demanded the adaptation of the data base to receive and manage new information (masters data register, updates, etc). 5/ Data entry. Time employed to upload sampling data into the data bases increased considerably as well as the time needed to check the sampling data.
ES - IEO (LD)	LEJANAS: In these fisheries the scientific monitoring is done with a similar sampling design previously to the implementation of the DCR and the concurrent sampling. For this reason this circumstance has not meant hardly difficulty added to the sampling on-board.
ES - IEO (MED)	The number of on board samplings (and thus the number of observers) had to be increased.
FI	- Working time per sample has increased - Increased sample size causes problems in transportation, refrigeration and waste-disposal - Direct costs have increased a bit due to buying of all species in the catch
IE	The main difficulties associated with land based concurrent sampling are With current resources it is only practical to sample concurrently in the main fishing ports where we have two personnel. No concurrent sampling takes place in the minor ports. Additional Personnel not available to do this work. Some of the selected metiers for sampling land in remote ports with no fixed pattern of landings so difficult to predict when and where concurrent sampling can take place. Vessels are monitored using AIS to try and help in this area. Very difficult in some ports to get full access to the full catch, some vessels when landing split the catch immediately, some to the auction floor and some directly on to the back of lorries or factories for packing for export. There is very little that can be done regarding this as lorries have to meet ferries and we cannot delay the process. Fish can move very quickly on the auction floor so it easy to miss some components. Analysts can enter some auction halls early and sample fish before the auction hall workers come in. Low volumes of Prime species from different vessels can be mixed on the floor. When possible we try to measure fish before they are mixed. Some auction halls do not like prime fish being handled, or if fish have been packed re-iced by auction hall staff they are reluctant for it to be handled again. It can be difficult to predict the amount of time available to sample, auction times can vary. These questions are asked before commencing a concurrent sample, but it is not always possible to complete the sampling. In some ports there can be up to 5 grades of some species, which all have to be sampled according to MI protocols. Some species can be graded once they hit the floor and analysts try and sample these fish before they are graded. Some fisheries can land up to 15 different species thus increasing the amount of time needed to sample concurrently. For sea based concurrent sampling, we do not encounter any difficulties as the protocols in the MI state that at a trip level all species must have measurements. Not all species are measured in every haul sampled but over the whole trip every species have measurements.
LT	The major problem is that almost 98% of national Baltic fleet do not have space on board as well as security facilities for extra persons. Fishermen are obliged to fill out forms (similar to logbooks in terms of structure) and declare volumes of landings and discards by species. Species compositions and length measurements from catches are recorded from samples provided by fishermen (self-sampling). Additionally, we do perform control surveys at sea, where we have possibility to get onboard of fishing vessel and perform full analysis of landings and discards (cross-checking). However, this could be done maximum once per quarter.
LV	In general there were no major difficulties because species composition in the catches in the Central Baltic Sea is not large. In the main fisheries the number of species in the catch do not exceed 2.
NL	Not relevant.
PT	Major problems encountered during concurrent sampling at market: - In comparison with the previous length sampling scheme the physical effort to collect data increased because the number of species sampled also increased; - Some species are sold before the bulk of the catch for its freshness or market value, immediately after being weighed, and it's not possible to sample them; - Time needed to sample all the species present in the catch often exceed the time available for sampling (time window between the weighing and selling) causing some samplings not to be completed; - Fish handling increased and some ship-owners and buyers fear quality loss; - The main Oracle database was not fully adapted to accommodate concurrent sampling data, resulting in the development of accessory access databases. How problems were tackled: Number of observers and market visits increased; - Introduction of digital recorders to collect information (but requires transcription time); - Efforts to increase industry awareness on the importance sampling; - Development of a new database (not fully completed yet). Sampling on board has always been concurrent. Concerning gillnets, it is often not possible to discriminate among samples from consecutive hauls (namely landed fraction).
SE	We have always sampled concurrently at sea and did never implement concurrent sampling of landings in port, so no main difficulties compared to previous situation. Pilots on concurrent sampling in harbors revealed a lot of problems (time constrains, difficulties to get hold of all species) and that was why we did not implement it. To be able to sample all species concurrently at sea we need to have 2 observers on most of the trips.
UK - E+W	Offshore catch sampling for concurrent data is our standard procedure. Onshore, the main difficulty has been resources, and having access to the entire catch to complete a full concurrent. The time required to sample a full concurrent can range from ½ hour to 3 hours for multiple staff depending on the fishery. If the entire catch is available then success is dependent on available resources (number of staff) primarily and the available time (the period that landings are available pre-sale or pre-processing).
UK - SCO	Concurrent sampling is very time consuming. We concurrently sample discards as a matter of course. At the market, it is usually only possible to concurrently sample trips landing a small number of species.

MS	3. Please specify the main benefits obtained from the implementation of concurrent sampling at your institute (e.g. data that could not be previously obtained).
CY	With the introduction of concurrent sampling in the DCR/DCF, more species have been selected to be sampled. Furthermore, during one sampling day (where clusters of fishing trips are sampled) more effort is made for achieving length measurements from all species from all trips sampled. In other words, more length measurements are achieved.
DE - TI-OF	The whole catch composition is documented, both in active and passive gear fisheries. The money spent to have an observer on board a commercial vessel is used in best possible way, i.e. collection of data from all species in the catch. We have no problem with concurrent sampling in the Baltic Sea. The Baltic Sea has fairly few species per demersal haul and simultanenous coverage of all major species (cod, flounder, plaice, dab) is not a serious challenge for us.
DE - TI-SF	Due to the fact that the majority of German catches for the North Sea and North Atlantic is landed in foreign harbors, concurrent sampling is the only possibility to obtain all necessary information for assessment purposes and discard estimations.
DK	Concurrent all species- species interaction – multi-species assessment. Concurrent length – gear selection – predation
EE	No benefits
ES - AZTI	Information about species which are landed together. This information is needed to calculate the share of the different species in the landings (i.e. monkfishes, megrims, sharks, rays, triglidae, cephalopods…) Information on length composition and catches by species is starting to be used for ecosystem approach to fisheries management (multispecies and ecosystem assessment models) Detailed information on cephalopods is especially important for some models due to their role in the ecosystem
ES - IEO (ICES)	1/ Availability of length sampling data of more species. Researchers have beneficiated from length information not available before 2009. In 2008 IEO collected length information from 23 species; in 2014 the number of species was 180. 2/ Improvements in the collection of landings data: 2.aTaxonomic identification of the landings. IEO sampling teams started to focus on more species in the auctions with the concurrent sampling. As a result it was proved some species were not properly identified by fishermen/auctions and some species were mixed. These problems, reflected in taxonomic low quality of sales notes and logbooks, are due to difficulty in their identification, low catches or similar sale prices. In some cases IEO sampling team works with local auctions to distinguish species leading to an improvement of their taxonomic identification level. Some common examples of these species are Diplodus spp. (D. cervinus, D. puntazzo, D. sargus, D. vulgaris), Scorpaena spp. (S. scrofa, S. porcus, S. Notata), Trisopterus (T. luscus, T. minutus), Beryx spp. (B. decadactylus, B. splendens), Trachurus spp. (T. mediterraneus, T. picturatus, T. trachurus), Triglidae (Aspitrigla cuculus, Chelidonichthys lucerna, Chelidonichthys obscurus, Eutrigla gurnardus, Trygla lyra), distinctions between Todaropsis eblanae and Illex coindetti or the register of species usually low reported as Eledone cirrosa. 2.b. Quality of catch composition. Concurrent sampling provides samplers the opportunity to work closer to the catches of all species and obliges them to spend more time with boxes in the auction. Both things allow a better evaluation of the landings, meaning an increase in the quality of the catch composition registered by the samplers.
ES - IEO (LD)	LEJANAS: Stability and improvement in the quality of the data due to the application of the DCR and the DCF.
ES - IEO (MED)	The concurrent sampling allows the collection of size composition of not only target species, but also by-catch. This allows to have a wider knowledge of the ecosystem and can be used to new approaches in the stock assessment (multispecific models), including biodiversity and community indices.
FI	Concurrent sampling saves time and expenses spent in travelling to remote sampling sites.
IE	For stock assessment, there has been no extra benefits of the concurrent sampling above the non- concurrent sampling at sea and/or port sampling programme because Ireland has historically sampled all species of commercial interest.
LT	Fishermen are asked to present all bycatch (discards not sorted out). This system of sampling was implemented since 2013. We consider that as an optional way to gather necessary data from commercial fishery
LV	In general concurrent sampling was carried out also previously. As it was said above the number of species is low in the catches in the Baltic Sea therefore concurrent sampling is not too difficult. E.g. in pelagic trawl fisheries the target species is usually sprat and the by-catch is herring and both species were measured as well as sampling of other biological parameters took place. The by-catch of other species is usually in single specimens and is recorded. The sampling of these species is not required by DCF.
NL	Not relevant.
PT	Collection of commercial catch data on numerous species not previously sampled (both landings and discards); Collection of data on interactions of species within gear and among gears; Improved answer to novel assessment requests (e.g., WGNEW); Detailed information on species usually landed together under the same trade name;
SE	We have always sampled concurrently at sea and did never implement concurrent sampling of landings in port, so no main benefits compared to previous situation. Data from the concurrent sampling at sea is of importance.
UK - E+W	Increase in the available data for non TAC or less ‘important’ species. Some of the species we are required to sample under the DCF are dependent on the concurrent programme for us to meet our planned ‘targets’.
UK - SCO	Not applicable.

MS	4. Did the implementation of concurrent sampling bring about significant increases or decreases in sampling costs at your institute? If yes, please provide a rough % of change.
CY	There have not been any changes in the sampling costs due to the implementation of concurrent sampling. The costs concern the number of sampling days, not the number of stocks and number of measurements made during one sampling day.
DE - TI-OF	n.a. (always used concurrent sampling)
DE - TI-SF	n.a. (always used concurrent sampling)
DK	We implemented concurrent sampling at-sea in 1996 when we started the at-sea program, so we are not able to estimate the cost due to the change in 2009
EE	Increase by ca 10%
ES - AZTI	Concurrent sampling has not result in an increase of the cost of sampling, because all our samples are part of the staff and we have not increased the number of samplers
ES - IEO (ICES)	Budget of the sampling network for ICES area increased by 6% between 2008 and 2009. This percentage of change is considered similar to those happening ordinarily (changes in ports and gears due to adaptation to fleet dynamics or governmental cuts) and cannot be attributed to the shift to concurrent sampling.
ES - IEO (LD)	LEJANAS: No. See answer question 1 and 2.
ES - IEO (MED)	Yes, around 25%.
FI	No significant changes in costs.
IE	Marginal increase in cost because the existing observer program was adapted to do concurrent sampling, it did not require extra trips. We have staff based in ports, so there was only a marginal increase in costs to have concurrent port sampling as supposed to stock specific sampling.
LT	In our case expenses did not increase. Budget for purchase of samples is foreseen in our national plan. Other samples (bycatch and discards) are provided free of charge
LV	The sampling costs did not change.
NL	Not relevant.
PT	Increased labour costs of about 10%.
SE	No (as we do not sample concurrently in harbors), see above. The cost has increased but that is because we started to sample more fisheries not due to concurrent sampling
UK - E+W	The concurrent programme had to be met within the budget we were receiving to meet our national programme so no increase in sampling costs
UK - SCO	We already carried out concurrent sampling of discards. As we do not intentionally implement concurrent sampling at the market, there have been no substantial increases or decreases in sampling costs. Implementation of concurrent sampling at the market would have been prohibitively expensive

MS	5. Did the implementation of concurrent sampling increase or decrease the capability of your institute to supply commercial catch data for a wider array of species and/or ICES WG's? If yes, please detail which species or WGs.
CY	Yes. With the introduction of concurrent sampling DFMR increased the number of species for which length data are collected. These species are basically Group 3 – of national interest (e.g. *Siganus* spp., *Sparisoma cretense* , *Diplodus* spp.).
DE - TI-OF	n.a.
DE - TI-SF	n.a.
DK	We implemented concurrent sampling at-sea in 1996, when we started the at-sea program
EE	No change
ES - AZTI	Concurrent sampling has increased our capability to supply commercial catch data for some more species: Catches and length distribution of dogfish (Scyliorhinus canicula), and rays (Raja clavata, Leucoraja naevus)
ES - IEO (ICES)	As explained in answer 3, improvements in the collection of landing data (taxonomic identification of landings and quality of catch composition) increase IEO capability to supply commercial catch data. For 2015 ICES working groups IEO provided information on these species: Aphanopus carbo, Argentina silus, Beryx spp, Brosme brosme, Centrophorus squamosus, Centroscymnus coelolepis, Coryphaenoides rupestris, Dicentrarchus labrax, Eledone cirrhosa, Eledone moschata, Eledone spp, Engraulis encrasicolus, Eutrigla gurnardus, Galeorhinus galeus, Hoplostethus atlanticus, Illex coindetii, Illex spp, Lepidorhombus boscii, Lepidorhombus spp, Lepidorhombus whiffiagonis, Loligo forbesi, Loligo spp, Loligo vulgaris, Lophius budegassa, Lophius piscatorius, Lophius spp, Macrourus berglax, Melanogrammus aeglefinus, Merlangius merlangus, Merluccius merluccius, Molva dypterygia, Molva molva, Mustelus asterias, Nephrops norvegicus, Octopus vulgaris, Ommastrephidae, Pagellus bogaraveo, Phycis blennoides, Pleuronectes platessa, Pollachius pollachius, Raja batis, Raja brachyura, Raja circularis, Raja clavata, Raja fullonica, Raja montagui, Raja naevus, Raja undulata, Sardina pilchardus, Scyliorhinus canicula, Sepia elegans, Sepia officinalis, Sepia orbignyana, Sepia spp, Solea solea, Todarodes sagittatus, Todaropsis eblanae, Todaropsis spp, Trachurus spp and Trachurus trachurus.
ES - IEO (LD)	LEJANAS: No. See answer question 1 and 2.
ES - IEO (MED)	It Increased the capability to supply data of new species to STECF expert working groups and GFCM WGs (and thus, to perform stock assessment of species never assessed before), like Sardinella aurita in the last EU data call for the Mediterranean and Black Sea.
FI	No effect in eg. trawl fishery where herring and sprat have always been sampled concurrently, as they occur simultaneously in catches.
IE	Historically our at sea programme carried out measurements on all species, but there has been an increase in number of samples and numbers measured. The increase would be attributed to the land based concurrent programme.
LT	The most difficult case of concurrent sampling is in distnat fishery, where number of species is very high, only one person is engaged in sampling, construction of fish processing facilities complicates sampling of catches, etc.
LV	The number of species for which length and biological sampling is carried out has slightly increased. But it is mainly connected with the requirements of ICES WG,s which are providing advice for new species for which it was not done before.
NL	Not relevant. CS was not missed out over the last years. Our current sampling and data collection schemes proved to be sufficient to answer all questions by end-users.
PT	Implementation of concurrent sampling increased the capability to supply commercial catch data for a wider array of species, namely sharks and rays (WGEF) and Eutrigla gurnardus, Chelidonichthys cuculus, Dicentrarchus labrax, Mullus surmuletus, Pleuronectes platessa, Pollachius pollachius, Solea solea (WGNEW). It also allowed the confirmation of null or negligible landings and discards for many ICES stocks that are rarely fished in some metiers or closer to their distribution limit (e.g., Clupea harengus). Finally concurrent sampling has allowed us to start reporting by-catch of PETS to, e.g., WGBYC.
SE	No (as we do not sample concurrently in harbors), see above. We do however submit data on by-catch species sampled concurrently at sea to ICES WGs when and if requested. Usually we only have data on lengths (not ages)
UK - E+W	Increased the capability for us to provide more data if it is required. Concurrent programme provides ‘forces’ the additional sampling of by-catch species which were not sampled before except on commercial trips and on surveys. These included - Shad Catfish Conger eels Anchovy Rockling Halibut Wrasses Grey mullet Starry smooth hound Sand sole Greater forked beard Lesser spotted dog Redfishes Cuttlefish Seabream Horse mackerel Tope Witch Dabs Red mullet Flounder or flukes Saithe Cuttlefish John dory
UK - SCO	Not applicable.

MS	6. Did the implementation of concurrent sampling increase or decrease the capability of your institute to supply commercial catch data for MSFD descriptors? If yes, please detail descriptors.
CY	No.
DE - TI-OF	n.a.
DE - TI-SF	n.a.
DK	We implemented concurrent sampling at-sea in 1996, when we started the at-sea program
EE	No change
ES - AZTI	Yes. Data coming from concurrent sampling are being used in the frame of several projects to calculate various indicators which have been proposed for D1 Biological diversity, D3 exploited fish and selfish and D4 food webs.
ES - IEO (ICES)	Data from concurrent sampling was not used in 2012 for MSFD descriptors. For Descriptor 3 (Commercially exploited fish and shellfish) input data to estimate F and SSB of many stocks was limited to those stocks with analytical assessment based on size or age. As those stocks were already sampled previously, concurrent sampling didn't increase or diminished in 2012 the capacity of the IEO/Secretary to provide data capture for those species. From 2014 the IEO methodology of landings estimation was updated starting to make a new use of the concurrent market sampling (raising the observed indices of landing to the total effort by metier). This methodology increases the capacity of the IEO to provide data capture and improve taxonomic identification of the landings. This estimation methodology could be useful in MSFD assessments profiting from concurrent sampling. Future developments of Descriptor 3 could also be regarded. Data poor stoks and methods for criterion 3 (Population age and size distribution) are currently under discussion and the role of fish lengths is not yet determined. In both cases, amelioration of IEO landing estimations and further developments of criterions in MSFD, data from concurrent sampling could be of interest in future assessments.
ES - IEO (LD)	LEJANAS: No. See answer question 1 and 2.
ES - IEO (MED)	Concurrent sampling data can be used for descriptors 1 (Biodiversity), 2 (Non-indigenous species), 3 (Commercial fish and shellfish), 4 (Food webs), 8 (Contaminants) and 10 (Marine litter).
FI	There was an increase: a new possibility to get data from the length distributions of commercially low valued species.
IE	At sea sampling has increased the capability to supply commercial catch data for MSFD descriptors esp bycatch of cetaceans, seabirds and PET fish species for descriptor 1 (mobile species component), bycatch of vulnerable habitat indicator species (D1 – habitat component and D6 sea floor integrity), however this cannot be directly attributed to concurrent sampling and is more likely a result of expanding the observer at sea programme to record non fish species.
LT	Discard and bycatch data could not be sampled in areas where such catch category is forbiden (like NEAFC)
LV	The sampling capability did not change.
NL	Not relevant
PT	Implementation of concurrent sampling didn't have effects on the capability to supply commercial catch data for MSFD descriptors. Only research survey data was used to compute MSFD descriptors. It could however be used to, e.g., monitor long-term changes in mean-length of landings.
SE	No (as we do not sample concurrently in harbors),see above. Most of the data for MSFD descriptors origins from surveys. Concurrent at sea to some extent used.
UK - E+W	No.
UK - SCO	Not applicable.

MS	7. Did the implementation of concurrent sampling increase or decrease the capability of your institute to supply commercial catch data for other assessment or management purposes (e.g. discard ban evaluations, advice to national or international authorities)? If yes, please detail which purposes.
CY	Considering that with concurrent sampling DFMR is collecting data on all species of interest with minimum landing size under the Mediterranean Regulation, we consider that these data can be used for evaluating implications of discard ban in Cyprus.
DE - TI-OF	n.a.
DE - TI-SF	n.a.
DK	We implemented concurrent sampling at-sea in 1996, when we started the at-sea program
EE	No. Discarding has been banned in the Estonian EEZ all the time, and our test-fishing programme allows to separate the „potential" discard part (undersized specimens eg).
ES - AZTI	Sampling on board has been always done concurrently, and collected data have proven to be useful for discard ban evaluations and the design of discards plans Data coming from concurrent port sampling has not been used yet for assessment purpose, but it is expected to be used in the future in the context of the ecosystem approach to fisheries management (multispecies and ecosystem assessment models)
ES - IEO (ICES)	Current IEO methodology –explained in answer 6—to estimate landings benefits from concurrent sampling implementation. Nevertheless, most part of requirements for assessment or management purposes received until now refer to species with TAC which were already covered under non concurrent sampling scheme. Regarding the discard ban, it has to be noticed that IEO has always done concurrent sampling on board.
ES - IEO (LD)	LEJANAS: No. See answer question 1 and 2.
ES - IEO (MED)	Yes, it did. For example, in 2014 the IEO responded to the request of information about the landing obligation of the European Parliament's Committee on (Regional Development) with the document: "The obligation to land all catches – consequences for the Mediterranean" (IP/B/PECH/IC/2013-168). In this document size composition of some non-targetspecies (Pagellus acarne, Pagellus bogaraveo, Pagellus erythrinus) were used.
FI	No major changes.
IE	Port-based concurrent sampling has not. Sea-based concurrent sampling has, but our sea-based sampling will be concurrent regardless of the regulations.
LT	no
LV	The implementation of concurrent sampling did not influenced capability of our institute.
NL	Not relevant
PT	Implementation of concurrent sampling increased the capability to supply commercial catch data for other assessment purposes, namely discard ban. Sampling on board has been always done concurrently. Data collected proven to be useful for discard ban plans.
SE	Our capacity to supply commercial catch for other assessment and management purposes is largely dependent on our concurrent sampling at sea (discard plans (de minimis), exceptions from effort regulation in the cod plan for highly selective gears, advice to national authorities….). We do not see that we would significantly increase the capacity if we sampled concurrently in harbours.
UK - E+W	Only the offshore data – see 1.
UK - SCO	Not applicable.

MS	8. Did the implementation of concurrent sampling increase or decrease the capability of your institute to supply commercial catch data for other purposes (e.g. research projects)? If yes, please detail examples.
CY	No.
DE - TI-OF	n.a.
DE - TI-SF	n.a.
DK	We implemented concurrent sampling at-sea in 1996, when we started the at-sea program
EE	No
ES - AZTI	Catch data by species are being used in several projects: discardless, devotes, (i.e. catches pf cephalopods by species), other local projects (ecopes). Data on length distribution has not been used yet because the time series is not long enough. But it is expected that they will be used in the future to feed ecosystem models
ES - IEO (ICES)	Concurrent data has been provided to several projects working on management of mixed fisheries (AFRAME, GEPETO), multispecies assessment (NEOX) and ecosystem changes (ECLIPSAME). Concurrent sampling provides an important source of information to manage poor-data stocks. The exploitation of stocks without analytical assessment can be parameterized in mixed fisheries management analyses, in order to provide scenarios to managers on which decide appropriate harvest control rules. For this, it is essential a concurrent metier-based sampling instead of the traditional stock-based sampling, since it is necessary to know the total catch profile to obtain the respective partial fishing mortalities.
ES - IEO (LD)	LEJANAS: No. See answer question 1 and 2.
ES - IEO (MED)	Yes, it did. In 2014 the IEO took part in some European research projects (MAREA – LANDMED, DISCATCH) and National Projects (VADEAR) in which the data of the concurrent sampling were used.
FI	Yes, for example in case of pike-perch. Undersized pike-perch specimens in the fishery of other target species were not measured earlier, now they are.
IE	Port-based concurrent sampling has not. Sea-based concurrent sampling has, but our sea-based sampling will be concurrent regardless of the regulations.
LT	no
LV	The implementation of concurrent sampling did not influenced capability of our institute.
NL	Not relevant
PT	Implementation of concurrent sampling increased the capability to supply commercial catch data for other purposes. Detailed information on species landed together under the same trade name proven to be useful to solve problems on species misidentification and to advice the national authorities. Longer time series on concurrent sampling data will allow future use in the context of ecosystem approach to fisheries management. They will also be important to support fisheries certification.
SE	Relevant for sampling at sea but not sampling in harbours.
UK - E+W	Offshore programme maintained. Onshore data has not been used in any further analysis.
UK - SCO	Not applicable.

MS	9. Did your institute upload commercial catch data sampled concurrently in the period 2009-2013 to the RDB? If your institute did not upload these data or has carried out a partial upload (e.g. some métiers, some years or some species), please specify the reasons and which data (if any) was uploaded.
CY	Not relevant concerning the RDB.
DE - TI-OF	Yes, Germany uploaded data to the RDB.
DE - TI-SF	Yes, Germany uploaded data to the RDB.
DK	Yes
EE	Yes, data are uploaded to the FishFrame (RDB).
ES - AZTI	Spain provided transversal data to the last RCMs, but did not upload transversal data, nor sampling data in the RDB for the period 2009-2013. This year, AZTI will try to upload sampling data related with Basque fisheries in response to the forthcoming RCM NA data call
ES - IEO (ICES)	Following instructions from the Spanish national correspondent, IEO did not upload any sampling data to the RDB in the period 2009-2013. In 2014, Spanish data (CS, CE and CL matrices) were not uploaded but provided to RCM NA (2013 data covering all metier and all species). IEO has recently agreed with the Spanish Administration to assume the RDB data provision starting from this year.
ES - IEO (LD)	LEJANAS: Commercial samplings data (2009-2013) for Data Call for RCM NS&EA 2014 were prepared in format FishFrame but not uploaded into the RDB because ESP is not obliged under the DCF to upload DCF data in international data bases. However csData were send by email to the chair of RCM NS&EA 2014.
ES - IEO (MED)	The RDB of the Mediterranean and Black Sea is still in developing process. However, our institute answers to all the data calls, requested by different bodies (GFCM, JRC).
FI	All metiers, except FYK_ANA_>0_0_0, which is not sampled concurrently.
IE	Yes, all data was uploaded , except Nephrops
LT	Lithuania uploaded North Atlantic catch data sampled concurrently to the RDB from 2011 and Baltic Sea catch data from 2013. Sampling on board has been always done concurrently, but Lithuania uploaded data to RDB only for species used for stock assessment until 2013. This year, Lithuania will upload commercial catch data sampled concurrently.
LV	Our institute has uploaded all commercial catch data.
NL	Not relevant
PT	Yes, most of data was uploaded. Several upload issues prevented full data upload (i.e. missing species, metiers and areas in the look up tables).
SE	Yes
UK - E+W	UKE uploaded data for all DCF collected samples. The RDB does not hold data by sampling scheme and separate those trips sampled concurrently from those that are not. Some parameters sampled could not be uploaded.
UK - SCO	Concurrently sampled catch data have been uploaded to the RDB as part of the usual national submission.

MS	10. Can you identify future benefits that can be obtained from concurrent sampling under the new and broader scopes of the revised DCF, such as the evaluation of impacts of fisheries on marine biological resources and on the ecosystem? Can these benefits be achieved more cost effectively from non-concurrent sampling of all species of interest?
CY	For DFMR, concurrent sampling is the most efficient way for sampling all the selected species. In the case of mixed fisheries, which is a rule for Cyprus, by sampling all species of interest from all sampling trips, , we consider that the information collected allows us to evaluate the impacts of the fisheries in all concerned stocks.
DE - TI-OF	In the opinion of TI-OF, concurrent sampling is the first choice to obtain information on commercial catches for all purposes.
DE - TI-SF	In the opinion of TI-SF, concurrent sampling is the first choice to obtain information on commercial catches for all purposes.
DK	If concurrent sampling include non-organic material e.g. litter, then it could be used for a range of other purposes. Invasive and PETS species – present or not
EE	These benefits can be achieved more cost effectively from non-concurrent sampling of all species of interest, as (mostly for national purposes) concurrent sampling has little positive effect on getting data for species which abundance is low and in coastal zone (test fishing in particular places and seasons is much more effective).
ES - AZTI	To feed ecosystem assessment models (length distribution, catches by species) Concurrent sampling can be used to collect relevant information at the ports, once the discard ban is applied Concurrent sampling ensures that the whole catch is being sampled in every country, and don't leave the selection of species to sample to the discretion of each MS Concurrent sampling of catches coming from the artisanal fleet will allow to improve the available data for this fleet
ES - IEO (ICES)	Identified benefits are: - Length information from more landed species - Landings estimation of secondary species. - Improving the registration of landings composition. Important characteristic of concurrent sampling is the homogeneity in the data collection through all fishing activities and species, thus allowing current and future undetermined uses of the information. These benefits could not be completely obtained from non-concurrent sampling of all species of interest. Main reason are: - Difficulty to define a group of current species of interest. Currently all end-users can beneficiate from concurrent data while defining a group of species could only be done through "current" end-users. - Difficulty to anticipate the evolution of that group of species: entrances and exits from the selected group of species. - Difficulties to obtain a consistent historic data series. Once the need is detected, the sampling programme has to be updated to compile the information, meaning both some time period is needed (thus not registering the information) and previous time series is not available.
ES - IEO (LD)	LEJANAS: It could consider the introduction of the data collection and sampling for the identification of vulnerable marine ecosystems of the fishing activity, incidental catches, stomach samples for feeding studies and genetic samples to support population studies.
ES - IEO (MED)	As the information obtained by concurrent sampling covers a large range of species, it can be used for the calculation of indicators which can help to analyze the state of the resources at an ecosystemic level. Size-based indicators (like biomass, abundance and size spectra or mean maximum length) can be used to assess the impact of fisheries on the ecosystem. Non-concurrent sampling is important to many target species, for which stock-specific stock assessment are routinely carried out, the importance of maintain concurrent sampling is clear for us. In this sense, both approach are complementary and non-exclusive.
FI	Concurrent sampling provides better overview on e.g. evaluation of impacts of fisheries on marine biological resources and on the ecosystem than single species sampling and is more cost -efficienct.
IE	From a stock assessment point of view, there are no major benefits; species composition (by weight) for landings is known from census data (logbook, sales notes). Additional benefits that could not be obtained more cost-effectively by non-concurrent sampling are not apparent. Currently Ireland is using the at sea programme to monitor by catch of birds, marine mammals; PETS (Protected, endangered and threatened species), and indicator species for Vulnerable Marine Habitats. Land based sampling whilst easier and more cost effective cannot monitor by catch. If this aspect of the observer sampling programme occurs on a haul by haul basis, it can be used to evaluate the impacts of fisheries on marine biological resources and on the ecosystem without necessarily continuing concurrent sampling. On a haul by haul basis is preferential to a trip level, as it allows determining the specific location of bycatch species, esp non mobile invertebrates. When new personnel are trained in the at sea catch sampling protocols we do some fish species id, however some of the more difficult species may be mis-identified. Not all contractors are scientifically trained so id of benthic invertebrates and birds may be an issue, further training will be required and quality assurance protocols will have to be developed. The main benefit in Ireland of the concurrent sampling at sea is that we receive data on length and catches including positional data in some cases for non-quota species in the landings. The main benefits of this data is to support the development of assessments for data poor stocks esp non-quota species and for the assessment of ecosystem effects on the fish community. It also provides the data for any PET fish species that would be landed.
LT	Collected concurrent sampling data have been useful for discard ban evaluations. After implementation of discard ban in some fishing regions more accurate data on bycatch could be collected
LV	The implementation of concurrent sampling did not influenced sampling of fisheries in Latvia due to fisheries peculiarities described above.
NL	Current procedures are sufficient for future use. Extensive logbook information is available. The major improvement in datacollection would be a good administration of discards, former discards now landed ashore and actual landings to arrive at a good catch estimate.
PT	Future purposes/benefits include: - To be used in ecosystem approach models; - Develop new ecosystem indicators; - New species assessment; - Information on rare species and PETS mortality; - Assess effects of climate changes; - Support fisheries certification; Concurrent sampling seems the more cost effective scheme to obtain information on commercial catches to feed these purposes.
SE	We think that concurrent sampling at sea is beneficial but that concurrent sampling in harbours is not always (in the fisheries that we sample) cost-effective.
UK - E+W	Catch composition regulations despite the landing obligation will persist as fisheries implement discard plans and manage their de minimus and defacto derogations. Bycatch composition for mixed fisheries and target species might become more defined. If we are not concurrent sampling we will need still need to decide which species we need to sample once we have selected a trip.
UK - SCO	Concurrent sampling of the whole catch would ensure that all relevant species are sampled.

MS	11. Can you identify disadvantages of carrying out concurrent sampling in commercial catches? If yes, please specify those disadvantages and how sampling non-concurrently might improve the situation.
CY	No.
DE - TI-OF	In the Baltic Sea, additional costs in terms of staff and time are negligible due to a species-poor environment. Occasional disadvantage: see point 2.
DE - TI-SF	Staff-intensive, labour costs
DK	Time and cost
EE	Unproportional increase of workload and expenses in some cases.
ES - AZTI	Sampling at port: more time needed to perform the sampling. In the offshore fleet, sometimes the time window we have to sample is not enough Sampling on board: has always been concurrent. No disadvantages observed
ES - IEO (ICES)	Not theoretical disadvantages. Disadvantages are related to the increase of work to compile, record and manage the information.
ES - IEO (LD)	LEJANAS: It would be appropriate to improve on the definition of the predefined assemblage of species currently established in the DCF (Decision 2010/93/UE).
ES - IEO (MED)	The main disadvantage is the increase of work on board and on the number of samples. However, this is no longer a problem, as new sampling schemes have been applied since 2009. Another disadvantage is that, for some target species, the number of individuals measured during the concurrent sampling is low (due to their scarcity, like for *Lophius spp*), but this problem can be solve by complementary species-based sampling.
FI	No.
IE	There was an initial concern that there was reduction in sampling quality for commercial species, but this was not the case. The main disadvantage is that it is difficult to carry out concurrent sampling completely and it is resource hungry and takes time with limited time available. If there were targets in terms of numbers measured and numbers of samples for stock based sampling it might be more efficient as this could be targeted more efficiently. Resource implications are the only disadvantages.
LT	The only disadvantage could be that this require more effort in terms of time and man power.
LV	No disadvantages for sampling in the Baltic Sea.
NL	High costs, labour intensive and not necessary to obtain the required information.
PT	Disadvantages of carrying concurrent sampling at market: time consuming; labour costs; higher risk of industry saturation.
SE	It is not (always) cost-effective to carry out concurrent sampling in harbours when the main aim is to collect data to support analytical assessment. Better quality for less money if sampling is targeted towards the species of interest.
UK - E+W	The only disadvantage is as mentioned before is the resources required if the data is not required or of use.
UK - SCO	Concurrent sampling is very time-consuming. There may be a tendency to target trips with fewer species when attempting to concurrently sample trips on a market. This would lead to bias.

MS	12. If you have any additional comments on concurrent sampling of commercial catch that you would like to provide WKISCON2, please state them here.
CY	No additional comments.
DE - TI-OF	(none)
DE - TI-SF	(none)
DK	Concurrent length sampling from a trip
EE	No
ES - AZTI	---
ES - IEO (ICES)	Form the scientific point of view, concurrent sampling has facilitated the leap from the single-stock approach to the ecosystem approach. A important criticism has been the lack of coordination of its implementation between countries. This can be amended betting on a real regionalization of the European sampling programs. The regional standardization of a list of secondary species would allow saving the economic cost done in last years.
ES - IEO (LD)	LEJANAS: Info about these fisheries Metiers in ICES Divisions: OTB_DEF_>=120_0_0 I-II Div. OTM_DEF_100-119_0_0 I-II Div. OTM_DEF_100-129_0_0 XII-XIVb Div OTB_DWS_100-129_0_0 VIb-XII Div. Vessels > 40 m Regional coordination on RCM NS&EA Similar sampling scheme, regional coordination and type of vessels for the NAFO area.
ES - IEO (MED)	---
FI	No additional comments.
IE	---
LT	No comments
LV	No additional comments.
NL	Do not impose CS to Member States. Leave the choice of sampling procedures to the MS.
PT	None.
SE	Our experience is that we get useful and important data and knowledge on exploitation patterns in fisheries (incl by-catches and discards) from concurrent sampling at sea. Concurrent sampling in harbours, are in our case, logistically difficult and not best use of money. This does however not mean that concurrent sampling in harbours always is wrong. This is most likely dependent on the main objectives of the sampling program as well as logistical constrains at the landing sites to in a robust way get access to all species at landings.
UK - E+W	---
UK - SCO	---

Annex 10: Questionnaire sent to selected ICES Expert Groups

To: Chairs of ICES WG's and WK's using commercial catch data
Reply to advice@ices.dk by 30th April 2013

One of the major changes in the EU Data Collection Framework (DCF) that came into force in 2009 was the introduction of concurrent sampling, i.e. the sampling of all species (or a predefined list of species) from a trip, for both landings and discards. With this strategy the DCF aimed to facilitate the data demands of the existing stock-based assessments as well as serving the revised needs for the ecosystem approach to fishery management. Recent discussions in STECF (STECF, 12-07) and RCM NA (2014), among other, have noted that concurrent sampling of different fish stocks is carried out differently by different MS, while at the same time recognizing both pros and cons to the adoption of concurrent sampling. In particular the RCM NA (2014) stated that "*It is unclear whether the significant resource needed to carry out concurrent sampling provides benefits that outweigh the costs. Some ICES Working groups have benefited from concurrent sampling data collected however there is no empirical evidence to support this. In order to decide if concurrent sampling should continue, more feedback from end-users is required*". To follow-up on this, RCM NA, and the Liaison Meeting requested that ICES WGCATCH set up a workshop to evaluate the implications of stopping concurrent sampling and the benefits concurrent sampling is providing (or can provide) considering the new and broader scopes of the revised DCF, such as the evaluation of impacts of fisheries on marine biological resources and the ecosystem. You are requested to provide feedback to the Workshop on implementation studies on concurrent length sampling (WKISCON2).

Note: In your reply please consider only the effects that can be directly attributed to the adoption of concurrent sampling (understood as data not available previously to 2009) excluding other data changes (such as those brought about by the adoption of sampling by *métiers* and other changes brought about by the implementation of DCF).

WG/WK Name:
WG/WK chair(s):
WG/WK chair(s) email address(es):

1. Are you aware of the availability of concurrently sampled multi-species landings and discard data?

2. Does the work of your WG/WK specifically require concurrently sampled data? If yes, please describe the variables of interest / stocks involved.

3. Did your WG/WK notice any change in the availability and/or quality of length or age data from commercial catches with the implementation of the revised DCF in 2009? If yes, please describe the variables of interest / stocks involved and the changes noticed.

4. Can you identify benefits that can be obtained in the context of your WG/WK from the use of concurrent data, such as the evaluation of impacts of fisheries on marine biological resources and on the ecosystem? If yes, please specify if those benefits require the sampling of all species in a trip or if a pre-defined list of species would be enough.

5. Can you identify disadvantages to your WG/WK from carrying out concurrent sampling in commercial catches? If yes, please specify those disadvantages and how sampling non-concurrently might improve the situation.

6. If you have any additional comments on concurrent sampling of commercial catch that you would like to provide WKISCON2, please state them here.

Annex 11: Answers from Chairs of ICES EGs to questionnaires

WG - WK acronym	1. Are you aware of the availability of concurrently sampled multi-species landings and discard data?
AFWG	No, not for EU sampling of catches in ICES I and II. EU fisheries are a very minor part of toal catches in this area for stocks assessed by AFWG.
HAWG	We are aware that it is available (though relevance is low for ‘clean’ pelagic fisheries), but ease of availability is limited.
NIPAG	No
NWWG	yes
PGDATA	We are aware of the DCF requirements but not how these have been carried out by different countries.
SGPIDS3	yes
WGBAST	Yes, but the landing obligation has been in force from the beginning of 2015 for the Baltic salmon so that we just expect the data accumulation (on proportion of undersized salmon) to start. This is related to a standard sampling in the salmon fisheries and probably not to the concurrent sampling.
WGBFAS	yes
WGBIE	Yes
WGBIOP	We are aware that it is available, however the initial relevance is low for our particular working group dealing with biological parameters of the samples. When the group has matured and consolidated the ToRs, concurrent sampling of biological parameters would have potential for the assessment of ecosystem status.
WGBYC	Yes
WGCATCH	Yes
WGCEPH	Yes, I am aware.
WGCOMEDA	No
WGCRAN	Yes
WGEEL	No. Most eel fisheries specifically target eel and have little or no bycatch of other species that would be sampled for DCF requirements. Therefore this topic is not so relevant for eel and eel data. However, please note that this answer does not mean that some eel fisheries don’t have bycatch, because some bycatches can be significant, but only that the species caught are not pertinent to DCF considerations.
WGEF	Yes.
WGHANSA	Yes
WGIAB	Yes, but not in depth
WGINOR	No, this has not been brought up at WGINOR meetings, which might be related to that no scientist from EU countries has attended them, perhaps as a consequence of EU being a relatively small player in the fishery in Norwegian Sea.
WGINOSE	At a national level but only at regional level intenationally
WGNAS	These not relevant to Atlantic salmon, which are not caught in mixed fisheries to any great extent. Most salmon are caught in targeted fisheries in homewaters, principally net and trap fisheries in estuaries and inshore coastal areas, and rod-and-line fisheries in freshwater. There is very little by-catch of other species of fish in these fisheries that might be of relevance in the context of DCF monitoring. Similarly, there is negligible by-catch in the inshore drift and gill net fishery which operates on mixed stocks of salmon in the waters off west Greenland (presumably not covered by DCF anyway). The only concurrent sampling that occurs in many homewater salmon fisheries would be the recording of catch data for anadromous sea trout from the same rivers of origin as the salmon.
WGNEW (extinct)	No
WGNSSK	Yes
WGRECORDS	No
WGRFS	Yes, but no concurrent sampling of recreational length data & only for species regulated by quotas (e.g. no data on sea trout in the Baltic Sea
WGSAM	Yes

WG - WK acronym	2. Does the work of your WG/WK specifically require concurrently sampled data? If yes, please describe the variables of interest / stocks involved.
AFWG	No
HAWG	For the core task of assessments, concurrently sampled data is not necessary. For the assessment of ecosystem status information on bycatch / PETS is of interest for herring, sprat and sandeel.
NIPAG	No
NWWG	No
PGDATA	PGDATA deals with end-user needs for data and will be interested to know if WKISCON2 identifies specific needs for concurrent sampling on shore or identifies any deterioration in data quality for individual species caused by concurrent sampling, or benefits that such sampling has brought. Concurrent sampling could for example be beneficial in a discard ban situation where it is important to compare the total length distribution from a catch to the total length distribution from a vessels landings.
SGPIDS3	Yes it did, discard estimates collected at-sea
WGBAST	Not required, but would be useful to estimate the rate of discards (e.g. proportion of undersized salmon) in different fisheries. Just to make sure on the true magnitudes.
WGBFAS	No, presently our working group does not require concurrent sampled data. However, some member states does presently not sample all the commercial data and this is off course important under a discard ban. There has been a tendency among some countries only to sample the discard species important to the flag country landing pattern. When moving to a discard ban some species can become chock species and it is therefore important to have discard information from all countries.
WGBIE	WGBIE does not specifically require concurrent sampling data.
WGBIOP	No
WGBYC	WGBYC primarily works with data on the bycatch of PETS (protected, endangered and threatened species – including marine mammals, sea turtles, sea birds and fish). Any data collected on the discard of PETS is of significant interest to WGBYC. However, we do not use length/age data sampled port-side or at sea. Our primary mission is estimate bycatch rates (# animals observed per day at sea or other unit of effort) for PETS. Estimated bycatch rates are expanded by total effort by métier to evaluate absolute removal levels for PETS as a result of bycatch in commercial fisheries.
WGCATCH	No
WGCEPH	No, it does not specifically require concurrently sampled data. It is just one part of the data being collected for the report.
WGCOMEDA	We use mainly fishery-independent data (i.e. surveys) from both Atlantic and Mediterranean sapling areas.
WGCRAN	Yes we require these data. The brown shrimp fishery is largely unregulated and there is no quota for brown shrimp so far. Depending on the nets used, the season and the area different fractions of undersized shrimps are caught which are discarded. Furthermore the shrimp fisheries has been critized especially for the amount fo undersized flatfished in the bycatch. Data on both the fraction of fish bycatch and undersized shrimps is not monitored besides the DCF efforts. These data thus give a valuable insight in the effects of the brown shrimp fishery on the stock and other stocks.
WGEEL	No
WGEF	Currently the advice provided for most elasmobranch stock does not specifically require a concurrent sampling program. Nevertheless since catches of elasmobranch are not derived from target fisheries, a good coverage of the different fisheries catching them is likely to have a positive effect on the quality of the available fishery data.
WGHANSA	No, WGHANSA stocks mostly rely on survey data and the fishing vessels are mostly targeting very few species (often 1 or 2)
WGIAB	no
WGINOR	No it is probably not critical, even if reliable data on fish removal from the Norwegian Sea is highly relevant for our WG. The main reason is given in the answer to question 1, beside the fact that the fishery there is relatively “clean” (i.e. not mixed) and by-catch of juveniles usually small as a consequence of their not being on the fishing grounds.
WGINOSE	Demersal and pelagic fish stocks – see previous (2013/14) WGINOSE reports for full lists of variables
WGNAS	No.
WGNEW (extinct)	WGNEW mainly used survey trends to describe stock trends, and used the available fisheries dependent data rather opportunically.
WGNSSK	Yes (so far landings and discards by weight for various bycatch species; future benchmarks aim for age based assessments (e.g., dab and witch) but it is not yet clear whether this will be successful. In addition, information on maturity at length is used for various category 3 stocks.
WGRECORDS	Because of the generally low abundance of diadromous species at sea and/or the special fishing techniques required to catch these species, WGRECORDS and the other EG’s studying diadromous species can seldom benefit much of concurrently sampled data. However, in certain cases concurrent sampling would bring valuable information also about diad. species. E.g., quantification of bycatches of these species, or sampling of such life stages which would be too costly to be sampled by other means.
WGRFS	Yes, we require recreational length data to estimate recreational catches and to convert them to numbers at age for assessment purposes. Since the recreational length distribution does not necessarily match the commercial length distribution we require recreational length data for those stocks where recreational removals take a high proportion of a given stock. Western Baltic Cod: recreational length data only for SD 22 & SD 24 (Germany) but not for SD 23; also no commercial length data from SD23 Sea bass ICES IV-VII: no on-site length data collected only from angling diaries Pollack (North Sea): no recreational length data Sea trout (Baltic Sea): no commercial length data very little recreational length data (SD 22 & SD 24, Germany)
WGSAM	Yes WG members use multi-species and ecosystem models that quantify sources of mortality from fisheries and from predator-prey interactions. Some of the models have detailed representation of species (up to 70) and of fleets also, thus enabling the evaluation of multispecies and mixed fishery affects at the same time. These tools can be used to evaluate the ecosystem affects of fisheries and to examine the relative impacts of fisheris and predation effects, both on species in the system and fisheries that depend upon them. Critically, they also enable examination of the effects on non-target species caught as bytcath so its important that this information is recorded at species level. With the implementation of the new CFP, and move toward multispecies multiannual plans under a landing obligation, the need for concurrent information has never been more important. Adding to this, implementation of MSFD and its inclusion of fishery objectives, points to the necessity for more information required for management.

WG - WK acronym	3. Did your WG/WK notice any change in the availability and/or quality of length or age data from commercial catches with the implementation of the revised DCF in 2009? If yes, please describe the variables of interest / stocks involved and the changes noticed.
AFWG	No
HAWG	We are unsure to what extent the revised DCF has had an effect on quality and availability. The national sampling coverage has increased. We can indicate that owing to InterCatch and foreign vessel sampling agreements between MS quality and availability of samples has improved.
NIPAG	Not as far as I am aware
NWWG	Before my time in ICES, so NA
PGDATA	Not applicable to PGDATA
SGPIDS3	No
WGBAST	No, we did not notice any change. In the Baltic salmon assessment there are two data needs associated in multi-species landings and discards: 1) amounts of small salmon (post-smolts) caught in the pelagic (industrial) fisheries e,g, trawl fisheries for the sprat and Baltic herring; 2) amounts of undersized salmon in the different salmon fisheries. Neither of these have been satisfied with the sampling data so far.
WGBFAS	We have received more information on the flatfish species (flounder, plaice, dab)
WGBIE	Yes, for instance, for the anglerfish stocks (anb-78ab anp-78ab) this might have had an negative impact on the level of sampling (too small samples in some strata). For the ANB8c9a and ANP8c9a: the number of fish sampled drop drastically, affecting the length distribution and the split of the catches by species.
WGBIOP	We are unsure to what extent the revised DCF has had an effect on quality and availability. The national sampling coverage has increased and the aim to quality assure the biological parameters has been prioritized.
WGBYC	WGBYC does not work with length or age data from commercial catches.
WGCATCH	No, this WG does not use raw data, except in case studies. No case studies have focused on changes in availability or quality in the length or age data.
WGCEPH	No really. We thought that the change was going to be for better buit no data is made available to the group however it is not consequence of the revised DCF 2009.
WGCOMEDA	Not used.
WGCRAN	In the beginning the sampling situation was low and increased over the recent years. However obtaining the data in a detailed manner is not always possible and depends on the interests and the collaboration with the scientists of the different institutes collecting them. Thus although the data and information are of high interest to the group we do not have the most recent data available to really judge quality changes.
WGEEL	N/A
WGEF	(FIRST PART OF THE QUESTION MAY VARY ACROSS MEMBER STATES). In WGEF the data requirements for advice of most stocks manly relies on landing data so the following considerations do not focus on the variables: length and age. Portugal (ICES IXa) – the adoption of a concurrent sampling had effect on the data available for elasmobranch. After 2009, the number of chondrichthyan species for which fishery sampling data is available increased. In particular, information on chondrichthyans became available for a more diverse list of fisheries taking place. However the quality of the data in regarding to species landing estimates are still questionable. For DCR purposes most chondrichthyan continue not to be included in the priority 1 list.
WGHANSA	No
WGIAB	We assume the changes have been to the better but the data has not been used in the analyses
WGINOR	No
WGINOSE	No
WGNAS	No – not applicable.
WGNEW (extinct)	No, in general availability of fisheries dependent data for WGNEW was limited, and given that most effort was put in analyzing fisheries independent data, we did not notice an increase in the availability or quality of the length- or age data from commercial catches. In addition, many countries did not even show up at WGNEW, so we were unaware of any increase in sampling, or changes to the sampling strategy.
WGNSSK	Yes (more age information available for bycatch species but often still not enough. For example, turbot is an important bycatch species but the assessment is still too uncertain because of insufficient information on age information from different fleets.
WGRECORDS	WGRECORDS is a coordinating 'umbrella group' for all other EG's studying diadromous species and therefore WGRECORDS does not go into such details needed to answer this question → I advice you to consult other EG's in this question.
WGRFS	For the use of recreational catch data in stock assessments we require commercial and recreational length data. Sometimes commercial length data is not available, e.g. western Baltic cod in SD23 and/or sea trout/salmon length data – on the other hand we require recreational length data for conversion of catches in numbers to biomass and/or length at age data (again using available commercial ALK). We haven't noticed any change since 2009. In general, the availability of recreational length data is patchy, often completely absent and of varying quality. Due to the changing availability of fish in costal areas, there can be annual variations, which would favor concurrent sampling. However, it is not necessarily required to have concurrent sampling but to have at least on complete set of length distribution data for a given stock in given area.
WGSAM	Multispecies models that explicitly take account of age and length (eg. SMS and Gadget) need good quality information on this.

WG - WK acronym	4. Can you identify benefits that can be obtained in the context of your WG/WK from the use of concurrent data, such as the evaluation of impacts of fisheries on marine biological resources and on the ecosystem? If yes, please specify if those benefits require the sampling of all species in a trip or if a pre-defined list of species would be enough.
AFWG	N/A
HAWG	For the core task of assessments, concurrently sampled data could be useful in the small-mesh fishery where catches contain both herring and sprat. For the assessment of ecosystem status, information on bycatch / PETS is of interest for herring, sprat and sandeel to assess the overlap and fishing pressure on large pelagics or marine mammals. Not all species have to be sampled, but a pre-defined short-list would suffice.
NIPAG	I don't think there has been any analysis of this in NIPAG
NWWG	Yes. Better by-catch data. A pre-defined list would suffice.
PGDATA	Concurrent sampling of landings was presumably intended for evaluating the size-selectivity of impacts on co-occurring species by individual métiers (gear; mesh etc.). Depending on end user, this could be relevant for mixed-fishery modelling, or evaluating ecosystem impacts and impacts on rare/endangered species. Unfortunately the DCF does not clearly specify such objectives. They would have different data requirements. You need to consider how the cost-benefit of concurrent sampling (as opposed to assembling the length data for a métier from non-concurrent stock based sampling), could or should be evaluated, for each type of end use, a topic of interest to PGDATA.
SGPIDS3	Collecting full species composition for at-sea sampling of discards is the only way to document the discard composition. For the at-sea context if you had a predefined list of species you would not know the full discard species composition and it would be impossible to estimate the full discard weight.
WGBAST	There are suspicions that substantial amounts of young salmon are caught in the pelagic fisheries. Any data on the subject would be useful. Effects on the natural mortality estimates.
WGBIE	No real benefits from single stock assessment point of view up to now but this might change in the future with more emphasis from ICES on ecosystem impact of fishing and mixed fishery approach.
WGBIOP	For the assessment of ecosystem status, information on the biological composition of concurrent caught species could be useful once we have a way to gauge these. In that case, all species on a trip would be needed initially.
WGBYC	Concurrent sampling (within the context of sampling all catches at sea, both kept and discard) is essential to the work of WGBYC to evaluate the magnitude of fisheries bycatch on PETS. Bycatch of PETS are generally rare events. As a result, 100% of catch/discard from all hauls within a trip must be observed to reduce bias in estimation of PETS bycatch rates. Furthering our understanding of the role of PETS in the ecosystem is essential to their management and conservation. Data collected from concurrent sampling schemes is necessary for filling data gaps.
WGCATCH	I cant think of any information that concurrent sampling provides that cannot be provided by sampling different species on different trips.
WGCEPH	I understand that for species (cephalopods) with no assessment and TAC and quota, it is of more interest to collect data on all species on a trip…as the amunt of species copvered by this group is quite large and the interest on species is both in the single and in the role of trhe cephalopods in the ecosystem.
WGCOMEDA	It may provide benefits in the future, but not really in the current ongoing topics of research that mainly use survey data.
WGCRAN	see 2.As WGCRAN relies to some extent on commercial data (LPUE, effort, total landings etc., VMS) each rather independent scientific validation of these data is highly appreciated.
WGEEL	Possibly – if concurrent sampling provided data on eel bycatch in sampled commercial marine species fisheries, although we would anticipate that any such bycatch would be of small quantities and irregular occurrence.
WGEF	For the scope of WGEF the concurrent sampling, with a good spatial and temporal coverage, will enable to get estimates of landings from the different fisheries catching chondrichthyans Under the actual advice provided for most elasmobranch stock a complete list of chondrichthyan species landed in a trip is strongly recommended.
WGBFAS	We have presently not used information from the observer trips that could be used in an ecosystem context. But if we would do that, I could imagine that we could look at ecosystem changes by analysis the species composition over time (new warm water species in the system)
WGHANSA	Length distribution of landings and discards are requested for some stocks as their lack is for the moment a problem to carry an analytical assessment.
WGIAB	Presumably, the benefits would be higher if all species are sampled
WGINOR	Discards ban has been in action for many years for the major parties in the fishery in Norwegian Sea (Faroe Island, Iceland, Norway and Russia) and by-catch of none-targeting species (e.g. blue whiting or redfish in the fishery for Norwegian spring spawning herring) is supposed to be recorded and sampled. We don't know if it holds but in can be argued that similar rules for EU vessels, even if small players, are beneficial.
WGINOSE	Spatial/temporal maps of fisheries and fish distribution
WGNAS	Possibly – if concurrent sampling provided data on the by-catch of salmon post-smolts or adults in commercial pelagic fisheries. We would anticipate that any such by-catch would be of small quantities and irregular occurrence.
WGNEW (extinct)	I would guess that the concurrent sampling gives better insight in the correlations of catchabilities within fisheries at a trip level. However, I do not know of any stock assessment method that explicitly accounts for the sampling strategy at the trip level.
WGNSSK	Yes, but so far mainly based on catch information by weight. Length or age distributions for bycatch species may be used in future assessments.
WGRECORDS	Yes, sure. I think it should be a general rule to sample all species in a trip. If going into species level would be inappropriate in some cases, then genus or family of the caught species should be identified.
WGRFS	No. See answer above. In general we require at least one set of recreational length data for a given region. In terms of commercial length data it would be good to have data also for species where the fishery (both commercial & recreational) has a noticeable impact on the stock, independent if this species is managed by quotas and/or a management plan, e.g. Baltic sea trout.
WGSAM	The ability to develop and operationalise models for use in providing advice on and evaluation of management options consistent with an ecosystem approach. Without this kind of data, the capability that is now being demanded and expected under the CFP and MSFD will not be possible.

WG - WK acronym	5. Can you identify disadvantages to your WG/WK from carrying out concurrent sampling in commercial catches? If yes, please specify those disadvantages and how sampling non-concurrently might improve the situation.
AFWG	N/A
HAWG	Quality of target species sampling may reduce as more attention has to be spend towards other species. Cost, man-power and time is limited for on-board pelagic vessel sampling to execute concurrent sampling. Refusal rate or behavior change may rise when concurrent sampling is introduced owing to reputation damage of fishing companies when reporting on bycatch / PETS become available.
NIPAG	No
NWWG	No
PGDATA	Not relevant to PGDATA. However it is likely that the disadvantages are mainly the additional costs for individual countries, and if sampling for key assessed stocks is being compromised by the time required for concurrent sampling, the precision on key species could be lower due to the spread of sampling over many species. This could be examined by looking for evidence for reduced numbers of landings sampled for individual stocks where this is not explained by budget cuts or other changes not related to the method of sampling.
SGPIDS3	No , see above
WGBAST	No, I don't.
WGBFAS	It is more time consuming and therefore less effective. If I should choose between having a good discard estimate of the 5 most important species or having a less well estimated discard estimate but for more species I would referee the first.
WGBIE	The only disadvantage noticed by the group was some apparent decrease in sampling level for some stocks (see above). For the ANB8c9a and ANP8c9a: the number of fish sampled drop drastically, affecting the length distribution and the split of the catches by species. Having an extra target sampling to anglerfish (besides the concurrent sampling) is attempted to solve this problem, but the levels of sampling never reach the ones done in the past.Example (number of anglerfish sampled (Portugal) 2007-8101; 2008-5948; 2009-732; 2010-578; 2011-753; 2012-1899; 2013-1502; 2014-1636.
WGBIOP	Quality of target species sampling may reduce as more attention has to be spent towards other species. Cost, man-power and time is limited for on-board pelagic vessel sampling to execute concurrent sampling.
WGBYC	No
WGCATCH	The resources required for concurrent sampling mean that overall sampling effort will be reduced. This results in poorer precision.
WGCEPH	I am not able to see disadvantages.
WGCOMEDA	Not applied.
WGCRAN	no
WGEEL	No
WGEF	With concurrent sampling, the list of species with available data increased but for less frequent species concurrent sampling may not improve their information. In fact to achieve that goal the sampling effort required would greatly increase. So to not greatly increase the sampling effort assigned to concurrent sampling in those situations special sampling program, e.g. Pilot sampling program, are considered more appropriated. For IXa if special sampling programs be developed it is expected to improve: - the track of misidentification problems with WGEF stocks (e.g. Rajidae, Mustelus spp.) - accuracy on the estimation of species composition in mixed categories - quality of landings and effort data by species, especially important for those not regularly caught by IBTS and other surveys (e.g. Raja brachyura, Raja undulata …) Since most chondrichthyans are by-catch species, to reach the same level of precision as on dedicated sampling programs, more sampling effort needs to be assigned. However due to the investment required by these dedicated studies it is unlike that European Institutes will readdress financial and human resources to them, to the detriment of the most commercially important species.
WGHANSA	No disadvantages
WGIAB	no
WGINOR	No
WGINOSE	Need catch data not landings data – discards is a poor substitute for calculating total catches
WGNAS	No – not applicable.
WGNEW (extinct)	No
WGNSSK	Yes, but so far mainly based on catch information by weight. Length or age distributions for bycatch species may be used in future assessments.
WGRECORDS	I think potential disadvantages can be resolved by careful planning and agreeing on priorities of sampling.
WGRFS	---
WGSAM	Non. The benefits of the information should outweight the costs since the information is to be used to better manage fisheries, getting to a state of sustainability and profitability. Advanced in technology and information gathering and handing should reduced cost and the at-sea burden.

WG - WK acronym	6. If you have any additional comments on concurrent sampling of commercial catch that you would like to provide WKISCON2, please state them here.
AFWG	No
HAWG	Please bear in mind that most pelagic vessels are large, operating long and therefore few trips in a year. Hence, random design and / or concurrent sampling may be more difficult to achieve and affect the precision of any catch sampling estimates.
NIPAG	Sampling of bycatch to gauge ecosystem effects could be important but use of grates in shrimp trawls is largely mandatory and the bycatch of other species has dropped to near inconsequential levels.
NWWG	---
PGDATA	If it was possible for WKISCON2 to do some comparisons of métier landings length compositions by species from shore based samples based only on concurrent samples or based only on assembly of stock-based length data over a period of years since concurrent sampling started, that would be very useful. For a lot of countries, sampling at sea is concurrent anyway, and this is likely to be the best source of such data, though there may be reasons why shore based and sea-based length compositions of landings may differ, such as partial presentation of commercial size categories on shore.
SGPIDS3	Concurrent sampling is required for at-sea sampling of the discarded fraction. However I think that the need for concurrent sampling for on-shore sampling is quite different, because (in most situations) you have the species composition from the log book, landing records (may not be the case in small scale and rec fisheries). Where you have the species composition already you have to ask whether there are any circumstances when the age or length composition of the FULL species landed fraction is actually used; I can't think of any circumstances where it is.
WGBAST	Even a non-regular but representative sampling for instance in 5-10 years intervals would probably satisfy the data need.
WGBFAS	--
WGBIE	None
WGBIOP	---
WGBYC	Thank you for the opportunity to comment. Please add WGBYC to the email distribution list for new developments related to the work of WKISCON2 and other affiliated groups
WGCATCH	None
WGCEPH	I understand that with concurrent sampling as everything has to be sample there is more chance that cephalopods would be sampled. I guess…but maybe for our WGCEPH the problem is not, apparently, the sample… but to make data available to the groups.
WGCOMEDA	Not applied
WGCRAN	---
WGEEL	No
WGEF	A closer analysis of the data available from concurrent sampling program actually in place is required before the adoption of a new sampling program.
WGHANSA	---
WGIAB	---
WGINOR	None
WGINOSE	No
WGNAS	N/A
WGNEW (extinct)	None
WGNSSK	Yes, but so far mainly based on catch information by weight. Length or age distributions for bycatch species may be used in future assessments.
WGRECORDS	No more comments.
WGRFS	---
WGSAM	---

Annex 12: Working Documents

Working document presented at WKISCON2

Jöel Vigneaux, Ifremer, France. Consequences of shifting to concurrent sampling by France in 2009. Working Document presented at WKISCON2, 5p.

Consequences of shifting to concurrent sampling by France in 2009

WD to WKISCON
June 2015

Joël Vigneau
IFREMER Port-en-Bessin, France

The context and the main outcomes

Following the provisions of the DCF, France implemented the concurrent sampling in 2009. The results of the modification of the on-shore sampling plan are clearly displayed figure 1. The concurrent sampling was implemented in all regions, but here we'll concentrate on the Atlantic auctions, since in the Mediterranean the length measures taken during the catch assessment survey complements the auction sampling, and troubles the interpretation. In the Atlantic, the total number of trips sampled dropped from an average of 1400 during the period 2005-2009 to less than 800 for the period 2009-2014. During the same periods, the number of species sparked from 20 to more than 50. The third pannel of figure 1 shows that the total number of individuals was not affected, at least by the concurrent sampling, more by man power difficulties from 2011 onwards, and by the increasing effort by at-sea sampling, relaxing the need to sample so many trips on-shore. Indeed, the at-sea protocol requires the sampling of both the retained and the discarded fraction (both weight and length structure) when sampling a fishing operation.

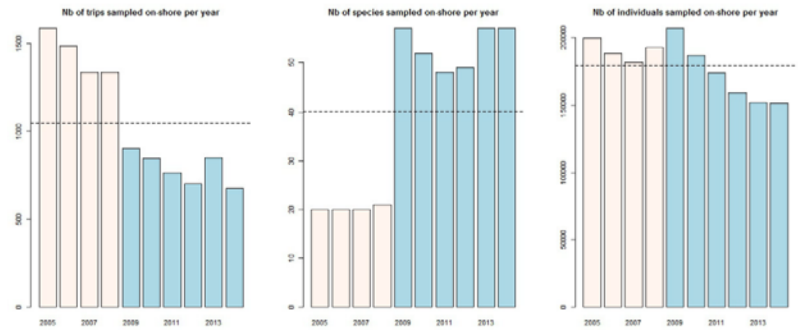

Figure 1 : Number of trips, number of species and number of individuals sampled on-shore in the French Atlantic auctions. The period before the concurrent sampling is in light grey, the period covering the concurrent sampling is in blue. The dash line is the mean of the whole series.

The protocol

The first year, a full concurrent sampling was used, i.e. the sampling of the whole landings of every single trip sampled. The feedbacks from the field aarrived quickly on the impossibility to realize such a protocol, mainly because of the increased workload, the need to double the staff, the time necessary to complete a concurrent sampling, the availability of the total landings at the moment of sampling, etc... all arguments raised by most countries, following this first year of implementation. It was then decided to focus on the only G1 species, but the elasmobranchs raised the most grievance (lots of species and large specimens). An arrangement was made with an other institue (Museum of National History, specialised in the determination and classification of species), and they were included as a partner of the French National programe in 2012,. Ifremer kept the rays only, but this was not sufficient to make protocols workable. Eventually, it was decided to create a fix list of species (G1 and some G2) per area, based on the end-user needs.(see table 1). The benefit of a fixed list of species per sampled strata is to better control the outcome (number of individuals measured at the end of the year) and better control the choice of species to sample on the field. This protocol is complemented with some specific samples in order to meet the demand (seabass because of low occurence per trip, Nephrops, sole).

Species Group 1	Nephrops trawlers Bay of Biscay	Offshore trawlers in area VI	Nephrops trawlers Celtic Sea	Demersal trawlers Celtic Sea	Purse seine Bay of Biscay
Anchovy					X
Seabass				X	
Monkfish	X	X	X	X	
Megrim	X		X	X	
Haddock				X	
Grenadier		X			
Nephrops	X		X		
Saithe		X			
Blue ling		X			
Macquerel					X
Whiting	X		X	X	
Hake	X	X	X	X	
Cod			X	X	
Phycis		X		X	
Plaice			X	X	
Rays	X		X	X	
Mullet				X	
Black scabbard		X			
Sardine					X
Sole	X		X	X	
John dory				X	
Horse macquerel	X				X

*table 1 : List of species to sample per strata in South Britanny auctions.

Consequences of the shift to concurrent sampling

As seen in the first section the immediate consequence is the increase of the number of species sampled. Figure 2 goes into the details by fishing ground and individual species. A filter was used to select only the species with an annual average of more than 1000 individuals per year. 1000 serving here as a proxy for the usability of the information. The big picture is that the increase of the number of species was done at the expense of the most sampled species (sole, Nephrops, hake, plaice, cod marginaly), in a rebalancing of the sampling effort. This feature is to be put in the benefit section, although a sensitivity analysis would be needed to confirm this. For different reasons, the number of species did not increase in Eastern Channel and North Sea (sampling difficulty in this region highlighted every year in the DCF annual Report) and in the Western Scotland (sampling taylored to the user needs and to the relative importance of French fisheries in the area).

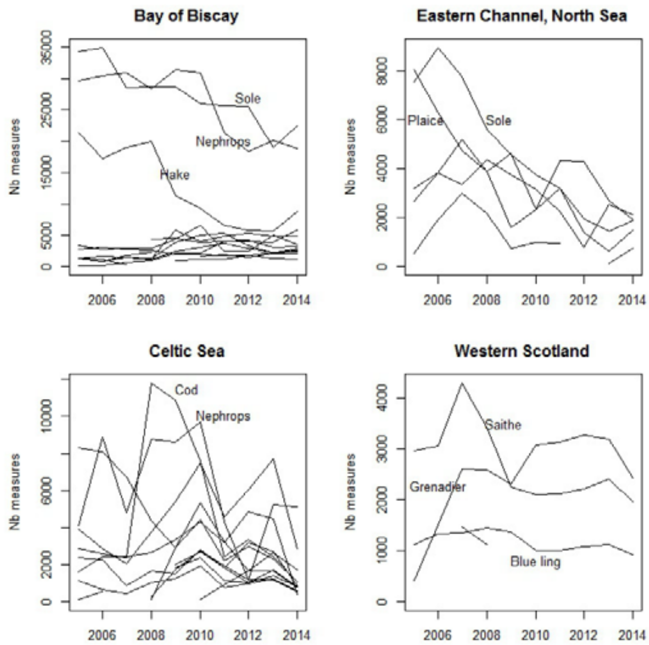

Figure 2 : Yearly evolution of the number of fish measured by species and fishing ground.

Another expected benefit is the sampling coverage to more sampled harbours for each species, giving a better proportionality of the samples. Indeed, the actual samples displayed for four species of interest in Figure 3 displays a mixing picture. The species receiving high sampling (sole and hake in subarea VIII) gained another 1 or 2 harbours, cod Celtic Sea gained also 2 harbours with the concurrent sampling and then decreased following the decrease of the number of vessels and the harbours receiving landings of the stock. Monkfish went from 4 harbours to 10 which is extremely beneficial. Mixing pictures occur also in the area IV, VIId, mainly due to the difficulties in sampling in this area (see also previous section). The main gain was on stocks not or hardly sampled before, like sole celtic sea and sole VIIe, cod VIId and VIIe, hake Celtic Sea and monkfish in VIIe and VIII. Eventually, concurrent sampling brought a better coverage of the species sampled and new information on stocks not sampled before.

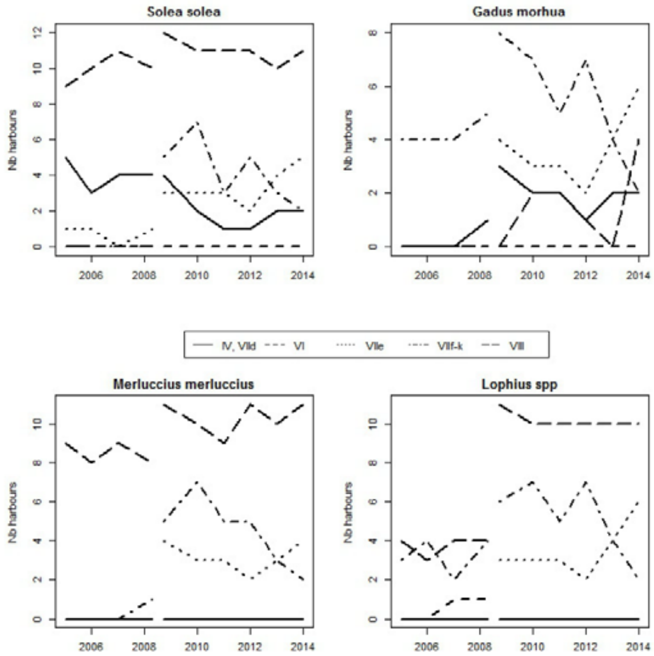

Figure 3 : Yearly evolution of the number of harbours visited by species and area for sole (Solea solea), cod (Gadus morhua), hake (Merluccius merluccius) and monkfish (Lophius spp).

Figure 4 displays a large increase of species receiving low sampling intensity (<8 samples per year) after the implementation of the concurrent sampling. This is the main concern, since species landed occasionnally will have a high probability of being under-sampled. The use of the fixed list helped reducing this issue from 2010 to 2012, but for some reasons, to be further analysed, the number of under-sampled species increased in 2013 and 2014 in the area IV, VIId and VIIe. This is a concern for concurrent sampling, which needs to be mitigated and monitored routinely.

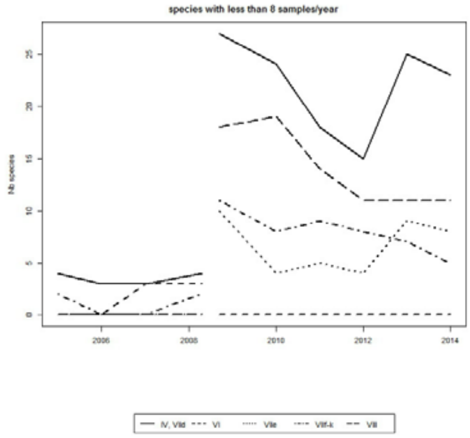

Figure 4: Yearly evolution of the number of species receiving less than 8 samples a year (i.e. 2 samples per quarter) by area.

Conclusions

The consequences of the shifitng from stock sampling plan to concurrent sampling in France were a decrease of the number of samples, an increase of the number of stocks sampled with approximately the same total number of individual measures. The number of individuals sampled per stocks were rebalanced, at the expense of the large sampled stocks. The decrease of the total number of samples is compensated by the increase of the number of locations where each stock could be sampled.

The message to the field samplers for shifting to concurrent sampling in France was well understood, although all feedbacks were on the impossibility to implement it fully. Adaptation had to be made, until the point where it was considered workable; The adaptation happended in a stepwise approach between the field technicians, the data users and the DCF managers. The end users were the most difficult to convince, since their long designed sampling plan would be modified, and they would lose in terms of number of individuals measured, which proved to be right. To ease the transition, stock specific samples were allowed to avoid too much difference between before and after (sole, Nephrops) or rightfully for species caught only in small quantity per trips (seabass). Eventually, the sampling plan stabilized after a few years, convinced everyone and will continue as it is, at least for the part of work to be done once a trip to sample is chosen, knowing that work is ongoing to shift to random sampling for the selection of auction, day and trip to sample.

The experience showed also that a non controlled concurrent sampling in terms of number of species per trip issued a number of stocks sampled with insufficient number of individuals at the end of the year. At a moment when more randomness in commercial fisheries sampling is discussed, the use of a fixed list of species to sample in a concurrent protocol for each location and sampled strata proved very useful, could lessen the number of low sampling intensity stocks, although not sufficient to fully eradicate the problem. The delivered length strucures to the assessment working group increased and were not of lower quality than before, since a filter on number of samples per strata and number of individuals measured was applied before uploading into InterCatch.