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Report of the Workshop on Using Fishers to Sample Catches (WKUFS)

5–6 June 2007

Bergen, Norway

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Executive summary

To assess a fishery it is necessary to determine the biological characteristics, such as age and length distributions, of the commercial catch. In addition, estimates of the amount of discards will lead to more accurate assessments, as will information about effort, fishing efficiency and fleet behaviour. Using scientists to collect information on commercial catches is usually not cost effective. Currently there is ongoing effort worldwide to develop programmes to use fishers to self-sample their catches. Because of the possibility that using fishers would be an efficient and cost effective means to collect fishery data, the workshop attracted many scientist and industry representatives from throughout Europe and Canada.

Two broad objectives for such self-sampling programmes were identified at the workshop. One is that it would be a way to efficiently collect commercial fishery data. The other goal of such programmes would be to involve fishing industry in the assessment process by having them work closely with the scientists. Therefore it is clear that the purpose of the programmes is to improve stock assessments. Here, the improvement is less a question of precision (which is a purely a scientific measure) or accuracy (which is difficult to ascertain) but more that the assessments should provide a common perception of what is in the sea. While self-sampling schemes often involve some form of payment, this should be regarded as secondary. It is the greater involvement of fishers in the assessment process that is the ultimate benefit of self-sampling programmes.

The sampling schemes should not be static but should be adapted to prevailing conditions. The practice of science, which is not perfect, should constantly be critiqued and then improved. The fishers would be an important source of information on how the programmes could be improved to more closely reflect the reality in the sea.

The workshop reviewed some self-sampling projects that are presently operational. Based on this review, six themes were identified for designing and implementing a self-sampling programme: creating incentives for fishermen, communication, confidentiality, financing, training, and survey design.

The workshop focussed mainly on two types of quality control procedures: cross-checking data from self- sampling surveys with other sources of information from the same area such as fleet positions, time period, etc.; and monitoring the internal consistency of data series.

Methods for analyzing self-sampled data, appropriate estimators and sources of variability were discussed. Bias in self-sampling may be avoided by routinely checking the coverage by, e.g., area, gear and season using simple ratio-estimators. For all self-sampling programmes, sources of variability should be detected and the sampling scheme adjusted accordingly. One rule for sampling in the marine environment appears to be generally true: It is better to sample a few fish from many locations than to sample many fish at each of a few locations.

1 Introduction

1.1 Terms of reference

2006/2/ACFM32 A **Workshop on Using Fishers to Sample Catches** [WKUFS] (Co-chairs: Kjell Nedreaas, Norway, and Michael Pennington, Norway, will be established and will take place in Bergen, Norway, during 5–6 June 2007 to:

a) Describe objectives of the data collection.

b) Review existing systems for using fishers to sample catches (self sampling systems).

c) Propose procedures for the design of self-sampling systems (training, survey design etc.).

d) Recommend procedures for ongoing quality control of the information obtained and the design of self-sampling systems, in particular how to assess whether the objectives have been met.

e) Discuss methods for analyzing these data; appropriate estimators and sources of variability.

WKUFS will report for the attention of ACFM, RMC and PGCCDBS.

1.2 Background and opening of the meeting

To assess a fishery it is necessary to determine the biological characteristics, such as the age and length distributions, of the commercial catch. In addition, estimates of the amount of discards will lead to more accurate assessments.

Using scientists to collect information on commercial catches is usually not cost effective. Several institutions are now employing selected fishers (often called a ‘reference fleet’, ‘study fleet’ or ‘sampling fleet’) to measure a subsample of their catches, extract otoliths, record the amount of discards, etc. This may be a cost efficient way to collect such data but care is needed to assure that these data are as useful as possible. The purpose of ToR 1 is that before a programme is implemented the goals and purpose of self-sampling should be carefully considered. For example, will it replace other data collection programmes or how will these data be used in an assessment? ToRs 2 through 4 examine current self-sampling programmes to determine their effectiveness, how they can be improved and their precision (standard errors, effective sample sizes, etc.). Finally ToR 5 will focus on whether these sampling schemes actually achieve their stated goals (ToR 1 revisited).

In view of its relevance to the EU Data Collection Regulation (DCR) and other national data sampling programmes, the Workshop was expected to attract wide interest from both ICES Member States and Mediterranean EU Member States. It was therefore a great pleasure and motivation to gather as many as 42 people from 16 countries to discuss and report on the terms of reference. The list of participants is shown in Annex 1.

2 Adoption of the agenda

A compilation of the oral presentations during the workshop is given in Annex 3.

2.1 Objectives for fisher collected data (ToR a)

Based on the presentations of current and planned fisher self-sampling schemes, two broad objectives for such schemes were identified; the efficient collection of commercial fishery data and increasing the involvement and understanding of the fishing industry in the assessment process.

With regard to data collection, self-sampling schemes were identified as being particularly useful for collecting data which would not be available from other forms of scientific sampling , e.g.:

- Data from areas inaccessible to research vessels, e.g. inshore or deepwater fisheries,
- Data from catches of vessels that are too small to accommodate a scientific observer,
- Data from catches from fisheries where for processing reasons the catches are not available to market sampling – e.g. some pelagic fisheries,
- Data on bycatches of seabirds and sea mammals where the probability of capture is low, so they are unlikely to occur during an observer trip.

It was also highlighted that self-sampling allows for continuous, broad area, high-resolution sampling, using large numbers of ships of opportunity. As such the resulting data allow the scientists to focus on “the right place at the right time”. It may also help the scientists to give better founded and targeted advice on regulation measures, since the new regulations will to a greater extent be based on a common perception of which measures will have the desired positive effect on the stock.

Large quantities of data from self-sampling may be combined with limited observer data, both in combination with observers at sea from time to time, and in some cases, more cost-effective processing of samples ashore. Large quantities of data from self-sampling may also contribute to a better understanding of fleet selectivity, and such trust based cooperation with fishers may also help scientists to observe and quantify technology creep and hence changes in fishing efficiency.

The data collected are almost always intended for stock assessments and thus feed into the fishery management process. In this respect, a clear objective is that such data should lead to improved stock assessments. Here, the improvement is less a question of precision (which is a purely a scientific measure) or accuracy (which is difficult to define) but more that the assessment should provide a common perception of what is in the sea.

One way of contributing to this common perception would be to ensure that the data collected by fishers are used to translate their ‘soft’ information and impressions about stock size into hard information that can be used directly in assessment models. And it is essential that the information is actually used, which should be the major the pay-off for fishers. While self-sampling schemes often involve some form of payment, this should be regarded as secondary. It is the greater involvement of fishers in the assessment process that is the ultimate benefit of self-sampling programmes. One example of this came from the experience with co-management in the Baltic where Swedish fishers now have a much greater understanding of why the data are collected through their greater involvement in the process and the feedback that they have received about the results.

Co-operation between scientist and fishers is not always sufficient in itself. In the recent case of the North Sea sand eel fishery there was close collaboration between Danish scientists and Danish fishers to obtain sand eel data, which formed the basis of recent management decisions. Because of this collaborative effort, fishers and scientists completely agreed on the assessments. However, a decision to close the fishery was taken by the managers (the European Commission), which does not reflect the conclusions of industry and scientists. The managers were not involved in the collaborate work, which is likely to lead to problems in the future. This led to discussion about possible future involvement of managers in a meeting such as the present one, given that they are the ones make the decisions that fishers have to live with. It was also pointed out that the fishery would not have opened at all during 2007 if there had not been this co-operation between scientists and fishers.

An important part of any co-operation between scientists and fishers is for both sides to recognise that their objectives are likely to differ. In particular, scientists typically have the financial security of a monthly salary, whereas fishermen are dependent on their catch for their income.

Another possible objective for the use of self-sampling data is to fill the gap that results from basing advice for the year ahead on data up to the end of the preceding year. The specific case of Barents Sea cod was mentioned, where during the late 1980s and early 1990s the quotas failed to track large-scale changes in the stock abundance. The perception amongst fishers was that the delay in using catch data contributed to this mismatch. In addition, there is a need for close co-operation and real-time information given the rapid changes observed recently, including saithe as far as 78^{o} North and cod spawning West of Spitzbergen. In relation to this it was generally agreed that sampling should not be kept static but needs to be adapted to prevailing conditions. It was also noted that science does not necessarily produce perfect information but that science involves a constant process of critique and improvement. There should be more of an exchange of information with fishers who need to have access to data in order to argue for their point of view.

It was recognised that self-sampling schemes could be classified by the following criteria:

- The level of sampling detail: from simple length compositions to complex biological sampling.
- The degree of commitment by the fishers: from voluntary to near-professional.
- Statistical approach and quantity of information collected: large number of samples from a few boats versus, to a small number of samples from many boats.

There is a need to describe a framework using these three measures to ensure a uniformity of approach.

2.2 Review of existing systems for using fishers for sampling (ToR b)

The workshop reviewed some self-sampling projects that are presently operational. The data from these programmes are currently used in the assessments of the sampled stocks. Some of these self-sampling systems were presented orally at the workshop (see Annex 3).

2.2.1 Canada

The Canadian sentinel survey, while not meeting the criterion of fishers' sampling their commercial catches, can be used as a model that may be modified when designing new programmes.

2.2.2 Denmark

In one self-sampling programme, some fishers sample perch and fill in an expanded logbook. The project covers all fishermen; professional, part-time and recreational. Participation is

voluntary, and no payment is involved. In another programme scientists have approached recreational fishermen's associations and asked them to report on their members' fishing effort and landings of salmonids. They provided data that are very difficult to obtain in any other way.

Denmark also has a 40–year project with salmon fishermen in the Baltic, who record their fishing effort, landings and discard data. These are recorded in official logbooks on a purely voluntary basis. The volunteers cover about 60% of the fleet.

There is a Danish reference fleet that takes samples in the sand eel fishery in the North Sea. Sampling levels are set at one sample per fishing ground fished. Since the fleet is constantly moving from one area to another, this proved to be sufficient coverage. There is also fishery-independent sampling of the landings by inspectors, which act as a check on the self-sampling results.

2.2.3 Iceland

Fishermen are hired to collect cod stomachs for feeding studies. They measure the sampled fish and collect and freeze the stomach. The aim is to collect data from all areas and seasons. Institute staff analyse the stomach contents.

2.2.4 Latvia

In 1993 a reference fleet and self-sampling system was started in Latvia to monitor the coastal fishery. Approximately 20 to 30 fishers and fishing companies are contracted each year by the Latvian Fisheries Research Institute (since 2006–by the Latvian Fish Resources Agency). The fishers record in special logbooks a detailed description of catches including any bird and mammal bycatches. Until 2007 the fishers were compensated by giving them the use of a number of additional fishing gears (the coastal fishery in Latvia is regulated mostly by number of fishing gears) as well letting them fish during closed periods. In 2007 they were paid based on the amount of work they did. Data quality is assured by proper training of involved fishermen and by frequent visiting and checking of their work. The same fishers do the sampling each year, thus allowing them to gain experience in sampling techniques.

2.2.5 Malta

The self-sampling programme for dolphin fish divides the area around Malta into three strata, and in each stratum a fisher is selected to take samples. The selected fishers collect length measurements on all fish caught by specific FADs (fish aggregating devices), and they also take a sample of fish for determining biological characteristics. The fishers are paid for this work.

2.2.6 The Netherlands

One objective of the Dutch demersal self-sampling programme is to better estimate the amount of discards of North Sea plaice and cod. Recently, 21 vessels volunteered to participate in the programme. Self-sampling also occurs in the pelagic fishery, which provides information on the targeted species, discards, etc.

2.2.7 Norway

In 2000 the IMR began a programme to collect data and biological samples directly from some chosen commercial fishing vessels, the so-called **"**reference fleet**.**" The fishers, who are paid for their effort, measure a subsample of fish at selected stations and less frequently they collect otolith, stomach, genetic and other biological samples, which are then analyzed by the IMR. The reference fleet also provides the IMR with information on fleet behaviour and

technical developments influencing efficiency and effort. At present there are 16 open sea- and 18 coastal fishing vessels in the Reference fleet.

2.2.8 Poland

Self-sampling has been used in Polish fisheries since late 90s. At first it was limited to the coastal fisheries in the Baltic Sea, but now it also covers part of offshore catches. The use of self-sampling was introduced mainly do reduce the costs of travelling and sampling conducted every year by technicians from the Sea Fisheries Institute in Gdynia. The primary species covered by self-sampling are: salmon, sea trout, whitefish (*Coregonus lavaretus)* and recently also cod.

For self-sampling of salmonids and whitefish a trusted fisherman was selected who was typical for that fishery. He was trained and equipped with the relevant equipment. Every year the amount of remuneration was negotiated with the SFI. According to the contracts, he was obliged to collect data from his catches that included: length and weight measurements, sex and maturity data and preserve scales for age reading. Approximately 70–85% of his total catch was sampled.

Presently discarded cod in the Polish hook fishery is continuously self-sampled because such data must be collected to be in compliance with DCR regulations. The Polish hook fleet consists mainly of small boats and cutters so there is no room for onboard observers. The fishers take length measurements and record other requested information on each haul. Presently there only ten hook fishery trips need to be sampled under the DCR regulations and sampling effort is distributed quarterly by sub-divisions based on the average catch over the previous three years (Appendix XII DCR).

2.2.9 Spain

There is a tag and release programme for monitoring the recreational tuna fishery. At the beginning of the season, training is provided for a number of skippers involved in this fishery. It is a voluntary project so the number of participants varies from year to year. There were around 25 fishers in 2006. Each fish that is caught is measured, tagged and released. The recapture rates are around 4–5%, which is very similar to returns from tags placed by experienced technicians.

2.2.10 United States

The Northeast Fisheries Science Center used fishers (called a “study fleet”) in a pilot study of the accuracy of the reported fishery-based data from off the northeast coast of the USA. A total of 32 vessels participated in the study. One of the primary goals of the Study Fleet project was to develop and implement electronic reporting technology (software and hardware) for the collection, recording, and transferring of more accurate and timely fishery data.

In the same area off the northeast coast of the USA, the School for Marine Science and Technology (SMAST), which is part of the University of Massachusetts/ Dartmouth, used a study fleet to assess the commercial fishery. Approximately 20 commercial vessels were in the fleet. The fishers recorded tow information (time, position, weather) and catch data (species, weight length). One of the many other goals of this project was to demonstrate to the fishers that they are important partners of the scientists.

2.3 Procedures for the designing self-sampling programmes (ToR c)

Six themes were identified for designing and implementing a self-sampling programme:

- Creating incentives for fishermen

- Communication
- Confidentiality
- Financing self sampling programmes
- Training
- Survey Design

The main points for each aspect of a self-sampling programme are as follows:

Creating incentives for fishermen

The most important issue is the need for incentives for fishers to participate in a self-sampling scheme. If there are no incentives, motivation will be lost and fishermen will stop cooperating. The most effective incentives are:

- The feeling/knowledge that participation is necessary and/or useful for the management of a stock.
- Compensation for example: an increased TAC or direct payment for their work.
- Create a network among fishers and between fishers and researchers.
- Provide fishers with relevant information that will give them a stronger position in management discussions.

Communication

Good communication is essential for the success of a project in which fishers and researchers cooperate. Good cooperation is based on trust and transparency among the different parties. General criteria for cooperative research are summarized in Table 1.

There may be many different cooperative projects within a country and, therefore, these will need to be centrally coordinated, either on a national or a regional (RAC) level. The coordinator would insure that fishers are not approached by too many different projects.

Table 1. Criteria for cooperative research (Johnson and Van Densen, 2007).

STEP	INGREDIENTS
Identification of problem	Involve fishermen Shared & sharp description
Definition of objectives	Derive from identified problem Name presumptions Clarify how results will be used/what meaning or implications they will have
Methods	Technical feasibility Analysis of statistical power Budget (time/money) Show format of results to fishermen Joint communication of problem, objectives, method and format & meaning of results
Carrying out the work	Instruction of vessel crew and researchers Cooperation of vessel crew and researchers onboard Give feedback on how data are collected (reliability of data) Direct communication of results by trip
Processing of data	Communicate significant results with fishermen involved Discuss meaning of results with fishermen and how to communicate results to the industry
Communication of results	Joint publication of results Clear distinction between results of research (neutral) and implications for management

Confidentiality

It should be assured that data are confidential and can only be presented in an anonymous and/or aggregated way. It should be noted that some data might be "interesting" for enforcement services etc., which might endanger trust between parties.

Financing

The industry, authorities and researchers should decide how to finance a programme. For example, the Norwegians finance their self-sampling programme with a research TAC for participants: the money that is earned from selling the fish is used to finance the project.

Training

Depending on the objectives of a self-sampling programme, the training should be adapted to each particular situation. Some general remarks are:

- Training/Instruction of a group of participants can be achieved through a plenary meeting. The timing of this meeting is important: make sure that fishermen are available, e.g., the meeting should not be held during the fishing season;
- An individual approach is important to increase understanding and commitment, which can be achieved by onboard training;
- The goal should be to instruct fishermen how to sample, not to educate them to be fisheries scientists;
- It should be clear what kind of data are required (and why) and what kind of format is required in order to make data processing more efficient;
- Short feedback loops from researchers to fishers are required;
- It should be easy for fishermen to contact the relevant researcher;
- To inform the industry about the project, it is useful to communicate the purpose of the project through a one-page flyer and/or an article in the fishermen's weekly.

Survey design

There are many different self-sampling programmes. Therefore, it is impossible to give general details on the required sampling scheme, the number of samples, gear used, etc. The following are common steps for setting up a self-sampling scheme:

1) What are the objectives, what do we want to know?
2) Define strata within the fishery (or métier) under investigation:
   2.1) Gear
   2.2) Target species
   2.3) Spatial units
   2.4) Temporal units
3) Decide which strata should be sampled. (Stratification can be defined according to the standard rules for stratification of a survey.)
4) Decide how the data should be analyzed.
5) Check feasibility of the desired stratification.

Examples of relevant questions for designing a survey:

- What kind of information is required (e.g. numbers per species of otoliths)?
- Short term versus long term?
- Voluntary or paid?
- How to select vessels and when does your sample of vessels represent the total fleet?

- To what extent should differences in gear/rigging be taken into account?
- What is the number of samples required (statistical power analyses)?
- Are samples taken and processed onboard the vessels or do we use port sampling?
- How can the results from samples taken be scaled up to the total fleet?
- How are data registered and processed (software onboard and in fishing laboratories)?
- How to deal with legal issues: e.g. keeping undersized fish onboard. How to arrange these kinds of issues with the authorities?

Once data are available, the sampling scheme should be optimized. For example, the efficiency of the sampling scheme for the Norwegian reference fleet was improved based on analyzing the sources of variability (for details, see Helle and Pennington, 2004).

Stratification for sampling discards and commercial landings are widely discussed in Section 3.3, 3.5, and 4 in the report of the Workshop on Discard Sampling Methodology and Raising Procedure (WKDSMRP), Denmark, 2003. (ICES CM 2004/ACFM:13).

These issues are also well documented in Section 6.4 of the report of an ICES Study Group on Discards and Bycatch Information. (2002: SGDBI, report ICES CM 2002/ACFM:09).

Finally, some general points to bear in mind are:

- Adapt sampling schemes to the real world: that is taking into account obstacles that may occur after programmes are implemented. A fishery system is very vulnerable to external factors e.g. changes in/decisions from management.
- Stick to the "KISS principle": Keep It Simple Stupid: don't ask too much of the fishers, only ask the essential.

2.4 Quality control of self-sampling systems (ToR d)

The workshop focussed mainly on two types of quality control procedures. The first procedure was defined as 'cross-checking': roughly described as checking data of self- sampling surveys with other sources of information from the same area, fleet, time period, etc. The second procedure could be best described as: monitoring the internal consistency of data series.

Sources of information that can be used for 'cross-checking' self-sampling information:

VMS: In Norway VMS data for the whole fishing fleet (greater than 24 meters) are successfully used to cross-check fish position data, and thus avoid area bias of the reference fleet self sampling programme.

Logbooks: In the Netherlands, EU logbooks were used to check the accuracy of catch and position information per participating vessel.

Observers: The future self-sampling programme in the UK (Irish Sea) plans to use observers on self-sampling ships as an ongoing quality control programme. Presently the Dutch compare self-sampled discard data from the fishery with discard survey trips conducted by observers.

Correlation with year class strength: Results from the self-sampled Danish sand eel larvae survey is nicely correlated with the observed year class strengths based on catch statistics.

Comparison with surveys from other countries: Denmark cross-checks discard data with surveys conducted by countries sampling the same fish stocks in the Baltic area.

Check with fishers: Compare the self-sampled data with the view of the fishers, e.g., do the data appear to reflect the experience of the entire fleet.

Monitoring consistency:

Internal consistency: Compare the coefficient of variation of individual participants fishing in the same period, area and fleet.

Range checks: Check if biological measures are within acceptable limits; for example fish length.

Observers: Compare self-sampled data with observer data on the vessels in the same fleet, period and area.

Fleet characteristics: Check if self-sampled data are consistent with fleet characteristics, for example, haul duration, soaking time, trip duration, etc.

2.5 Methods for analyzing data, appropriate estimators, and sources of variability (ToR e)

The workshop covered broad aspects of self-sampling programmes, including advice and criteria for establishing effective cooperative research between scientists and fishermen. Many presentations focused on the description of field sampling protocols. This section focuses on the presentations that presented examples of analysis methods, and evaluated sources of sampling variability. An example of the use of self-sampling for scientific experimental studies was also presented.

Methods for evaluating the sampling coverage and potential bias in estimates of discard included GIS analysis of data from VMS, and comparisons of estimates from self-sampling programmes and observer data. Self-sampling programmes can provide data from more hauls, but will generally include less information per haul than data from observer programmes. Methods for the estimation of discards included traditional design-based estimators such as the ratio estimator, and model-based estimators. Simple ratio-estimators, e.g. the ratio of discards to the total catch of a haul, were applied to estimate discards in many of the self-sampling programmes that were presented. In these programmes, data from individual hauls or trips were pooled across larger areas and time-periods. It was noted in the discussions that the lumping of samples from individual hauls and trips, without any weighting to account for varying catches among hauls and trips, could introduce bias in the discard estimates, and preclude the proper estimation of variance in the discard estimates.

Examples of data analysis from the Dutch programme included comparisons of discard estimates based on self-sampling programmes versus estimates based on samples collected under the Data Collection Commission Regulation (DCR) programme. Analysis of variance of proportions of discard, using the arcsine transformation to reduce the dependency between the proportions and the variance, where used to assess sampling strategies. Results demonstrated that an increased catch-discard sampling from more vessels or trips (primary sampling units) is needed to achieve improvements in estimates of proportion of discard in total catches, while the number of catches sampled per trip could be reduced.

Analysis of self-reported data from the Norwegian reference included the estimation of catch and discard, using ratio-estimators for multi-stage sampling. The samples were weighted to account for the varying catches across trips within vessels, and for varying catches across vessels. Estimates of the expected relative standard error (RSE) in discard estimates as a function of sample size (number of vessels, versus number of trips or hauls within vessels) were presented. Results show that the number of vessels in the sample is more important than the number of trips sampled within vessels for improving the precision in discard estimates, thus agreeing with the results from the Dutch programme. Analysis of biological characteristics such as mean length of fish in the total catch also demonstrated that fish caught in local areas tend to be more similar than fish in the catches at large. Thus, samples of fish for length measurements should be collected from as many vessels as possible (better area

coverage), while the number of fish measured per vessel, trip, or haul could be adjusted downwards. With such sampling strategies, improved precision in key estimates may be achieved even though the total number of fish measured is reduced. Sources of bias in data from the Norwegian reference fleet were evaluated by comparing overlap in the areas covered by the reference fleet as compared to the general fleet by sector (bottom trawl, gillnets, long-line) using VMS data. It was demonstrated that the long-line fishery in Norway covers much larger areas that the fisheries-independent surveys.

Self-sampling programmes in the North Sea conducted by Danish fishermen demonstrated its utility to estimate the length and species composition of sand-eel, with good agreement with data from the entire fishing fleet collected by inspectors at port. Self-sampling by the fishermen was also used to test two methods for predicting 0–group strength of sand eel experimentally. This project tested claims by fishermen that 0–group strength of sand eel could be predicted from larvae observations at the end of the previous fishing season. Results suggested strong correlation between larval catch and age 0. Fisheries-independent surveys of juveniles using dredges (in December) did not predict age o strength, thus confirming the utility of self-sampling programmes for scientific studies.

Appropriate estimators and source of variability have recently been addressed (in relation to discards and landings) in Section 4 and 5 of the report of Workshop on Discard Raising Procedures (WKDRP), 2007 (ICES CM 2007/ACFM:06).

These issues are also well documented in Section 6.4 of the report of an ICES Study Group on Discards and Bycatch Information. (2002: SGDBI, report ICES CM 2002/ACFM:09).

For all self-sampling, sources of variability should be detected and the sampling scheme adjusted according (see, e.g., Helle and Pennington, 2004). One rule for sampling in the marine environment appears to be generally true: It is better to sample a few fish from many locations than to sample many fish at each of a few locations. The former sampling scheme will generally have a much larger effective sample size (i.e. much more information) than the latter scheme (Pennington, referred to in Annex 3; Pennington *et al*., 2002).

3 Brief conclusions and future work

During the Workshop, criteria for cooperative research with fishers were presented, and five themes for designing and implementing a self-sampling programme were identified and discussed. Based on these themes, it was concluded that self-sampling schemes could be classified by the following criteria:

- The level of sampling detail: from simple length compositions to complex biological sampling.
- The degree of commitment by the fishers: from voluntary to near professional.
- Statistical approach and quantity of information collected: large number of samples from a few boats versus, to a small number of samples from many boats.

It is recommended that a further compilation and review of existing self-sampling systems should be conducted as intercessional work. A request should be sent out for descriptions of self-sampling schemes, which discuss among other factors, the three criteria listed above, and advice on what has and has not been successful. In addition to the technical aspects of self-sampling programmes, it is important to document the benefits of cooperation between fishers and scientists.

It is recommended that the WKUFS should hold a second meeting in 2008 to develop further the issues presented and recommended during the workshop, and to recommend and plan future work based on intercessional reviews and case studies. Suggested Terms of reference for the next workshop are given in Annex 4. Before the next workshop, requests will be sent out for descriptions of self-sampling schemes (contact persons: Daniel Stepputtis and Rick Stead, see list of participants). Until the next workshop these points should be further elaborated and developed in Share Point.

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Annex 1: List of participants

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Annex 2: Agenda

Tuesday 5 June

09.00	Opening of the Workshop. Presentations of contributions to the workshop (open for revision dependent on other/more presentations). Appointment of rapporteurs.
09.40	I. Artetxe: Fishermen sampling fisheries: Two examples.
10.00	F.J. Quirijns: Criteria for cooperative research between scientists and fishermen.
10.20	F. J. Quirijns: Establishing the Dutch sampling programme.
10.40	Coffee break.
11.00	E. van Helmond: Analyses and quality control of the Dutch programme.
11.20	R. Stead: Some information on a 10 years Canadian programme using fishers.
11.40	S. Reeves: Self-sampling of discards in the Irish Sea. The story so far…
12.00	Free lunch in the IMR cantina (other building).
13.00	Presentations, continue.
13.10	P-J. Schon: Northern Ireland self sampling scheme in the Irish Sea.
13.30	K. Nedreaas: The Norwegian Reference fleet.
13.50	K. Helle: Does the Norwegian reference fleet represent the entire fleet?
14.10	M. Pennington: Some sampling considerations for estimating population characterist.
14.30	Coffee break.
14.50	Discussion related to the Terms of Reference.
18.00	End of 1st day meeting.
18.15–20.30	Reception in the IMR cantina (other building)

Wednesday 6 June

09.00	H. Degel: Self-sampling from Danish sandeel fishery.
09.30	Discussion related to the Terms of Reference to be continued.
10.30	Coffee break.
12.00–13.00	Free lunch in the cantina of the Directorate of Fisheries (neighbour building).
13.00	Conclusions and recommendations related to the ToRs.
14.30	Coffee break.
14.50	Conclusions and recommendations related to the ToRs, continued.
16.00	The way further.
17.00	Closing of the workshop.

The meeting room supports wireless LAN and Internet connection.

Coffee and tea will be available all the time.

Annex 3: Oral presentations at the workshop

I. Artetxe: Fishermen sampling fisheries: Two examples.

F. J. Quirijns: Criteria for cooperative research between scientists and fishermen.

F. J. Quirijns: Establishing the Dutch sampling programme.

E. van Helmond: Analyses and quality control of the Dutch programme.

R. Stead: Some information on a 10 years Canadian programme using fishers.

S. Reeves: Self-sampling of discards in the Irish Sea. The story so far…

P-J. Schon: Northern Ireland self sampling scheme in the Irish Sea.

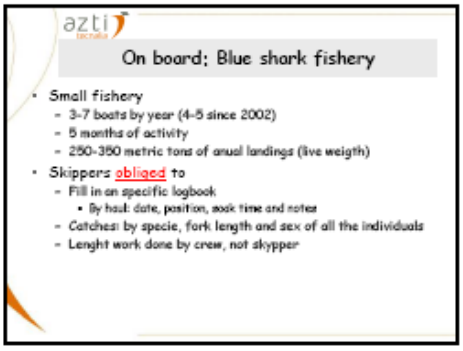
K. Nedreaas: The Norwegian Reference fleet.

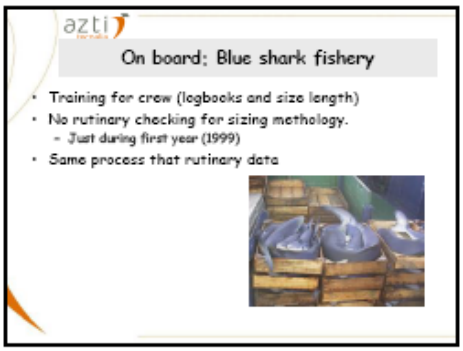
K. Helle: Does the Norwegian reference fleet represent the entire fleet?

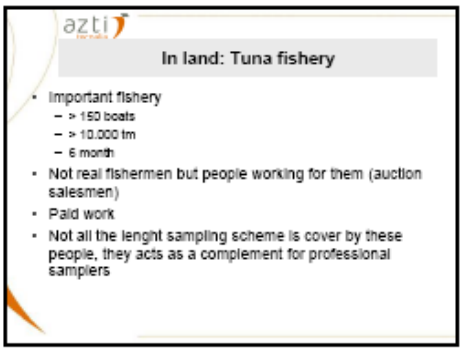
M. Pennington: Some sampling considerations for estimating population characteristics.

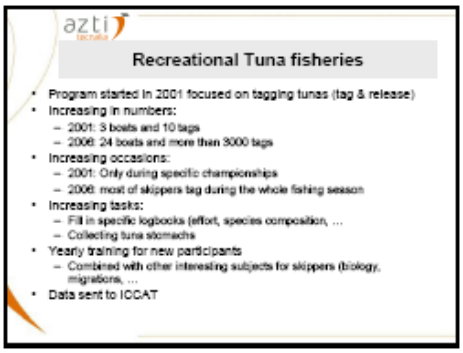
H. Degel: Self-sampling from Danish sandeel fishery.

I. Artetxe: Fishermen sampling fisheries: Two examples

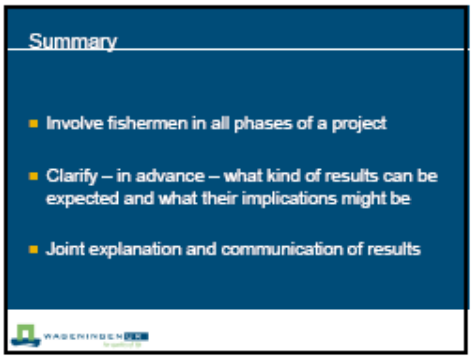




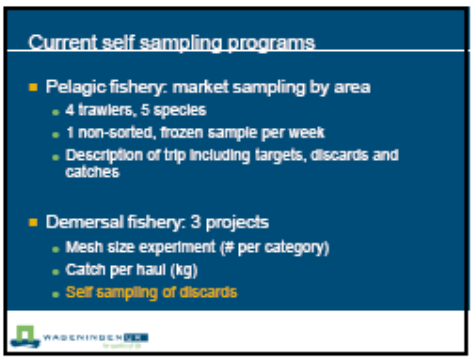


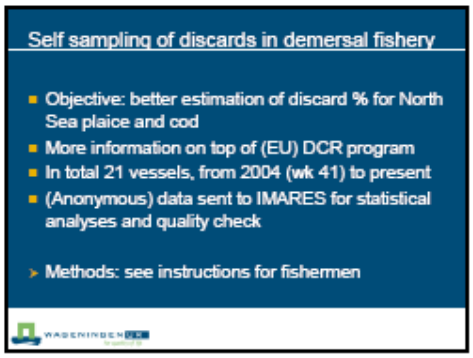


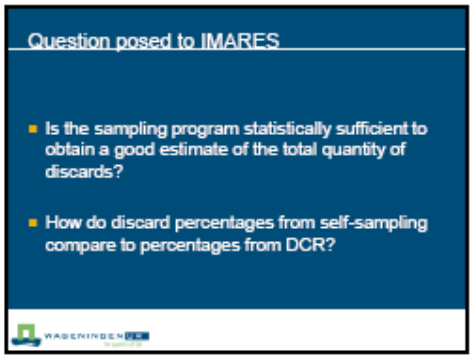
F. J. Quirijns: Criteria for cooperative research between scientists and fishermen

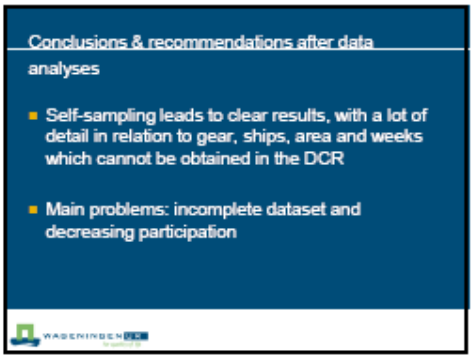


F. J. Quirijns and E. van Helmond: Establishing the Dutch sampling programme. Analyses and quality control of the Dutch programme









Conclusions & recommendations - continued

- Current 2 samples per trip is minimum number of samples required to give reliable results
- Low variation between samples within a trip → more samples would not lead to significant increase of reliability

Conclusions & recommendations - continued

- Current program leads to an estimation of the overall average discards percentage with a range of 2%
- Current program leads to an estimation of the average discards percentage by area, gear, ship or week with a range of 11%
- Accuracy can be increased by increasing number of participating ships

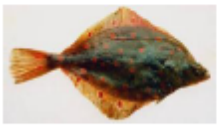
Conclusions & recommendations - continued

- Did the self-sampling program come up with better discard estimations?
  - More information available
  - Differences between self sampling and DCR
  - To clarify differences between sampling programs, direct comparison of vessels is required (expose vessel identity).

Wageningen IMARES

W. de Boer (presented by F.J. Quirijns): Instructions for fishermen in the Dutch discards self sampling scheme

Split plaice in the sample in sized & under-sized



Sized

Under-sized

Read the volume

Register volume of sized and under-sized plaice

Measure length of the plaice

- Measure 50 sized*
- Measure 50 under-sized*
- Register the numbers
- Discard undersized fish
- Process sized fish

* Take plaice individuals randomly from the sample. Length is measured in whole centimeters.

Record the track data

Complete the registration form

After the fishing trip data from the fish market are included

Register quantities (kg) of landed plaice per category

Cod

Take a sample = Collect all the cod

Collect all cod from the entire week (sized and under-sized) in boxes. Separate sized and undersized individuals.

Leave the undersized cod ungutted !

Measure length of the cod after the last haul

- Measure 50 sized*
- Measure 50 under-sized*
- Register the numbers
- Store under-sized fish without gutting them
- Process sized fish

* Take cod individuals randomly from the sample. Length is measured in whole centimeters.

Land sized and under-sized cod to the fish auction

- Report the number of boxes of sized and under-sized cod to the A/D and fish auction before landing
- Land the under-sized cod in plastic bags in boxes including ship-ID
- The plastic bags must be tied up

Weigh the cod in the fish auction

- The undersized cod are kept separate in the auction and are weighed: supervised by an employee of the Dutch Product Board
- This employee will inform you of the quantity of under-sized cod
- The sized cod will be weighed and sold through the regular traject

After the fishing trip data from the fishmarket are included

Register quantities (kg) of landed cod per category: both sized and under-sized

Send data to the Product Board

- Check if the registration form is complete
- Send data and registration form (elektronic) to the Dutch Product Board

• discards@pvis.nl
• Productschap Vis, discardsonderzoek
Antwoordnummer 10387
2280 WB Rijswijk

R. Stead: Some information on a 10 years Canadian programme using fishers

Newfoundland Region Sentinel Survey Background

- In 1990 the Northern Cod Science Program hired inshore cod biologist to study inshore cod distribution
- Start an index program to develop an inshore CPUE time series
- Bring inshore fish harvesters and their traditional ecological knowledge (TEK) into assessment process

Newfoundland Region Sentinel Survey Background (cont'd)

- A moratorium on the northern cod stock in 1992 and the 3PS stock in 1993 ended this initiative
- This created a need for alternate source of data normally collected from commercial inshore fishery
- A "sentinel" fishery would have limited number of fishers using small amounts of gear fishing in traditional manner
- Cover areas inaccessible to RV survey

Newfoundland Region Sentinel Survey Training

- Course curriculum developed by Marine Institute of MUN and DFO Science
- 6 week classroom and vessel training program covered
  - Ocean environment
  - Survey and sampling
  - Computer training
  - Fisheries Resource Management
  - Presentation skills

Newfoundland Region Sentinel Survey 3PS Pilot Project

- 12 fishers started training January 1995
- Fishing started late February
- Extensive on-site support from DFO staff
- 20 week pilot proved successful in quantity and quality of data collected
- Plans made to extend to other areas

Newfoundland Region Sentinel Survey Projects

- 3PS pilot program extended, sites added
- Northern cod (2J3KL) project with 51 sites started spring 1995 (FFAW)
- Community-based project initiated at Petty Harbour 1995, since discontinued
- Fogo Island Co-operative Society sponsored project with 4 sites on Fogo Island in 1995

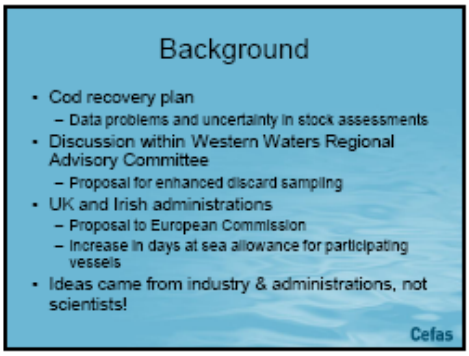
Newfoundland Region Sentinel Survey Protocols

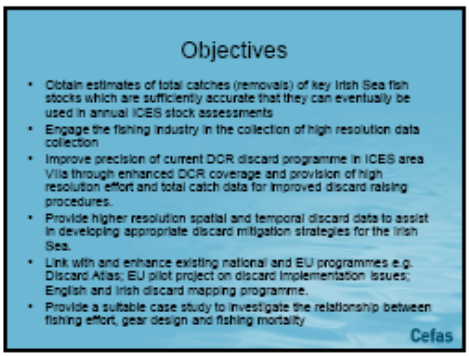
- Fixed gear, inshore only
- Control and experimental fishing sites
- Detailed fishing log
- Biological sampling
- Oceanographic data collection
- Tagging platform
- Other requested operations

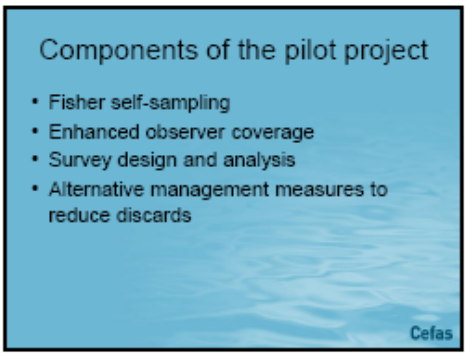
Newfoundland Region Sentinel Survey Fisheries Sampling Section

- Responsible for Sentinel surveys and other industry-science partnering projects
- Extensive field support and training
- Data handling and quality control
- Contract management and administration

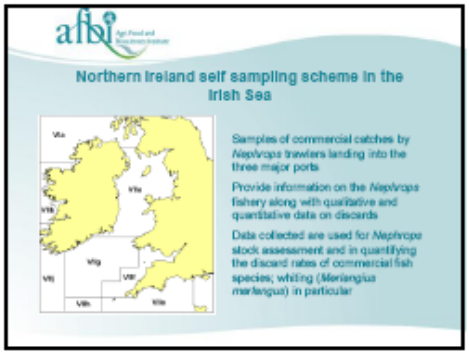
S. Reeves: Self-sampling of discards in the Irish Sea. The story so far…

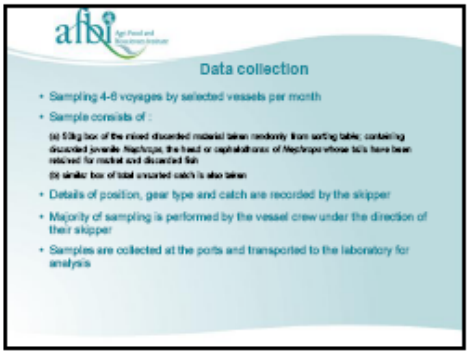


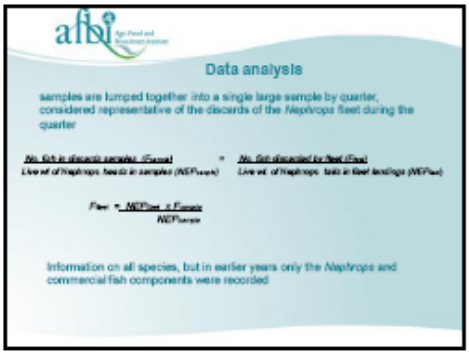


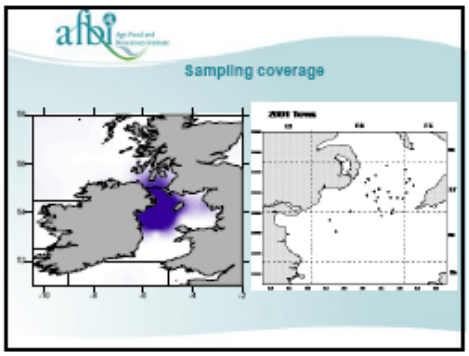


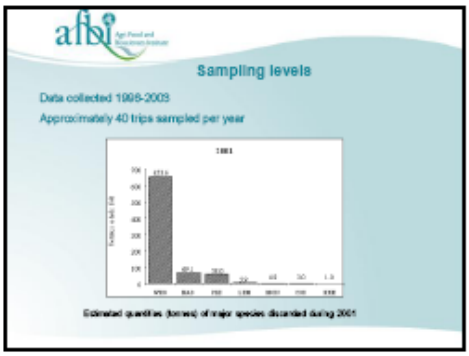
P-J. Schon: Northern Ireland self sampling scheme in the Irish Sea

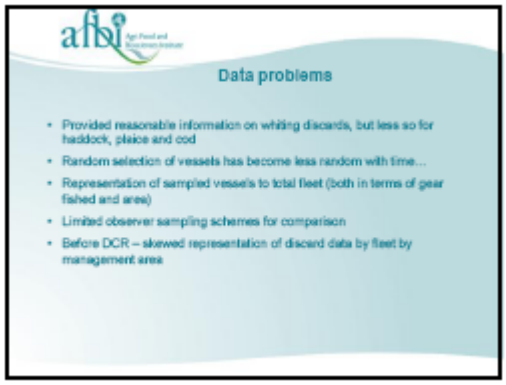




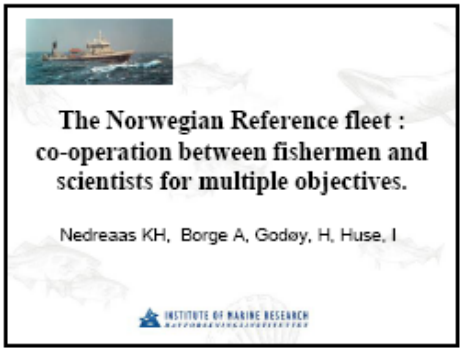


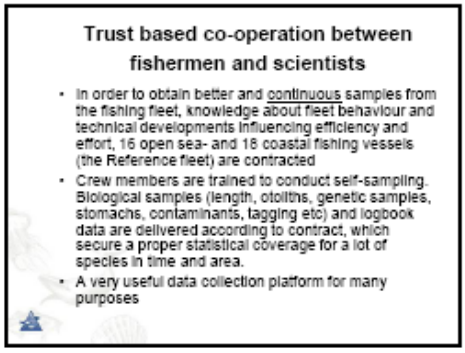


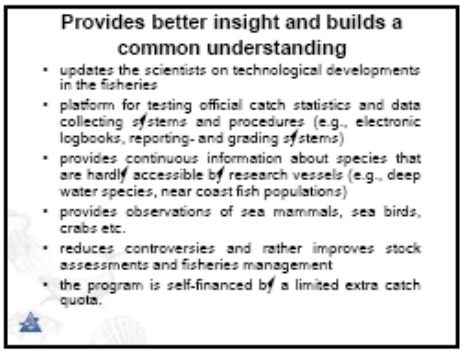


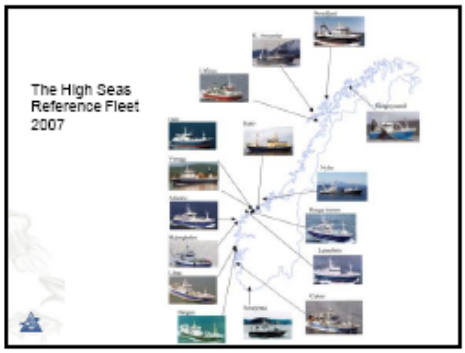


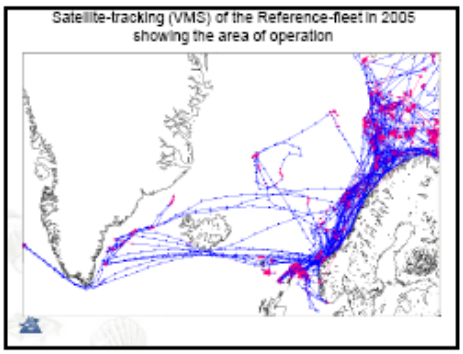
K. Nedreaas: The Norwegian Reference fleet

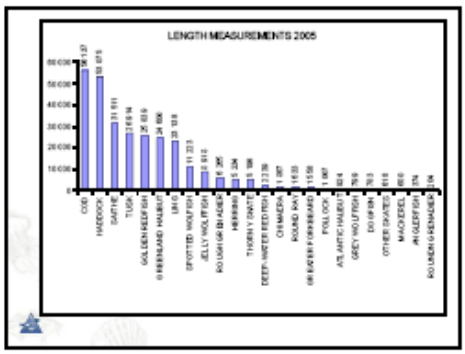












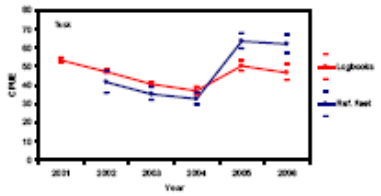
Otolitter 2005

Båt	Torsk	Hyse	Blåkveite	Sei	Kveite	Lange	Brosme	Steinbider	Vanlig uer	Totalt
Atlantic	444	180			4	500	540		20	1 640
Geir	1 000						100		20	1 140
Hauge Senior	820			120		140	240		20	1 140
K. Arctander	540		220	240					20	1 020
Kaio	820	100	280	820						1 600
Leinebris	580	240	180	180		40				1 180
Prestfjord	700	80	180	280				40	40	1 320
Skjongholm	85									85
Utlaca	80		120	180						380
Vikaga	300			200						500
Total	4 977	600	940	1 700		680	880	40	120	10 000
Line	2 652	400	180	120	4	680	880	0	80	4 992
Gaun	705	100	280	700	0	0	0	0	0	1 845
Trål	1 540	80	400	720	0	0	0	40	80	2 840
Snurrevad	80	0	120	0	0	0	0	0	0	200
Not	0	0	0	180	0	0	0	0	0	180

Is the Reference fleet representative/a good reference for the whole Norwegian fleet?

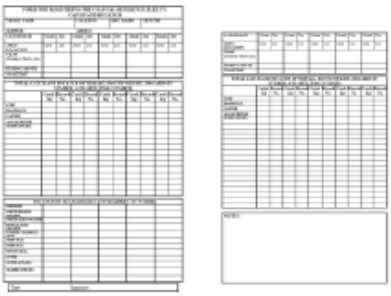
...an example from the longline fisheries follows.....

Estimated mean CPUE ([kg/hook]x1000) based on official logbook data from the whole fleet (red line) and the Reference fleet data (blue line) for tusk in ICES subarea IIa. The bars denote the 95% confidence intervals.



Hefre 2007

The coastal gillnet Reference fleet



Not to be cited without prior reference to the authors

NAMMCO/SC/8/03

A System for Monitoring Bycatches of Marine Mammals in Norwegian Coastal and Inshore Waters

ARNE BJØRGE, HALLVARD CODDY & KJELL NEDREAAS
Institute of Marine Research
Bergen, Norway

ABSTRACT

In order to improve the fisheries statistics for coastal and inshore fisheries, a number of coastal fishing vessels was contracted to provide year detailed information on their fishing effort, catches, bycatches including accidental catches of seabirds and marine mammals. The skippers of a sub-sample of coastal fishing vessels less than 15 m total length were contracted and offered economic compensation for providing information on their fishing operations and catches. The financial compensation in combination with the selection procedure, and a continuous personal dialog with the skippers contribute to the reliability of the reported information.

By the end of 2005 a total of 81 vessels was contracted, two vessels in each of nine fishery stratification areas. Fourteen of these vessels were contracted for 1st October and for these vessels information on effort, catch and bycatch were available for the period 1st October-31st December 2005.

Forty marine mammals (26 harbour porpoises, 13 harbour seals and 1 grey seal) were incidentally by-caught. Information on the associated gear type, fishing effort and landed catches of target species is provided. The first period of data from the contracted fishing vessels indicates that this is a promising method for monitoring by-catches and estimating total removals of marine mammals by commercial coastal fisheries.

Data from the Reference fleet – coast

14 boats recorded log books in 2005

Gear	Number of gears	Catch of fish (kg round weight)	Catch of shellfish (number)	Catch of sea mammals (number)
Gillnet	43 830	271 872	7 957	37
Longline	25 000	5 561	287	0
Fish trap	1 028	758		3
Pot	1 738	3	868	0

18 boats recorded log books in 2006

Gear	Number of gears	Catch of fish (kg round weight)	Catch of shellfish (number)	Catch of sea mammals (number)
Gillnet	181 479	1 699 505	54 515	165
Jigging	2 160	111 733		
Longline	90 800	33 358	82	
Purse seine	14	40 500		

Bycatch of sea mammals distributed by gear, area and species 2006

Sum of catch number	Species												
	HARP SEAL		GRAY SEAL		HARBOUR PORPOISE				HARBOUR SEAL				Total
Area/Gear	4	Total	4	5	3	4	5	7	Total	4	5	Total	Total
Gillnet unspecified					5	1			6				6
Gillnet 70mm					25		2	3	28				28
Gillnet 80mm	1	1			5			1	6				7
Gillnet 90mm					4	4	2	13	23				23
Gillnet 100mm			1	1				2	2	1		1	4
Gillnet 180mm			3	3	54			4	58	14	1	15	76
Jigging													
Grand total	1	1	4	4	91	5	4	23	123	15	1	16	140

Number of gears and kg fish per bycatch of sea mammals 2005

GEAR	Gears per sea mammal	Kg fish per sea mammal
Gillnet unspecified	808	1 888
Gillnet 70mm	9 983	170 084
Gillnet 80mm	5 505	22 988
Gillnet 90mm		
Gillnet 180mm	854	1 461
Fish Trap		
Longline		
Pot (Lobster)	503	
Pot (Norway lobster)		
Grand Total	1 890	6 950
Gillnet total	1 185	7 348

Number of gears and kg fish per bycatch of sea mammals 2006

	Gears per sea mammal	Kg fish per sea mammal
Gillnet unspecified	5 513	22 915
Gillnet 70mm	1 287	13 852
Gillnet 80mm	683	8 172
Gillnet 90mm	1 252	25 019
Gillnet 100mm	1 774	57 126
Gillnet 110mm		
Gillnet 180mm	745	1 360
Drift net	1 017	4 536
Jig		
Longline		
Purse seine		
Danish seine		
Gillnet total	1 099	10 297


Bycatch of king crab in gillnets .

To be at the right place at the right time – the Reference fleet makes it possible !!

Urgent sampling of otoliths (and genetics) for determining cod type.
MS Leirvåg Junior:

Date	Area	NEA cod	Coastal cod
06.05.06	0020	3	10
21.05.06	0020	16	4
27.05.06	0020	13	7
Sum		34	19

MS Nimrod:

Date	Area	NEA cod	Coastal cod
09.05.06	0044	2	20

Optimization of the data collection and implications for stock assessments

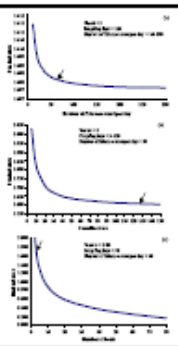
Precision of the estimate of the mean length of tusk (*Brosme brosme*) as a function of

(a) the number of fish sampled per day,

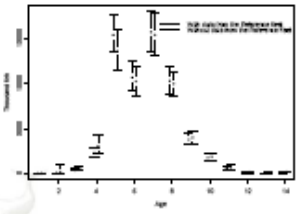
(b) the number of days each boat collects samples,

(c) the number of boats in the reference fleet.

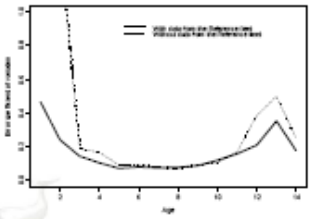
The arrows denote the precision of the 2003 data (from Helle and Pennington 2004).



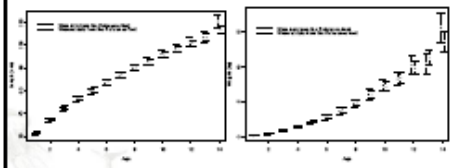
Norwegian catch-at age of Northeast Arctic cod (*Gadus morhua*) in 2005 with and without data from the Reference Fleet.



Error coefficient of variation (standard deviation/ mean) for the estimated numbers at age shown in previous figure



Differences in length- (left) and weight-at-age (right) of the Northeast Arctic cod (*Gadus morhua*) caught by Norwegian fishermen in 2005 dependent on using data from the Reference Fleet or not.



INCLUDING DATA COLLECTED BY THE REFERENCE FLEET

Rationale	SSB 2006	TSB 2006	TAC (1000's)	Rule	F 2006	SSB 2007	TSB 2007
Zero catch	701	1715	0	$F=0$	0	1338	2174
Status quo	701	1715	307	F_{sq}	0.4966	701	1738
High long term yield	701	1715	334	F_{msy}	0.55	667	1664
Agreed management plan	701	1715	333	TAC(management plan)	0.4334	809	1800
Precautionary basis	701	1715	306	F_{pa}	0.4	855	1809

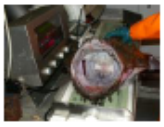
WITHOUT DATA FROM THE REFERENCE FLEET

Rationale	SSB 2006	TSB 2006	TAC (1000's)	Rule	F 2006	SSB 2007	TSB 2007
Zero catch	711	1643	0	$F=0$	0	1338	2184
Status quo	711	1643	307	F_{sq}	0.5317	692	1658
High long term yield	711	1643	319	F_{msy}	0.55	667	1612
Agreed management plan	711	1643	306	TAC(management plan)	0.4403	772	1742
Precautionary basis	711	1643	464	F_{pa}	0.4	750	1709

Some future plans:

- document how representative the Reference fleet is for the whole Norwegian fleet regarding different matters
- improve the design and optimize the catch sampling by doing more precision analyses, incl. more species and more parameters
- investigate and analyse the possibility of using the Reference fleet in the estimation of discards in the Norwegian fisheries (in combination with Coast Guard inspection, inspectors from the Directorate and port sampling). If necessary more observers.
- description, quantification and consequences of changes in fishing efficiency
- use the network of Reference fishers to discuss better operationalization of biological advices into practical regulations
- stimulate the fishers to provide ideas for new projects to improve our knowledge about the fish resources, not at least local and regional coastal resources

Thank you for your attention!



K. Helle: Does the Norwegian reference fleet represent the entire fleet?

Does the reference fleet represent the entire fleet?

Kristin Helle

INSTITUTE OF MARINE RESEARCH

- Area coverage
  - Bottom trawl (3), gillnets (4), longline (4)
- CPUE
  - Ling and tusk
- Other reference fleet applications

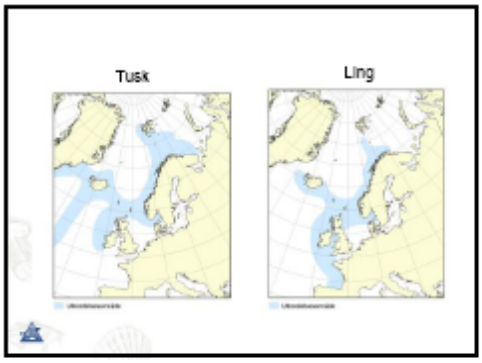
Area coverage

- Data from bottom trawl catches of cod, haddock and saithe in ICES areas I, IIa, IIb, IVa and IVb
  - Reference fleet data from all areas
- Cod and saithe caught in gillnets
  - Reference fleet covers the main areas

What about fisheries that take place over a much larger area?

Data for ling and tusk (cusk)

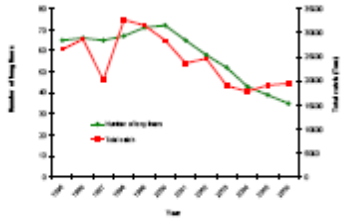
- The scientific surveys only cover a small part of the distribution area
  - Commercial data
    - Official catch statistics
    - Log books"
    - Reference fleet



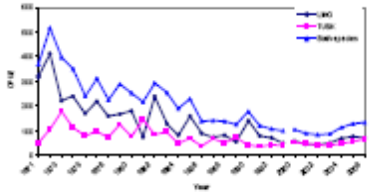
Norwegian fishery for ling and tusk

- Norway takes about 70% of the total catches of tusk (in 2006 14 400 tons) and about 40-50% of the ling catches (in 2005 16 800 tons)

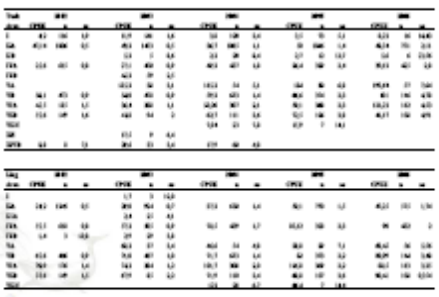
The Norwegian long line fleet

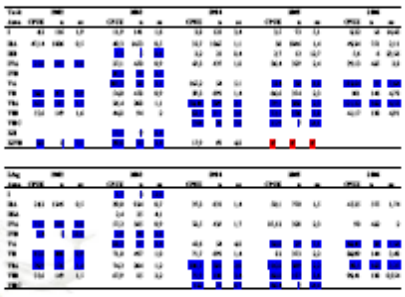


Development of CPUE

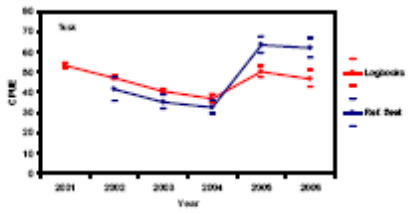


CPUE ([kg/hook] x1000) for ling, tusk and both species combined for the period 1971-1993 and for 2000-2006.

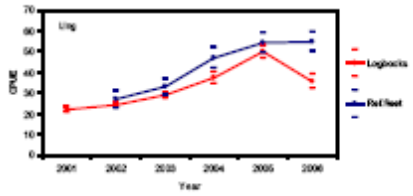




CPUE tusk in ICES area IIa



CPUE ling in ICES area IIa



Reference fleet vs. the rest

- Cover only parts of the fishing areas
- Only area IIa has sufficient data to compare the reference fleet with the logbooks
- Must have logbooks from more vessels than only the reference fleet

The reference fleet- what is it good for?

- Length measurements
- Genetic samples
- Otoliths
- Pollution samples
- Direct information from the fishers

M. Pennington: Some sampling considerations for estimating population characteristics

Some sampling considerations for estimating population characteristics

Fish that are caught together at a station form a cluster. From each cluster, fish for aging, measuring, *etc.* are selected, that is data on population characteristics are often generated by two-stage cluster sampling. When the sample consists of a total of *m* fish from *n* clusters, the individual animals are not a random sample from the entire population. This is because animals caught together tend to be more similar than animals in the entire population (*i.e.* there is positive intra-cluster correlation).

Given a random sample of *n* clusters and a random subsample of m_i fish from a total of M_i individuals in cluster *i*, then the design-based estimator

$$\hat{\mu}_1 = \frac{\sum_{i=1}^{n} M_i \bar{x}_i}{\sum_{i=1}^{n} M_i}$$

is a consistent estimator of the mean.

An alternative to the design-based estimator, which in some situations may have a smaller variance than the design based estimator, is the unweighted average

$$\hat{\mu}_2 = \frac{\sum_{i=1}^{n} \bar{x}_i}{n}$$

This estimator may be biased, and the bias may not decrease with increasing sample size.

The expected bias is given by

$$Bias(\hat{\mu}_2) = -\frac{Cov(M_i, \bar{x}_i)}{\overline{M}}$$

Therefore if cluster size and the estimate for the cluster are uncorrelated, then the unweighted estimator will be unbiased

"If the (unweighted estimator) is intended to be used, the relation of cluster sizes and cluster means should be examined carefully."

From: Practical Methods for Design and Analysis of Complex Surveys
By
Lehtonen and Pahkinen (2004)

To evaluate the relative precision of the two estimators, consider the standard random effects model

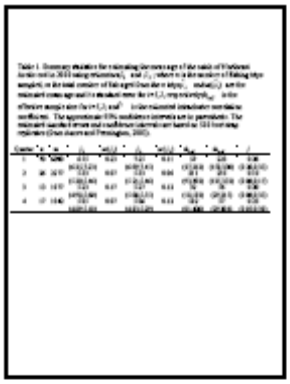
$$x_{ij} = \mu + A_i + e_{ij}$$

Then

$$Var(\hat{\mu}_1 \mid \mathbf{m}) = \frac{\sigma_e^2}{n\overline{m}} + \frac{\sigma_A^2}{n}\left(1 + \frac{s_m^2}{\overline{m}^2}\right)$$

and

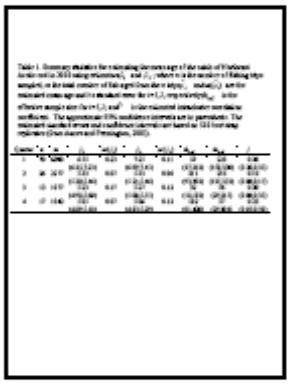
$$Var(\hat{\mu}_2 \mid \mathbf{m}) = \frac{\sigma_e^2}{n^2} \sum \frac{1}{m_i} + \frac{\sigma_A^2}{n}$$



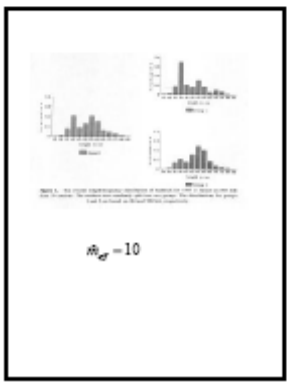
If there is positive intracluster correlation, then a sample consisting of a total of *m* fish from *n* clusters will generally contain much less information on the population structure than an equal number of fish sampled at random, that is the effective sample size is much smaller than the number of animals sampled.

The effective sample size is defined by

$$\frac{\hat{\sigma}_\beta^2}{\hat{m}_{ef}} = \mathrm{var}(\beta_n)$$



A small effective sample size implies that the estimate of the entire distribution is rather imprecise



$\hat{m}_{ef} = 10$

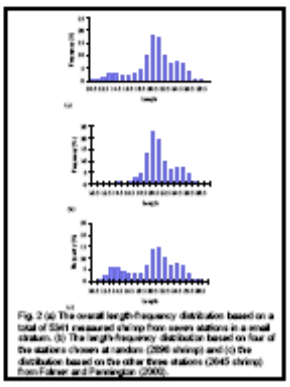
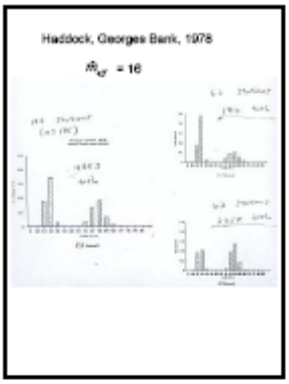
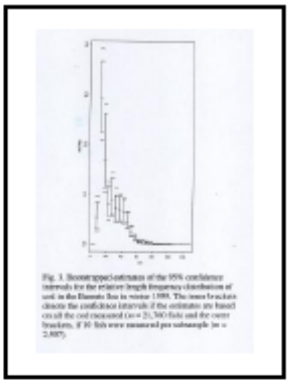


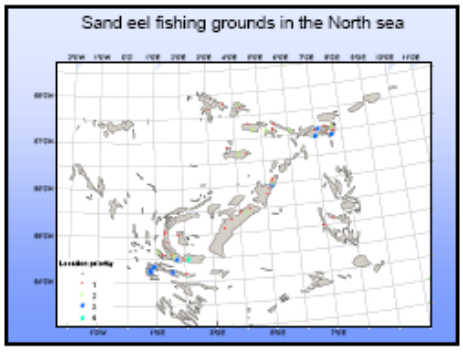
Fig. 2 (a) The overall length-frequency distribution based on a total of 5361 measured shrimp from seven stations in a small stratum. (b) The length-frequency distribution based on four of the stations chosen at random (2696 shrimp) and (c) the distribution based on the other three stations (2645 shrimp) from Fahrner and Pennington (2000).

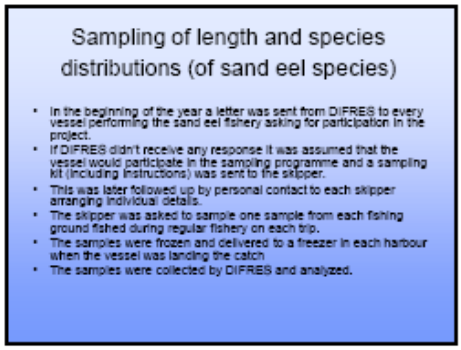


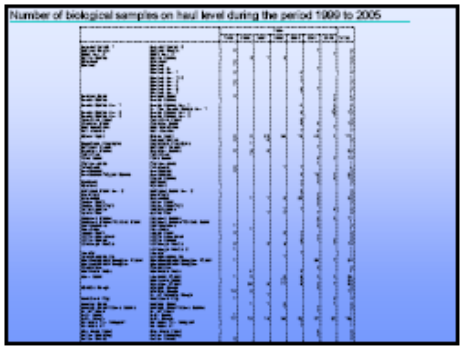


The effective sample size and its 'twin', the design effect, are used to adjust chi-square statistics for goodness-of-fit tests, for comparing frequency distributions, etc.

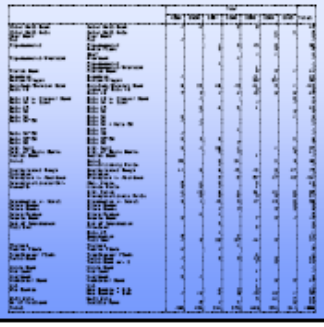
H. Degel: Self-sampling from Danish sandeel fishery





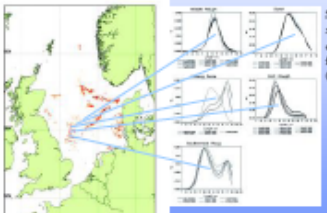


Number of biological samples on haul level during the period 1999 to 2005



Biological samples collected on haul level during the period from 1999 to 2005

Analysis of lengthdistributions of sand eel



Sands eel have a specific length distribution on each fishing ground. (data from 1999)

Summing up…

Because the stock has a very complex dynamic with little or no interchange between most fishing grounds each having deferent seasonality it must be a textbook example of "cluster sampling".

This means that the sampling level has to be very high in order to obtain precise estimates of each fishing ground and the whole population.

This again probably leaves self sampling as the single candidate for a cost efficient sampling scheme.

Sampling of sand eel larvae/juvenile by commercial fishing vessels

Cooperation between :

- Danmarks Fiskeriforening
- Danmarks Fiskeriundersøgelser
- Danske Industrifiskere
- Fiskeriselskabsfiskerne

Objective:

To investigate the ability for commercial fishing vessels to sample quantitative samples of 0-group sand eel,
i.e. samples which can be used to indicate the year class strength of the 0-group.

Background:

The stock development and the fishing possibilities do very much depend on the recruitment.

There is a need for fishery independent data as input for the assessment of sand eel.

The sand eel fishermen claim to be able to predict the size of the 0-group year class based on their observation of the concentration of larvae in the end of the fishing season. It has not been possible to utilize such information in the management of the stock.

Sampling of sand eel larvae by commercial fishing vessels

2 methods were tested.

Method 1:

- Sampling of larvae using a plankton net (1m MIK).

Cattleya 2004
Alkyone 2004

Method 2:

- Sampling of juvenile sand eel from the seabed using a modified mussel's dredge

Preliminary conclusions

- The catch of larvae seems to be very nicely correlated with the year class strength.
- The catch of juvenile sand eel using the dredge does not always reflect the year class strength.

Annex 4: WKUFS terms of reference for the next meeting

2007/x/ACFMxx A **Workshop on Using Fishers to Sample Catches** [WKUFS] (Co-chairs: Kjell Nedreaas, Norway* and Michael Pennington, Norway* will be established and will take place at ICES HQ in Copenhagen, Denmark, during 4 days in 2008 to:

a) Review existing systems for using fishers to sample catches (self-sampling systems) based on intercessional exchange of information.

b) Develop standards for designing self-sampling programmes, e.g., present the effective sample size for a survey.

c) Determine sampling schemes that are meant for estimating, among other quantities, discards and unreported landings.

d) Examine general survey design issues such as the use of fixed stations, the use of fishing vessels or fishery independent surveys, etc.

WKUFS will report for the attention of ACFM, RMC and PGCCDBS by dd.mm 2008.

Supporting Information

PRIORITY:	To assess a fishery it is necessary to determine the biological characteristics, such as age and length distributions, of the commercial catch. In addition, estimates of the amount of discards will lead to more accurate assessments.
SCIENTIFIC JUSTIFICATION AND RELATION TO ACTION PLAN:	Action Plan No: ??
RESOURCE REQUIREMENTS:	DCR data collection system.
PARTICIPANTS:	In view of its relevance to the DCR, the Workshop is expected to attract wide interest from both ICES Member States and Mediterranean EU Member States.
SECRETARIAT FACILITIES:	None.
FINANCIAL:	To ensure wide attendance of relevant experts, additional funding will be required, preferably through the EU, e.g. by making attendance to the Workshop eligible under the DCR.
LINKAGES TO ADVISORY COMMITTEES:	ACFM and its assessment Working Groups.
LINKAGES TO OTHER COMMITTEES OR GROUPS:	This workshop was proposed by PGCCDBS. Outcomes from this Workshop will be of interest to the Living Resources Committee and the Resource Management Committee.
LINKAGES TO OTHER ORGANIZATIONS:	There is a direct link with the EU DCR and outcomes from this Workshop will be of interest to several RFOs, including GFCM and NAFO.

Annex 5: Recommendations

We suggest that each Expert Group collate and list their recommendations (if any) in a separate annex to the report. It has not always been clear to whom recommendations are addressed. Most often, we have seen that recommendations are addressed to:

- Another Expert Group under the Advisory or the Science Programme;
- The ICES Data Centre;
- Generally addressed to ICES;
- One or more members of the Expert Group itself.

RECOMMENDATION	ACTION
1) Next WKUFS in 2008.	ACFM, PGCCDBS
2) Collection and Interpretation of Fishery Dependent Data-ICES Symposium 2010	ICES ConC
3)	
4)	
5)	
6)	

After submission of the report, the ICES Secretariat will follow up on the recommendations, which will also include communication of proposed terms of reference to other ICES Expert Group Chairs. The "Action" column is optional, but in some cases, it would be helpful for ICES if you would specify to whom the recommendation is addressed.