ICES WKSC REPORT 2008

ICES Advisory Committee

ICES CM 2008/ACOM:30

Ref. LRC, RMC, PGCCDBS

Report of the Workshop on Fishers Sampling of Catches (WKSC)

10–13 June 2008

ICES, Copenhagen, Denmark

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

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

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

Recommended format for purposes of citation:

ICES. 2008. Report of the Workshop on Fishers Sampling of Catches (WKSC), 10–13 June 2008, ICES, Copenhagen, Denmark. ICES CM 2008/ACOM:30. 61 pp.

Contents

Executive summary

A workshop (ICES-WKUFS) on self-sampling by fishers was held in Bergen, Norway in 2007. At this workshop it was decided that it would be useful to have a follow-up workshop that would expand on the topics covered in 2007, go into more detail on sampling strategies and determine the amount of information in particular datasets. It was observed during the 2007 workshop that 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.

Surveys and experiments conducted by fishing vessels may complement studies and scientific surveys conducted by research vessels and in some cases provide a cost-effective alternative to research surveys. The use of fishing vessels can facilitate synoptic surveys because the fishing fleet covers large areas, and can be an effective platform for experimental studies, with more flexibility then research vessels, which generally are committed to routine surveys. When fishing vessels are used for marine abundance surveys and other scientific studies, it is crucial that the selection of stations and protocols for biological sampling be conducted according to proven statistical principles. When trawl surveys conducted by fishing vessels use standard designs such as stratified random or systematic selection of stations, then the mean catch per area swept provides an estimate of relative abundance. Also, sampling by fishing vessels (using trawls, traps, or other gears) at fixed stations, or at a combination of fixed and random stations, may prove effective for monitoring trends in abundance.

The workshop reviewed and when appropriate updated the 2007 summaries of some self-sampling programs conducted in various countries. Based on this latest review, six themes were still found to be of major importance for designing and implementing a self-sampling programme: creating incentives for fishermen, communication, confidentiality, financing, training, and survey design

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. It was emphasized that for each programme the effective sample size is a more meaningful statistic than just giving the sample size. This is because fish caught together are more similar than those in the entire catch, i.e. there is positive intracluster correlation. It follows that samples of animals caught in 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. This implies that in general it is best to collect a few fish from as many clusters as possible.

Finally, to keep a dialogue among scientists working on self-sampling programs going, it was decided to construct an Internet website for self-sampling. At this site scientists can answer survey questions which will describe their self-programs and whom to contact for more specific information. This should provide valuable resource for both ongoing and start-up self-sampling programs.

1 Introduction

1.1 Terms of Reference

2007/2/ACOM30 The **Workshop on Fishers Sampling of Catches** [WKSC] (Co-Chairs: Kjell Nedreaas, Norway* and Michael Pennington*, Norway will be established and will meet at ICES HQ, Copenhagen, Denmark, 10–13 June 2008 to:

a) Review existing systems with fishers sampling of catches (industry sampling systems) based on intercessional exchange of information.

b) Develop standards for designing industry-sampling programs, e.g. Present the effective sample size for a survey.

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

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

WKSC will report by 20 June 2008 for the attention of ACOM, LRC, RMC and PGCCDBS.

1.2 Background and opening of the meeting

A workshop (ICES-WKUFS) on self-sampling by fishers was held in Bergen, Norway in 2007 (ICES 2007). At this workshop it was decided that it would be useful to have a follow-up workshop that would expand on the topics covered in 2007, go into more detail on sampling strategies and determine the amount of information in particular datasets. This is because to assess a fishery it is necessary to estimate, among other biological characteristics, the age and length distributions of the commercial catch. Additionally, self-sampling by fishers is probably the only practical and cost-effective way to generate accurate and precise estimates of the amount of discards by time and area, which should lead to more accurate assessments.

It was observed that 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 appears to 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 a was to update information on current self-sampling programmes, examine whether there were any changes to these programs in the past year and document the reason such modifications were made. ToRs b through d focused on current sampling strategies, survey designs and data precision. The objective of these studies was to evaluate potential strategies for increasing their usefulness by appropriate changes in sampling strategies.

2 Adoption of the agenda

A list of working documents and compilation of the oral presentations during the workshop is given in Annex 3. All working documents and oral presentations are available from the author(s)/presenter or the co-chairs.

2.1 Review of existing systems for using fishers for sampling (ToR a)

The workshop reviewed some self-sampling projects that are currently operational or at a very early development status.

Some of these self-sampling systems were presented orally at the workshop (see Annex 3). Additionally, participating countries were asked to give a short description of their self-sampling system or to update the description given in the report of WKUFS (ICES 2007). In those cases, where WKUFS-reviews were not updated, since no representative of this country participated, the former review was included again to give as complete review as possible (those reviews are marked).

In addition to these more general introductions to several self-sampling systems, WKSC prepared an online-questionnaire to review self-sampling programs in a more systematic way (Annex 4). Participants were asked to fill out this online-questionnaire after the meeting. A first analysis of this questionnaire survey can be found in Annex 5.

The questionnaire led to discussions about the future use of this information, future work and the continuation of the WKSC-network. If there is agreement that this work should continue (perhaps in another structural context), then this questionnaire could be used to collect information about self-sampling systems all over the world. Hereby, the question of data publication and the setup of (e.g.) an online-source for information related to self-sampling programs should be discussed.

2.1.1 Belgium

Since April 2008, ILVO was involved in the EU project 'Joint data collection between the fishing sector and the scientific community in Western Waters', a project in support of the Common Fisheries Policy. The project team consist of members from professional organizations as well as fisheries scientists from the following member states: United Kingdom, France, Ireland, Belgium, Spain and Portugal. The aim is to gather an extensive knowledge and expertise of fishers and to use this information to support policy decisions. The study will improve the use of existing information (e.g. logbooks, VMS), and design and implement pilot programmes to obtain supplementary information from the fishing industry. The latter will be established, among other things, by questionnaires (e.g. to document changes in fleet behaviour in response to management measures) and by the implementation of self-sampling programmes to gather data on, e.g. discards.

Another Belgian programme, ILVO, is looking at the potential to include self-sampling programmes in its National Data Gathering Programme. Considering the substantial latent capacity for fishers to provide haul-based data on catch compositions and discard quantities and to collect biological information throughout the year; self sampling would allow a serious increase in coverage and reducing problems of very large raising factors based on scientific observer data only.

Contact: Sofie Vandemaele (sofie.vandemaele@ilvo.vlaanderen.be)

2.1.2 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 programs.

Contact: Rick Stead (rick.stead@dfo-mpo.gc.ca)

In addition, the Department of Fisheries and Oceans, Newfoundland and Labrador Region, runs a lobster data collection project. The project rationale is to conduct basic monitoring of the lobster fishery in Placentia Bay and Fortune Bay (NAFO Sub-Division 3Ps), Notre Dame Bay (NAFO Division 3K) and Newfoundland West Coast

(NAFO Division 4R) to provide data necessary to evaluate fishery performance and to assess the status of the resource.

The project objectives may be summarized as follows:

- To implement a scientifically sound at-sea sampling and logbook programme to collect biological and catch and effort information.
- To continue use of modified traps by selected harvesters that limit escapement of sub-commercial lobster in an effort to develop a reliable recruitment index.
- To consult with industry in the design of the survey and the sampling protocols.
- To incorporate industry vessels and fish harvesters in completing the project.
- To provide an analysis of the data to the Regional assessment process, thereby increasing understanding of the stock in these areas.

The work and experimental protocol may be described as follows:

- Sampling will be conducted in the areas specified above. The project will consist of two initiatives, at-sea sampling of catch from commercial and modified traps in each area by a trained technician provided by industry partner, and the collection of catch and effort data from fish harvester completed logbooks. The following protocols will be used.
- Logbooks will be provided to 15-20% of license holders in each area for their voluntary completion daily throughout the fishing season. Most harvesters completing logbooks will also use traps that have been modified to prevent escapement of non-commercial (undersized) lobsters. From these traps the harvester will record numbers of commercial sized animals, berried females, non-commercials and any v-notched animals each day the traps are hauled. Because this is a time-consuming process, harvesters will be assisted by at-sea samplers several times during the season.
- A trained observer will ride aboard a commercial lobster boat for the duration of its fishing day and sample all lobsters in all the modified traps and as many individual commercial traps as possible without unduly impeding the operation. In traps sampled, each lobster will be measured (carapace length to nearest mm), sexed and females carefully examined for presence of eggs and v-notches. Data will be recorded onto waterproof slates and transcribed onto data sheets onshore at the end of each sampling day.
- Sampling will be done on board a number of different boats representing at least 20-25% license holders in each area to ensure good coverage of the fishing area throughout the season. Priority will be given to those using modified traps.
- Bottom temperatures will be collected wherever possible in the fishing areas.
- Logbook and at-sea sampling data entry will be done by industry partner staff according to detailed instructions provided by DFO scientific staff.

Analyses of data will be carried out by DFO staff or designated individuals or organizations.

Similar programs are in place in other Regions of Canada, specifically Maritimes (Nova Scotia) and southern Gulf of St. Lawrence (New Brunswick/Quebec) where index harvesters (same as a reference fleet) use logbooks, experimental traps (no vents), and measuring devices (carapace size) to collect data.

For the herring fishery in the southern Gulf of St. Lawrence index harvesters complete logbooks, and are provided special accoustic equipment and some multi-mesh size gillnets to sample the catch. In Maritimes region the Industry sample silver hake for length distribution.

Contact: Rick Stead (rick.stead@dfo-mpo.gc.ca)

2.1.3 Denmark

Baltic Salmon: Denmark has a 40–year-old project with salmon fishers 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.

Contact: Frank Ivan Hansen (fih@difres.dk)

Sand eel in the North Sea: There is a Danish reference fleet consisting of 15-20 vessels that takes about 400 samples yearly in the sandeel 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. The fishermen are not paid for this sampling.

Contact: Henrik Jensen (hj@difres.dk)

Sand eel larvae in the North Sea: 2 vessels collect yearly about 60 samples of sandeel larvae, which are caught at night-time with a special MIK "trawl" with a opening of 1 meter. The fishermen are paid about 500 Euros per sample,

Contact: : Henrik Jensen (hj@difres.dk)

Sole in the Kattegat: A small group of fishers have during a 10 year period delivered private logbooks with information on catches and effort on a haul by haul basis.

Contact: Ole Jørgensen (olj@difres.dk)

Cod in the Kattegat- Skagerrak: In August 2008 a pilot study for one year using 6 trawlers and gillnetters will conducted to document the fishery in the Kattegat and Skagerrak. The fishers will be monitored using video cameras, VMS data and observers on 2-3 trips during the study period. The participating vessels will get an additional quota in the pilot study period. Results from the pilot study will be reported in October 2009

Contact: Jørgen Dalskov (jd@difres.dk)

Cod in the Baltic: A small reference fleet of 5 trawlers have since November 2007 recorded in logbooks catch data in the Baltic Sea on a haul by haul basis. Probably, starting in August 2008, length distributions for landed cod and discard information also will be collected. Observers will participate in the fishery from time to time.

Contact: Marie Storr-Paulsen (msp@difres.dk)

Cod in Øresund (sport fishing): It is planned to start up a reference fleet of sport fishing tour boats in the Øresund region in the course of 2008. The fleet will collect catch data on a daily basis for cod.

Contact: Cecilia Kvaavik (ckv@difres.dk)

Non-commercial fishing with passive gears (not sport fishing): This project was started in 2002, and today 93 non-commercial fishers that are fishing with 3 gillnets or 3 trapnets are involved. – These 93 persons covers all Danish salt waters, and all 93 fishers register once per month their catches, which are sent to our institute. The fishers are paid by receiving 3 free gears per person.

Contact: Josianne Støttrup (jsv@difres.dk)

Herring and Sprat in the Baltic: The fishing industry collected samples from landings in three harbours in the Baltic during the last 5 years.

Contact: Frank Ivan Hansen (fih@difres.dk)

2.1.4 Germany

Since May 2007, Institute for Baltic Sea Fisheries (OSF) is involved in the EU project JOIFISH/Lot8 (Joint data collection between the fishing sector and the scientific community in the Baltic Sea), a project in support of the Common Fisheries Policy.

Professional fishery organizations and fishery scientists from following countries work together: Sweden, Denmark, Germany and Poland.

The main aim of the project is to review, design and test the feasibility of new joint data collection programmes improving the data quality for fish stock assessments and fisheries management in a cost-effective way and involving the fishing industry more actively in the scientific process leading to the provision of scientific advice.

A secondary objective is to build trust between fishermen and the scientists.

In April 2008 the first reference fleet fisherman has started to fill out a protocol which has been designed together in this project. Currently 4 trawlers and 4 gillnetters collect data on a haul by haul basis in the Baltic Sea. This includes detailed information about their fishing activity, fishing effort, catch composition (landings and discards) and biological characteristics of the catch. In every tenth haul a sample of cod will be length measured. The allowance for length measuring will be approximately 50€ per measuring sample.

In many cases, fishing vessels have taken OSF staff to sea as observers and the crews have been made familiar with the self sampling scheme. Data quality is assured by proper training of involved fishermen and by frequent visiting and checking of their work. So the fishermen stand in close contact with the scientists and have a good possibility to discuss actual problems.

To improve the estimation of cod recruitment, a survey was realized in April 2008 in the West Baltic Sea on board of two commercial boats. In October 2008 a common survey is planned with Sweden and Denmark in the same way.

Contact: Petra Jantschik (petra.jantschik@vti.bund.de), Ronny Weigelt (ronny.weigelt@vti.bund.de), Daniel Stepputtis (daniel.stepputtis@vti.bund.de)

2.1.5 Iceland

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

Contact: Guõmundur J. Óskarsson (gjos@hafro.is)

2.1.6 Ireland

Irish Sea Data Enhancement Pilot (ISDEP):

The Irish Sea Data Enhancement Pilot (ISDEP) was conceived in 2006 and driven by a NWWRAC, UK and Irish industry initiative. The principal goal is to provide detailed, robust and accurate data on catches (landings and discards) from the Irish trawl fleets operating in the Irish Sea (VIIa) to supplement and enhance existing data collection programmes (e.g. DCR).

ISDEP is intended to run for two years at a minimum and provide data useful data for stock assessment purposes and give sufficiently detailed information on which alternative/supplementary management approaches can be investigated for the Irish Sea, in particular for discard reduction initiatives (e.g. spatial and temporal closed areas and provide baseline data for gear selectivity projects) and for Irish Sea cod recovery. ISDEP is coordinated by national scientists, administrators and fishermen's representatives.

Data collection program and fisher self sampling co-operative industry/science pilot programme for Irish Sea demersal trawl and seine fisheries were initiated in summer 2007.

To ensure that the data being collected from the FSS scheme are concurrent with existing national programmes, FSS data will be cross checked with discard observer data collected from vessels from the same métier with similar spatial and temporal attributes.

Industry participation has been deliberately limited to a few vessels (5).

Four trips were conducted during Q4 2007, while the DCR target was one, and eight trips conducted in Q1 2008, again the associated DCR target was one. By January 2008, five (different) Irish vessels (4 Nephrops and 1 whitefish) were participating on a semi-regular basis. Some initial problems with data collection have been resolved by concentrating on fewer, permanent vessels, who have consistently demonstrated good record keeping. Some skippers have noted that the additional paperwork associated with the diaries generates too much additional work and investigations are underway into methods of streamlining or automating the data collection.

Contact: Norman Graham (Norman.graham@marine.ie)

Marine Institute Ireland Self Sampling Programme for *Nephrops norvegicus:*

Background:

Under the EC Regulation EC Data Collection Regulation1543/2000 (DCR) the Marine Institute is responsible for the fulfilment of data collection requirements for demersal and Nephrops stocks in Irish waters. As part of the DCR the Marine Instituted currently has a self-sampling programme for *Nephrops norvegicus*, a discard sampling programme and a catch sampling programme up and running for the main Nephrops fisheries (Table 1).

In Ireland a self-sampling programme for Nephrops catches (i.e. landings and discards) has been in place in the Irish Sea - FU15 for almost two decades.

The self sampling programme is a voluntary scheme and the skipper is paid for the samples. Payment is calculated by the weight of Nephrops in the sample by the current market price.

The number of vessels that collect samples varies depending on weather, fishing operations etc but in the Irish Sea this has been up to 15 vessels in a year.

The sampling frequency is aligned to the landings trend in a specific Nephrops fishery as this is seasonal and the sampling levels are determined by the DCR National programme.

The data collected is used by the ICES Working groups (WGs) to provide information on the state of the stock in terms of indicators such as mean size of the sexes, sex ratio, levels of discarding. This information is used to determine the state of the stock at the WGs.

Table 1. Nephrops Self Sampling Programme.

FU	Area	2008 DCR target*
FU15 Nephrops	Irish Sea West	46
FU16 Nephrops	Porcupine Bank	17
FU17 Nephrops	Aran Grounds	16
FU19 Nephrops	Ireland SW and SE Coast	15
FU20 Nephrops	Celtic Sea	50
*Based on 1 sample/50 tonnes landed;average of last 3 years landings		

a) Contacting the Vessel Owner/Skipper:

- Port based staff have been an important factor in the Self sampling programme and these staff have built up and maintained close links with the fishing industry.
- In many cases fishing vessels have taken MI staff to sea as observers and the crews have been made familiar with the self sampling scheme.
- Port based staff contact the vessel owner or skipper to explain the sampling procedure and to arrange the collection of the Bulk Catch and Discard sample.

b) Obtaining a Catch Sample:

- Fishing crew to obtain a 1 box random sample of unsorted bulk catch, from a haul which has not been a foul haul.
- A foul haul is where there has been no gear damage.
- If possible the crew should hose down the sample so it is free of sand and mud.
- Sample to be held in the fish-hold until vessel lands.

c) Obtaining a Discard Sample:

- Fishing crew to obtain a 1 box random sample of discards, from a haul which has not been a foul haul.
- The discard sample should contain discarded small Nephrops and heads when tailing is occurring and also discarded fish.
- If possible the crew should hose down the sample so it is free of sand and mud.
- Sample to be held in the fish-hold until vessel lands.
- The 'unsorted bulk catch' and 'discard' samples must not be mixed.

d) Collection and transportation of the samples:

- MI staff collect and transport the samples when the vessel lands and work up the samples back in the laboratory using an electronic measuring and data capture system called "NEMESYS".

Contact: Colm Lordan (colm.lordan@marine.ie)

2.1.7 Latvia

Since 1993, a reference fleet and a self-sampling system were developed in Latvia for the coastal fishery. Around 20 to 30 individual fishers and fishing enterprises are annually contracted by Latvian Fisheries Research Institute (since 2006 – Latvian Fish Resources Agency). Their responsibility is to write down in special logbooks detailed information about their catches, bird and mammal bycatch and Chinese mitten crab findings. Additionally, in some areas every salmon and sea trout specimen is measured, weighed and scale samples are taken for age estimation. Length measurements in several sites are done also for cod and flounder.

Until 2007 the contracted fishers were compensated by an additional number of fishing gears (the coastal fishery in Latvia is regulated mostly by number of fishing gears) as well as the opportunity to fish during closed periods. Since 2007 the compensation is based on amount of work done. The duties of each fishers can be based on research needs in particular area or type of fishery. They can be either more sophisticated - fish measurements, sampling of scales and/or otoliths, or just the routine collection of fish samples and their transportation to the laboratory for

further analyses. The duty of all contracted fishers is to collect detailed information about their fishery (fishing effort, bycatch, weather conditions during fishing etc.).

The reference fleet programme is based mostly on the needs of the National Data Collection Program for collection of cod, herring, sprat and salmon, and the Coastal Fisheries survey programme.

National legislation demands that a tender for contracting fishing enterprises open to everyone has to be organized each year. However, careful selection of criteria ensures that most of contracting enterprises have good previous experience in data collection and basically remain the same each year. In the majority of cases the contracted fishing enterprises are enthusiastic to participate in the data collection and the program itself is mutually beneficial to both sides in terms of the exchange of information and specific knowledge.

Data quality is assured by proper training of involved fishers and by frequent visiting and checking of their work. People involved in the self-sampling scheme are the same every year thus allowing them to gain experience in sampling techniques.

Contact: Atis Minde (atis.minde@lzra.gov.lv)

2.1.8 Malta

The self sampling of Dolphinfish mentioned in last year's report that was carried out in 2000 and 2001, has been discontinued.

Currently a group of ten fishermen are collecting self-sampled data as part of the EU-LIFE Yelkouan Shearwater project, of which the Malta Centre for Fisheries Sciences (MCFS) is a partner. The Yelkouan Shearwater Project is a partnership of organizations, funded by EU LIFE, which will provide Yelkouan Shearwaters and their main breeding site in Malta a bright future. The Maltese islands are very important for these seabirds. An estimated 1,500 pairs are known to breed here, which equals approximately 10% of the world's Yelkouan Shearwater population. With the help of the EU LIFE Fund, a partnership of three conservation organizations and four government authorities are working together to reverse the population decline and reduce future threats to the birds at the Rdum tal-Madonna site. The project will run until 2010.

The Malta Centre for Fisheries Sciences is lead partner in three actions. The first action was that of identifying the fishing grounds of the Maltese fleet and compiling a detailed report. A questionnaire was later carried out by direct interviews to about 10% of the Maltese fishers in order to have a rough estimate of Seabird bycatch and to assess the fishers' perception regarding the problem. The results were then presented in a paper.

Later, after cordial meetings with the two main Maltese fisher's cooperatives, they were asked to submit ten names of fishermen who are willing to take part in the project and carry out a self-sampling exercise, i.e. collecting data on seabirds, sea-turtles and shark bycatch. Seven surface longline vessels and three bottom longline vessels were enrolled last May and are now sub-contactors to the MCFS. They must make at least twenty-five trips each per year to qualify for the financial benefit of €700 per year. They are also bound to take on-board observers, both to carryout sampling or to observe the birds at sea. All were armed with disposable cameras and a guide to seabirds' identification. The observers were also trained by MCFS scientists on how to identify and record various species of seabirds, sea turtles and sharks.

Contact: Ray Caruana (e-mail: raymond.caruana@gov.mt)

2.1.9 The Netherlands

See Annex 3 for presentation.

Self-sampling in the Dutch demersal fleet was carried out since October 2004, with about 20 vessels participating. Objectives of this sampling program are:

- Collect data for a second opinion on and add more detail to DCR-data
- Monitor effects of the flatfish management plan
- Enhance the perception of fishers about discards

Twice a week (at prescribed days and times) the crew takes a sample of the catch and measures the discards percentage (in volume) of plaice. Since 2006, discards of cod are also measured. The data are sent to the Dutch Product Board, which do the first analysis. IMARES is involved in quality checks and advice on how to carry out the program.

Recently, it was desired to integrate the self-sampling program with the DCR sampling program. In comparing the results of both surveys, it appeared that the estimated discards percentage was structurally higher in the latter sampling program. Before being able to integrate both programs, it needed to be clear why there were differences in results. Therefore, on board comparison of the DCR and self-sampling method was carried out: so far percentages were the same. This indicates that the method in itself does not create the difference. In March a meeting was held with participating fishers to discuss how the differences might have been caused. From this discussion it was concluded that reasons might be: 1) a multi-interpretable protocol; and 2) lack of motivation of some of the crews, which both resulted in measurements not being carried out in a consistent way. The next step is to improve the protocol, including a video on how to carry out the sampling, and to increase the amount of incentives for fishers.

Contact: Edwin van Helmond (Edwin.vanHelmond@wur.nl)

2.1.10 Norway

Current self-sampling programs cover two main surveys:

2.1.10.1 The Reference fleet

In 2000 the Institute of Marine Research (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 otoliths, stomachs, genetic and other biological samples, which are then analysed by the IMR. The reference fleet also provides the IMR with information on fleet behavior and technical developments influencing efficiency and effort. At present there are 17 high seas- and 22 coastal fishing vessels in the Reference fleet. Work is currently being done on designing grids of fixed gillnet or trap stations along the Norwegian coast with the help of local fishermen.

Contacts: Asbjørn Borge (asbjorn.borge@imr.no) and Irene Huse (irene.huse@imr.no)

2.1.10.2 Tourist sea fishing

The Institute of Marine Research has since 2007 collaborated directly with owners of fishing resorts ("rorbuer") that have boats for rent to tourist anglers. The resort

managers and anglers contribute to the program by distributing diaries in which anglers from each cottage/apartment will enter information about their daily catches and fishing effort. All information received by IMR will be treated confidentially and will only be used for research, not for control of the angler's catches. Diaries from anglers reporting accurate data on daily catch and effort will be valuable to the scientists in their effort to improve the assessment of the coastal fish stocks. Over time, trends in yearly catches by anglers are meant to help IMR to evaluate the health of coastal fish stocks and to determine what levels of fishing effort can be sustained for future anglers. In the current pilot project, 65 fishing resorts along the Norwegian coast are cooperating with the institute. The goal is to quantify the catches (by species) taken by tourists operating from more than 500 registered resorts/companies during a three-year feasibility project. This should then establish cost-efficient routines for future tourist catch registration/estimation. All biological sampling (length, age, sex etc.) are currently done by the institute staff subsampling the resorts.

Contacts: Jon Helge Vølstad (jon.helge.volstad@imr.no) and Merete Nilsen (merete.nilsen@imr.no)

2.1.11 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 the 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 the self-sampling programs are: salmon, sea trout, whitefish (*Coregonus lavaretus)* and recently cod was included.

Currently self-sampling covers four main areas:

1) The main goal of the project "Determining the magnitude of discards in the Baltic cod fisherie and further action with regard to them if a no-discard fisheries is implemented". The program, representing LOT 8 program, is to determine the magnitude of discards in Polish cod fisheries by strengthening the cooperation between fisheries scientists and fishing sector. For this project four fishing vessels were randomly selected from the list of four groups of vessels provided by fishermen organizations. Selected vessels were two gillnetters (18 m and 17.5 m length) and two trawlers (12.7 m (fishing with BACOMA codend) and 22 m length fishing with T-90 codend). The choice of any fishing ground depended on the skipper's preference. According to an established scheme most of the fishery trips were made with an observer (scientist or fishery inspector) on the fishery vessel. The role of the observer was to record the bulk of the catch, divided by species, separately for landings and the discard part of the catch as well as length measurement of fish species. In the no-observer trips no length measurements were made but the species recordings were the responsibility of the skippers who were prepared for that role by the Institute. For the purpose of the project there were specially designed haul information forms, which allowed for data recording with higher level of resolution than it is possible with currently existing fishermen logbooks. Hand written forms were delivered (either by mail or submitted personally in case of a trip with Institute scientist on board) to the Institute for computer database recording. Copies of logbooks and first sale documents were submitted in accordance with regulations in force to the Fisheries Monitoring Centre to be entered into the system.

2) The cooperation with selected believable fisherman (specialized in salmonids and whitefish fishing), who represented typical professional profile for that kind of the fishery, is still kept. The fishers were trained and equipped with the relevant equipment. Every year the amount of remuneration was negotiated with the SFI. According to the contracts, they were obliged to collect data from their 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.

3) Starting in the mid-Nineties, there has been cooperation between fishers and SFI in the Vistula Lagoon. Every year two fishery teams set fykenet complexes during entire fishery season. Although they do not get any financial incentive, they are allowed to catch fish in a special prohibited area within Vistula Lagoon. The fishermen are obligated to deliver all information required by SFI staff. Additionally, as supplementary surveys conducted in the area, other groups of fishers were paid to collect data from their catches (length, weight, etc.) and preserve the samples of scales. All mentioned groups are controlled randomly without a previous announcement.

4) 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 on board observers. The fishers take length measurements and record other requested information on each haul. Presently there are only ten hook fishery trips that need to be sampled under the DCR regulations and the sampling effort is distributed quarterly by subdivisions based on the average catch over the previous three years

Contact: Adam Grochowski (agrochowski@mir.gdynia.pl)

2.1.12 Spain

Since 2001, a tag and release programme has been carried out to monitor the recreational tuna fishery. This is a voluntary project, and the number of participants varies from year to year. At the beginning of the season, training is provided to a number of skippers involved in the fishery. Every fish caught, is measured, tagged and released. Additional information about spatial distribution of effort and catches is also recorded.

The number of fish tagged since 2001 is presented in the following table. In 2007, 311 fish where tagged. Mean recapture rates obtained since 2001 are around 4–5%, which is very similar to returns from tags placed by experienced technicians.

Contacts: Iñaki Artetxe (iartetxe@suk.azti.es) and Lucía Zarauz (lzarauz@suk.azti.es)

Year	Albacore	Blue Fin Tuna	Skipjack tuna	Frigate and bullet tunas	Total
2001	10				**10**
2002	80	1			**81**
2003	367	10	1		**378**
2004	125	71	17		**213**
2005	343	144	3		**490**
2006	2539	44	21	12	**2616**
2007	97	213	1		**311**

2.1.13 Sweden

Self-sampling was used in the vendace (*Coregonus albula*) trawl-fishery in the Bothnian Bay area since 2001. This fishery is one of the most valuable coastal fisheries in Sweden. Only roe is exploited and the fishing season is short. The fishery is self-managed (right-based management) so that fishers are regulating the yearly fishing practices through a steering group. Members of the steering group are elected yearly from among the active fishermen. All the vessels (36 in 2007) with licences for vendace-trawling are included. Fishers are voluntarily sampling each trawl-haul (the sample is sorted and different species are weighed separately) and deliver the results to scientists to be used in assessment work. The self-sampling provides detailed information on catch composition (proportion of adult and juvenile vendace and other species) and is combined with the age and length sampling. This has made the assessment of the stock more reliable. The self-management has greatly improved the dialogue between the fishers and scientists. Dialogue meetings, where the stock status and fishing practices are discussed, are held usually twice a year.

Contact: Teija Aho (teija.aho@fiskeriverket.se)

2.1.14 United Kingdom

Northern Ireland

As part of the Irish Sea Enhanced Data collection programme a self-sampling scheme for the N. Irish fleet has been undertaken in 2008.

Background: The majority of N. Irish vessels partake in Nephrops trawl fishing. The economic realities of fishing dictate that fishers must continuously maximize the value of the landed catch. In practice this will involve discarding of low value or unmarketable species and grade sizes while retaining the most profitable components of the catch for landing. As with unaccounted landings this also leads to substantial biases in stock assessments and forecasts. Discarding is also prevalent in the Nephrops trawl fishery due to the comparative small mesh size needed to retain the target species. In essence, discarding induced by quota and catch composition restrictions and poor gear selectivity contribute to stock uncertainty.

In order to improve the robustness of catch data (discards and landings) further sampling from commercial catches is needed. In addition to the observer programme it is hoped that this scheme will encourage fishers to be proactive and to have a central role in the assessment process giving them strong incentives to provide reliable data.

Methodological approach

A two level approach is being adopted. All vessels participating in the programme will fill in log sheets for every haul conducted during a trip. This will provide information on

- Date/Time of shooting and hauling
- Position of shooting and hauling
- Fishing ground and ICES statistical square
- Total bulk catch estimated in boxes/baskets
- Retained catch in boxes/baskets by species

This will provide both spatial and temporal information, and estimates of gross discard levels and landings by species. This will provide accurate data for raising procedures either by effort or catch. Fishers will be requested to provide details of fishing gear used.

In addition to the information above, a subset of vessels will also provide biological samples of discards and bulk catch for on shore analysis by scientific staff. Collection of samples will be rotated around boats involved in the scheme.

As incentive boats will be offered additional days at sea as well as monetary compensation for the samples of bulk catch.

Current situation

The scheme is at an early stage, however so far 10 vessels have agreed to fill in log-sheet data and two vessels have been collecting and freezing samples on a daily basis. Although some samples have been collected, previous attempts to initiate the scheme fully in the later part of 2007 have proved difficult. This is due to a number of factors.

- Many of the N. Irish vessels fished away from their local port and fishing grounds of the western Irish Sea, moving to fishing grounds off Scotland as well as the Eastern Irish Sea. This made it difficult to arrange collection of samples and keep in regular contact with the vessels as many were not based in their homeport for a number of months.
- Nephrops fishing is very labour intensive and crews can spend as much as 20 hours/day working on deck. Routine collection of samples and recording of additional log-sheet information provides extra work for already busy crews and skippers. This is especially true on small boats were a skipper may also be involved in tailing Nephrops on deck.
- Limited staff resources have made it difficult to carry out the work in addition to maintaining Data Collection Regulation observer coverage. Additional staff has been provided to resolve this.

Contact: Greg Foster AFBI observer (Greg.Foster@afbni.gov.uk)

Project Leader: Pieter-Jan Schon (Pieter-Jan.Schon@afbini.gov.uk)

Scotland

FRS, Scotland has run an ongoing (demersal) observer sampling programme since 1975 with approximately 80 trips being done on an annual basis and this work has since extended to cover the nephrops, mackerel and herring fisheries. Until 2003 the need for adopting fisher self sampling schemes was not regarded as a necessity as resources were in place at the time to ensure adequate coverage. However, with increasing demands being placed on the Observer Programmes it has been

acknowledged that there may be considerable benefits to be gained if satisfactory schemes could be designed and adopted.

During 2003, FRS initiated a trial self-sampling study (for discard data) using a vessel that had previous experience of carrying observers on board. The outcomes from this trial indicated that difficulties existed in ensuring that all species and all sizes of fish were collected by all members of the crew and that suitable steps would need to be taken to address these issues.

During 2004 (in response to DCR requirements), FRS carried out a pilot study in relation to sampling of discards (demersal species) within the <10 metre sector of the Fleet. Building on lessons learned from the initial trial, the vessel was instructed not to discard (overboard) any of the catch but simply box all discarded prawns, benthos and fish for sampling by FRS staff on return to port. Due to the size of catch being caught by this size of vessel, this was thought to be a more appropriate method as the quantities involved were more manageable. During the two occasions that this work was undertaken, FRS had an observer on board another vessel carrying out sampling duties under normal conditions. Results from this work proved encouraging and while FRS decided that the need to continue self sampling for this class of vessel was not necessary at that particular time, a similar system could be adopted in the future if the need arose.

Contact: Kenny Coull (coullka@marlab.ac.uk)

During the 'Fishers Self Sampling Workshop' (WKUFS) in Bergen, in June 2008, Mr Andrew Tait (representing SPFA) intuitively suggested that there was perhaps an opportunity for the scientific community to access individual fish weight information that the majority of pelagic vessels collect on a haul by haul basis. This information is provided to processors and to electronic auction, thus enabling buyers and processors to accurately assess the size / weight composition of the catch. Since then FRS has met with representatives of the pelagic sector and discussed how such information could be collected and made available. After further discussion within the Industry, FRS have put in place arrangements for a pilot study to be carried out by 6 vessels who have volunteered to participate and this should commence during the (2008) summer herring fishery. During this period FRS will also have an observer on board at least one of these vessels and the sampling protocols will be developed further in light of feedback received.

Contact: Craig Davis (daviscg@marlab.ac.uk)

2.1.15 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.

2.2 Develop standards for designing industry-sampling programs, e.g. present the effective sample size for a survey (ToR b).

2.2.1 Estimates based on cluster samples

Unfortunately fish can rarely be sampled at random. In practice the fish that are sampled are selected from a cluster of fish. For example, fish that are caught together at a station form a cluster. From each cluster, fish for aging, measuring, *etc.* are selected, that is such data 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). The practical implication of positive intra-cluster correlation is that a sample of animals caught in 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 (Pennington *et al.*, 2002; Aanes and Pennington, 2003; Helle and Pennington, 2004). This implies that in general it is best to collect a few fish from as many clusters as possible.

2.2.1.1 A Norwegian example

In Table 1 are summary statistics for estimating the mean age of the Norwegian commercial catch of northeast Arctic cod in 2000 (Aanes and Pennington, 2003). A number of cod were aged from individual fishing trips, and thus the fish caught during a trip form a cluster. For these data there was positive intracluster correlation. The effective sample sizes for estimating mean age were rather small compared with the number of fish aged. For example during the first quarter a total of 6000 cod were aged and the estimated effective sample size was 59. This means that if it were possible to sample cod randomly, then an estimate of mean age based on 59 cod chosen randomly would have the same precision as the current estimate based on 6000 cod collected from clusters. If one cannot estimate the mean precisely one cannot expect to estimate the distribution precisely either (Pennington *et al.*, 2002). This implies that the estimate of the entire age distribution in this case is rather imprecise.

Table 1. The estimated mean age of the commercial catch of northeast Arctic cod in 2000 is denoted by $\hat{\mu}_1$; *n* is the number of fishing trips sampled; *m* the total number of fish aged from the *n* trips; $\hat{\mu}_1$ and $se(\hat{\mu}_1)$ are the estimated mean age and its standard error, respectively; $\hat{\mu}_1$; $\hat{m}_{eff}$ is the effective sample size; and $\hat{\rho}$ is the estimated intracluster correlation coefficient. The approximate 95% confidence intervals are in parentheses. The estimated standard errors and confidence intervals are based on 500 bootstrap replicates (from Aanes and Pennington, 2003).

Quarter	n	m	$\hat{\mu}_1$	$se(\hat{\mu}_1)$	$\hat{m}_{eff}$	$\hat{\rho}$
1	70	6000	6.75	0.23	59	0.26
			(6.35,7.23)		(37,212)	(0.20,0.33)
2	26	2277	5.33	0.07	211	0.10
			(5.20,5.46)		(93,393)	(0.06,0.15)
3	13	1077	5.23	0.17	32	0.20
			(4.98,5.60)		(18,193)	(0.06,0.33)
4	17	1342	5.05	0.07	182	0.23
			(4.89,5.18)		(81,428)	(0.07,0.38)

2.2.1.2 Estimation of effective sample size for Dutch self sampling data

About 20 vessels have been included in the Dutch self-sampling program. Since October 2004 the vessels also collected discard samples. Most of the vessels used beam trawls and tickler chains < 100 mm mesh sizes. Other gears involved, but with much less effort, are beam trawl and tickler chains > 100 mm; beam trawl with chain mats < 100 mm; and multirig.

Samples are taken twice a week: on Tuesdays and on Thursdays, from the first haul after 16:00 hours. Target species in the sampling were plaice and cod.

This analysis investigates the effective sample size by year, for the plaice discard samples caught with beam trawls.

Methods

In order to estimate effective sample size, the following steps were taken.

Step 1. Mean discard proportion by ship and trip (Pij)

$$p_{ij} = \frac{\sum (C_{ijh} \times p_{ijh})}{\sum C_{ijh}}$$

where C_{ijh} is the total catch by vessel i, in week j, for haul h, and p_{ijh} is the proportion of discard for haul

Step 2: Mean discard proportion by ship (Pi)

$$p_i = \frac{\sum (C_{ij} \times p_{ij})}{\sum C_{ij}}$$

Step 3: Mean discard proportion by gear (P)

$$p = \frac{\sum (C_i \times p_i)}{\sum C_i}$$

Step 4. Variance of p

$$\mathrm{var}(\hat{p}) \approx (1 - f_i)\frac{\sum C_i^2 \times (\hat{p}_i - \hat{p})^2}{\bar{C}^2 \times n \times (n-1)}$$

Where f_i is the fraction of vessels that participate in the self sampling program; and n is the number of trips sampled.

Step 5. Variance of p, simplified

Estimate variance in discard proportion, assuming that all measurements are obtained by simple random sampling.

Step 6. Design Effect and Effective Sample Size

Calculate the design effect by dividing the variance in p from step 4 by the simplified variance of p.

$$deff = \frac{\mathrm{var}(\bar{x})}{\mathrm{var}(\bar{x}_{srs})}$$

Estimate effective sample size by dividing # fish measured by the design effect

$$n_{eff} = \frac{\#\ fish}{deff}$$

Results

Table 1. Number of trips sampled; design effect and effective sample size for three fleets: beam trawl with tickler chains <100 mm; and beam trawl with tickler chains >100 mm.

Gear	Year	Trips sampled	Design Effect	Effective Sample Size (trips)
Beamtrawl with tickler chains (< 100 mm)	2004	105	0.84	124
	2005	263	1.14	231
	2006	222	1.56	142
Beamtrawl with tickler chains (> 100 mm)	2004	3		
	2005	24	1.53	16
	2006	23	0.71	32

The results show a rather good correspondence between the Effective Sample Size and the numbers of trips actually sampled. If this is the real case then it may be concluded that the current sampling scheme is fairly efficient.

2.2.1.3 Spanish example: Estimating mean length of fish in catches based on port sampling

Market sampling for estimating length distribution of hake was carried out for bottom otter trawlers and pair bottom trawlers. Two ports were sampled (Ondarroa and Pasajes de San Pedro), which together represent 99% of hake landed in the Basque country in 2007. The sampling strategy was stratified random sampling, where the sampling strata were defined by each unique combination of port, fishing gear and fishing area.

In Basque county markets, the landings are sorted into different commercial categories. These categories are defined on the basis of fish size, and are different in every port. In our sampling, the target vessel was selected randomly, and all the commercial categories landed by this target vessel were sampled. From each

category, individuals were selected randomly, and a number of individuals high enough to obtain a normal distribution were sampled.

Assuming simple random sample of vessels/trips, the goal was to is to estimate mean size for all catches in the fleet.

Catches from each trip (i) are grouped into categories (j) before being landed.

Length measurements are collected from each category. Assuming that fish are selected randomly from each category, then this is similar to stratified random sampling of fish.

Step 1: Estimate mean length within each category, $\overline{x}_{ij}$

Step 2: Estimate stratified mean size for catch in trip (i):

$$\overline{x}_i = \frac{\sum C_{ij}\overline{x}_{ij}}{\sum C_{ij}}$$

where C_{ij} is total catch in category (j) for trip (i)

Step 3: Estimate mean size for total landings based on sample of vessels (weighted by number of fish caught in each trip)

$$\overline{x} = \frac{\sum C_i\overline{x}_i}{\sum C_i}$$

Step 4: Estimate approximate variance of mean length based on variation in mean size between vessels (primary sampling units):

$$\text{var}(\overline{x}) \approx \sum \frac{C_i^2(\overline{x}_i - \overline{x})^2}{\overline{C}^2 n(n-1)}$$

Step 5: Estimate variance in mean length of fish, assuming that all measurements from all catches are obtained by simple random sampling.

Step 6: Estimate design effect:

$$deff = \frac{\text{var}(\overline{x})}{\text{var}(\overline{x}_{srs})}$$

Step 7: Estimate effective sample size by dividing # fish measured by the design effect

$$n_{eff} = \frac{\#\ fish}{deff}$$

Preliminary results indicate that the effective sample sizes for the Spanish data are rather small, being closer to the actual number of trips sampled than the actual number of fish measured. This implies that the estimate of the entire length distribution is rather imprecise.

2.2.2 Standards for designing an industry self-sampling program (SSP)

2.2.2.1 Fishers views, wishes and needs for Self Sampling Programs

There needs to be very good communication between the scientific community and the industry involved in any self-sampling project. This relates to communication throughout the life of the project, the planning stages and with clearly stating the aims of the project.

Communication should be personal and often, with a single person being a point of contact seen as the best way forward. There should be a report back every 3-6 months with a main meeting of participants at least annually. In that way, people from both sides can share their experiences.

During the planning of any self-sampling project, industry should be closely involved. This gives the industry a sense of ownership of the project and will help to keep long-term interest in the project if they are a part of it from the beginning.

It is necessary to keep the interest of the participating industry members; some sort of incentive is the best way of doing this. Incentives can be in the form of extra quota, monetary payments, etc. Nevertheless, several SSP exist where more idealistic incentives are used (demand for better assessment etc.)

One of the major problems with industry self-sampling is that data, which have been collected by the industry, are not seen as fully scientific or valid by some scientists in ICES. There needs to be a shift in this attitude and then it is felt that the industry would be more willing to participate in self sampling schemes. A basis for this paradigm shift is a proper verification of usability and high quality of data from SSP.

To help with self-sampling projects there should be some observer coverage of participating vessels. This should serve a dual purpose of quality control and would give the participating vessel some form of reassurance that they are carrying the work out correctly

2.2.2.2 Important considerations for designing a self-sampling survey

Aims	Clearly define the aim Agreement on the aims among participants Communication of aims to participants
Survey Design	1) In order to get a scientific basis and knowledge of expected sources of variance in your SSP-Evaluate available catch data (catch-at-age, length distributions etc.) from relevant similar sampling programmes (e.g.) the procedure as described below can also be used to evaluate a running sampling program (i.e. as a feedback loop). Data can be obtained from: • observer surveys • harbour samples • other sources Use effective sample sizes and variance analysis to get an idea on how much information the present survey design is giving and if/how you could optimize it within available amount of resources. E.g. how much (or little) you are gaining in precision by sampling many fish from the a tow. 2) Define the optimal temporal and spatial coverage and proper stratification to achieve coverage. Bearing in mind that effective sample size can increase with an optimized stratification design. • Time e.g. monthly, by quarter • Geographical units e.g. ICES squares, subdivisions • Frequency of sampling e.g. Every 10th haul • Fisheries/fleets e.g. every fleet segment

	Evaluate the new design – have you improved the effective sample size? 3) Select a number of vessels that are representative for the fishery to take part in the SSP. Selection of vessels could be done after advertising in fishers papers, through fishermen cooperatives etc. Keep in mind: the selected fleet will probably be biased to the more honest part of the fishers, and information on illegal fishery is likely not available.
Financing a SSP	Financing a self-sampling program can be done in a number of ways. • Reserve a part of the quota (Norwegian model see Appendix 5) • Fishers pay for the observer program (e.g. British Colombia) • The European Data Sampling program (DCR) gives the possibility to pay fishers by samples • Bonus system (extra days at sea, fishing during closed season etc.). • Direct payment from national program. Motivate the fishers to participate in the SSP and to follow the survey design by creating incentives for the fishers to participate. Such incentives could be: • Fishers can improve the data input in assessment • Get extra quota/ money 1) Basic payment – all participants get the same basic money (everybody is equally important). 2) Bonus payment given to the fishers who deliver the most samples/ information (to a given level) • General feedback – inform the fishers on a regular basis (every 3-6 month) • Annually meetings with all fishers to exchange experiences – networking. Such meetings could include: 1) Show data from individuals (to compare among participants) 2) Show data from different years (do the data quality improve) 3) Show the assessment with and with out the improved data • Have personal contact person – trust building (be aware this could be time consuming). The contact person should be easy to access by the participating fishers. • Select a spokesman among participants – to act as communicator between fishers and scientist • It is crucial that the data are used in accordance with the aim of the SSP. If for example if the aim is to improve input data tfor assessments, then it is important that the SSP is designed to fit the needs of the assessment working groups and the data consequently used in the assessment.
Confidentiality	Scientists do not act as a control authority and data are confidential. Most counties have a data law protecting personal information. Scientist may have to hand out data if required by the police / court. This must be communicated to the participants
Training	• It is important that all participants are properly trained, not only the ship owners (as it is the men on deck that take the samples). • Have training courses on an annually basis. This could include special topics where you go into more details (e.g. species identification). • Annual training by observers on the ships – to follow up and to standardized sampling • A clear procedure on how to pick tows to sample (write down a sampling scheme)

Quality	Data have to be evaluated, this can be done by: • Cross check with 1) VMS data 2) Logbook information 3) Observer cruises • Internal consistency – variability within each vessel • External consistency- variability between vessels

2.3 Determine sampling schemes for estimating, among other quantities, discards and unreported landings (ToR c)

Sampling the part of the catch that is not landed is more complicated than sampling the part of the catch that is landed. Therefore, specific sampling strategies are required to sample these discards and non-reported landings. Different examples of this kind of sampling were discussed during the workshop. Issues in relation to on-board sampling and quality checks were dealt with.

2.3.1 Sampling of the commercial catch

2.3.1.1 Scottish example

In Scotland FRS carried out a pilot study to investigate the feasibility of sampling discards in the under 10-meter Nephrops trawler fleet. In order to ensure that all demersal species caught by the <10 meter vessel were recorded, the skipper was asked not to discard any of his catch but simply to box all his discarded prawns, benthos and fish for sampling by FRS staff. On his return to Port, FRS staff, again following normal DCR sampling procedures, sampled the catch.

2.3.1.2 French example

In France a self-sampling project was carried out in the Celtic Sea Cod fishery. In every second haul, all the cod were taken from the catch and separated in the categories "retained" and "not retained" (i.e. all cod not meant for sale: too small, damaged, thin). The number of baskets of both retained cod and not retained cod were registered. Also the mean weight of a full basket was registered. From all baskets of retained cod and from 1 basket of not retained cod, the length distribution was registered.

2.3.1.3 Dutch example

In The Netherlands, about 20 vessels have been included in a discards self-sampling program, which started in October 2004. Crews take samples of the catch twice a week: on Tuesdays and on Thursdays, from the first haul after 16:00 hours. Target species were plaice and cod. The crew ought to take a representative sample of the catch (volume: basket) and separate sized and undersized plaice. Volumes of both categories were measured and registered. For cod all the specimens in the catch were taken out and divided in a sized and undersized category. Both weight and volume of these categories were registered. The project is organized by the Dutch Product Board. IMARES is involved in advising on how to carry out the program and in quality checks.

2.3.2 Quality checks

2.3.2.1 Scottish example

The objective of the Scottish pilot study was to consider whether the assumption that vessels in the <10 meter category have the same catching and discarding characteristics as the >10 meter vessels. As it was a pilot study, no structured methods were set up for assessing the quality of the data. While skippers were asked to retain all of the catch, it was assumed that there would be no reason to expect any problems in quality of the data.

2.3.2.2 French example

The goal of the French self-sampling program was to estimate the discards of cod due to high grading caught in area VIIe-k. Since this program was started recently, only four trawlers are currently participating. One interesting observation was that the amount discarded was fairly highly correlated with the amount landed. Therefore, if the amount landed for each vessel in the fleet is known, then a ratio type estimator can increase the precision of the estimate of discards based on a sample of trips. In addition the observed high correlation may provide a way to check the validity of self-reported discards amounts.

2.3.2.3 Dutch example

IMARES performed a cross-check to see to what extent the results of the self-sampling overlapped the results of the DCR discards sampling program. It appeared that discard percentages in the self sampling program were structurally lower than percentages in the DCR program. In order to find out how these differences were possible, two activities were carried out.

First of all, and this is still ongoing, on-board comparison of the sampling methods were conducted. During each trip that was part of the DCR program, the self sampling method was also applied. Preliminary results show that both of the methods result in similar discard percentages. At the end of 2008 final conclusions can be drawn based on the on-board comparisons.

Second, a discussion about possible causes of the difference with participating fishers was organized. It appeared that the protocols used in the self-sampling program were interpreted in different ways by different crews. Especially the method of taking the representative sample varied among vessels. It is very likely that this contributes to the different outcomes. Furthermore, some of the crews do not carry out the prescribed methods as strict as necessary, mainly due to lack of incentives. For example, if the weather is bad, they might decide to do it quick and dirty and get rough estimates in stead of following the protocol step by step.

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

This session focused on surveys conducted by commercial fishing vessels in collaborative projects between the fishing industry and research institutions.

Surveys and experiments conducted by fishing vessels may complement studies and scientific surveys conducted by research vessels, and in some cases provide a cost-effective alternative to research surveys. The use of fishing vessels can facilitate synoptic surveys because the fishing fleet covers large areas, and can be an effective platform for experimental studies, with more flexibility then research vessels, which generally are committed to routine surveys. When fishing vessels are used for

marine abundance surveys and other scientific studies, it is crucial that the selection of stations and protocols for biological sampling be conducted according to proven statistical principles. When trawl surveys conducted by fishing vessels use standard designs such as stratified random or systematic selection of stations, then the mean catch per area swept provides an estimate of relative abundance. Also, sampling by fishing vessels (using trawls, traps, or other gears) at fixed stations, or at a combination of fixed and random stations, may prove effective for monitoring trends in abundance.

An example of collaboration between research institutes and the fishing industry to conduct probability-based abundance surveys was presented by David Reid from the Scottish Fisheries Research Services (FRS), Marine Laboratory in Aberdeen. The presentation, done on behalf of Paul Fernandes who is the project leader, demonstrated how FRS and the Fishing Industry collaborate to estimate the absolute abundance of anglerfish on the European northern shelf from a trawl survey using fishing vessels. The project has involved the fishing industry throughout the study design and implementation of the surveys. An Industry Science Planning group was established to develop protocols for the FRS anglerfish survey, with an objective to estimate the abundance and distribution of anglerfish (also commonly known as monkfish). The survey has been conducted in 2005, 2006, and 2007, and has employed survey methods approved by the industry science-planning group. Four vessels have been used to conduct the anglerfish surveys. FRS purchased four new trawls to equip each vessel on the anglerfish survey. All vessels use the same trawl gear rigged in a consistent manner, and no modifications to the trawl are employed.

Four surveys areas on the northern shelf are covered each year. Trawling locations are selected using stratified random sampling, and standardized tows are conducted during day using bespoke trawl gear. Monitoring of bottom contact and door spread is conducted for each tow, and the towing distance is measured with GPS. Scientists process the survey catches. Absolute abundance and biomass estimates are based on area-swept estimates of fish density, corrected for the estimated trawl catching efficiency, and then extrapolated to the total survey area. The surveys included experimental studies to estimate the catchability of fish. The principal basis for stratification was depth, while allocation of sample sized to strata took into account information about abundance in relation to depth provided by the fishing industry. The stratification scheme and allocation of stations to strata were modified over time to improve precision for a fixed survey effort. During 2005 and 2006 the tow duration was 2 hours, and then reduced to 1-hour tows in 2006. The reduction of towing time allowed more trawl stations for a fixed survey duration, and improved the precision for fixed cost. This is an example of a rigorous scientific survey conducted by fishing vessels.

Floor Quirijns (IMARES) presented guidelines for setting up fisheries survey to be conducted by the fishing industry. She used the fishers critique of the "IMARES' beam trawl survey (BTS) for assessing the plaice stock in the North Sea to motivate the need for a collaboration between research and the industry. The BTS provides stock indices for demersal species, and recruitment indices for important commercial species (plaice, sole). The BTS has been conducted yearly since 1985 in August/September by 2 research vessels, covering the North Sea. Fishers consider the BTS unsuitable for assessing the plaice stock, while IMARES has argued that the survey which has been conducted yearly since 1985 with no change in survey set-up must be continued to ensure unbiased estimates of trends. To improve the cooperation between research and the industry, fishers were invited to join the BTS in

2007. The objective was to allow fishers to provide advice for improvement of the surveys to assess plaice. The fishing industry has proposed several changes to BTS, including increase in fishing speed, adjustment of gear rigging to bottom type, trawling by night, and targeted fishing on concentrations. The effects of such changes can be tested using industry surveys. Floor Quirijns argued that important steps of planning an industry survey include the development of work plan, testing of methodology, getting support from all parties, and learning from experiences elsewhere. In the discussions it was noted that the proposal by the fishing industry to fish on concentration would introduce a bias of unknown magnitude in the estimates of abundance. Mean catches per area swept from targeted fishing cannot be extrapolated to the general survey area, and often provide severely biased estimates of trends since the mean catch per tow in local areas can remain high despite a general decline in the overall stock. It was also noted that survey protocols and gear should not necessarily be kept fixed over time. If long-term surveys reveal problems that affect data quality, then modifications should be considered even though this results a change in the time-series. For example, if new developments in survey gears and instrumentation can result in more reliable catches of recruits by minimizing escapement, then a change may be warranted.

Kjell Nedreaas (IMR) presented an overview of a pilot project conduced in 2001-2003 to assess the fishery for edible crab (*Cancer pagurus*) using vessels in the Norwegian reference fleet (see also Woll *et al*. 2006). The fishery for edible crab is conducted by small vessels (< 15 m) in inshore coastal waters using traps. Landings have increased fourfold in the last decade, and the industry is questioning how much increase in fishing pressure the stock can sustain. IMR is conducting an experimental survey in collaboration with the industry, where each collaborating fisher place 4 standardized experimental traps in the middle of each string of several traps to give representative samples of the day's catch. The fishers report counts of all crabs including discards and biological measurements (carapace width, sex, etc.) from the experimental traps in daily reports during 10 weeks in the crab season. Mean CW is used as indicator of biological population parameter, while catch per unit of effort is used as an index of abundance.

Working documents 2 and 3 (Gjøsæter) provide an example of studies where fish pots or trammelnets are placed at fixed stations and fished over a multiyear sampling program to assess fish communities. In Risør, southern Norway, fish communities were studied by pot surveys (WD 2). Pots were set in three areas, and with 1-3 days soak time at each station. All cod were counted and measured for length. Exploratory fishing with trammelnets (three panels gillnets) at the Norwegian Skagerrak Coast (WD 3) has been conduced to study cod and other coastal fish since 1984. Sampling has been conducted with trammelnets set inn sets of two nets at depth between 2 and 16 m. The nets were set in the afternoon and hauled in the morning, thus fishing one night at each locality. Fishing was conducted in November and sometimes first week of December each year. These fishing operations by trammelnets and pots have NOT been carried out by fishers, but fishers were consulted when choosing the fixed stations to begin with. The fishing at fixed stations could easily be contracted out to fishers, and thus provide an example of studies that could be conducted by the industry.

The next step is to improve the protocol, including a video for how to carry out the sampling, and to increase the amount of incentives for fishers.

3 References

Aanes, S. and M. Pennington, 2003. On estimating the age composition of the commercial catch of Northeast Arctic cod from a sample of clusters. ICES J. Mar. Sci. 60:297-303.

Helle, K., and M. Pennington. 2004. Survey design considerations for estimating the length composition of the commercial catch of some deep-water species in the Northeast Atlantic. Fisheries Research 70:55-60.

ICES 2007. Report of the Workshop on Using Fishers to Sample Catches (WKUFS), 5–6 June 2007, Bergen, Norway. ICES CM 2007/ACFM:24. 45 pp.

Pennington, M., L.M. Burmeister and V. Hjellvik, 2002. Assessing the precision of frequency distributions estimated from trawl-survey samples. Fish. Bull. 100:74-81.

Woll, A. K., van der Meeren, G. I., and Fossen, I. 2006. Spatial variation in abundance and catch composition of *Cancer pagurus* in Norwegian waters: biological reasoning and implications for assessment. ICES Journal of Marine Science, 63: 421e433.

Annex 1: WKSC list of participants

Name	Address	Phone/Fax	Email
Campbell, Rory	Scottish Fishermens Federation, 24 Rubislaw Terrace, AB10 1XE Aberdeen, UK	Tel. +44 1224 646944 Fax +44 1224 647058	r.campbell@sff.co.uk
Caruana, Raymond	Malta Centre for Fisheries Sciences, Education and Exhibition Section, Fort San Lucjan, Marsaxlokk, BBG 06, Malta	Tel +356 22293310 Fax +356 21659380	raymond.caruana@gov.mt
Coull, Kenny	Fisheries Research Services, Marine Laboratory, PO Box 101, AB11 9DB, Aberdeen, UK	Tel. +44 1224 295399 Fax +44 1224 295511	coullka@marlab.ac.uk
de Boer ,Willem	Dutch Fishermen s Organisation, PO Box 72, 2280 AB Rijswijk, Netherlands	Tel. +31 6 10463501	gmeun@visserij.nl
Foster, Greg	Agri-food and Biosciences Institute, 18a Newforge Lane, BT9 5PX Belfast, UK	Tel. +44 90 255 472	greg.foster@afbini.gov.uk
Gatt, Ian	Scottish Fishermens Federation, 24 Rubislaw Terrace, AB10 1XE Aberdeen, UK		iangatt@btconnect.com
Grochowski, Adam	Sea Fisheries Institute in Gdynia, ul. Kollataja 1, PL-81-332 Gdynia, Poland		agrochowski@mir.gdynia.pl
Hansen, Frank Ivan	The National Institute of Aquatic Resources, Department of Sea Fisheries, Charlottenlund Slot, Jægersborg Alle 1, 2920 Charlottenlund, Denmark	Tel. +45 3396 3363 Fax +45 3396 3333	fih@aqua.dtu.dk
Harlay, Xavier	The Marine Institute, Rinville, Oranmore Co., Galway, Ireland	Tel. +353 91 387 395 Fax +353 91 387 201	xavier.harlay@marine.ie
Huse, Irene	Institute of Marine Research, PO Box 1870, N-5817 Bergen, Norway	Tel. +47 55 23 68 22 Fax +47 55 23 53 93	irene.huse@imr.no
Hutchison, David	Scottish Pelargic Fishermen s Association, 1 Frithside Street, AB43 9AR, Fraserburgh, UK		davidhutchison763@btinternet.com

Name	Address	Phone/Fax	Email
Krieger, Antje	Johann Heinrich von Thünen-Institute, Federal Research Institute for Rural Areas, Forestry and Fisheries, Institute for Baltic Sea Fisheries, Alter Hafen Süd 2, 18069 Rostock, Germany	Phone +49 381 5116133 Fax +49 381 8116199	antje.krieger@vti.bund.de (until August 2008) Antje.Krieger@t-online.de
Minde, Atis	Latvian Fish Resources Agency, 8 Daugavgrivas Str, LV-1048 Riga, Latvia		atis.minde@lzra.gov.lv
Nedreaas Kjell *(Co-chair)*	Institute of Marine Research, PO Box 1870, N-5817 Bergen, Norway	Tel. +47 55 238671 Fax +47 55 235393	kjell.nedreaas@imr.no
Pennington, Michael *(Co-chair)*	Institute of Marine Research, PO Box 1870, N-5817 Bergen, Norway	Tel. +47 55 238601	michael.pennington@imr.no
Quirijns, Floor	Wageningen IMARES, PO Box 68, 1970 AB IJmuiden, Netherlands	Tel. +31 317 487190 Fax +31 317 487326	Floor.Quirijns@wur.nl
Ringdahl, Katja	Swedish Board of Fisheries Institute of Marine Research, Lysekil, PO Box 4, 453 21 Lysekil, Sweden		katja.ringdahl@fiskeriverket.se
Stepputtis, Daniel	Johann Heinrich von Thünen-Institute, Federal Research Institute for Rural Areas, Forestry and Fisheries, Institute for Baltic Sea Fisheries, Alter Hafen Süd 2, D-18069 Rostock, Germany	Tel. +49 381 8116 136 Fax +49 381 8116 199	daniel.stepputtis@vti.bund.de
Storr-Paulsen, Marie	The National Institute of Aquatic Resources, Department of Sea Fisheries, Charlottenlund Slot, Jægersborg Alle 1, 2920 Charlottenlund, Denmark	Tel. +45 3396 3442 Fax +45 3396 3333	msp@aqua.dtu.dk
Toliusis, Sarunas	Lithuanian State Pisciculture and Fisheries Research Centre, Fisheries Research Laboratory, 91001 Klaipeda, Lithuania	Tel. +370 46 391122 Fax +370 46 391104	sarunast@gmail.com
Vandemaele, Sofie	Institute for Agricultural and Fisheries Research, Ankerstraat 1, B-8400 Oostende, Belgium		sofie.vandemaele@ilvo.vlaanderen.be
Vølstad, Jon Helge	Institute of Marine Research, PO Box 1870, N-5817 Bergen, Norway		jonhelge@imr.no

Name	Address	Phone/Fax	Email
Zarauz, Lucia	AZTI-Tecnalia AZTI Sukarrieta, Txatxarramendi ugartea z/g, 48395 Sukarrieta (Bizkaia), Spain	Tel. +34-946029400	lzarauz@suk.azti.es

WKSC met at the ICES Headquarters in Copenhagen on 10–13 June 2008.

Annex 2: Agenda

10 June	1000-1100	Welcome
		ICES introduction. Presentation of participants and agenda. Setting up computers. Appointment of rapporteurs. List of presentations. Coffee break.
	1100-1300	ToR a) presentations, incl. questionaire
	1300-1400	Lunch
	1400-1600	ToR a) presentations and discussion, incl. improvements of questionaire
	1600-1630	Coffee break. Some people will attend the EU Lot8 meeting.
	1630-1800	ToR a) summarizing and reporting
	1800	Adjourn
11 June	0900-1100	ToR b) presentations
	1100-1115	Coffee break
	1115-1300	ToR b) practical work estimating effective sample size using datasets brought to the workshop
	1300-1400	Lunch
	1400-1600	ToR b) discussing standards for designing industry sampling programs
	1600-1630	Coffee break
	1630-1800	ToR b) summarizing and reporting, incl. improvements of questionnaire (ToR a))
	1800	Adjourn
12 June	0900-1030	ToR c) presentations
	1030-1500	Participate at the seminar on "Traceability and fully documented fishery as a management tool" , incl. free lunch
	1500-1600	ToR c) continue
	1600-1615	Coffee break
	1615-1800	ToR c) summarizing and reporting
	1800	Adjourn
13 June	0900-1100	ToR d) presentations
	1100-1115	Coffee break
	1115-1300	ToR d) continue
	1300-1400	Lunch
	1400-1500	ToR d) summarizing and reporting
	1500-1600	Recommendations, future work and closing of the workshop
	1600	Adjourn

Annex 3: List of working documents and oral presentations during the workshop

All working documents and oral presentations are available from the author(s)/presenter or the co-chairs.

Working Documents:

WD 1 - Robert Bellail, Isabelle Péronnet, Marie-Joëlle Rochet, Julien Lamothe. Self-sampling of cod in the Celtic Sea by French trawlers. IFREMER (Lorient and Nantes) and PMA-FROM Bretagne, France.

WD 2 - Jakob Gjøsæter. Fish pots fishery in Risør at the Norwegian Skagerrak Coast. Institute of Marine Research, Norway.

WD 3 - Jakob Gjøsæter. Exploratory fishing with trammelnets at the Norwegian Skagerrak Coast. Institute of Marine Research, Norway.

WD 4 - Kenny Coull. EC Fisheries Data Collection Regulation 1639/2001, Scotland, 2004. Pilot Study on Discard Sampling of <10 metre vessels by FRS, Marine Laboratory, Aberdeen, UK.

The Oral Presentations are listed below under the respective Terms of reference where they were presented by the person underlined.

ToRa) review existing systems with fishers sampling of catches (industry sampling systems) based on intercessional exchange of information.

Daniel Stepputtis: Selfsampling in Fisheries - A web-based survey (questionnaire) to collect information about self-sampling program in fisheries.

Kenny Coull: Pilot Study on Discard Sampling of <10 meter vessels by FRS, Marine Laboratory, Aberdeen, UK.

Marie Storr-Paulsen: Danish experience

Floor Quirijns and Edwin van Helmond: Integration of discards self sampling and DCR sampling. IMARES, The Netherlands.

Antje Krieger: Self-sampling in Germany (Baltic Sea) - JOIFISH - Joint data collection between fishing sector and the scientific community in the Baltic Sea (EU call for tender 2006/15 Lot 8). Recruitment surveys, reference fleet and self-sampling. Johan Heinrich von Thünen Institut, Germany.

Robert Bellail, Isabelle Péronnet, Marie-Joëlle Rochet, Julien Lamothe: Self-sampling of cod in the Celtic Sea by French trawlers. IFREMER and PMA-FROM, France

Kjell Nedreaas: Using a reference fleet to document the fishery. IMR, Norway.

Irene Huse and Cecilie Kvamme: Changes in the dynamics of the Norwegian mackerel purse-seine fishery – does it influence the representativeness of the reference fleet data? IMR, Norway.

ToRb) develop standards for designing industry sampling programs, e.g. present the effective sample size for a survey.

Michael Pennington: Some sampling considerations for estimating population characteristics (cluster sampling and effective sampling size). IMR, Norway.

ToR c) determine sampling schemes for estimating, among other quantities, discards and unreported landings.

Floor Quirijns and Edwin van Helmond: Integration of discards self sampling and DCR sampling. IMARES, The Netherlands.

Kenny Coull: Pilot Study on Discard Sampling of <10 meter vessels by FRS, Marine Laboratory, Aberdeen, UK.

Robert Bellail, Isabelle Péronnet, Marie-Joëlle Rochet, Julien Lamothe: Self-sampling of cod in the Celtic Sea by French trawlers. IFREMER and PMA-FROM, France

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

Jakob Gjøsæter (presented by Kjell Nedreaas): Exploratory fishing with trammelnets at the Norwegian Skagerrak Coast. IMR, Norway.

Jakob Gjøsæter (presented by Kjell Nedreaas): Fish pots fishery in Risør at the Norwegian Skagerrak Coast. IMR, Norway.

Astrid K. Woll, Gro I. van der Meeren, and Inge Fossen (presented by Kjell Nedreaas): Reference fleet in the Norwegian fishery for edible crab (Cancer pagurus). Experience from the pilot programme 2001-2003. Møre Research and IMR, Norway.

Floor Quirijns: Setting up an Industry Survey for stock estimation. IMARES, The Netherlands.

Paul Fernandes *et al.* (presented by Kenny Coull): Progress in estimating the absolute abundance of anglerfish on the European northern shelf from a trawl survey. FRS, Aberdeen, and the Scottish fishing industry.

Annex 4: An online-questionnaire to review self-sampling programs in a more systematic way

Selfsampling in Fisheries

This survey is intended to collect information about self-sampling program in fisheries.

personal information

This section ask for your personal information. The information about your name, adress, email-adress may be published in a database/summary of self-sampling programs. If you do not allow this usage, please check the box at the end of this page. In this case, your contact data will be solely taken for internal use and to contact you directly.

1. * **Please specify your name**

Please write your answer here:

2. * **Your email-adress?**

Please write your answer here:

3. * **Please, give the name of your institution.**

Please write your answer here:

4. **What is your position in your institution?**

e.g. technician, scientist, head of department etc.

Please write your answer here:

5. **Your postal adress**

department
street
ZIP-code + town
Country

Please write your answer here:

6. **Your phone number.**

e.g. +49 381 8116136

Please write your answer here:

7. * **Do you agree with the publication of your personal data (name, adress, email-adress) within a summary of self-sampling programs?**
Please keep in mind that people, interested in your self-sampling program, should have the chance to contact you. I you are in doubt, please contact us directly (daniel.stepputtis@vti.bund.de).

Please choose *only one* of the following:

- ☐ Yes
- ☐ No

self-sampling programm - general information

8. * **What is the name of your self-sampling program?**

Please write your answer here:

9. **If you have a project-website (or page at your institutes website) please give the web-adress (URL)**

Please write your answer here:

10. **What is your position/role in the project?**

Please write your answer here:

11. **When the project was started/will start?**

Please enter a date:

12. **When the project ended/will end?**

If your project is not limited in time, please leave this field empty.

Please enter a date:

13. **Which groups of fishermen are involved in the program?**

you can check more than one group

Please choose *all* that apply:

- ☐ professional/semi-professional
- ☐ recreational

Other:

14. **What types of fishing activity are covered by your self-sampling program?**

Please choose *all* that apply:
- active-bottom
- active-pelagic
- passive

Other:

15. Is your self-sampling program focusing on one or few species?

Choose "No" if the entire reference fleet is not directed towards specific species "Yes" if (at least) parts of your sample-effort is directed towards specific species

Please choose *only one* of the following:
- Yes
- No

[Only answer this question if you answered 'Yes' to question 15.]

16. You have stated that your self-sampling program is focused on one or few species. Please specify the species.

If possible give the englisch name and latin name (seperated by ";"). E.g.: "cod; Gadus morhua"

Please write your answer(s) here:

Species 1:
Species 2:
Species 3:
Species 4:
Species 5:

17. What type of self-sampling program do you have?

Please, check all items which are relevant and give comments, if possible/necessary.

Please choose all that apply and provide a comment:
- reference fleet (selected vessels, which e.g. represent a fishery)
- expanded (official) logbooks
- private logbooks
- questionnaires/surveys
- combined fishery/science surveys
- ad hoc fleet (the participating vessels sample on demand)

18. Please specify the area in which your self-sampling program is conducted. Use hereby the FAO area-codes which can be found on the FAO-website (ftp://ftp.fao.org/fi/maps/world_2003.gif).

e.g. "01" for Africa inland waters "27" for the North East Atlantic and adjacent seas

Please write your answer here:

19. Please, specify (if possible) the region.

e.g. Grand Banks, North Sea, Baltic Sea (Skagerrak)

Please write your answer here:

20. How many vessels/fishermen participate in your self-sampling programm and what is the approximate cove rage?

if necessary: PLEASE give a ROUGH estimation
- an approximate answer is much better than no answer -

If you sample more than one vessel category please give an average over all categories.

Please write your answer(s) here:

How many vessels/fishermen participate (a number):
What does this mean in coverage of national vessels belonging to the same vessel category (in percent):
What does this mean in coverage of catches taken by the total vessel category (in percent):

21. If possible, please specify how many vessels do participate in your self-sampling program in each vessel-size category.

Vessel-size categories are taken from fleet definition given in the data collection program of the European Union. Other vessel size categories may be used in other areas.

Please write your answer(s) here:

<6m:
6-12m:
12-24m:
24-40m:
>40m:

22. What is the general purpose of your self-sampling program?

Please check all items which are relevant and give comments if possible/necessary.

Please choose all that apply and provide a comment:
- to gather data, which can be used in the stock assessment/ for management purposes
- feasibility study (to test whether a self-sampling program is possible to implement)
- to investigate the catch of unwanted bycatch (birds, mammals etc.)

[Only answer this question if you answered 'to gather data, which can be used in the stock assessment/ for management purposes' to question 22.]

23. You have stated, that the general purpose of your survey is to gather data usable in the stock assessment ans/or for management purposes.

Please, give more details.

Please choose the appropriate response for each item:

are the data (successfully) used in the recent assessment ☐Yes ☐Uncertain ☐No
are the data (successfully) used for management purposes ☐Yes ☐Uncertain ☐No

24. Please, insert (if possible) more general information about your self-sampling-program here (e.g. the executive summary of your last report etc.)

Please write your answer here:

practical issues

This section asks for information regarding the practical work in your self-sampling program

25. Please, specify which type of samples are gathered in your self-sampling program.

Please choose all that apply and provide a comment:

- ☐ fishing effort
- ☐ landings (composition and/or weight)
- ☐ discards (composition and/or weight)
- ☐ individual or group weights of specimen
- ☐ lengths of specimen
- ☐ stomach samples
- ☐ otoliths/scales
- ☐ genetic samples
- ☐ unwanted bycatch (e.g. birds mammals)
- ☐ VMS (Vessel monitoring system) data
- ☐ environmental data (weather hydrography etc.)
- ☐ economic data
- ☐ hydro-acoustic data
- ☐ gear information (e.g. mesh sizes)

[Only answer this question if you answered 'fishing effort' to question 25.]

26. You have specified, that effort data are gathered in your self-sampling program. Please, give details on how effort is estimated.

Please choose all that apply and provide a comment:

- ☐ trawl time (e.g. hours)
- ☐ fishing days (excluding searching time/steaming)
- ☐ fishing days (including searching time/steaming)
- ☐ number of nets/hooks
- ☐ soaking time (e.g. gill net)

[Only answer this question if you answered 'lengths of specimen' or 'otoliths/scales' to question 25.]

27. You have specified, that age and/or length data are gathered within your self-sampling program.
We are interested in the (approximate) number of samples per year and what is their contribution to the data, which are used in the assessment for the relevant gear (if you sample several gears, give an average).

Please write your answer(s) here:

What is the (approximate) number of age samples per year?:
How much this is in percentage of the total number of samples per gear available for assessment purpose?:
What is the (approximate) number of length samples per year?:
How much this is in percentage of the total number of samples per gear available for assessment purpose?:

28. Please, specify at which intervall samples were/will be taken. Select the basis for the intervalls (deployment, trip, time, ...) and give details.

Please choose all that apply and provide a comment:

- ☐ deployment of the gear (e.g. all, every 10th)
- ☐ trip (e.g. all, every second)
- ☐ time (e.g. every day one sample, every week)
- ☐ catch location (e.g. every time a new catch location is fished)

29. An essential part of a self-sampling program is the training of fishermen.
Please give some information on how you have solved this task.

Since this is an essential part of all self-sampling programmes (or at least, it should be...), it would be really great if you could share your materials to inspire other programmes. You will be ask for sharing materials at the last page of this questionnaire.

Please choose all that apply and provide a comment:

- ☐ manual
- ☐ video
- ☐ workshop
- ☐ individual onboard-training
- ☐ no training

financial aspects

This section will ask for financial aspects of your self-sampling program (who pays, what the money is used for, etc.)

30. Who is financing your self-sampling program?

Please, check all items which are relevant and give comments, if possible/necessary.

Please choose all that apply and provide a comment:

- ☐ national government
- ☐ regional government (e.g. European Union)
- ☐ project based financing
- ☐ budget of a/your research institution
- ☐ additional quota /scientific quota

31. If possible, please give an approximation for the annual budget of your self-sampling program and its relation to the value of the sampled fishery

.

If necessary (e.g. if the program has a duration of only several months), please calculate a 12-months budget.

Please, specify the currency! (e.g. €, US$). If possible, please convert your currency into € or US$.

Please write your answer(s) here:

What is the total budget for your self-sampling program? (e.g. including value of additional quota):

What are the running costs for your self-samplling program?:

What is the value of the sampled fishery?:

32. What are the incentives for the fishermen?

Please check all that apply and provide comments if necessary/possible.

Please choose all that apply and provide a comment:

- ☐ fishermen are paid for their effort
- ☐ fishermen get additional quota
- ☐ fishermen get additional day(s) at sea
- ☐ fishermen want to have a better data basis for management

[Only answer this question if you answered 'fishermen get additional quota' or 'fishermen are paid for their effort' or 'fishermen get additional day(s) at sea' to question 32.]

33. You have stated, that fishermen are paid for their effort or are compensated by additional quoata or days at sea, please give details.
- What is the basis of payment/compensation? (e.g. per sample, per effort, fixed payment)
- What is the amount of money/quota/days fishermen get (e.g. per sample)
- Where does the additional quota comes from (e.g. national scientific quota of 10%)

Please write your answer here:

quality assurance

This section will ask for your way of quality assurance.

34. How do you assure the quality of your self-sampling program?

Please, use the comment-field for additional information.

Please choose all that apply and provide a comment:

- ☐ estimation of "effective sample size"? Give details (underlying variable, stratification, etc.)
- ☐ crosschecks between self-sampling data and observer/landsampling data
- ☐ training of fishermen
- ☐ statistic procedures and checks
- ☐ protocol/sampling scheme is documented
- ☐ spatial/temporal coverage is documented/analysed

evaluation of the self-sampling program

This section asks for your experience and opinion regarding self-sampling programs.

Here we are asking for the view of th eproject manager/scientist. It is planned to set up a (short) second questionnaire to ask for the opinion of fishermen.

35. What is your opinion?
Self-sampling programs (in general) are useful to ...

1 - absolute true
3 - neutral
5 - definitely not true

Please choose the appropriate response for each item:

...obtain data, which are not accessible with other methods	☐1	☐2	☐3	☐4	☐5
...gather data, which are usefull in the assessment	☐1	☐2	☐3	☐4	☐5
...get closer cooperation/communication with between fishery and fishery science	☐1	☐2	☐3	☐4	☐5
...demonstrate that fishery scientist are important partner to fisheries	☐1	☐2	☐3	☐4	☐5

36. What is your experience in your self-sampling program?
Please give your evaluation for the following topics:

1 - very good
2 - almost good
3 - neutral
4 - sometimes difficult
5 - very difficult

Please choose the appropriate response for each item:

cooperation between fishery and science	☐1	☐2	☐3	☐4	☐5
get the needed permissions from administration (if needed)	☐1	☐2	☐3	☐4	☐5
assurance of data quality	☐1	☐2	☐3	☐4	☐5
improvement of relevant fisheries management	☐1	☐2	☐3	☐4	☐5

cost efficient ☐1 ☐2 ☐3 ☐4 ☐5

37. Which main problems you have encountered and how you have solved them?

This is one of the most important question in this questionnaire since others will directly learn from your experience!!!

Please keep in mind:
- pratical problems
- financial problems
- communication problems
... many others

Please write your answer here:

38. What are the positive things in you program?

Please write your answer here:

Additonal information

This sections asks for more information on your self-sampling program.

39. Please insert (if possible) more general information about your self-sampling-program here (e.g. the executive summary of your last report etc.).

Additionally we are interested in all additional information you can deliver.
For others interested to set up or to further develop their self-sampling programm all information are incredible important. this could be:
- your sampling scheme/manual
- contracts with fishermen
- training material
- protocols
- equipment (e.g. desgined length-measurement boards)
- presentations
- reports
- much much more

Every of these informations is very helpful for others which could result in a step forward in fishery science

You can send all files to Daniel Stepputtis (daniel.stepputtis@vti.bund.de). In those cases where files are large (several MB) please use your ftp-server (and submit the link ;-) or ask for a ftp-account at our server.

Thank you very much!

Please write your answer here:

Submit Your Survey.

Thank you for completing this survey..

Annex 5: Content of some self-sampling programs as reported in the questionnaire database

ID	1	3	4	5	6	7	8	9	10
Time Submitted	2008-07-02 13:16:24	2008-07-09 14:23:59	2008-07-10 11:46:10	2008-07-22 13:59:20	2008-07-25 13:51:38	2008-07-29 10:48:36	2008-07-30 16:24:52	2008-08-11 20:36:03	2008-08-04 14:52:43
pers_name	Frank Ivan Hansen	Antje Krieger	Josianne Støttrup	Lucía Zarauz	Rick Stead	Floor Quirijns	Petra Jantschik	Kjell Nedreaas	Merete Nilsen
pers_email	fih@difres.dk	Antje.Krieger@vti.bund.de	jgs@aqua.dtu.dk	lzarauz@suk.azti.es	Rick.Stead@dfo-mpo.gc.ca	floor.quirijns@wur.nl	petra.jantschik@vti.bund.de	kjelln@imr.no	mereten@imr.no
pers_institute	DTU Aqua	Institute of Baltic Sea Fishe	DTU Aqua	AZTI Tecnalia	Dept. Fisheries and Oceans	Wageningen IMARES	Johann Heinrich von Thünen-	Institute of Marine Researc	Institute of Marine Researc
pers_phone	+45 3396 3363	+49 381 8116 133	+45 33963429	34946029400	1-709-772-0561	+31 317 487190	+49 +381 8116126	47552385	+47 55 23 68 04
proname	**Discard and effort sampli**	**Joifish/Lot 8**	**Catch Registration of rec**	**Tuna tag and release pro**	**Lobster Catch Monitoring**	**Discards Self Sampling -**	**JOIFISH: Joint data collecti**	**The Reference fleet**	**Tourist Sea Fisheries in N**
website		no	www.fiskepleje.dk				http://www.vti.bund.de/de/institute/osf/		www.imr.no/turistfiske
start	1960-01-01	2007-07-01	2002-01-01		2006-04-01	2004-10-01	2007-05-01	2001-01-01	2007-01-01
end		2008-11-15	2020-12-31				2008-11-15		2009-12-31
fishermen [professional/semi-profes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	No
fishermen [recreational]	No	No	Yes	Yes	No	No	No	No	Yes
fishactivity [active-bottom]	No	Yes	No	No	No	Yes	Yes	Yes	No
fishactivity [active-pelagic]	No	No	No	Yes	No	No	No	Yes	No
fishactivity [passive]	Yes	Yes	Yes	No	Yes	No	Yes	Yes	No
fishactivity [Other]	driftnet + longline								Handline
fishspec [Species All]	Yes	Yes	No	Yes	Yes	Yes	Yes	No	No
fishspec [Species 1]	Baltic Salmon	cod (main focus)		Albacore	American Lobster	Plaice; Plauronectes plates	"cod ; Gadus morhua"		
fishspec [Species 2]		flatfish		Blue fin tuna		Cod; Gadus morhua			
fishspec [Species 3]		others		Skipjack tuna					
fishspec [Species 4]				Frigate and bullet tunas					
reference fleet (selected vessels, wh	No	Yes	No	No	Yes	Yes	Yes	Yes	No
expanded (official) logbooks	Yes	No	No	No	No	No	No	Yes	Yes
private logbooks	No	No	No	No	Yes	No	No	Yes	No
questionnaires/surveys	No	No	No	No	No	No	No	No	Yes
combined fishery/science surveys	No	Yes	No	No	Yes	No	Yes	No	No
ad hoc fleet (the participating vessel	No	No	No	No	No	No	No	Yes	No
Other			indivdual involvement						
Other - comment		self sampling by fishermen	individual registration of catch						
area	27	27	27	27	21	27	27	27	27
areasub	Baltic Sea	western Baltic Sea	Baltic Sea (Kattegat Belt Se	Bay of Biscay	Canada-Newfoundland Near	North Sea (ICES area IV)	western Baltic Sea	Barents Sea Norwegian Se	Norwegian coast.
numbervessel [How many vessels/fi	6	13	93		150	15	8	35	65
numbervessel [What does this mear	30	3			5	12	28	0.5	10
numbervessel [What does this mear	60				5			5	10
vesselsize []			93				0	0	
vesselsize [6-12m]		9			150		5	7	
vesselsize [12-24m]	6	4					3	12	
vesselsize [24-40m]						15		4	
vesselsize [>40m]								12	

ID	1	3	4	5	6	7	8	9	10
purpose [stock assessment/manage	Yes	No	Yes	No	Yes	Yes	No	Yes	Yes
purpose - comment			for coastal recreational fish			Data for estimation of disca			
purpose [feasibility study (to test whe	No	Yes	No	No	No	Yes	Yes	Yes	Yes
purpose [to investigate the catch of i	No	No	Yes	No	No	Yes	No	Yes	No
purpose - comment						Bycatch of undersized plaice and cod			
assessment [are the data (successfi	Uncertain				Yes	No		Yes	
assessment [are the data (successfi	Yes		Yes		No	Uncertain		Yes	
sampletype [fishing effort]	Yes	Yes	No	No	Yes	Yes	No	Yes	Yes
sampletype - comment	no of hooks and no of driftnets per day.								
sampletype [landings (composition a	No	Yes	No	No	Yes	Yes	Yes	Yes	Yes
sampletype [discards (composition a	Yes	Yes	No	No	Yes	Yes	Yes	Yes	No
sampletype - comment	no. of undersized salmon				Undersize and egg-bearing fe				
sampletype [individual or group weig	No	Yes	No	No	No	No	Yes	Yes	Yes
sampletype [lengths of specimen]	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
sampletype [stomach samples]	No	No	No	No	No	No	No	Yes	No
sampletype [otoliths/scales]	No	No	No	No	No	No	No	Yes	Yes
sampletype [genetic samples]	No	No	No	No	No	No	No	Yes	No
sampletype [unwanted bycatch (e.g.	No	No	Yes	No	No	No	Yes	Yes	No
sampletype [VMS (Vessel monitorin	No	No	No	No	No	No	No	Yes	No
sampletype [environmental data (we	No	Yes	Yes	No	No	No	Yes	Yes	No
sampletype [economic data]	No	No	No	No	No	No	No	Yes	No
sampletype [hydro-acoustic data]	No	No	No	No	No	No	No	Yes	No
sampletype [gear information (e.g. n	No	Yes	Yes	No	No	No	Yes	Yes	No
effort [trawl time (e.g. hours)]	No	Yes	No	No	No	Yes	No	Yes	No
effort [fishing days (excluding searcl	Yes	Yes	No	No	No	No	No	Yes	No
effort [fishing days (including search	No	Yes	No	No	No	No	No	Yes	Yes
effort [number of nets/hooks]	Yes	Yes	No	No	Yes	No	No	Yes	No
effort [soaking time (e.g. gill net)]	No	Yes	No	No	Yes	No	No	Yes	No
age [Number of age samples per ye			0		0			900	
age [% of the total number of sampl			0		0			30	
length [Number of length samples pe		30	3000	300	20000			16000	
length [% of the total number of sam			0		20			60	
sampleinterval [deployment of the ge	No	No	Yes	No	Yes	No	Yes	Yes	No
sampleinterval - comment			monthly sampling				every 10th		
sampleinterval [trip (e.g. all, every s	Yes	Yes	No	No	No	No	No	Yes	No
sampleinterval - comment	every trip	erery 10th							
sampleinterval [time (e.g. every day	No	No	Yes	No	No	Yes	No	Yes	Yes
sampleinterval - comment			up to three times per month			every Tuesday and Thursd			
sampleinterval [catch location (e.g. e	No	No	Yes	No	No	No	No	No	No
sampleinterval - comment			same location every sampling						

ID	1	3	4	5	6	7	8	9	10
training [manual]	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes
training [video]	No	No	No	No	No	Yes	No	No	No
training - comment						not yet used: will be implen			
training [workshop]	No	No	No	No	No	No	No	Yes	No
training [individual onboard-training]	Yes	Yes	No	No	Yes	No	Yes	Yes	No
training - comment	very little training in the beginning (1960)								
training [no training]	No	No	No	No	No	No	No	No	No
training [Other]			X						Visits
training [Other] - comment			meetings visit and interview						By visiting the boat rental c
financ. who [national government]	No	No	Yes	No	No	No	No	No	No
financ. who [regional government (e.g. E	No	Yes	No	No	No	No	No	No	No
financ. who [project based financing]	No	No	No	No	No	No	Yes	Yes	Yes
financ. who - comment									The Norwegian Research C
financ. who [budget of a/your research i	Yes	No	No	No	No	No	No	No	No
financ. who - comment	there is no realy extra cost (only IT time)								
financ. who [additional quota /scientific c	No	No	No	No	No	No	No	Yes	No
financ. who [Other]					Govt/industry	Fishing Industry			
financ. budget [total budget for your self			EUR 50000		EUR 125000	EUR 40		EUR 4 mill	EUR 625000
financ. budget [running costs for your se					EUR 125000			EUR 1 mill	EUR 200000
financ. budget [val. of sampled fishery]								EUR 1.6 bill	0
financ. incentive [fishermen are paid for	No	Yes	No	No	Yes	No	No	Yes	No
financ. incentive [fishers get add. quota]	No	No	No	No	No	No	No	Yes	No
financ. incentive [fishers get add. day(s)]	No	No	No	No	No	Yes	No	No	No
financ. incentive [better data basis for m	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes
financ. incentive [Other]	fishermen receive a yearly		X						
financ. incentive [Other] - comment			fishermen get additional gear to catch with						
financ. payment		The money per sample is d			A one-time payment is made	Up to 3 extra days at sea in		Part of the Norw quotas for	
qual_samplesize [estimation of "effectiv	No	No	No	No	No	No	No	Yes	Yes
qual_samplesize [crosschecks between	No	Yes	No	No	Yes	Yes	Yes	Yes	Yes
qual_samplesize - comment						comparison self sampling d			
qual_samplesize [training of fishermen]	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes
qual_samplesize [statistic procedures at	No	No	No	No	No	No	No	Yes	Yes
qual_samplesize [protocol/sampling sch	No	Yes	No	No	Yes	Yes	Yes	Yes	Yes
qual_samplesize [spatial/temporal cover	Yes	No	No	No	Yes	No	No	Yes	Yes
qual_samplesize - comment	very few days at sea in this								
qual_samplesize [Other]	effort: knowledge via good		X						
qual_samplesize [Other] - comment			interview and yearly meetings						
eval_opinion [...obtain data, which are n	2	1	1		2	1		1	1
eval_opinion [...gather data, which are u	3	1	3		2	1		1	2
eval_opinion [...get closer cooperation/c	1	1	1		1	1		1	1
eval_opinion [...demonstrate that fishery	1	1	1		2	2		2	3
eval_experience [cooperation between f	2	1	1		2	2		1	2
eval_experience [get the needed permis	1	2	1		2	2		2	
eval_experience [assurance of data qua	2	2	3		2	3		2	4
eval_experience [improvement of releva	2	2	1		3	4		2	
eval_experience [cost efficient]	2	1	1		3	3		1	3
eval_problems	The big problem is that you	it is not easy to define the g			Training and follow-up are cri	Consistency in sampling m		Practical problems: register	Financial problems - Langu
eval_positive	Very good effort data. Good	we have got close contact t	Improved communication w		I find it has helped fishers bet	Amount of data on discards		See comments given in pre	Feedback from the tourists
addinf_request		See the reports of SAS 29	New report covering data fo		Daniel some variation of this				

Annex 6: Main positive outcome and common problems encountered in the self-sampling programs reported in Annex 5

Program (ID)	Which main problems have you encountered and how have you solved them?	What are the main positive things in your program?	Additional information
1	The big problem is that you have to invest much time in "visiting" the vessels quite often if you really want to make a proper quality assurance.	Very good effort data. Good contact and cooperation with the fishery. Discard info and the quality could be better.	
3	It is not easy to define the general conditions for sampling using the Glmp (Greenlandic length measurement paper) the budget for chartering fishing vessels is limited.	Close contact to the fishermen. Scientists get a feeling for the current problems in the fishery sector. Can collect reliable fishing data together with the fishers. Better understanding for the fishing methods on the vessels and the work on board.	See the reports of SAS 29 and BUR 6 as well as the summary of cod recruitment survey and the EU final report of Lot 8.
4		Improved communication with fishermen and improved data and local knowledge of fish communities.	New report covering data for 2005-2007 will be available as per Sept. 2008 at www.fiskepleje.dk and as a report on www.dtu-aqua.dk
6	Training and follow-up are critical. In the lobster survey it is always possible to get an observer or technician on a vessel to check the fisher's compliance with the survey protocols since the boats fish close to shore and are in port each night.	I find it has helped fishers better understand how the data collected are used and has led to greater communication between the two groups.	Some variation of this self-sampling scheme for lobster is followed in most areas of the east coast of Canada, not just Newfoundl.

Program (ID)	Which main problems have you encountered and how have you solved them?	What are the main positive things in your program?	Additional information
7	Consistency in sampling method: different fishers carried out the sampling in different ways. Partly due to a manual that could be interpreted in different ways and partly due to the human effect: crew members adjusted the method to make it more practicable and efficient. Use of data in stock assessment: the data are not yet used in stock assessment even though data have been collected since 2004. The problem is that the outcome of this sampling program does not concur with the outcome of the IMARES sampling and it is not clear why there are differences. When the causes for the differences were investigated it appeared that the results of the self sampling were biased due to inconsistent methods applied by the crew. First the methods should be made consistent again in order to get more reliable data. Then the data might be used in the assessment for estimating discard mortality. Incentives: participating in the self sampling program requires much effort of fishers. Incentives and effort are currently not in balance so fishers tend to cancel their cooperation. The set up of the project was slightly adjusted and incentives were increased recently which might improve the rate of participation.	Amount of data on discards increased tremendously. Next to the 10 trips per year covered by the IMARES research a huge amount of information on spatial and temporal distribution of discard percentages has become available. Qualitatively better discussion between fishers, managers and scientists on discards: because of the availability of more data on discards there are more sources to discuss about this subject. Better graphical information (maps time-series) is available now.	

Program (ID)	Which main problems have you encountered and how have you solved them?	What are the main positive things in your program?	Additional information
9	Practical problems: registering the whole catch/all species incl. bycatch and discards - a code system will be used to tell us how complete the catch has been sampled. Trust based. Technical problems with measuring boards and scales - ensure that the vessel has two sets on board and a technical routine service program is working. Only possible to operate a limited number of vessels despite the statistical advice and benefit of sampling many vessels. Financial problems: at present none but has over years been developed together with the fishers and their acceptance to use part of the total national quota for this purpose. Communication problems: being available at all times - a mentor system has been introduced involving several technicians to improve this.	See comments given in previous section. Trust based cooperation between fishermen and scientists. Provides better insight and builds a common understanding. Provides continuous information, not at least about mixed fisheries.	
10	Financial problems - Language problems - Geographical coverage (long coastline)	Feedback from the tourists and the companies. Learning by doing. Reduces controversies. Provides knowledge of the coastal ecosystems.	

Annex 7: Example of main contract with fishers concerning biological sampling and electronic logbook reporting during a self-sampling program

MAIN CONTRACT

concerning biological sampling and electronic logbook reporting from commercial catches as part of the "Reference fleet for marine research – a joint research and development project with fishers"

1. Background

2. What the contract is about

The Institute of Marine Research (the Charterer) and AS NN, Strandgaten 3, 6003 Ålesund (the Shipowner) have entered into the following agreement: about sampling, registering and transfer of biological and technical data from the vessel's commercial fishery.

3 a. Contract time period

The contract is valid from the date of signature until 31 December 2011. The project will each year be evaluated before 1 October.

3 b. Termination

The contract can be terminated by either party by giving two months' notice. Such notice shall be given in writing. With severe breach of contract, e.g. if during the charter period, the vessel breaks Norwegian fishing legislation or any other Norwegian legislation in such a way as to result in sanctions being taken against the vessel and/ or crew, the Charterer is entitled to terminate the contract with immediate effect.

3c. Jurisdiction

This paragraph refers to relevant laws and prescriptions.

4. Confidentiality

The Shipowner and his staff shall not divulge details of results, or other information to which they become privy during the charter, without the permission of the Charterer.

5. Satellite tracking data (VMS) and information of fishing plan

The Shipowner mounts and runs necessary equipment for satellite tracking (VMS) and accepts that the Institute of Marine Research receives and uses all VMS data from the vessel during the contract period. The institute wishes to be informed by e-mail in advance about the start of fishing trips, the planned fishing area and target species.

6. Technical equipment

Purchasing and service responsibilities of necessary technical equipment on board.

7. Ownership of equipment

Equipment purchased by the Institute of Marine Research belongs to the institute, and should be returned to the institute when the contract is ended. The institute pays

for the return transport. The Shipowner may though come to an agreement with the institute to keep the equipment after ending the contract.

8. Training incl. the right for institute personnel to come and stay on board the vessel

The Institute is responsible for the training of those crew members that the Shipowner appoints as being responsible for the sampling on board the vessel during the contract period. This includes how to use the technical equipment, the software and how the sampling itself should be conducted. This should already be done in connection with first time installation of the equipment on board. Training beyond this may be arranged and agreed between the institute and the Shipowner. Personnel from the institute should have the right to be on board the vessel during fishing. Agreement of such participation should be made well in advance of starting the trip, and should be limited to maximum 2 persons. The institute pays all expenses related to this participation. Any testing of technical equipment should not hamper the vessel's fishing operation. Collection of instrumental data may also be done via Internet without institute personnel being on board.

9. Description of the work/tasks

See Instructions given in a separate document

10. Quality approvement of the collected sample(s)

Collected data are not approved until they have been quality checked by institute personnel after being electronically transferred using the communication equipment installed on board by the project or (regarding biological samples) received by post mail.

11. Transfer of data to the Institute of Marine Research

The data and samples should be transferred to the institute immediately after each fishing trip or within 24 hours after receiving special requests from the institute.

12. Payment

The institute pays a fixed rate of NOK xxxx per year for covering all communication expenses.

Every approved sample will be paid according to the following rates:

Length sample (NOK per fish)
Age (otolith) sample (NOK per fish)
Stomach sample (NOK per fish)
Genetic sample (NOK per fish)
Electronic logbook information per haul
etc.

A frozen sample of whole fish (nos. specimens) (sent to the institute for sampling in the lab on land), NOK per sample

The payment above is fixed for a certain period of time.

The payment to the Shipowner will be done soon after the quality of the data/samples have been approved, maximum 30 days after delivery.

13. Testing of electronic devices/equipment for the institute or the Directorate of Fisheries

The Shipowner is bound to test out for free any equipment for reporting and transferring data to the institute or the Directorate of Fisheries.

There are two – 2 – copies of this contract, and each party shall retain one copy.

Institute for Marine Research	Shipowner
Charterer	
Date:	Date:

Annex 8: Example of charter of vessel for research catch purposes

The parties to the agreement

The Institute of Marine Research (the Charterer) and NN Ltd, Strandgaten 3, 6003 Ålesund (the Shipowner) have entered into the following agreement:

Charter period

The Shipowner will charter his vessel F/T "Trawler", N-203-B to the Institute of Marine Research for research purposes as part of the Reference Fleet during the first half of 2008.

The research catch shall be taken during the period 30 April 2008-1 September 2008.

Sale of catch and payment

The Shipowner is to sell the catch on behalf of the Charterer at the market price. All delivery notes for the catch shall be completed in the name of the Institute of Marine Research and shall be marked: "Charter no. 2008 801. Research carried out by the Institute of Marine Research, not to be deducted from the vessel's own quota". The delivery note is to be sent to the Charterer. Detailed instructions for the delivery of the catch are enclosed, and the Shipowner undertakes to comply with them.

Gross catch revenues, less marketing organization, product, packaging and unloading fees, are to be split 60:40 between the Shipowner and Charterer. The Charterer is to transfer the Shipowner's share within 14 days of receiving payment for the catch.

Packaging and unloading fees are calculated as being 3% of the gross value of the catch less marketing organization and product fees, etc.

The Shipowner is to cover all bunker, lubricant and general operating costs.

The cost to the Shipowner of taking samples for the Charterer are governed by the "Contract on taking samples from commercial catches as part of the 'Reference fleet for marine research' project" (see Annex 7).

Terms and conditions for research catches

Enclosed is a letter giving permission to catch fish for research purposes from the Norwegian Directorate of Fisheries. The Shipowner undertakes to comply with the terms and conditions stated in the letter.

The research catch of cod must be taken from the northeast Arctic cod population. The vessel's allocated quota for the first half of 2008 is 43 tonnes live weight of northeast Arctic cod and 30 tonnes live weight of Greenland halibut. The research catch shall be delivered for sale by 1 September 2008.

Any catch of other species subject to quotas shall be deducted from the vessel's own quota.

Catches of species that are not subject to quotas and bycatch regulations are not shared, and belong to the Shipowner in their entirety.

Equipment and crew

The Shipowner is to equip and crew the vessel, at his own expense, in such a way as to allow normally efficient fishing and 24-hour operation.

Insurance

The Shipowner undertakes to keep the vessel insured and in compliance with relevant regulations (certificates, etc.) during the charter period. The Shipowner is to cover the cost of insuring the crew.

Liability for losses and damage

The Charterer is not liable for any losses or damage suffered by the vessel, gear and/ or crew, which includes exemption from liability to third parties.

Performance of the charter

The charter shall run continuously, and be planned and directed by the Shipowner.

During the charter a catch logbook shall be kept in the normal way, and a note shall be made in the comments field at the beginning and end of the charter for the Institute of Marine Research. A copy of the relevant pages of the catch logbook shall be signed by the captain and be sent to NN of the Institute of Marine Research after the completion of the charter.

The captain of the vessel is responsible for given notification when entering and leaving other countries' economic zones, including the Svalbard zone. The captain shall also report whether he is active or passive to the quota control section at the Norwegian Directorate of Fisheries (fax +47 55 23 80 90), and to NN of the Institute of Marine Research (fax +47 55 23 85 31), at the beginning and end of the charter. The passive notification shall include details of the catch (species and quantity) taken during the charter.

Duty of confidentiality

The Shipowner and his staff shall not divulge details of results, or other information to which they become privy during the charter, without the permission of the Charterer.

Termination

The contract can be terminated by either party by giving two months' notice. Such notice shall be given in writing.

Breach of contract

If, during the charter period, the vessel breaks Norwegian fishing legislation or any other Norwegian legislation in such a way as to result in sanctions being taken against the vessel and/ or crew, the Charterer is entitled to terminate the contract with immediate effect.

Relationship with the fisheries authorities

The Institute of Marine Research wishes to use partners from the fishing industry who comply with Norwegian fishing legislation, and who help to give the industry a good name.

It is very important to the Institute of Marine Research that the Shipowner's vessels are not given a warning by the fisheries authorities during the charter period. This requirement applies to all of the Shipowner's fishing vessels during the charter period.

The Shipowner undertakes to inform the Institute of Marine Research immediately of any warnings received during the charter period.

If a warning is given to one of the Shipowner's vessels, the Institute of Marine Research reserves the right to terminate this contract with immediate effect.

Scope of the contract

The tender documents form a part of this contract.

Jurisdiction

The parties agree that Bergen city court shall be the place of jurisdiction for any disputes arising from this contract, unless otherwise follows from the law.

Appendices to the contract

Letter dated 11 March 2008 from the Norwegian Directorate of Fisheries regarding permission to catch fish for sampling purposes and the operation of the Reference fleet in 2008. Instructions for delivery of catch.

There are two – 2 – copies of this contract, and each party shall retain one copy.

Institute for Marine Research	Shipowner
Charterer	

Annex 9: Instructions I – An example from the Norwegian Coastal Reference Fleet 2008. A short version without illustrations, appendices and examples

1) Contact people at the Institute of Marine Research
2) List of equipment
3) Instructions for the catch report form
4) Instructions for biological sampling (length measurements, otolith and stomach sampling)
5) Sampling – Coastal Reference Fleet 2008

1. Contact people at the Institute of Marine Research

Name Tel. no. E-mail

2. List of equipment

Writing equipment, incl. writing underlay

Catch report form

Biological sampling form (length measurement form)

Measuring strip

Fish measuring board

Otolith envelopes

Tweezers

Bags for stomach samples

Knife

Counter

(Scales)

(Dictaphone)

It is important to report any equipment faults/ defects as soon as possible. You are welcome to report them by e-mail.

3. Instructions for the catch report form

Completing the catch report form

Each day's catch shall be entered on the catch report form, including the date, area/ location, gear (including number of nets and mesh size; for longlines/ pots, indicate the number of hooks/ pots), fish depth and standing time of the pots.

If several types of gear/ mesh sizes are used on the same day, the catch should be entered in a column for each gear/ mesh size per day.

Fish/ shellfish

The total catch and bycatch of fish and shellfish shall be recorded daily (sea days) on the catch report form. Fish weight shall be reported in live weight (kg) by species (discards to be stated by numbers), and shellfish shall be reported by numbers per species. The king crab catch/ bycatch is to be reported by numbers per sex. Fish that is

delivered to and weighed at a fish processing plant can be converted to live weight using conversion factors and entered on the form.

Fish that are not delivered (discards) are to be counted and recorded on the catch report form.

The Institute of Marine Research wants the **whole** catch to be recorded. This applies to all species that are caught, including non-commercial species (use the back of the form if there is too little space on the front).

Marine mammals/ seabirds

Bycatches of marine mammals and seabirds shall be reported as numbers per species. Use the wallchart provided to help determine the species.

Completed forms shall be sent monthly to (NN is the vessel's contact person at the Institute of Marine Research):

Institute for Marine Research
Fisheries dynamics
NN
Postboks 1870 Nordnes
5817 Bergen

4. Instructions for biological sampling (length measurements, otolith and stomach sampling)

A. Sampling fish – general

The main principle for sampling fish is that the sample shall be representative of the catch, i.e. it shall give an accurate impression of the composition of the catch. The fish that are to be measured must therefore be selected in such a way as to avoid selecting a disproportionate number of a particular size (in our experience there tends to be a bias towards selecting big fish). The aim is for the ratio between the various length classes in the sample to reflect the ratio in the catch as a whole.

i) Sampling from gillnets

It is important to take a sample from a gillnet that has the same mesh size as the rest of the gillnets used by the vessel.

ii) Sampling from longlines

The size of fish on longlines often varies between the shallowest and the deepest end of the snood. The fish that are to be measured must therefore be taken from the first, middle and final part of the snood.

B. Length measurement

A length sample shall consist of no more than 60 fish. The fish length shall be stated in **whole cm**.

Lengths are to be rounded down to the nearest whole cm. E.g.: 27.9 cm = 27 cm.

There are details of how different species are to be measured in the complete version of the coastal reference fleet instructions.

Manual fish measuring board: Place the measuring board with the cross-piece on the left, and place the fish with its snout against the cross-piece. The tail fin should lie in a natural position, and the length reading should be taken in the length group where the far tip of the tail fin is. (Draw a line beside the right fish length on the fish length

form (see Section D – completing forms); use "tally lines" (//// ///). Ideally two people will perform the measuring process: one to measure, and one to write.)

Measuring strip: It is also possible to use a measuring strip to measure the length of fish. This is a waterproof strip mounted on a board. Put the fish on the measuring strip and mark the length with an awl. More detailed instructions about how to use the measuring strip can be found on the back of the strip. This method of length measurement allows one person to measure the fish alone, as the length of the fish is marked directly on to the strip.

Electronic measuring board: If using an electronic measuring board, the length measurements are transferred to a PC, and the weight of individual fish or samples are recorded on scales. Detailed instructions for the electronic measuring board and associated software will be provided to the relevant vessels.

C. Weight of the length sample

Once you have finished measuring the length of a species, you should if possible weigh the sample (i.e. the fish whose lengths have been measured). This should be done for all species.

If it is not possible to weigh the length sample, the quantity of the relevant species in the total catch will provide equally good information. If you can/ do count the fish that are delivered, enter the number on the form instead of, or in addition to, the sample weight.

D. Completing forms

We have produced a fish measurement form to be used when sampling. At the top of the sheet you enter details of the haul/ snood/ panel, date, gear and fish depth. The fixed values are printed on the form, such as the vessel name, radio call sign, etc.

(The comments field at the bottom of the sheet can be used if there are any special issues that you want to highlight.)

E. Otoliths

Instructions:

At stations where the length of up to 60 fish is measured, the earstones (otoliths) should be extracted from 20 of them. (The 20 fish shall be randomly selected from the 60 fish whose length has been measured!!!!)

Number the otolith bags (small grey envelopes) from 1-20. The **length**, **weight**, **sex** and **maturity** (see separate table in complete instructions) of each fish shall be entered on the otolith bag. Put the earstones in the otolith bag (one bag for each fish). When you have done this, bundle the envelopes together and mark the bundle with the vessel name, species and date. Otolith samples should be sent to:

Institute for Marine Research
Fisheries dynamics
NN
Postboks 1870 Nordnes
5817 Bergen

F. Stomach sampling and collection of samples for genetic analyses

Instructions for this will be given as and when the samples need to be taken.

G. Sampling by the Coastal Reference Fleet in 2008

		Length measurements		Age samples	
Species	**Fishery**	**Nos. measurements**	**Nos. fish/sample**	**Nos. samples**	**Nos. fish/sample**
Cod	Directed and bycatch	From 1 daycatch per week	Max 60	1 sample per 14 days	20
Golden redfish	Directed and bycatch	From 1 daycatch per week	Max 60	1 sample per 14 days	20
Anglerfish	Directed and bycatch *	From 1 daycatch per week	Max 60	Upon request	
Atlantic halibut	Directed and bycatch *	From 1 daycatch per week	Max 60	Upon request	
Spiny dogfish	Directed and bycatch	From 1 daycatch per week	Max 60	Upon request	
Pollock	Directed and bycatch	From 1 daycatch per week	Max 60	Upon request	
Tusk	Directed and bycatch	From 1 daycatch per week	Max 60	Upon request	
Greenland halibut	Directed	From 1 daycatch per week	Max 60	Upon request	
Hake	Directed	From 1 daycatch per week	Max 60	Upon request	
Ling	Directed	From 1 daycatch per week	Max 60	Upon request	
Haddock	Directed	From 1 daycatch per week	Max 60	Upon request	
Saithe	Directed	From 1 daycatch per week	Max 60	Upon request	
Mackerel	Directed	From 1 daycatch per week	Max 60	Upon request	
Herring	Directed	From 1 daycatch per week	Max 60	Upon request	
Eel	Directed	From 1 daycatch per week	Max 60		
Lobster	Directed	From 1 daycatch per week	Max 60		
Other species	Upon request				

*** If only bycatches of one or few specimens per day then length measurements of (upto) 60 specimens per week from different trips should be reported.**

Annex 10: Instructions II – An extract of some points from the instructions used for the Norwegian High Seas Reference Fleet 2008

1) Contact people at the Institute of Marine Research
2) List of necessary equipment to perform the sampling, registration and reporting
3) Scope of sampling
4) Sampling instructions

1. Contact people at the Institute of Marine Research

Name, Tel. no., E-mail.

2. List of equipment

3. Scope of sampling, applies from 1 January 2008

A: Completing the catch logbook

Each bottom trawl haul, Danish seine haul and purse-seine cast shall be entered in an electronic catch logbook. For longlines/ gillnets, a catch logbook shall be kept for one representative snood/ panel per day, including its position, as well as for the day's total catch, including a position representative of the day's fishing.

The whole catch, including the bycatch and discards, shall be recorded in the electronic logbook.

B: Length measurement – weighing

Sampling from bottom trawlers:

Each week, seven length measurements shall be taken for each species. From 2008, try to measure the length of all species in a haul/ cast/ snood/ panel, up to a maximum of 60 fish per species.

The general rule is one sample per day for each of the demersal species. Each sample shall be weighed. An effort should be made to spread measurements across both night and day catches.

Sampling from pelagic vessels:

Herring, blue whiting, capelin, sprat, mackerel and horse mackerel are defined as being pelagic species. The length and weight of 100-150 fish shall be measured from every second haul/ cast. At least 100 fish shall be frozen from the alternate hauls/ casts from which no such measurements are taken.

The total weight of the bycatch of non-target species, including demersal species, is to be recorded by species. A length sample of no more than 60 fish is to be taken for each bycatch species (remember to weigh the length sample) from hauls/ casts where the length of the pelagic species is measured. It may be necessary to sort out the bycatch when delivering to the onshore processing plant.

C: Otoliths, stomach sampling and collection of samples for genetic analyses

These samples shall be taken as and when requested by the Institute of Marine Research. For 2008, regular weekly otolith samples are to be taken for cod and haddock. A regular otolith sample is also to be taken every two weeks for redfish. Trawlers shall in addition take a regular weekly otolith sample for saithe.

D: Shrimp samples

Shrimp samples shall be taken daily when a vessel is fishing for shrimp. A shrimp sample involves the contents of one bucket (approx. 10 litres) of the catch in a trawl haul being sorted and weighed by species each day. The lengths of all 0-group fish in the sample are to be measured. The lengths of 300 shrimp are to be measured. (See instructions from the Institute of Marine Research's department in Tromsø.)

E: Counting king crabs

For each trawl haul of king crab, the number caught shall be recorded, preferably by sex.

For longlines and gillnets, the number per snood and for the day's catch shall be recorded (preferably by sex). This should be entered on a separate form, or on an Excel spreadsheet.

F: Recording marine mammals in the catch

All marine mammals caught must be recorded in the electronic logbook, in the same way as species of fish (use the comments field if necessary). Use the wallchart/ booklet provided to help determine the species.

G: Frozen sample

For every second haul/ cast for pelagic fish, at least 100 fish of the target species shall be frozen. These samples are to be sent to the Institute of Marine Research by further agreement. The recipient is to pay the transport costs.

4. Sampling instructions

Sampling from trawling – Danish seine – purse-seine

Fish must be taken from different locations in the haul/ cast. This can be done by distributing the sampling across 2-4 hatches that lead fish out from the fish tank. In other words, and/ or depending on what is possible, approx. 1/3 of the sample should be taken from the first part of the catch from the haul in question, approx. 1/3 should be taken when around half of the catch has been brought aboard and approx. 1/3 from the end of the catch.

Special rules for pelagic fishing

Fish must be selected for sampling when the cast/ haul is being pumped aboard. A sample of this kind must contain at least two random samples of fish taken during the pumping process itself. The sample should be taken in conjunction with the weight samples that the vessel uses when reporting its catch to Norges Sildesalgslag (the marketing organization for pelagic fish).

In order to record bycatches of non-target species, including demersal species, during pelagic fishing, it may be necessary to use a grid when pumping the fish aboard. Bycatches are to be recorded as the total weight of each species. Instead of recording this on board, the bycatch can be recorded when the catch is delivered to the onshore processing plant. The onshore processing plant generally sorts out any bycatch and directs it into separate tanks, sometimes together with off-cuts of the target species. The sampler can take a representative sample of approx. 100 kg from this tank, sort it by species, record the weight and quantity of each species, and finally multiply/ scale this up to reach the total weight of the bycatch sorted out by the processing plant. The sampler must exclude the weight of off-cuts from the figures recorded on the Institute of Marine Research's form.

Scales are used to determine the age of spring-spawning herring. It is hence important to take samples for freezing at an early stage during pumping, as that is when there are most scales on the herring.

Sampling from gillnets

It is important to take a sample from a gillnet that has the same mesh size as the rest of the gillnets used by the vessel.

Sampling from longlines

The size of fish on longlines often varies between the shallowest and the deepest end of the snood. The fish that are to be measured must therefore be taken from the first, middle and final part of the snood.