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Report of the Review Group on Fisheries Surveys of North Sea Stocks (RGFS)

12–14 December 2006

ICES Headquarters



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Executive summary

The North Sea Stock Survey (“the Survey”) has been organized by the North Sea Commission Fisheries Partnership (NSCFP) with the Scottish North Atlantic Fisheries Centre (NAFC), Marine Centre in Shetland, Scotland, overseeing data collection and undertaking data analysis and producing the Survey reports. The Survey has been performed since 2003, with a trial survey in 2002. The survey is conducted nationally by the EU member countries around the North Sea, Skagerrak and Kattegat (except Germany). Questionnaires are distributed to fishers, data from returned forms are digitized nationally prior to analysis at NAFC. The results are communicated to the respective ICES Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak and to ACFM. Both the Working Group and ACFM have used the data to some extent. In the survey reports from 2005 and 2006 the perception of abundance of each stock was transformed in a semi-numerical format to illustrate the changes in perception of the abundance throughout time, these have been incorporated into the Working Group reports for some of the stocks.

The prime purpose of the Survey is to provide most recent information from the fishery for the respective scientific assessment working group when projecting the state of the stocks into the intermediate year, i.e. the year while the assessment takes place. The information from the fishery is supposed to balance the projection by using the observations by the fishery on most recent biological events taking place in the sea. Before reaching this the question arises to what degree the perception of the fishery coincides with the assessments.

The general conclusions of the review are that the survey *should be continued* significant changes in the Survey design need however to be made. This is inevitable since the ICES working group meeting will be moved in 2007 from September to May. It will be impossible to collect information from the first months of the year and provide the data in time for the working group. For this reason a fishers’ reflection will inevitably cover the previous fishing season, i.e. the previous year. As a result, there will be no Survey available for the Working Group in 2007. The next one will be available in 2008, covering the entire fishing period 2007.

The response rate is at present between approximately 5–20% and as such far too low. Before continuing the Survey, a strategic decision needs to be taken as to what degree the Survey is professionalized and the response rate significantly increased to meet the survey standards of the social sciences and what financial (man power) implications this will have. To achieve a better response rate, the request to fishers for filling out and returning the questionnaire should be changed, from postal distribution to a mix of postal distribution and personal interview. It was felt, that a continuation of the Survey would require substantially more “footwork”. Articles in leaflets or newsletters to fishers are certainly important but by far not enough. This will only reach those who participate and return the questionnaires. It will be necessary to perform a representativity analysis to ensure that the collected data is covering the métiers representatively. This includes to undertake focused approaches (personal or telephone interviews) to métiers where response is weak and implies that effort is made to analyse who of the fleets / communities is not actively involved in the Survey and moreover, attempts (personal approaches) to reach and involve these. If these decisions have been made and are positive, a number of other recommendations need to be taken into account:

The questionnaire is too complicated to achieve ready willingness of the fishers to comply. It should be simplified. This has been requested by a number of fishers. At the same time it should be possible to give more specific information. This was also requested by the fishery. To achieve this apparently contradicting requirements the questionnaire needs a fundamental new design.

It should be tried to define better the biological questions to focus on. The stocks should be screened as to which of them have the potential to provide more specific biological information, for example a recruitment index for certain stocks, distribution or discard quantities.

The stocks should be screened for “good results”, i.e. those where perception of fishers and scientist diverge or match clearly, these should be highlighted and interpreted.

The results of the surveys should be communicated to the fishers in a better and more encouraging way. Positive effects of previous efforts should be presented and explained. It should be made clear how the perception of fishers diverges or coincides with the scientific assessments. The aims of the Survey should be clarified and made transparent to the fishery as well as the scientists.

In summary

The Survey should be continued. The design and approach should be changed substantially. It should develop into a Survey that is more user-friendly for the fishers and can be used better by ICES. By becoming more “usable” it is also aimed to develop a stronger voice, gaining therefore in importance for fishers.

1 Opening of the meeting

The meeting took place in ICES headquarter from 12 to 14 December 2006. The meeting was opened 12 December 10:00 hrs and closed 14 December 15 hrs

2 Adoption of the agenda

The agenda was unanimously adopted

3 Terms of Reference

The Terms of Reference were set by the European Commission by letter to ICES dated June 30 2006 with the request to submit the evaluation until the end of 2006.

- 1) Evaluate the information provided by the survey in relation to other information about stock abundance and distribution: the evaluation should consider both
 - a) The consistencies between different types of information, and
 - b) The relative contribution of the survey. The survey contribution should be considered not only from a longer-term consistency perspective but also in terms of its potential contribution as an early warning of future developments
- 2) Provide recommendations and proposals concerning the survey.

4 The Survey - Introduction

The Fishermen's Survey of North Sea Stocks ("the Survey") was started as a test trial in 2002, based on a Scottish investigation in 2001 and is performed as the documented Survey since. Therefore four full surveys are available for evaluation. In the meantime the 2006-survey was investigated by the University of Newcastle as part of a PhD study (see Annex 2).

The general purpose of The Survey has so far been to collect the fishers' perception of the most recent developments of the stocks and to provide this very recent information for the ICES WG on North Sea and Skagerrak Demersal Stocks. The underlying assumption of the Survey is that it should be possible to provide most recent and up-to-date information from the fishery for the respective scientific assessment working group. By nature of the assessment procedure the state of the stock in the previous year is assessed and is then projected to the current (intermediate year) and the following year (TAC-year). The observations from the fishery, as retrieved from the questionnaires, are supposed to balance the projections by taking into account the most recent biological events taking place in the sea which may be of importance, may influence the projection and may remain unnoticed for at least a year, until the signals are picked up by the research vessels or other scientific means.

The core question posed here is whether or not the perception of the fishers is in agreement with assessment. The Working Group has sought to use this information by comparing their abundance prognosis for the intermediate assessment year with the fishers' perception of the state of stocks in the sea. As a result, great discrepancies between both should encourage the WG to identify assessment problems better, or vice versa find support for the assessments.

The Survey is based on questionnaires which have originally been designed by the Scottish Fishermen Federation for the first 2002-version. In 2003 a review was performed by a working group consisting of representatives of the fishers organizations of North Sea countries (UK, DK, NL). As a result, the questionnaire was changed for the 2003-Survey, again modified for the 2004-Survey by the same working group and used as such since.

The questionnaire is distributed by the NAFC, Marine Centre, in Scotland, to the one or many national fisheries organisations of North Sea and Kattegat bordering countries. The national

fishers' organisations distribute the questionnaire to the fishers, in cases (e.g. DK, not so in NL) after translation. The mode of distribution to the fishers is nationally different. It is not defined or recommended which fishers receive the questionnaire and which eventually not. In some cases all registered fishers or members of the fishers' organisations are addressed, in other cases lists of selected fishers from particular fleets (e.g. demersal vessel skippers) are chosen and in other cases the forms are spread out uncritically.

The mode of distribution of questionnaires has however not been uniform and constant but was modified to increase the response rate. While for instance in Denmark initially all fishers received a questionnaire who were on the list of the newspaper of the Danish Fishermen's Association, this was changed to a more specific list of skippers only, for whom the postal charge of the return mail is covered by DFA. A similar protocol was developed in case of the Netherlands. Based on previous experience and the simultaneous development of a project (F-project) a list of cooperating fishers was used who were addressed primarily. In Scotland from the start all known skippers were approached. Therefore it appears that there has been a fairly strict protocol in Scotland from the start.

However, in spite of the efforts to narrow down the list of participants, there is no strict protocol or proper documentation who of the fishers actually receive the questionnaire and who do not. For this reason it is hardly possible to evaluate a sampling bias by addressing only particular fishers. It is at present not clear if or what kind of sampling error is produced and to what degree the sampling is biased due to the approach and uneven distribution of the questionnaire. As it seems, the bias might be different between the countries participating. *This leads to the recommendation, that in future the distribution practice of the questionnaire should be investigated.*

The questionnaire is filled out by the fishers without having direct help provided or incentives being offered, although the covering letters of the fishers' organisations probably have telephone numbers included which could be used in seeking support.

The fishers return the forms to their organization which extracts the information and enters the data into an Access-database. The data are forwarded to the NAFC in Scotland and evaluated. The response rate differs from country to country and from year to year, but is not in all instances clear. The total number of returned questionnaires is at present about 250 out of approximately 5000 fishers in the North Sea who are potential candidates for filling out the questionnaire, making approximately a 5% return rate. This varies naturally between countries. In Scotland in 2006 about 60 questionnaires out of approximately 300 were returned, making a return rate of about 20%. Never the less, for an analysis using sociological analytical methods this is still a very low percentage. Depending on the stratification of the Survey (area or fleet-wise) the minimum rate of returns should be at least 30–60%, depending on the stratification. For this reason methods should be sought to substantially increase the return rate of questionnaires. The method proposed here is to combine the postal distribution of forms as done so far, with an individual approach. For the latter a trained person should contact fishers individually either by visit in the harbour or by making telephone contact. This should be the approach for reaching fishers who have so far not been responding. The key to such contact is considered to be to establishing communication, which includes the explanation of the questions, the explanation of the purpose of the questions, the importance of the exercise and the results, which have been shown so far. It is understood that such an individual approach is by far more laborious and resource demanding. However, to obtain scientifically qualified results, such an approach seems necessary. It is obvious that the publication of the results in form of an article in each national organizations leaflet or newspaper will primarily reach only those who are actively involved anyway (the "motivated" fishers).

Moreover, the questionnaire itself needs to be redesigned. It has been brought to the attention of the organizers that the questionnaire for some fishers is too complicated. Apparently they have difficulties in handling such a questionnaire and would need either help by a skilled interviewer, or would need simpler forms. The analysis of the 2006 Survey (Annex 2) shows by contrast, that some fishers would favour a more detailed questionnaire, since they do not consider the questionnaire appropriate to reflect their specific problems. Again, more detailed questionnaires combined with personal interviews could offer a solution. However, when any redesign is undertaken consideration must always be given to the use and usefulness of the data being sought.

The questionnaire covers the period of the first 6 months of the year. In August the data are analysed and the results passed on timely for the use of the ICES Working Group on North Sea and Skagerrak Demersal Stocks, which so far took place in September. However, due to requests from clients ICES felt the need to shift the North Sea Working Group from September to May. To provide the working group with information in May, the questionnaires will at the latest have to be analysed in April and the forms will have to be sent out and be recollected in January and February. For this reason the Working Group will in the future not have recent and up-to-date information of the state of the stocks, i.e. a reflection from a fishers' perspective of the state of the stocks of that particular spring. Inevitably the reference period to which the fishers will refer is going to be the year before, and then referring to the entire year and not as so far only half of the year.

As a result, the Survey will not any longer provide information on the intermediate assessment year but rather the assessed year itself. In practice this will not matter much since evidence suggests that the fishers' reflection covers always an entire fishing period, no matter what the questions ask for. Never the less, the core purpose of the Survey is indeed jeopardized by this shift, since the prime purpose of the Survey is to seek for match or mismatches between the assessment projections and the fishers' perceptions of the actual year in which the assessment is performed and the TAC's for the next year drafted.

No matter what the future decisions for the Survey are going to be, if it is continued there is the need to take the timing of the Working Group into account and inevitably there will be one year (2007) in which the Working Group will not be able to have the results of a Survey available. Only in 2008 this could be the case again. Therefore, the time series of the Survey is interrupted for one year, no matter what the decisions on the format of the Survey will be.

After analysis the Survey results are immediately transferred to the respective ICES working group. The analysis (Section 5) shows in summary, that for a number of stocks figures on the change of abundance over the years have been produced. These have subsequently been updated with the new Survey information. The perceived trends have then been compared with the assessment results. Beyond this, the results of the Surveys were not extensively employed by the ICES working group in terms of using discards or recruitment information. It appears that the working group was not fully convinced of the validity of the abundance data. The potential of the Survey for providing CPUE information has so far not been used. It is therefore recommended to seek new ways to make better use of the Survey, preferably by a small group providing an interface between the Survey organizers and the working group for discussing the format of the questionnaire and to provide more useful information for the working group. As a result, a development of the Survey methodology should be initiated, leading to more useful results for the working group.

5 Use of the Survey in ICES assessment and advice production

The Survey results have found their place both in the reports of ICES Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak and the subsequent ACFM reports. For some early years parts of the results from the Surveys (histograms on abundance,

discards etc.) were given in the ACFM report as additional information from the fishery. Later, the abundance estimates of the fishery in categories of “same”, “more”, “much more” etc. were transformed by the Working Group into figures with a semi-numerical scale. When updated in the following years the diagrams produced show the development of perception throughout the years (Figures 1 and 2). From Figure 1 for instance, it becomes apparent that for most areas the fishers considered the cod stock increasing (e.g. area 1), remaining constant (e.g. area 2) or decreasing (e.g. area 4). The development of the North Sea plaice stock is perceived even better by the fishery (Figure 2). Except for area 2 the development of plaice abundance is considered to improve throughout the years.

The approach of a semi-numerical presentation of the results is a very sensible way to illustrate the development of the perception with respect to the previous fishing period and throughout the years. This approach was adopted by the organizers of the Survey and used for each species in the 2005 and 2006 Survey reports.

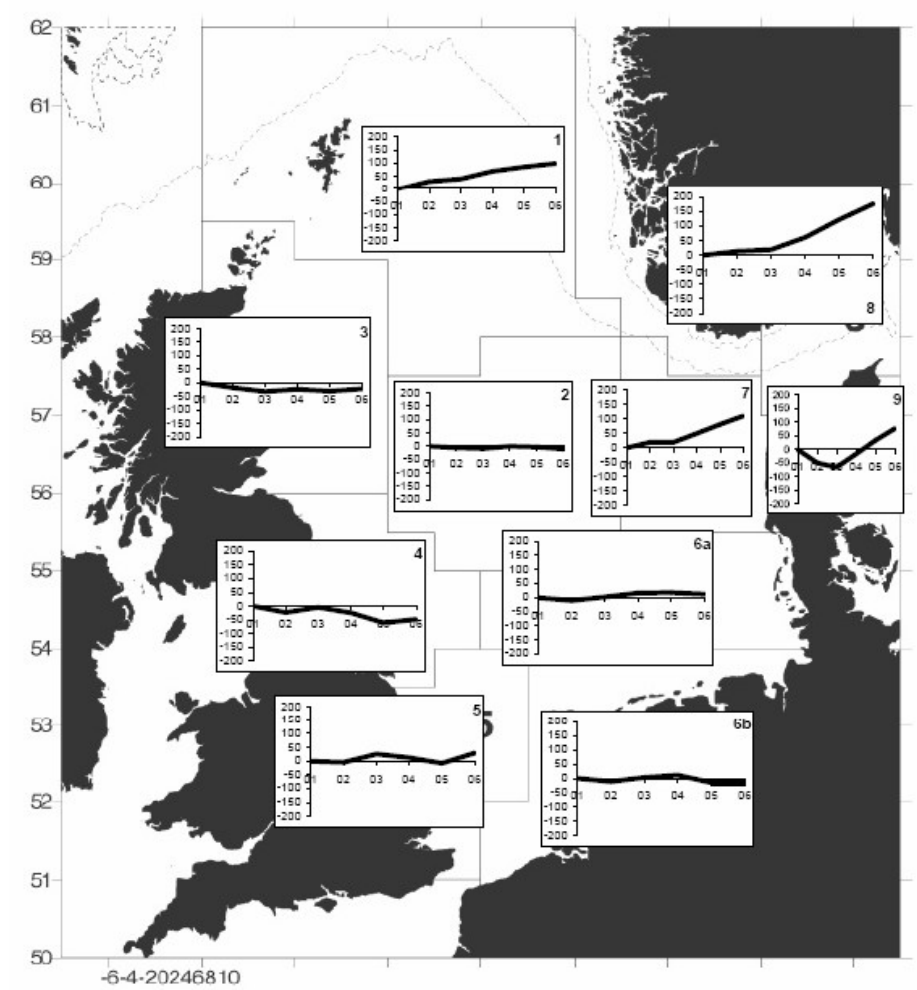


Figure 1. Development of the cod stock in the North Sea as perceived by the fishery 2001–2006 (source: 2006 Survey report).



Figure 2. Development of the plaice stock in the North Sea as perceived by the fishery 2001–2006 (source: 2006 Survey report).

The use of the information by ICES differs by years. Screening the ACFM reports shows (without claiming completeness) that in 2002 only the fishers' perception of the cod stock development was reflected in the ACFM report. In 2003, cod, haddock, saithe, whiting, plaice, and sole are presented. The results of the Survey are referred to, with comments about the degree of agreement with the assessment. Results about abundance, size range, and discards are represented in figures lifted from the report, but not used in the text. In 2004 plaice and sole are given and commented with respect to the abundance, together with a map of abundance. The map was produced by ACFM or the respective working group, based on information from the Survey. In addition, cod, haddock, saithe, and whiting are mentioned and a small comment is offered, whether this was in agreement with the assessment or not.

In 2005 it is mentioned that the cod and haddock perception was in accordance with the assessment. For whiting it is stated that apparently different developments were observed in the northern and southern part of the North Sea. A divergence in perception was noted for plaice.

For 2006 it was elaborated that agreement exists in the perception of the development of haddock and saithe. Divergences were found in whiting and partly in plaice and sole.

In conclusion, the data on abundance are used to a higher degree with the years, but the remainder of the information, i.e. discards, distribution and recruitment are only presented for the year 2002, not used however, and subsequently not discussed any further.

For whiting in particular, there is a constant trend in the results from the questionnaire that the stock is stable or declining in the north but increasing in the south. It is noticed that this does not show up in the results of the assessment.

For Nephrops and monkfish, the results from the questionnaire are not at all mentioned and apparently not utilized. This may be due to a mismatch between the timing of the assessment working group and the Survey, since monkfish are assessed by the Working Group for the Northern Shelf Demersal Stocks (WGNSDS) in May. This does not appear to be the case in the last two years for Nephrops, after this species was been included in the North Sea Demersal Working Group.

6 Methodology of the Survey

The prime purpose of the Survey is to reflect fishers' experience, which is supposed to be put into perspective with the trends derived from scientific assessments. Therefore, information ("experience", "knowledge", "opinion") is attempted to be brought into relation with numerical scientific results (SSB-estimates, short- and medium-term forecasts etc.). Both are naturally very difficult to compare and to synchronize. Methodologically are both sources of information derived with different approaches and as a result the Survey falls in-between two chairs: On one hand, a questionnaire survey like this one is a social science instrument with inherent prescriptions to ensure representativity, validity and reliability; on the other hand the contents/outcome of the questionnaire have a biological aim and should be spliced into the biological analysis. The survey is however struggling to meet the standard of both the social scientists and the biologists. For a biological survey there is a lack of representative and hard data, and for a social survey the basic standards of representativity, validity, and reliability are not met.

All three requirements of social surveys need to be fulfilled and thought careful about in order to be able to generalize the Survey's results and to derive at more valid statements and anything more than just being a statement of the fishers who responded to the Survey.

Representativity

Two approaches can be taken to ensure representativity of the Survey of ICES fishing units (areas). The basic problem of representativity is that in the present survey, lack of response on questionnaire can in some cases be mis-interpreted as lack of fish abundance as it has not been defined, when/how the survey is representative in the present form.

- 1) Stock assessments are based on a spatial distribution of species; the reporting of the Survey has adopted this approach. The input of the Survey is fishers' answers. The outcome is a description of the perceived state of the stocks being distributed on the fishing areas. No considerations have been put into if the representativeness of the fishers/fishing gear/time of year (the Survey only represents the first six months of the year). It is not apparent if there is a proper representation of answers for each fishing area. Many factors need to be taken into consideration in order to ensure proper representation of each area; which potentially would make the exercise very complex as there is a need for *a priori* knowledge on which fleet operates in which area at the particular time of the year.
- 2) When assuming that fishers are usually operating in the best available (approachable) fishing areas, representation of fishers is another way forward to ensure representativity of the survey (and hence indirectly of the areas). This way seems more straightforward as making sure that the sample of responding questionnaires is a proper representation of the fishers in the North Sea is easier than ensuring rectangle representation. As the questionnaire scarcely provides any background information on the fishers, an analysis of respondents to ensure representativity is not possible in the present format of the questionnaire.

Validity and Reliability

Validity and *reliability* are two quality standards that every survey should take into consideration on how to meet. The terms *validity* covers the question ‘do we research/investigate what we think that we are researching/investigating?’ Reliability covers the question ‘how accurate/precise/repeatable is the survey?’ – in other words how much does the outcome/the results rely on the specific situation/context rather than on the stock situation.

The table below shows a general picture of the different methods having different strength in terms of validity and reliability.

	Qualitative	Quantitative
Validity	High	Low
Reliability	Low	High

One of the main problems from a methodological perspective is that the Survey is neither qualitative nor quantitative. This means that the Survey does not gain the benefits (high validity or high reliability) from being in-between but collect all the losses (low on both validity and reliability).

Validity and reliability can be obtained in a number of ways – usually a survey has to make a trade-off between reliability and validity due to different ways of distribution. Validity- and reliability-improving factors should be integrated in the overall design (including defining relevant questions and their graphical set-up, distribution of the questionnaire and the entry of data to computer software).

Comments for improving the questionnaire on the reliability and validity

Validity

- In the present questionnaire, the “don’t know” categories have been left out. It is unclear what the fishers, who didn’t know, answered.
- No pilot tests on fishers’ understanding of the survey/the quality of the answers have been carried out – this leaves room for unknown misunderstandings / misinterpretations of the questionnaire. However, this has partly been made now in an investigation as reported in Annex 2.
- The survey is conducted differently in the different countries – in some countries it is conducted in a more systematic manner than in others. Further, some countries have changed their procedures with in the years.
- It is not clear, who of the fishers community responded, i.e. it is not clear how competent the responding individuals were

Various methodological recommendations

- The questionnaire should be re-designed in collaboration with both a social scientist and a biologist in order to ensure that social science and biology standards are met in a higher degree.
- The survey should aim for representativity through fishers (i.e. fleets) rather than through areas. Hence, the questionnaire should contain more questions on background information of the fishers in order to make a respondent analysis.
- Communication with the fishers when distributing the questionnaire is essential for the survey.
 - o Fishers should get clear answer as to how, when and where their questionnaires are used. This is assumed to ensure a higher response rate and better representativity.

- Communication would also provide a better understanding of how fishers fill out the questionnaire, which would provide a strong base for analysis.
- Communication would increase the motivation to answer the questionnaire and help understanding the questions.
- The distribution of the survey is essential in a number of ways:
 - Distribution should be seen as an integrated part of the survey, a tool to communication with the fishers rather than a practical exercise.

7 Summary of the “Report on a Review of the North Sea Stocks Survey – Tim Daw, PhD student, University of Newcastle”

General summary

During 2006 Tim Daw, a PhD student at Newcastle University, has undertaken a qualitative study on the perceptions of Scottish and English fishers who participated in the 2006 the Survey. This study has not only obtained information on the fishers’ perceptions of the Survey, but has also compared responses under interview to those given in the questionnaires and their estimates of cod, whiting and *Nephrops* abundances to those given in scientific assessments. The study was supplemented by observations from the AFCM 2006 meeting and interviews with scientists.

This study is of direct relevance to the current review of the Survey which is being undertaken (Copenhagen, 12–14 December 2006). Many of the questions posed and the issues that arose during the meetings have already been addressed, at least on a UK level, by Tim Daw and the conclusions that are presented in his report are in agreement with those independently assimilated by the review group.

Issues Raised

Some important issues raised in the report include those relating to the purpose and aims of the Survey; a cost/benefit analysis of potential modification options; the use and usefulness of the data; and maintaining fishers’ support and participation.

Purpose and aims: It was suggested that a review of the aims of the Survey be undertaken. Presently the survey identifies agreement between fishers’ perceptions and scientific surveys but that it could be altered to collect useful information which scientists are missing, or it could be used to identify differences in opinion between fishers and scientists which can then be addressed.

Potential modifications: The pros and cons of a large number of potential modifications are assessed.

Survey Usage: From observations of the 2006 AFCM meeting it was observed that only the time series of abundance trends was compared to trawl survey indices. It was suggested that, in particular, discard data could be used given the high levels of uncertainty in scientific data. Although the time series is still relatively short and the data is underused, interviewed scientists were “unanimously positive” about the survey.

Maintaining participation: In the report it is suggested that this can be partially addressed by increased publicity, feedback and proven usage. However there may be unrealistic expectations by fishers of what can be achieved with the survey results and if modifications occur a balance needs to be maintained between design simplicity and obtaining useful data.

Summary of fishers' perceptions

The following are general perceptions that were obtained under interview from Scottish and English fishers by Tim Daw.

Positive feedback:

- Approval of current survey design and level of detail,
- General belief that the Survey benefits industry through benefiting science and better science leading to better management,
- General belief that responses would be honest because those likely to respond would be more conscientious and honest,
- Positive support because it has backing of fishers' organisations,
- General perception is that relationships between fishers and scientists were improving and scientists became more open to fishers' opinions.

Negative feedback:

- Not detailed enough, particularly spatially; zones too large to depict patterns or trends,
- For those fishing in multiple areas the survey design does not allow different answers for different areas,
- Not enough feedback on results and uncertainty of how the results are used,
- If opinions of fishers are seen to be disregarded then fewer will participate in the Survey,
- Speculation that low return rates would be due to practical inconvenience, general disaffection or suspicion of science,
- Belief that a minority would inflate answers.

List of participants

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Annex 1: Recommendations

A number of suggestions and recommendations are made:

- 1) The survey should be continued, changes in the Survey design need however to be made.
- 2) Before continuing the Survey, a strategic decision needs to be taken as to what degree the Survey is professionalized to meet the survey standards of the social sciences and what financial (man power) implications this will have. If these decisions have been made and are positive, a number of other recommendations need to be taken into account:
- 3) The questionnaire is too complicated to achieve ready willingness of the fishers to comply. It should be simplified. At the same time it should be possible to give more specific information. To achieve this apparently contradicting requirements the questionnaire needs a fundamental new designed.
- 4) It should be tried to define better the biological questions to focus at. The stocks should be screened as to which of them have the potential to provide more specific biological information, for example a recruitment index for certain stocks, distribution or discard quantities.
- 5) The stocks should be screened for “good results”, i.e. those where perception of fishers and scientist diverge or match clearly, these should be highlighted and interpreted.
- 6) Stocks should be screened as to which of them have weak tuning fleets and which could benefit from posing more specific questions to the fishery (i.e. monk-fish assessment?).
- 7) The results of the surveys should be communicated to the fishers. It should be made clear how the perception of fishers diverges or coincides with the scientific assessments. The aims of the Survey should be clarified and made transparent to the fishery as well as the scientists
- 8) The response rate is far too low (approx. 5–20%) and must be significantly increased. To achieve this the request to fishers for filling out and returning the questionnaire should be changed, from postal distribution to a mix of postal distribution and personal interview.
- 9) Perform a representativity analysis to ensure that the collected data is covering the metiers representatively. Undertake focused approaches (personal or telephone interviews) to metiers where response is weak. Along this line the distribution practice of the questionnaires needs to be investigated and probably amended.

Annex 2: Report on a Review of the North Sea Stocks Survey 2006

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 December 2006
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Executive Summary

This report summarises findings from qualitative interviews with 24 Scottish and English fishermen who took part in the North Sea Stocks Survey (NSSS) in 2006 supplemented by information from observation of the 2006 ACFM meeting and interviews with some stock assessment scientists. Interviewees were those fishermen who responded to a request distributed in conjunction with the 2006 survey.

Fishermen's perception of the NSSS

Most fishermen approved of the design of the NSSS, which was quick and easy to complete. About a quarter of the interviewees thought the NSSS was not detailed enough particularly that the spatial resolution was crude.

Few interviewees reported receiving feedback on the NSSS results although most interviewees participated in the NSSS expecting that it would in some way benefit the industry. Some interviewees hoped to improve science while others merely supported the initiative for the sake of their representative body.

Interviewees thought that the low return rate of the NSSS was due to the practical inconvenience of completing the NSSS or general disaffection with the situation of the industry, management decisions or suspicion of fisheries science.

Answers to the NSSS Related to Perceptions of Stocks

Most interviewees had completed the NSSS based on their own general perceptions of stock or catch trends. Alternative strategies were to use information from other information sources or consult logbooks for direct comparison of catch rates. Some Fishermen described factors which disrupted their perceptions or the relationship between catch rate and stock abundance.

Interviewees were asked to estimate this year's abundance of cod, whiting and Nephrops as a percentage of last year, 2000 and 20 years ago. The answers relative to last year were correlated to the response which interviewees had given on their NSSS forms although there were small inconsistencies. Two outlying estimates of extremely high percentage changes were due to comparisons of extremely low abundances observed last year.

Estimates of cod abundance compared to 20 years ago was largely in agreement with the latest stock assessment from ACFM but few interviewees perceived major changes since 2000 while the ACFM analysis indicates stock abundance has approximately halved.

Fishermen generally thought that the responses in the NSSS would be reliable and honest but it was conceded that a minority of skippers may inflate their answers to improve perceptions of the stocks. The futility of such a course of action, the genuine motivation of those that completed the NSSS and the general shift in attitudes within the industry were cited as reasons why the NSSS would be completed honestly.

In addition to the NSSS, interviewees also discussed trends within the fishing industry, issues of illegal reporting, opinions on fisheries science, ecological forcing of fish stock abundance and criticisms of the current regime of fisheries management.

Use of the NSSS

There was little evidence of the NSSS being used for fisheries science or management beyond comparison of the time series of abundance trends with scientific trawl survey indices used by stock assessors. Further use could be made, particularly of discard and recruitment data.

Implications of the results

The type of information collected by the survey allows comparison with trawl survey results but does not target gaps in the knowledge of stock assessment scientists or issues which are of most concern to fishermen. It is not clear whether the NSSS is aimed at perceptions of stock abundance or an indication of CPUE. These are not necessarily the same and have different implications for the potential use of NSSS data and the design of the NSSS.

The link between an expectation of beneficial outcomes from the NSSS and fishermen's motivation to participate may be problematic as the format of the NSSS and the management regime makes this direct expectation unrealistic. Greater feedback of the NSSS was requested and may help morale, although explicitly stating its limited impact may have the opposite effect.

Some fishermen see completing the NSSS as a duty to support the industry and their organisations and so their participation may be relatively unaffected by such trends.

The risks of complicating the form and reducing participation and the disruption of the time series speak against changing the format of the survey. However some fishers did want more spatial detail. Some possibilities are discussed briefly. Better use could be made of qualitative information by expanding the space to add comments and giving guidance on the types of useful information.

Ultimately the design and strategy adopted for the NSSS depends on its aims. Currently it serves to highlight agreement between some aspects of scientific and fishermen's knowledge. Alternatively, the NSSS could aim to enhance scientific assessments by filling knowledge gaps or to highlight disagreements in perceptions of fishermen, scientists and managers, stimulating discussion and ultimately assisting the development of shared understandings between fishermen, scientists and managers.

Acknowledgments

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Introduction

Following the distribution of the North Sea Stocks Survey (NSSS) in 2006, Tim Daw, a postgraduate student from Newcastle University conducted qualitative telephone interviews with 24 skippers from the British demersal fishing fleet to investigate perspectives of fishermen towards the survey and the questionnaire's ability to collect the knowledge of the fishermen.

This report summarises findings for the ICES review of the NSSS in December 2006.

Methods

Sampling

Fishermen were contacted through the distribution of the 2006 NSSS and contact numbers were requested to allow follow up interviews. Scottish Fishermen's Federation (SFF) members were requested to return a short reply slip directly to Tim Daw in a supplied stamped addressed envelope. To allow the individual questionnaire responses of individual fishermen to be compared with their interviews, questionnaire forms were numbered and each fisher was requested for the unique number of their questionnaire. In England, National Fishermen's Federations Organisation (NFFO) members were requested to add their contact details to the cover sheet of the usually anonymous forms. Forms completed in this way were copied and forwarded directly to Tim Daw by NFFO. The sample of fishers selected are not therefore representative of the population of British North Sea demersal fishermen or even of the fishermen who completed the survey. Only fishers who completed the survey were interviewed and of those who completed the survey, it can be expected that it was the most engaged or outspoken who chose to return their contact details to be interviewed. This is reflected in the fact that only 3 of the 24 interviewees were not involved with their representative organisation, not attending meetings, while 8 of the interviewees were deeply involved, sitting on executives or sometimes attending European-level meetings. One Scottish fisherman was an exception who responded by the mail out by telephone to express his views about the state of the fishing industry and the survey but was not interested in completing the survey.

Table 1. Level of response to NSSS questionnaires, contact detail requests and number of interviews conducted in 2006

Country	No. of NSSS responses (% of surveys distributed)	No. of contact details returned (% of NSSS responses)	No. of details returned with unique survey Numbers	No. of surveys conducted (% of NSSS responses)
Scotland (SFF only)	46 returns (16% response rate)	29 (63%)	17 (37%)	17 (37%)
England	19 returns (response rate NA)	8 (42%)	8 (complete forms)	6 (32%)

Table 2. Home region of interviewed fishers

Region	No. interviewees
Shetland	2
Orkney	1
N Scot	2
NE Scot	11
Fife	1
SE Scot	2
NE England	2
Yorkshire	3
Total	24

Table 3. Gear types of interviewed fishers

Main Gear	No. Interviewees
Creels	1
Fish trawl	7
Pair trawl	1
Prawn	9
Prawn/Fish	4
Seine	2

Interviews

At a mutually agreed time, telephone (and one face-to-face) interviews were conducted between 11th July and 20th August and lasted between 30 and 80 minutes. The interviews were based around the open-ended questions in Appendix 1 but were conducted as semi-structured conversations in order to gain an insight into perceptions and opinions of fishermen and to give them the opportunity to elaborate on topics which they felt were important. Specific questions were asked about fishers' opinions on the survey, the status of cod, whiting and *Nephrops* stocks this year compared to last year, 2000 and 20 years ago, and the work of fisheries scientists and their interactions with fishermen. Interviews were recorded with the permission of the interviewee, transcribed and coded by topic using the qualitative data analysis software Nvivo.

Comparisons between interviews and NSSS responses

The NSSS returns of the interviewees from SFF were identified by the unique number quoted in reply slips while copies of the survey forms of NFFO fishermen were forwarded along with their contact details. The perception of the current stock levels of cod, whiting and *Nephrops* as a percentage of the last years' stock were then compared with the responses to the appropriate NSSS abundance question.

Observation of meetings and key informant interviews

As fieldwork for TD's thesis, participant observation was conducted of several scientific and stakeholder consultation meetings (Appendix 2) and the opportunity was taken to interview fishermen's representatives and scientists involved in the generation of scientific advice on North Sea stocks.

Results

Opinions about the design of the NSSS

Fishers generally approved of the survey design, 12 fishers used phrases to express their approval of the current level of detail, for example:

“I think that was a fair way to put it because that way you would get a feel of whether the stock had increased or decreased”

“it would be too complicated if it had any more detail”

“Aye, yes, it’s nae bad”

“I think it’s a dish for a dish, simple and to the point and that’s the whole idea of it”

On the other hand, five interviewees suggested the survey was not detailed enough,

“the survey was kinda vague”,

“it could be doing with more detail, because the more information you get the better it is for us in the long run,”

while other individuals made specific suggestions to include information on discards as a percentage of catch rather than a trend, more details on economics, observations of total fishing effort on the ground, more detailed descriptions of gear characteristics and observations on pollution.

“we did a lot of pair trawling, you could split that up maybe in your categories because in a pair trawl you’ll probably target different species than you would in a hard ground trawl, working softer bottoms.”

No interviewees expressed difficulty with any of the questions in the survey nor that the survey was already too detailed.

Several interviewees made comments and suggestions on the spatial scale of the survey, which can be summarised as two main points.

a) The most common point (offered by 7 fishermen) was that the zones were too large to depict patterns in fishing activity or stock trends (particularly sizes of fish caught)

“Our area is area 4 on the map. It’s a hell of a big gap. I mean fishermen 5 miles apart can have a totally different opinion because they might have a lot of whittings just 5 mile away and we might not see one so I’ll fill in saying ‘whittings are extinct’ and another fisherman will say ‘the sea’s full of whittings’ y’know.”

“it’s the same with the haddock, smaller ones are inshore and the bigger ones are more offshore”

“Two years ago we caught, we filled out the survey, och must have been 3,4 years ago there was a tremendous number of haddocks off the north coast of Scotland off what we call Strathy point, off of Scrabster, West side of Orkney and the last 2 or three years there’s been absolutely nothing you know, but if you come round to the east side of Orkney there’s been a lot of haddock”

b) Different trends were observed in different areas but the survey did not allow these to be described. The survey only accepts one trend answer for each species, so that for example, a fisher observing very different trends in cod in the northern and southern North Sea has to choose one single response for cod.

“like that’s the sort of way with cod, small ones seem to be south and the bigger ones north”

“I’ve covered quite a lot of areas and it’s no usually too big a problem but you could give a better answer if it was split up a bit more, maybe the similar questions for each area”

Despite these issues with the spatial resolution and suggestions for more detail, several fishers described the trade off and potential pitfalls of increasing the complexity or scope of the survey as dissuading fishers from completing it.

“but it’s like far do you start and far do you stop? You could make it mair, ... pernickety, how pernickety can you be? It’s a never ending thing, splitting hairs”

“any more detail and the fishermen will maybe loose sight of what they’re trying to fill in”

Some fishers were still supportive of the idea of collecting information on finer or at least disaggregated spatial scales.

“You probably could, you could get a lot more information out of it without too much work.”

How fishermen go about answering the NSSS questionnaire

There was variability in the way in which fishermen chose their responses to the NSSS questionnaire. It was seen by nearly all as being a quick job taking between 10 and 75 (mean 25) minutes to complete and only one fishermen mentioned consulting their records,

“Yes just a quick look, I wasn’t counting, I mean you could see how we fished roughly and it was just done like that but they wouldn’t hold up to scientific scrutiny”.

Just over half of fishers based their answers on general perceptions while a third of interviewees spoke specifically about their memories of catches or landings (Table 4),

“Well I just thought about it ken, and says well this time last year we were maybe landing 1000 boxes and this time we’re maybe landing 1200 so it would be slightly more. So we just thought about it a minute... it’s all in my memory”.

Eighteen of the interviewees completed the survey based only on their own experience (Table 4) but notable exceptions incorporated information from other boats catches or producer organisations and markets in order to formulate their opinions, especially if their own practices limited their ability to perceive changes in abundance:

“well I’ve answered different questions in different ways. I’ve answered the cod question based on my own fishing, I’ve answered the haddock question due to what the pair trawlers were landing at the start of the year”

and due to what my haddock buyer has been seeing and I answered the whiting question with information that I've had back from the PO."

Fisherman: Well basically you're just doing it on your own catches but then you might generally think, you might have an overall perspective on how it's going on with some of the other boats.

Interviewer: And would you use that information when choosing your answers?

Fisherman: Yes I would say that because you'll say och no I've heard the pair seiners or trawlers is getting big fishing in such and such an area so you do generally kinda, although you're using your own information you probably tend to have a good picture on what the other boats are doing as well like.

Table 4. Basis of answers to NSSS abundance questions

Experience base	% respondents (n=21)	Data source	% respondents (n=16)
Only own experience	82%	logbooks	13%
Also other fishers	14%	catches	31%
Also other sources	5%	general impressions	56%

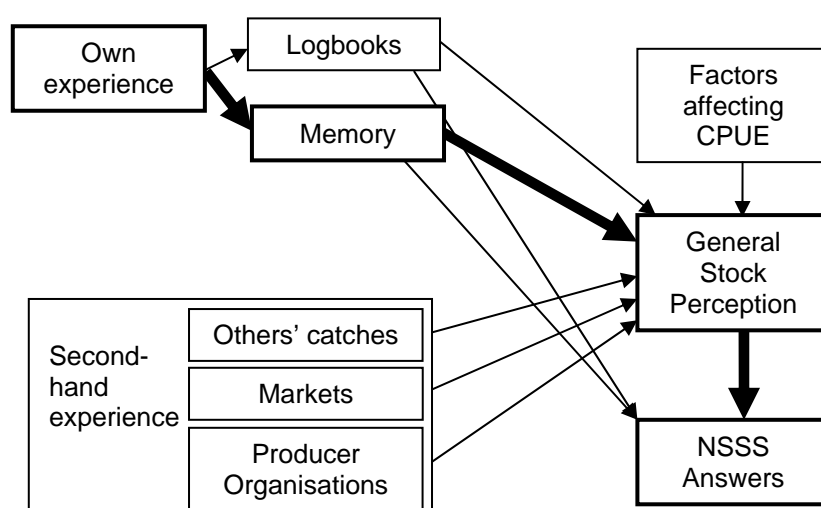


Figure 1. Sources of information contributing to NSSS answers. Thick arrows indicate commonest route according to interviews

Factors affecting perceptions and NSSS responses

Several fishers gave qualifications for their estimates of abundance or commented on factors which have affected catch rates and their answers. The catch rates were therefore not always thought to be indicative of stock abundance. Several prawn fishermen said that they did not have a clear perception of fish stocks because they don't catch much fish due to bycatch regulations.

"Well just with the small drops of fish you couldnae really tell because they're catching that little fish nowadays"

"if there's not the prawns we've got to move on so really a prawner's not got a great idea really how much fish there is in the North Sea. If we see fish we've got to move on"

“nowadays there isn’t a 2 net rule and we can’t be seen to, well we’re just not allowed to land them, so we’re not going to catch them so we’re concentrating much more on the Nephrops fishery”

The registration of buyers and sellers, increasing fuel prices and enforcement of strict fish bycatch limits for prawn boats has reportedly had a large impact on the targeting behaviour of the fishermen which has also affected catch rates. Several prawn fishers stated that they were changing fishing grounds in order to aim for large prawns and maximise the returns from their quota.

“it’s probably not a good year to do a survey ‘cause there’s been so much change. Probably the smaller boats in the fleet, the smaller prawn boats, 400hp 15, 16, 17m boats you’ll probably get a better idea from those boats than you will from boats like our own that have been trying different things and trying to change our mode of fishing”

“We haven’t caught so much tonnage of prawn this year but it’s not because we couldn’t, it’s because we’ve been looking for better prawns.”

“At the moment we’re working the soft bottoms a lot because it’s easier on fuel and a lot higher value of species, you’ve got your prawns a lot and quite a few pout and turbot and soles, the higher value of fish to replace the lack of cod.”

The weather was also seen to affect fishermen’s perception of the stock.

“[if] you spent the whole of January fishing on the east, it look’s like the monks have gone but it’s just you canna go where the monks is”

Interviewees also commented on the difficulty of observing recruitment with large mesh sizes.

“With the likes of whiting, of haddock, our mesh size is too big to tell if there’s nae small ones on the grounds.”

Finally, the limited days available to fishermen were also thought to undermine fishermen’s ability to explore grounds and perceive trends in the stock,

“They’re there on a restricted time limit so any experimental fishery, isn’t done now because of the restriction on being out there.”

Comparisons with interview and NSSS results

Table 5 shows the average percentage changes offered by skippers for cod, whiting and Nephrops with the relevant answer they gave on their NSSS questionnaire. No 'much less' responses were collected from the interviewed fishermen. There was some inconsistency between the NSSS and the answers given in interview. Four fishermen who checked 'more' on their questionnaire reported 0% increase during the interview while 3 fishermen who checked 'no change' on the NSSS indicated a change in the interview (50% increase and a 0-25% and 25% decrease). Two NSSS statements of 'less' were reported during the interview as 0% changes. Two clear outliers existed in the 'more' category of 533 and 1000% increases. These interviews related current catches of whiting and cod compared to extremely low levels last year, giving the very high percentage change for a limited absolute change.

Table 5. Mean range and standard deviations for stock abundance of cod, whiting and Nephrops as a percentage of last year grouped by answers given on NSSS forms

Answer	Mean	Min	Max	StdDev	n
Less	78%	45%	100%	22%	7
No Change	101%	75%	150%	17%	12
More	210%	100%	1000%	265%	13
More (2 Outliers removed)	109%	100%	123%	8%	11
Much More	210%	130%	300%	85%	3

Although there was some overlap between the categories, there was a very highly significant correlation between the ranks (Spearman's coefficient 0.780, $p < 0.001$). When the NSSS responses were represented as numbers (2,3,4,5 for less, no change, more and much more respectively) the correlation between the NSSS response and the percentage change was low ($r^2 = 0.324$, $p = 0.058$) however the correlation between the NSSS response and \log_{10} (percentage change) was much higher and significant ($r^2 = 0.543$, $p = 0.001$, Figure 2**Error! Reference source not found.**) suggesting that the scale may be best interpreted as a log scale.

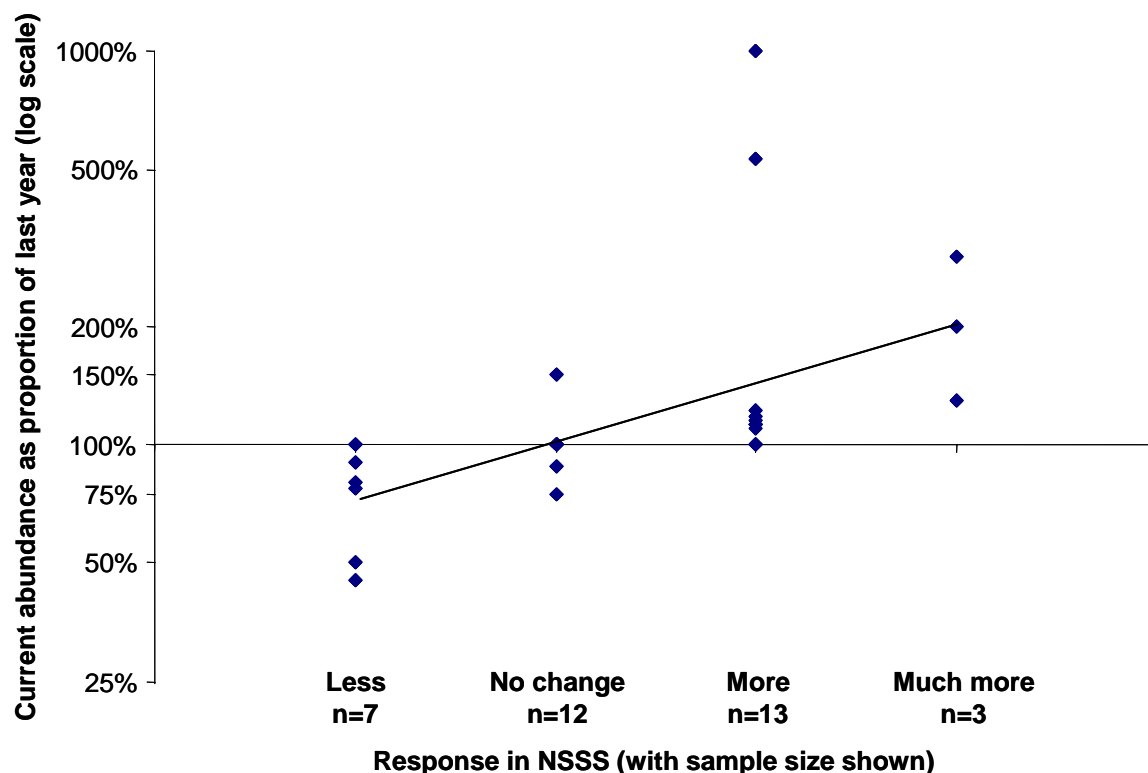


Figure 2. Quantitative estimates of abundance changes of cod, whiting and Nephrops from interviews compared with responses to abundance questions in the NSSS

Awareness and perception of the use of the NSSS

There were varying levels of awareness of how the NSSS was used. Of the fishermen who answered this question (n=22) 59% indicated that they didn't really know what happened with the results of the survey while 32% specifically stated that they didn't receive feedback on the results of the survey. Only two fishermen (9%) made vague reference to feedback from the survey:

"Erm I think we do get a..., once it's been digested we get the consensus of everybody that's filled it in"

"I did read it but I've forgotten"

Those 13 fishers who did offer views or guesses on how the survey was used suggested that it was to get an overall impression of fishers' views for the use of scientists, fishers' representatives, or to feed into a stock assessment system. Their responses on the use of the NSSS often reflected a level of uncertainty.

"I just presume that it went into the pot and then it was discussed at meetings etc"

"I assume it's fed into a system for, for the scientists, I'm not sure. I ken it gets fed into a system"

A senior member of the NFFO, was confident that CEFAS, and Dutch scientists used the survey, although stated it was "probably" not used enough

Motivations to take part in the NSSS

Fishermen's perceptions on the use of the NSSS give some insights into their motivation for participating. They were also directly asked about their motivation to take part in the survey and their hopes and expectations for how it would be used. Fishers hoped to improve fisheries science win rewards for participation or chose to fill in the form to support the fishermen's organisations responsible for it. There was a general expectation that the survey should benefit fishermen:

"I'm doing it to help the fishing rather than to seeing it as another nail in the coffin"

Although interviewees were often vague in their own motivations for taking part in the survey, many hoped for more favourable management as a result of the NSSS. Nineteen interviewees spoke about their incentives to participate. For 63% of these this was directly linked to improving the science and the assessments of stocks:

"if we're going to be run by the science, we'd like the science to be as accurate as possible"

"Anything that I can do to help let you understand what's going on better, because it's a hard thing to study. I understand that"

58% specifically mentioned the hope or expectation that the provision of data would be rewarded by more favourable management decisions for the industry.

"Just well to help in any way, any sort of help for the industry"

"I've answered the questions as good as I can because I want things done for the good of the fishing and for the good of the industry"

"fishermen are not getting rewarded for trying to work with the scientists"

Some fishermen felt a sense of duty or imperative to take part in the survey for the sake of the industry or from loyalty to the organisations promoting the survey.

"I think it's our duty to put these surveys in and answer them as honestly as we can"

"Interviewer: Will you fill it out in the future?"

Fisherman: Oh yes. You have to"

"I'm an NFFO member and I support what the NFFO's doing"

Disincentives to take part in the NSSS

Twenty fishermen spoke about factors dissuading people from participating in the survey. A lack of tangible improvements in management decisions and general scepticism of the process was cited by 55% as the main factor discouraging fishermen from participating, making a direct link between unfavourable management decisions and participation in the survey.

"Brussels is speaking about more cuts of effort on cod and all that so you immediately begin to think, what's the point of me filling it in if Brussels are going to do what they want anyway"

"if they turn round and everything we've said is disregarded again then we go to meetings in December and we get bloody stuffed again then, what's the point?"

“I think there’s definitely a conception now of fishermen thinking “Och to hell with that what we filling that in for, fill it in every year and they keep cutting our quotas.””

The one Scottish interviewee who was not an NSSS participant also linked his dismissal of the survey with wider management issues. When asked why he thought the NSSS was “a waste of time” he gave an irate and detailed account of the way in which pressure from environmental groups had destroyed the market for his skate catch based on flawed and incorrect environmental ‘science’.

Mistrust of scientists and the management system was thought by some interviewees to be a major barrier to persuading some fishers to be involved. There was a fear or suspicion that the NSSS results could be used against them.

“there’s always the fear – and this is maybe the reason why some fishermen don’t fill it in – that the information would be used against you”.

Sometimes this was a general opinion.

“Some fishermen won’t have nothing to do with it, like. It’s black magic like...”

It’s just the anti-science sort of feeling ... ‘you shouldn’t cooperate with the enemy’ ”

In particular, some Scottish fishermen felt that the response to the survey was impacted because of the perceptions that Scottish fishers had been penalised as a result of providing discard data to FRS in the past.

“quite a lot would be sceptical because of what happened with the scientists about 3,4 years ago”

One Scottish prawn fisherman also suggested that the results of the survey would be good news for the prawn fleet and so they would be more willing to fill in the survey than large cod-catching fish boats for whom the results of the survey would be bad:

“the 70 footers, they probably think it’s a heap o’ shite ... Ken that boys, they depend on cod, and it’s the big boats that’s catching cod, ken cod north of 61 and away west and that ... In case if affected them. I think the surveys not returned will be the big boats and its most of the prawn boats will put them back.”

60% of those discussing disincentives mentioned the practical inconvenience of filling in the survey, and this was often brought up when interviewees were discussing potential elaborations of the survey design.

“there’s a questionnaire to fill in and you think well. I’ve got better things to do with quarter of an hour of me time”

“It doesn’t sound very much but it’s the last thing you want to do, especially if you’re towing a net and you’ve got your job to think about. It’s just finding the time.”

“the more elaborate you make it, the less fishermen will fill it in”

In the same way that loyalty to FOs was an incentive to take part, two interviewees suggested that the level of participation in the survey was affected by general support for the fishermen’s organisations involved:

“some that it’s been posted to and they haven’t bothered with it. Because some fishermen are a little bit pissed off with the NFFO lack of bite on some policies”

“I’m really surprised it [the return rate of NSSS surveys] was as low as that. See there was a lot of internal strife inside SFF”

The non-participating interviewee also questioned the legitimacy of fishermen’s organisations. He claimed his more sceptical views reflected “the thinking of the guys at the coal face”, which was different to the views of the formal representatives:

“when you go into these meetings. You get the same type of person. When you meet with the NFFO or with the SFF or these people. They’re all singing from the same hymn sheet but sometimes they’re very out of touch with the grass roots.”

Reliability of the survey

Twenty fishermen discussed the reliability of the survey answers and whether there was a temptation for skippers to inflate their answers. Their points can be categorised into three positions as shown in Table 6.

Table 6. Percentages of respondents with different views on the reliability of the survey

Opinion on reliability of the survey	Percentage of respondents (n=20)
Answers are generally reliable and honest	85%
Some respondents may inflate answers	40%
Many answers may be inflated	15%

Most fishers conceded that a minority of respondents to the NSSS may be tempted to inflate perceptions of stocks but believed the majority would fill it in honestly.

“you might get the odd one thinking, oh we’ll bump the stocks up to this and that but I think it’ll only be the odd one so I think overall the majority will be from the heart”

“I would think that most of the guys would just, write it as it is. I think that most of the guys that I work with would do that. I mean you’re always gonna get one or two, that will maybe err on the side of optimism”

“I wouldn’t think that fishermen would over emphasise anything. There might be a perception that they would”

One might not expect the interviewees to openly undermine the reliability of the survey and it could be suspected that they would downplay the impact of dishonesty on the survey answers. However, interviewees claiming that the survey was on the whole reliable did support their assertions with credible reasoning.

Their confidence in the reliability of the answers was attributed to three factors:

a) the futility of trying to artificially improve the perception of stocks,

“if they put in a pack of lies it’s nae going to help them so it’s a waste of time”

“At the end of the day, with the log sheets and catch data they’ll know if it’s crap.”

“some fishermen want to make on it’s all rosy in the garden and I says that’ll show up straight away, if you’re saying there’s loads of cod and other fishermen are saying there’s not and the scientists are saying there’s not’. They’re gonna notice!”

b) the fact that the fishermen who would fill the survey in are the most conscientious fishermen while those more likely to exaggerate catches would not be likely to engage with the survey.

“most of that fishermen that’s no filled it in’s just, they’re just ignoring it. But those who’ve filled it in have done it for the right reason.”

c) that the culture of the industry had changed with a greater appreciation of issues of sustainability, both through a change in perception of individual fishers and the exit (through decommissioning) of skippers who did not have a long-term outlook for the industry. The fishermen that are left have significant investments and are looking for a sustainable future.

“If you’d asked me that 10 years ago, I would have said “sorry you’re up a gum tree” but nowadays I would think it would be more reliable”

“we do know now, it’s been drummed in and we all know – we’re not daft – that we have had overfishing in the past”

“I think the fishermen that are left at sea now are pretty conscientious I think ...and they wouldn’t be putting in something that’s not [true].”

“we’re not just wanting what we can get for this year and next year, we need to know there’s something there 15, 20 years down the line”

Contrary to the responses above, one interviewee expected some systematic inflation in the fishers’ answers to be the norm and also expected this be taken into account by the users of the data.

“they would already interpret a certain amount of bulling up surely because you would expect fishermen to do that just like you would expect fishermen to be positive where you would expect scientists to be negative I think the two would even themselves out like”

Long term perceptions of stocks

The NSSS questions ask about perceptions of stock changes within the previous year. To get an insight into interviewees’ longer term perspectives they were asked their perception of current stock levels relative to 1, 6 and 20 years ago. Responses were only sought from the time span of individuals’ fishing experience and not all fishermen were willing to state a quantitative estimate for each species. Figures 3-11 indicate the range of responses obtained for Cod, Whiting and Nephrops.

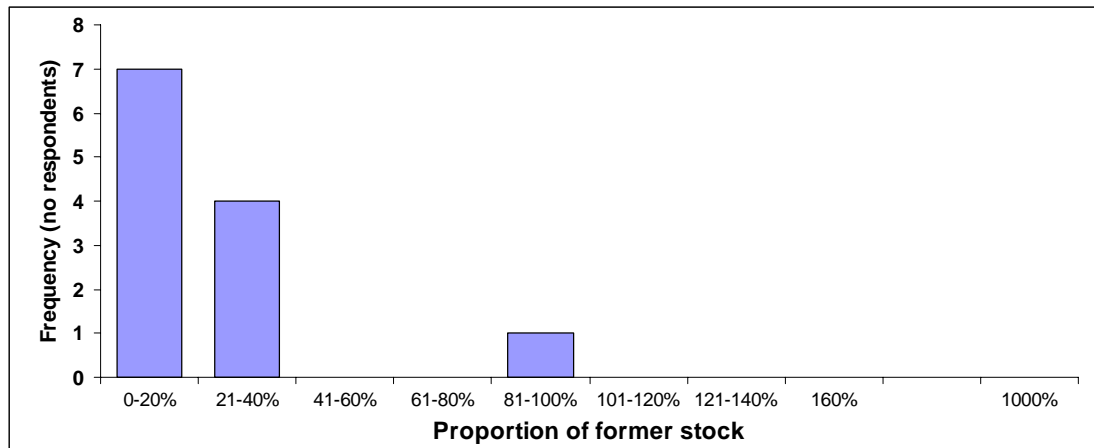


Figure 3. Perceptions of current cod stock as a proportion of the stock 20 years ago

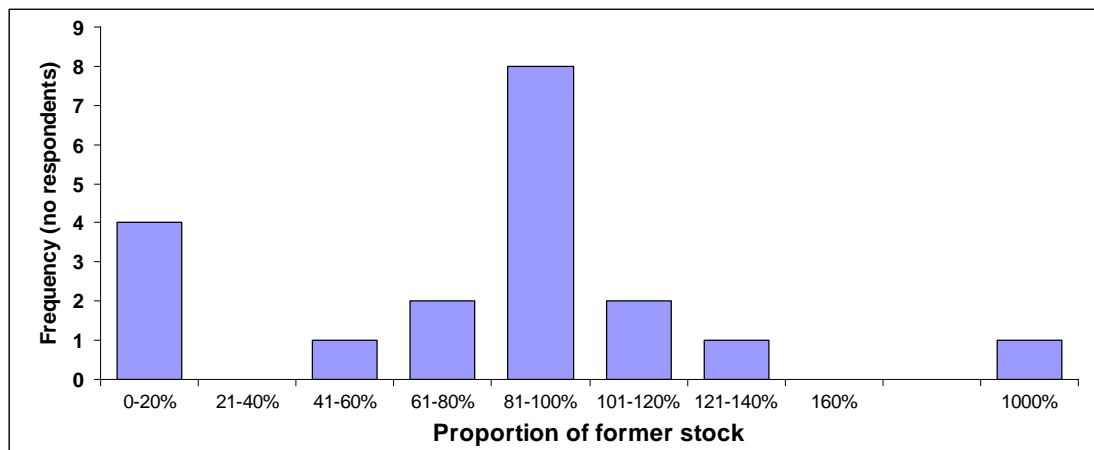


Figure 4. Perceptions of current cod stock as a proportion of the stock 6 years ago

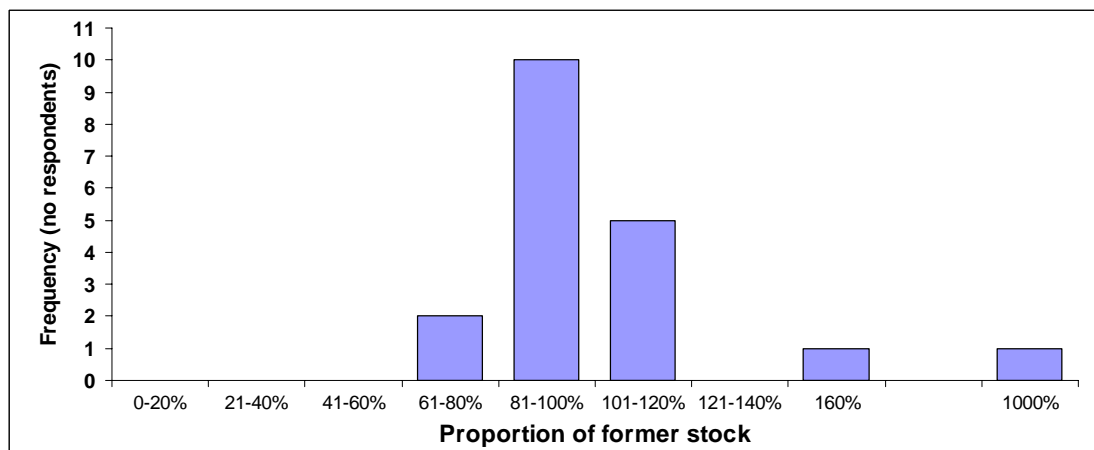


Figure 5. Perceptions of current cod stock as a proportion of the stock 1 year ago

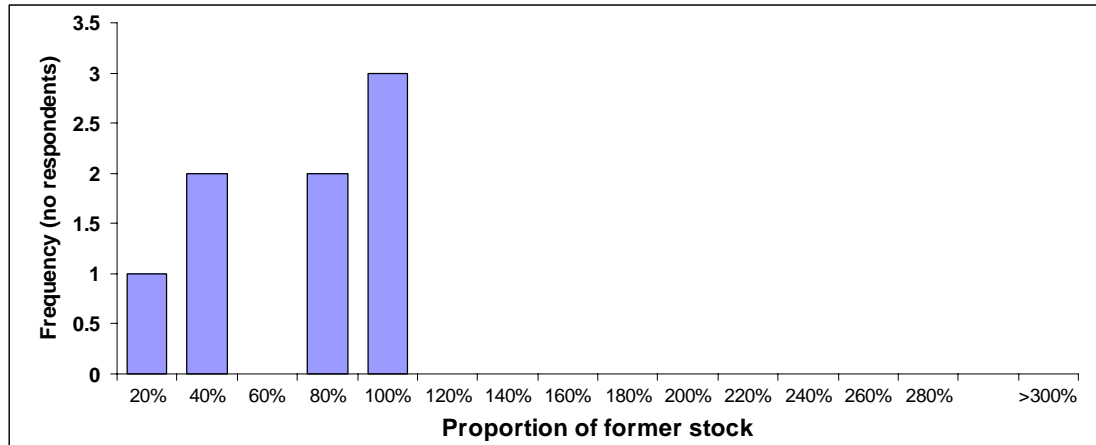


Figure 6. Perceptions of current whiting stock as a proportion of the stock 20 years ago

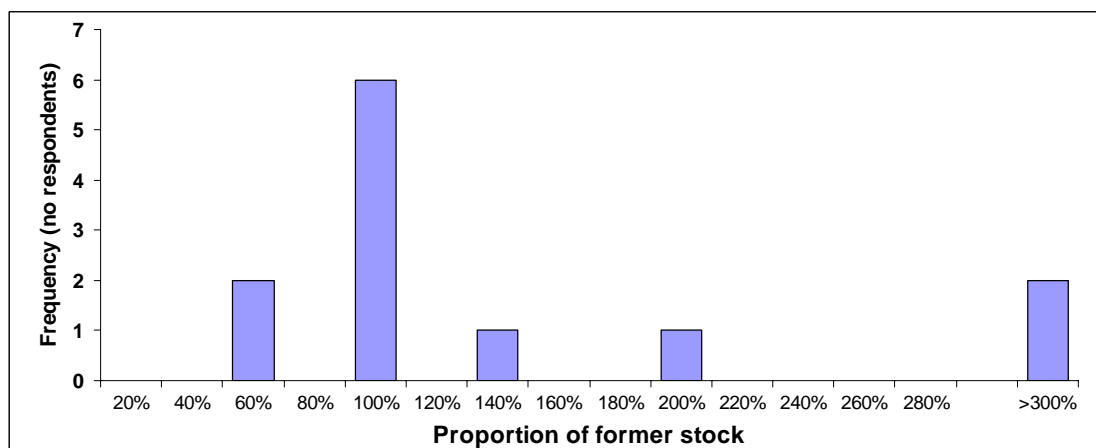


Figure 7. Perceptions of current whiting stock as a proportion of the stock 6 years ago

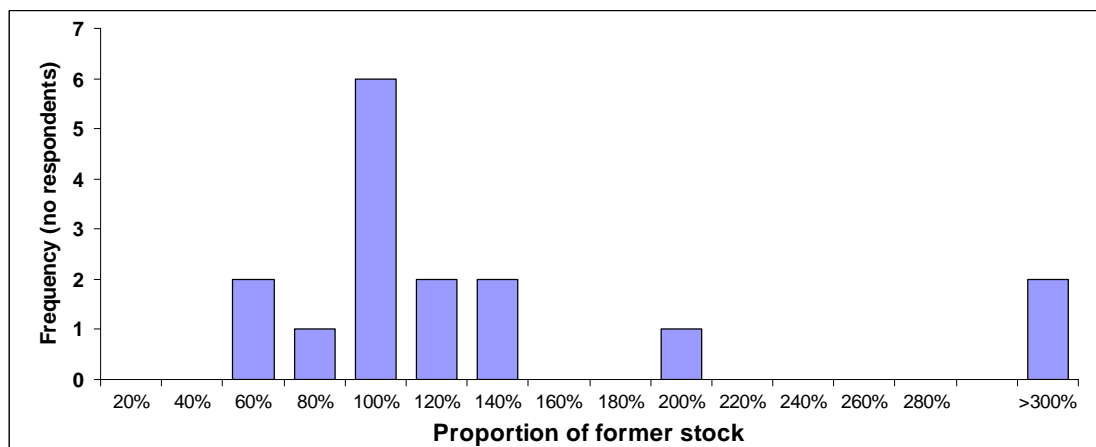


Figure 8. Perceptions of current whiting stock as a proportion of the stock 1 year ago

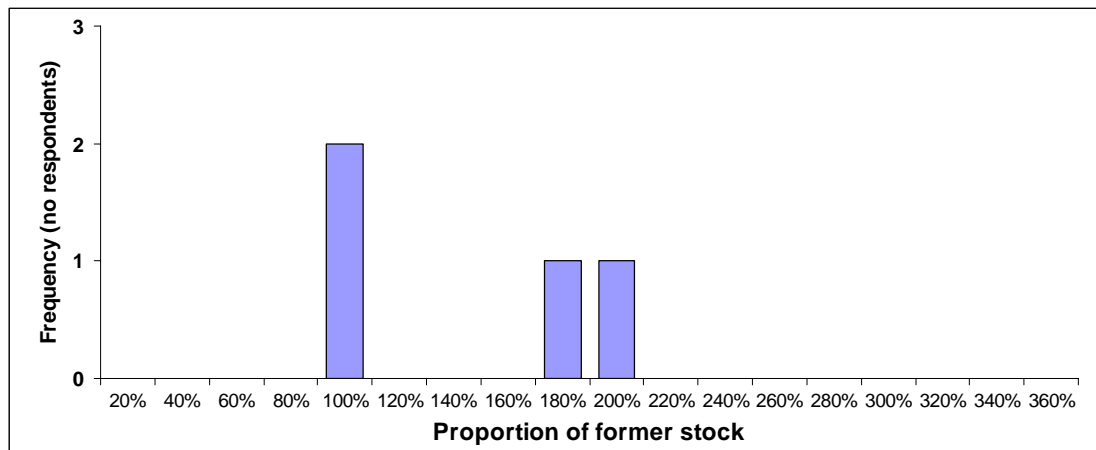


Figure 9. Perceptions of current Nephrops stock as a proportion of the stock 20 years ago

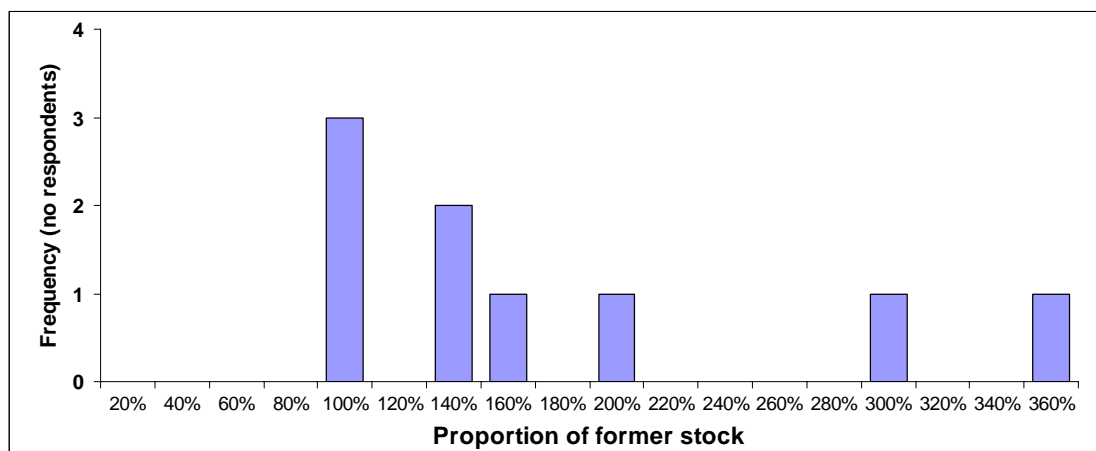


Figure 10. Perceptions of current Nephrops stock as a proportion of the stock 6 years ago

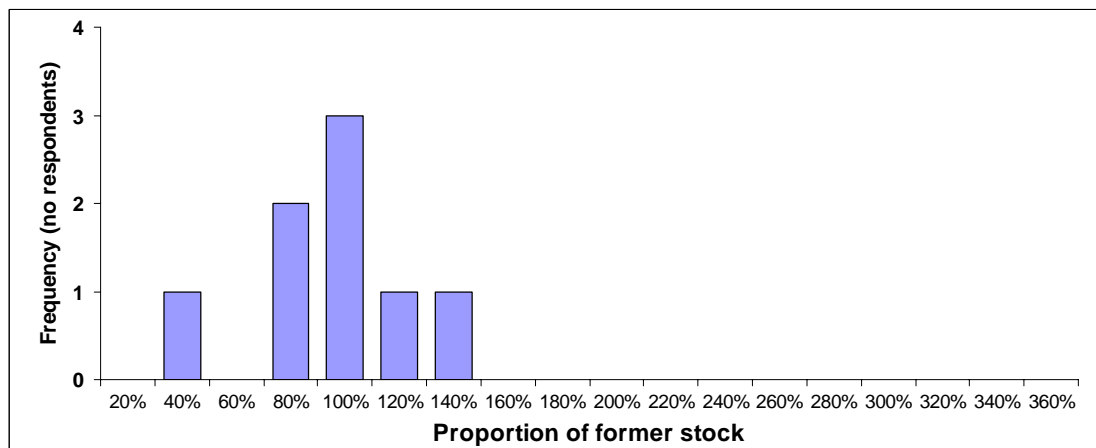


Figure 11. Perceptions of current Nephrops stock as a proportion of the stock 1 year ago

Table 7. Estimates of current and previous biomass and catch levels of cod in the North Sea, Eastern Channel and Skagerrak from the 2006 ACFM report

	Time period	Biomass	SSB	Catch
Stock 20 years ago	mean '80s	671,441	130,534	323,550
	mean '83-'87	625,555	119,351	298,911
	1985	478,360	118,028	247,031
Stock 6 years ago	mean 1998-2002	251,367	53,076	115,706
	mean 1999-2001	228,461	50,046	104,406
	2000	254,951	45,933	96,271
Most recent estimate (2005 or 2006 for SSB)		128231	31542	54745
Most recent estimate as a proportion of:	Mean '80s	19%	24%	17%
	mean '83-'87	20%	26%	18%
	1985	27%	27%	22%
	mean 1998-2002	51%	59%	47%
	mean 1999-2001	56%	63%	52%
	2000	50%	69%	57%

For Cod, Table 7 shows equivalent scientific estimates of abundance and catches from the most recent ACFM analysis. The 12 interviewees who gave opinions on the current status of cod stocks compared to “20 years ago” or “back in the 80s” mostly fell within a similar range as the scientific estimate. All but one estimated that the stock was less than 30% of 20 years ago and 7 estimated that stocks were less than 20%. Depending on which statistic and which average is taken for the former stock levels the ACFM analysis gives a perception of current stocks as 19-27% of those in the 1980s. The single interviewee who claimed his perception of cod stocks as being the same as in the 1980s also qualified his answer by saying:

“Well to me it’s just the same but then 20 years ago I didn’t have the experience that I’ve got now and we’re not a whitefish boat as such. But I’m sure the likes of the Whitby men that used to go to the cod, they used to work up the ground edge there 3 miles off. You don’t see them now. So that speaks for itself that the cod aren’t there or they would still be chasing it.”

There is less accord between scientific and interviewees’ perception of the stock now as a proportion of 6 years ago. The ACFM analysis suggests that stocks are about half of that around 2000. Most (8/19) interviewees did not perceive a significant change in cod abundance while four thought that stocks were less than 20% of those in 2000. The outlier at 1000% was a creel fisherman who reported that he catches 50-80 codlings per day in his creels rather than 5-8 back in 2000.

Although the NSSS specifically asks for changes within the last year, there was evidence that some interviewees’ longer term perspective on stock changes influenced their answers:

“Oh well I think I just put much the same you know. There’s no been any abundance of fish, you couldn’t see any less. It’s just the same. The thing collapsed I think 20 years ago”

“Interviewer: How do you go about answering what you’re going to answer there?”

Fisherman: On my experience of fishing, on this type of fishery in excess of 25 years.”

Additional information and perceptions from interviews with fishermen

Although not analysed here in detail, interviews provided a lot of further information and perspectives of fishermen about other aspects of fisheries, fisheries management and fisheries science.

Changes in the industry were described by several interviewees as a result of fuel prices, clampdowns on black fish landings, and decommissioning.

The relationship with science was variable amongst interviewees. Even amongst this sample of the most engaged of fishermen many still disagreed or had deep rooted scepticism of science and scientific methods.

However, there was a general perception that relationships with scientists had improved and interviewees were glad of improved openness of scientists to fishermen’s views. There was a consensus of opinion on the desire for scientists to spend more time at sea out with the fleet so they can see what the fishermen are seeing.

Use of the NSSS during the scientific advice process

Observation and interviews at the 2006 ACFM meeting indicated that there was limited use of the survey. The area-based summaries of stock trends from the NSSS were presented in the WGNSSK report for each species and the level of agreement between these trends and indications from the stock assessments and survey indices was commented on. There was no formal quantitative integration of the NSSS results into the assessments. Only the question on abundance was presented or mentioned. The other questions on discarding, recruitment and fish size were not mentioned at any point. The lack of quantitative integration of the NSSS into the assessments is unsurprising considering the relatively short time series (5 years), the nature of the data and the sophisticated modelling approach already established for assessments. However the considerable uncertainties in catches, discards, targeting, recruitment and black landings observed for many stocks during the meeting emphasise the potential for anonymously collected FK to provide indications of trends in these variables.

It was not clear why none of the other questions were used. Given the repeatedly mentioned uncertainty of discards one would expect that the discards question could offer some useful information for stock assessors.

Despite the limited use of the NSSS, scientists were unanimously positive about the initiative. An often-cited benefit was that the agreement between regional trends in scientific trawl surveys and the NSSS trends had demonstrated to fishermen that the science was valid. This reflects the survey achieving a political, or governance aim rather than a scientific one.

Discussion

Types of knowledge accessed by the NSSS

Focussing the NSSS on trends in stock biomasses means that the information gleaned will duplicate scientific stock assessment results rather than compliment knowledge gaps in the scientific advice process. The agreement generally apparent between NSSS results and regional trawl survey indices give the impression of harmony between fishermen and the science whereas even fishermen interviewed during this review (expected to be a biased sample of the most engaged fishermen) expressed major objections to aspects of the scientific or management regime. I.e. they may agree on year on year directional trends in stock size but may vehemently disagree on the status of the stock in relation to historical experience, sustainable boundaries of biomass and fishing mortality or assumptions underlying the scientific or management process. Such a disagreement is masked by the selective questions included in the NSSS.

Although most fishermen did not suggest adding extra topics to the survey, they were keen to discuss their perceptions of ecological linkages and management practicalities (e.g. the impact of fishing relative to other factors on stocks, discussions about quotas, blackfish etc) and challenge assumptions about these factors.

There is therefore a tension between the information requested by the questionnaire and the types of information which fishers are anxious to express. Currently, the NSSS does not record perceptions of ecological processes or management practises. Nor can fishers express perceptions on the absolute status of stocks relative to long term trends or absolute levels of discarding. The results of the NSSS are therefore never going to challenge the emphasis and assumptions inherent in the current management regime. In addition, such broader issues and knowledge are arguably more interesting and relevant for the formulation of scientific advice and management proposals as it is in these topics that fishermen can contribute new perspectives and fresh knowledge which is currently lacking within scientific assessment circles. The interviewees did not seem to perceive the survey as being the appropriate tool to collect such perspectives, but their desire to see beneficial management changes resulting from the NSSS is unrealistic when it only collects basic, knowledge on short-term trends. Expanding the scope of the survey to include perceptions of management and ecology may make it more relevant to the concerns of fishermen. However it may also appear to offer fishermen a level of input into policy which it cannot realistically provide. Extending the survey to cover such issues would also increase the complexity and inconvenience of completing the survey as well as massively increasing the analysis and processing time of the resultant data.

Catch rates or perceptions of stock?

Although the survey states “Information on abundance should be provided on the basis of **catch** not landings” it is unclear whether the survey is targeting CPUE or perceptions of stock abundance. The two things are not the same, as illustrated by the way in which many interviewees described several factors affecting CPUE (e.g. targeting behaviour and gear regulations), in addition, overall perceptions of stock status can be related to other sources of information like the catches of other fishermen or quota availability. Some fishermen answered strictly based on the

difference between catch rates in the two years while others gave their perceptions of stock trends. It would be useful to be clear which is requested by the survey, an indication of catch-rate trends or an impression of fishers' overall perceptions of stock trends. The former would be analogous to CPUE data while the latter would more thoroughly reflect the views of fishermen. It may be pragmatic to target overall perceptions as even if specifically requesting fishermen's views on catch rate, other factors (e.g. profitability, political desire to make stocks seem healthy) may affect how they are reported. Overall perceptions may be more informative ultimately as they allow fishers to take account of factors affecting CPUE which are not clear from data available to stock assessment scientists (e.g. changing strategies in the light of higher fuel prices).

Motivations of participants and expectations of the NSSS

It has been suggested that those fishermen who fill out the survey do so if they 'have an axe to grind'. These interviews do little to support that theory. Motivation was explained in terms of a hope to improve science, an expectation to somehow be rewarded with more favourable management decisions, or out of a sense of duty. The lack of an 'axe-grinding' incentive is perhaps not surprising considering the focussed nature of the survey and the limited scope it gives for airing complaints with the management system. Interviewees felt that disenchanted fishermen were more likely to have ignored the survey as was the case with the individual who made contact to express his views.

Motivation to participate is tied to wider management issues affecting the industry. The fact that "*Fishermen are just a bit fed up to be honest*" is seen as a problem for motivating participation in the NSSS. The blurring of wider issues facing the industry and the willingness to take part in the NSSS can be seen in the way in which one fisherman spoke about the impact of environmentalist activities on the skate market when asked why he thought the survey was a waste of time. There is no direct link between the anecdote and the NSSS. In fact, it could be suggested that the NSSS should be more important to him in the light of alarmist claims about conservation. However, the point also still stands: in the eyes of this fisherman the main issue is not about year-on-year abundance trends but much wider issues of management, environmental discourses and political power. This fisherman perceives that he is being forced out of business as a result of an unfair and flawed science and governance system. In this regard, this sceptical fisherman is correct that the NSSS does not address the issues with which he is concerned.

According to responses of the survey participants, their motivation to take part appears in many cases to be based on a false premise (the expectation of rewards for the industry). The limited scope of the survey and the current fisheries management policies, make it entirely unrealistic that they will experience better (in their eyes) management and certainly not improved catching opportunities as a result of their participation in the NSSS. Thus the NSSS presents a familiar risk of fisher participation projects of disappointment if the results of participation do not live up to the expectation of the participants. Although North Sea fisheries management policies are not directly linked to the NSSS, it is clear from the interviews that disagreement with these high level policies and management decisions affect the overall morale of fishermen and their willingness to participate in a process like the NSSS. A similar problem was experienced by the Dutch collaborative F-project in 2003 when skippers

withdrew their cooperation as a result their opposition to December council decisions (pers comm., Floor Quirinis, RIVO). This illustrates how the success of initiatives like the NSSS is dependent on the larger political and governance context.

The mismatch between the expectations of fishers and the format and possibilities of the NSSS raises questions about the sustainability of the initiative. If discontent with fisheries management continues the willingness of participants to engage with the survey may erode, lessening the breadth of knowledge accessed and ultimately the usefulness of the survey.

Maintaining participation

Fishermen were generally not aware of the results or usage made of the survey suggesting that more resources could be expended on feedback.

Some Scottish fishermen were disappointed and surprised to hear of the low rate of returns of the survey while one noted that they had not heard other fishermen talking about it. He suggested that more publicity (particularly in Fishing News) could help to obtain a higher return rate.

The results of the interviews illustrate several dilemmas in how to maximise the motivation of fishers to participate in the survey: The survey should be as simple as possible to reduce the inconvenience of completing it, but some fishers found it overly simplistic or spatially crude. The narrow scope of the survey keeps its size down but means that it does not address issues which fishermen are commonly keen to address and it does not collect contextual knowledge which is arguably more able to contribute to knowledge gaps in the scientific advice process. Fishermen are interested to hear more feedback on the survey's use but if the limited impact of the survey on stock assessments is explicitly stated morale may be further damaged. Despite the above points, the impact of these issues on fishers' participation may be overstated as, several interviewees appeared willing to dutifully complete the survey regardless of these overarching issues.

These considerations would suggest different options for sustaining the participation of fishermen in the survey:

1. Continue with current practise, hoping that the general trend in fisher-scientist relations, development of participatory governance structures, improvements in catch opportunities (as a result of stock recovery) maintain morale and the appetite for completing the survey.
2. Keep the survey in the current format but expend greater effort to explain how it is being used. There is a risk that fishers could be disappointed to hear that it makes no substantive input and that it doesn't address common objections with management assumptions nor hold hope for any automatically improved catching opportunities.
3. Change or add to the survey to include more issues that fishermen are engaged by in order to increase the interest in the survey. Such views could be taken up by NSRAC, ICES and the European Commission. This option also has a risk of disenchantment in the long run if it suggests that fishermen have more of a meaningful input into high-level decisions than is politically feasible.

Potential Design Changes of the NSSS

Interviews gave little support for further complicating the design of the NSSS. No interviewees thought that the questionnaire was currently too complicated but many warned of the effect of further complications on the rate of response. Although some fishermen would have liked an opportunity to add more detail to their answers there was no clear consensus on topics which needed elaboration. Adding further detail would presumably be even less popular amongst the total population of fishermen than amongst this sample of the most engaged and discursive fishermen.

A balance has to be struck between making the survey too simplistic, in which case it risks being viewed as ineffective, and making it so complex that participation rates drop due to the inconvenience of completing it.

Most discussion by interviewees on survey design was focussed on spatial detail. Some fishermen wanted to answer questions with a higher spatial resolution although this would inevitably complicate the results and analysis. The fact that all responses are related to all zones fished presented problems for fishermen if they experienced different trends in different areas. This could cause noise in the analysis because trends observed in one area get ascribed to other areas.

This effect could be reduced by asking fishermen to tick only the “main” fishing area for each species. This would reduce the amount of data available for less heavily fished areas but if the data from these zones were actually coming from trends in other areas then the accuracy of the survey would be increased. Alternatively, respondents could be given the option to differentiate trends between different areas to improve the quality of responses from those fishermen whose range extends over several zones. This would be less straightforward and require a reworking of the form. One possibility would be to include a copy of the map for each species and integrate tick boxes for each area with the zones on the map.

Another suggestion is for discards to be reported in terms of proportions of catches rather than trends from one year to the next. For example: What proportion of the whiting you catch do you discard? Most ($>\frac{2}{3}$), Half ($\frac{1}{3}$ - $\frac{2}{3}$), Few ($<\frac{1}{3}$) or None? Many interviewees were at pains to point out the low discard levels (or high levels in the case of saithe) but the current format in which discard amounts are given relative to last year does not allow the opportunity to contribute that. However, the current year-on-year trends may be easier to present in a format that can be broadly used by assessment scientists.

This document only reflects the views of participating fishermen. Judgement of the merits of complicating the survey would also need to be made in light of the cost of disrupting the current time-series and the scientific usefulness of additional information or detail.

One option would be to allow more space for open ended responses or comments in addition to the checkboxes so fishers could add detail where they wish. This would not increase the complexity of the form considerably or change the existing questions. However much more time and effort in terms of analysis would be required to make use of such information.

Some qualitative guidance or suggestions on what would be useful for section 4 (e.g. recruitment pulses, changes in fleet behaviour, explanations of answers & factors affecting them, effects of unusual seasonality etc) and extending the amount of space allocated to section 4 may result in more useable qualitative information being offered.

Use of the NSSS data

Given the uncertainties expressed by assessment scientists around discards levels and contemporary recruitment, there appears to be considerable potential for utilising the discard and recruitment questions from the survey. Currently, only the abundance question is presented in a form which condenses and integrates all data by area and the working groups only comment on this question. Similar treatment of the time series of discard data (perhaps by fleet) may be a useful first step in using this information.

Clarifying the Aims of the NSSS

The detailed aims of the NSSS should inform future developments or directions of the survey. For example the emphasis of the survey would be different for each of the following different aims:

1. to identify agreement between fishermen's experience and scientific surveys
2. to collect useful information which scientists are missing in order to improve stock assessments
3. to assess fishermen's perceptions of stocks to identify disagreements with science and management.

The NSSS currently serves the first of these aims. The second aim would be served by the collection of different/additional data tailored to match key gaps in the information available to assessment scientists and discard and recruitment information should be utilised. For the third aim, the focus should be on general impressions of stocks, encouraging fishermen to take account of other factors (rather than just CPUE) and questioning fishermen about their perceptions on status of the stocks in relation to long-term trends and the appropriateness of current fishing effort levels.

Pursuit of the third goal would allow specific feedback to be related to fishermen based on disagreements, with the NSSS to initiating an 'arena of collaborative learning' where differing perceptions can be highlighted. Identifying and engaging with root disagreements between fishermen and scientists can help to address disengagement and improve governance, stewardship and shared understandings. One of the problems of the CFP has been top-down science which has no legitimacy among stakeholders. Identifying those gaps in perspectives allows them to be picked up in collaborative arenas and allow monitoring the success of developing common understandings as a result of other initiatives (e.g. NSRAC, FSP).

Potential options for the future of the NSSS

Table 8 presents options and potential recommendations which have arisen from this data and analysis along with a summary of the pros and cons of each.

Table 8. Options for the future design and management of the NSSS.

Option	Advantages	Disadvantages
Business as usual	<ul style="list-style-type: none"> • Other changes in fisheries governance (e.g. NSRAC, FSP projects) may improve response rates • Survey format is approved and not too complicated • Time series is not disrupted 	<ul style="list-style-type: none"> • Participation appears to be declining and was at lowest level in England and Scotland in 2006 • There is a mismatch between expectations of fishermen and potential for survey to deliver • Fishermen's main interests/concerns are not covered • Gaps in scientific knowledge are not targetted
More publicity of survey (e.g. in fishing News in UK)	<ul style="list-style-type: none"> • Elicit more responses 	<ul style="list-style-type: none"> •
More feed back to fishermen of the results and use of NSSS	<ul style="list-style-type: none"> • Demonstrates that the survey data is processed • Generate more publicity 	<ul style="list-style-type: none"> • Highlights limited impact of survey
Focus answers on CPUE	<ul style="list-style-type: none"> • Very clear what the question is about 	<ul style="list-style-type: none"> • Answers may reflect other impacts on perception of catch (e.g. price, profits) anyway (i.e. even if specifically ask for CPUE, answers are likely to have element of general perceptions) • Duplicates information which should already be available • May not be indicative of stock trends or fishermen's perceptions

Option	Advantages	Disadvantages
Focus answers on fishermen's perceptions of stocks	<ul style="list-style-type: none"> • Gives indication on what fishermen actually think about stock trends • Answers would integrate complex factors like targeting behaviour and effect of regulations 	<ul style="list-style-type: none"> • Unclear what the data source would be • As a more 'fuzzy' and subjective variable, might be more influenced by long-term memories or desire for larger TACs
Incorporate questions on ecological processes	<ul style="list-style-type: none"> • Maps onto a major concern and interest of fishermen • Provides anecdotal information not currently available to scientists • Useful generally in understanding fishermen's perspectives and engaging them in dialogue with scientists 	<ul style="list-style-type: none"> • Qualitative and difficult to analyse • Complicates survey
Incorporate questions on management or practical industry behaviour	<ul style="list-style-type: none"> • As above • Relevant for policy formulation • Useful for developing dialogue with managers. 	<ul style="list-style-type: none"> • As above • May make NSSS overly political
Higher spatial resolution in questionnaire	<ul style="list-style-type: none"> • Easier to complete for fishermen who observe localised trends • More useful data? • Survey would appear more scientific and useful 	<ul style="list-style-type: none"> • Complicates survey & disrupts time series • By itself, doesn't allow differences between areas to be explicitly stated
Allow different trends in different areas (e.g. repeat questions for each area for each species)	<ul style="list-style-type: none"> • Easier to complete for fishermen who observe different trends in different areas • Survey would appear more scientific and useful • Prevents trends in one area artificially being ascribed to another 	<ul style="list-style-type: none"> • Complicates survey
Ask for response only in fishermen's 'main area' for each species	<ul style="list-style-type: none"> • Prevents trends in one area artificially being ascribed to another • Easy to fill in 	<ul style="list-style-type: none"> • Obtain less data on areas fished less intensively

Option	Advantages	Disadvantages
Ask for discards as a percentage of catch	<ul style="list-style-type: none"> • Gives more quantitative indication of discarding behaviour • Addresses an issue fishermen are keen to express 	<ul style="list-style-type: none"> • No indication of absolute quantities discarded • Adds another question format to the survey and so complicates it • Loss of time series
More space for qualitative data in section 4 or additional space for comments on each section	<ul style="list-style-type: none"> • May encourage more useful anecdotal data • May help interpretation/evaluation of responses • Allows fishermen to elaborate where they wish 	<ul style="list-style-type: none"> • More processing and analysis resources required
Attempt to make more scientific use of discard and recruitment questions	<ul style="list-style-type: none"> • Addresses uncertainty affecting scientific assessments and management proposals • Shows NSSS being used 	<ul style="list-style-type: none"> • May politicise responses as e.g. discards of cod become a big issue
Ask about trends relative to long time span	<ul style="list-style-type: none"> • Provide indication of trends extending beyond reliable scientific time series • Reflects fishermen's perception of stock abundance relative to long term trends (and therefore the status of the stocks) • Might prevent long term perceptions colouring questions on one year trends 	<ul style="list-style-type: none"> • Complicates survey with an extra question • No indication of the effect of technical creep • Only relevant for older fishermen or fishermen with access to local knowledge of old/retired fishermen

Appendix 1 – Interview guide for semi structured interviews with fishermen

Do fishermen think the survey is well designed what would be their suggested improvements?

1. What do you feel about the survey?
 - a. Is it well designed?
 - b. Is the level of detail appropriate?
2. How could it be improved?
3. Is there any other information that you think should be included?
4. How long did you spend answering the survey?
 - a. Did you find any questions difficult to answer?
5. Did trends vary with area?

How do fishermen go about answering the survey?

6. Can you talk me through how you chose which box to tick for abundance questions (much more, more, less, much less)
7. Do you answer questions based only on your own experience or that of other boats too?
8. How did you answer questions on the abundance of young fish about to enter the fishery? What would you consider a ‘young fish’?

One of the problems for scientists using the survey is the difficulty of quantifying what people actually mean when they tick ‘a lot more’. Can you try to give me some indications of the % this year compared to last year?

	Cod	Whiting	Nephrops
Stock abundance as % of last year			
Discards as % of last year			
Large fish size			
Amount of large fish			
Perception of recruitment			
Abundance as % of 2000			
Abundance as % of 20 years ago			

Influence of Technical changes on fishermen’s perceptions of stocks

9. Are you fishing more efficiently now than you were then?
 - a. If you were to go back in time with your current gears and fish alongside your old self how much more would you catch?
 - b. Does that affect your perception of the abundance?

How do fishermen perceive the survey is used?

10. How do you think the results of the NSSS are used?
11. Do you feel the results of the NSSS are used enough? Why?
12. Do you expect the results to agree or disagree with scientific assessments?
13. Do you think the results are reliable? Why?
 - a. Is there a temptation for fishers to err on the optimistic side?

What motivates fishermen to participate?

14. Why do you take part in the survey?
15. Did you complete the survey last year? Every year?
16. Will you participate in the survey next year? (no, yes)
17. What could make more fishermen participate in the survey?
18. Would anything deter you from participating in the survey in future?

Fisher-science relationships in UK?

19. Do you tend to agree with the findings of fisheries scientists in the North Sea?
 - a. Can you give details/examples?
20. Do you think the relationship between scientists and fishers has changed in the last few years? Why?
 - a. Has the attitude of fishers towards science changed?
 - b. Has the attitude of scientists towards fishers' knowledge changed?
21. Do you think management is more based on science now than in the past?
 - a. Are you pleased about that?
22. What effect have environmental groups had on the way fishers deal with fisheries authorities and scientists?
23. Do you think the NSRAC will improve management of the North Sea? Why?
24. Have you ever worked with scientists or provided them with any information?
 - a. Can you describe how?
25. Are you involved with the SFF/NFFO?

Attributes of individual fisher

- | | |
|---------------------------------|------------|
| 26. Vessel type | |
| 27. Vessel length | Engine HP: |
| 28. Length of time vessel owned | |
| 29. Main Gears used | Mesh size: |
| 30. ICES areas fished | |
| 31. Target species | |
| 32. Length of time a fisherman | |
| 33. Length of time a skipper | |
| 34. Age | |

Appendix 2 – Meetings Attended

<i>Meeting</i>	<i>Meeting participants</i>
ICES/NSCFP Study Group on the Incorporation of Additional Information from the Fishing Industry into Fish Stock Assessments (SGFI) Den Haag, Netherlands. 3–4 February 2004	Scientists and industry representatives
North Sea Commission Fisheries Partnership (NSCFP) Den Haag, Netherlands. February 5th, 2004	Scientists and industry representatives
Consultation between ICES Working Group on the Assessment of North Sea Demersal Stocks (WGNSSK) and the NSCFP Copenhagen, Denmark. 4-5 th October 2004.	Scientists and industry representatives
North Sea Commission Fisheries Partnership (NSCFP) Copenhagen, Denmark. 5-6 th October 2004.	Scientists and industry representatives
NSRAC Demersal Working Group Den Helder, Netherlands. 15 th June 2006	Scientists and stakeholder representatives
NSRAC Executive Committee meeting Den Helder, Netherlands. 16 th June 2006	Stakeholder representatives
ICES Advisory Committee on Fisheries Management Copenhagen, Denmark. 5-12 th October 2006	Scientists