ICES WGRS REPORT 2011

SCICOM STEERING GROUP ON ECOSYSTEM SURVEYS SCIENCE AND TECHNOLOGY

ICES CM 2011/SSGESST:03

REF. SCICOM, ACOM

Report of the Working Group on Redfish Surveys (WGRS)

1-3 February 2011

ICES Headquarters, Copenhagen

ICES International Council for the Exploration of the Sea

CIEM Conseil International pour l'Exploration de la Mer

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Recommended format for purposes of citation:

ICES. 2011. Report of the Working Group on Redfish Surveys (WGRS), 1-3 February 2011, ICES Headquarters, Copenhagen. ICES CM 2011/SSGESST:03. 40 pp.

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Executive Summary

The Working Group on Redfish Surveys (WGRS) met in Copenhagen, Denmark from the 1–3 February 2011. The meeting, co-chaired by Benjamin Planque and Kristján Kristinsson, was attended by seven participants from the Germany, Iceland, Norway and Russia. The group planned the redfish survey in 2011 in the Irminger Sea in June /July. There was no planning for the survey in the Norwegian Sea because funding for this survey had not been secured at the time of the meeting.

The detailed planning of the international trawl/acoustic survey on pelagic redfish in the Irminger Sea and adjacent waters in June/July 2011 has been agreed by all participating countries. Three vessels from Germany, Iceland and Russia will participate in the survey and operate within an area of around 360 000 square nautical miles (NM^2) in the Irminger and Labrador Sea to estimate the abundance and biomass of pelagic redfish. In the depth zone that can be surveyed by hydroacoustic measurements, i.e. shallower than the deep-scattering layer (DSL; down to about 350 m), hydroacoustic measurements and identification trawls will be carried out. Within and below the DSL (down to about 950 m), redfish abundance will be estimated by trawls. The trawl method applied is the same as in the 2009 survey and is line with the recommendation from ICES to study separately the stock shallower and deeper than 500m. Russia's position regarding ICES recommendations is reflected in Section 2.5. As in past surveys, biological data will be collected from the redfish caught in the pelagic trawls, and hydrographical measurements will be taken on regular stations on the survey tracks.

In response to a request from NEAFC on the variability of oceanographic conditions and their effects on the abundance and distribution of beaked redfish, WGRS recommends that workshop be conducted in September (WKREDOCE-1) and followed by 2 additional workshops in 2012.

Participants have agreed to transfer part of the data collected during the redfish surveys, on an individual country basis, to the ICES data centre, starting with data collected in 2009.

As in previous years, the Group recommended that more countries participate in the surveys to increase the density of the acoustic tracks and trawl hauls in order to improve the quality of the derived abundance and biomass estimates for redfish. ICES has made considerable efforts to involve at least the main nations holding major shares in the redfish fisheries in the areas. Only one response, however, was received officially, rejecting a possible participation in redfish survey in Norwegian Sea. The group decided to continue its efforts regarding the inclusion of further countries in the surveys on this important fishery resource.

1 Introduction

1.1 Terms of Reference

According to **2010/2/SSGESST03 "**The **Study Group on Redfish Stocks (SGRS)** has been renamed the **Working Group on Redfish Surveys (WGRS),** chaired by Kristjan Kristinsson, Iceland and Benjamin Planque, Norway. The group met at ICES Headquarters, Copenhagen, from 1–3 February 2011.

The Terms of Reference applicable for the February meeting are:

a) Plan:

i) a joint international trawl/acoustic survey on the redfish stock in the Norwegian Sea and adjacent waters in August 2011.

ii) a joint international trawl/acoustic survey on the redfish stocks in the Irminger Sea and adjacent waters in June/July 2011.

b) Prepare methods for delivery of the following information to assessment working groups in 2012:

i) Proportion of fish larger than the mean size of first sexual maturation

ii) Mean maximum length of fish found in research vessel surveys

iii) 95th % percentile of the fish length distribution observed

c) The information should be provided for all major fish stocks covered by the survey.

WGRS will report on the February meeting by 15 March 2011 for the attention of the SCICOM and ACOM.

In addition, the group considered the following requests/recommendations

From WKTAR (ICES, 2010):

> To ensure that high quality acoustic/biological data for TS determination are collected during redfish surveys,
>
> To conduct simultaneous comparative measurements between EK500 and EK60 for Target Strength determination,
>
> To continue TS analysis during a new workshop WKTAR-II.

From SGRS in 2009:

> To initiate an international database for redfish surveys.

1.2 Participants

Alexey Astakhov	Russia
Matthias Bernreuther	Germany
Eckhard Bethke	Germany
Konstantin Drevetnyak	Russia
Kristján Kristinsson (Co-Chair)	Iceland
Benjamin Planque (Co-Chair)	Norway
Alexey Rolskiy	Russia

Detailed contact information of the participants is given in Annex 1.

The group lacked the attendance and expertise of a further country that is expected to participate in the Norwegian Sea redfish survey. Most cruise leaders and specialists on biology, hydroacoustics, and physical oceanography surveys were present.

1.3 Structure of the report

The main part of this report is divided into several sections. Detailed planning of the international trawl/acoustic surveys on redfish in the Irminger Sea and adjacent waters in June/July 2011 is presented in Section 2. There was no detailed planning for the Norwegian Sea, due the expected lack of participation (Section 3). Details about the participating vessels, surveys time, geographic distribution of surveys effort and data exchange are given in Sections 2.1–2.2. In Sections 2.3–2.4, the hydroacoustic estimation methods and their practical arrangements are described, whereas Sections 2.5–2.7 provide the survey planning regarding the employed trawl hauls and biological sampling of the redfish caught in the pelagic nets. The recording of environmental conditions is laid out in Section 2.8. In Section 2.9, further issues concerning the exchange of experts, the involvement of further nations are dealt with. The time schedule for reporting on the survey is presented in Section 2.10. The specific issue of database is discussed in Section 4 and a response to the recent NEAFC request on the compilation of hydrographical and redfish data are given in Section 5. All recommendations are summarized in Section 6.

In the Annexes, several reporting templates are displayed for consistent data recording and reporting, as well as details on meeting participants, agenda for the meeting and the recommendation for a workshop on hydrography/redfish data analysis following a request from NEAFC.

1.4 Working documents and presentations

There were no working documents presented at the meeting. B. Planque presented the main outcomes of the workshop on the determination of redfish acoustic target strength (WKTAR) held in 2010 (ICES, 2010). The implications of these results for the survey planning are discussed in Section 2.3.5.

2 Planning of the international trawl/acoustic survey on redfish in the Irminger Sea and adjacent waters in June/July 2011

2.1 Vessels, timing and survey area

The main objective of this survey is the trawl-acoustic assessment of the pelagic redfish in the Irminger Sea and adjacent waters in June/July 2011. As the results of the last surveys indicated, the area covered did not reach the boundary of the distribution area of pelagic redfish on the west and southwest (ICES, 1999, 2002, 2005b, 2007a, 2009b). Therefore, the group agreed to continue to cover area from 52°30′N to 65°30′N and from the 24°W on the east till western boundary to 53°W. It is also considered important to continue the expansion of the vertical coverage to assess the redfish below the acoustic layer (within and deeper than the DSL; see Sections 2.4 and 2.5).

The following research vessels will participate in the survey:

Name of the vessel	Country	Period	Approx. working period in the field	Days in field
Árni Friðriksson	Iceland	20 June – 15 July	22 June – 13 July	22
Vilnyus	Russia	4 June – 10 July	15 June – 1 July	17
Walther Herwig III	Germany	20 June – 19 July	26 June – 13 July	18

The vessels will communicate daily via e-mail or telex or telephone. Information on the communication between vessels is given in Annex 2.

In Figure 1 and Table 1, the planned survey tracks are displayed for each participating vessel. The distribution of survey tracks within the distribution area of pelagic redfish was planned, on the basis of experience from the past surveys, fisheries information and expected hydrographical conditions.

"Árni Friðriksson" will cover the northwestern and central part of the survey area, "Vilnyus" will cover the northeastern, and "Walther Herwig III" the southwestern and western parts of the area. The total length of the planned survey tracks is about 7600 nautical miles (NM), divided between the vessels as follows:

"Árni Friðriksson" 2900 NM, "Vilnyus" 2200 NM and "Walther Herwig III" 2450 NM.

The cruise leaders of these vessels will apply for entry into the relevant EEZs by notifications to Canada, Greenland and Iceland. The operations in the NAFO Convention Area will be notified to NAFO by each cruise leader.

As in previous surveys, the mean distance between the planned cruise tracks is 45 NM (30, 45 or 60 NM between tracks).

For evaluating the data, the subdivision of the survey area into subareas A-G will be kept as in previous surveys (Figure 2). For the aggregation of biological data, these subareas were summarized to three geographical units since the 2005–2007 surveys (ICES, 2005b, 2007a), namely a northeastern, southwestern and southeastern area.

2.2 Data exchange during the survey

The daily reporting on the data between the vessels will be performed in the sheet given in Annex 3. In addition, the range of the acoustic values between the positions of the stations of the most recent day shall be reported. Information about the data exchange after the survey is given in Section 2.10. Additional considerations about archiving of data in a database are discussed in Section 4.

2.3 Acoustic estimation

2.3.1 Methodological aspects

The standard sphere calibration (Foote *et al.*, 1987) is a key procedure that contributes to the accuracy of the survey results in a fundamental way and is essential on each vessel. This procedure must be carried out at the start of a survey and repeated if there are any doubts about the achieved success (e.g. long-term track record demonstrates larger changes, unexpected fish TS and density measurements).

The calibration is usually carried out at a small range between the calibration sphere and the transducer, but at those distances a filter delay causes a time variant gain (TVG) error and wrong calibration results. This can be avoided if the calibration is carried out at a large range, preferable a range larger than 25 m.

For the calibration, the lobe program (or a similar program) has to be used. To provide appropriate settings for calibration, it is necessary to adjust the angle sensitivity to the environmental conditions (Bodholt, 2002) before starting the calibration. For this procedure, the results of the calibration tank experiments delivered by Simrad with the transducer are needed. This ensures to be able to compensate the beam function of the transducer applied within the recorded data. The use of angle sensitivity of the specific transducer used within the survey instead of the default value can improve the accuracy of the hydroacoustic measurements.

All participating vessels will use scientific echosounder from Simrad (Germany: EK500, Russia and Iceland: EK 60 and the EI software BI500, EchoView or FAMAS). For the evaluation of acoustic data, the echo integration method is used. However, the recorded data are often disturbed by vessel noise especially in bad weather.

For thresholding during echo integration, the method derived in Bethke (2004), with modifications on the comparable evaluation system, should be used:

- Measure or calculate S_{vMax} for the smallest target (zoom function of the BI500 or EchoView or Equation 9 in Bethke (2004), $G_{env} = 1$)
- Calculate the maximum threshold value by subtracting 13 dB.
- Obtain the maximum range for the desired measurement accuracy (±10%) at that range where the noise and reverberation level is larger than the S_v threshold – 4dB. The maximum range has to be considered as the starting depth of the DSL.

The range dependence of the signal and noise can make it necessary to carry out the evaluation in several layers and in several steps. It is expected that when only applying EI data down to the upper limit of the DSL (night/day: ≈ 250/400 m), the applied EI threshold (-80 to -84 dB/m^3) should be sufficiently low. When having low densities and mainly smaller fish, one should have a more dynamic attitude of using a lower threshold.

The EK500/EK60 delivers target-strength measurements of single targets. These measurements can be analysed and converted into equivalent s_A measures (Bethke, 2004). Noise may disturb the single-target detection and decrease the computed s_A values, whereas the noise not removed by thresholding increases the computed s_A values for echo integration. Therefore, results obtained by echo integration usually overestimate the stock, whereas echo-counting results underestimate it. Both methods should be applied for the evaluation of acoustic data if possible.

To provide data collection for the development of echo counting, the target strength settings of the sounder should be the same on each vessel. At the moment, no professional echo counter is available; however, the integration software stores single fish data which can be applied for echo counting analyses and development work.

2.3.2 Target strength measurements

In response to recommendation 1 from the WKTAR to "ensure that high quality acoustic/biological data for TS determination are collected during redfish surveys" , specific sampling for target strength determination, should be carried out when appropriate (good weather conditions, pure redfish scattered aggregations). In case additional time is required to carry out these measurements, this should be allocated for.

2.3.3 Echo sounder comparison

Recommendation 2 from the workshop WKTAR (ICES, 2010) was to carry out "simultaneous comparative measurements between EK500 and EK60 for Target Strength determination". The group discussed three possible ways of carrying these measurements during the survey:

- use of one vessel with the two echosounders recording simultaneously or near/simultaneously. This would likely involve Iceland. It will be possible to use EK500 and EK60, but not at the same time. So sampling can be done from a given transect with EK60, and then with EK500.
- use of two vessels in parallel in an intercomparison exercise. This would require the two vessels meeting in a location with appropriate densities of redfish and carrying out measurements simultaneously, in good weather conditions and for several hours. This would likely involve Russia (EK60) and Germany (EK500).
- same as above but the two vessels would not meet. Instead the data comparison would be between two nearby transects sampled on EK60 and EK500 data from two different vessels. This would likely involve Russia or Iceland (EK60) and Germany (EK500).

The participants will investigate the possibility of either option before the start of the survey.

2.3.4 Practical arrangements

Acoustic data obtained when the mixing of the target fish with the components of the DSL is greatest (during the night) should be discarded in the biomass estimation. On sections along the survey tracks, where the available acoustic data are not satisfactory due to mixing, the integrator values will be estimated by interpolation (from values in the nearest vicinity).

The acoustic survey data will be divided into statistical rectangles, which are one degree in latitude and two degrees in longitude. The mean s_A value in each rectangle is estimated and subsequently, the number of fish. Values in rectangles which have not been covered, but are within the surveyed area, are estimated by interpolation from values obtained within rectangles in the nearest vicinity. The total number of fish is then obtained by summation of individual rectangles.

Acoustic data for redfish within and below the DSL shall be stored separately. This shall be done by scrutinizing the acoustic data in each depth category as a separate unit in the EI- post-processing software.

In order to measure the noise from the environment and vessel, participants integrate in passive mode in depth channels (25 m) from 250 m down to at least 750 m for at least 5 NM with a resolution of 1 NM. This could be done during night, using both bandwidths (wide and narrow), pulse lengths (1 and 3 ms) and thresholds used during the survey.

To be able to make a comparable "detailed report" in the post-processing, the height of the layers should be set to 25 m, and the registrations should be scrutinized and presented for every 5 NM. The data should, however, be stored for every 1 NM. In the acoustic report table (see Annex 4a), a column for including the upper depth limit of the DSL is added.

An effort should be made to estimate the effect of different thresholds at different depths on the integrator values from the acoustic equipment used on the three vessels. This is especially important for the low scattering values expected, as the threshold effect will vary with the pulse length, noise and depth used and may as well be dependent on the resolution of the S_v-values stored by the EI software system (stored depth interval/number of stored values per ping).

2.3.5 Instrumental settings, target strength, calibration

All participating vessels will use a 38 kHz Simrad EK500/EK60 split-beam echosounder and EchoView or FAMAS post-processor for echo integration.

The standardization of the setting of instruments was discussed and it was agreed to use an integration threshold of –80 to –84 dB/m^3, depending on the pulse length used and the system noise level according to the method derived in Bethke (2004). To collect experimental data on redfish echoes within and below the DSL, a pulse length of 3 ms and narrow band width will be applied during night-time as an alternative to the standard setting of 1 ms and wide band width. both pulse length and bandwidth can be set manually in EK500. In EK60 the pulse length may be changed, but the bandwidth is determined by matched filters. Whether the bandwidth in EK500 and EK60 are comparable should be verified.

It was also agreed that the acoustic data should be stored down to the DSL and during night-time at least down to 750 m depth. In Table 2, the settings of instruments are given for each vessel. On all vessels hull-mounted transducers are used.

A length based target strength model of:

$$TS=20 \log L-71.3 \text{ dB}$$

will be used for the estimation of the number of pelagic redfish in the survey area. This is the same TS model as was used in 2001, 2003, 2005, 2007 and 2009. In addition, it was agreed to undertake biomass calculations using the equation derived from the workshop on the determination of acoustic target strength of redfish (ICES 2010):

$$TS = 10.6 \log L - 55.4 \text{ dB}$$

At the beginning of each national part of the survey, the calibration of the acoustic equipment on-board each vessel will be carried out using a standard sphere calibration (Foote *et al.*, 1987; Section 2.3.1) or equivalent method, and applying both pulse length and bandwidth settings (1 ms wide, 3 ms narrow).

2.4 Abundance estimation deeper than the acoustic layer

The estimation of the redfish abundance within and deeper than the DSL is based on catches. The stock size shallower than the DSL is acoustically measured (see Section 2.3). The hydroacoustic measuring system (FAMAS/EchoView) is providing nautical area backscattering coefficients (NASC), expressed as s_A values, which are converted by means of the length distribution from the catches to fish density. It is assumed that the acoustically measured fish density values are more precise than fish density estimated from trawling (swept-area method), because relatively little is known about the catchability and effective area of the trawls. To obtain a correlation between catches and s_A values (calibration), the hydroacoustic measurements are carried out at the same time and depth as trawling shallower than the DSL. A problem with these data acquisition is that in some areas, the redfish occurs shallower than the DSL in very low densities and is frequently mixed with planktonic species inhabiting the DSL. Here, the challenge is to exclude these species from echo integration by means

of the integration threshold to avoid overestimating the redfish density. Echo counting, however, doesn't overestimate the fish density disturbed by species of the DSL. To improve the accuracy of the measurements, the correlation between catches and s_A values should be calculated based on echo counting and echo integration. The correlation should highlight different years of survey and the possible use of different codends (standard vs. multi-sampler).

As in previous surveys, the assessment of the redfish abundance within and deeper than the DSL will be attempted by two methods providing an absolute estimate (based on the acoustic data) and a survey trawl index. The catches in numbers per standardized tow will be converted to s_A values expected using trawl calibration results (regression analysis between s_A values – dependent variable and catches in standardized hauls performed – independent variable in the layer shallower than the DSL). This requires the sufficient coverage of the variation in s_A values and catches between minimum and maximum values. Thereafter, the estimated total-s_A values will be converted to absolute fish numbers and fish biomass.

In order to study the relation between catch and acoustically measured values (calibration of trawls), additional measurements will be added successively and verified by calculations based on the echo counting method. The results of echo counting can be converted into equivalent s_A values, with the advantage that small single targets can be excluded more reliably from the echo integration. These computations must be done to a large extent manually. The German participant will do this after the survey. The other participants supply the catch data, trawl data and hydroacoustic data needed for this procedure. The settings for the EK500/EK60 will be specified before the survey.

An improved regression analysis, including the standard errors and the confidence intervals of the parameter estimates, as described in WD3 of ICES (2003), will be used to predict the s_A values within and deeper than the DSL. This work will be carried out by the Icelandic participants.

2.5 Trawling

In the 2005 SGRS planning meeting, the design of the survey was reviewed thoroughly (ICES, 2005a). The group aimed at increasing the precision of the trawl estimates, and at the same time, to make best use of the limited available survey time. In the acoustic layer shallower than the DSL, several trawls are made to compare the trawl estimates with the s_A values. Within and deeper than the DSL, the trawling duration of the deeper hauls was expanded to at least 3 hours to increase the catch rates for more precise abundance estimation. This also increases the relative contribution of the pure trawling time to the whole time effort spent on each trawl, considering the time-consuming shooting and hauling procedures. As the redfish abundance within and deeper than the DSL can only be estimated by trawls and as the maximum depth of the upper part of DSL was around 350 m in previous surveys (e.g. ICES, 2002; ICES, 2005b), the group decided to start trawling at this depth and to continue stepwise down to approximately 1000 m (see below). In 2009, the group anticipated that the workshop on redfish stock structure (WKREDS) held in 22–23 January 2009, may recommend that redfish above and below 500m be sampled separately and advised for the following protocol:

Each vessel should identify the acoustic redfish records by trawl catches in three different types. The identification hauls should exclusively cover:

1) The depth zones shallower than the DSL, in which redfish could be acoustically identified. For abundance estimation, it is essential to integrate the s_A value over the trawled distance in the trawled depth zones shallower than the DSL and to report those s_A values in the specified format (Annexes 4a and 8). Trawling distance should be 4 NM.

2) the depth zone shallower than 500 m, in which acoustic redfish registration is hampered by the deep scattering layer. The identification hauls may cover the following layer (headrope of the net): from the top of the DSL down to 450m. There should be no overlap between the sampling in layers 1 and 2. Trawling distance at each depth layer should be 2 nautical miles calculated with GPS.

3) the depth zones deeper than 500 m depth. The deep identification hauls should cover the following 3 depth layers (headline): 550 m, 700 m, and 850 m. Trawling distance at each depth layer should be 2 nautical miles calculated with GPS.

All three types of identification hauls should be evenly distributed in the survey area, with a minimum of eight trawl hauls conducted for each depth layer. Station data as well as total redfish catch in numbers and weight should be reported in accordance with Annex 4. Changes of course shall also be registered in the sailing diary sheet (Annex 3 and 4).

If possible, the inflow of redfish into the trawl at the depth intervals described above should be estimated by a probe device mounted to the net.

Iceland and Germany will use a multi-sampler which permits the collection of samples in three separate codends. This equipment allows for more intensive sampling and better vertical resolution. In particular, it will be possible to carry out several 'trawl types' within a single trawl haul (i.e. the different codends will correspond to distinct depth strata). When this is the case, the biological sampling protocol described in Section 2.6 should be repeated for each sample or group of samples within the same depth strata (i.e. one biological sampling for each trawl type).

In addition to the direct trawl estimates, the Group recommends keeping the calculation of s_A values from the regression between trawl abundance and s_A values in the hydroacoustic layer shallower than the DSL (see Section 2.4).

The net used on "Árni Friðriksson" and "Walther Herwig III" will be a Gloria type #1024, with a vertical opening of approximately 45 m. On "Vilnyus", a Russian pelagic trawl (design 75/448) with a circumference of 448 m and a vertical opening of 47–50 m will be used. All vessels use a mesh opening of 40 mm in the codend.

The use of a multi-sampler instead of a standard codends may change the catchability of the trawl. For the measurement of these changes, a greater number of hauls would have to be carried out. Due to time constraints, however, this is not possible within the survey. Therefore it will be assumed here that the catchability remains unchanged. Russia's position regarding the structure of redfish stock in the Irminger Sea remains unchanged, i.e. that there is a single-stock of *S. mentella* in that area. With that in view, Russia does not agree with the ICES advice splitting the stock into two, nor with the recommendation to conduct stratified surveys dividing the water column arbitrarily into 0–500 and 500–1000 m depth intervals, which generally does not contribute to better quality of stock assessment.

However, recognizing the need to obtain more accurate abundance and biomass estimates, in the light of possible underestimation of the stock by the 2009 international

TAS results, the Russian Federation agrees to conduct sampling in the international trawl and acoustic survey of *S. mentella* as described above. However, Russia will not be able to agree with separate estimates for the stock distributing above 500 m and below 500 m.

2.6 Biological sampling

It was agreed to follow a similar procedure as used during the surveys since 1994 (ICES, 1993, 1994, 1999, 2002, 2003, 2005a, 2007a, 2009b). The biological data mentioned below shall be exchanged by e-mail, using the database format given in Annex 4c (Excel spreadsheets).

2.6.1 Species composition

Catch weight and number of all species will be recorded for each haul. The occurrence of species in the trawls will be reported. Ribbon barracudina is agreed as the common name used for *Arctozenus risso* (also named *Notolepis*). If possible, squids should be split by species and/or size. For specimen with uncertain taxonomic identification (e.g. blackfish, Cornish blackfish) a photograph should be taken and the specimen eventually frozen. Shrimps will be reported in one group, but krill will be reported in a separate category.

For large catches, the total number of fish can be derived from the total weight of the catch and the ratio between numbers and weight established from a subsample of the total catch. Commercial conversion factors should not be used. The weight of jelly fish should be recorded.

2.6.2 Individual biological sampling

1) In the case of subsampling, the ratio of the subsample to the total catch should be noted as "conversion factor" in the data recording sheet.

2) Individual data: The total length (cm below), individual weight, sex and stage of maturity should be measured on at least 300 redfish from each haul type (as described in Section 2.5). The maturity scale given in Annex 6 will be used for data exchange. The Russian participants will use the maturity scale given in Annex 7 that will be converted to the one given in Annex 6.

3) Otolith sampling should be carried out at each station. Sampling will be conducted on 50 individuals following a random sampling procedure (i.e. not stratified by length). The otolith envelope should carry at least the station no. and fish ID no. given in the database to allow for allocation to the individual biological data. If possible, length and weight of individual fish should not be recorded on the otolith envelopes.

4) Stomach fullness, parasites and pigmentation: Observations on the stomach fullness, the location and size of skin/muscular pigments as well as infestation with *Sphyrion lumpi* and its remnants should be investigated on at least 50 randomly sampled fish from the subsample of each haul, according to the details given in Annex 4c (see also WD 2 in ICES, 1999). Registration of melanin shall also be recorded on a scale 1–4 (1= nothing, 2= little; 3= medium; 4= much). Diet data should be collected on individual fish for which otoliths are sampled. The data will be reported on the form given in Annex 4d.

5) Biological data as well as scales (and otoliths if possible) of roundnose grenadier (*Coryphaenoides rupestris*) should be collected by all participating nations according to WD3 of ICES (2005a). It was noted, however, that fish weight can only be recorded with a precision of 1 g on "Árni Friðriksson" and "Walther Herwig III". Maturity staging guidelines for roundnose grenadier was provided by Norway in Annex 9.

2.6.3 Genetic sampling

On a limited number of stations (~5 for each vessel) genetic sampling will be carried out. For this purpose fin clips will be sampled from 100 fish (randomly sampled) and preserved in ethanol. Otoliths will be collected from all the individuals and individual length, weight, sex, maturity, parasites and pigmentation recorded. The genetic stations will be selected on an ad hoc basis so that they are located in different regions of the survey and depth strata. Only stations with at least 100 individuals (or close to) should be selected for genetics.

Plankton sampling is optional.

2.6.4 Sampling of *S. mentella* on the Greenland slope

Preliminary results of the analysis of length distributions of *S. mentella* on the Greenlandic slope and the Irminger Sea revealed interesting observations: a limited area with a high abundance and a relatively high mean length (34 to 36 cm) of *S. mentella* was identified on the Greenlandic slope (latitude: 64.40 to 64.75°N, longitude: -34.5 to -35.5°W; see marked area as green box on cruise track, Figure 1). The group decided that an investigation of that area is worthwhile and feasible due to the closeness to the standard cruise track. The optimal solution would be a transect onto the shelf area mentioned above, with hydroacoustics and bottom-trawl hauls, along hydroacoustics and trawls type 2 and 3 close to this shelf area. The cruise leader of the research vessel (r/s Árni Friðriksson) being in charge of that cruise track will decide which investigations are feasible.

2.7 Reporting of length measurements

A specific ToR on length measurements was given to the group, following the Marine Strategy Framework Directive.

The first request was to assemble survey data in order to provide "Proportion of fish larger than the mean size of first sexual maturation". The group did not understand the meaning of this request. First because it is not yet possible to determine "first maturation" and second because the fish sampled during the redfish pelagic surveys (either in the Irminger or the Norwegian Sea) are adult fish, so that the proportion would always be 100%.

The second request concerned the computation of "mean maximum length of fish found in research vessel surveys". Again the group was uncertain about what was meant there. Did this mean `the one largest fish caught during the whole survey` or the mean size of largest specimen grouped by species? By haul? By vessel? By survey?

The third request was to derive the "95th % percentile of the fish length distribution observed". This was understood as 95% percentile for the length distribution for S. mentella, averaged over the whole survey (i.e. all vessels combined). The numerical protocol used to assemble length data from the different trawl hauls and vessels will need to be clarified and documented before this quantity can be provided.

2.8 Hydrography

All participants will carry out hydrographical observations using CTD probes down to 1000 m depth. The CTD stations should be taken at the corners of each transect and at each trawl station. The CTD stations should be divided evenly throughout the survey area but the distance between CTD should be not more than 60 NM.

The hydrographical data at depths of 0, 10, 20, 30, 50, 100, 200, 300, 400, 500, 600, 700, 800, 900 and 1000 m from each CTD station shall be included in daily report for exchange between the participants during the survey (Annex 3).

After the survey, when the data have been calibrated, the whole set of obtained information on pressure, temperature and salinity will be exchanged to each of the participating countries in CTD standard files (Annex 5).

The long-term hydrographical Russian 3K section (nine standard stations) in the Irminger Sea will be included in the joint survey programme and carried out by the Russian vessel.

2.9 Further issues

2.9.1 Exchange of experts

Germany, Iceland and Russia invited other participants to join their part of the survey. Russia accepted the invitation from Germany and will send a specialist with "Walther Herwig III". Furthermore, Russia offers to send a biologist with "Árni Friðriksson", which was accepted by Iceland. Due to staff limitations, the Icelandic and German cruise partners will not be able to send guest scientists from their labs onto other vessels.

2.9.2 Participation of further countries

The Group was again facing the problem of covering the entire survey area with only three vessels, resulting in a large spacing of survey tracks and trawl hauls. In order to improve the precision of the survey by increasing the density of the tracks and trawl stations, additional vessels should take part in the survey. The Group recommended as in 2005 (ICES, 2005a) that "at least four vessels should participate to allow a sufficiently dense coverage of the survey area and to permit an improvement in the quality of the derived abundance and biomass estimates. Thus, the efforts directed at involving other nations in the survey should be continued."

Notwithstanding the disappointing outcome of earlier attempts, the group will continue its efforts in involving further countries in the survey. The group also notes that other non-EU countries involved in the fishery should consider their participation in the survey.

2.10 Time schedule for the survey report

The final reporting will take place during the next WGRS meeting in Murmansk from 2–4 August 2011. To finalize the work during three days, the following plan will be followed:

As soon as the vessel has finished scrutinising the acoustic data, after the survey tracks are finished, the data (according to Annex 8) must be sent to other participants. Not later than 22 July, all data shall be sent via e-mail to all cruise leaders and Co-Chairs. The data shall be sent in the format described in Annex 4a-c, 5 and 8 all participants shall have a copy in an electronic format.

Iceland will calculate the abundance estimation of the redfish within and deeper than the DSL, including writing of the material and methods, results and discussion.

Russia will work up the environmental data, including the drawing of pictures, writing of the material and methods, results and discussion.

Iceland will calculate and finalize the acoustic data, including writing of the material and methods, results and discussion. Iceland will also draw the cruise tracks and information on stations.

Germany will be responsible for writing about biological results, including writing of the material and methods, results and discussion. In addition, Germany will be responsible for the echo counting work described in Sections 2.3 and 2.4.

Germany will be responsible for writing about target-strength measurements and echosounder comparisons, if applicable.

All drafts must be sent to the WGRS Co-Chairs before 28 July 2011.

3 International trawl/acoustic survey on redfish in the Norwegian Sea in 2011

At the time of the meeting Faroe Islands indicated that they could not participate to the survey in 2011. The Russian participation to the survey is conditional on available quota which might be provided by Norwegian authorities, as was the case in 2008. These were not agreed at the time of the meeting. The Norwegian participation to the survey is conditional on available research vessel time. This was not secured either at the time of the meeting. There was no indication of participation from other countries. As a consequence, it is very unlikely that an international coordinated survey for redfish in the Norwegian Sea will take place in 2011. For that reason, no specific planning was made. In case, some of the issues above are solved in a reasonable time frame and the survey could be conducted it was agreed that the general principles of the survey design outlined in the PGRS report of 2009 (ICES, 2009b) would apply.

We recommend that the Coastal States involved in the NEAFC request to carry out a redfish survey in the Norwegian Sea should secure appropriate funding support at national level, to conduct the survey.

4 Database

For several years, SGRS/PGRS/WGRS members have discussed the need for coordinated archiving and extraction of data within a common database system. As ICES is the natural host for data collected during ICES/coordinated surveys, the group invited Neil Holdsworth, head of ICES data centre, to discuss this issue.

Neil reminded the group of the ICES open access data policy adopted in 2006 by the Council and informed in more detail about the different databases which could host redfish survey data, namely OCEAN and DATRAS for the hydrographic and trawl data, and possibly DOME and STOMACH for the parasite and diet data.

Russian experts expressed concerns about the ICES data policy which possibly conflicts with their national data policy. The group noted that the hydroacoustic data can unfortunately not be hosted by ICES databases at present.

Despite the above limitations, it was decided that the data collected during the redfish surveys coordinated by WGRS will be send to ICES on individual country basis. The first step will be to send hydrographical and trawl data collected in 2009 in the

Norwegian and Irminger Seas. Germany, Iceland and Norway have agreed to do so and Russia will wait for official approval.

Key information for the process to progress:

- ICES data policy: http://www.ices.dk/datacentre/datapolicy.asp
- Contact point for the DATRAS DB: anna.osypchuk@ices.dk / http://datras.ices.dk
- Datras User Advisory Panel (DUAP): http://groupnet.ices.dk/duap/default.aspx
- Contact point for the OCEAN DB: else@ices.dk / http://www.ices.dk/ocean/.

5 NEAFC request on compilation of hydrographical/redfish distribution data

"NEAFC has requested ICES to:

> "compile all available data with a view to evaluate the variability of oceanographic conditions and their effect on the abundance and distribution of beaked redfish (*Sebastes mentella*) in the NEAFC Convention Area."

WGRS recommends that ICES establishes a multistage workshop that should meet three times to answer this request. The workshop should be held in September 2011, January 2012 and June 2012 and the final report should be delivered to ACOM in September 2012. The primary objective of the workshop will be to compile and evaluate available hydrographical, hydroacoustic and trawl data from the Irminger Sea and adjacent waters.

ICES should invite, apart from WGRS members, physical oceanographers to participate in this workshop (from Faroe Islands, Germany, Iceland, Norway, and Russia). WGRS also recommends that ICES invites the chair of this workshop, who should be external to WGRS.

The group recommends that the first workshop should be a one day meeting in September in relation to ICES ASC in Gdańsk, Poland, either before (Sunday 18 September) or after the conference (Saturday 24 September). The object of this first meeting will be to discuss data availability and to define further work. The workshop will deliver a report from this meeting 15 October 2011.

A recommendation for this 3-stage workshop is given in Annex 10.

6 Recommendations

RECOMMENDATION	ACTION
WGRS meeting to report on the Irminger Sea survey To be held in Murmansk 2–4 August 2011	WGRS members
WGRS meeting to report on the Norwegian Sea survey CANCELLED until further notice	WGRS members
Involve more countries in the Irminger and Norwegian Seas surveys	ICES Secretariat, ICES Delegates
Secure appropriate funding to support the Norwegian Sea survey	NEAFC Coastal States
Organise a workshop to answer NEAFC request on variability of oceanographic conditions and their effects on the abundance and distribution of beaked redfish (WKREDOCE-1)	ICES, ACOM
Transfer survey data from 2009 to ICES databases OCEAN/DATRAS/DOME/STOMACH	WGRS members

7 References

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ICES. 2003. Report of the Planning Group on Redfish stocks. ICES CM 2003/D:02, 21 pp.

ICES. 2005a. Report of the Study Group on Redfish stocks. ICES CM 2005/D:02, 31 pp.

ICES. 2005b. Report of the Study Group on Redfish stocks. ICES CM 2005/D:03, 48 pp.

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ICES. 2010. Report of workshop on the Determination of Acoustic Target Strength of Redfish (WKTAR). ICES CM, 2010/SSGESST:15: 29pp.

8 Tables

Table 1. Agreed preliminary cruise tracks for the international survey on redfish in June/July 2011.

Vilnyus			Walther Herwig III			Árni Friðriksson		
Lat	Long	Distance	Lat	Long	Distance	Lat	Long	Distance
63.15	-26.00	Start	55.45	-39.30	Start	62.45	-26.20	Start
63.15	-34.00	216	53.45	-43.30	183	62.45	-36.30	274
62.15	-35.00	66	52.30	-47.00	147	63.45	-35.00	72
62.15	-25.00	279	52.30	-51.00	147	63.45	-27.15	206
61.45	-26.00	41	53.30	-52.00	70	64.45	-28.30	68
61.45	-35.00	255	53.30	-47.00	178	64.45	-34.45	160
62.15	-33.30	52	54.30	-44.15	114	63.45	-36.30	75
59.40	-26.15	262	54.30	-52.00	270	63.00	-38.00	60
61.00	-27.15	85	55.30	-52.00	60	63.00	-40.00	54
61.00	-35.30	240	55.30	-43.00	306	62.15	-40.00	45
60.15	-35.30	45	56.15	-40.30	95	62.15	-37.00	84
61.15	-29.30	179	56.15	-52.00	383	61.45	-36.00	41
59.30	-31.00	64	57.00	-50.45	61	61.45	-41.00	142
59.30	-37.00	183	57.00	-37.00	449	61.00	-41.30	47
58.45	-38.00	55				61.00	-36.30	145
58.45	-32.30	171				60.15	-36.30	45
						60.15	-41.30	149
						59.30	-42.30	54
						59.30	-38.00	137
						58.45	-39.00	55
						58.45	-50.00	342
						57.45	-51.30	76
						57.45	-34.30	543
Total sailing (NM)		2193			2463			2874
Days in the field		21			18			22
Average sailing/day		129			137			130

Table 2. Instrument settings of the acoustic equipment settings on-board the vessels participating in the international survey for redfish in June/July 2011. The sound speed setting used in the EK500 will be set at the beginning of the survey. The alternative pulse length and bandwidth settings given in parentheses will be applied during night-time to collect experimental data on redfish echoes within and deeper than the DSL.

	ÁRNI FRIÐRIKSSON	VILNYUS	WALTHER HERWIG III
Echo sounder/ integrator	Simrad EK60/ EchoView	Simrad EK60/BI60 +FAMAS	Simrad EK500 /EchoView
Frequency	38 kHz	38 kHz	38kHz
Transmission power	2000 W	2000 W	2000 W
Pulse length	1.0 ms (3.0 ms)	1.0 ms (3.0 ms)	1.0 ms (3.0 ms)
Bandwidth	Wide (Narrow)	Wide (Narrow)	Wide (Narrow)
Transducer type	ES38-B	ES38-B	ES38-B
Integration threshold	-80 dB/m3	-80 dB/m3	-80 dB/m3

9 Figures

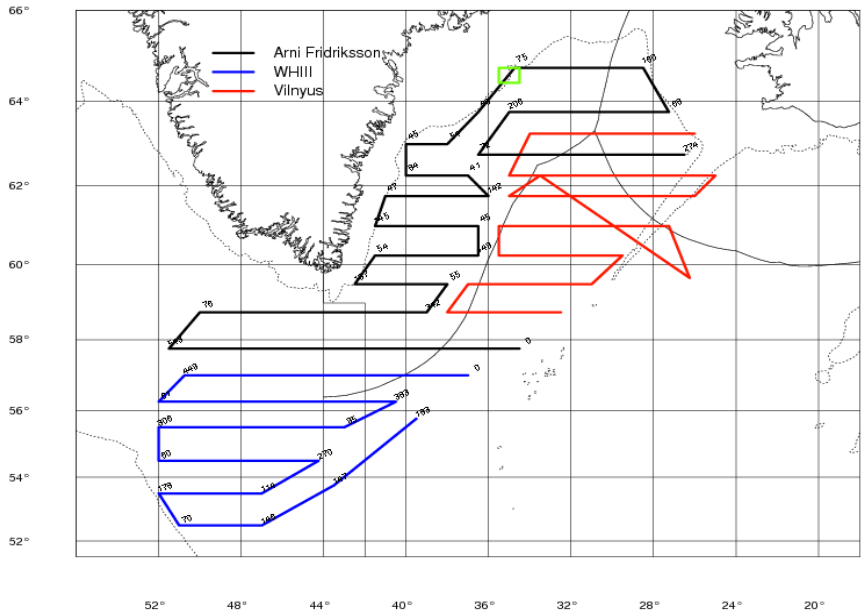

Figure 1. Preliminary cruise tracks of the international survey on redfish in June/July 2011. Black: RV "A. Fridriksson", Red: RV "Vilnyus". Blue: RV "Walther Herwig III".

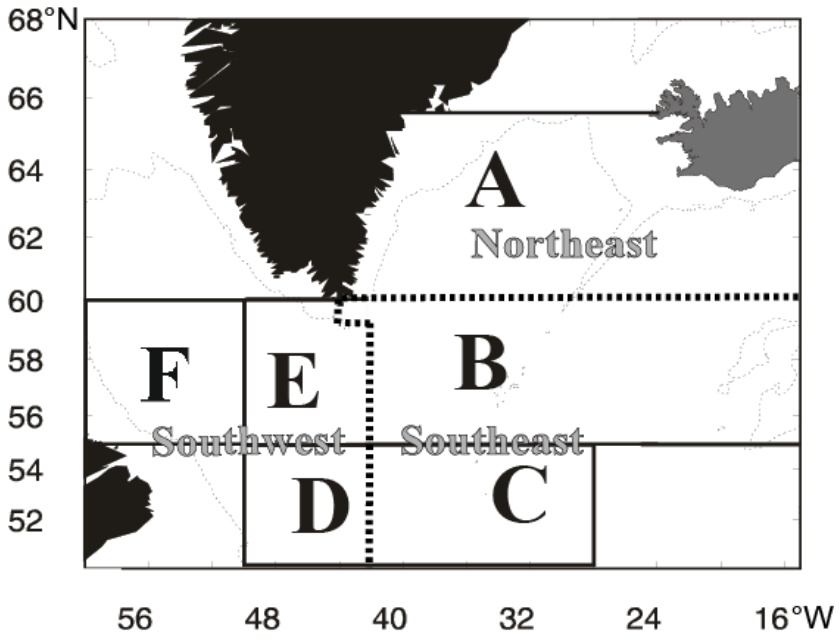

Figure 2. Sub-areas A-G, agreed to be used in the international survey on redfish in June/July 2011. Dashed area boundaries and grey area names relate to the geographic aggregation of biological data.

Annex 1: List of participants

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Annex 2: Information on communication between vessels for the Irminger Sea survey

RV "Vilnyus" (Russia) Call sign: UFJN Telephone: +7 9212895300 Inmarsat C: 427311390@inmc.eik.com E-mail: vilnyus@pinro.ru	RV "Walther Herwig III" (Germany) Call sign: DBFR Telephone: 00870 763936068 Telefax: 00870 763936070 or 00870 600365043 Data: 00870 600365042 Inmarsat C (Telex): +581 421121550 e-mail: wherwig.fahrtleiter@fischereiforschung.eu (fahrtleiter@wh3.bfa-fisch.de or (wh001.wherwig-ble@skyfile.de)
RV "Árni Friðriksson" RE 200 (Iceland) Call sign: TFNA Telephone: +354 8540535 Telefax: +354 8540532 Inmarsat C (Telex): +581 425150710 Inmarsat B (Tel.): 00874 325150710 Telefax: 00874 325150711 Data: 00874 325150712 Iridium (Tel.): 881-631426272 e-mail: arnif@hafro.is	

Annex 3: Sheet used for daily reporting of data among the vessels

This example also demonstrates the format of the data. The data should be sent as ASCII text with semicolon (;) as a separator.

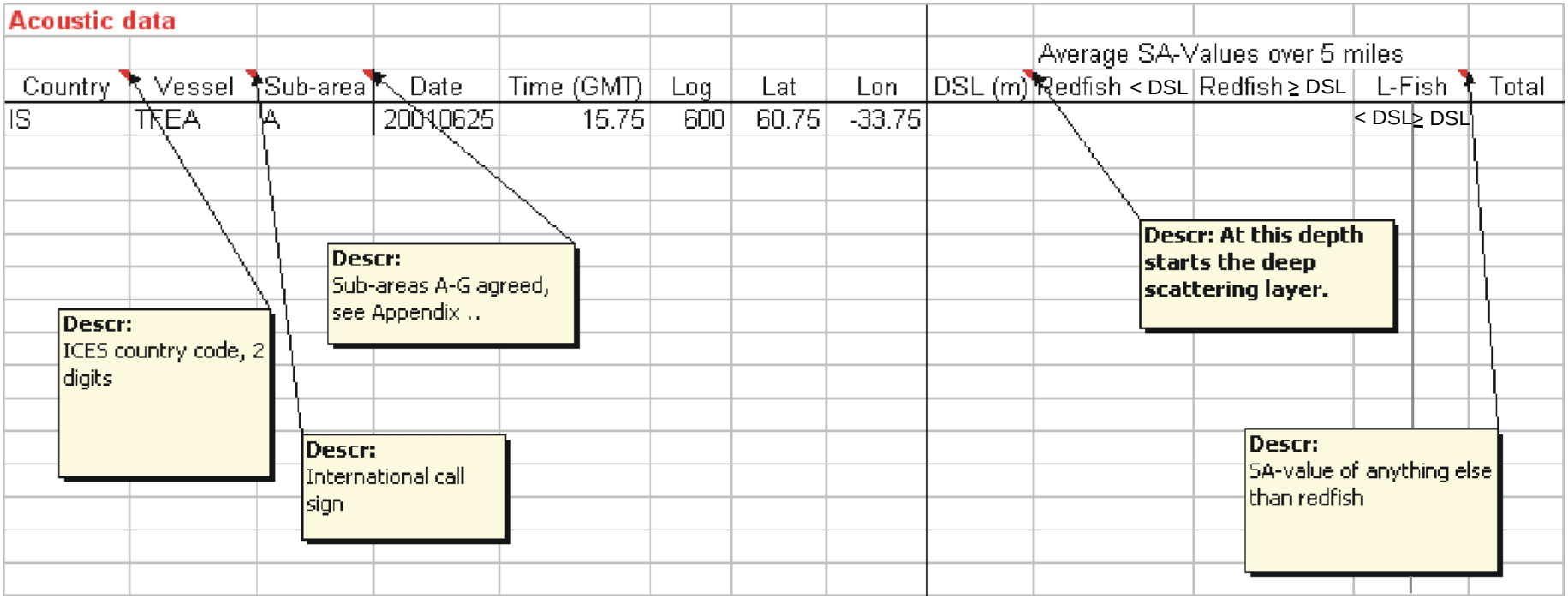
Daily reporting of data

Vessel: vessel name

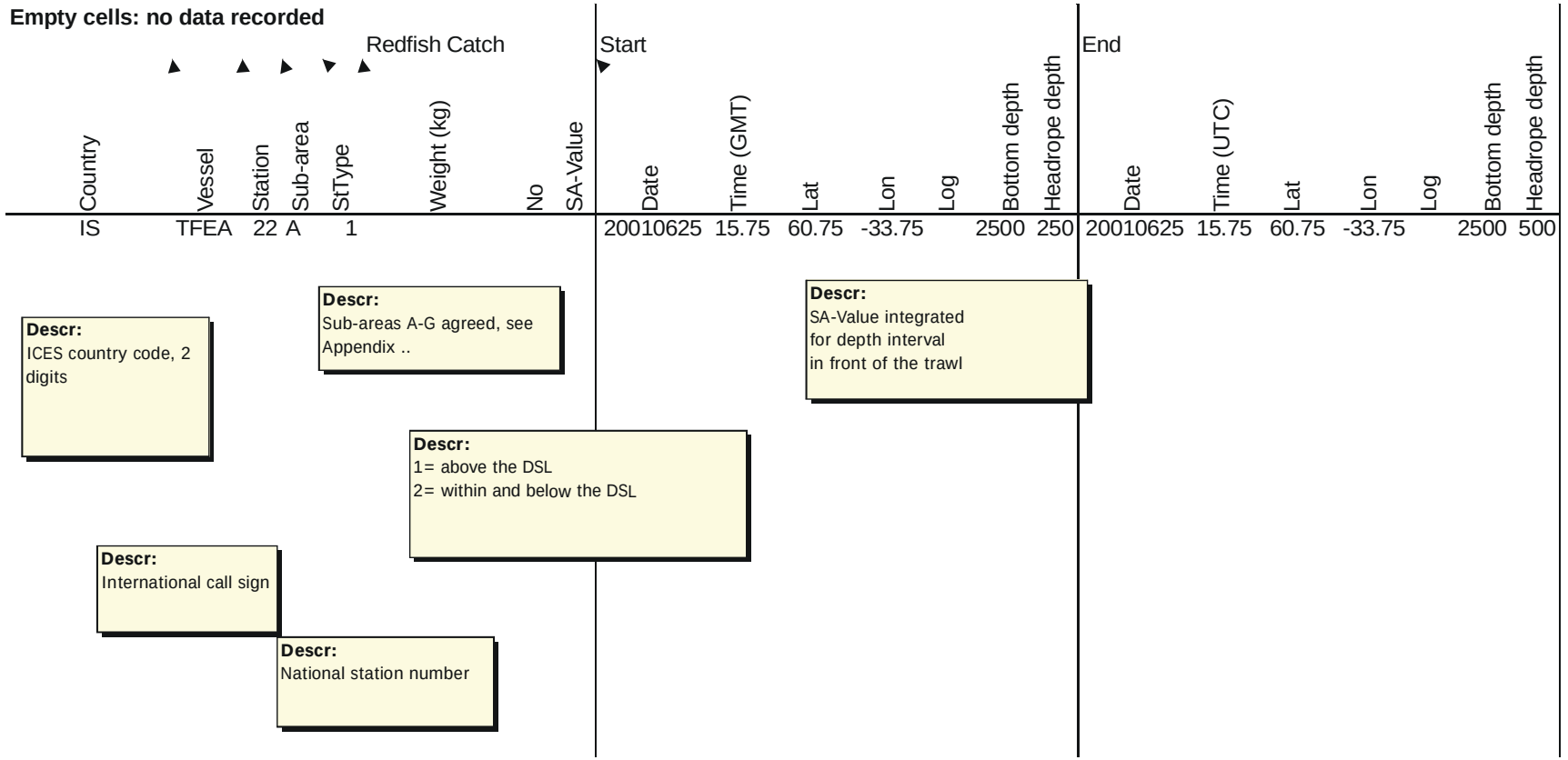
sent	N	Station number	Type of station	Log	Date	Position Lat	Position Lon	Time (GMT)	Catch (kg)	Sa range min	Sa range max	from last	TEMPERATURE AT DUFFERENT DEPTHS T0	T10	T20	T30	T50	T100	T200	T300	T400	T500	T600	T700	T800	T900	T1000
+	1		ch.course	160	22.06	6250	2710	1300		0	0																
+	2	273	ctd	180	22.06	6238	2742	1650		0	0		8.90	8.90	8.73	8.58	8.44	7.66	7.31	7.25	7.1	6.57	6.37	5.86	5.45	5.01	4.59
+	3		ch.course	184	22.06	6235	2748	1752		0	0																
+	4		ch.course	197	22.06	6226	2805	1907		0	0																
+	5	274	3	215	22.06	6219	2808	2130	103	0	0																
+	6	275	3	299	23.06	6230	2806	2300	186	0	0																
+	7	276	ctd	318	24.06	6233	2752	0316		0	0		9.30	9.29	9.94	8.60	8.46	7.47	7.15	6.89	7.05	6.85	6.56	6.23	5.58	5.02	4.64
+	8	277	1	369	24.06	6231	2600	0925	0	0	0																
+	9	278	3	416	24.06	6230	2440	1515	6	0	0																
+	10	279	ctd	436	24.06	6231	2427	1810		0	0		9.00	8.96	8.73	8.44	8.09	7.79	7.57	7.37	7.19	6.94	6.61	6.21	5.68	5.1	4.63
+	11	280	3	487	25.06	6230	2214	0145	6	0	0																
+	12	281	ctd	491	25.06	6230	2208	0340		0	0		9.70	9.66	9.64	9.30	8.49	7.96	7.71	7.47	7.28	7.07	6.87	6.23	5.6	5.1	4.7
+	13	282	ctd	548	25.06	6230	2011	0955		0	0		10.10	10.10	9.94	9.55	9.03	8.52	8.21	7.94	7.81	7.7	7.51	7.21	6.85	6.27	5.63
+	14	283	3	560	25.06	6218	2013	1200	0	0	0																
+	15	284	ctd	607	25.06	6130	2012	1847		0	0		10.60	10.55	10.25	9.74	9.31	8.6	8.28	8.1	7.91	7.75	7.57	7.32	6.85	6.27	5.6
+	16	285	3	625	25.06	6129	2046	2105	2	0	0																
+	17	286	2	636	26.06	6129	2108	0040	1	0	0																
+	18	287	3	723	26.06	6130	2407	0942	8	0	0																
+	19	288	ctd	729	26.06	6130	2415	1215		0	0		9.80	9.78	9.43	9.09	8.49	8.16	7.83	7.66	7.53	7.37	7.14	6.8	6.28	5.63	5.13
+	20	289	ctd	800	26.06	6130	2647	1925		0	0		9.80	9.70	9.30	9.10	8.46	7.82	7.37	7.21	7.03	6.95	6.69	6.31	5.86	5.54	
+	21	290	3	802	26.06	6130	2646	2000	4	0	0																
+	22	291	3	860	27.06	6130	2834	0323	14	0	0																
+	23	292	ctd	868	27.06	6130	2847	0610		0	0		9.80	9.82	8.70	8.09	7.26	6.5	6.05	5.71	5.17	4.93	4.83	4.55	4.44	4.17	3.98
+	24	293	3	948	27.06	6032	3027	1420	20	0	0																
+	25	294	ctd	958	27.06	6031	3018	1835		0	0		10.90	10.87	10.36	9.39	8.39	7.59	7.37	7.21	6.94	6.32	6.54	5.33	5.24	4.6	4.43
+	26	295	2	994	27.06	6030	2857	2228	0	0	0																
+	27	296	3	1016	28.06	6030	2815	0155	5	0	0																
+	28	297	ctd	1024	28.06	6030	2758	0457		0	0		10.90	10.89	10.67	9.69	8.86	8.03	7.58	7.47	7.35	7.22	6.9	6.57	5.97	5.47	4.83
+	29		ch.course	1064	28.06	6031	2630	0902		0	0																
+	30	298	3	1097	28.06	6004	2718	1210	6.2	0	0																
+	31	299	ctd	1107	28.06	5958	2735	1558		0	0		11.90	11.86	11.84	10.84	9.7	9.2	8.96	8.03	7.53	7.36	7.18	6.9	6.06	5.57	5
+	32	300	2	1213	29.06	5839	2950	0200	0	0	0																
+	33	301	ctd	1268	29.06	5800	3101	0800		0	0		11.10	11.12	10.81	9.69	8.63	7.95	7.61	7.51	7.35	7.01	6.69	6.7	6.11	5.44	5.03
+	34	302	3	1303	29.06	5800	3206	1155	8.5	0	0																
+	35	303	1	1390	29.06	5800	3449	2202	4.9	0	7																
+	36	304	3	1404	30.06	5800	3512	0215	8	7	20																
+	37	305	ctd	1409	30.06	5800	3518	0349					11.00	10.94	10.94	10.77	8.29	7.38	7.35	6.59	6.2	6.01	5.48	4.9	4.43	4.09	3.92

Annex 4: Various Sheets used for Observations

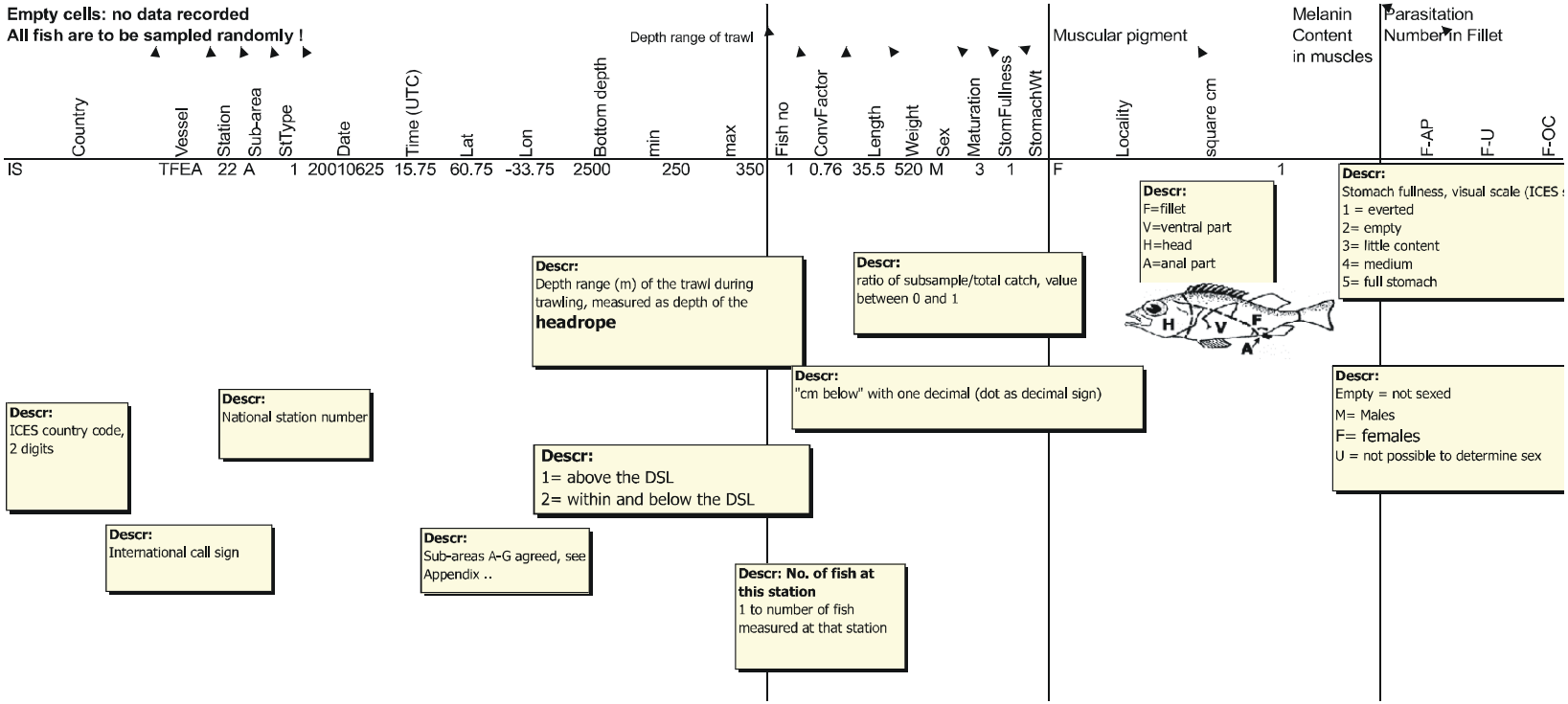
Annex 4a: Sheet used for exchange of acoustical observations



Annex 4b: Sheet used for exchange of station information and sailing diary



Annex 4c: Sheet used for exchange of biological observations



Annex 4d: Protocol for diet analysis of beaked redfish

cruise:	
station:	
depth zone:	

stomach ID:	
stomach weight full (g):	
stomach fullness index (0–5):	

processor:	
date(s):	

food item	digestion grade	size (mm)	weight (g)	number	percentage	comments

Page no.

Stomach fullness index (SFI), after the points method (Hyslop, 1980) and PINRO standard method.

STOMACH FULLNESS INDEX	DESCRIPTION
0	Stomach completely empty, not even mucus present. Stomach wall completely contracted
1	1–20% of stomach filled. Usually only mucus or well-digested organisms present. < 10% of the stomach wall relaxed
2	20–70% of stomach filled. Up to 80% of stomach wall relaxed
3	> 70% of stomach filled. 80–100% of stomach wall relaxed
4	100% of stomach filled. Stomach walls are expanded and food transpires through walls
5	Stomach regurgitated

Digestion grades, after the points method (Hyslop, 1980).

DIGESTION GRADE	DESCRIPTION
1	Organism completely or almost completely preserved (> 95% intact), no or very slight digestion or mechanical deformation perceptible. Skin/cuticula almost completely intact, coloration pattern almost completely preserved.
2	> 80% of organism still intact, skin/cuticula mostly intact, coloration pattern still discernible.
3	50–80% of organism intact, most of skin already destroyed, coloration pattern still discernible.
4	< 50% of organism remaining. Often in pieces, single body parts frequently (e.g. the whole head) missing. Coloration in most cases not discernible.
5	< 5% of organism remaining. Often only hard parts. Fish otoliths, bones, eye lenses and scales; crustacean exoskeletons and complex eyes, cephalopod beaks and eye lenses; bivalve shells; bryozoa/stone coral branches.

Annex 5: Sheet used for exchange of hydrographical observations

Form for hydrographic data exchange.
Vessel:
Station no:
Date:
Time:
Lat:
Lon:
Bottom depth:

Pressure	Temp	Salinity
db	**ITS-90**	**PSS-78**
5.000	2.5595	32.5555

Annex 6: Maturity scale agreed to be used in the international survey in June/July 2011 for redfish in the Irminger Sea and adjacent waters

MATURITY STAGES OF FEMALE REDFISH

Stage	Code	Ovaries description
Immature	1 (I)	Ovaries tubular, thin and small. Ovarian wall whitish and delicate. Without conspicuous blood vessels. If visible eggs occur, they are very small, whitish or pale yellowish. Pigmented eye larvae are never observed in the ovary.
Maturing/ Mature	2 (M)	The ovary has increased in size considerably and it is easy to distinguish in the body cavity. The ovary wall and eggs inside the ovary are clearly visible. Eggs are yellow and opaque.
Mature/ Fertilized	3 (F)	Ovaries are considerably bigger and occupy most of the body cavity. Colour is bright yellow. Many eggs are transparent (approx. 50%) because of yolk re-absorption the eye pigment of the larvae becomes visible.
Parturition	4 (P)	Ovary occupy practically the whole body cavity, it is delicate and the wall transparent and thin. The colour shift to a green-yellowish due to larval developing, the eyes are evident and there is little yolk. Larvae are easily released from the ovary when it is manipulated.
Post spawning	5 (S)	Ovary is flaccid, but still big. No visible larvae inside or just a remainder of them. The colour is purple or blackish, sometimes confused with the body cavity wall (peritoneum).
Recovery	6 (R)	Size is reduced to stage 3 or smaller, but no visible eggs, colour yellow to purple.

MATURITY STAGES OF MALE REDFISH

Stage	Code	Testes and genital papilla description
Immature	1 (I)	Testes are translucent, very thin and sometimes even difficult to detect, because it is confused with the mesentery. Width less than 1 mm. The penis is difficult to distinguish and easy to confuse with female genital papilla.
Maturing/ Mature	2 (M)	The testes are more easily distinguishable because of increasing size. They are white. Width more than 1.1–1.5 mm. There is no running sperm when the testes are cut. Penis is visible, and it is easy to identify sex externally.
Mature/ Fertilized	3 (F)	Testes are bright white. The sperm is observed inside the testes, but only when they are cut, i.e. sperm doesn't run out of the testes when they are pressed. Penis is thick, but no sperm is observed on it.
Parturition	4 (P)	Testes are big and with a cream colour. The sperm run out of the fish when belly is pressed. Penis is very conspicuous, with a purple tip and there are remains of sperm on it.
Post spawning	5 (S)	Testes are flaccid. The colour is still cream but with obvious dark (brown) patches. Practically no sperm inside the testes.
Recovery	6 (R)	Size of the testes has been reduced to stage 3, but the sperm is not visible. The colour is whitish.

Annex 7: Maturity scale used by Russia in the international survey in June/July 2011 for redfish in the Irminger Sea and adjacent waters

	MALES
Juvenile stage	Gonads are poorly developed, sex is indistinguishable. Specimens at this stage occur throughout a year.
Stage 1	Sex is distinguishable. Testicles are as thin long colourless bends and occur throughout a year.
Stage 2	Testicles are as thick long bends, on a cross section they are of irregular triangular shape of brownish colouring. Remnants of non-extruded sperm are available in repetitive-maturing specimens. December-March.
Stage 3	Testicles are large, elastic, coloured brown, in some cases they are of violet shade. Along a cross section they are of triangular shape with smoothed angles. March-June.
Stage 4	Testicles are large, of light-brown colouring, with a white colour being irregular in some areas. At the end of the stage the testicles are white due to the sperm formed. Along the cross section the sperm does not run. June-September.
Stage 5	Mating period. Testicles are of milky-white colour. When dissecting the external sides flow down and drops of sperm are released from spermatic duct. September-November.
Stage 6	Extrusion (after mating). Testicles are of brownish colour with white patches. Two zones are visible along a cross section, i.e. brown marginal and white middle zones. October-December.
	FEMALES
Juvenile stage	Gonads are poorly developed, sex is indistinguishable. Specimens at this stage occur all the year-round.
Stage 1	Ovaries are poorly developed, of light-yellowish colour; eggs are indistinguishable during a whole year.
Stage 2	(For repetitive-spawning fish – stage 9–2). Eggs are with 0.2–0.5mm diameter. In immature fish a membrane of ovaries is transparent, in repetitive-spawning specimens it is covered with black pigment. May-August.
Stage 3	Ovaries are bright-orange, egg diameter is about 1mm. August-September.
Stage 4	Ovaries occupy above a half of the body cavity, egg diameter is up to 1.5mm. September-December.
Stage 5	Ovaries are muddy-greenish, eggs are transparent. December-March.
Stage 6	Ovary membrane is strongly prolonged. The stage lasts from the moment of cleavage to the beginning of eye pigmentation in embryo. December-March.
Stage 7	Eye pigmentation begins in embryos owing to which ovaries gradually acquire black colouring. February-March.
Stage 8	Eyes acquire bright metallic shade. Embryos are well developed and mobile. The stage lasts until larvae extrusion.
Stage 9	Ovaries have fallen off, of bloody colouring. Single unextruded larvae occur. April-June.

Annex 8: Sheet used for registration of acoustic values of redfish during trawling at depths shallower than the DSL

			S_A values for redfish at the same location as the trawl haul							
Station No.	Depth of trawl (m)	Vertical opening	Inside the trawl opening	0-150 m	150-300 m	300-450 m	450-600 m	600-750 m	> 750 m	Comments

Annex 9: Maturity scale for roundnose grenadier

Proposed scale used for macroscopic visual determination of maturity stages, roundnose grenadier (*Coryphenoides rupestris*).

STAGE	FEMALES	MALES
1	Juvenile, ovary transparent and very small	Juvenile, testes thread-like and very small
2	Ovary small; oocytes visible but not hydrated	Testes small; firm ribbon containing very viscous milt
3	Ovary enlarged with scattered hydrated oocytes	Testes enlarged, otherwise as Stage 2
4	Ovary fills most of visceral cavity; most oocytes hydrated	Testes much enlarged; milt less viscous
5	Ripe; eggs easily extruded	Ripe; milt easily extruded
6	Recently spent; ovary bluish with brownish interior, often containing some remaining large oocytes; enlarged blood vessels	Testes small and bluish; ducts red or blue
7	Spent and recovering; ovary small; oocytes not readily visible	Spent and recovering; thin undulating ribbon

Given in: Bergstad, O.A. (1990). Marine biology, 107: 25–39.

IMR-Håndboken, 2011: Tabell 13. Spesialstadier for skolest

Annex 10: Recommendation for WKREDOCE-1

The first **Workshop on Redfish and Oceanographic conditions** (WKREDOCE) chaired by (to be decided), will take place in Gdańsk, Poland in September 2011 at the time of the ICES ASC to:

a) Plan work and expected results to be delivered in response to NEAFC requests ICES to compile all available data with a view to evaluate the variability of oceanographic conditions and their effect on the abundance and distribution of beaked redfish (*Sebastes mentella*) in the NEAFC Convention Area;

b) Identify appropriate biological and hydrological datasets.

WKREDOCE-1 will report by 10 October 2011to the attention of the ACOM.

Supporting Information

Priority	This workshop recommendation follows directly from the NEAFC request to ICES to compile all available data with a view to evaluate the variability of oceanographic conditions and their effect on the abundance and distribution of beaked redfish (Sebastes mentella) in the NEAFC Convention Area.
Scientific justification and relation to action plan	The work envisaged in the workshop contributes directly to ICES goals 1 and 3 of the strategic plan, namely to carry the science needed to deliver needs of customers and stakeholders and to deliver the advice decision-makers needs.
Resource requirements	The research programmes which provide the main input to this group are already underway, and resources are already committed. The workshop is expected to be chaired by a expert in hydrography and marine ecology in the North Atlantic, outside the WGRS group. The cost of inviting the chair should be covered by ICES.
Participants	The workshop is expected to be attented by 10 participants.
Secretariat facilities	Use of sharepoint (WGRS). The meeting will be held during the ICES ASC in Gdańsk and will require meeting room facility.
Financial	The cost of inviting the external independent chair should be covered by ICES.
Linkages to advisory committees	The result of the workshop are of direct relevance to ACOM, to respond to NEAFC request.
Linkages to other committees or groups	This workshop is tightly linked to activities conducted in WGRS, AFWG, NWWG, ACOM and SCICOM.
Linkages to other organizations	NEAFC, NAFO.

Annex 11: Agenda of the meeting

Tuesday 1 February

9:30–12:30

Opening of the meeting

Adoption of the Agenda

Review of recommendations from the last surveys reports (PGRS reports 2009/RMC:05 and 2009/RMC:08) and other expert groups

National participation to the Irminger and Norwegian Sea surveys in 2011

12:30–13:30 Lunch

13:30–17:00

Report on the Workshop on the determination of Redfish Target Strength (WKTAR) and adoption of TS equation for the surveys in 2011.

Planning of the survey in the Irminger Sea

Vessels, timing and survey areas

Data Exchange during the survey

Hydro-acoustics

Trawling

Biological sampling

Hydrography

Wednesday 2 February

9:00–12:30

Planning of the survey in the Irminger Sea continues…

12:30–13:30 Lunch

13:30–17:00

Planning of the survey in the Norwegian Sea

Vessels, timing and survey areas

Data Exchange during the survey

Hydro-acoustics

Trawling

Biological sampling

Hydrography

Thursday 3 February

9:00–12:30

Which steps to take for the establishment of a database to host redfish survey data. Invitation of Neil Holdsworth (Head of ICES Data Center)

Summary of otolith exchange in 2010 and planning of otolith exchange in 2011.

Participation to the forthcoming ICES workshop on sexual maturity staging of redfish

Contribution to the ICES/ASC Session A on rockfish/redfish in September 2011

Finalisation of working group recommendations

Any Other Business

12:30–13:30 Lunch

13:30: meeting ends.