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Report of the PGNAPES Scrutiny of Echograms Workshop (WKECHOSCRU)

16–18 February 2009

Bergen, Norway



ICES

International Council for
the Exploration of the Sea

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

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

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Executive Summary

The PGNAPES Scrutiny of Echograms Workshop (WKECHOSCRU) was initiated by the Planning Group on Northeast Atlantic Pelagic Ecosystem Surveys (PGNAPES) in Hirtshals, Denmark (August 2008).

Since 1995 the Faroes, Iceland, Norway, and Russia have coordinated survey effort on International Ecosystem Survey in the Nordic Sea. EU participation began in 1997 and has continued since, with the exception of the period 2002–2003. This survey is coordinated through the planning Group on Northeast Atlantic Pelagic Ecosystem Surveys (PGNAPES).

During the PGNAPES meeting in 2008 the RV DANA survey blue whiting registrations were overlaid on top of the Norwegian registrations from interlaced transects. Large relative differences were found where the DANA abundance was significant lower on most of the cruise track.

This whole exercise led to a discussion within the group on how to reveal differences between scrutiny methodologies used by individual members.

The present report was prepared by PGNAPES Scrutiny of Echograms Workshop (WKECHOSCRU) in Bergen, Norway, from 16–18 February 2009. Eleven people from seven nations participated in the Workshop (Chaired by: Alexander Krysov).

During the workshop participant countries presented and discussed the methods employed during the IESNS (International Ecosystem Survey in the Norwegian Sea) and the future of distribution of main acoustic target species. We also became familiarised with new post survey analysis software - *Large Scale Survey System (LSSS)*.

The workshop has approved recommendations for Scrutinisation of echograms:

- Should be conducted in the presence of at least one experienced scientist familiar with the target species and the survey area
- The participants should use the layer approach in the scrutinizing procedure until a thorough comparison has been made between a layer and a school approach

1 Introduction

1.1 Terms of Reference 2009

The **PGNAPES Scrutiny of Echograms Workshop** [WKECHOSCRU] (Chair: Alexander Krysov*, the Russian Federation) will meet in Bergen, Norway from 16–18 February 2009 to:

- a) review methods for the scrutiny of the PGNAPES survey echograms;
- b) develop a standard scrutinizing method;
- c) compare the old and the new standard methods.

WKECHOSCRU will report by 18 August 2009 for the attention of PGNAPES.

1.2 List of participants

Alexander Krysov (Chair),	Russia
Alexey Astakhov	Russia
Karl-Johan Staehr	Denmark
Leon Smith,	Faroe Islands
Guðmundur Oskarsson	Iceland
Ciaran O'Donnell,	Ireland
Sytse Ybema	Netherlands
Rolf Korneliussen	Norway
Aril Slotte	Norway
Øyvind Tangen,	Norway
Jens Cristian Holst	Norway

A full address list for the participants is provided in Annex 1.

1.3 Background and general introduction

Since 1995 the Faroes, Iceland, Norway, and Russia have coordinated survey effort on International Ecosystem Survey in the Nordic Sea. EU participation began in 1997 and has continued since, with the exception of the period 2002–2003. This survey is coordinated through the planning Group on Northeast Atlantic Pelagic Ecosystem Surveys (PGNAPES).

Acoustic data are analysed to determine an age stratified index of abundance for herring and blue whiting within the survey area. This is done by visual scrutiny of the echograms using LSSS/BI500 or the Echoview post-processing system. In 2008, the EU-survey (Dana) changed their post-processing software package from BI500 to Echoview. A different scrutiny approach was introduced with the new software leaving behind the previously system.

During the PGNAPES meeting in 2008 the DANA survey blue whiting registrations were overlaid on top of the Norwegian registrations from interlaced transects. Large relative differences were found where the DANA abundance was significant lower on most of the cruise track.

To find the cause of these discrepancies the Dana echo recordings were then reprocessed by using the old BI500 method.

This whole exercise lead to a discussion within the group on how to reveal differences between scrutiny methodologies used by individual members.

Therefore it was decided to recommend a scrutiny workshop for early 2009. Here the group would discuss individual methods used and come to standardization.

2 Summary of Survey Presentation

Experience from the redfish workshop presented by Benjamin Planque

A combined redfish survey was carried out in the Norwegian Sea in August 2008 using commercial vessels from Russia, Faroes and Norway. This survey represents a geographical extension of the existing Redfish survey time-series. Post survey analysis revealed large discrepancies in the results. A workshop was carried out in November, 2008 to discuss and review survey design, echogram scrutinisation and data analysis procedures.

Conclusions;

- Trawl catches most important information for redfish scrutinisation
- Correlation between age and depth of redfish distribution observed

Recommendations from the workshop included:

- More trawling should be undertaken to ground-truth school composition
- Standardisation of survey trawl
- Standardise EK60 settings and echogram scrutinisation procedure

The report can be viewed at:

http://www.ices.dk/reports/ACOM/2008/AGRED/agred2008_Revision1.pdf

Large Scale Survey System (LSSS) presented by Rolf Korneliussen

- History of BEI system and development of LSSS
- System design and capabilities
- Speed of processing and data storage
- Commercial and research applications
- Cost

Survey design and scrutinisation methodologies during the May survey in the Norwegian Sea

Participant countries each presented the methods employed during the IESNS (International Ecosystem Survey in the Norwegian Sea).

Norwegian survey (Jens Christian Holst)

Russian survey (Alexey Astakhov)

EU, Denmark (Sytse Ybema)

Icelandic survey (Gudmundur Oskarsson)

Faroes (Leon Smith)

Aspects regarding acoustic data and scrutinizing procedure used by Iceland

The same general procedure has been used in scrutinizing the Icelandic acoustic data in this May survey since its establishments in 1995. The scrutinizing has been done with the BI500 software. The scientists in charge of the post-processing in the "blue

whiting areas" W-, S and SE off Iceland has been Sveinn Sveinbjörnsson and in the "herring areas" E off Iceland and Norwegian Sea was Hjálmar Vilhjálmsson, which was replaced by Guðmundur Óskarsson in 2007 (both on board in 2006 and 2007). The Sv threshold used in the scrutinizing is generally -69 dB.

The species identification is mainly based on trawling samples, but also characteristic of the schools, their behaviour and depth. The Sv threshold and TS values are also used as possible to separate between species. If there is a mixture of species in the trawl samples, the species are usually recognizable in different layers in the scrutinizing procedure. If not, i.e. being in mixed layers, the species composition is allocated according to the composition in the trawl (kg) and Sv threshold.

Generally, the herring is easily recognizable from other species, being in dense isolated schools in the depth range of 0 to 400 m, then often deeper further north. Distinguishing between herring and blue whiting is therefore generally not a problem. Above the continental slope off SW, S, and SE Iceland juvenile and adult blue whiting used to be found, even if it has hardly been observed around during 2005 to 2008. Towing in that area gave usually clean catches of blue whiting because the mesopelagic fish was found in different layers, thus scrutinizing the data were strait forward there. In the area between Iceland and the Faroese, the highest concentrations of blue whiting are usually found. Occasionally, herring, saithe, cod, and/or mesopelagic fish is mixed in the trawl samples in that area. In the few cases where the different layers of fish species are not recognizable according to the procedure described above, the registrations are allocated according to the catch composition.

Common scrutinisation methods across PGNAPES surveys

- Importance of trawl information to allocated echotrace composition
- Use of TS histograms to aid species identification
- Use of Sv thresholding
- Importance of having experienced personnel present on board the survey during the scrutinisation process

3 General Distribution of the Acoustic Registrations in the Norwegian Sea

In general, blue whiting is relatively equally vertically distributed in the survey region, with average depth at around 300 m (Figure 3.1). There is a weak tendency for a shallower distribution in the area between Iceland and the Faroese. The general vertical distribution of the herring is more complicated with more variation (Figure 3.2). There are some features to notice, such that herring can be expected to have the shallowest distribution furthest southwest and the deepest in the middle part. This examination of the whole area gives the impression that there is no general rule about the vertical distribution of the two species, especially herring. It emphasizes the importance of taking trawl samples when uncertainty rises about species composition. We have separated the survey region into three areas for more detailed descriptions; (1) the eastern and middle part of the Norwegian Sea, (2) around the Faroese EEZ, and (3) Icelandic waters.

Eastern part and middle of the Norwegian Sea:

A typical echogram for the eastern and middle part of the Norwegian Sea show layers with plankton from the surface to 50 m, herring from 200–400 m, blue whiting

there below from 250–450 m, and mixture of meso-pelagic fish and plankton below 400m (Figures 3.3a and 3.3b).

Around the Faroese EEZ:

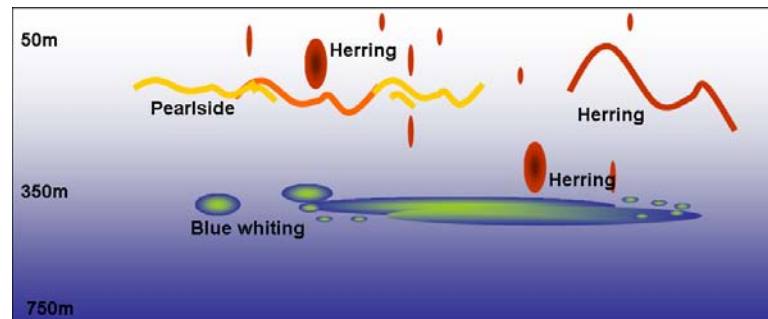
Typical echograms for the area around the Faroese EEZ are shown in Figure 3.4a and Figure 3.4b. The herring in this area can be a mix of autumn and springspawners, and submitted NASC values for springspawning herring must be corrected accordingly.

Icelandic waters:

A typical echograms for the area between Iceland and the Faroese show scattering layer consisting of plankton and meso-pelagic fish at around 200 m depth and blue whiting below at 300 to 500 m (Figure 3.5a). Similar vertical distribution can be expected S and SW off Iceland above the continental slope, in years when blue whiting is found there. The herring in Icelandic waters in this period are generally found in dense schools at different sizes from the surface down to 400 m, then often deeper further north (Figure 3.5b).

4 Discussion

After having presented national scrutiny procedures a general vertical distribution pattern of the main acoustic target species could be drawn as shown below. Many exceptions to this rough situation outline have been mentioned but those will be described in the manual.



The scrutiny procedure on board Dana was based on the above illustration meaning that only schools were targeted. The Russian method uses both layer and school approach whereas the other members of the group have been using a layer approach which also included single targets. For the 2008 situation this meant that single target blue whiting had not been taken into account by Dana which caused an overall lesser abundance estimate of 20–30%.

The difference in scrutiny technique raises some important questions:

- How can we get most information out of our acoustic data?
- How do we handle the ecosystem approach of this survey in our scrutiny procedure?

Both school and layer approach have their advantages which, in the ideal situation, should be available to all. Therefore both LSSS and Echoview users will continue improving their scrutiny algorithms where these ideas will be taken into account.

That means: thresholding guidelines, school detection methods and even time and area based assumptions.

5 Agreement and Recommendations

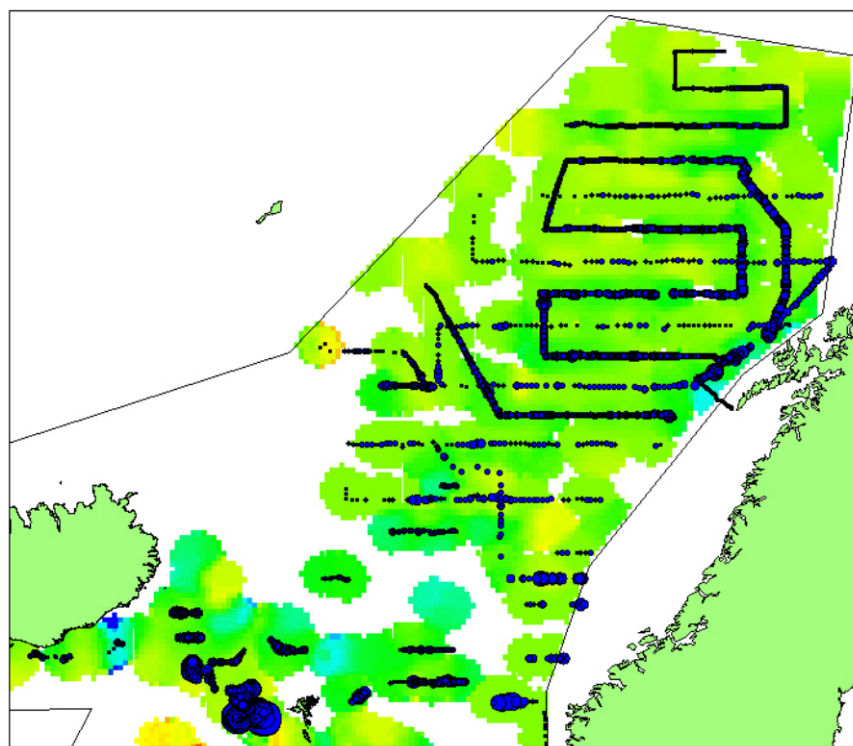
Recommendations:

Scrutinisation of echograms

- Should be conducted in the presence of at least one experienced scientist familiar with the target species and the survey area
- The participants should use the layer approach in the scrutinizing procedure until a thorough comparison has been made between a layer and a school approach

6 References

ICES. 2009. Report of the Planning Group on Northeast Atlantic Pelagic Ecosystem Surveys (PGNAPES). ICES CM 2008/D:05: 87 pp.



WHB horizontal distribution 2008
and vertical distribution 2005-2008

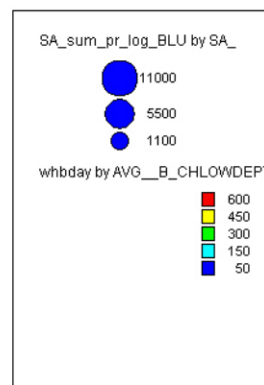


Figure 1. The horizontal distribution in May 2008 (circles) and un-weighted mean vertical distribution during 2005–2008 surveys of blue whiting (colour scale).

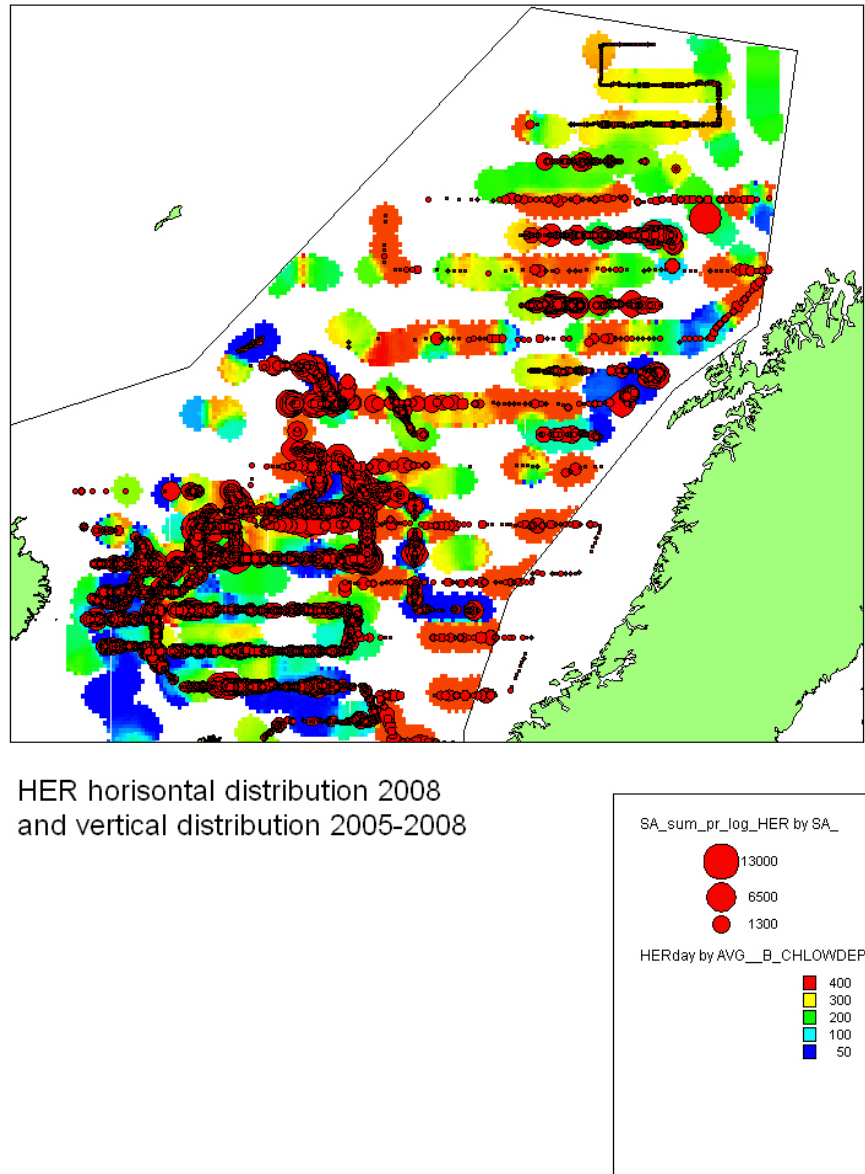


Figure 2. The horizontal distribution in the May survey 2008 (circles) and un-weighted mean vertical distribution during 2005–2008 surveys of herring (colour-scale).

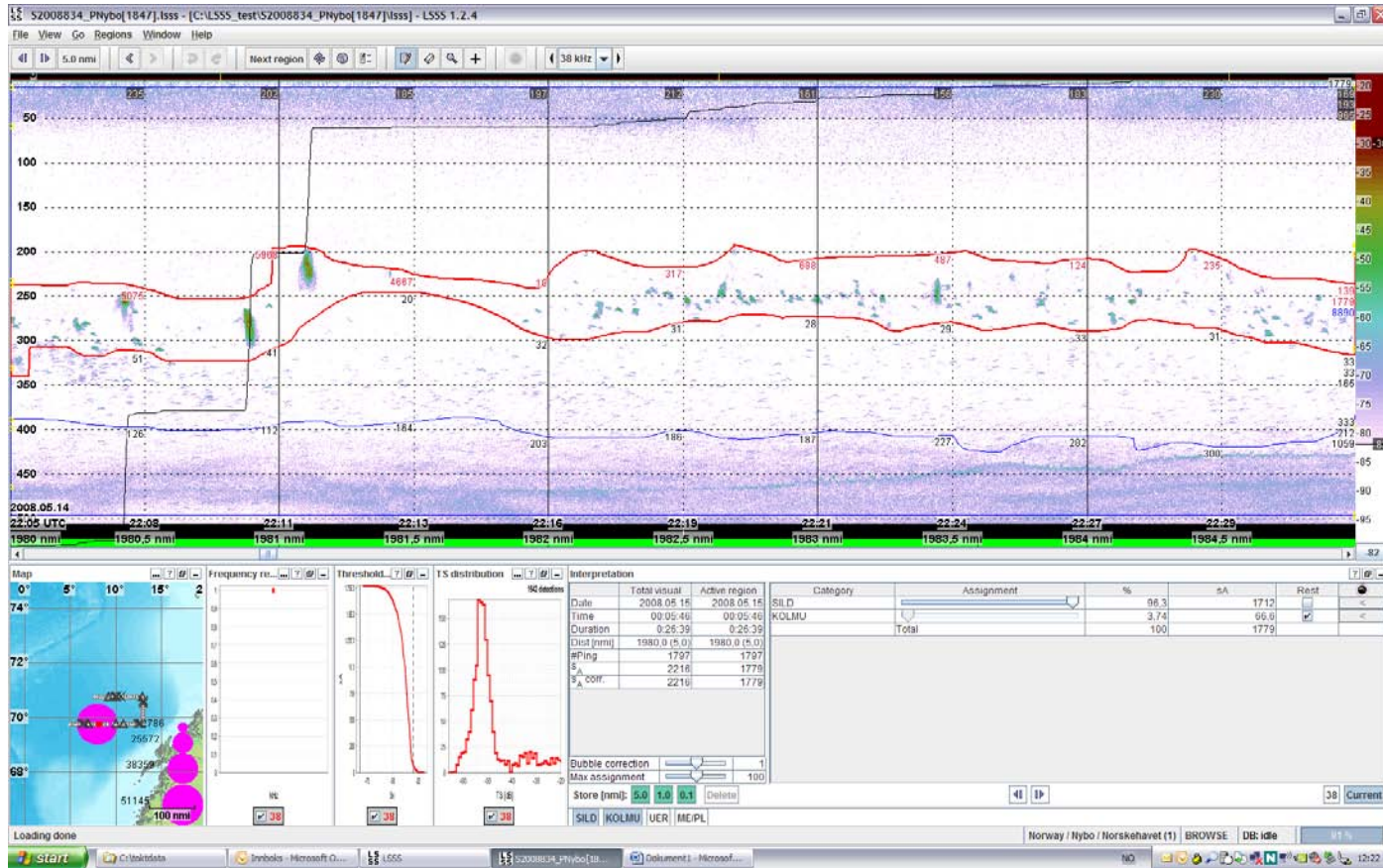


Figure 3a. Acoustic registration at 69°35 N and 08°00 E (15 May 2008, at 00.05) shown with LSSS and highlighting a layer with herring schools (between the red lines).

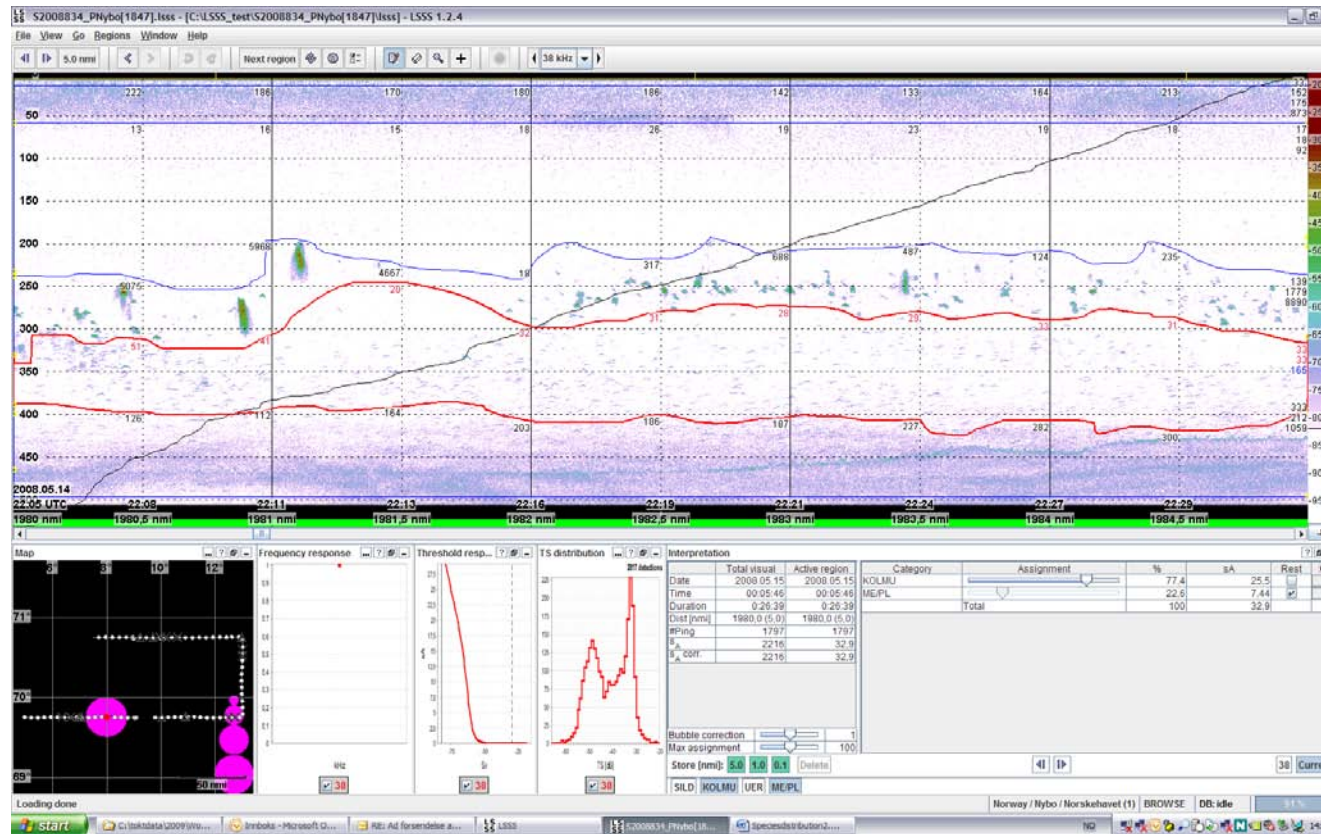


Figure 3b. Acoustic registration at 69°35 N and 08°00 E (15 May 2008, at 00.05) shown with LSSS and highlighting a layer with blue whiting mixed with Meso-pelagic fish and plankton (between the red lines).



Figure 4a. Acoustic registrations at 62°4 N and 0°15 W in the area around Faroese and EU EEZ. The layer show from top and down: MAC,HER,PLS,KRZ,WHB,KRZ. Thresholding used to detect WHB -69 dB and HER -54 dB.

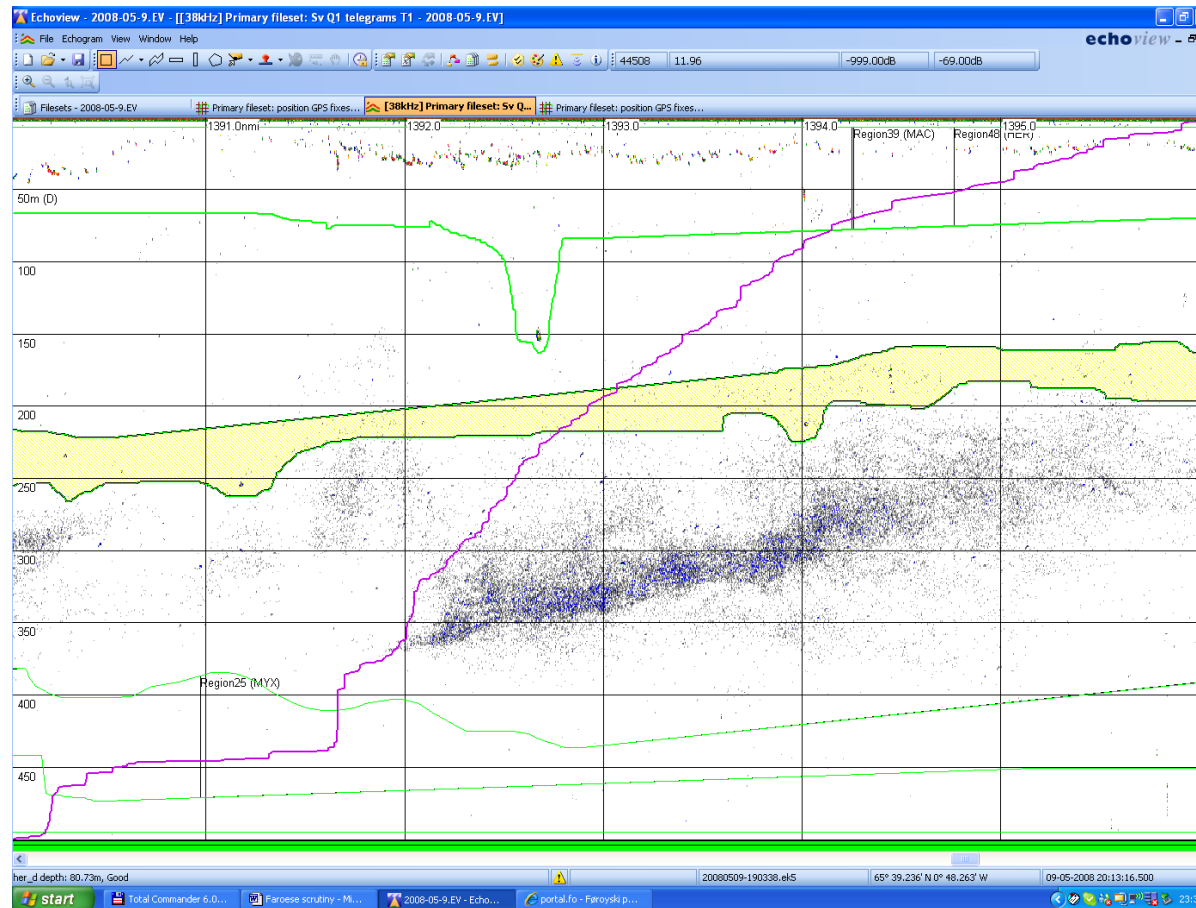


Figure 4b. Acoustic registrations at 65°40 N and 0°52 W north of Faroese EEZ in international zone. The layer show from top and down: HER with intermittent echotracers allocated to MAC (trawlsample showed a mix of HER and MAC), PLS, WHB, KRZ, MYX Integrationline indicating the Herring schools.

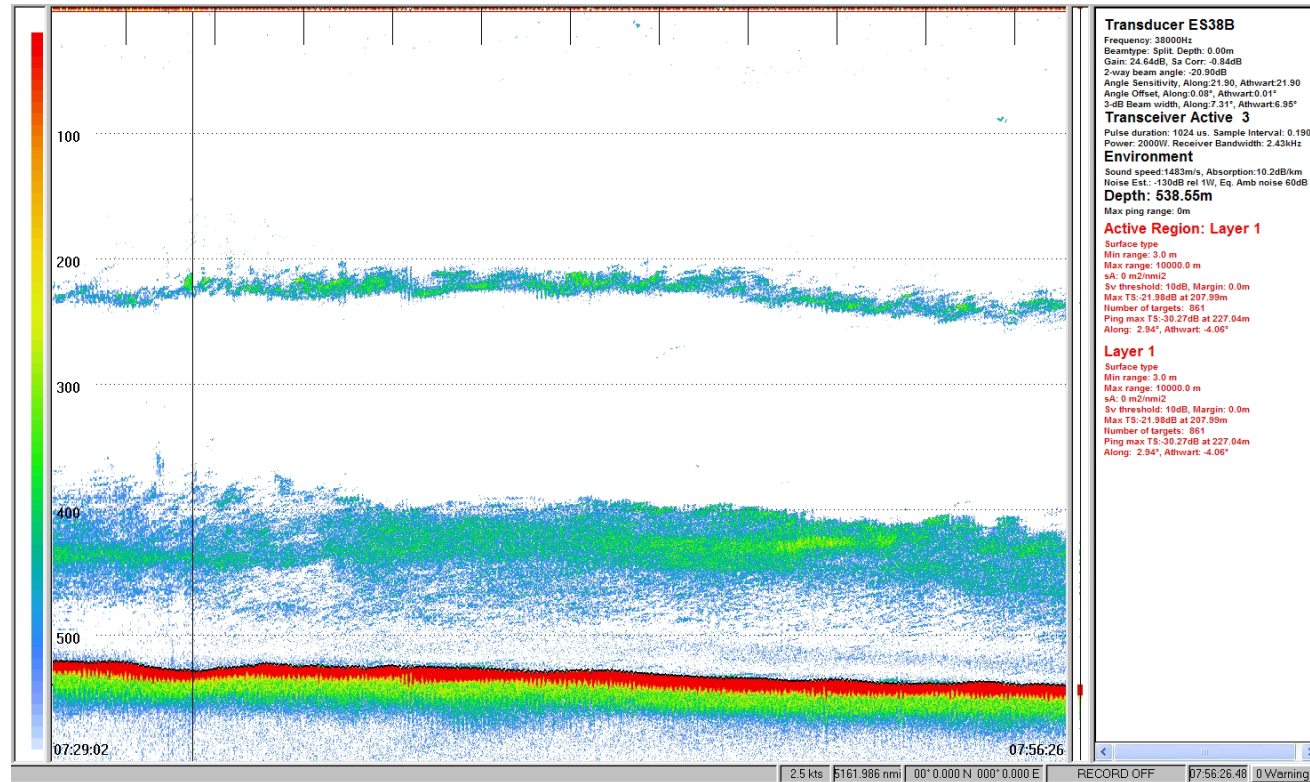


Figure 5a. A typical echogram for the area between Iceland and the Faroese showing acoustic registrations at 62°05N and 09°21W (6 May 2008, at 7.29 am) from EK60 with threshold at -70 dB, where clean blue whiting catch was taken from the lower layer but towing in the upper layer gave no catch (plankton and perhaps small meso-pelagic species).

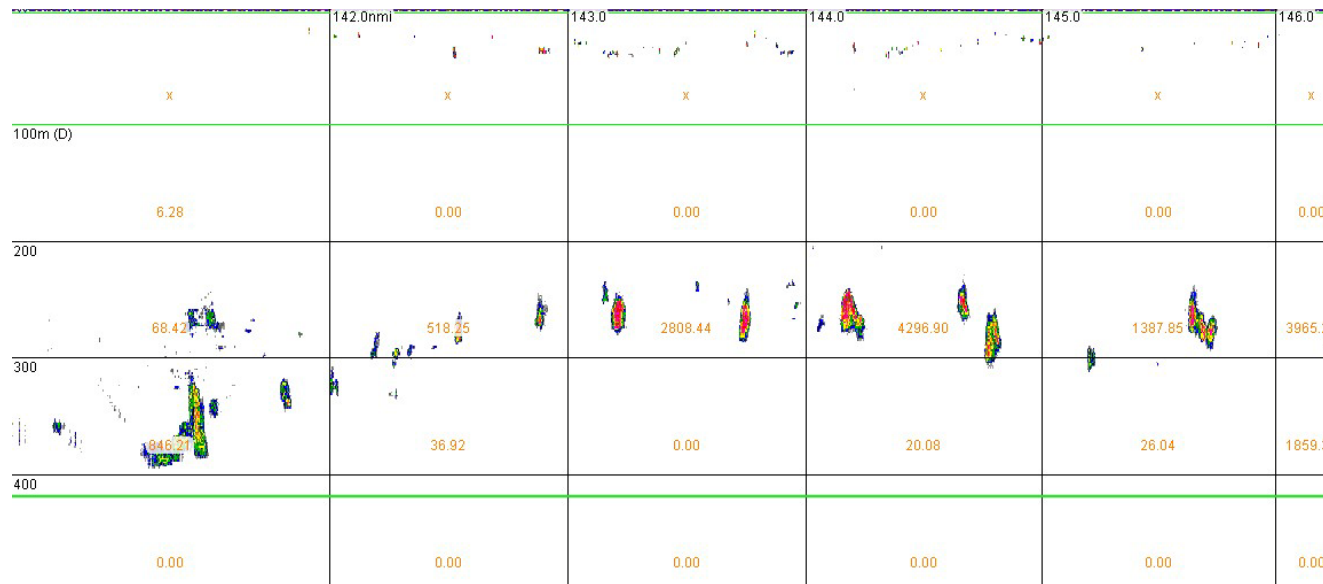


Figure 5.b. A typical echogram for the areas E and NE off Iceland, showing acoustic registrations of herring at 65°35 N and 09°34 W (11 May 2008, at 18.40), from Echoview with threshold at -70 dB. There are schools between 200 and 400m but also small herring schools near 25 m depth.

Annex 1: List of participants

NAME	ADDRESS	TELEPHONE	FAX	E-MAIL
Alexander Krysov (Chair)	PINRO 6 Knipovich Street, 183763, Murmansk, Russia	+78152473424	+47 78910518	a_krysov@pinro.ru
Karl-Johan Staehr	National Institute for Aquatic Research Technical University of Denmark Nordsoen Forskerpark DK-9850 Hirtshals Denmark	+4533963271	+4533963260	kjs@difres.dk
Alexey Astakhov	PINRO 6,Knipovich Street, 183763, Murmansk, Russia	+78152473424	+47 78910518	Aleks_a@pinro.ru
Ciaran O'Donnell	Marine Institute Rinville, Oranmore Co. Galway, Ireland	+353 87 968 1954	+353 9138 7200	ciar.odonnell@marine.ie
Gudmundur J. Oskarsson	Marine Research Institute Skulagata 4 101 Reykjavik, Iceland	+354 575 2000	+354 575 2001	gjos@hafro.is
Leon Smith	Faroese Fisheries Laboratory Nóatún PO Box 3051 FO-110 Tórshavn Faroe Islands	+298 353900	+298 353901	leonsmit@frs.fo
Rolf Korneliussen	Institute of Marine Research, PO Box 1870, N-5817 Bergen, Norway	+47 55238414 +47 91803405	+47 55238687	@imr.no
Oyvind Tangen	Institute of Marine Research, PO Box 1870, N-5817 Bergen, Norway	+47 55238414 +47 91803405	+47 55238687	oyvind.tangen@imr.no
Aril Slotte	Institute of Marine Research, PO Box 1870, N-5817 Bergen, Norway	+47 55236962 +47 55585444	+47 55238687	@imr.no
Jens Christian Host	Institute of Marine Research, PO Box 1870, N-5817 Bergen, Norway	+47 55238673	+47 55238687	jens.christian.holst@imr.no

NAME	ADDRESS	TELEPHONE	FAX	E-MAIL
Sytse Ybema	IMARES Haringkade 1 1976 CP IJmuiden Netherlands	+31 255 564728	+31255564644	sytsse.ybema@wur.nl
