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Cruise report

Observation methodology part 1

RV G.O. Sars Oct 1–20, 2006

Testing acoustic platforms and methodology for observing marine ecosystem processes

By

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Contents

1. Introduction

The cruise was carried out with RV G.O. Sars in October 2006 (Appendix I, participants and cruise plan (in Norwegian)). The study area was in the Barents Sea along the western coast of Finnmark and south of Bear Island in (Figure 1).

The main objectives of this cruise was:

1. Testing functionality and operations of new instrumentation.
2. Develop methodology for observing vertical distribution and migration of 0-group.
3. Develop methodology for acoustic profiling of the vertical size distribution in marine ecosystems.
4. Study the influence of vertical distribution, including the acoustic dead zone, on abundance estimates of fish.
5. Develop methodology for observation of fish behaviour related to survey trawling.

The cruise also provided data for studying and quantifying the processes targeted with the new methodology. During the cruise, a new instrument (CatchMeter) for automatic species identification and length measuring of trawl catches based on picture analysis were tested i the period Oct 1-5 (Appendix VI). In the period Oct 6-20, a new interface (IMR_map) for bringing survey data into and analysing them in ArcGIS was further developed and tested (Appendix VII).

2. Material and methods

The cruise was carried out in Oct 1-20, 2006 with RV G.O. Sars (cruise no.: 2006114, serial nos.: 83201-83268), with start and finish in Tromsø. Note that this is the first part of two methodology cruises with the same cruise number. The second part (Oct 21-Nov11) is reported in a separate cruise report. The cruise covered several areas: west of Finnmark (Oct 1-5, 153-319 m bottom depth, Oct 15-17, 148-200 m bottom depth, Oct 20, 121 m bottom depth), west and south of Bear Island (Oct 8-13, 104-191 m bottom depth) and inshore, west of Hammerfest (Oct 18-19, 104-122 m bottom depth). Some testing and calibration of acoustic instruments were carried out along the coast of northern Troms. Figure 1 shows cruise tracks and stations for experiments.

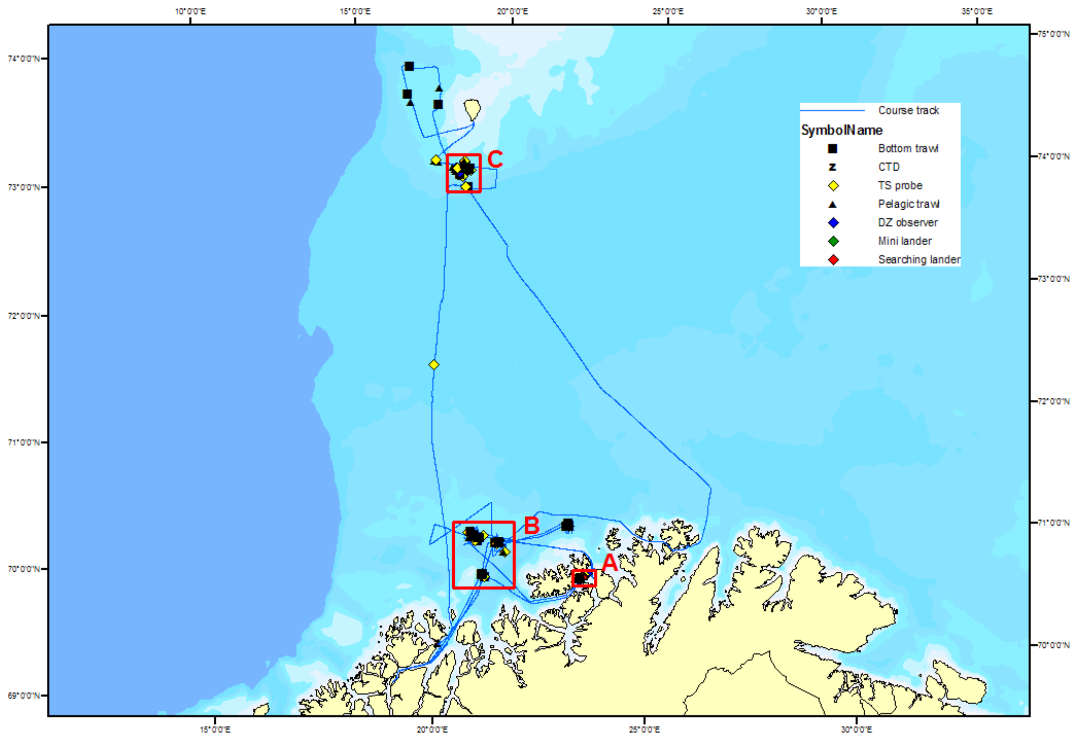


Figure 1a. Course tracks and activities for RV G.O. Sars in the period Oct 1-20, 2006. Test and experiment areas indicated with red squares.

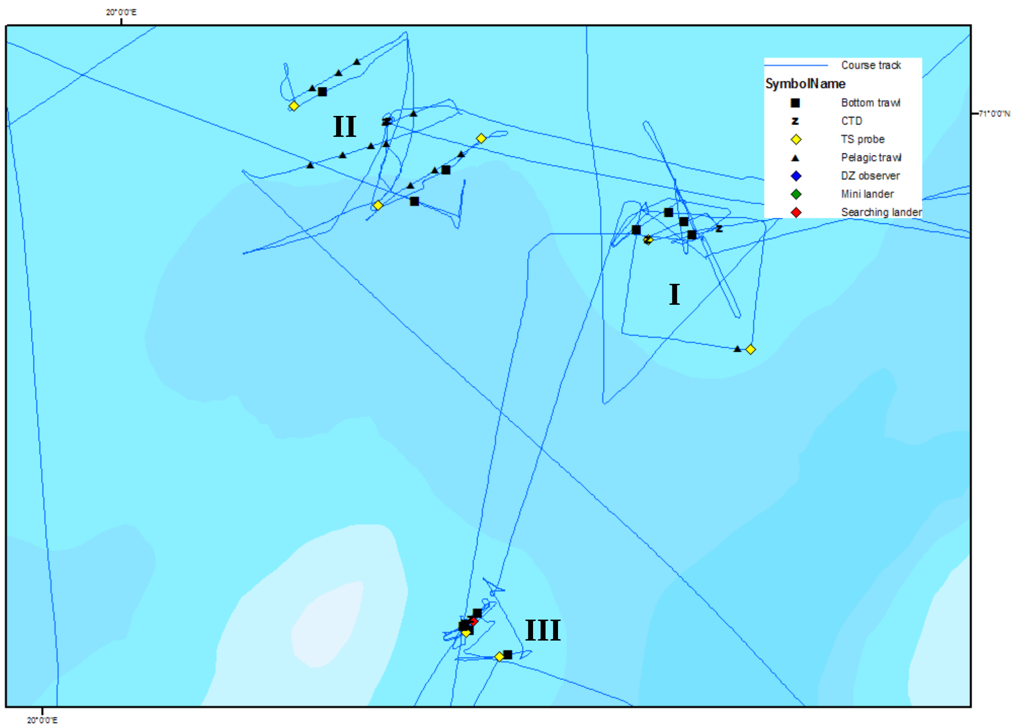


Figure 1b. Details of course tracks and activities for RV G.O. Sars (Area B in Fig 1a). I. Test area Oct 4-5. II. Experiment area Oct 15-17. III. Experiment area Oct 20.

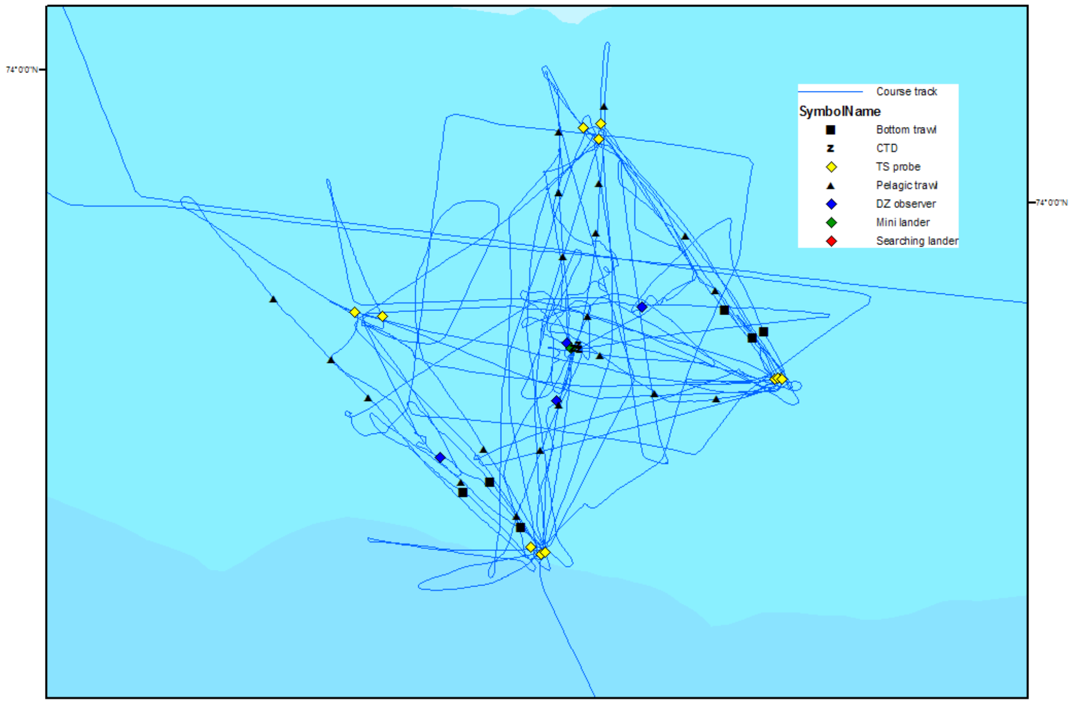


Figure 1c. Details of course tracks and activities for RV G.O. Sars in experiment area south of Bear Island (Area C in Fig 1a) in Oct 9-13.

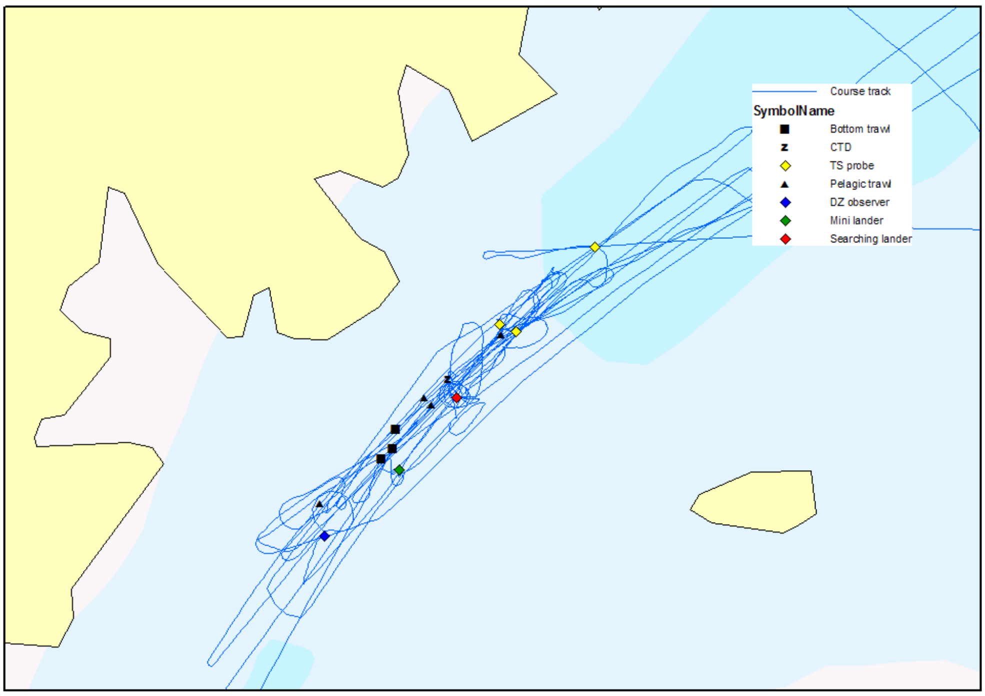


Figure 1d. Details of course tracks and activities for RV G.O. Sars in experiment area west of Hammerfest (Area A in Fig 1a) in Oct 18-19.

Several acoustic platforms were used to record distribution and behaviour of fish during the cruise:

1. Small and a large stationary platform, referred to as Mini Lander and Searching Lander, respectively.
2. Remotely operated probing target strength collector (TS-probe).
3. Autonomous dead zone observer (DZ-observer).

The TS-probe and the DZ-observer were ready for use at cruise start. The Landers had been through extensive modifications since the last time they where used, and were still under construction. Due to this, a considerable effort was needed onboard GOS during the first two weeks of the cruise to get the instrument platforms up running. A detailed description of these preparations and other modifications carried out during the cruise is given in Appendix II. An acoustic target tracker attached to the bottom trawl was planned assembled and used at the cruise, but was not finished in time.

The ships hull-mounted acoustic systems were operated in several different modes throughout the cruise. Standard mode with sampling on 18, 38, 70, 120 and 200 kHz was used when searching for suitable fish aggregations for the experiments, and along acoustic transects during experiments. Passive mode was used when passing platforms to avoid interference. A modified mode was used to obtain TS samples from the upper 50 m of the water column when the weather was too bad for deployment of the TS-probe near the surface. In this mode we used the 38 and 120 kHz transducers with maximal obtainable pulse rate (dependent on number of deployed frequencies, range and bottom detection) and a pulse length of 0.256 ms.

The experimental setup with course tracks, sampling stations and arrangement of the acoustic platforms were designed to target the different objectives at stake. The objectives of this cruise related to developing methodology for observing vertical distribution and migration of 0-group, acoustic profiling of vertical size distribution, and vertical distribution and abundance estimation were simultaneously targeted with two slightly different experimental designs (Fig. 2). The cruise design targeting behaviour related to trawling is given in Figure 3 (experiment on Oct 20 was limited). The cruise designs are discernable in the maps in Figure 1.

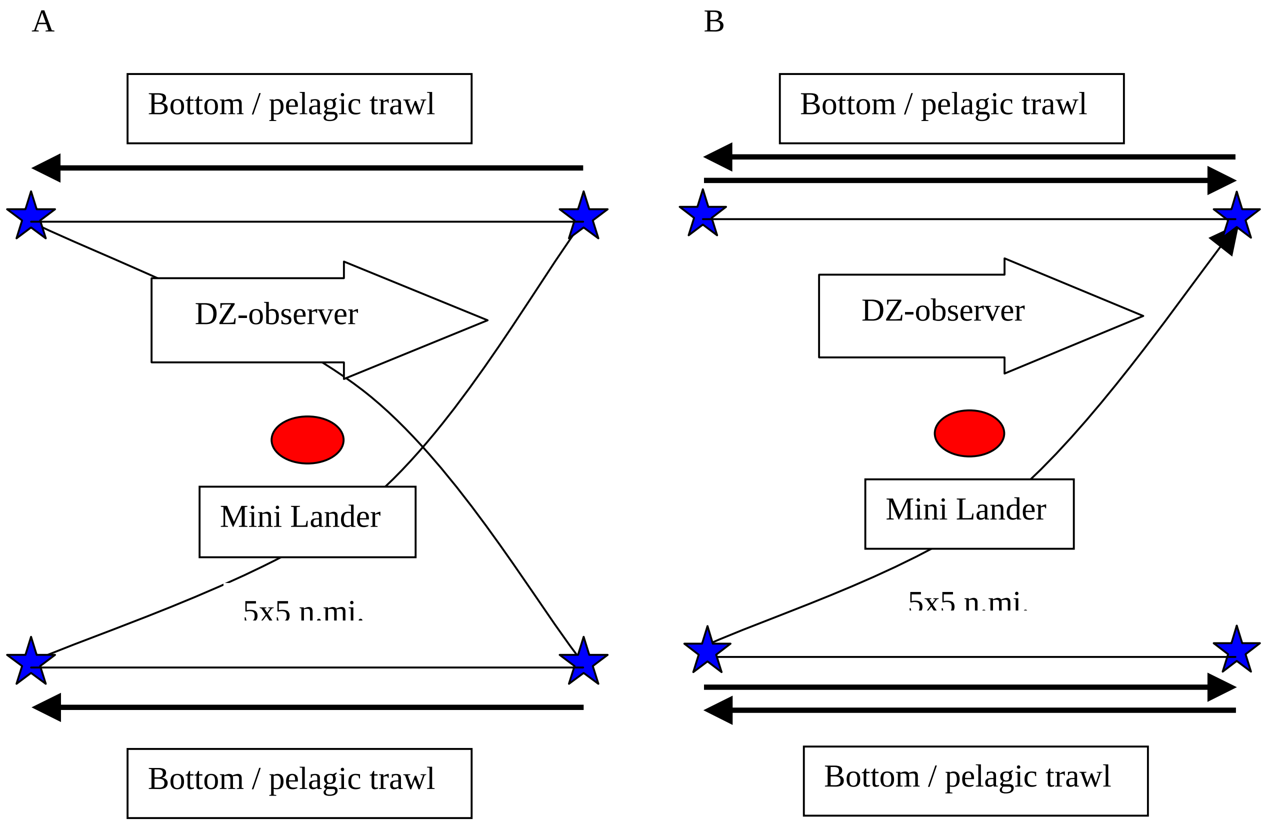


Figure 2. Experimental design and course tracks in the areas south of Bear Island (A) and west of Finnmark (B). Red circle denotes the Mini Lander, blue stars the TS stations and arrows the trawl paths. Drift of DZ-observer indicated. Note that design B was not fully realised due to weather conditions.

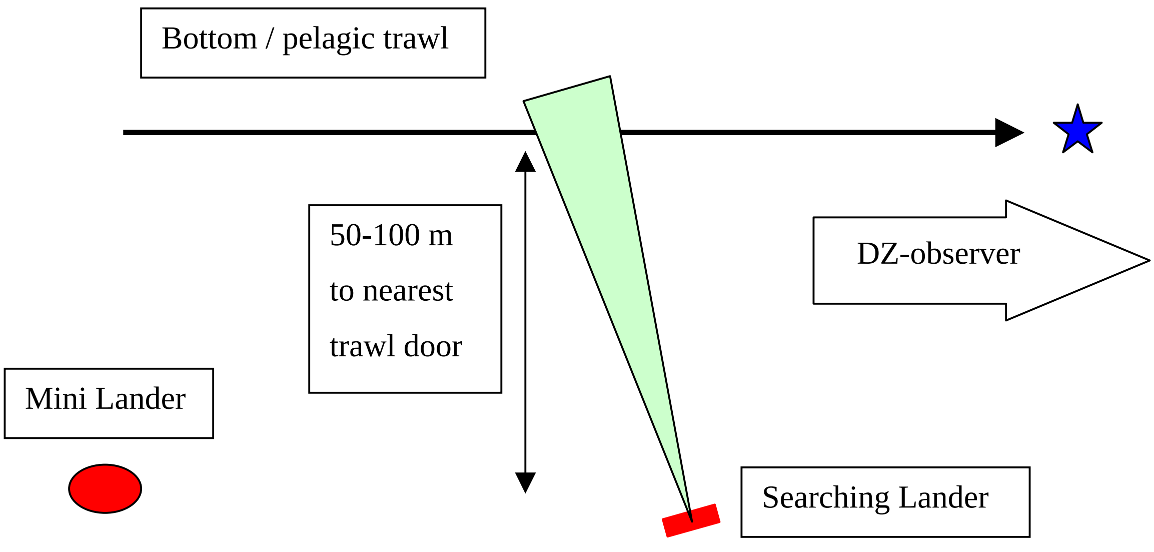


Figure 3. Experimental design and course tracks in the area west of Hammerfest. Same symbols as in Fig 2. In addition, Searching Lander with acoustic beam are indicated. Distance between Mini and Searching Landers was about 0.5 nmi. to avoid interference. They were deployed at similar depths. It was at least two hours between successive passing of the Searching Lander with trawl.

2.1 Stationary acoustic platform (Lander)

The Landers was originally designed and made for the MAR-ECO cruise (http://www.mar-eco.no/), which took place the summer of 2004. The technology with upward pointed transducer was developed for the Ocean HUB project where it was used for monitoring the spring spawning herring stock in Ofotfjorden. Ocean HUB was launched in September 2002. Since then particular algorithms for extracting of data have been developed, and valuable experience regarding interpretation of data is gained. The two types of Landers used in this cruise are mechanically slightly different.

The Mini Lander is made as small and light as possible and equipped with a computer with ER60 software, 38 kHz split beam GPT and ES38DD transducer. It is constructed in a way allowing the user to choose if the transducer should be pointed upwards or downwards prior to deployment. A nylon rope is used for mooring to a bottom anchor at the preferred depth. The nylon is nearly acoustically transparent, and would not create noise in the transducer beam. Detailed description of the Mini Lander with instrumentation and settings during the cruise are given in Appendix III.

The Searching Lander is also equipped with a computer with ER60 software, 38 kHz split beam GPT and ES38DD transducer, but is considerably larger than the Mini Lander. It is designed with the transducer and electronic housing fixed in a gimbal. The transducer can be tilted and trained in a pre-selected direction, controlled by two separate motors. It has large capacity for other payload such as CTD, current meters, acoustic Doppler current profilers (ADCP), hydrophones, multiple echosounders and other instruments. The Searching Lander is specially designed for deployment close to the bottom. Detailed description of the Searching Lander with instrumentation, settings, deployments and results during the cruise are given in Appendix IV.

The Landers were used with positive buoyancy and deployed with anchors. After data sampling they are retrieved by releasing them from the anchor with an acoustic releaser.

2.1.2 Lander deployment

In total, 7 deployments of the two acoustic Landers were carried out during this cruise, 4 with the Mini Lander for observations of vertical distribution and migration and 3 with the

Searching Lander for observations of behaviour around the bottom trawl. In the three first deployments of the Mini Lander, the transducer was pointed upwards, while it was pointed downwards in the last deployment. The first deployment of the Mini Lander was unsuccessful due to software problems.

When using the large Lander deployed on the seafloor with horizontally pointed transducer, detailed knowledge of the seafloor topography is vital before selecting a suitable area for the experiment. Selecting an area where trawling can be easily performed is important. Furthermore, reflections from objects at the seafloor should be avoided to be able to get clear single echoes from fish towards the sounder. The echo sounder transducer has two side lobes that can give unwanted reflections from the bottom. The deployment area should therefore be as flat as possible without hills, stones and rocks obstructing the transducer beam. It is important to select a trawl path where the trawl is clearly visible for the transducer. A Simrad multibeam (EM300/EM1002) bottom profiler system and Olex software were used to produce bottom maps of the area prior to deployment. These maps were used to find a suitable area for the experiments. Compass direction and tilt of the acoustic beam were predefined to suit the bottom profile in the area, and define the path of the passing trawl. Details about the outcome of this procedure can be found in Appendix IV.

2.2 Remotely operated TS-probe

The TS-probe is an acoustic instrument specialised for detailed measuring of the target strength of fish throughout the entire water column down to 1500 m depth. It is remotely operable through a fibre optic cable from the vessel. It can be equipped with three GPTs with transducers of preferred frequencies, but during this cruise we only applied two, 38 and 120 kHz. It is also equipped with two motors to remotely control the transducer platforms pitch and roll. This enables accurate calibration of pressure-stabilised transducers at specified depth. During this cruise the TS probe was used for profiling the water column at predefined locations. A schematic presentation of the TS-probe is given in Appendix V.

2.3 Acoustic deadzone observer

The acoustic dead zone observer is a vertically migrating, autonomous platform for collecting detailed information on fish distribution close to the seabed (se description at:
http://www.imr.no/aktiviteter/forskningsgrupper/observasjonsmetodikk/projects/akust,_dodso

ne). This was calibrated, tested and used in the experimental areas during this cruise. A total of 7 dives were performed during this cruise, one in test area west of Finnmark Oct 2, 4 in experimental area south of Bear Island Oct 9-12, and two in experimental area west of Hammerfest Oct 18-19. The duration of the dives varied from 1,5 to 12 hours. This is the first cruise where the Deadzone Observer provides data for scientific analyses. The outcome of the cruise has been a big step forward.

2.4 Biological sampling

A total of 26 bottom trawl hauls and 24 pelagic trawl hauls were taken for species identification and length samples and to study behaviour during trawling. 9 of the pelagic trawl hauls were taken with multi sampler nets. This is a device replacing the codend of the trawl, with three remotely controlled nets, which can be opened at specified depths. In addition 3 passes of Searching Lander were made with bottom trawl with open codend. The bottom trawl was a Campelen 1800 shrimp trawl with 80 mm stretched mesh size in front and a codend with 22 mm stretched mesh size. The length of the sweep wires was 40 m, and the trawl was equipped with rockhopper ground gear. Pelagic trawl hauls were taken with both Harstad trawl and modified Åkra trawl. The modifications of the latter include about 40% enlarged trawl opening, and larger mesh size in the front end compared to the standard Åkra trawl. The data from the biological samples can be found in the IMR database under the respective cruise number.

2.5 Other data

Other data from the cruise includes: the multibeam echosounder for bottom mapping, the MS70 mutibeam sonar (sporadically), data from the ships GPS system, weather data, current data from the ship mounted acoustic Doppler current profiler (ADCP) and an autonomous Aquadopp Profiler (Nortek) attached to the acoustic platforms, CTD, ships log, and trawl instrumentation. The CTD data can be found in the IMR database.

All data from the cruise are stored in external hard disks at IMR research group Observation methodology.

3. Preliminary results and discussion

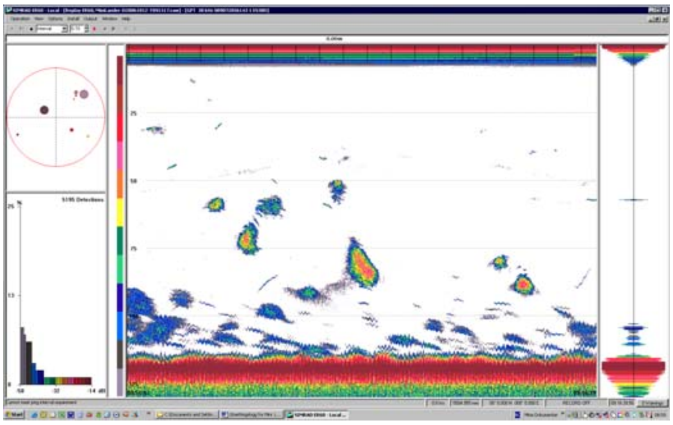
3.1 General discussion

The cruise was very successful in targeting the main objectives, except from observation of fish behaviour related to survey trawling, discussed in section 3.5 below. Extensive datasets for testing the new instrument (CatchMeter) for automatic species identification and length measuring of trawl catches were provided (Appendix VI). The work done on the new interface (IMR_map) for bringing survey data into and analysing them in ArcGIS was also fruitful, with a lot of new functionality discussed, developed and tested (Appendix VII).
The experience from this cruise demonstrated that method development cruises demand careful planning both to get the equipment ready and routines for their operation and prioritising after the cruise have been initiated. Sufficient backup activities must be included to give the possibility to adjust program according to actual natural conditions (weather and fish distribution). A majority of the equipment required high effort of preparation during the cruise before it could be used. Due to this there was a hectic activity related to technical work to get all the instruments up running, and we failed to finish preparation of the Target Tracker. This is not satisfactory for the technical personnel, which should be more involved in the data acquisition and analysis. In future methodology cruises one should aim at starting with fully operational systems requiring only small efforts of maintenance. These experiences show the importance of an early start of the planning of an experimental cruise.

3.2 Methodology for observing vertical distribution and migration of 0-group

The Mini Lander was used for observing vertical distribution and migration in the experimental areas. This resulted in new and valuable information about vertical structuring of both 0-group cod (*Gadus* morhua) and haddock (*Melanogrammus aeglefinus*), and other marine organisms. This equipment is now fully operational, and is very compact, durable and easy to launch. 0-group cod and haddock, in that order with respect to abundance in the trawl catches, dominated the recordings from south of Bear Island. There was also some capelin (*Mallotus villosus*) in the area. The general picture of vertical structuring of 0-group based on data from this area is a diurnal cycle of contraction and dispersion instead of a profound vertical migration. It is distributed in dense aggregations during daytime, and disperses throughout the water column during the night (Fig. 4).

a)



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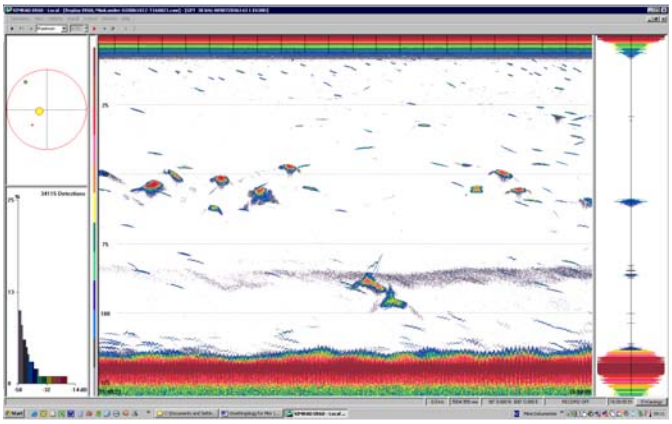

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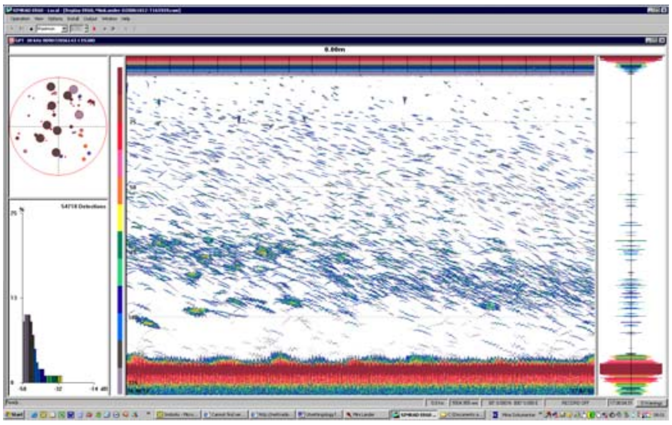

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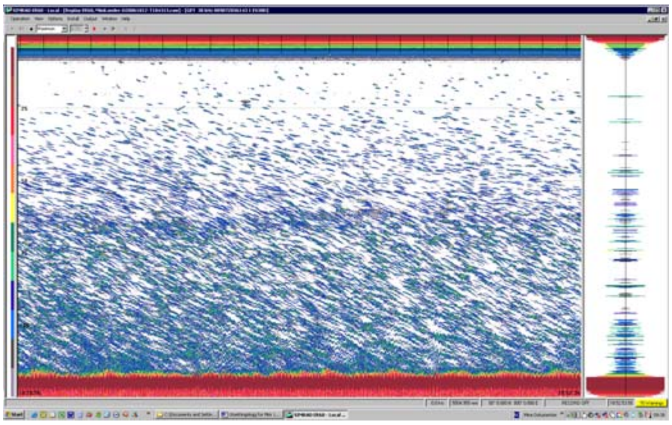

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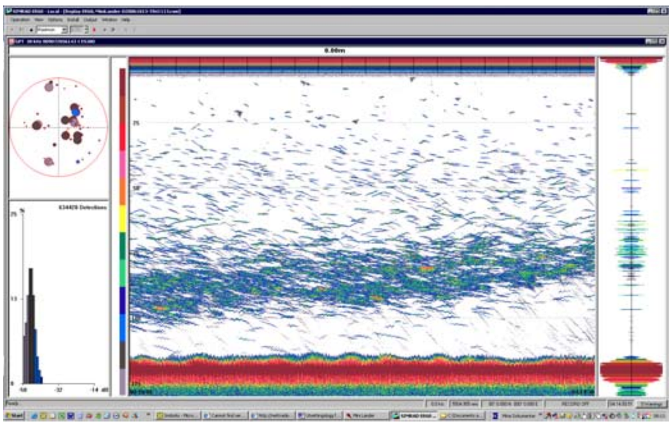


f)

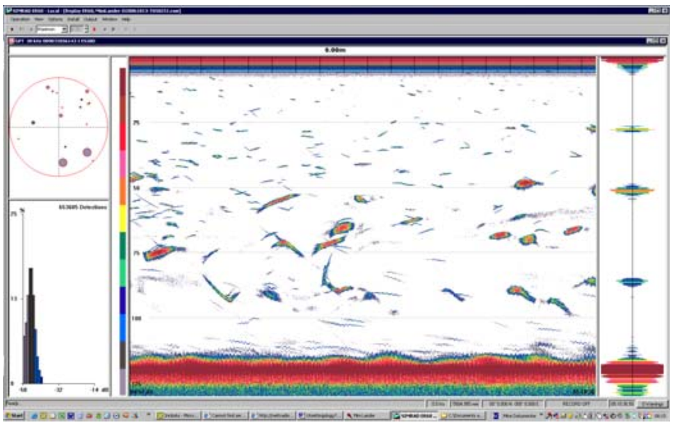


Figure 4. Echograms showing vertical distribution of 0 group in experimental area south of Bear Island Oct 12-13. The echograms are from a upwards looking transducer, so the surface is at the bottom. Different panels are from different times (local time): a) 11.16, b) 18.09, c) 19.08, d) 20.52, e) 06.14, and f) 07.10.

In the area west of Finnmark the catches was more diverse with 0-group haddock mixed with Norway pout (*Trisopterus esmarkii*), lantern fish (Myctophidae), snake pipe-fish (*Entelurus aequoreus*) and krill (Euphausiacea). The recordings from this area include a longer diurnal period, and illustrate vertical migration of some other species as well as 0-group (Fig. 5).

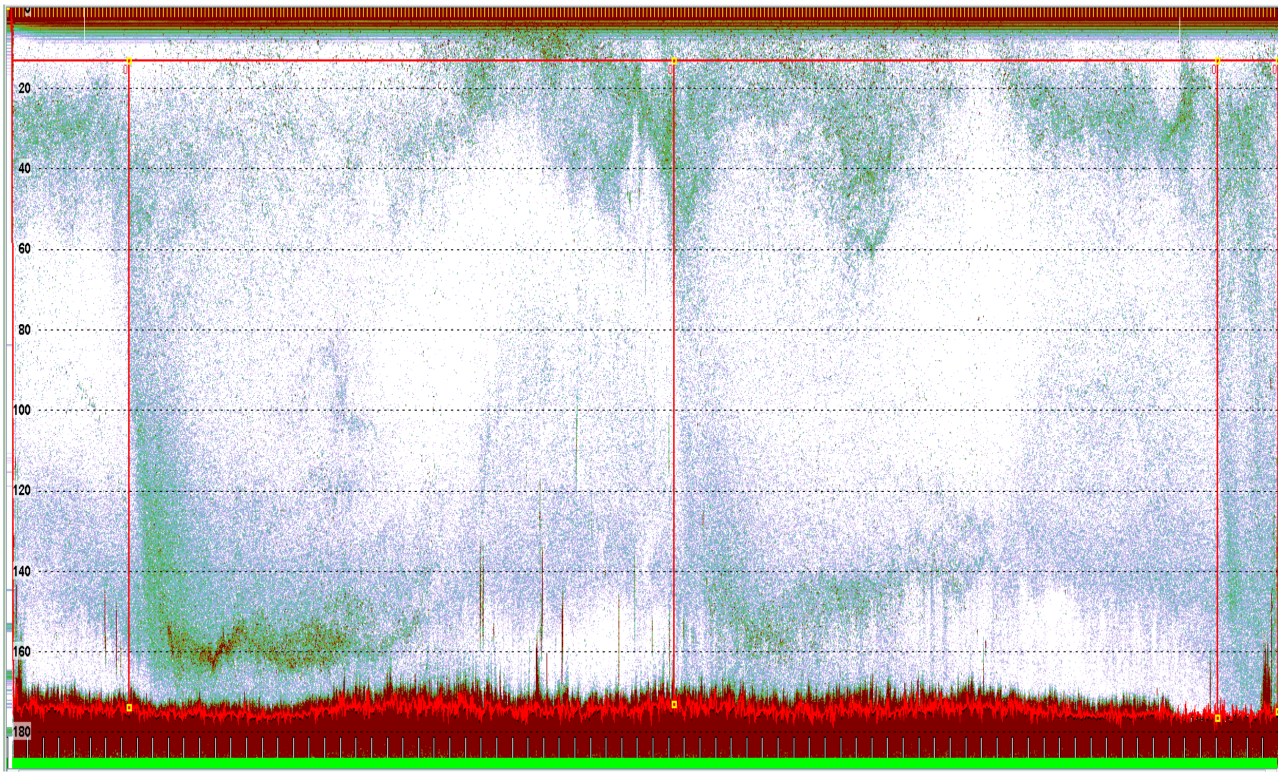


Figure 5. Echogram showing vertical dynamics of marine organisms in experimental area west of Finnmark Oct 15-17. The echogram is from a upwards looking transducer, so the surface is at the bottom. The echogram covers a period of about 56 h, the red lines mark 15.00 local time.

3.3 Methodology for acoustic profiling of the vertical size distribution in marine ecosystems

Acoustic profiling of the vertical size distribution was done with the remotely operated TS-probe in the experimental areas. This was deployed in 50 m intervals from the surface to the bottom sampling 3000 or more single targets and not less than 15 min. During bad weather conditions the upper 50 m was observed with the boats hull mounted 38 and 120 kHz transducers. This method for profiling the water column was efficient, and the cruise resulted in several acoustic profiles with associated current measures from ADCP. This data can be used to track swimming trajectories of individual fish, and obtain the TS-distribution for each individual dependent on tilt angle. An example of this is given in Figure 6. The TS-probe data can also be combined with bottom and pelagic trawl samples for further verification and comparison. Some of the samples can be related to pelagic trawl hauls with Multisampler, giving samples from different depths. Note however that we experienced problems with this device, both with the software steering and monitoring the acoustic release mechanism, and the release mechanism itself. We also suspect the catchability of the Åkra trawl to be influenced by this instrument. We recommend further testing of the Multisampler to valuate its performance.

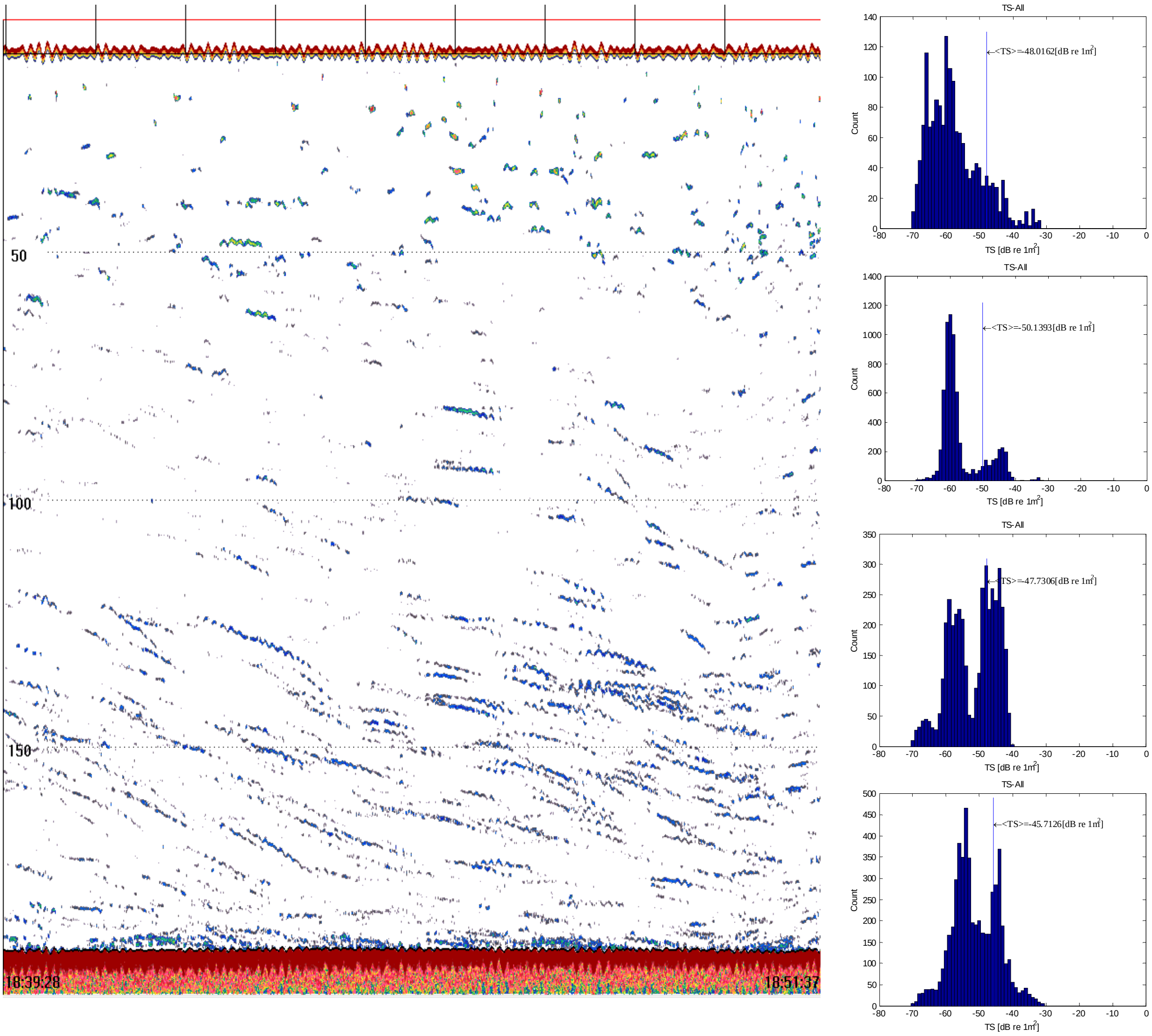


Figure 6. Example of acoustic vertical profiling from TS-probe station. The echogram is from the vessels hull mounted transducer. The histograms are TS distributions for each 50 m depth interval after tracking of single targets. The upper distribution is from the ships transducer due to weather conditions, the rest is form the TS-probe.

3.4 Influence of vertical distribution, including the acoustic dead zone, on abundance estimates of fish

In combination with the data from the Mini Lander, TS-probe and the trawls, we also obtained data from several drifts of the acoustic deadzone observer in the experimental areas. Examples of the data sampled are given in Figure 7. These date are unique, as this is the first time this equipment is used for sampling data for scientific analyses as well as one of the first direct measurements of the contribution of fish in acoustic deadzone. All the data from different sources combined with data from the ships hull mounted transducers enable a thorough analysis of different sources of error in acoustic abundance estimation of fish in standard acoustic surveys.

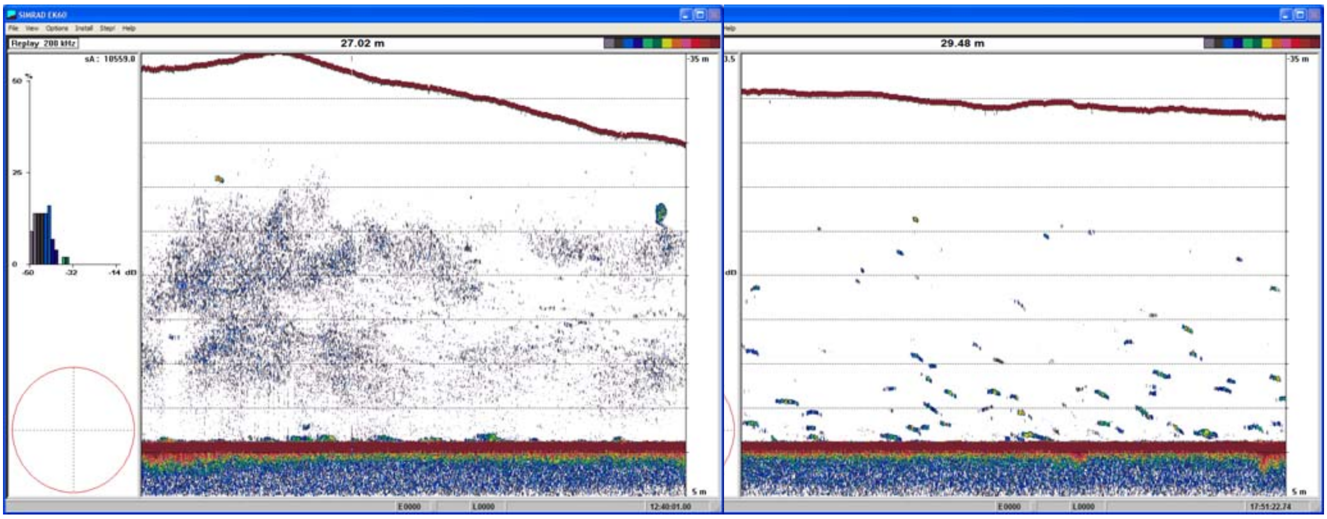


Figure 7. Example of recordings of fish in the vessels acoustic deadzone with the acoustic deadzone observer in the experimental area south of Bear Island. Daytime recording (14.30 local time) in the left echogram, and night time recording (19.51 local time) in the right.

3.5 Methodology for observation of fish behaviour related to survey trawling

We had some problems achieving this last task of the cruise plan, probably related to difficulties with the bottom conditions in the first deployment area, west of Hammerfest. Although the bottom appeared smooth in the profiles from the multi-beam echosounder, this area had large concentrations of sponges. These probably obstructed parts of the acoustic beam, as this is pointed horizontally along the bottom when using the Searching Lander. In the recordings from this area we could barley see traces of the passing bottom trawl, and fish echoes were difficult to separate. At the second location west of Finnmark, the bottom conditions were better, and the observations of the passing trawl were of good quality. However, domination of small fish in this area, made the data less suitable for behavioural observations related to surveys. The experiments were successful as a test of the new instrumentation and application of the Searching Lander. It provided valuable experience for further development and use of this equipment, concerning both the practical operation and the need for adjustments and further development of the instrumentation. Although the fish distributions were unfavourable for behavioural studies, we confirmed that the method with a horizontal looking echo sounder could provide data on fish behavioural in relation to the fish capture situation. Detailed presentation and some discussion about the results can be found in Appendix IV.

As a conclusion, the survey provided a lot of interesting data enabling further analysed of the objectives outlined above, as well as other problems related to acoustic abundance estimation in general. It also provided valuable experience in handling, deployment and data sampling when using the acoustic platforms available at IMR today. One important conclusion about further development of the acoustic systems used at this cruise is inclusion of communication channels between the platforms and the vessels. This could be brought about with an acoustic modem. This would have revealed the software problems experienced during the first deployment of the Mini Lander, where only 10 m above the transducer was recorded. It would also have greatly facilitated the correct deployment and evaluation of observation conditions for the Searching Lander, so that the tilt angle and compass direction of the transducer could have been adjusted to provide suitable observations.

The communication and cooperation with the crew of G.O. Sars was excellent, and their effort and skills are highly appreciated as a large contribution to the results obtained at this cruise.

Appendix I: Participants and Cruise plan (in Norwegian)

REVIDERT TOKTPLAN HAVFORSKNINGSINSTITUTTET

Fartøy: G.O. Sars		Toktnr.: 2006114
Avgangsdato: 01.10.2006	Avgangssted: Tromsø Avg. 16.00	
Ankomstdato: 20.10.2006	Ankomststed: Tromsø Ank. 17.00	
Anløp: 06.10.2006 Tromsø Mannskapsskifte Avg. 16.00		
Dekningsområde: Barentshavet		
Formål: Utprøving av fangstmåler (Catchmeter). Kvantifisering av akustisk dødsone. Studere betydningen av vertikal fordeling for bestandsestimering. Kvantifisering av vertikalvandring og migrasjon hos 0-gruppe. Observasjon av atferd rundt bunntrål. Akustisk informasjon for vertikal arts og størrelsesfordeling.		
Deltakernavn:	Avdeling/gruppe:	Tidsrom:
Geir Odd Johansen	410 FG Observasjonsmetodikk	01.10-20.10.2006
Olav Rune Godø	410 FG Observasjonsmetodikk	06.10-20.10.2006
Geir Pedersen	410 FG Observasjonsmetodikk	06.10-20.10.2006
Ole N. Staurland Aarbakke	410 FG Observasjonsmetodikk	01.10-20.10.2006
Terje Torkelsen	307 Observasjonsteknologi	01.10-20.10.2006
Atle Totland	307 Observasjonsteknologi	01.10-20.10.2006
Jan Tore Øvredal	307 Observasjonsteknologi	01.10-06.10.2006
Harald Fitje	Driftsteknisk seksjon - Bergen	01.10-06.10.2006
Hans Petter Knudsen	Fartøysinstrumentering	01.10-20.10.2006
Asgeir Steinsland	Fartøysinstrumentering	01.10-20.10.2006
Hildegunn Græsdal	FTG Bunnfisk	01.10-20.10.2006
Ole O. Arnøy	FTG Bunnfisk	01.10-20.10.2006
Trond Westgård	FG Oseanografi og Klima	06.10-20.10.2006

Toktleder: Geir Odd Johansen Toktkoordinator: Egil Ona
Gjester: Anette Mauno Johansen, Kvaløya videregående skole, Tromsø. 01.10-14.10.2006 Therese-Mari Sølversen Isaksen, Kvaløya videregående skole, Tromsø. 01.10-20.06.2006 Ingvill Storås, Kvaløya videregående skole, Tromsø. 06.10-20.10.2006 Cato Svellingen, Scantrol, Bergen. 01.10-06.10.2006 Richard J. Wawrzonek, NMFS Alaska Fisheries Science Center, Seattle. 01.10-06.10.2006
Prosjektnr. og prosentandel: 10242 (87%), 11291 (1%), 10086 (12%)

Appendix II: Resume of the status of the acoustic platforms at the beginning of the cruise and the work done

Mini Lander:

Status at the start of the cruise:

- A empty Small Lander frame modified for the new: -**Mini Lander**
- All the necessary mechanical parts for modification of Small Lander to new Mini Lander

Work done:

- New carbon battery container with 54 pcs of 9,5 a/h batteries were installed in the centre of the gravity of the frame. The battery bank has a capacity sufficient to supply the Lander for 64 hours.
- GPT and computer were installed in new Aluminium container, and installed in the frame
- New stabilized transducer gimbal platform was installed.
- Additional flotation were added to the frame
- Software was installed, the rigging of the entire system was completed and successful sea trials were performed.

Searching Lander:

Status at the start of the cruise:

- Standard Lander with fixt angled transducer were available
- Aluminium container for GPT and computer were available.
- All necessary mechanical parts to make Searching Lander were available.

Work done:

- Old Lander frame was rebuilt for Searching Lander.
- Motors for tilting and training of the transducer were assembled.
- Tilting and training mechanism with gimbal was assembled

- Battery container was moved to the bottom of the frame.
- Flotation spheres were installed on the frame.
- The training mechanism was balanced for correct angle.
- Preliminary software was made for control of the motor according to angle measured by the sensor module.
- Successful deployments were made with system preset to transducer pointing in fixt tilt and fixt bearing.

Deadzone observer:

Status at the start of the cruise:

During last years methodology cruise on RV Johan Hjort we had an unsuccessful dive where the Observer went to the bottom and had to be retrieved by RV G.O. Sars. RV Johan Hjort does not have the equipment needed to locate the position of the Observers onboard HPR emergency transponder. Since last year a number of improvements have been introduced to the Observer and a successful test cruise was performed in the spring of 2006. The improvements are:

- Air pockets can now be easily removed from the buoyancy systems hydraulic oil. Last years unsuccessful dive was due to an accumulation of air bobbles in the buoyancy pump house after the Observer had been transported horizontally.
- A new transport frame has been made, allowing the Observer to be transported vertically.
- A so-called “watch dog” circuit has been made. In combination with software updates it will make the Observer surface if there is some sort of software “hang”.
- The Observer control software has been modified for a better and more accurate buoyancy regulation.
- The battery circuit boards have been modified for more reliable data connection to the external charging software.
- The charger has been modified to avoid the possibility of causing damage as a result of incorrect use.
- Coupling of pressure air for cooling during charging has been made very easy by the introduction of “snap on” connectors.

Work done:

- After the first deployment early in the cruise it was discovered that no data connection could be established between the external charging software and the battery circuit boards, thus preventing charging of the batteries. The battery was taken out of the Observer and several defect components were replaced. A representative from Marine Innovation AS came onboard and the repair work turned out to be successful.
- During the repair of the battery system an error in the charging software was discovered. This error was later fixed, resulting in removal of some previous data connection problems.
- Charging the batteries turned out to be very time consuming due to rapid overheating. The cooling time between charging sessions turned out to exceed charging time. The charging current had to be set low to avoid rapid heating. The DC-DC converters are causing the problems. They are located too close to some of the battery cells. The problem can easily be removed by moving the converters away from the batteries. This will be done before the next cruise.
- The echo sounder was successfully calibrated on 6/10 –06
- The Observer PC booted during dive 2, resulting in a premature ascend after 1,5 hour (the new watch dog circuit functioned as intended). This error has one of the following explanations:
  1) Bad power connection to the PC
  2) Problem with the PC hardware or Windows2000

  The problem will be looked into and fixed before the next cruise.
- As a result of the premature ascend during Dive 2 a modified version of the dzone.exe software was made. If the PC boots during a dive an emergency message together with GPS data will be sent to the ship. This new function was tested and works as planned.
- A minor bug in the Observer software was discovered during dive 3. The Observer attempts to send position data through the Iridium when submerged. This error was corrected.
- The Iridium communication turned out to work better that assumed. Even in extremely rough seas the communication was just as stable as in good weather and calm sea.

- A new safer rigging of the Observer was used. A flag buoy with flash and radar reflector was attached to the Observer with a thin line. This made it easy to locate the whereabouts of Observer from the ship at any time. During dive6 and 7 the flag buoy did however have an influence on the Observer due to strong currents. This problem can however be reduced by:
  1) Using a flag buoy with less drag in the sea (already made)
  2) Only use a line of a length just a little longer than the maximum depth in the experiment area.

Appendix III: Deployment-log for Mini Lander

Content:

Introduction

Stationary acoustic platform (Lander)

The Landers was originally designed and made for the MAR-ECO cruise, which took place the summer of 2004. The technology with upward pointed transducer was developed for the Ocean HUB project where it was used for monitoring the spring spawning herring stock in Ofotfjorden. Ocean HUB was launched in September 2002. Since then particular algorithms for extracting of data have been developed, and valuable experience regarding interpretation of data is gained. The Mini Lander is made for short-term deployments, with limited battery capacity, single echo sounder frequency, and limited payload.. The Lander was originally made with the transducers pointing upwards, but Mini Lander is modified so the user can select if the transducer shall be deployed with transducer pointing upwards or downwards, prior to deployment.

Lander instrumentation and settings

The Landers was set up with standard instrumentation: Computer with ER60 software, 38 kHz split beam GPT and ES38DD transducer. A sensor unit within a separate pressure container consisting of compass, inclinometer and depth sensor is installed, and data from the sensor is saved to a separate file for reference. The instruments are installed in a pressure housing, and batteries with capacity of 486 A/h are installed in a separate carbon fiber container. Settings of the instruments in the Mini Landers prior to deployment are selected for the actual area and measure situation. Range, ping rate, and transmit power of the echo sounder are selected from an external computer by using Ethernet and Net-Up remote control program. The Landers are pre-programmed to start transmitting at 10 meters depth. This prevents damage to the transducer due to transmitting above the water surface. Signals from the depth sensor are used to control this function.

Lander deployment

The Mini Landers can be deployed in two ways: Downwards looking transducer, with transducer horizontal stabilized with a gimbal, or upwards looking transducer with fixt transducer. In both cases the Mini Lander is positive buoyancy, dropped with an acoustic release connected to a weight. When deployed looking downward, the Mini Lander is suspended to the anchor in a 100 meter long nylon rope: Nylon is transparent to acoustic signals, and do not give disturbing reflections in the sounder picture.

Structure in data files

All data from the Mini Lander was saved on a portable hard disc. Data is also saved on my personal laptop as backup. During the cruise, the acoustic data files were also stored in the local computer in the Mini Lander, also for backup.
All Lander data from this cruise is also saved on a separate DVD

Acoustic release

IXSEA	AR 861 B2S
Serial no:	301
Arming Code:	1421
Release Code:	1455

Anchoring

Weight:	one railroad wheel, 300 kg,
Chain:	app 1 meter
Sinking rate	0,8 meter/sec
Rising rate:	1 meter/sec

1st deployment

Setup

EK60 setup

Scale:	150 m
Pulse length:	256 ms
Ping rate:	1 sec
Suspension:	Normal, looking up.
Height above bottom:	14 m
Height above fish reg:	-
Bottom depth:	136 m
Suspension:	12 m rope
Cal sphere:	-
Payload:	Nortek Aquadop CTD

Deployed:	9 October at 18:15 UTC.
Ships Log:	-
Retrieved:	11 October at ??:?? UTC.
Position:	N 73° 56,39’
	W 019° 02,27’
Location:	Bjørnøya

Lander level:	Roll: 7°
	Pitch: 17°

Pitch: Positive pitch: Forward part of transducer tilting down
Roll: Positive roll: Port side of transducer tilting down

Deployment area

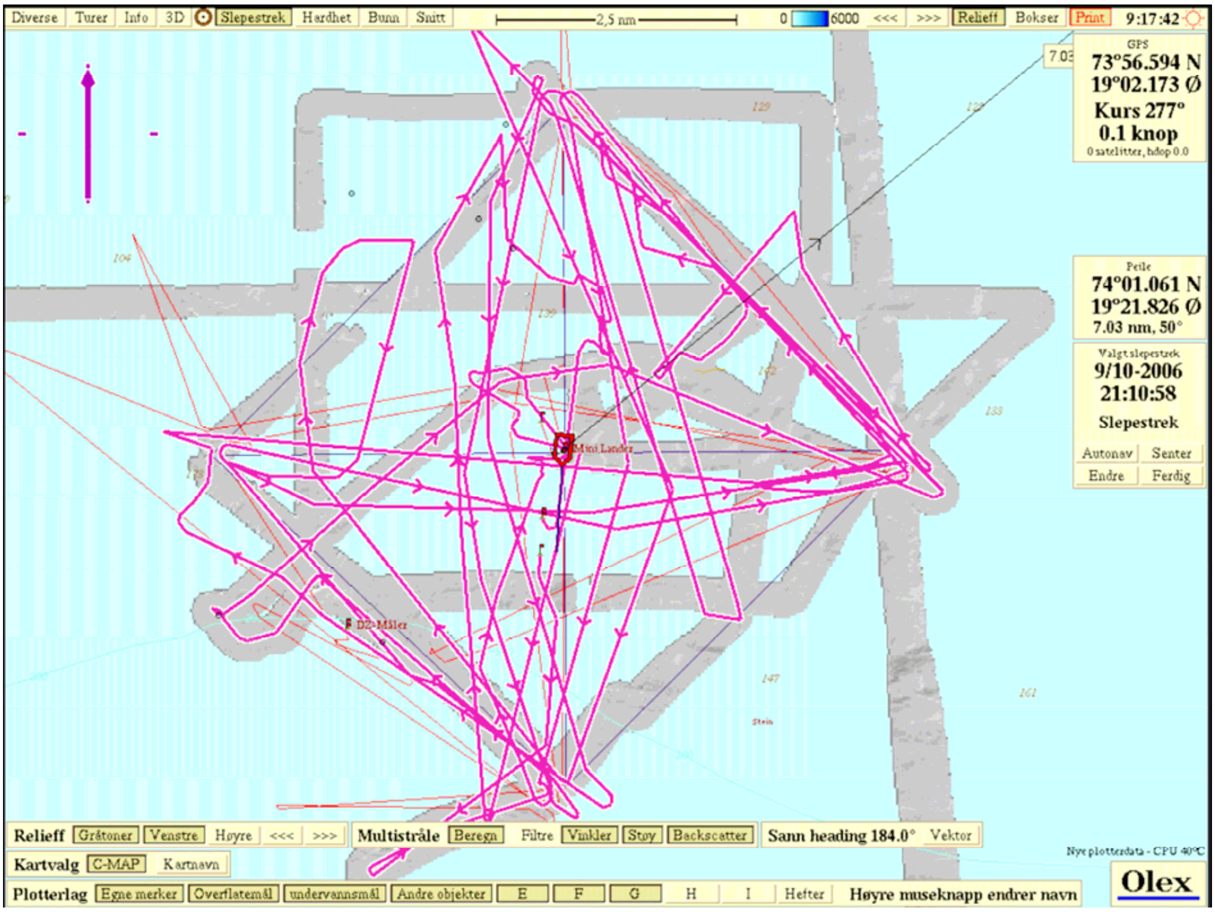


Fig. 1: Map over the deployment area at Bjørnøya.

Sensor data

Data from EZ compass shows that the Pitch angle of the Mini Lander is 17° and roll angle is 7°

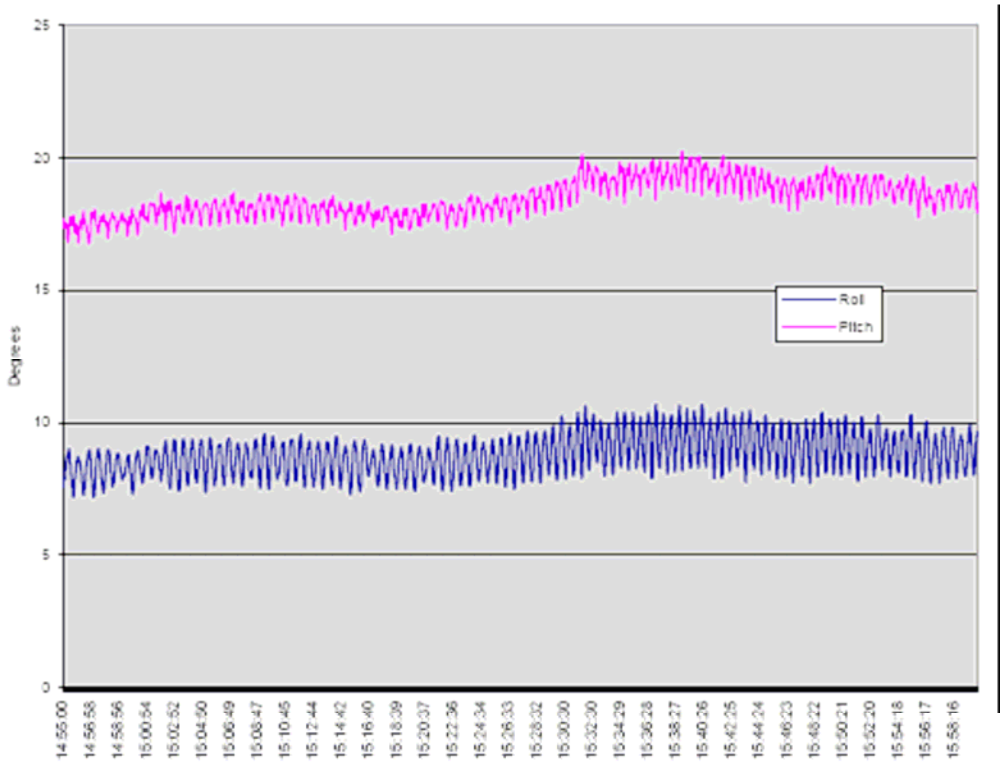


Fig. 2: Inclinometer data

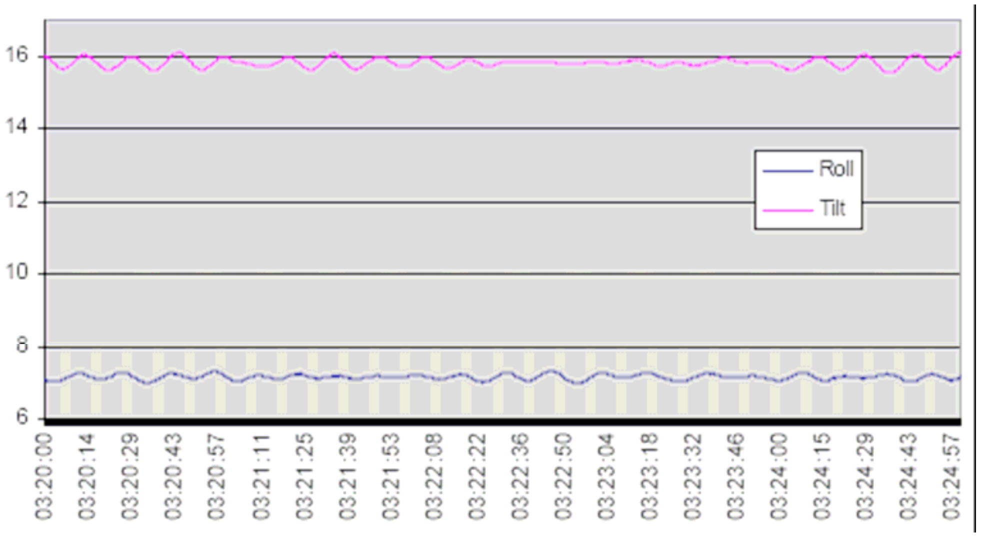


Fig. 3: Movements of Lander

Screen dumps

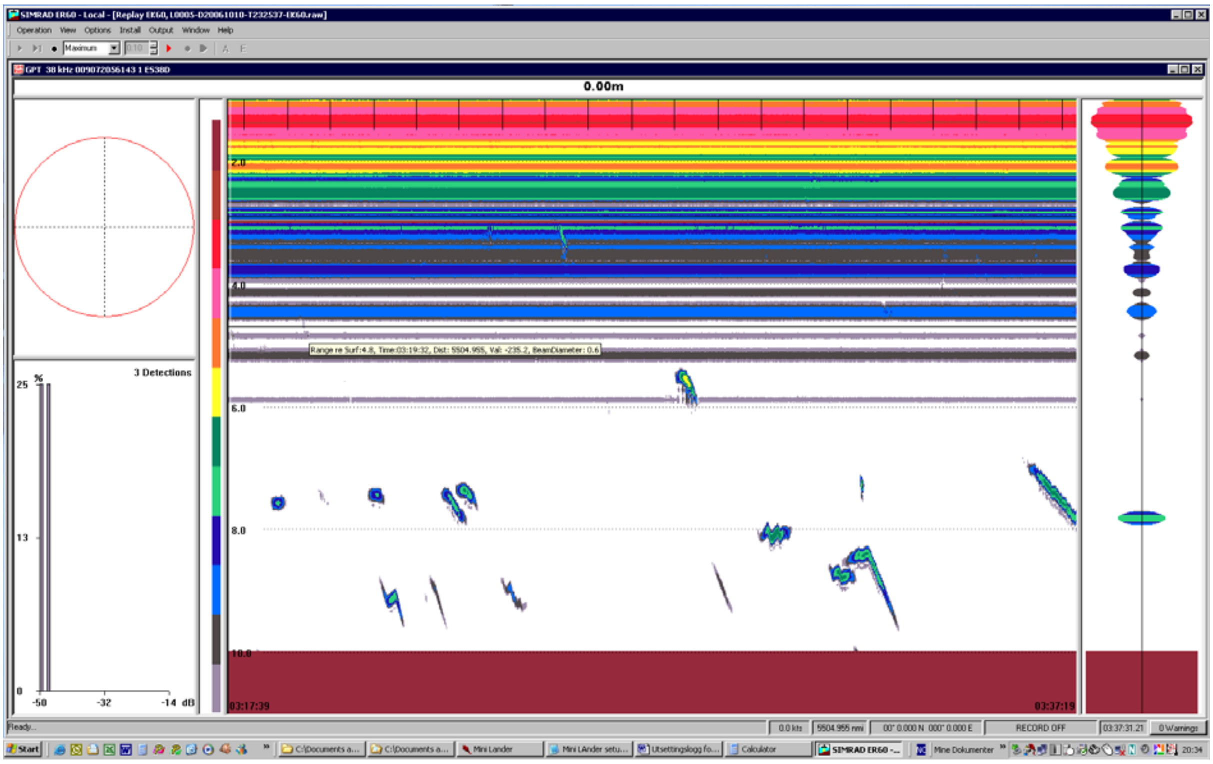


Fig. 4: Echogram at 03:30 UTC

Even if only 10 meters was saved, we could clearly see that the fish disappeared from the area around 4 in the morning, and little echoes was detected until the sounder stopped at 11:16 UTC

Corrections made

The EK60 had only saved data down to 10 meters depth even if the range of the sounder was set to 150 meters.

We could not figure out why this happened, so we decided to install and use Simrad ER60 software version: 2.1.1

This was working during test, prior to next deployment

Also two 8 litres trawl spheres were attached to the same side as the GPT container for better balance of the Mini Lander.

2nd deployment

Setup

ER60 setup

Scale:	200 m
Pulse length:	256 ms
Ping rate:	1 sec
Suspension:	Normal, looking up.
Height above bottom:	15 m
Height above fish reg:	-
Bottom depth:	136 m
Suspension:	12 m rope
Cal sphere:	Non
Payload:	Nortek Aquadop CTD

Deployed:	12 October at 08:24 UTC.
Retrieved:	13 October at 17:50 UTC.
Position:	N 73° 56,56’
	W 019° 02,17’
Location:	Bjørnøya
Acoustic station	042

Compass direction:	Bow is forward on the transducer
Positive pitch:	Forward part of transducer tilting down
Positive roll:	Port side of transducer tilting down

Sensor data

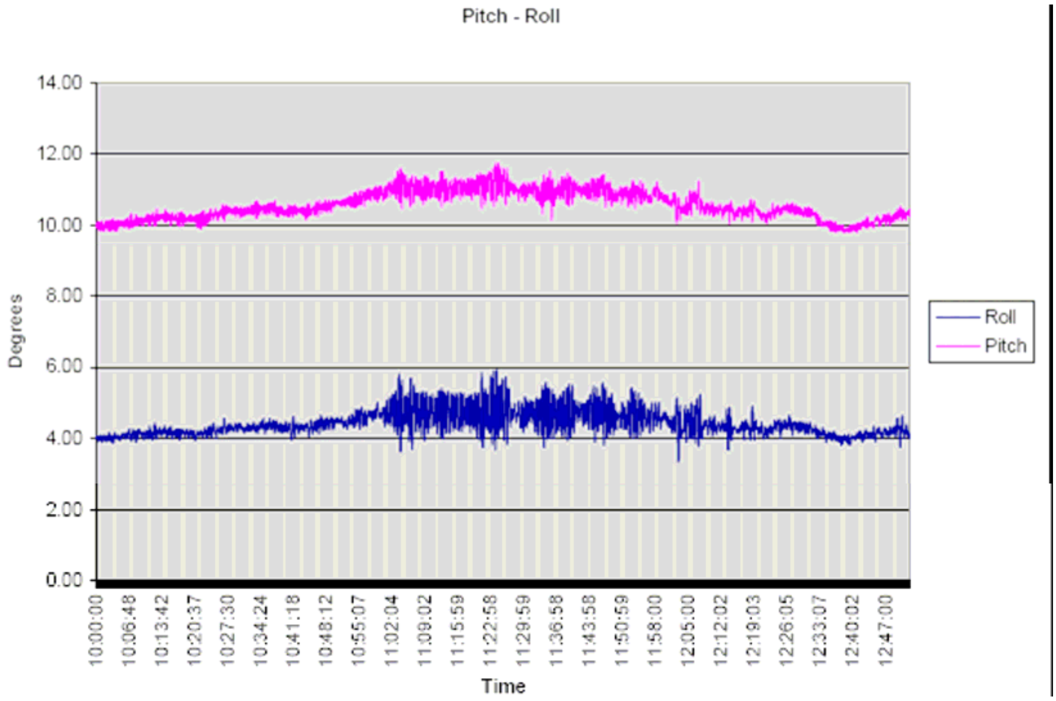


Fig. 5: Inclinometer data

Corrections

The first deployment shows that the Lander is tilting down forwards.

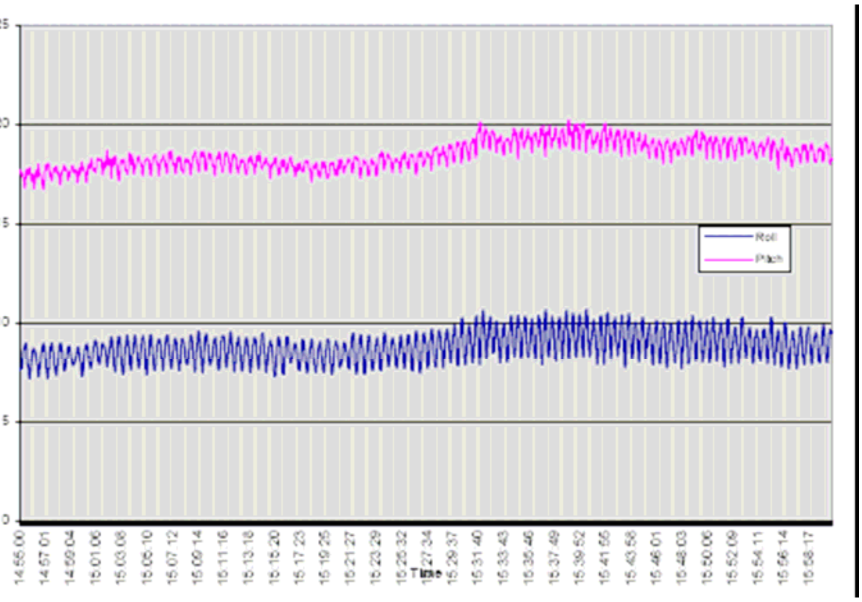


Fig. 6: Inclinometer from 1st. Deployment

Two 8 litre trawl sphere were added to each side of the GPT container giving better angle level

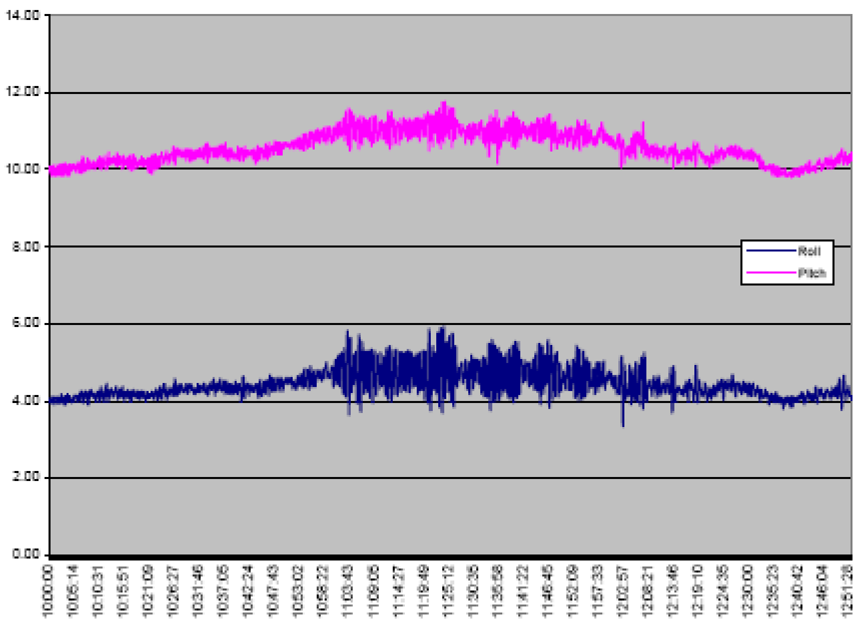


Fig. 7: Inclinometer from 2nd. Deployment

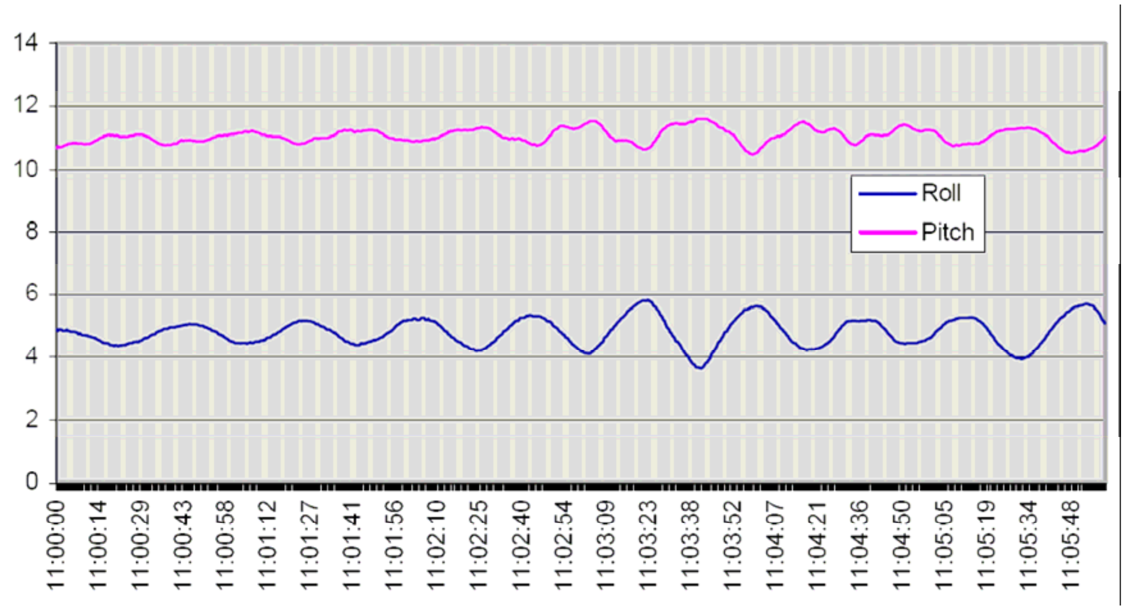


Fig. 8: Movements of Lander

Screen dumps

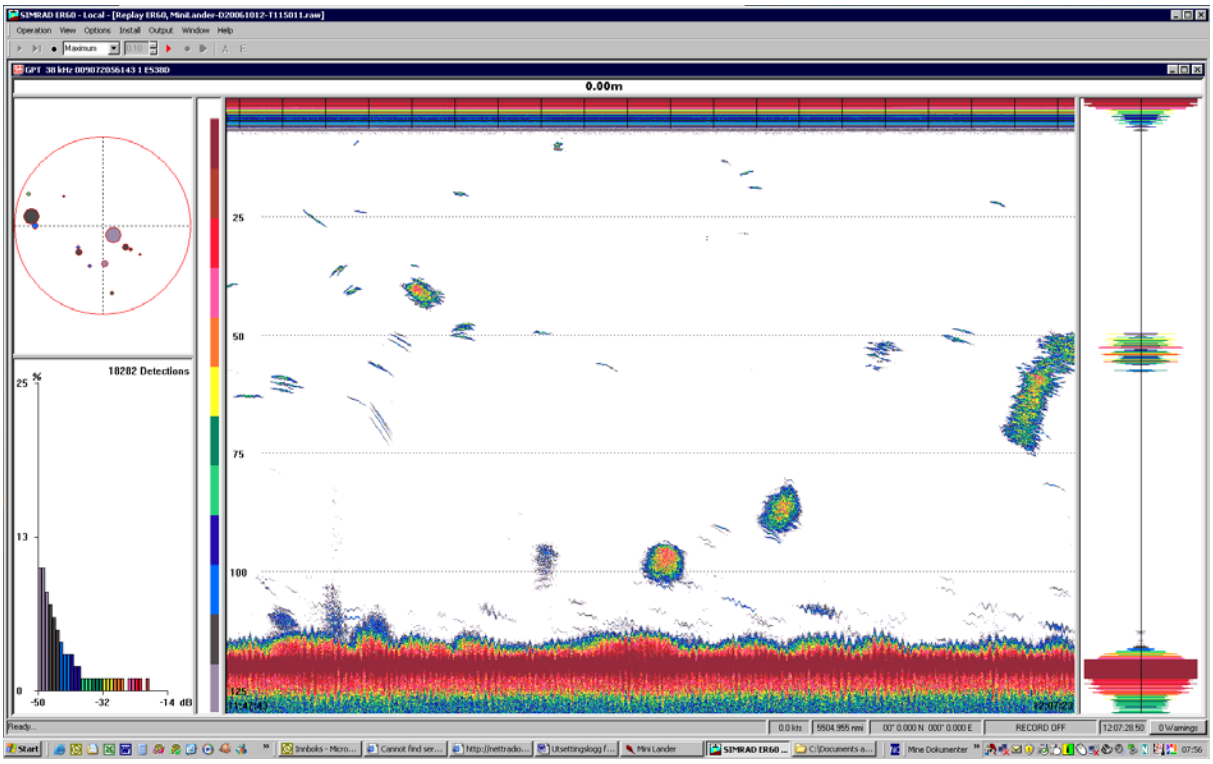


Fig. 9: At 12:07 UTC

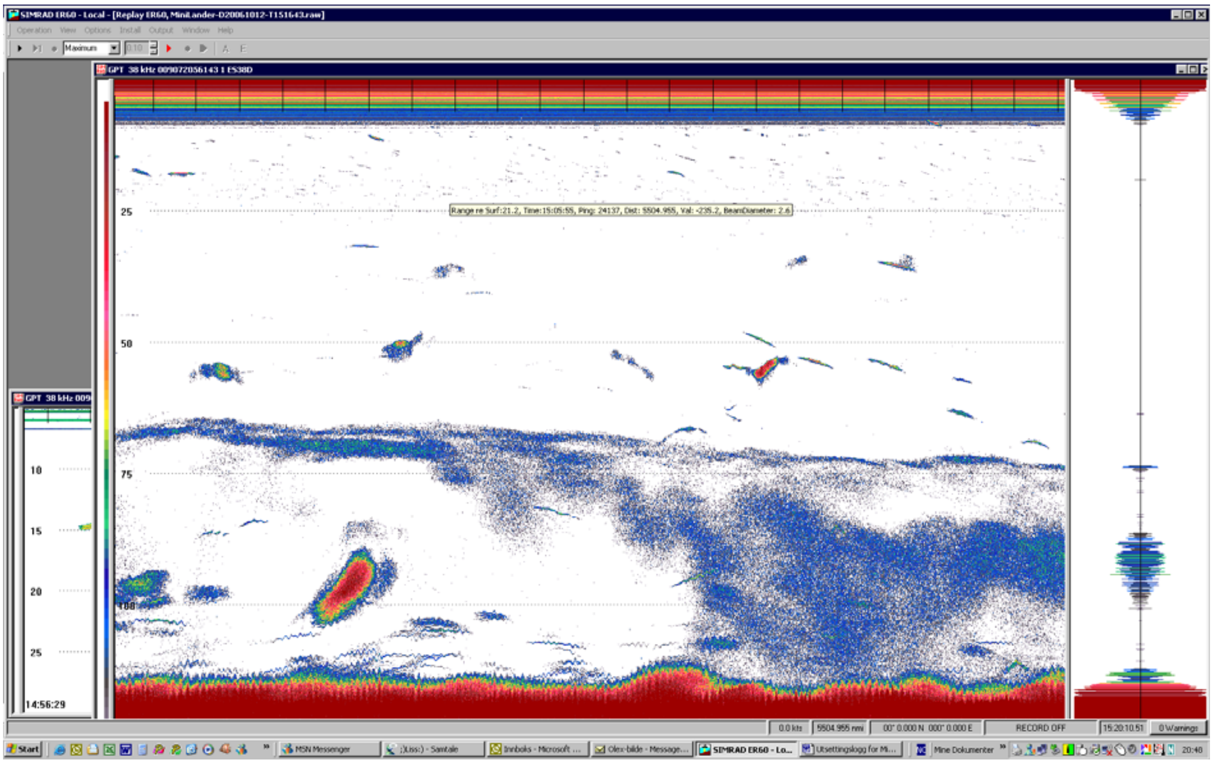


Fig. 10: At 15:20 UTC

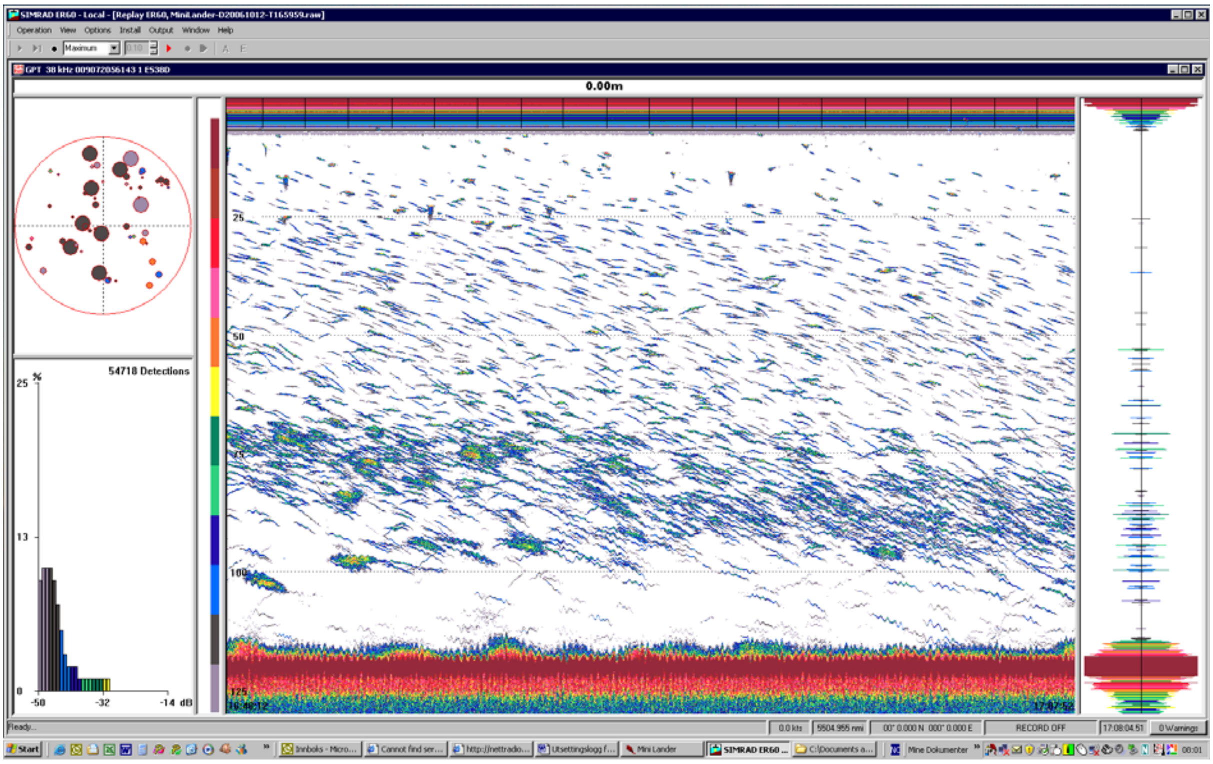


Fig. 11: At 17:08 UTC

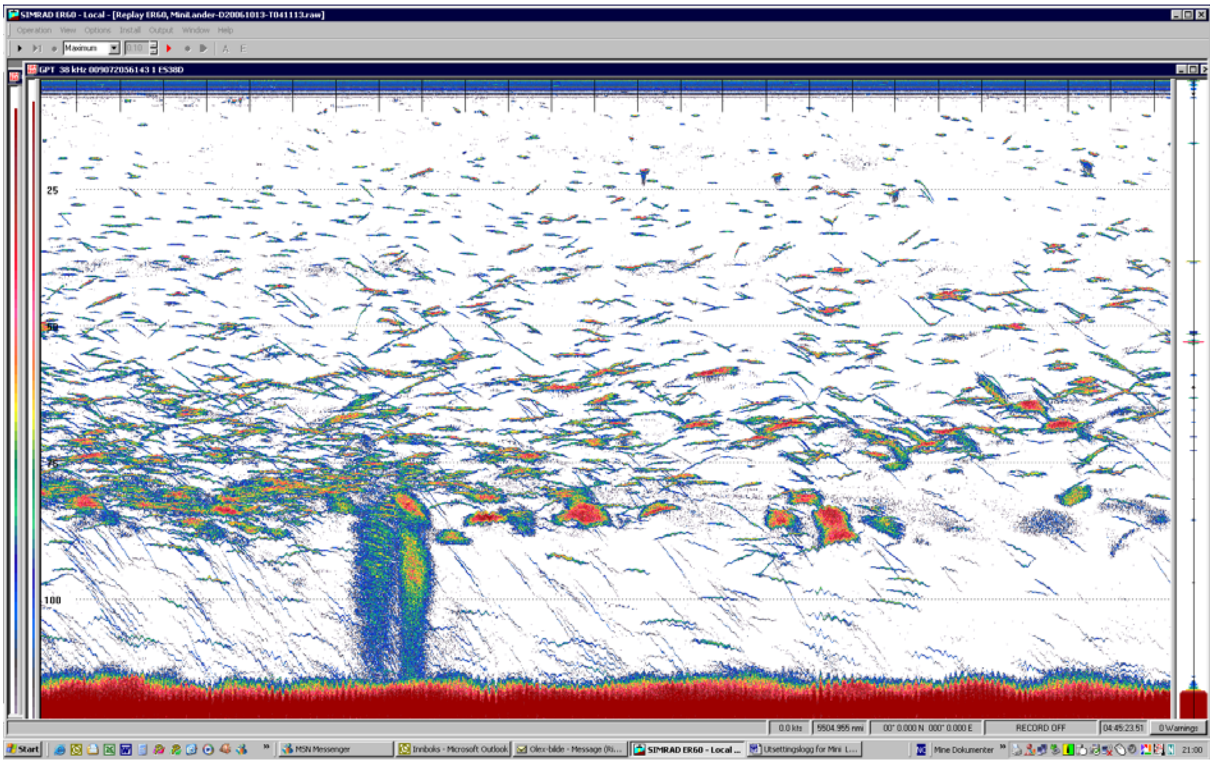


Fig. 12: At 04:45 UTC

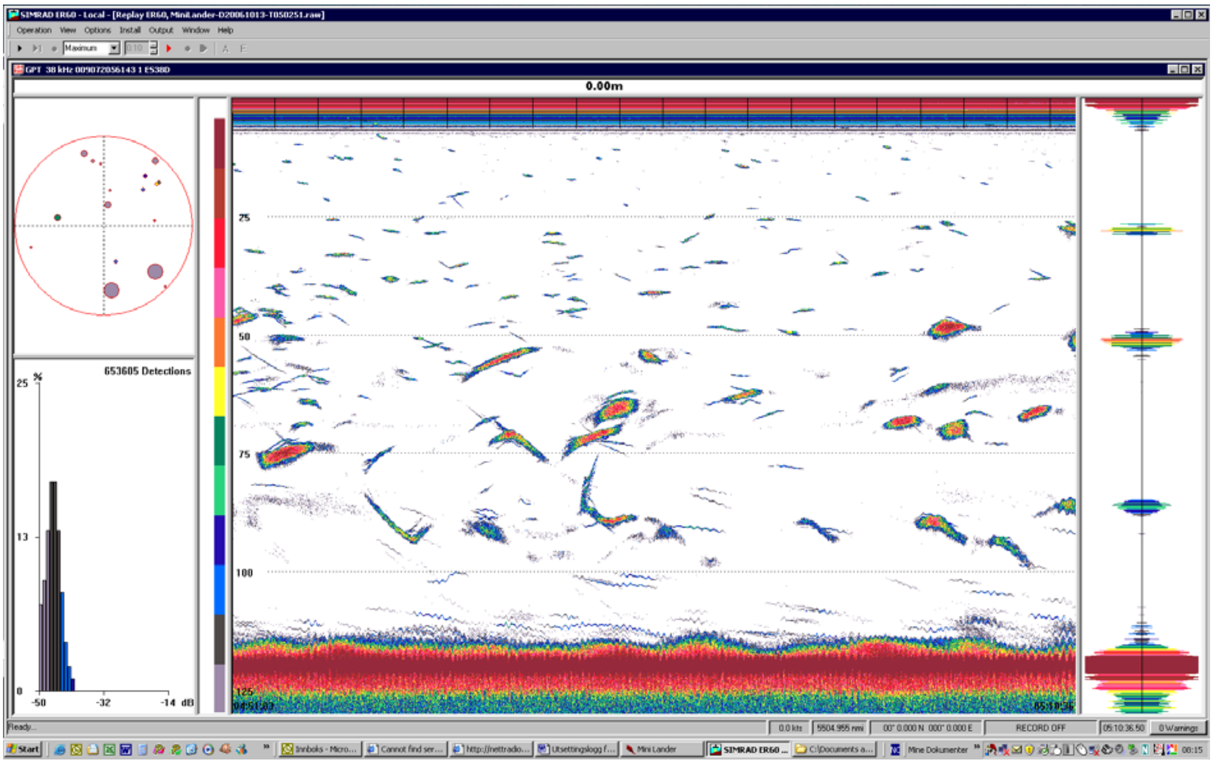


Fig. 13: At 05:10 UTC

3rd deployment

Setup

ER60 setup

Scale:	250 m
Pulse length:	256 ms
Ping rate:	1 sec
Suspension:	Normal, looking up.
Height above bottom:	15 m
Height above fish reg:	-
Bottom depth:	195 m
Suspension:	12 m rope
Cal sphere:	Non
Payload:	Nortek Aquadop CTD

Deployed:	15 October at 09:50 UTC.
Retrieved:	17 October at 18:12 UTC.
Position:	N 70° 57,51’
	W 020° 33,48’
Location:	Vestbanken
Acoustic station	

Compass direction:	Bow is forward on the transducer
Positive pitch:	Forward part of transducer tilting down
Positive roll:	Port side of transducer tilting down

Lander Ini fil

Mini Lander Ini fil

COM port - Magnetometer : 2
COM port - Pressure and depth : 1
COM port - EK60 trigging : 3
Data storage directory : C:\LanderData\
Roll offset (degrees) : 0
Pitch offset (degrees) : 0
Compass offset (degrees) : 0
Depth when file log interval DT sensor is to be reduced (m) : 150
Reduced file log interval DT sensor (when deployed at bottom) (sec) : 20
Start depth EK60 pinging (m) : 10
EK60 path : G:\ek60\ek60.exe
EK60 trigging interval (ms) : 100

D

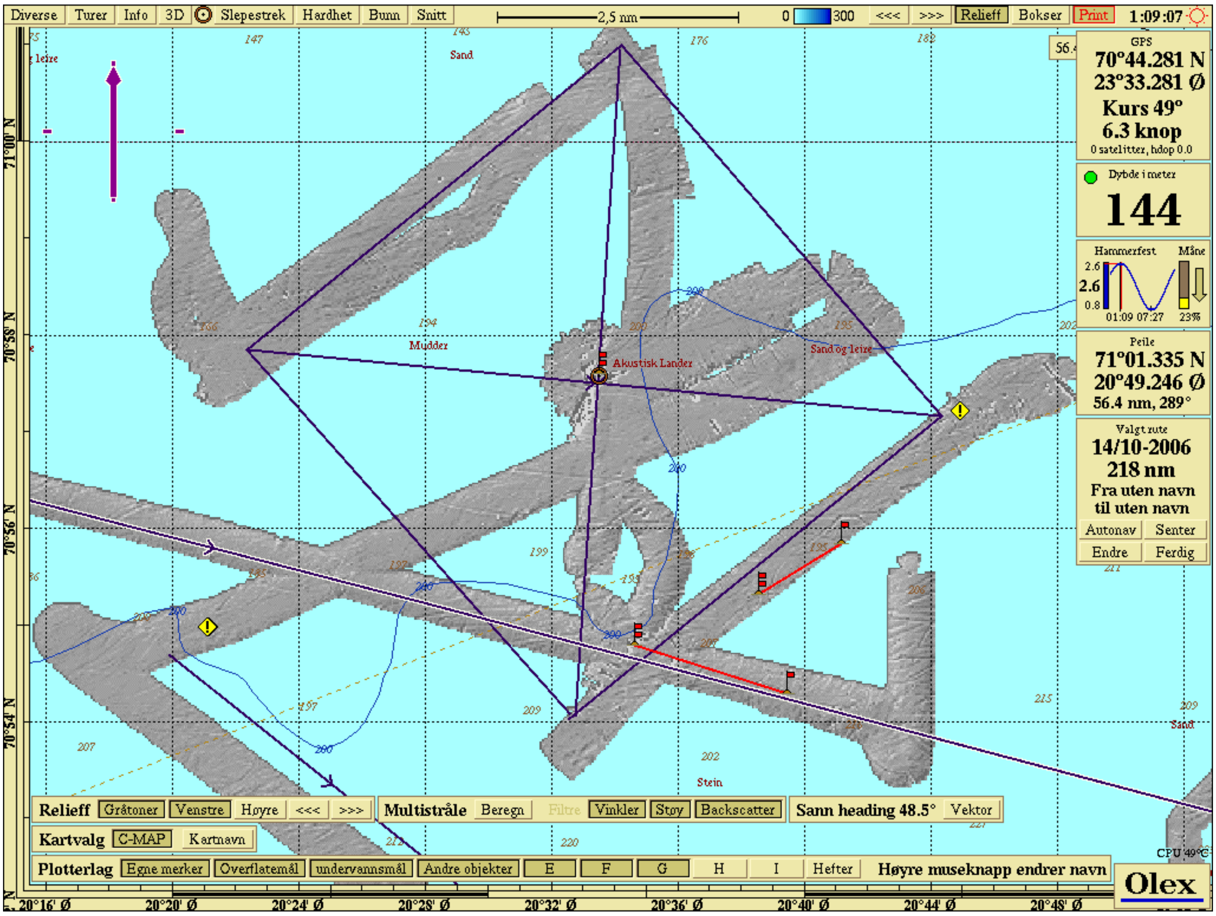


Fig. 14: Deployment area at Vestbanken

Sensor data

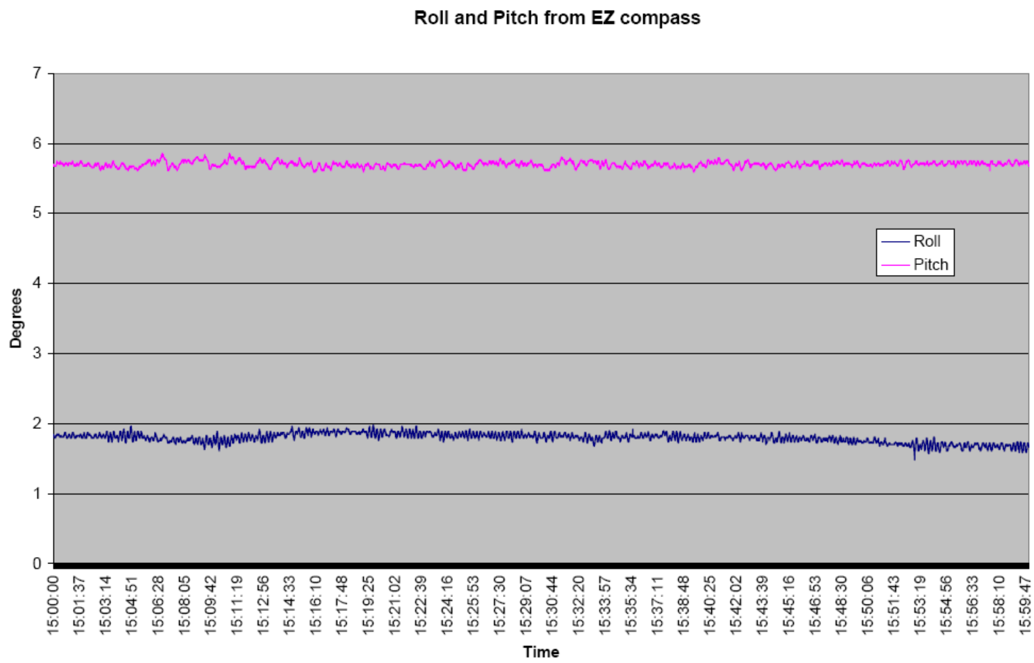


Fig. 15: Sensordata

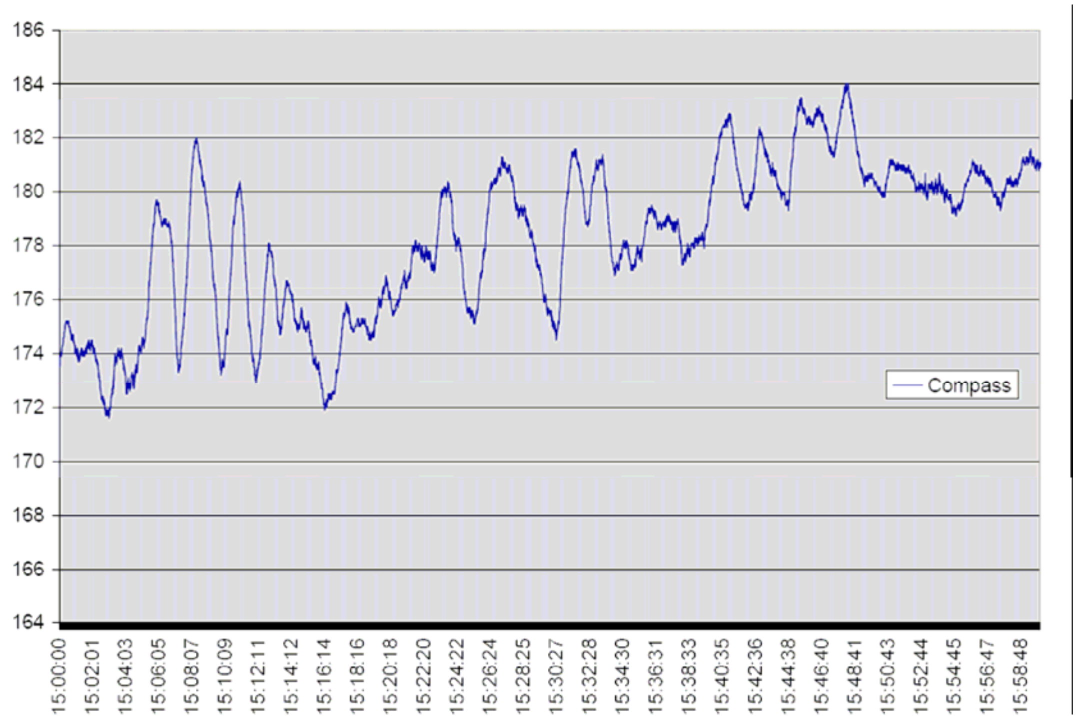


Fig. 16: Compass data

3.5.Screen dumps

Timebase: App 25 min across the screen.

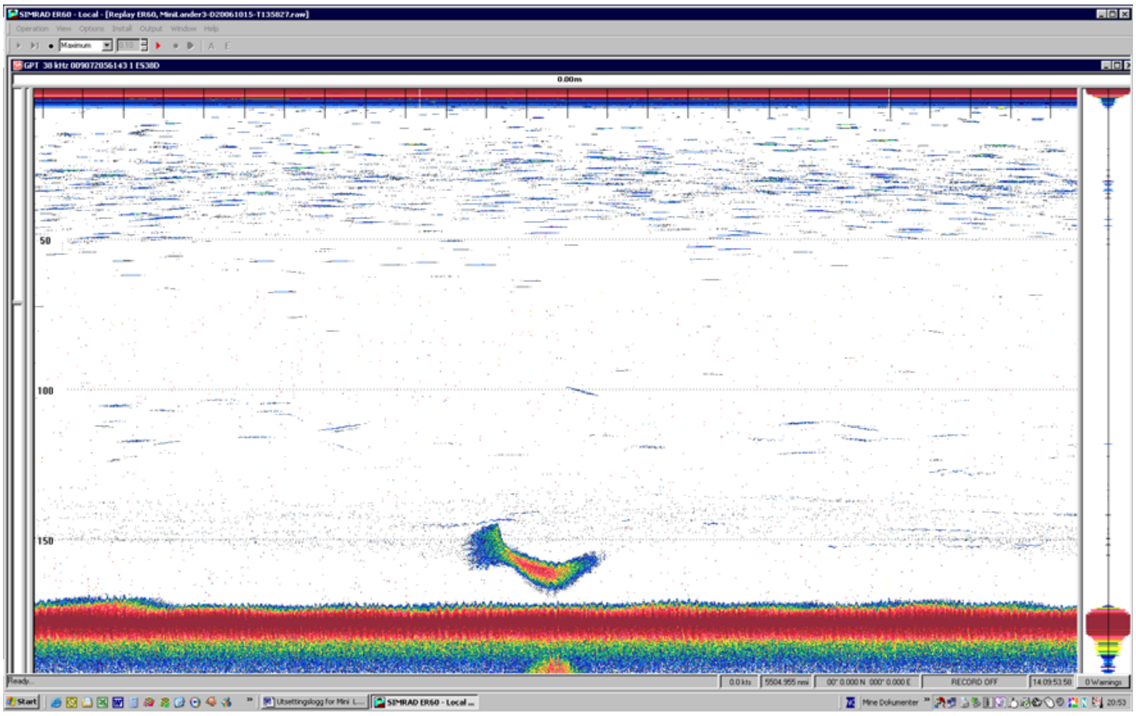


Fig. 17: At 14:09 UTC

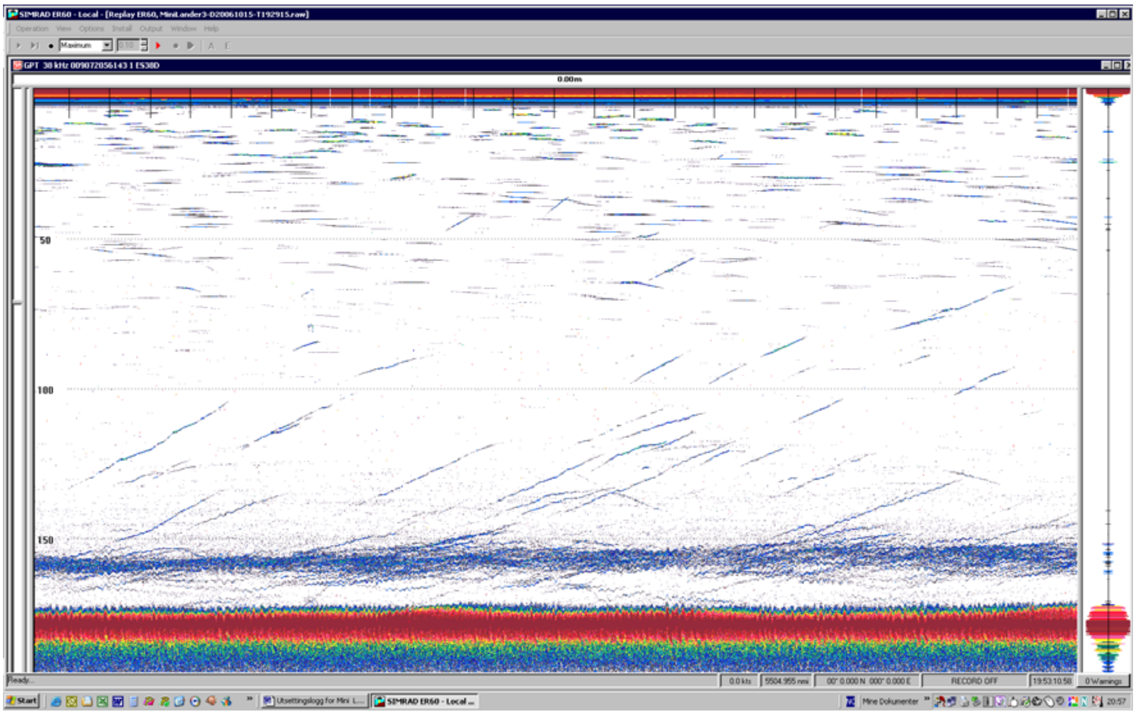


Fig. 18: At 19:53 UTC

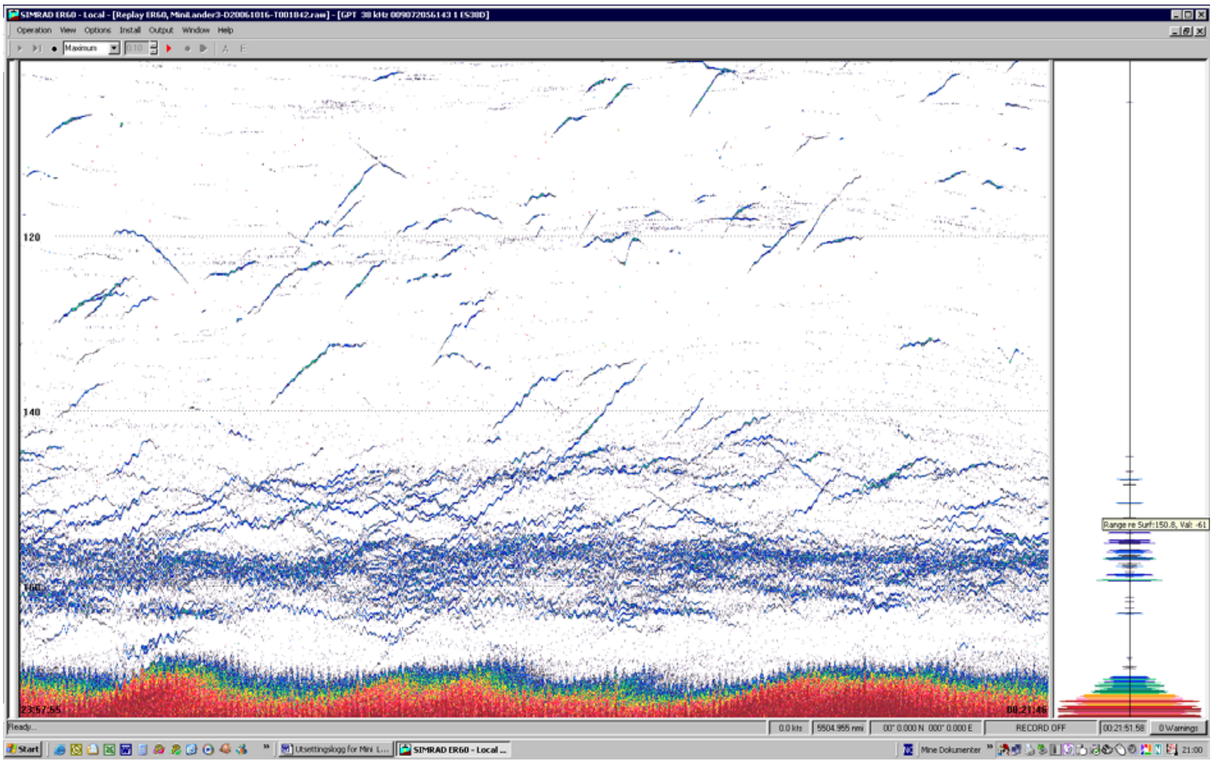


Fig. 19: At 00:21 UTC

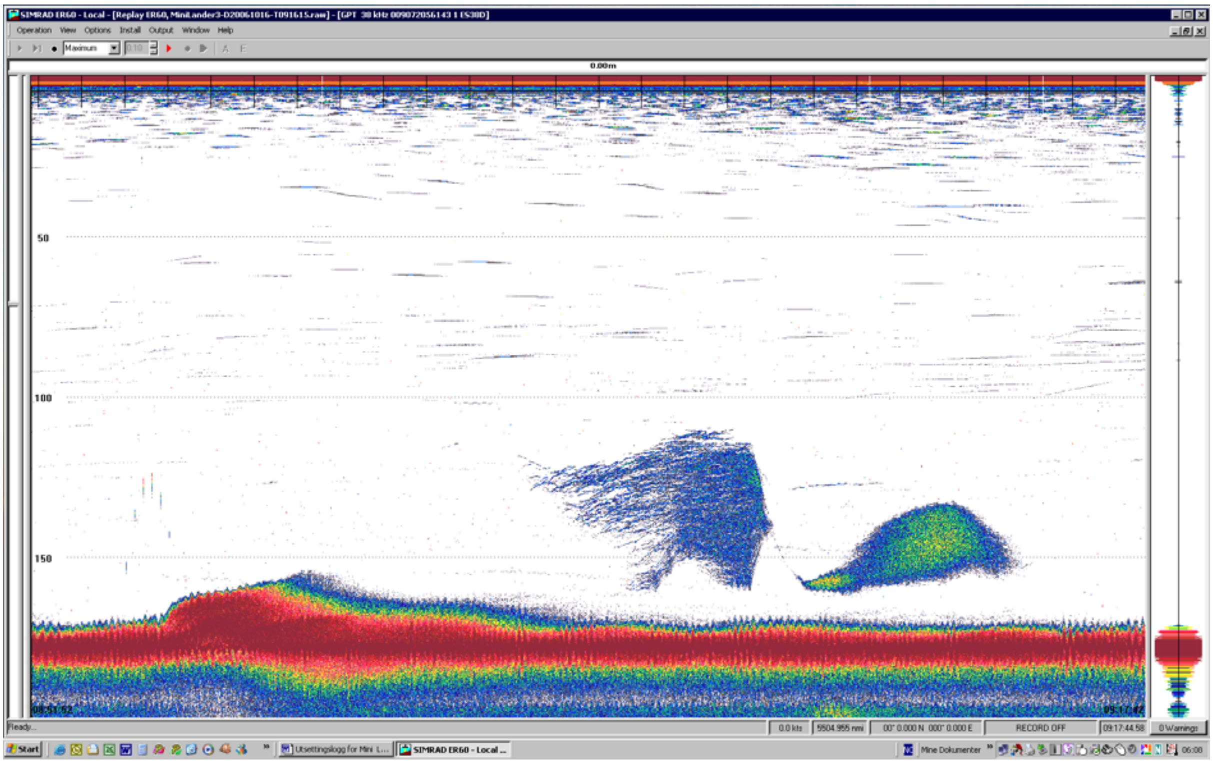


Fig. 20: At 09:17 UTC

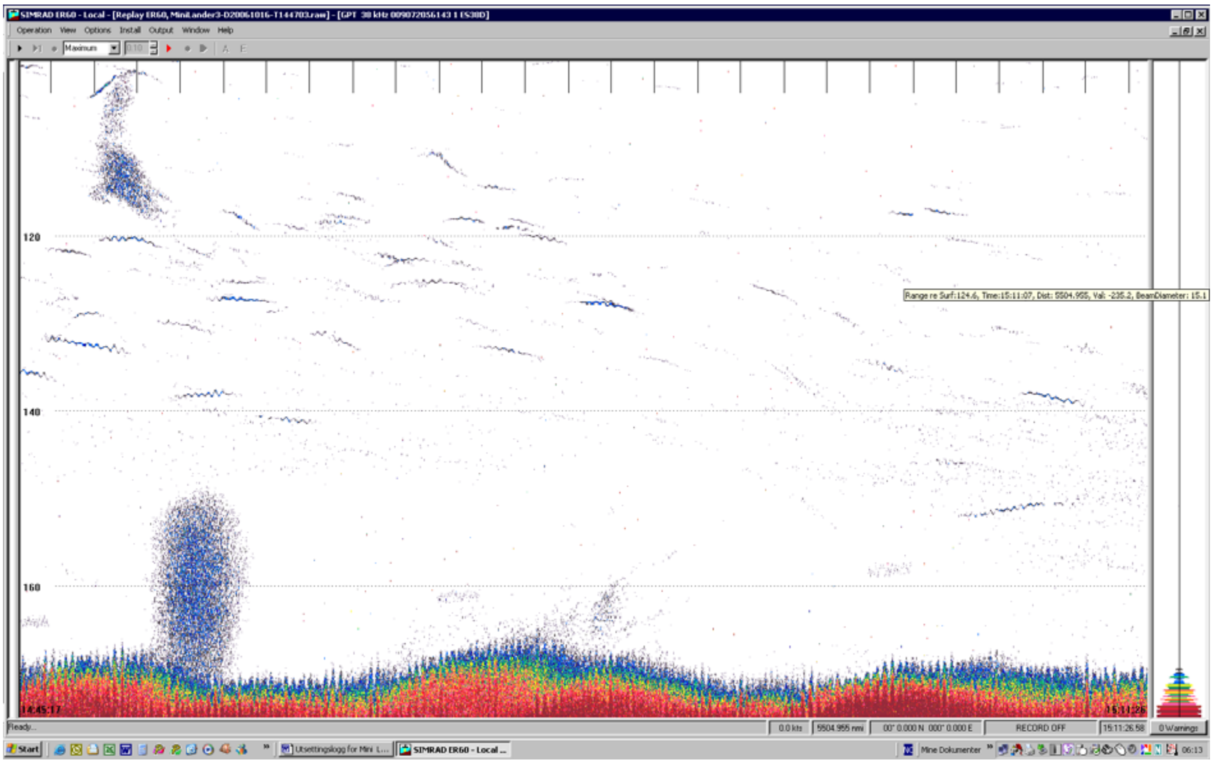


Fig. 21: At 15:11 UTC

4th deployment

Setup

ER60 setup

Scale:	200 m
Pulse length:	256 ms
Ping rate:	1 sec
Suspension:	Normal, looking down.
Height above bottom:	98 m
Height above fish reg:	-
Bottom depth:	126 m
Suspension:	94 m nylon
Cal sphere:	Non
Payload:	-

Deployed:	18 October at 10:45 UTC.
Retrieved:	19 October at 16:34 UTC.
Position:	N 70° 39,63’
	W 0023° 16,94’
Location:	Sørøysundet, -ved Hjelmen
Acoustic station	

Compass direction:	Bow is forward on the transducer
Positive pitch:	Forward part of transducer tilting up
Positive roll:	Port side of transducer tilting up

Lander Ini file

Mini Lander Ini fil

COM port - Magnetometer : 2
COM port - Pressure and depth : 1
COM port - EK60 trigging : 3
Data storage directory : C:\LanderData\
Roll offset (degrees) : 0
Pitch offset (degrees) : 0
Compass offset (degrees) : 0
Depth when file log interval DT sensor is to be reduced (m) : 150
Reduced file log interval DT sensor (when deployed at bottom) (sec) : 20
Start depth EK60 pinging (m) : 10
EK60 path : G:\ek60\ek60.exe
EK60 trigging interval (ms) : 100

Deployment area

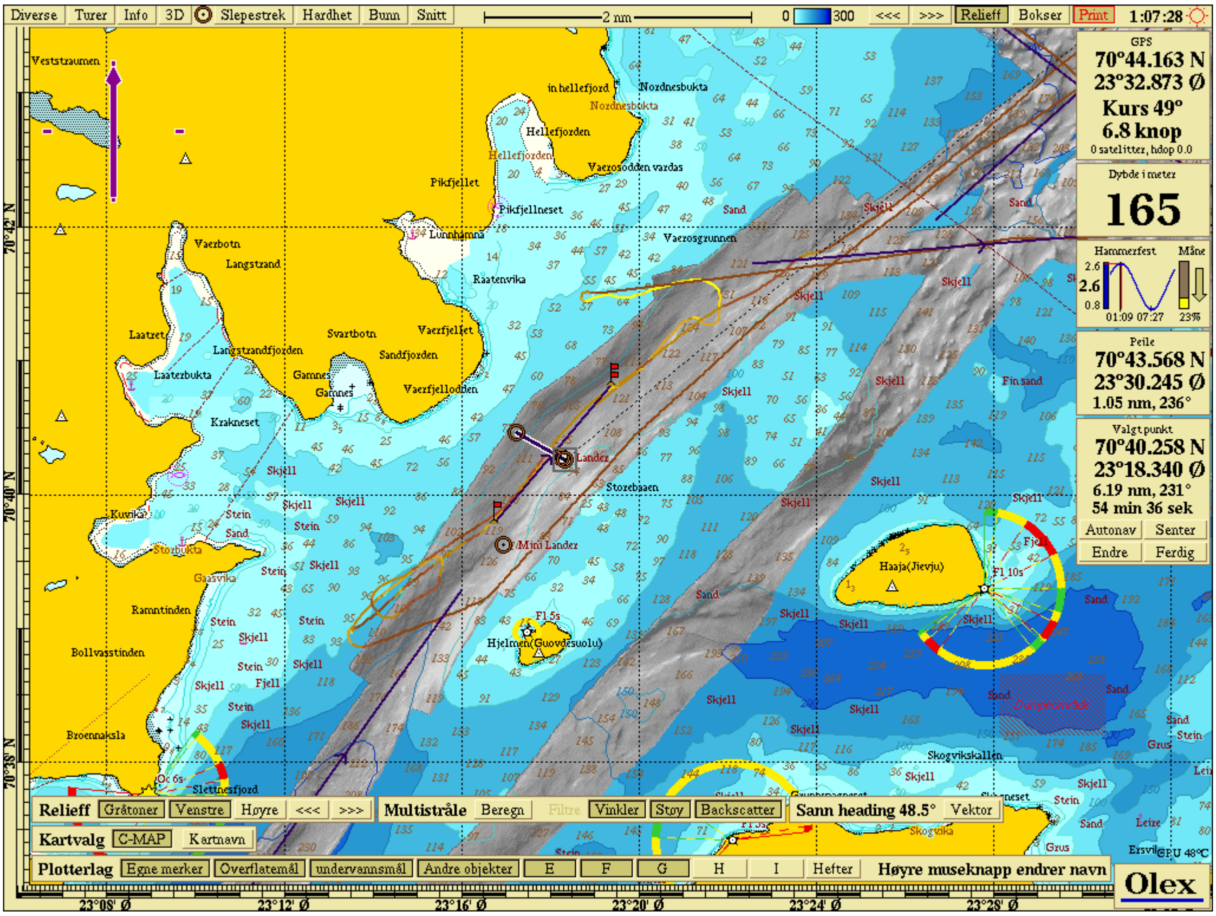


Fig. 22: Deployment area Sørøysundet

Sensor data

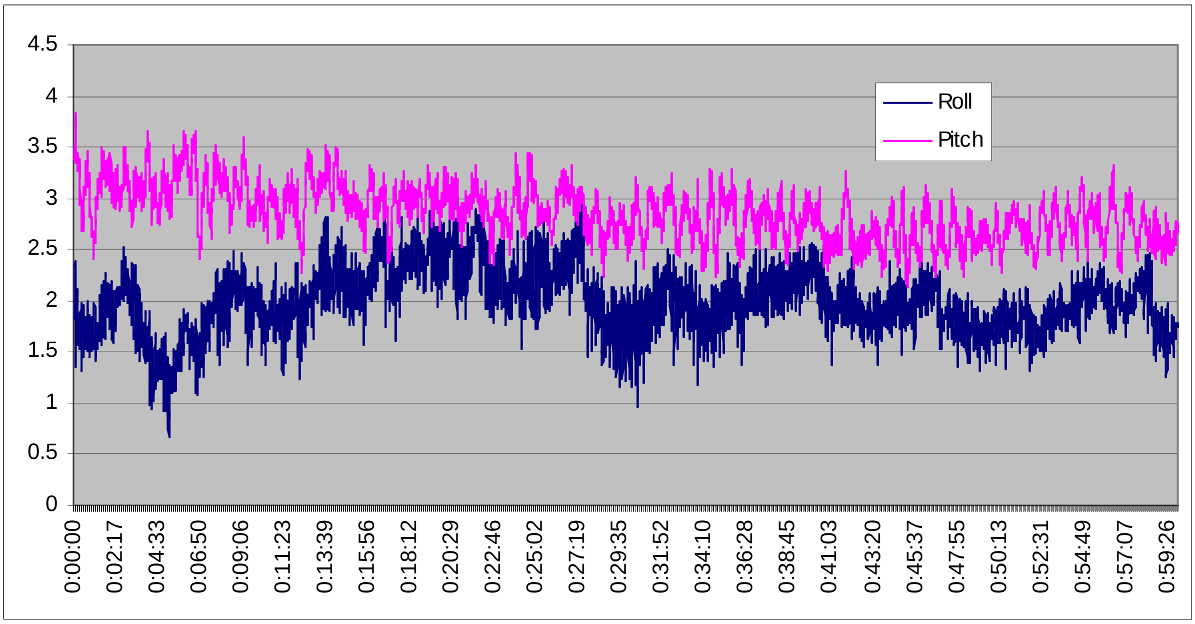


Fig. 23: Inclinometer data

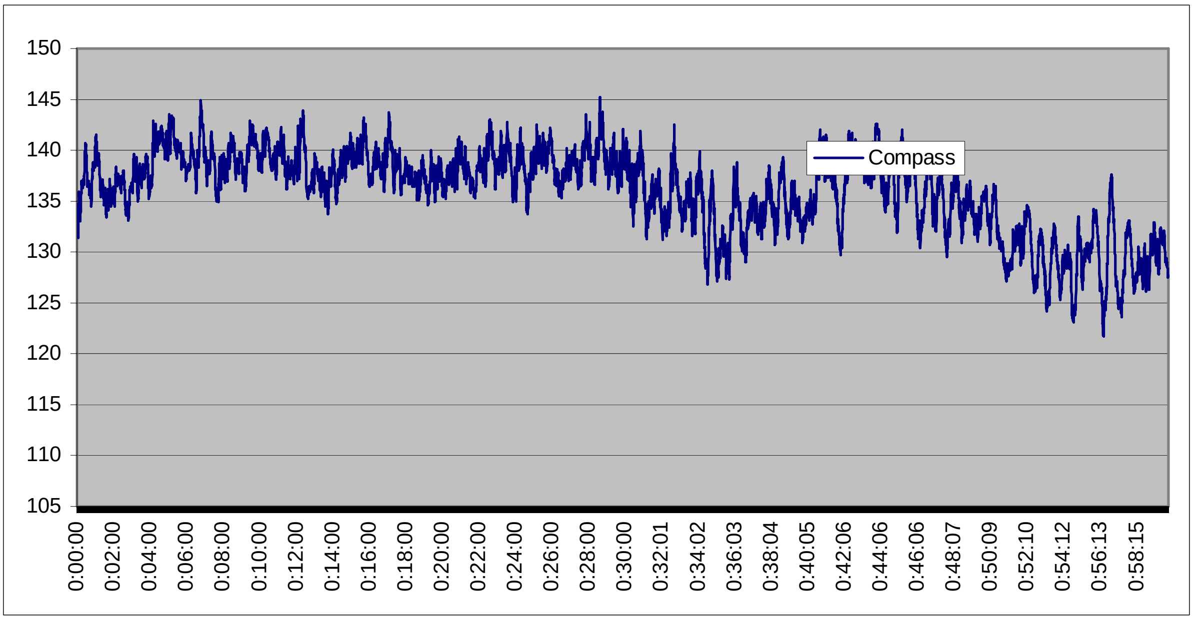


Fig. 24: Compass data.

Screen dumps

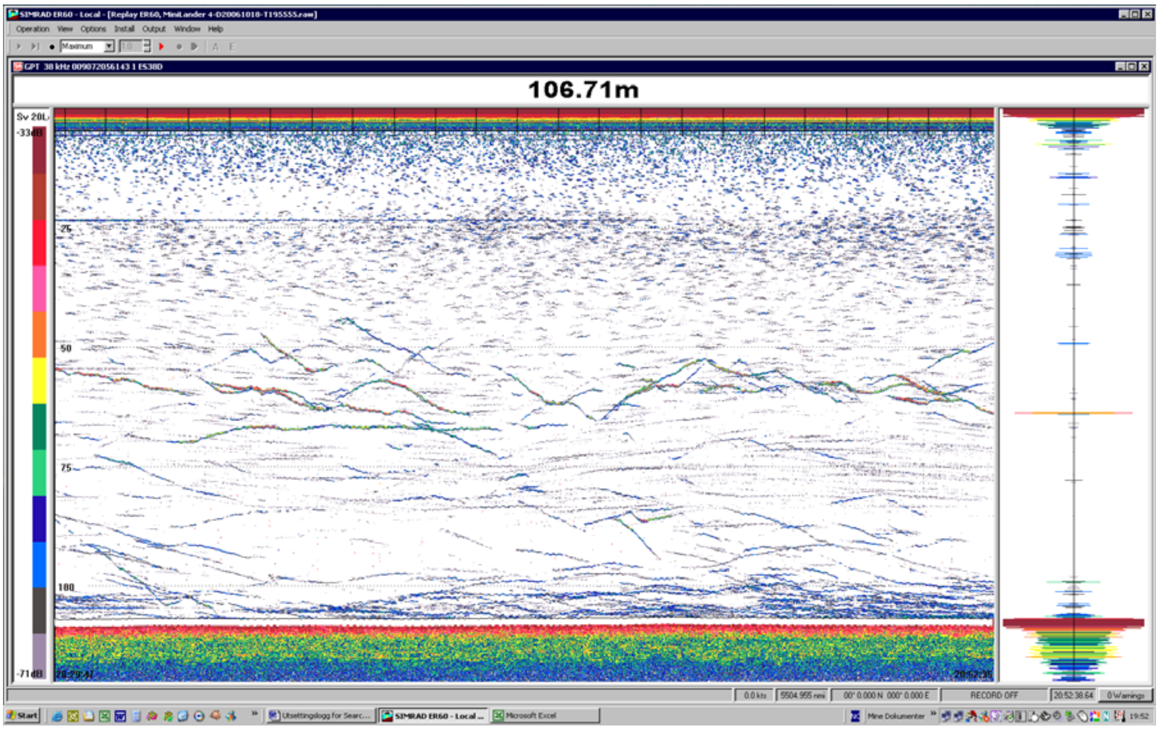


Fig. 25: At 20:52 UTC.

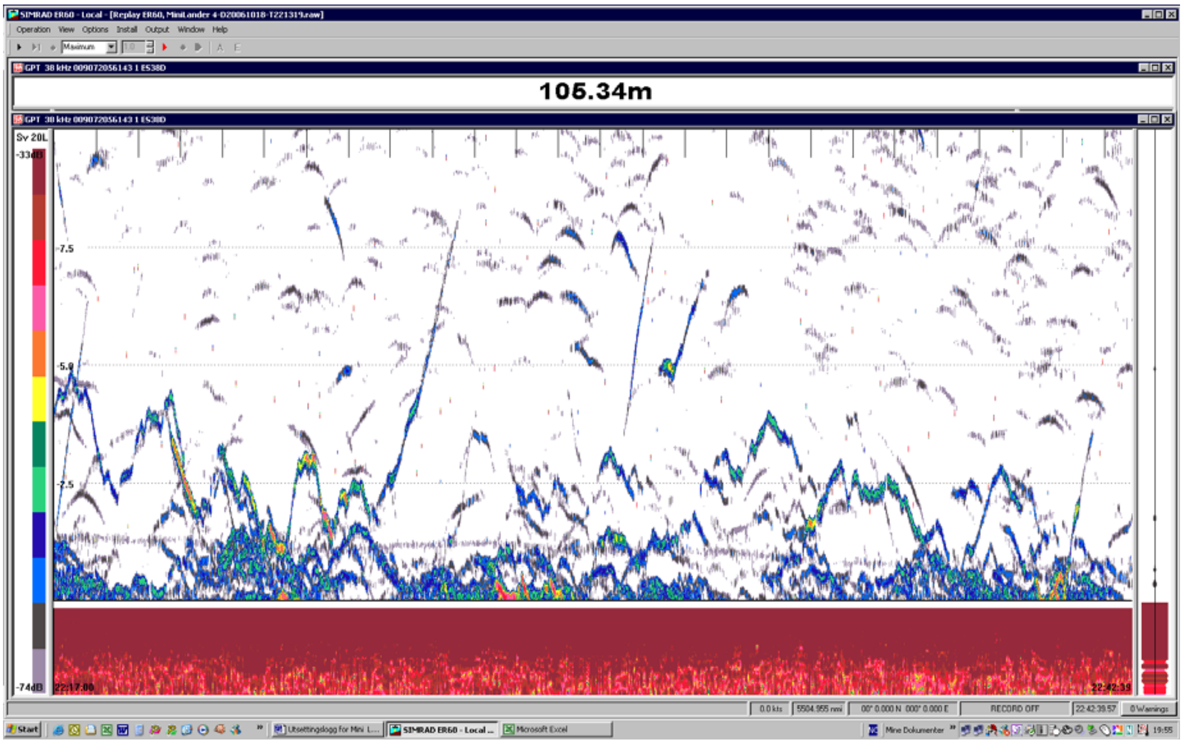


Fig. 26: At 22:42 UTC.

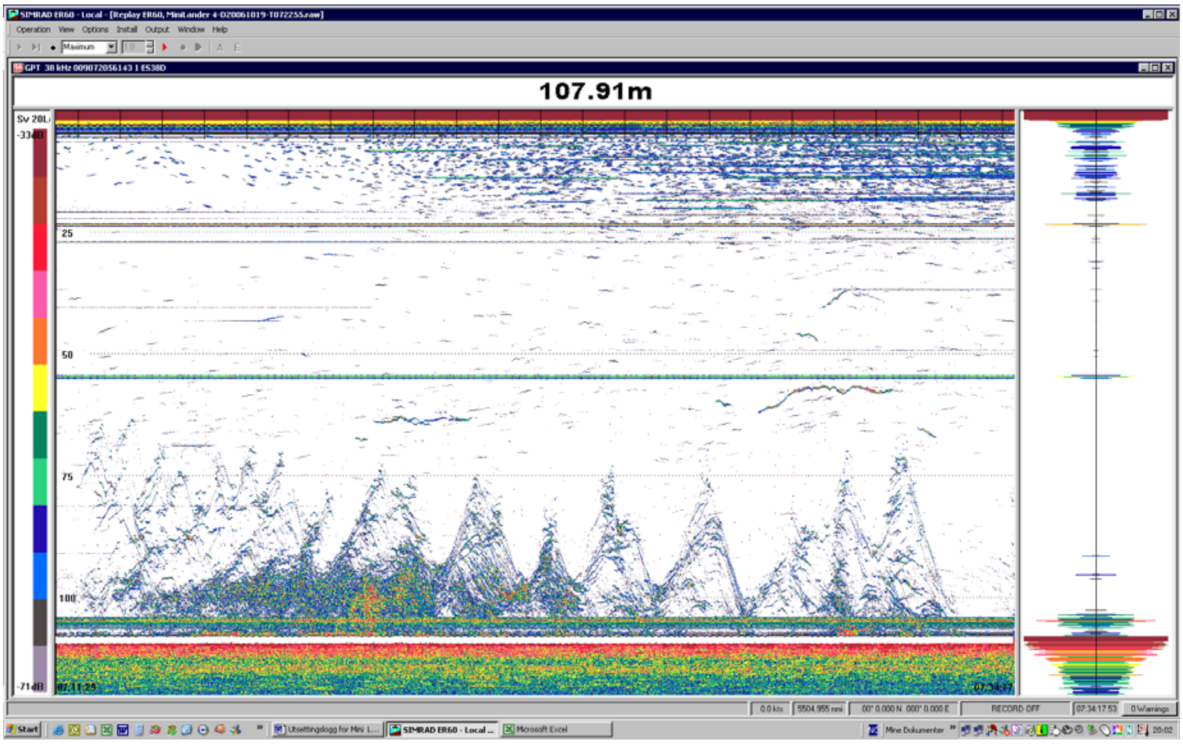


Fig. 27: At 07:34 UTC

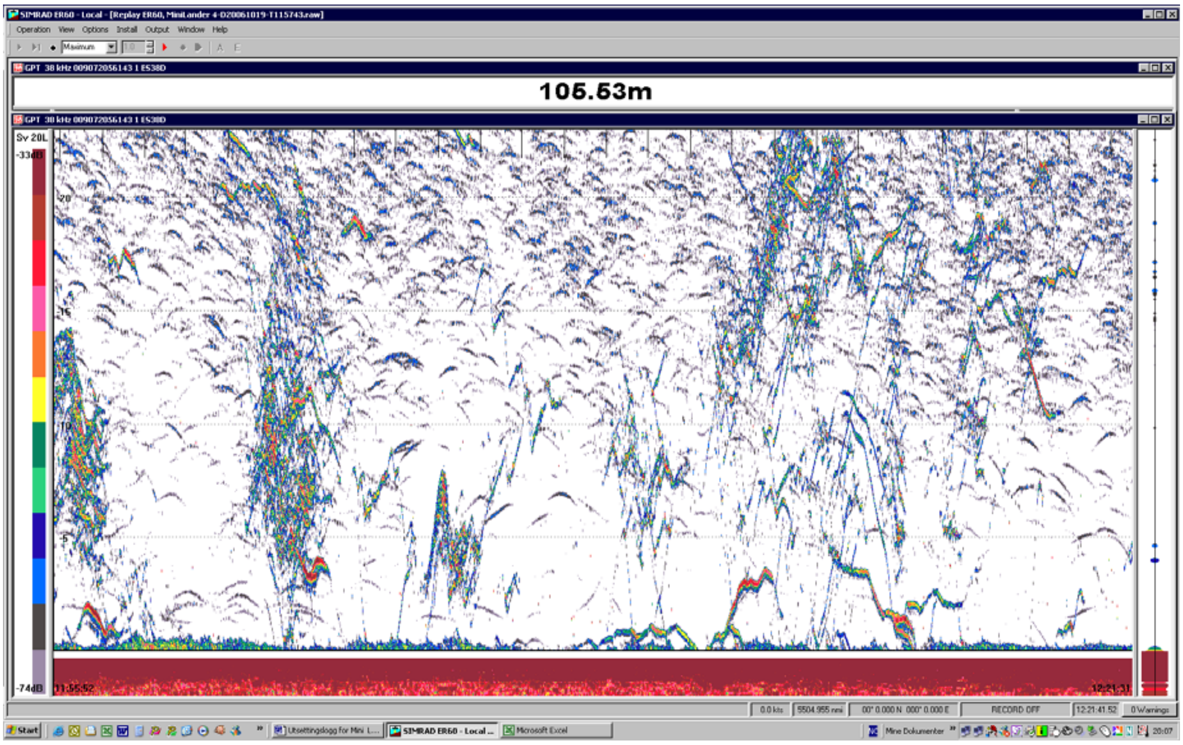


Fig. 28: At 12:21 UTC

Potential improvements

The deployment procedure is now working very well, but if we were able to communicate via cable to the Lander after deployment we could have improved the experiments dramatically. Some technical improvements are desirable and listed below:
To reduce back radiation we could mount a divinicel plate at the backside of the transducer.
The gimbal used for stabilization in downward looking mode is working very well. Similar gimbal should also be used for stabilisation when looking upwards.
Installation of dual transducers would increase the range of applicability of the Mini Lander
A second transducer installed, looking up, would make simultaneous observations both up and down possible.

Appendix IV: Deployment-log for Searching Lander

Content:

Introduction

Stationary acoustic platforms (Landers)

The Landers was originally designed and made for the MAR-ECO cruise, which took place the summer of 2004. The technology with upward pointed transducer was developed for the Ocean HUB project where it was used for monitoring the spring spawning herring stock in Ofotfjorden. Ocean HUB was launched in September 2002. Since then particular algorithms for extracting of data have been developed, and valuable experience regarding interpretation of data is gained. The Searching Lander is made for short-term deployments, with limited battery capacity, single echo sounder frequency, and good space for payload. The Lander was originally made with the transducers pointing upwards, but the Searching Lander is designed with the transducer and electronic housing fixed in a gimbal. The transducer can be tilted and trained in a pre-selected direction, controlled by two separate motors.

Lander instrumentation and settings

The Searching Landers is set up with standard instrumentation: Computer with ER60 software, motor control software, 38 kHz split beam GPT and ES38DD transducer. A sensor unit within a separate pressure container consisting of compass, inclinometer and depth sensor is installed, and data from the sensor is saved to a separate file for reference. The instruments are installed in a pressure housing, and batteries with capacity of 680 A/h are installed in a separate carbon fiber container. Settings of the instruments in the searching Landers prior to deployment are selected for the actual area and measure situation. Range, ping rate, and transmit power of the echo sounder are selected from an external computer by using Ethernet and Net-Up remote control program. The motor control is set for the wanted tilt and compass direction of the transducer, and the motors are keeping the transducer in this direction even if the Lander is turning and tilting after deployment due to high current. The Landers are pre-programmed to start transmitting at 10 meters depth. This prevents damage to the transducer due to transmitting above the water surface. Signals from the depth sensor are used to control this function.

Lander deployment

The Searching Landers is positive buoyancies, dropped with an acoustic release connected to a weight of app 1000 kg. The Searching Lander is normally deployed close to the seabed

Structure in data files

All data from the Mini Lander was saved on a portable hard disc. Data is also saved on my personal laptop and in the computer for the Mini Lander as backup.

Objective

The objective for this experiment is to try to monitor if the fish is avoiding the trawl. The Lander is deployed on a suitable area, with fixt direction and tilt of the transducer, than trawling was performed across the transducer beam on a distance of 200 – 300 meter

Acoustic release

IXSEA	AR 861 B2S
Serial no:	300
Arming Code:	1420
Release Code:	1455

Anchoring

Weight:	Two railroad wheel, 600 kg,
Chain:	app 1 meter
Sinking rate	1.1 meter/sec
Rising rate:	0.9 meter/sec

1st deployment

Setup

EK60 setup

Scale:	500 m
Pulse length:	1.024 ms
Ping rate:	1 sec
Suspension:	Normal.
Height above bottom:	6 m
Bottom depth:	116 m
Suspension:	2 m rope
Cal sphere:	-
Payload:	Nortek Aquadop CTD
	Simrad HIPAP – Code -58
Transducer bearing:	300°
Transducer tilt:	-3°

Deployed:	18 October at 15:01 UTC.
Retrieved:	19 October at 06:23 UTC.
Position:	N 70° 40,258’
	W 023° 18,34’
Area	Sørøysundet, Hjelmen

Deployment area

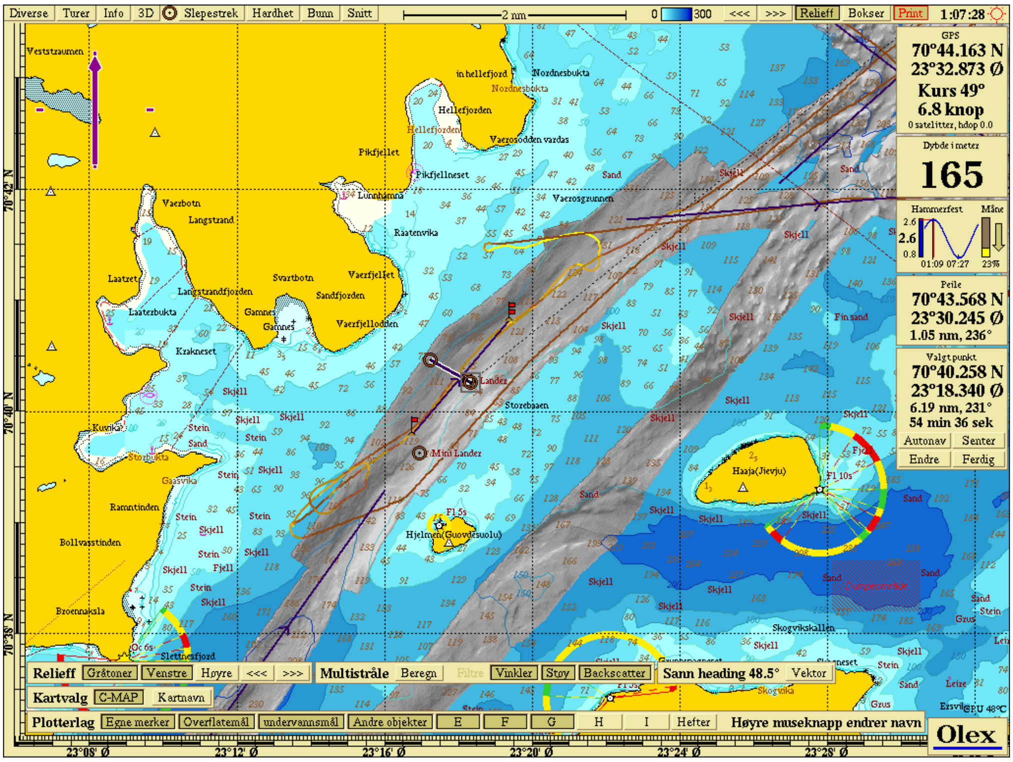


Fig. 1 Map over the deployment area.

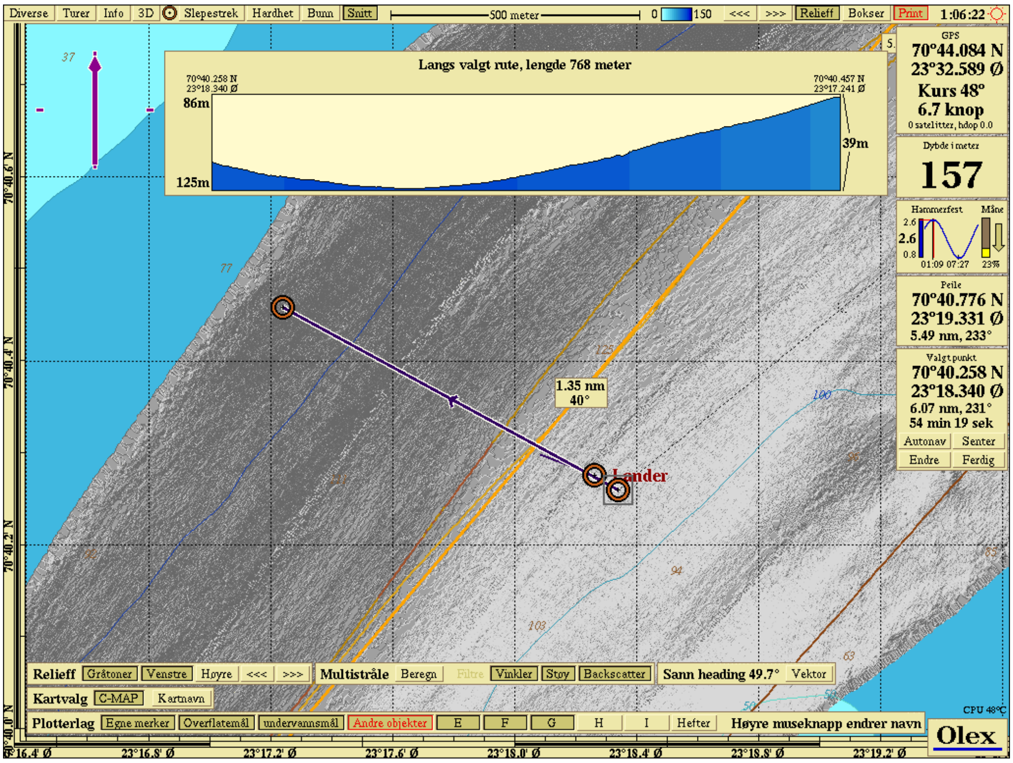


Fig. 2: Detailed map over deployment area

Lander Ini file

```
COM port - Magnetometer : 1
COM port - Pressure and depth : 5
COM port - EK60 trigging : 6
COM port - Sea water detector : 7
Data storage directory : C:\LanderSensorData\
Roll offset (degrees) : 0
Pitch offset (degrees) : 0
Compass offset (degrees) : 0
Depth when file log interval DT sensor is to be reduced (m) : 250
Reduced file log interval DT sensor (when deployed at bottom) (sec) : 20
Start depth EK60 pinging (m) : 10
EK60 path : X"C:\Program Files\Simrad\Scientific\EK60\Bin\ComContainer.exe"
/RegPath=HKEY_LOCAL_MACHINE\SOFTWARE\simrad\ComSounder\ER60
/AppName=ER60
EK60 trigging interval (ms) : 100
COM port - Pan motor : 3
COM port - Tilt motor : 4
COM port - Pan and Tilt Motor power : 2
Bearing (0-359 degrees) : 300
Bearing hysteresis inner limit : 1
Bearing hysteresis outer limit : 2
Pan motor speed (Hz) : 100
Tilt (0-90 degrees) : -3
Tilt hysteresis inner limit : 1
```

Sensor data

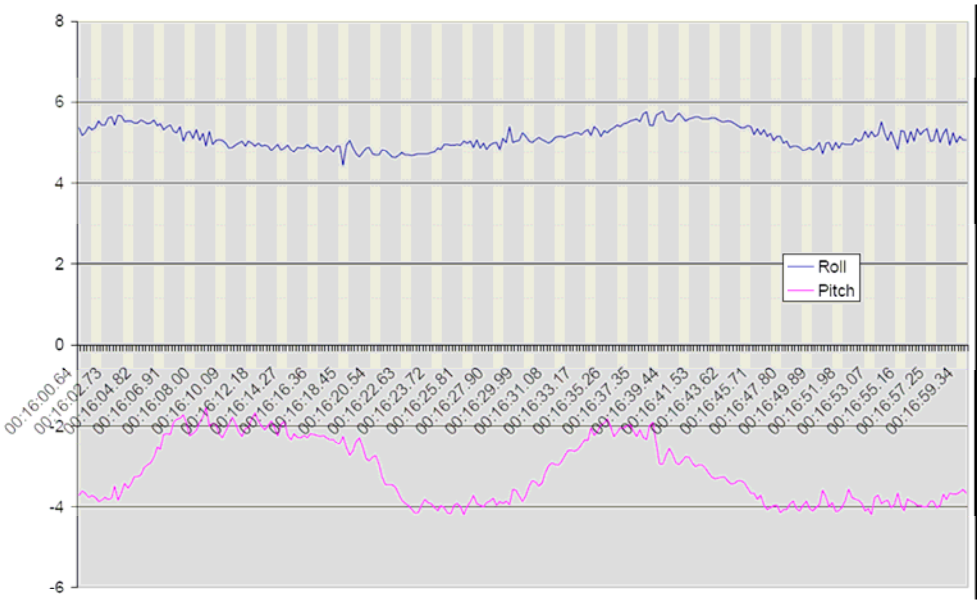


Fig. 3: Inclinometer data

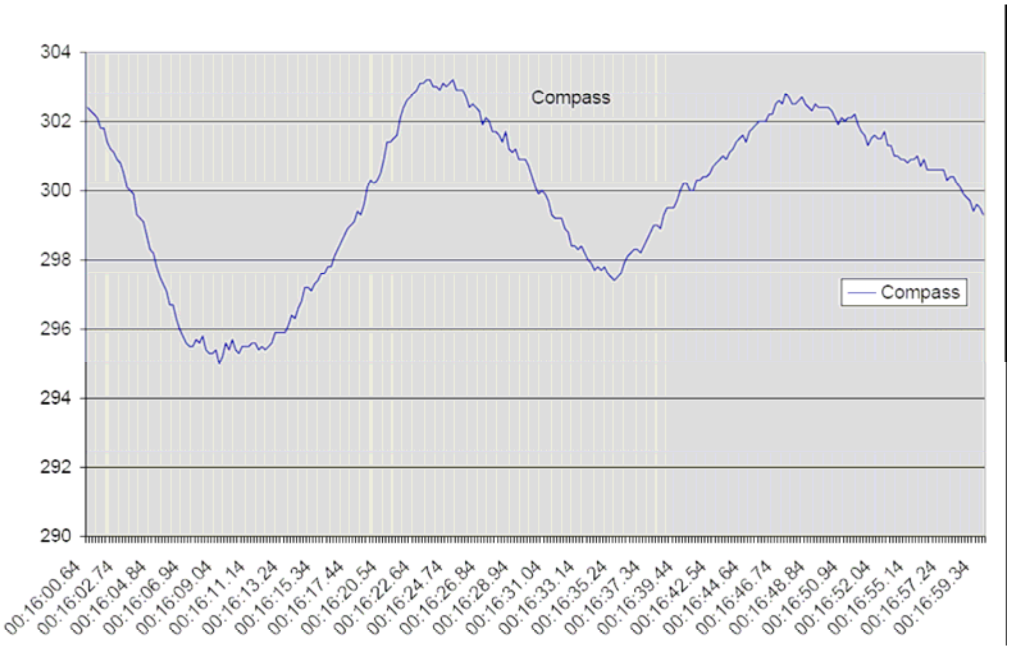


Fig. 4: Compass

Screen dumps

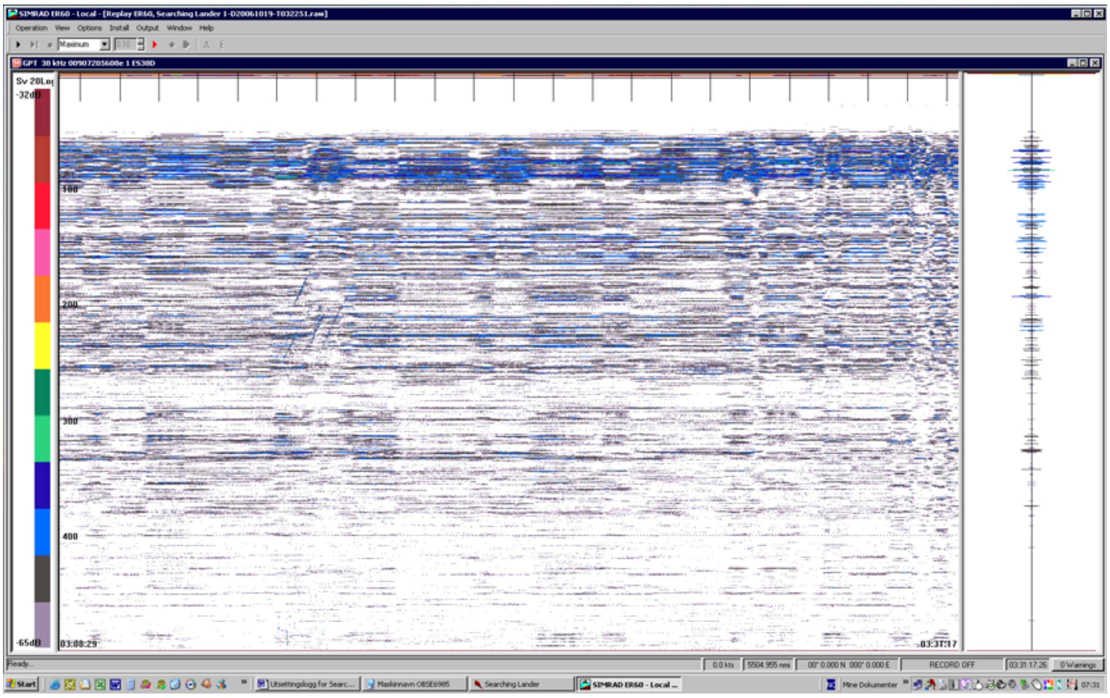


Fig. 5: Bottom trawl passing

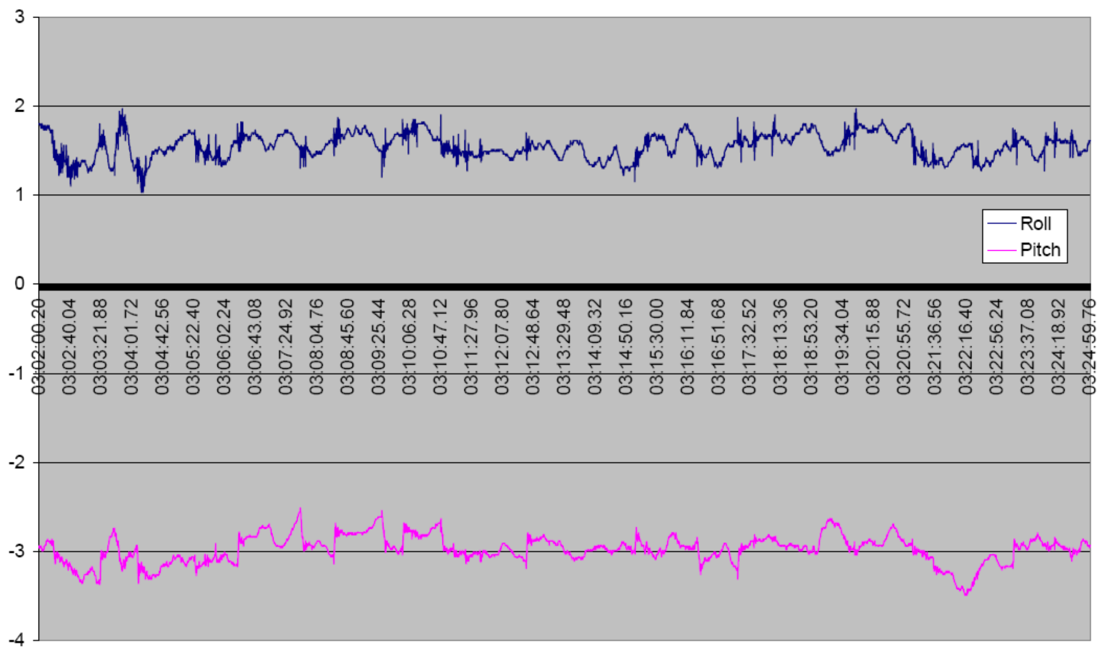


Fig. 6: Inclinometer during trawl passing at previous picture

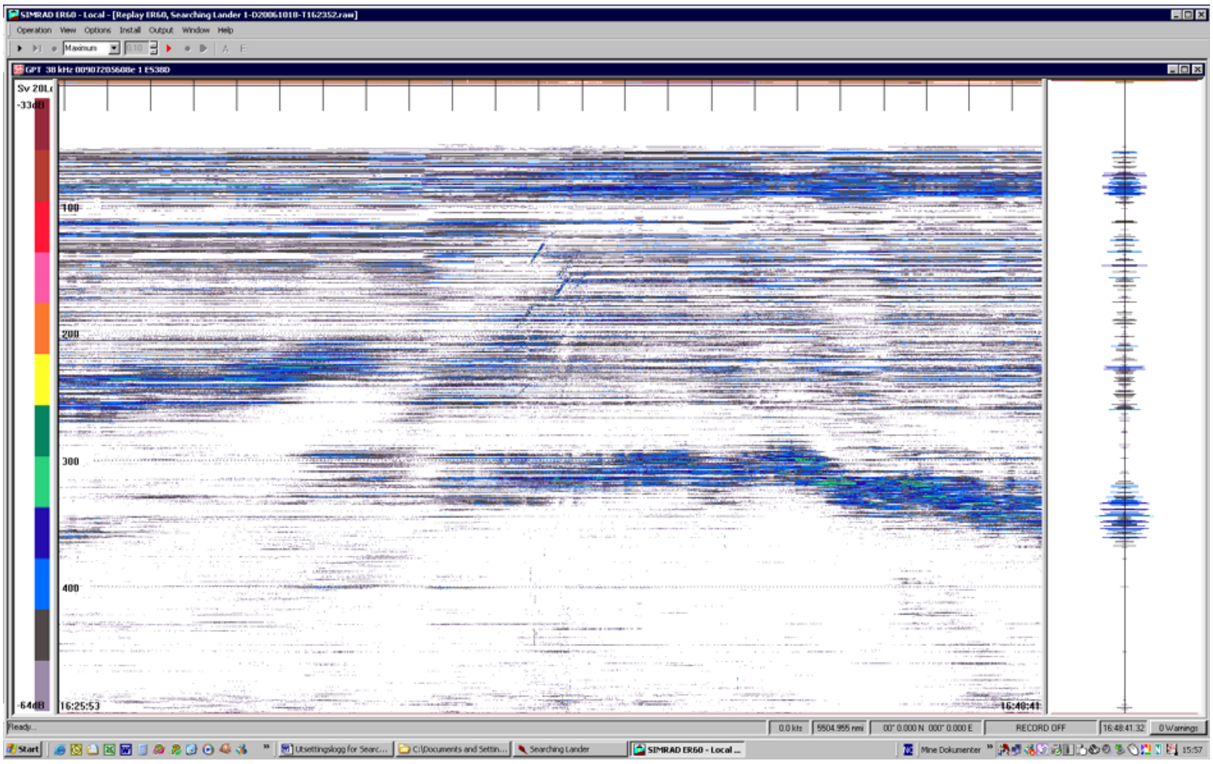


Fig. 7: Trawl passing at -64 dB

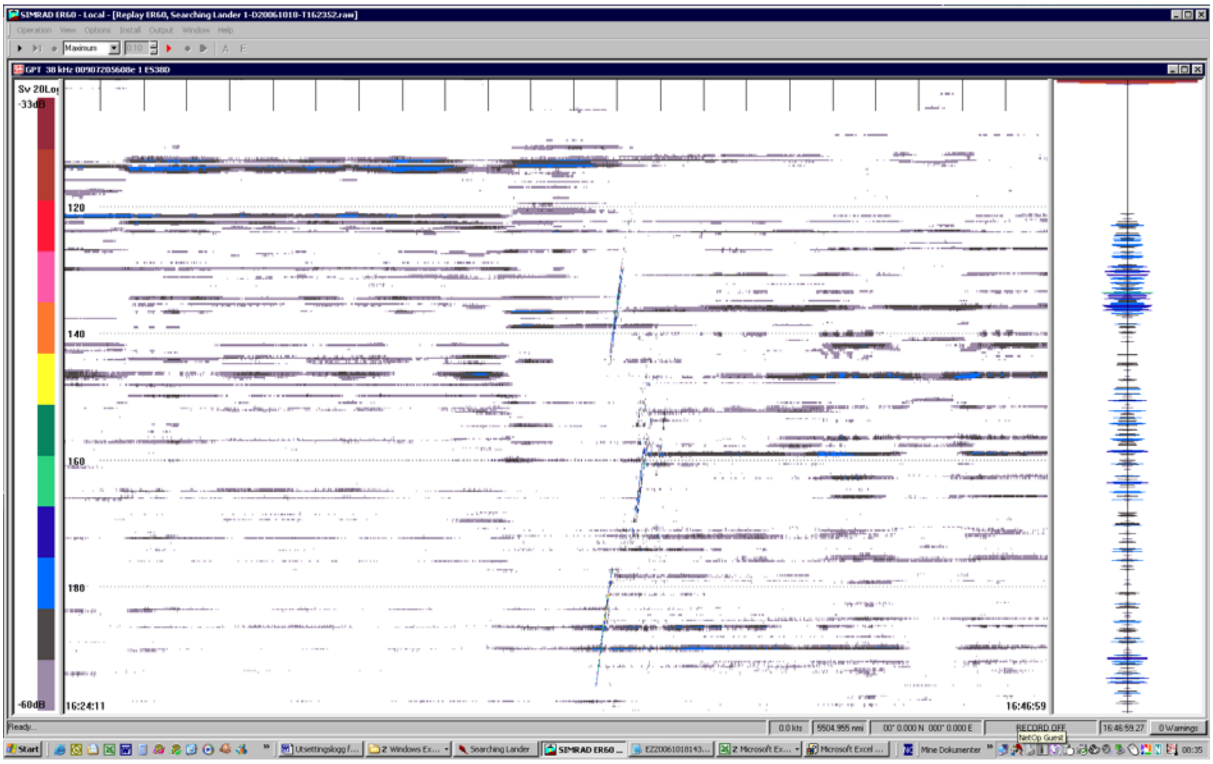


Fig. 8: Expansion of trawl passing

Corrections

The Lander came up, floating up side down. Added 50 kg of chain to the releaser suspension as weight.

For next deployment, increase the angle by 30 degrees to get a more straight angle towards the trawl.

Also tilt changed from –3° tilt to 0° to reduce the reflection from bottom contoure.

2nd deployment

Setup

EK60 setup

Scale:	500 m
Pulse length:	1.024 ms
Ping rate:	1 sec
Suspension:	Normal.
Height above bottom:	6 m
Bottom depth:	116 m
Suspension:	2 m chain
Cal sphere:	-
Payload:	Nortek Aquadop CTD
	Simrad HIPAP – Code -58
Transducer bearing:	300°
Transducer tilt:	-3°

Deployed:	19 October at 10:08 UTC.
Retrieved:	19 October at 15:15 UTC.
Position:	N 70° 40,26’
	W 023° 18,34’
Area:	Sørøysundet, Hjelmen

Deployment area

Same position as previous deployment

Lander Ini file

```
COM port - Magnetometer : 1
COM port - Pressure and depth : 5
COM port - EK60 trigging : 6
COM port - Sea water detector : 7
Data storage directory : C:\LanderSensorData\
Roll offset (degrees) : 0
Pitch offset (degrees) : 0
Compass offset (degrees) : 0
Depth when file log interval DT sensor is to be reduced (m) : 250
Reduced file log interval DT sensor (when deployed at bottom) (sec) : 20
Start depth EK60 pinging (m) : 10
EK60 path : X"C:\Program Files\Simrad\Scientific\EK60\Bin\ComContainer.exe"
/RegPath=HKEY_LOCAL_MACHINE\SOFTWARE\simrad\ComSounder\ER60
/AppName=ER60
EK60 trigging interval (ms) : 100
COM port - Pan motor : 3
COM port - Tilt motor : 4
COM port - Pan and Tilt Motor power : 2
Bearing (0-359 degrees) : 325
Bearing hysteresis inner limit : 1
Bearing hysteresis outer limit : 3
Pan motor speed (Hz) : 100
Tilt (0-90 degrees) : 0
Tilt hysteresis inner limit : 1
```

Sensor data

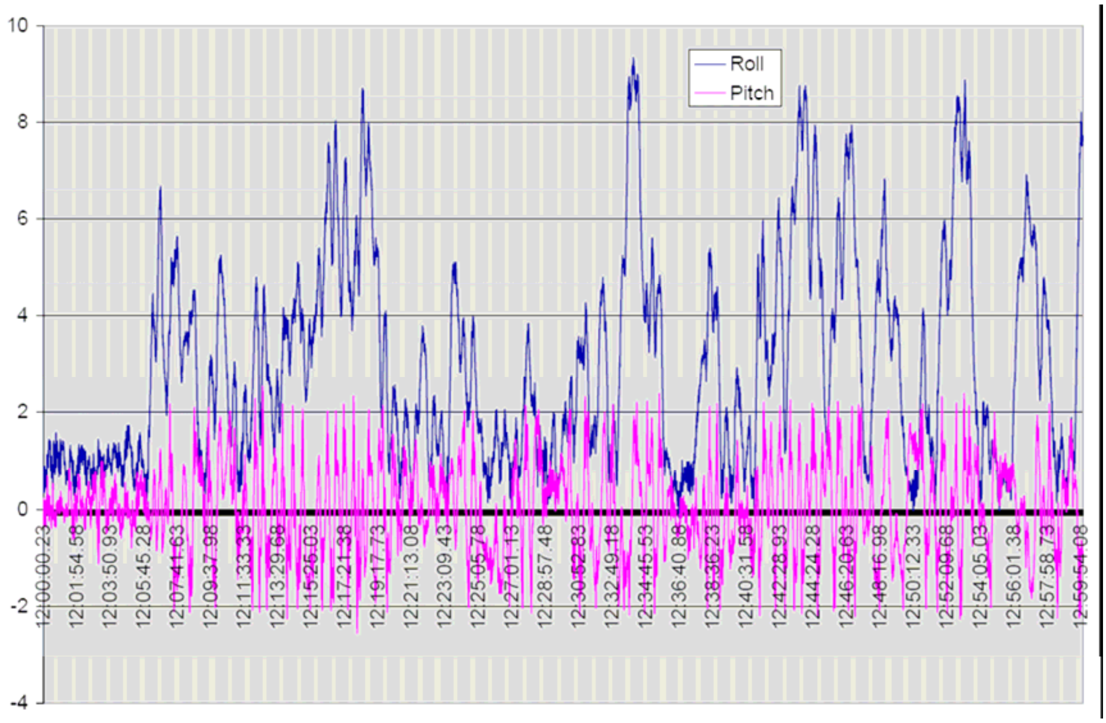


Fig. 9: Inclinometer

Inclinometer showing 8° roll movement, probably caused by current, causing the gimbal to tilt sideways

Screen dumps

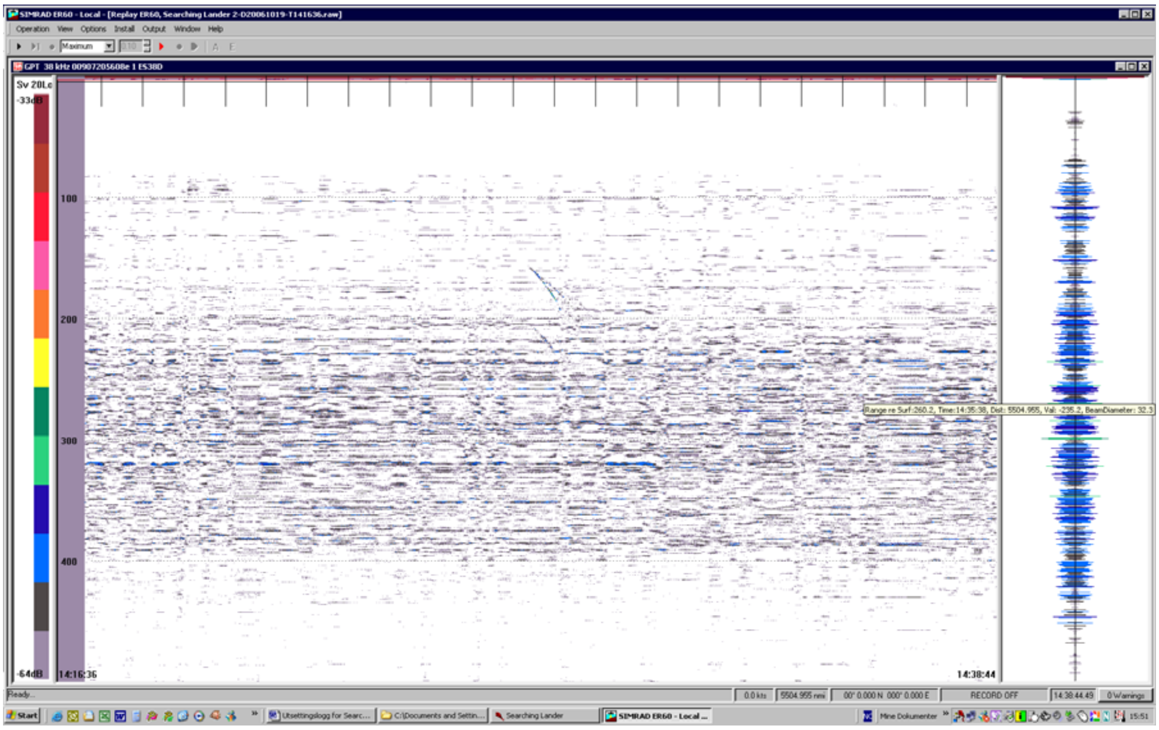


Fig. 10. Trawl passing at 14:30 UTC

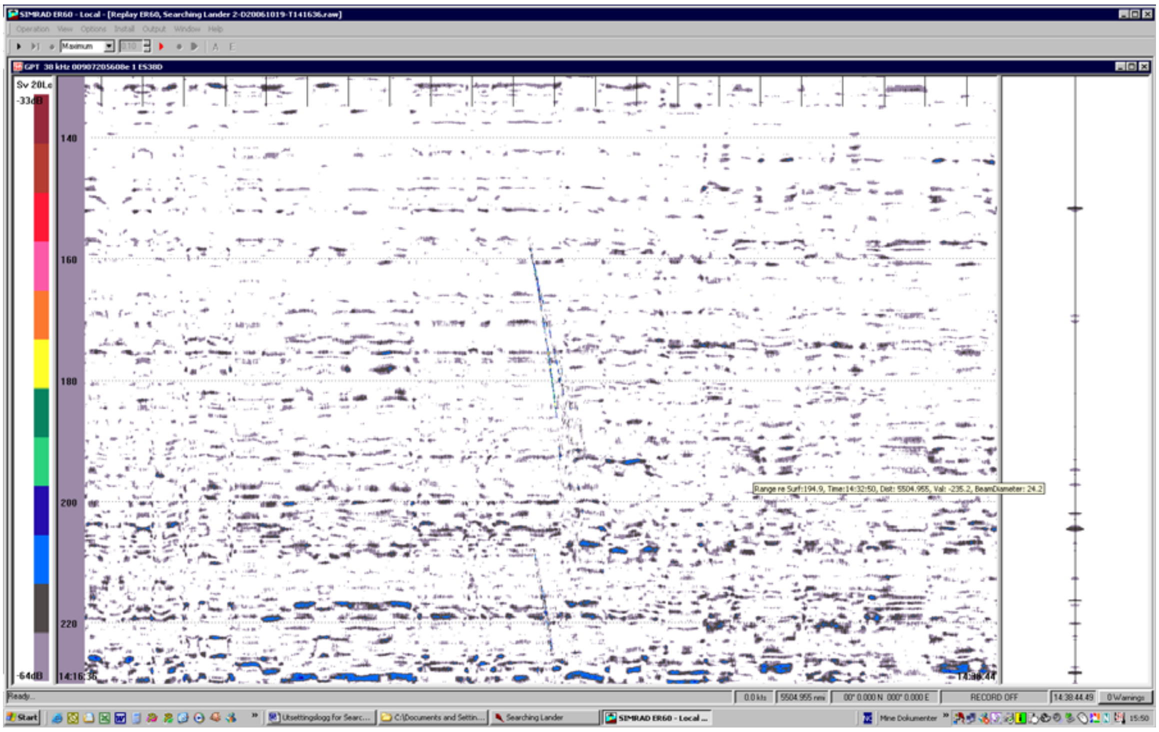


Fig. 11: Expansion of trawl passing at 64 dB

Corrections

320° change in azimuth, resulted in transducer to look at the trawl mouth from behind.

Probably 220° would have been sufficient.

Change in tilt in 3 ° caused the bottom to show up with less reflection as expected, but the reflection from the trawl also become weaker. So the tilt angle was ok.

Conclusion: this experiment area has too much reflection from the seabed to be useful as a test area for this experiment. Moved to a new area.

3rd deployment

Setup

EK60 setup

Scale:	500 m
Pulse length:	1.024 ms
Ping rate:	1 sec
Suspension:	Normal.
Height above bottom:	6 m
Bottom depth:	174 m
Suspension:	2 m chain
Cal sphere:	-
Payload:	Nortek Aquadop CTD
	Simrad HIPAP – Code -58
Transducer bearing:	315°
Transducer tilt:	-1°

Deployed:	20 October at 00:30 UTC.
Retrieved:	20 October at ??:?? UTC.
Position:	N 70° 40,27’
	W 023° 18,25’
Area:	Lopphavet

Deployment area

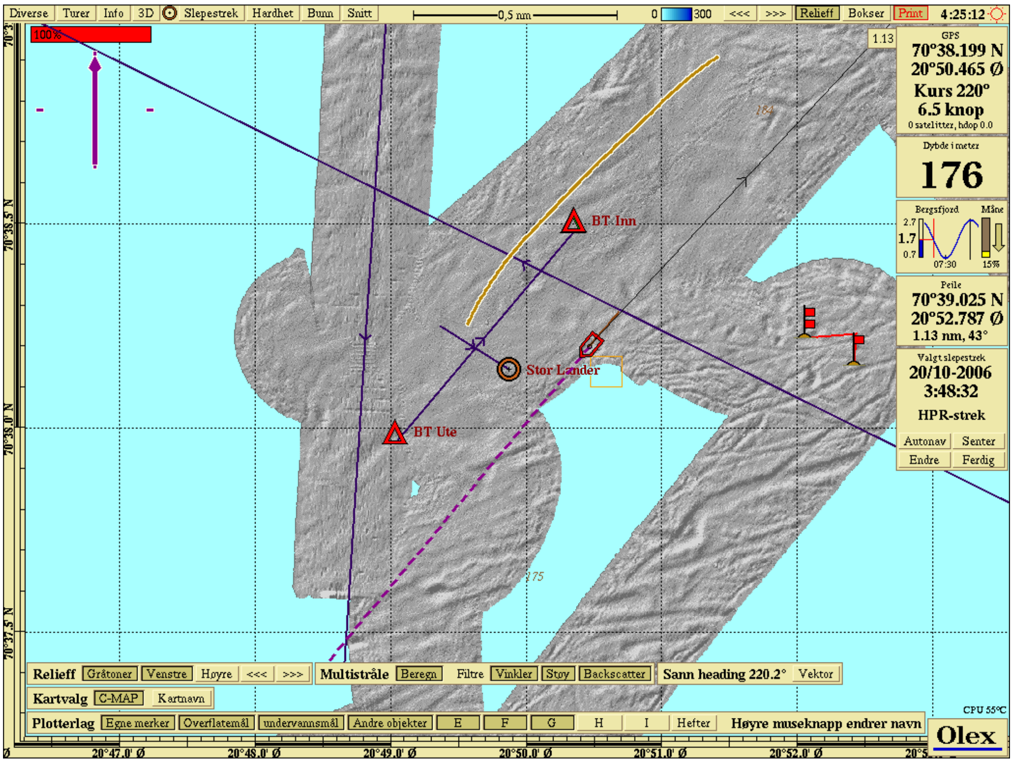


Fig. 12: Detailed map over deployment area

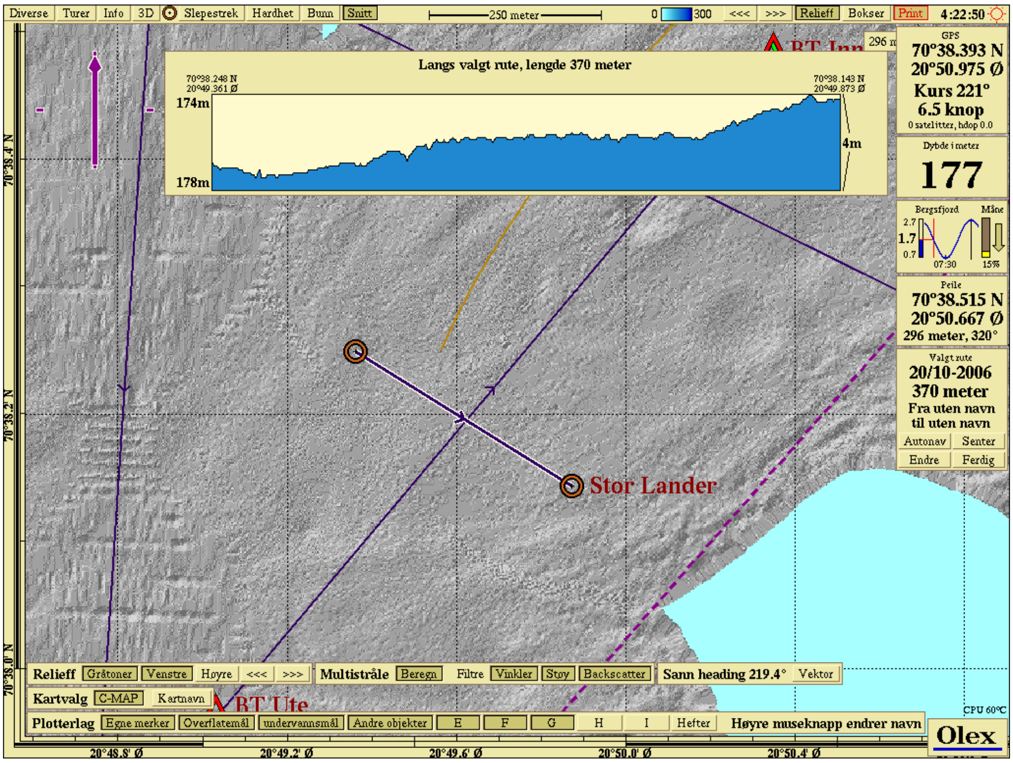


Fig. 13: Detailed map with profile

Lander Ini file

COM port - Magnetometer : 1
COM port - Pressure and depth : 5
COM port - EK60 trigging : 6
COM port - Sea water detector : 7
Data storage directory : C:\LanderSensorData\
Roll offset (degrees) : 0
Pitch offset (degrees) : 0
Compass offset (degrees) : 0
Depth when file log interval DT sensor is to be reduced (m) : 250
Reduced file log interval DT sensor (when deployed at bottom) (sec) : 20
Start depth EK60 pinging (m) : 10
EK60 path : X"C:\Program Files\Simrad\Scientific\EK60\Bin\ComContainer.exe"
/RegPath=HKEY_LOCAL_MACHINE\SOFTWARE\simrad\ComSounder\ER60
/AppName=ER60
EK60 trigging interval (ms) : 100
COM port - Pan motor : 3
COM port - Tilt motor : 4
COM port - Pan and Tilt Motor power : 2
Bearing (0-359 degrees) : 315
Bearing hysteresis inner limit : 1
Bearing hysteresis outer limit : 3
Pan motor speed (Hz) : 100
Tilt (0-90 degrees) : -1
Tilt hysteresis inner limit : 1
Tilt hysteresis outer limit : 2

Sensor data

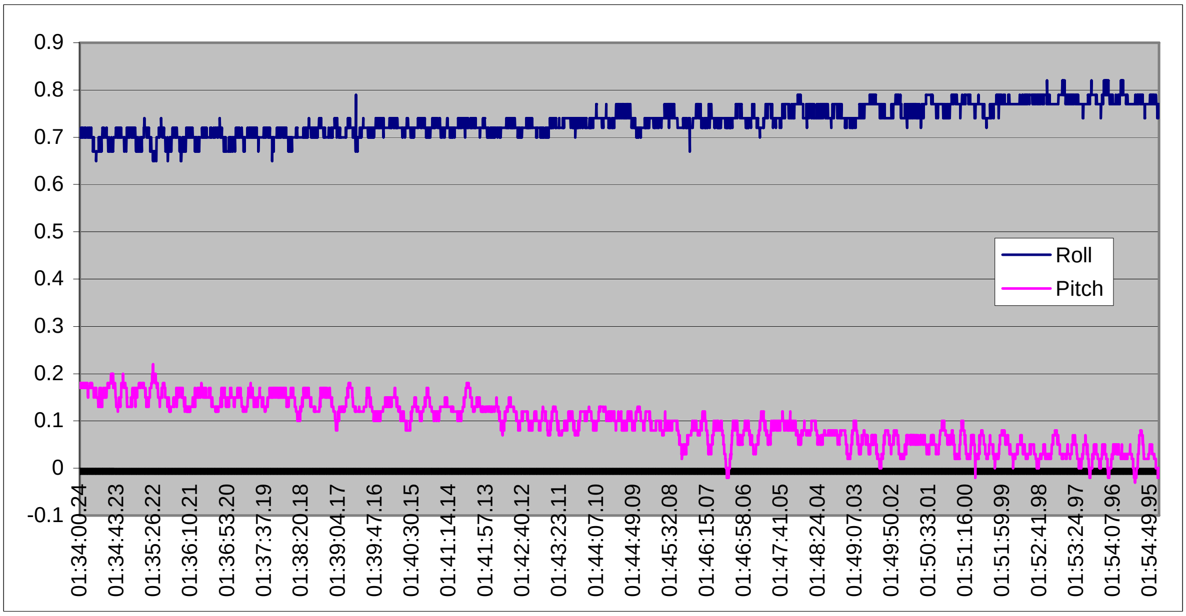


Fig. 14: Inclinometer data

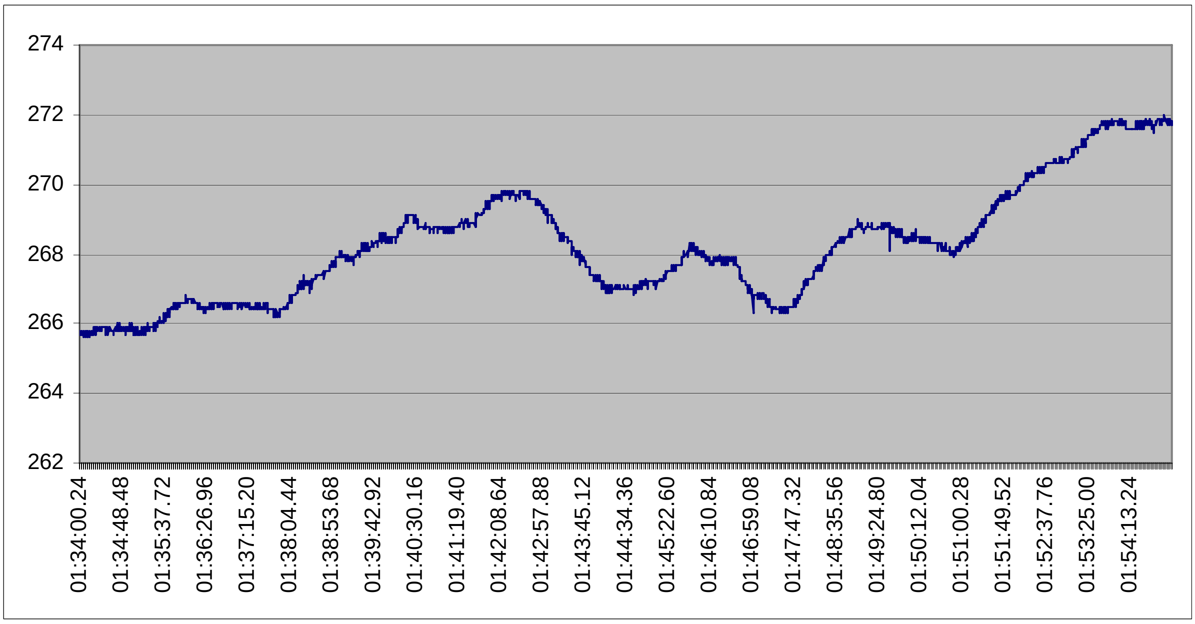


Fig. 15: Compass data

Screen dumps

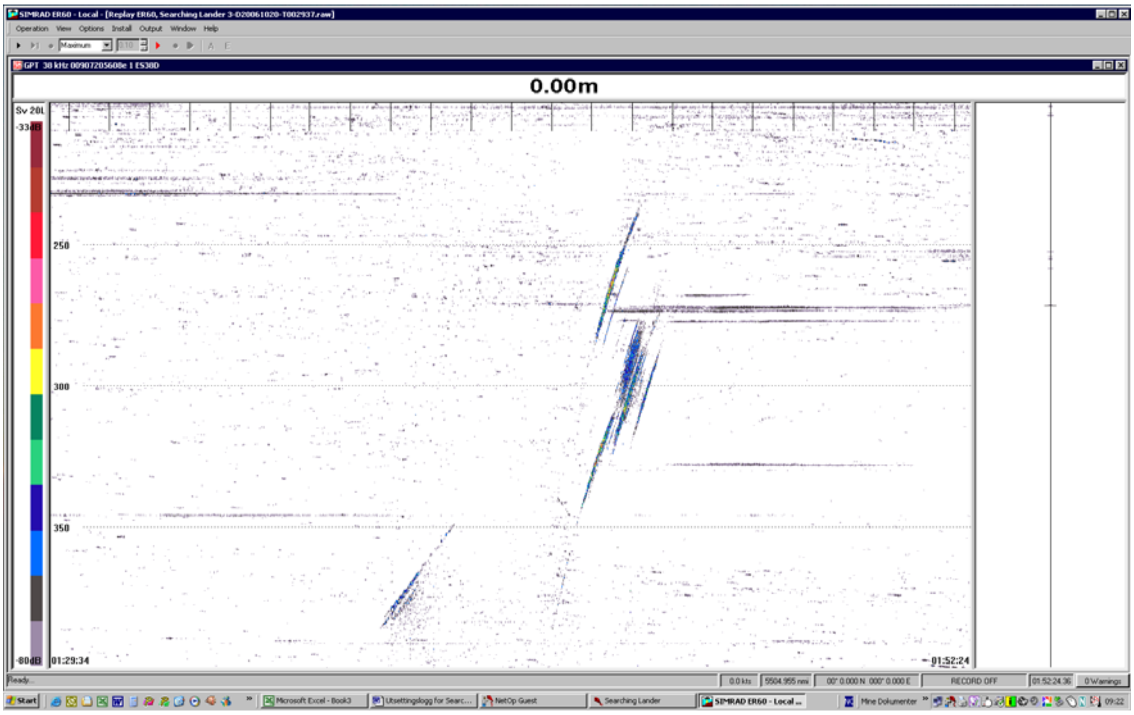


Fig. 16: 1st trawl passing at 01:44 UTC

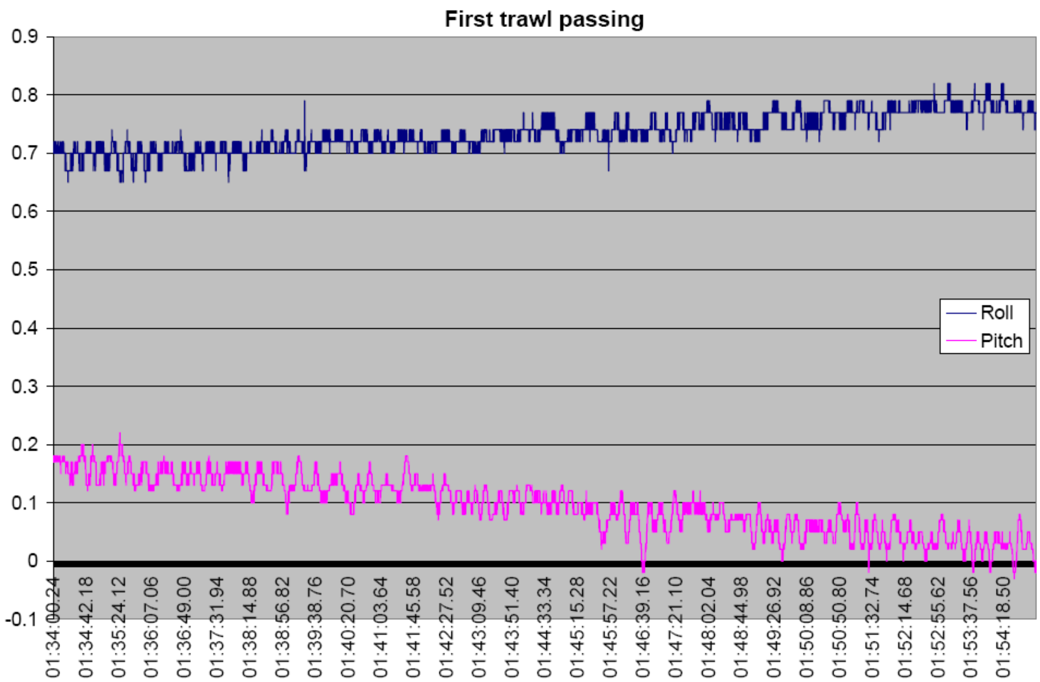


Fig. 17: Inclinometer, 10 minutes on each side of trawl passing

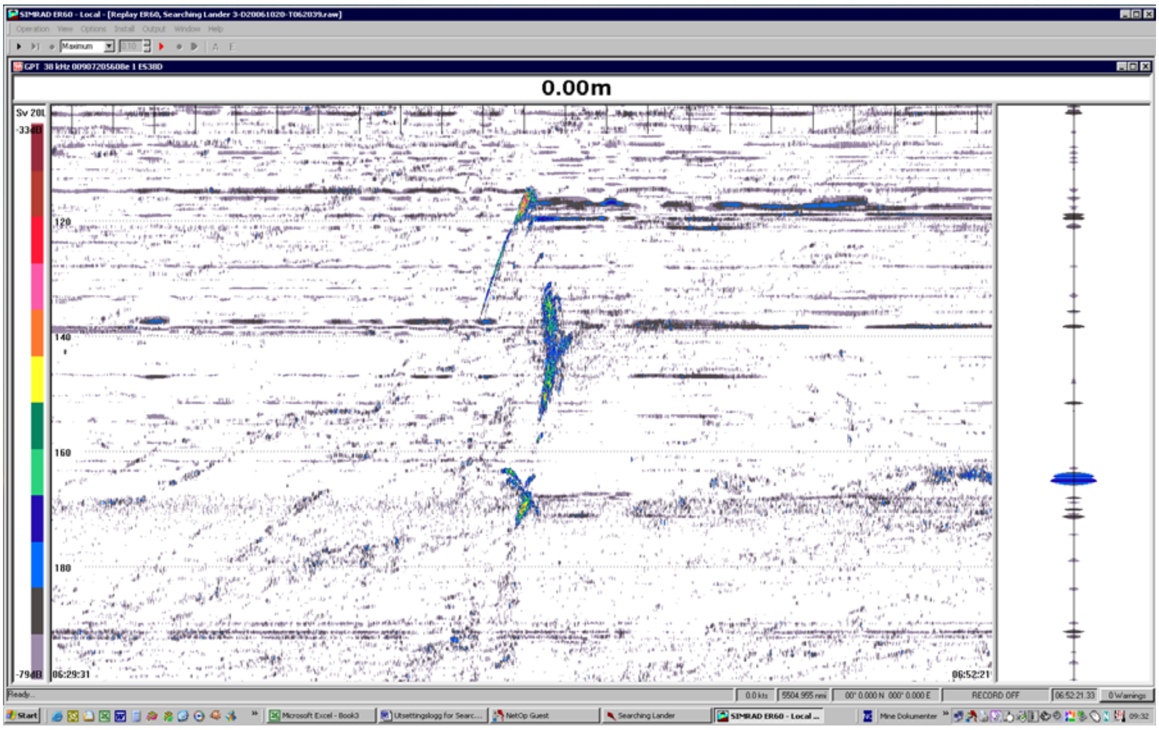


Fig. 18: 4th trawl passing at 06:41 UTC

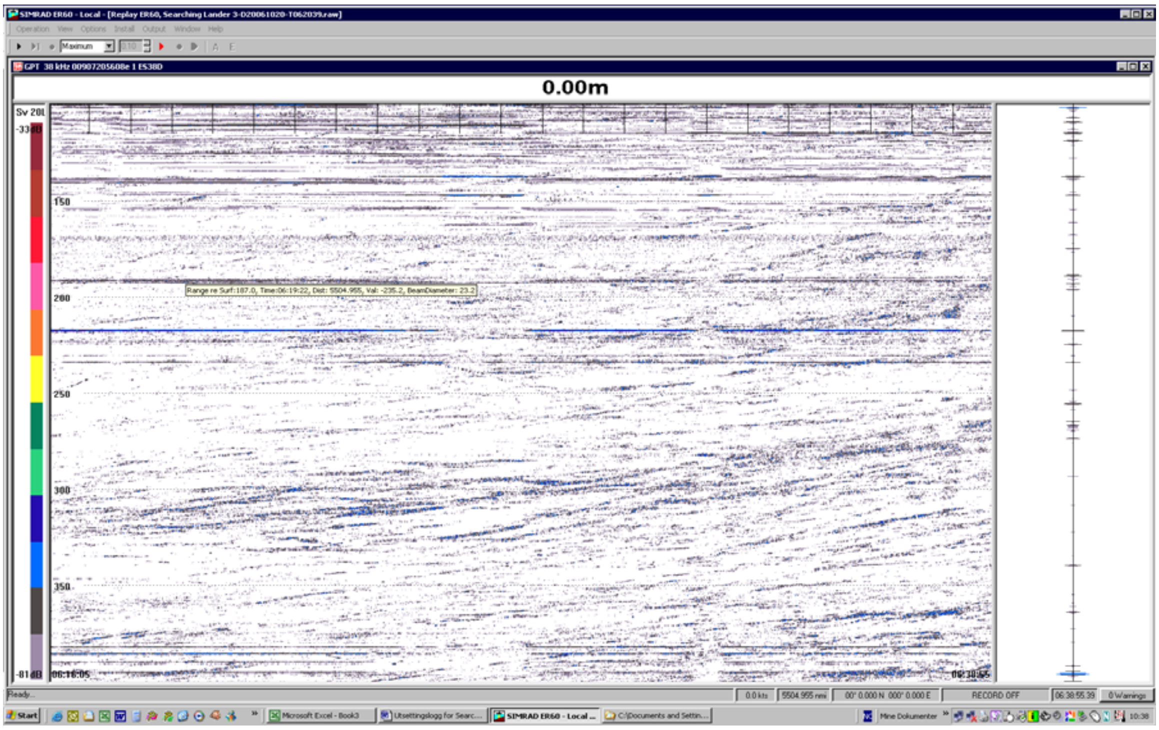


Fig. 19: Echoes from fish coming in

Potential Improvements

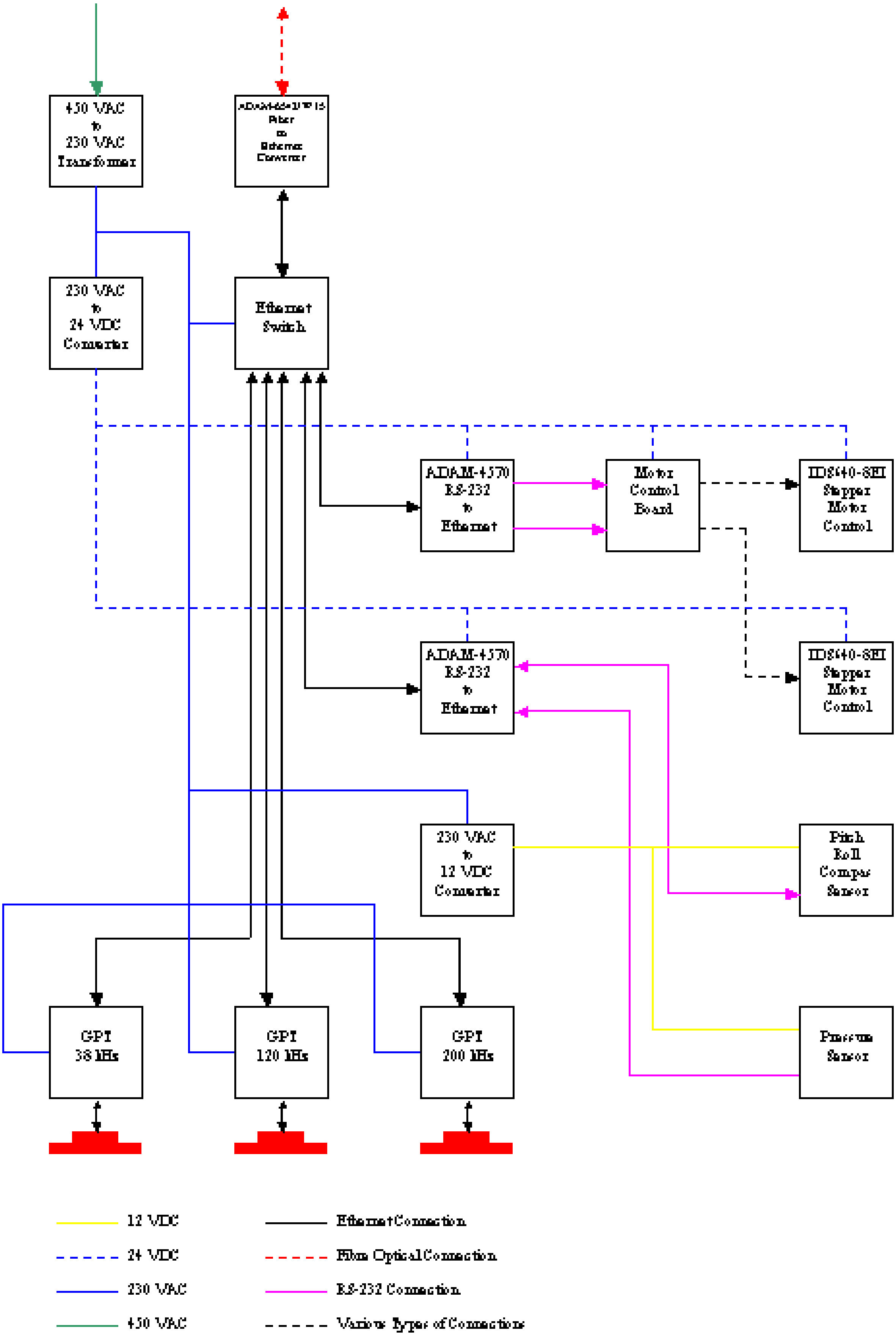
If we are able to communicate via cable or acoustic modem to the Lander after deployment, better experiment could have been performed.

Some technical improvements for making the Searching Lander more versatile is listed below:

To increase the stability of the platform, weights have to be added to the bottom of the GPT housing. This will stabilize the roll movement caused by heavy current in the water.

Increased positive buoyancy would be a useful improvement to the Lander. Adding 12 trawl spheres (-8 litres) as floating to the top of the Lander, beneath the protective housing ring will give the Lander app 100 litre more positive buoyancy.

Appendix V: Schematic presentation of the TS-probe



Appendix VI: Report of the test of CatchMeter, system for automatic species identification and length measuring of trawl catches (in Norwegian).

Cato Svellingen (SCANTROL) & Jan Tore Øvredal (IMR)

CatchMeter er et visjonsbasert målesystem, som automatisk bestemmer art og måler lengde på fisk (tidligere beskrevet på Hinnsiden). Fargebilder av hver enkelt fisk kan også lagres og analyseres i ettertid.

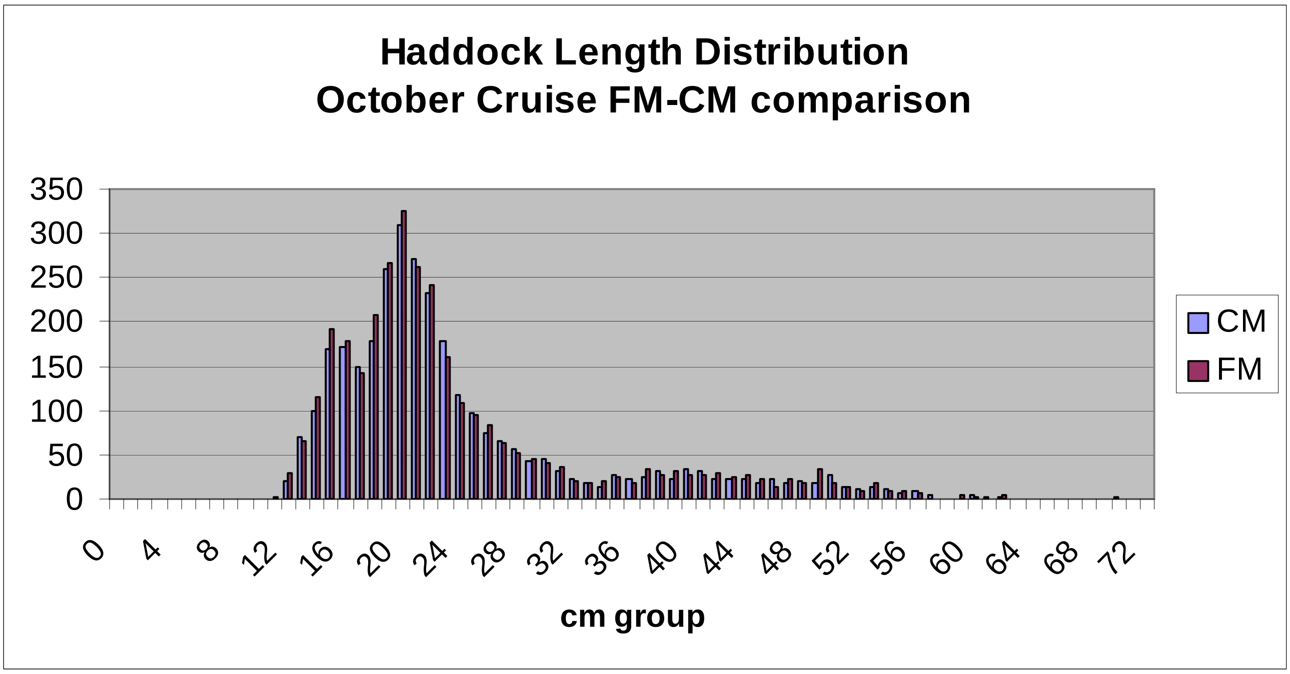
I den første uken av metodetoktet, fra første til femte oktober, var CatchMeter igjen i bruk på G.O. Sars. Deltakere var denne gangen Jan Tore Øvredal fra IMR, Rich Wawrzonek fra NOAA, og Cato Svellingen fra Scantrol.

Rich Wawrzonek var med som gjest fra NOAA, da disse er svært interessert i å lære mer om automatisk fangstmåling ved bruk av CatchMeter. NOAA planlegger også en utprøving av CatchMeter i Alaska til neste år.

På dette toktet fikk vi målt mye fisk, totalt 8500 fiskebilder av totalt 15 arter er lagret. Bildene blir lagret som fargebilder på en harddisk for senere bruk og analyser.

Resultatene for lengdefordeling er sammenlignet med resultatene for FishMeter art for art for alle trålhal (totalt 8 bunntrålhal er sammenlignet). Både artsgjenkjenning og lengdemåling ser svært lovende ut.

Grafen under viser på lengdefordelingen for all hyse som vi målte på toktet, fisken ble målt med både CatcMeter og FishMeter.


Haddock Length Distribution
October Cruise FM-CM comparison
350
300
250
200
150
100
50
0
0
4
8
12
16
20
24
28
32
36
40
44
48
52
56
60
64
68
72
cm group
CM
FM

Appendix VII: Report of test and development of new interface (IMR_map) for bringing survey data into and analysing them in ArcGIS (in Norwegian)

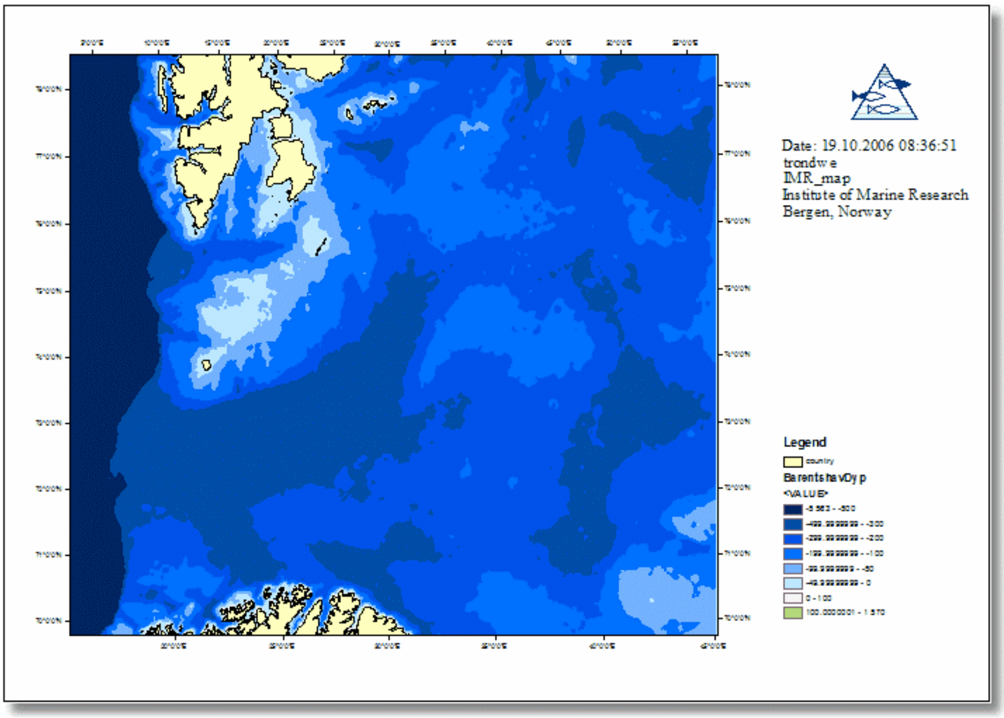
Trond Westgård (IMR)

Etter en presentasjon av IMR_map for Observasjonsmetodikk-gruppen den 25.9.2006 ble det bestemt at Trond Westgård skulle delta på metodikktoktet i perioden 6.10 til 20.10. Med diskusjoner, ”workshops” foran skjermen og testing mot data som ble samlet inn på toktet ville en bidra til at IMR_map blir et effektivt operativt verktøy.

Reaksjonen fra de som testet løsningen om bord var at dette var en brukervennlig måte å behandle data på. IMR_map vil også gi nye muligheter for å lage surveykart med delresultater underveis i toktet. Diskusjonene om bord som førte til en rekke forbedringer i IMR_map som ble lagt inn underveis:

Kartografi

Det er viktig at kart som lages ved HI har et helhetlig kartografisk utseende. Det er nå bygget inn en mekanisme i IMR_map som gjør at man kan legge til kartografiske maler. Slike maler kan legges til for hvordan et A4 standard-plott skal se ut med påskrift, HI-logo osv, men også faste fargevalg for temperaturkart, og fargeskalaer for andre rasterlag som skal sammenlignes innbyrdes. Dette letter brukerens arbeid og sikrer et helhetlig utseende. Dette bør følges opp mot informasjonsavdelingen og NMD for å få alle detaljer rett.
Det er også lagt til en metode som gjør at et kartografisk symbolsett kan knyttes mot et kartlag, eksempelvis et survey der stasjonene kommer ut med standard utseende (z for CTD stasjon osv.).

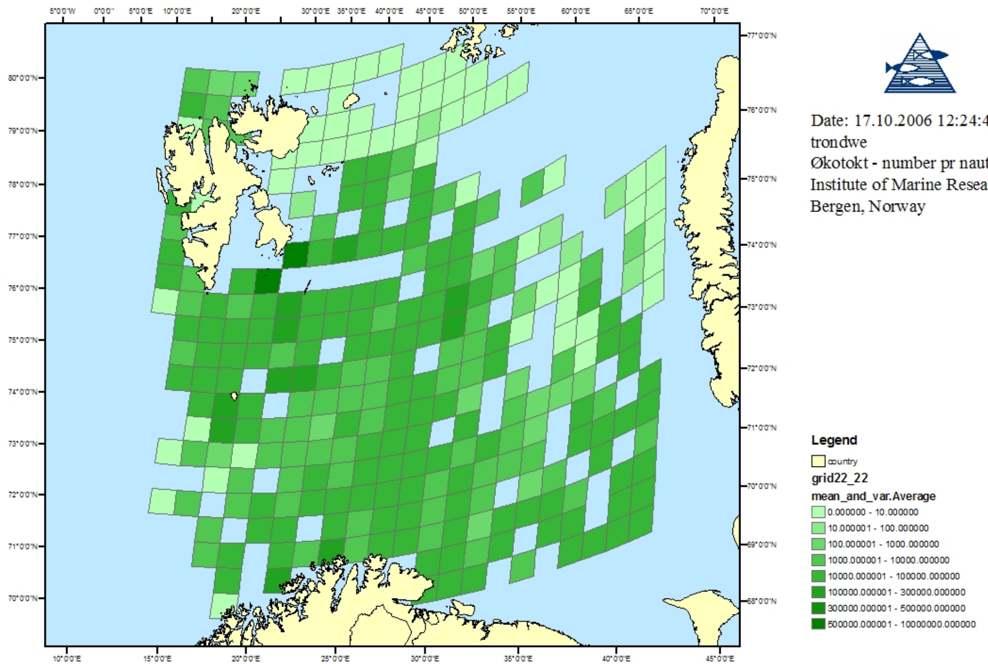


Områder for stratifisering

Flere av våre survey av biologiske ressurser baserer seg på stratifisert prøvetaking. Man trenger da enkle måter å få laget slike strata på. Det er lagt inn tre nye måter brukeren kan få slike strata inn i GIS-systemet:

- Brukeren lager en enkel tekstfil med hjørnekoordinater og navn på strata som systemet leser og lager polygon ut fra.
- Brukeren gir et startpunkt (Bredde,lengde) for et rutenett med faste sidelengder i **meter** og antall ruter i bredde- og lengderetning. Systemet lager automatisk rutenettet.
- Brukeren gir et startpunkt (Bredde,lengde) for et rutenett med faste sidelengder i **desimale grader** og antall ruter i bredde- og lengderetning. Systemet lager automatisk rutenettet.

Fra før inneholder IMR_map rutiner for å beregne middelverdi, varians og standardavvik for disse strataene på en enkel måte. Et eksempel på bruk kan være antall torsk fanget pr nautisk mil for tråltrekk. Verdiene for trålhalene ”kjøres” så mot et rutenett eller mot et strataområde som vintertoktets ”system9”-inndeling. I figuren under er økosytemtoktets data for torsk fanget pr nautisk mil vist mot et ad hoc strata system med 30 * 30 nm ruter. Data er hentet direkte fra SPD-filer og kunne vært laget om bord.



Akustikkfiler

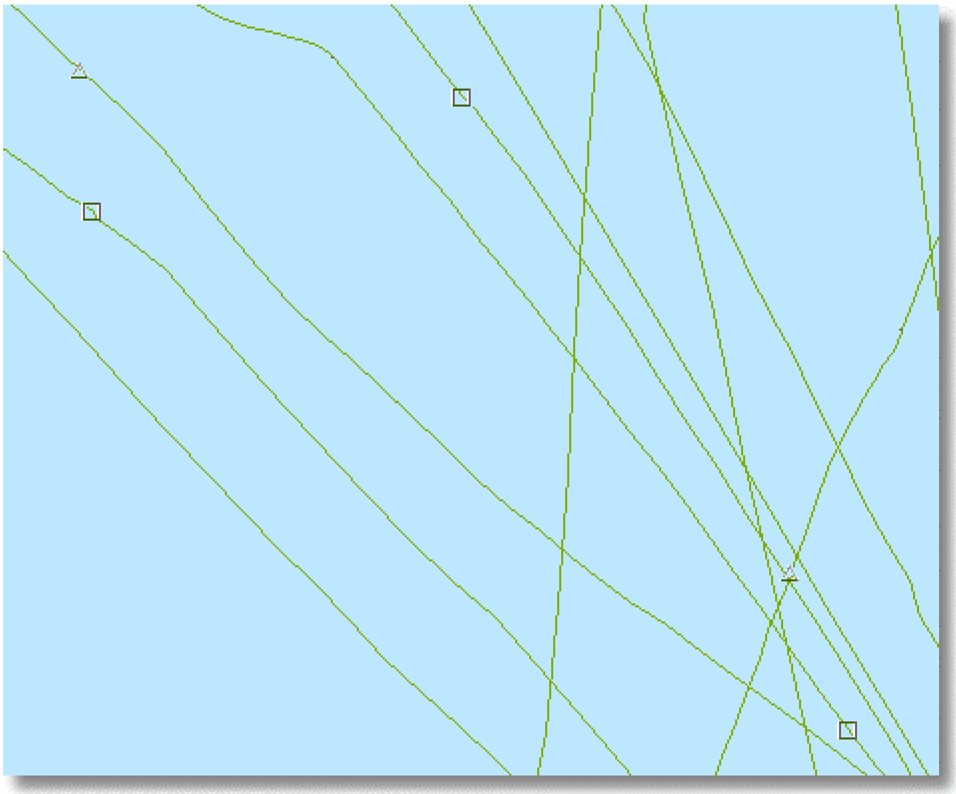
Både BEI-systemet og LSSS kan rapportere i det såkalte listuser05-formatet. Dette formatet gir en fil med tolkede akustikkdata for hver art som skal mengdeberegnes. IMR_map kunne også tidligere lage temakart ved å lese disse filene, men på toktet ble det også lagt inn mulighet for å ta ut data for ulike dybdelag. På denne måten kan man på en enkel måte sammenligne ekkomengde for en art f.eks i dybdelagene 0-50 m og 50-100 meter. Det ble også lagt inn en rutine for å beregne solhøyden. Ut fra solhøyden kan man avgjøre om det var natt eller dag for hver "milverdi". Dette er viktig nå en skal sammenligne data da mange arter viser en vertikal døgnvandring.

Beregning av foreløpige bestandsestimat

Det er en omfattende prosess å lage et bestandsestimat basert på data innsamlet fra ekkolodd og biologiske prøver om bord. Når dette er gjort stratifiserer man prøvene og bruker programmet BEAM. Olav Rune Godø foreslo å bruke funksjonaliteten i GIS-systemet til å beregne et "hurtigestimat" av bestanden målt med ekkoloddet om bord. Dette estimatet kan om en vil beregnes daglig og prosessen tar ikke mer enn noen minutter. Det er nå lagt til en egen dialog i IMR_map for slike beregninger. Foreløpig bruker en konstantene for kolmule for å beregne mengden individ, men det er lett å legge inn konstanter for alle arter som instituttet driver survey på.

Kurslinjer og ref-linjer

Den detaljerte dagboka (log-filer) som føres på brua er uvurderlig når en i etterkant skal tolke datene. Rutinene for å lese og tolke slike filer er forbedret slik at både symbolikk og påskrift for hva som skjedde er på plass i ”kartet”. Under er vist et detaljert kurskart i et eksperimentområde der slepeloggen til båten og trålstasjoner er vist.



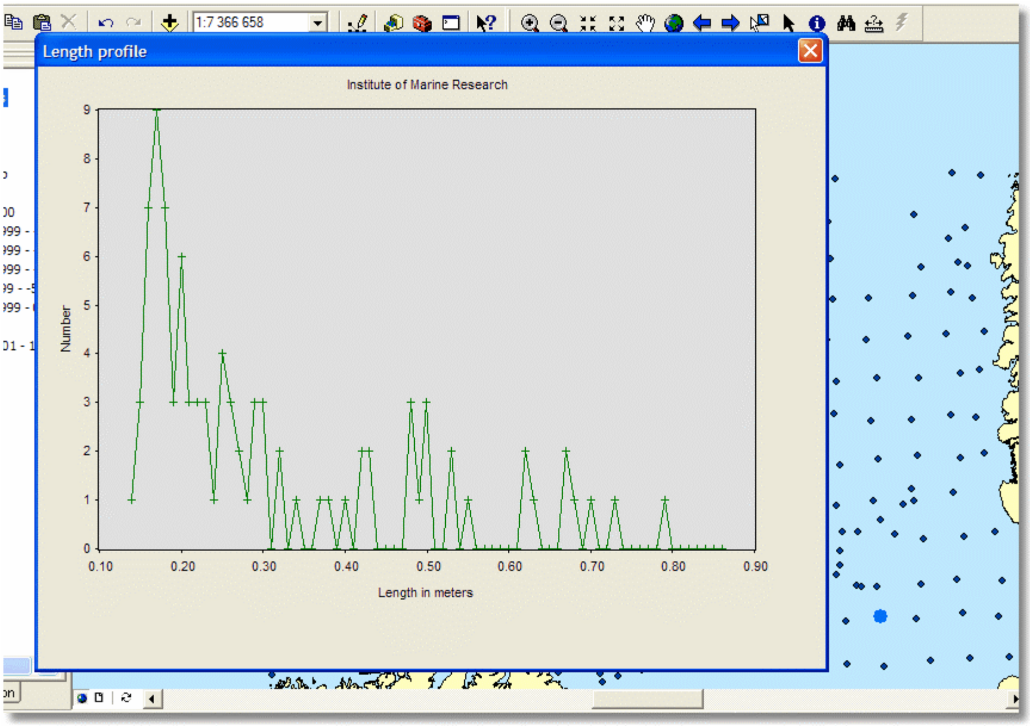
Utbredelseskart for fisk

Det er nå lagt til funksjonalitet slik at brukeren kan vise temakart for en art etter lengdekriterier. Tidligere viste man i IMR_map all fisk for en art, men nå kan brukeren f.eks be om all torsk større enn 25 cm eller torsk mellom 50 og 80 cm.

Det ble også lagt inn beregninger for antall fisk/mengde fisk fanget pr time og pr nautisk mil.

Lengdefrekvens for fisk rett på skjerm.

IMR_map har lenge hatt muligheten for å vise vertikalprofil av temperatur og salt for en CTD-stasjon. Dette skjer ved at brukeren klikker på en CTD-stasjon i kartet, data blir så hentet i CTD-databasen for denne stasjonen og en figur blir vist på skjermen. Nå er den samme mekanismen lagt inn for trålstasjoner. Brukeren kan da klikke rundt om i kartet og få en rask oversikt over størrelsesfordelingen til et fiskeslag.



Tekniske forbedringer

Det er foretatt en rekke tekniske forbedringer som ikke er synlig for brukeren. IMR_map inneholder nå 11 ulike dialoger styrt av en hovedmeny. Noen av disse dialogene har faner slik at en kan regne at systemet har rundt 20 ”enkelt”-dialoger. Hver av disse dialogene har kildekode knyttet til seg, men det meste av kildekoden finnes i et rutinebibliotek som har rundt regnet 15000 kodelinjer. IMR_map er dermed et ganske stort prosjekt.