

**CENTRE FOR ENVIRONMENT, FISHERIES AND AQUACULTURE SCIENCE  
LOWESTOFT LABORATORY, LOWESTOFT, SUFFOLK NR33 0HT**

**2005 RESEARCH VESSEL PROGRAMME**

**REPORT: RV CEFAS ENDEAVOUR: CRUISE 13**

**STAFF:**

Part A	Part B	Part C
B Harley (SIC)	B Harley (SIC)	B Harley (SIC)
N Taylor(2IC)	N Taylor (2IC)	
M Etherton	M Etherton	M Etherton
R Humphreys	R Humphreys	R Humphreys
M Parker-Humphreys	J Pettigrew	J Pettigrew
K Sullivan	C Whittaker	K Warr
M Eade	J Keable	E Lane
	J van der Kooij	
	K Warr	
	K Coull (FRS) for 7 days	

**DURATION:** Part A: 09 August – 23 August  
Part B: 25 August – 3 September  
Part C: 14 September – 26 September

**LOCATION:** North Sea

**AIMS:**

1. To carry out a groundfish survey of the North Sea as part of the ICES coordinated IBTS, using a standard GOV trawl in order to obtain information on:
  - a) Distribution, size composition and abundance of all fish species caught.
  - b) Age – length distribution of selected species.
  - c) Distribution of fish in relation to their environment.
  - d) Distribution of macrobenthos and anthropogenic debris.
  - e) Surface and bottom temperature and salinity data using CTD.
  - f) Length weight & maturity information using individual fish measurements, in support of the EU Data Regulation.
2. To collect acoustic data at two operating frequencies (38 kHz and 120 kHz) continuously throughout the cruise. Data recorded from the 38 kHz transducer will be combined with GOV trawl data and an estimate of total abundance made for roundfish species. This work will form part of a three year project (CATEFA) aimed at examining the relationships between trawl catches and acoustic data.

3. To collect fish white muscle and queen scallop tissue for stable isotope analysis, as part of an ongoing study on the effects of fishing in the North Sea (S Jennings, CEFAS Lowestoft).
4. To carry out 6 hard ground tows of the NE coast using the modified rock-hopper GOV.
5. To collect cod blood and tissue samples as part of cod endocrine project (S. Scott, CEFAS, Weymouth)

**NARRATIVE:**  
(all times GMT)

RV CEFAS ENDEAVOUR sailed from Lowestoft at 1030h 9 August. In addition to its complement of scientific staff and crew a BBC film crew and David Righton from CEFAS were also onboard to film the ship working at a trawl station and interview David Righton for an Anglia BBC program. Whilst we had this opportunity the vessel tested the new software for the NUASt auto-trawl system that had been recently upgraded. Two stations, not normally fished on the August survey were fished off Southwold, this enabled the BBC to get footage and the interview they required. These personnel were put off by the work boat into Lowestoft later that evening and once the boat was retrieved the ship steamed over night to the Thames to start the survey proper on the morning of the 10 August. As part of the new standard procedures on this survey a cast with a MiniCTD with a 10 litre Niskin bottle attached, is to be carried out at each GOV trawl station. The first set of valid CTD and GOV (serial number 4) stations were started at 0510h on Wednesday in the Thames and the vessel worked east and completed 3 sets of stations on the 10 August. In fine weather, and working across the North Sea and in a generally northerly direction (see figure 1), a further 34 sets of stations were fished without incident. However, on the first GOV trawl at approximately 0530h on 20 August, the gear was hauled and the entire belly of the net was damaged. Panels 4 and 5 were very badly torn and panel 6,7 and 8 were completely missing. On examination of the SCANMAR data it was possible to deduce that this damage occurred 25 minutes into the tow and this station was deemed valid for that 25 minutes. Due to the amount of damage, this net was written off and a new net (serial number 10) was rigged. Fishing resumed at 1134 and a further 9 sets of stations were fished without incident. The vessel docked in Aberdeen on the afternoon on the 23 August, for a scientific and SMIT crew change.

We were joined by Kenny Coull from FRS, Aberdeen, for the second half of the trip, as part of IBTS request for staff exchange amongst the institutes involved in the IBTS. Sailing from Aberdeen was delayed slightly but the CEFAS ENDEAVOUR sailed again from Aberdeen at 1400 on the 25 August to continue the survey. The net was shot away at 1630, however there was a problem with the main deck net drum and the tow had to be abandoned. Overnight we steamed north-west to another station and the ships engineers made an attempt to rectify the problem. They found that the net drum brake had been damaged and they replaced it with one from the split net drum on the deck above. We shot the gear again the following morning but again the net drum failed to work satisfactorily and the brake from the split net drum was damaged in the attempt. At this time CEFAS ENDEAVOUR sailed back towards Aberdeen and asked for assistance from SMIT and CEFAS shore personnel. Another brake from the towed-body cable winch was fitted to the main net drum. Again this failed to work satisfactorily and a call was made to have a new brake unit sent from the manufacturer (for

full details of these instances, please see the chief engineers report). Kenny Coull and Carl Whittaker were put ashore by small boat on 31 August. When the part arrived, unfortunately this failed to work and the decision to return to Lowestoft and abandon the survey was made on the evening of 1 September.

On 14 September, having finally fixed the net drum problems, CEFAS ENDEAVOUR sailed from Lowestoft at 0430h, to attempt to complete the planned survey. The first station 40 miles east of Flamborough Head was fished without incident on the afternoon of the 14 September, however the next station inshore hauled with a tear through the belly in panels 5,6 and 7. From the Scanmar log it was possible to conclude that this damage occurred 25 minutes into the tow so this stations was worked up as a valid 25 minute tow. The ship steamed north overnight to the stations in the north of the survey area. Taking into consideration the generally poor weather forecast and the limited time that we had to complete the survey, it was decided to drop prime station 40, as gear damage, some of it severe, has been a problem in the past on this station. The damaged net from the previous day was repaired whilst steaming during the morning and fishing continued at 1536h on 15 September at prime station 52 off the north east coast of Scotland. In moderate weather fishing continued in a generally anti-clockwise direction over the next 9 days. On the first haul on 20 September the station was hauled on 20 minutes when the Scanmar units started to give inconsistent readings. When the net was retrieved there was no damage so the tow was deemed a valid 20 minute tow. Prime station 71, the most north-westerly tow of the survey grid was abandoned for the same reasons as noted for prime station 40 earlier in the trip. On 22 Sept the moderate weather worsened with wind speeds up to 35 mph (force 7), however we were able to fish in this marginal weather, and continued to do so until we finally completed the main survey grid at 1544h with winds gusting 55mph (storm force 10). The ship then steamed south to carry out the hard ground tows off the Yorkshire coast and around the Dogger Bank.

Having changed the gear over from the standard IBTS GOV to the modified rockhopper GOV, the 6 hard ground tows off the Yorkshire coast commenced on the morning of 24 September. The first tow was hauled at 1219h and when it was eventually sampled the catch consisted of 5.1 tonnes of spawning herring. The next tow only 16 nautical miles(nm) south had similar echo sounder marks along it, so the decision to make this tow only 20 minutes was made, however the catch was not excessive. The last four stations were all fished without incident. Fishing finished at 1431h and the ship then made its way back to Lowestoft, docking at 1100h on 26 September.

## **RESULTS:**

**Aim 1.** A valid GOV trawl haul was successfully completed at 73 of the primary station positions. 69 of these were 30 minute, two were 25 minute and two were 20 minute. Trawling was carried out using the standard specification for International Bottom Trawl Surveys (North Sea). A SAIV micro CTD was used, attached to the starboard wing of the trawl to obtain temperature and salinity data. Trawl number 4 was written off at prime station 36, however the tow was deemed valid. A chart indicating the position of each trawl station is attached (Figure 1). Scanmar equipment was used to monitor headline height, wing width and door spread. At each station, the catch of each species was weighed and all fish, or representative samples, were measured. Samples of otoliths for age determination were taken as specified in standard instructions. Benthos and crustacea were identified to the species wherever possible and recorded as present. Any anthropogenic waste material was recorded

and weighed. The resultant data were input to computer database using the CEFAS Electronic Data Capture System. These data will be analysed at CEFAS Lowestoft and will provide a major input to the ICES assessment of North Sea gadoids and pelagic species.

Surface and bottom salinity samples and a water column CTD profile were taken at each of the primary stations fished up to station 90. However due to staffing levels and time constraints no CTD profiles were taken on station 91 to 119. Only a surface salinity bottle was taken at the GOV station on these tows. These samples will be forwarded to EQ in order that the CTD profile can be calibrated.

It was noted that although the SCANMAR readings for the GOV trawl serial number 4, were within acceptable limits, the headline height was at the lower end of this range. All the measurements of the bridles and sweeps, the length of the centre part of the headline and the position of the kite were double checked but all were acceptable. After this trawl was written off, trawl number 10 was used. This appeared to have gear parameters that matched those described in the IBTS manual.

Below is a table showing the top 20 species caught by weight.

Top 20 species by weight	
Species	weight (kg)
Herring	8384.535
Whiting	6969.510
Haddock	3529.500
Dab	3359.213
Mackerel	1254.585
Grey Gurnard	1043.566
Horse Mackerel	826.329
Saithe	603.908
Plaice	454.212
Cod	318.080
Sprat	309.410
Lemon Sole	197.710
Long Rough Dab	195.875
Norway Pout	163.094
Starry Ray	40.121
Hake	36.456
Blue Whiting	35.205
Argentine spp.	23.605
Nephrops	21.642
Anglerfish	20.338

**Aim 2.** Fisheries acoustic data were continuously collected for the first half of the cruise (see above) at two operating frequencies (38kHz and 120kHz), using the SIMRAD EK60 split beam sounder. Post processing was undertaken on the 38kHz frequency only, which is considered to be the standard operating frequency for fisheries acoustic surveys. The 120kHz echogram was scrutinised in parallel with the 38kHz data to aid identification of echo targets and bad data regions.

Relationships between the acoustic backscatter data of 0-5m above the bottom and the catch data (species composition, length and weight) on the sample stations are extrapolated to the between station acoustic data (partitioned in 2nmi intervals) to quantify demersal fish abundance in the North Sea. This work continues on the three-year EU project (CATEFA) aimed at examining the relationships between ground fish trawl catches and acoustic data. It will contribute to the acoustic ground fish database ensuring participation in future EU projects. A new software package allowed us to use the recorded fisheries acoustic data for acoustic ground discrimination (AGDS) applications with QTC Impact. Post processing of the AGDS data from the 38kHz sounder will be undertaken at the Lowestoft laboratory and will be used in combination with data from other cruises to map the North Sea seabed. Interference from unknown sources was observed in the acoustic data.

Three (all recorded on the 18<sup>th</sup> of August) of the 43 stations contained poor quality data due to (irreversible) malfunction of the data-compression software and will have to be validated in further analyses. Data from some stations had been contaminated with interference and these will be cleaned up when the appropriate tools are available.

**Aim 3.** White muscle tissue samples were collected from 15 different species for stable isotope analysis, 185 samples from 9 stations in area A and 196 samples from 11 stations in area B. No samples were taken from prime station 63 as a split oil drum was hauled and it would have been difficult to obtain clean muscle samples. No samples of bivalves were taken as no live specimens were caught in the trawl at the stations within areas A or B.

**Aim 4.** Using a re-rigged GOV trawl fitted with rockhopper ground gear, six hauls were completed on harder ground. Three of these were off shore around the Dogger Bank and three inshore on the Yorkshire coast. Notable were the 5.1 tonne of spawning herring caught on the northerly inshore station and the 77 kg of cod caught on the most north easterly station on the Dogger Bank.(Figure 1).

**Aim 5.** Not started due to failure of net drum.

#### **MISCELLANEOUS:**

The following aims, which did not appear in the cruise programme, were also accomplished.

1. 45 surface and bottom water samples between 9 and 26 August and 29 surface water samples between 14 and 24 September were collected for Andrew Harwood from UEA, Norwich.

**2.** Samples were collected by Suhaimi Suratman, UEA Norwich, to measure the distributions of nutrients (dissolved and particulate) and chlorophyll-a during the end of the algae bloom (late summer) and to conduct the experiments of nitrate and ammonium uptake rates and subsequent DON (dissolved organic nitrogen) release for phytoplankton using  $^{15}\text{N}$  labelling method. Sampling stations were chosen according to the IBTS primary stations plus some stations between them. In total about 55 sampling stations were chosen to collect the surface water samples. These surface samples were taken from an on-line continuous flow. Some samples were also collected from the bottom (especially from the centre and northern part of the North Sea) using 10-l Niskin bottle to give the general idea about the nutrients and chlorophyll-a concentrations for these stratified areas. Samples for inorganic nutrients (ammonium, nitrate, nitrite, phosphate and silicate) were added with  $\text{HgCl}_2$  after filtration onboard using glass fibre filters (Whatman GF/F) whereas samples for organic nutrients (nitrogen and carbon) were stored frozen until analysed. A single water sample (250 ml) was filtered through GF/F filters and frozen quickly to determine the chlorophyll-a concentration. A one litre water sample was also filtered through GF/F filters (combusted at  $450^\circ\text{C}$ ), dried at  $60^\circ\text{C}$  and then analysed for its particulate organic nitrogen and carbon. For the uptake/release rates of nitrogen, samples were obtained from on-line continuous flow, spiked with  $^{15}\text{N}$  nitrate and ammonium and incubated in on-deck incubators cooled with flowing seawater and covered with a neutral density screen simulating the surface light level. All incubations were carried out for 24 hours.

**3.** Multibeam Sonar - Multibeam data, recording 3D acoustic data of the seabed as well as the water column, were collected using a dual head Simrad EM3002 multibeam sonar, available on temporary loan from Simrad. In total 38 stations and 15 between station transects were sampled. The bottom data will be worked up in the lab and will provide info on the seabed bathymetry and roughness and where appropriate tools are available its application will be tested for seabed classification purposes. Although the quality of the 3D water column data has yet to be tested, its potential applications lie in improving the relation between on station acoustic data and the trawl catches.

**4.** Scanning sonar - A new processor was installed in the hull unit of the Simrad SH80 scanning sonar during the mid cruise break. The sonar was subject to brief tests but no opportunities for further tests and/or data logging arose in the second half.

I would like to take the opportunity to express my thanks to both the SMIT personnel and scientific staff for the effort put in, and cooperation that was given, throughout this survey.

B F M Harley  
26 September 2005

**SEEN IN DRAFT:**

Master	R J McCurry/ T Reading
Senior Fishing Mate	A Simpson/ B Salter

**INITIALED:**

Surveys Contract Manager	R Millner
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**DISTRIBUTION:**

Basic list +

B Harley	J van der Kooij
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N Bunn	K Warr
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M Etherton	J Pettigrew
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R Humphreys	K Sullivan
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M Parker-Humphreys	J Keable
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M Eade	C Whittaker
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E Lane

**Figure. 1 Station positions CEFAS Endeavour 13/05.**

