CRUISE: CIRO 6_01

STAFF:

Part A	Part B
T W Boon (SIC)	T W Boon (SIC)
G Course (2 SIC)	R A Ayers (2 SIC)
D Brown	G Course
K Sullivan	D Brown
N Bunn	M Etherton
D Maxwell	A Tidd
C Whittaker	R Taylor
R Callaway	R Callaway
R Flatt	R Flatt
S Jennings	K Warr
	C Firmin
	S Mackinson
	S Neville

B Fogg (16 Aug – 21 Aug)

DURATION: Part A: 6 August – 21 August
Part B: 22 August – 6 September

LOCATION: North Sea

AIMS:

1. To carry out a groundfish survey of the North Sea 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 information using individual fish measurements.

2. To investigate potential cod (*Gadus morhua*)/sandeel (*Ammodytidae*) interactions.

3. To collect material for fish identification courses (T Watson, CEFAS Lowestoft).

4. To preserve material from diseased fish (S Feist, CEFAS Weymouth)

5. To monitor epibenthic diversity, using a fine mesh 2m beam trawl.

6. To investigate the practicalities of recording acoustic measurements during the standard GFS using the dual frequency Simrad EK500 echo-sounder.

7. To sample fish by species and size class for stable isotope analysis (S Jennings, CEFAS Lowestoft).

8. To collect samples of hake (*Merluccius merluccius*) gonad for genetic studies (P MacDonald, University of Leeds).

9. To collect dabs (*Limanda limanda*) for bass (*Dicentrarchus labrax*) feeding experiments (C Sweeting, University of Newcastle).

10. To collect and preserve two each of benthic species as specified (R Kirby, Plymouth Marine Laboratory).

NARRATIVE:
(all times are GMT)

RV CIROLANA sailed from Lowestoft at 1100h 6 August and steamed slowly south to rendezvous at 1700h with RV CORYSTES in the Black Deep area of the Thames Estuary. A micro CTD and some engineering spares were transferred to Cirolana and the vessel then moved to a position east of the Thames Estuary, Lat. 51°44.1'N; Long. 01°44.5'E; where the survey began at 0526h on the following day. Sampling at each primary station consisted of one thirty-minute tow with the GOV trawl and one 200m drift with the two metre beam trawl. Temperature and salinity profiles were obtained using a micro CTD attached to the GOV port wing. Sampling at three primary stations was completed on each of the first five days, working northwards through the southern Bight of the North Sea up to Lat.55°N;. At the first position on the morning of 12 August, the starboard main trawl warp parted as the gear was squared up. All the gear was recovered but the tedious and strenuous job of cutting back and re-splicing both warps took until mid afternoon. However, two positions were successfully worked that day and a further four positions on each of the two following days. After completing three primary stations during 15 August and two during 16 August, the vessel steamed into the Tyne where B Fogg was embarked by sea-rider.
During the period 17 August to 20 August a further 14 stations were completed at the rate of three or four a day. One beam trawl haul was abandoned during a brief spell of poor weather during 19 August. Over this period trials were made with a 'Trawlometer', a device fitted to the 2m beam trawl for indicating bottom contact. Overnight passage was made into the Firth of Forth and the vessel was locked into Leith at 0900h 21 August.
Cirolana was moved to a bunkering quay at 1400h 22 August. Whilst on this berth a member of the deck crew 'jumped ship'. RV Cirolana departed Leith 1800h and made overnight passage to a position off Aberdeen (Lat. 57°14.7'N; Long. 01°28.8'W) where a single station was completed before awaiting the arrival of a replacement crew member. Embarkation was completed by sea-rider by 1530h and the survey recommenced at 0530h 24 August at a position Lat. 56°49.7'N; Long. 00°19.3'E. Two three haul days were worked out to the eastern edge of the survey area off the Danish north west coast and then a four haul day north along the edge of the Norwegian Deeps. Deteriorating weather restricted the following day to two hauls. By the end of 30 August 11 more stations had been completed and the vessel made an overnight passage to Dales Voe, north of Lerwick, where fore and aft anchors were deployed. The aft anchor being an ingenious combination of both trawl doors and a creeper, devised by the senior fishing mate. The Simrad EK500 was calibrated and the vessel left the anchorage at 1200h. The remaining seven primary stations were completed by 1200h 2 September. Later that evening a successful exploratory tow was made off Aberdeen. This will be considered as a potential future replacement for primary station 40 which has a history of gear damage.
The vessel then made passage to a position west of the SouthWest Patch (Lat. 54°51.1'N; Long. 01°20.6'W), where, at 1419h, a fishing survey was started as part of the on-going cod/sandeel investigations. Three hauls were completed in the remaining daylight. All of 4 September was spent 'dodging' in a north west gale. Three further hauls were completed

during the morning of 5 September after which a course was set for Lowestoft. Cirolana docked at 0900h 6 September.

RESULTS:

Aim 1. All 75 standard 30 minute GOV trawl stations were attempted. Net damage was sustained at two and one of these (primary 71) was classified as invalid. Trawling was carried out using the standard specification for International Young Fish Surveys. Temperature and salinity profiles were obtained at all bar five trawling positions using a micro CTD attached to the wing of the trawl (see Misc.). A chart indicating the position of each valid trawl station is attached (Figure 1). Scanmar equipment was used to monitor headline height 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.

Aim 2. One 40 minute and five 30 minute tows were made with the standard GOV trawl. The groundrope had been adjusted to reduce bottom contact and avoid excessive catches of dabs (*Limanda limanda*), known to be abundant in the area. At each station, the catch of each species was weighed and all fish, or representative samples, were measured of whiting (*Merlangius merlangus*) and haddock (*Melanogrammus aeglefinus*). All cod (*Gadus morhua*) were sampled for length, weight, sex, maturity, age and stomach content. All sandeels were sorted into species and measured and samples of 200 *Ammodytes marinus* frozen for later processing.

Aim 3. Specimens of more than 50 different species were preserved for the Laboratory's fish identification courses.

Aim 4. No unusual occurrences of diseased fish were encountered on the survey.

Aim 5. The aim of this project was to monitor the biodiversity of epibenthos in the North Sea. The epibenthos was sampled at 74 stations close to the primary trawl station positions. Samples were taken with a 2m-beam trawl, fitted with a 20mm mesh and a 4mm knotless mesh liner. The beam trawl was towed over a distance of 200m at a speed of about 1.8 knots. The samples caught were sieved through 5mm mesh and the fauna was sorted and identified to species level. Numbers of individuals of each species were counted and biomass of each species was determined by weighing the organisms with a POLS marine balance with an accuracy of 1g. Data were entered into an ACCESS database. Primary station 44 could not be sampled due to bad weather conditions.

Aim 6. Acoustic data was recorded at two operating frequencies (38Khz and 120Khz) continuously throughout the cruise. Post processing was undertaken only on the 38Khz, which is considered to be the standard operating frequency for fisheries acoustic surveys. The 120Khz was scrutinised in parallel with the 38Khz data to aid identification of echo targets and bad data regions. During post processing, bad data regions included (i) regions where the bottom signal was lost due to poor weather conditions affecting the operation of the sounder, (ii) regions where sections of the cruise track was repeated, and (iii) regions where the vessel was drifting after trawling. Backscatter data recorded from the 38Khz was partitioned into 5nm intervals and allotted to species according to the proportions of various roundfish caught

at the nearest trawl station. Species specific length dependent target strength values were obtained using published data and length frequencies from catches. Using these target strengths and the proportions of backscatter, an estimate of total abundance was made for roundfish species. Additionally, distribution maps of relative abundance were constructed for each roundfish species. The present work forms part of 3 year project (CATEFA) aimed at examining the relationships between trawl catches and acoustic data. Specific data were recorded for this purpose during the cruise and will be analysed in due course.

Aim 7. At the 74 valid primary trawl stations, fish were sampled to collect tissue samples for stable isotope analysis. Sub-samples from 1% to 10% of the GOV catches were divided into body mass classes and tissue from fish in those classes was macerated for a size-based isotopic analysis. Samples of dab (*Limanda limanda*), whiting (*Merlangius merlangus*) and queen scallop (*Chlamys opercularis*) tissue were collected for stable isotope analysis at all the stations where these species were caught, along with samples from a range of other species for which size-related stable isotope data were previously not available. Samples of dab of 190-210mm, whiting of 240-260mm and scallops of around 5cm were collected at 43, 45 and 23 stations respectively.

Aim 8. Samples of testes tissue were collected from 5 male hake (*Merluccius merluccius*) caught in the central North Sea and preserved in an acetic acid/ ethanol mix for genetic analysis (Paul McDonald, University of Hull)

Aim 9. Approximately 80kg of dabs (*Limanda limanda*) >22 cm total length were frozen and bagged for bass (*Dicentrarchus labrax*) feeding experiments (C. Sweeting, University of Newcastle)

Aim 10. Of the list of 16 echinoderm species provided by R. Kirby, 8 species were recorded in the epibenthic samples. One of each were frozen and one of each preserved in 98% Ethanol. Additionally other echinoderm species found in the samples were preserved in case they might be of interest for genetic research.

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

1. Samples of white muscle tissue were collected from 32 hake (*Merluccius merluccius*) and preserved in ethanol for genetic analysis (Pablo Presa, University of Vigo)

2. A prototype instrument (a Trawlometer) designed to indicate bottom contact of the 2m beam trawl was tested. The instrument employs a simple reed switch and sonar link. Data are logged and graphed on a PC. B Fogg was aboard Cirolana from 16 to 21 August to fine tune the instrument and provide instructions, with further trials continuing during the second half of the cruise. The device indicates orientation of the trawl during deployment, allows determination of the period of bottom contact and gives some insight into the behaviour of the trawl in deep water and when being used in heavy weather. However, the trials revealed some technical weaknesses of the prototype of the trawlometer, which will be dealt with in the future.

3. The recently acquired self-logging AML Micro CTD units were deployed for the first time on an IBTS survey. By attaching the unit to the GOV trawl considerable reduction in 'on-station' time is achieved; this data previously being obtained through 'over-the-side' deployments, before or after trawling. The units were deployed on all 75 trawl stations with

the following results. No data – 5 stations; Incomplete profile – 6 stations; Split data – 20 stations. Good data – 44 stations. Only the 'no data' stations failed to provide surface and bottom temperature and salinity. Two, and possibly three, of the 'no data' stations are attributed to a poor connection between the instruments interface PCB and the main electronics; the manufacturers being aware of this problem. Low battery voltage probably accounted for one other 'no data' station. Inspection of the data shows that the above problem is likely not the cause of 'split data' (meaning that logging temporarily stops and restarts), in most cases the logging interruptions amounted to one second, the profiles can be considered complete.. 'Incomplete profile' means that the unit stopped logging and failed to restart. The reason for this type of failure is unknown (although it is observed that the depth reading shows zero at the failure point). The advantage of using self-logging units was proven on this cruise; the manufacturers will now be advised of the above problems to increase reliability.

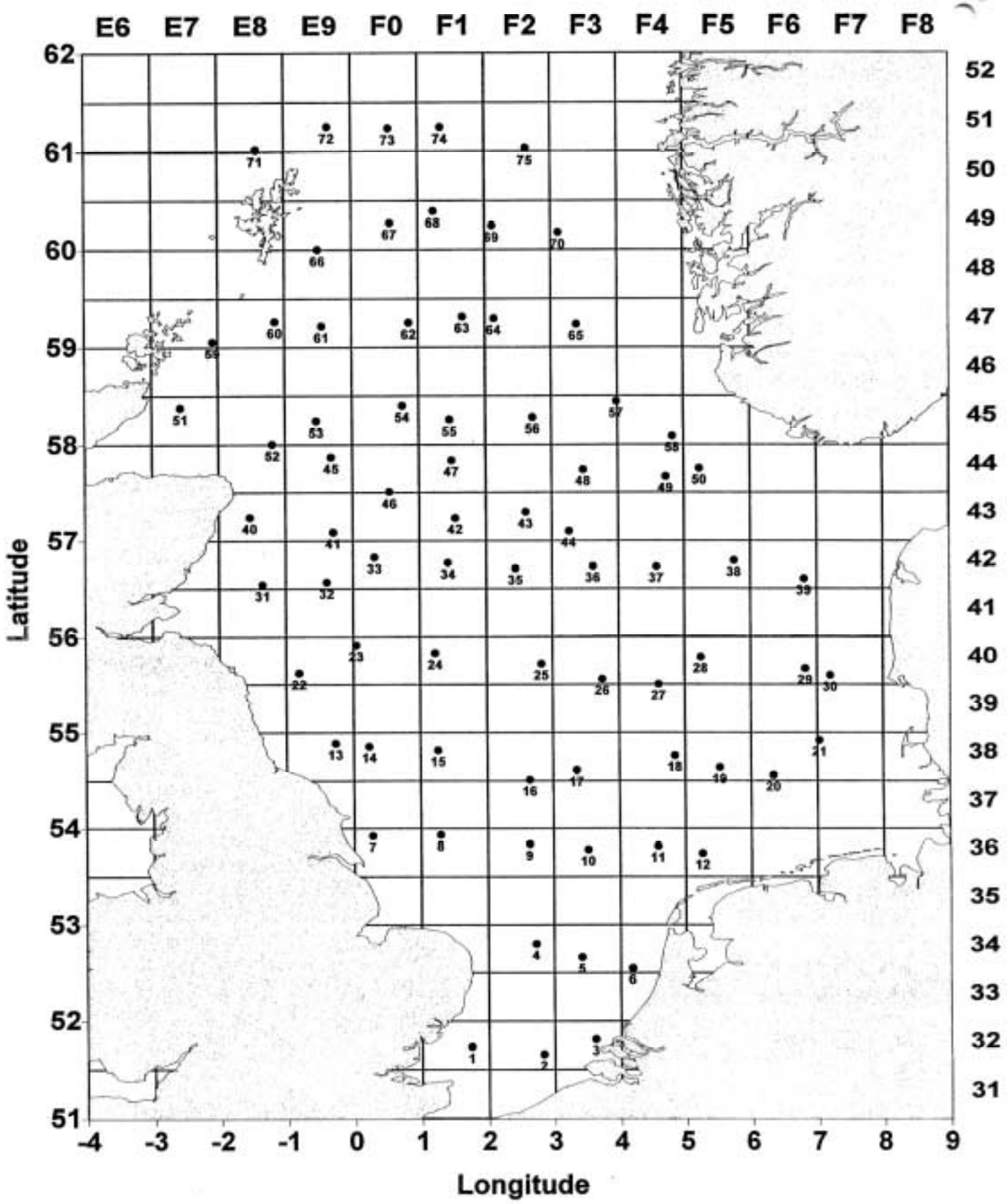
T W Boon
6 September 2001

SEEN IN DRAFT:

Master	R J McCurry
Senior Fishing Mate	A G Lincoln

INITIALLED:

Surveys Contract Manager	R Millner



Primary fishing positions
Cirolana 6/2001