MINISTRY OF AGRICULTURE, FISHERIES AND FOOD
FISHERIES LABORATORY, LOWESTOFT, SUFFOLK, NR33 0HT, ENGLAND

1995 RESEARCH VESSEL PROGRAMME

REPORT: CIROLANA 5/95

STAFF

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DURATION: 9 June 1995 - 27 June 1995

LOCATION: Irish Sea

AIMS:
1. To collect sediment samples in order to establish an inventory of artificial radionuclides in the seabed sediments of the northern Irish Sea (AE0118).
2. To conduct trials and a survey of seabed gamma activity using the IAEA seabed towed gamma spectrometer (AE0118 and IAEA-MEL).
3. To collect sediment cores at a number of sites to allow a detailed analysis of spatial variability of radionuclide concentration in relation to sediment type, location and infaunal distribution (AE0118).
4. To collect sediment samples to assess macro- and mega-faunal distributions at selected sites in the eastern Irish Sea (AE0132, CSG extramural DML).
5. To collect physical oceanographic data in the western Irish Sea (AE0128).
6. To collect water samples at 39 sites for the determination of ^{3}H (AE0122).
7. To collect water samples at 39 sites for the determination of technetium and caesium (AE0114).
8. To recover 2 moorings from the North Channel (AE0128).
9. To collect water column and sediment samples for natural series radionuclide studies of resuspension and scavenging in the western Irish Sea gyre (AE0118).
10. To collect a bulk sample of mixed fish for IAEA.
Additional aim
11. To collect a bulk sample of sediment for IAEA for intercomparsion purposes.

12. To collect surface sediment samples at 41 sites for E Hamilton to examine total α-activity and Fe-geochemistry (CSG extra-mural commission AE0127) and to collect additional surface sediment samples for M Krom for trace metal and grain size analysis (DoE/SOAFD contract)

NARRATIVE: (all times are Greenwich Mean Time)
RV Cirolana left Lowestoft at 1651h on Friday 9 June 1995 and travelled directly to the Irish Sea working area. The first sediment sampling station was worked on Sunday 11 June 1995. Good weather throughout the cruise allowed very good progress with all sampling tasks. A minor delay resulted from the fraying of the main wire strop of the NIOZ corer. Scientific staff changeovers occurred on the 15 June and the 22 June and Cirolana returned to Lowestoft a day ahead of the schedule, docking on the morning tide of Tuesday 27 June 1995.

RESULTS
Aim 1 : 56 NIOZ core samples and 26 Kaston core samples were collected from stations in the northern Irish Sea for the 1995 budget survey (Fig 1). The sediment subsamples will be used for the determination of radionuclides. Priority will be given to GeLi analysis of samples from the immediate area of Sellafield, which holds the bulk of the radionuclide inventory, with a view to producing an interim report to the customer for the September Aquatic Environment Commission review meeting (for details refer A J Poole and D C Denoon, AE0118).
Aim 2. The IAEA MEL towed gamma probe was successfully tested and used to survey 13 lines in the Sellafield area (Fig 2). Information from the NaI detector will be used to refine the estimates of radionuclide budget derived from the sediment sampling programme. Twelve NIOZ core samples were collected from the transects to calibrate the instrument. Spectra were produced for every minute of tow (Fig 3) and preliminary data for one transect line shows high activity inshore decreasing with distance offshore (Fig 4) (for details refer to D S Woodhead).
Aim 3. Kaston cores were collected at two sites, one in the eastern and one in the western Irish Sea mud patches. The cores were subsampled to allow detailed analysis of spatial variability of radionuclide concentration in relation to sedimentology and geochemistry. Initial work on this material will be conducted by an MSc student from Leeds University (supervisors M D Krom, S J Malcolm and A J Poole) who will report at the end of August 1995 (for details refer to S J Malcolm, AE0118).
Aim 4. NIOZ cores were collected at three sites in the Sellafield area for detailed analysis of the macro- and mega-fauna present. The samples were sieved through 0.5mm mesh and picked organisms were preserved for sorting and interpretation at the Dunstaffnage Marine Laboratory (D Hughes). Several Callianasa spp were collected live for use in experimental work at the University Marine Biological Station Millport (Dr R J Atkinson) (for details of this work refer to S J Malcolm, AE0132 extramural).
Aim 5. A Scanfish survey of the western Irish Sea covered the southern part of the grid (Fig 5). The instrument worked well and recovered a good data set but the survey had to be curtailed due to software problems. The survey clearly delineates the frontal boundaries between the strongly stratified deep areas and well mixed water to the east (Fig 6). The fluorescence plot (Fig 7. chlorophyll-a, µg/l) indicates the strong biological activity on the thermocline and at the frontal boundary, with very little

activity elsewhere. The patchiness scales relevant to phytoplankton can be resolved (for details of this work refer to J Brown, AE0128).
Aim 6. Thirty six 1 litre water samples were collected in the working area for the determination of ^{3}H (for details of this work refer to W Camplin, AE0122).
Aim7. Thirty six 50 litre water samples were collected in the working area for the determination of technetium and caesium radionuclides. These measurements will be used to estimate dispersion of technetium discharged from Sellafield (for details of this work refer to K Leonard, AE0114).
Aim 8. Mooring N was recovered from the Beauforts Dyke in the North Channel. A similar mooring to the north (Mooring P) could not be found. There was sufficient time to search for a further mooring (Mooring L) bit it too could not be found (for details of this work refer to J Read, AE0128).
Aim 9. Three 100 litre water samples were collected at each of two stations in the western Irish Sea using the CTD-rosette. The CTD profiles showed strong stratification (Fig 8). Surface sediment samples were also collected. Natural series radionuclide measurements will be used for the assessment of resuspension within hydrographic 'domes' which develop in this shelf area. This forms part of the developing collaboration with the Aquatic Sciences Division of DANI (I Heaney) (for details of this work refer to A J Poole, AE0118).
Aim 10. Four two hour Granton trawls were completed to collect fish for the IAEA bulk sample. A total of 340kg assorted fish were collected and preserved (for details of this work refer to D S Woodhead, AE0118).
Aim 11. A bulk sediment sample of about 300kg was collected from one site in the western Irish Sea for use by IAEA MEL as a calibration standard (for details of this work refer to D S Woodhead, AE0118).
Aim 12. Surface sediment samples were collected from 41 sites for examination of total α-activity and Fe-geochemistry (E Hamilton, CSG extra-mural commission AE0127) and additional surface sediment samples were collected for trace metal and grain size analysis (M Krom, DoE/SOAFD contract) (for details of this work refer to D S Woodhead or S J Malcolm).

S J Malcolm (SIC)
26 June 1995

SEEN IN DRAFT: Master

Senior Fishing Mate

DISTRIBUTION:

Basic List +

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BUDGET CORE SITES AND WATER STATION SAMPLED .

SHOWING :
STATION POSITION
COASTLINE

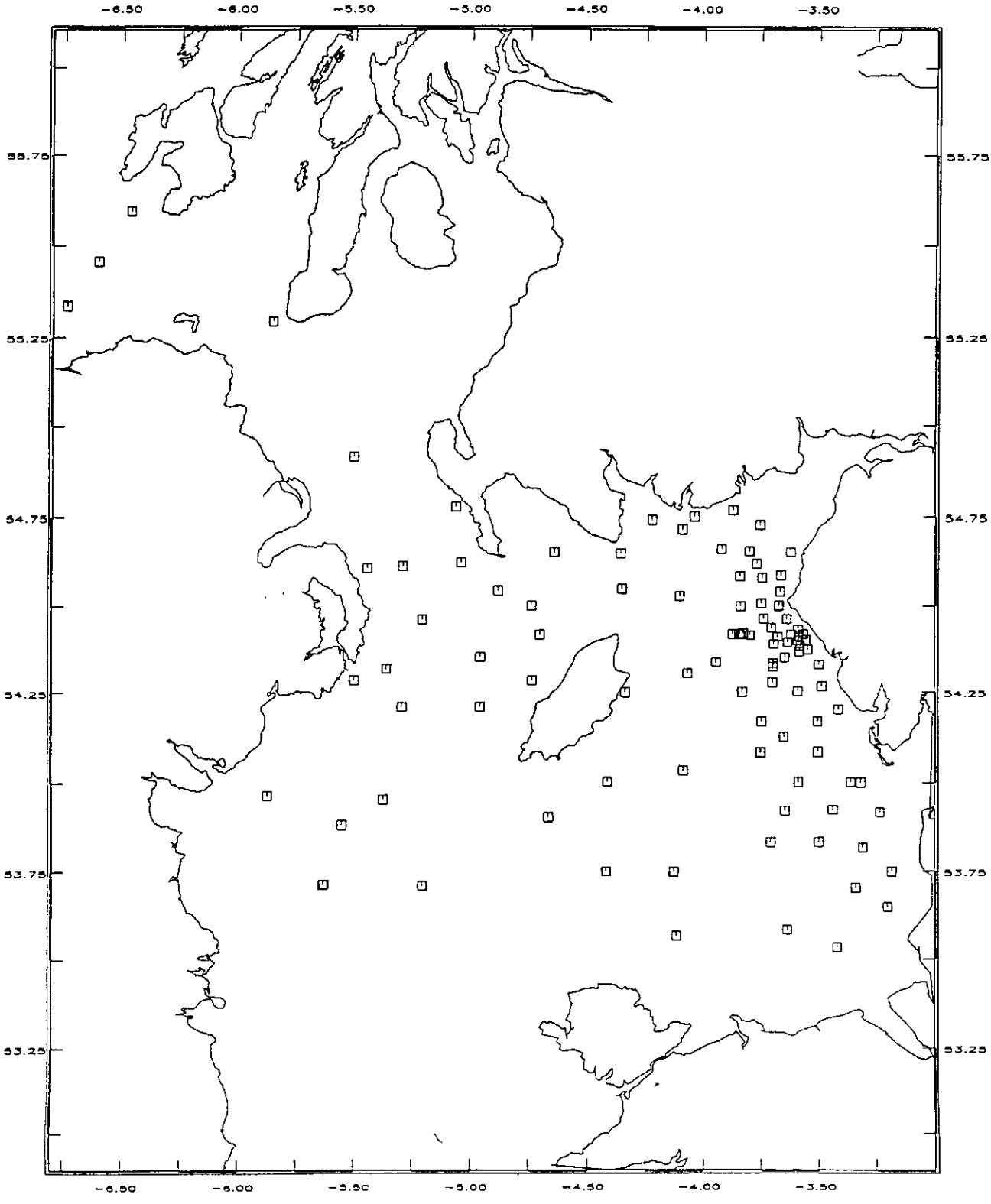


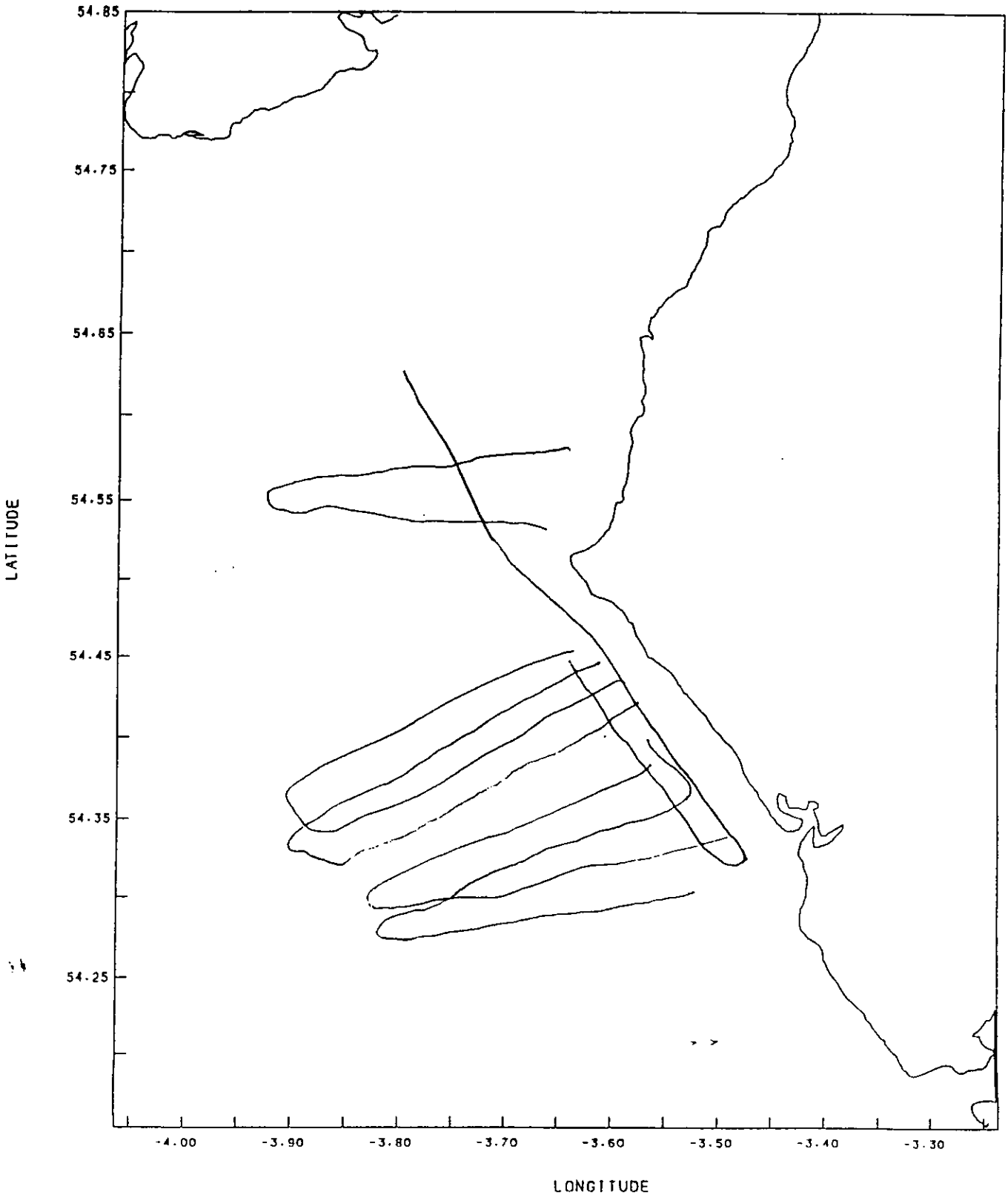
Fig 2.

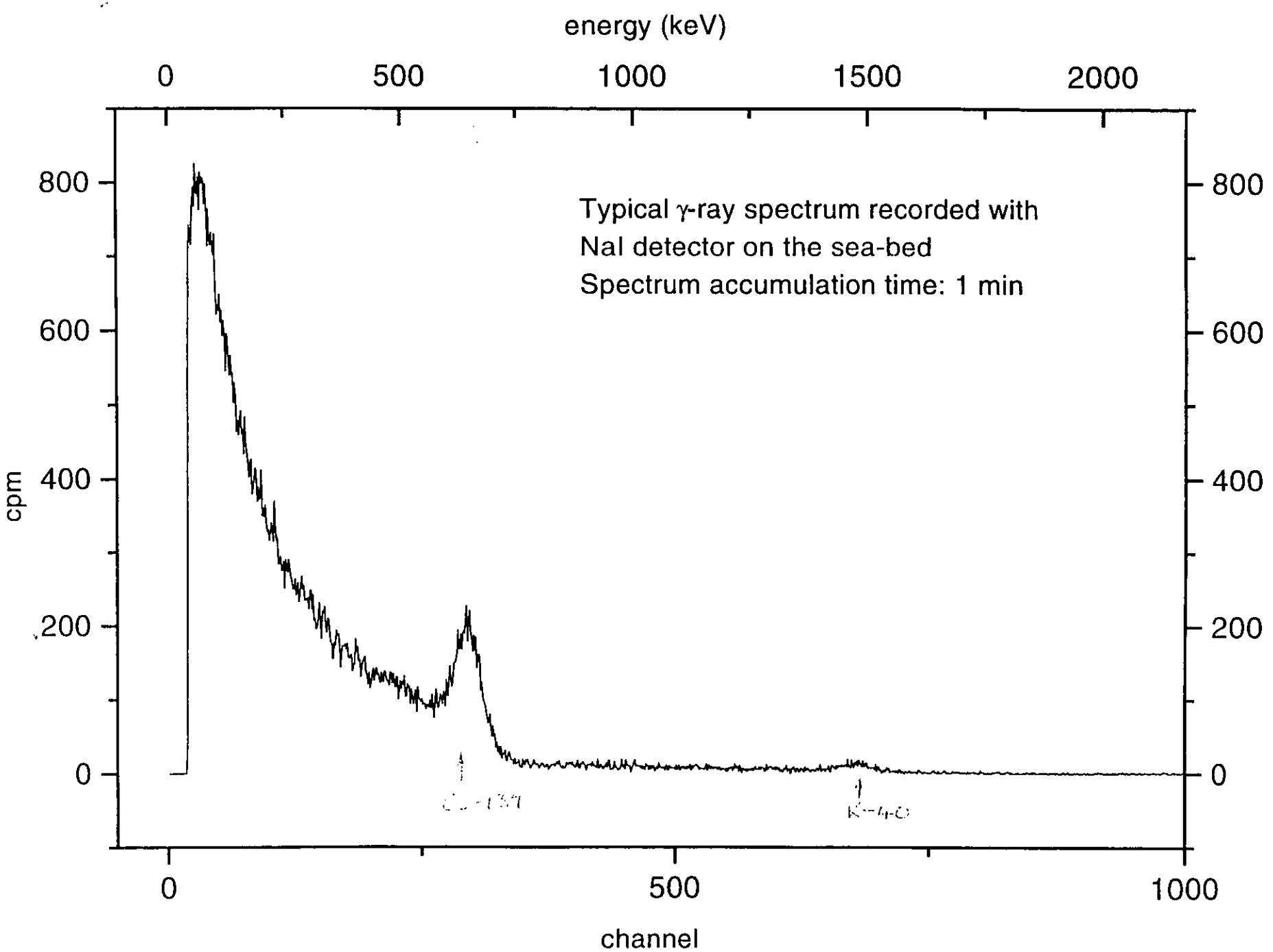
CIR5/95

DATA: MONACO 1 12/6/95, 21:00 - 13/6/95, 04:23

SHOWING :
CRUISE TRACK
COASTLINE

Box lines covered by IAEA-MEL gamma detector system.
(~ 48 hours towing)




energy (keV)
0
500
1000
1500
2000
800
600
400
200
0
cpm
Typical γ-ray spectrum recorded with
NaI detector on the sea-bed
Spectrum accumulation time: 1 min
Cs-137
K-40
0
500
1000
channel

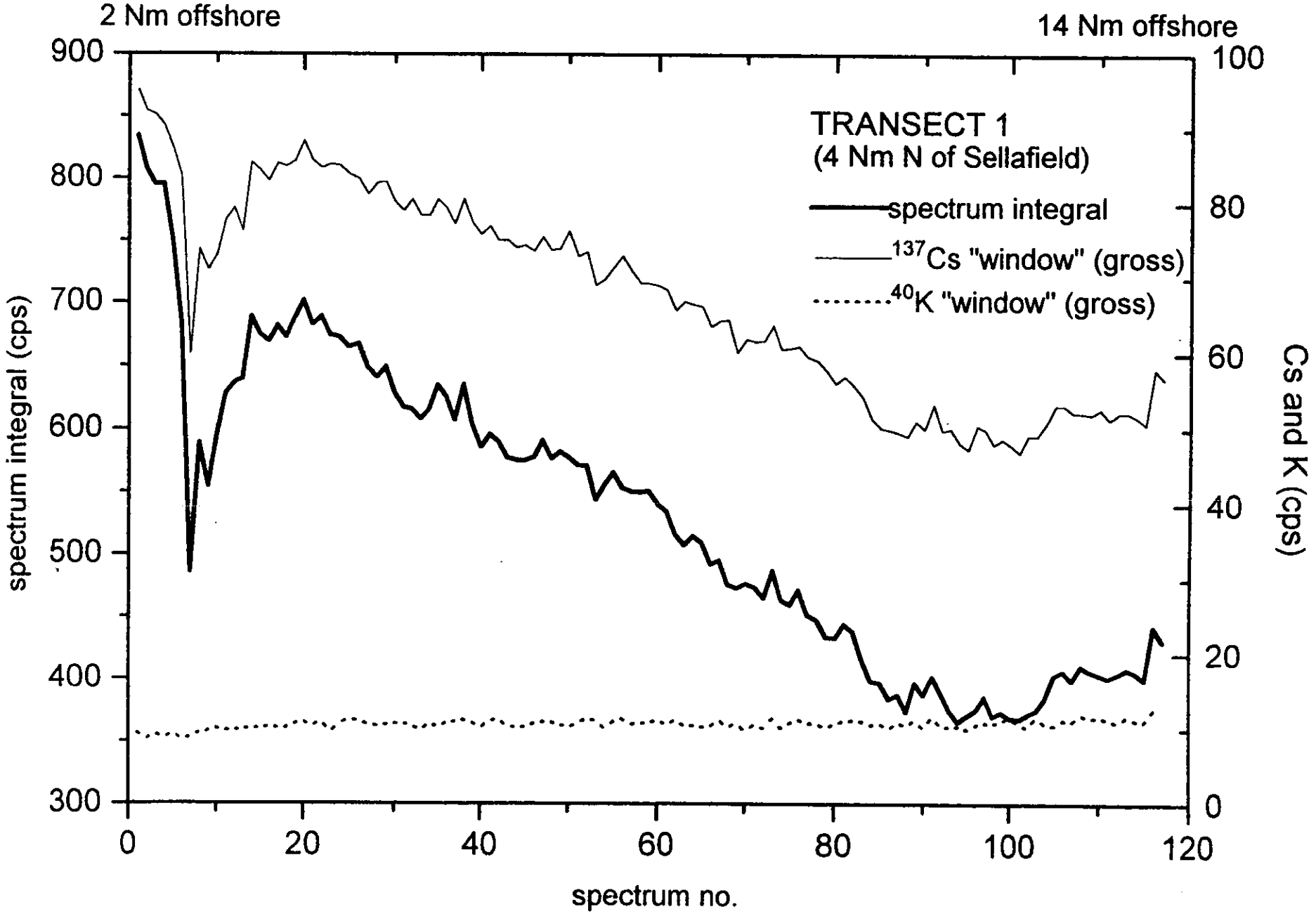

2 Nm offshore
14 Nm offshore
TRANSECT 1
(4 Nm N of Sellafield)
spectrum integral
137Cs "window" (gross)
40K "window" (gross)
spectrum integral (cps)
Cs and K (cps)
spectrum no.
900
800
700
600
500
400
300
100
80
60
40
20
0
0
20
40
60
80
100
120

Fig 5

SCANFISH GRID 22/6 - 24/6

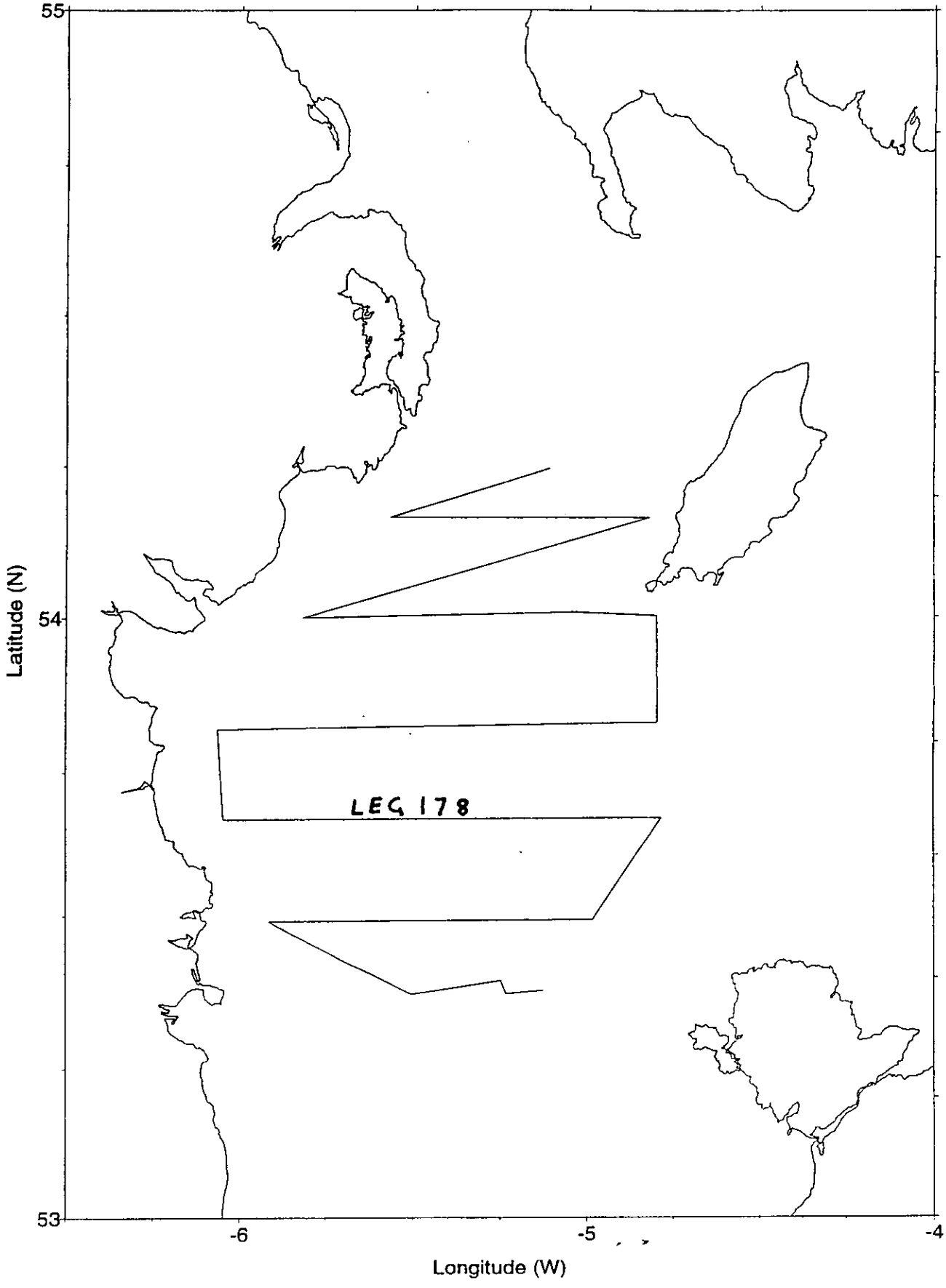
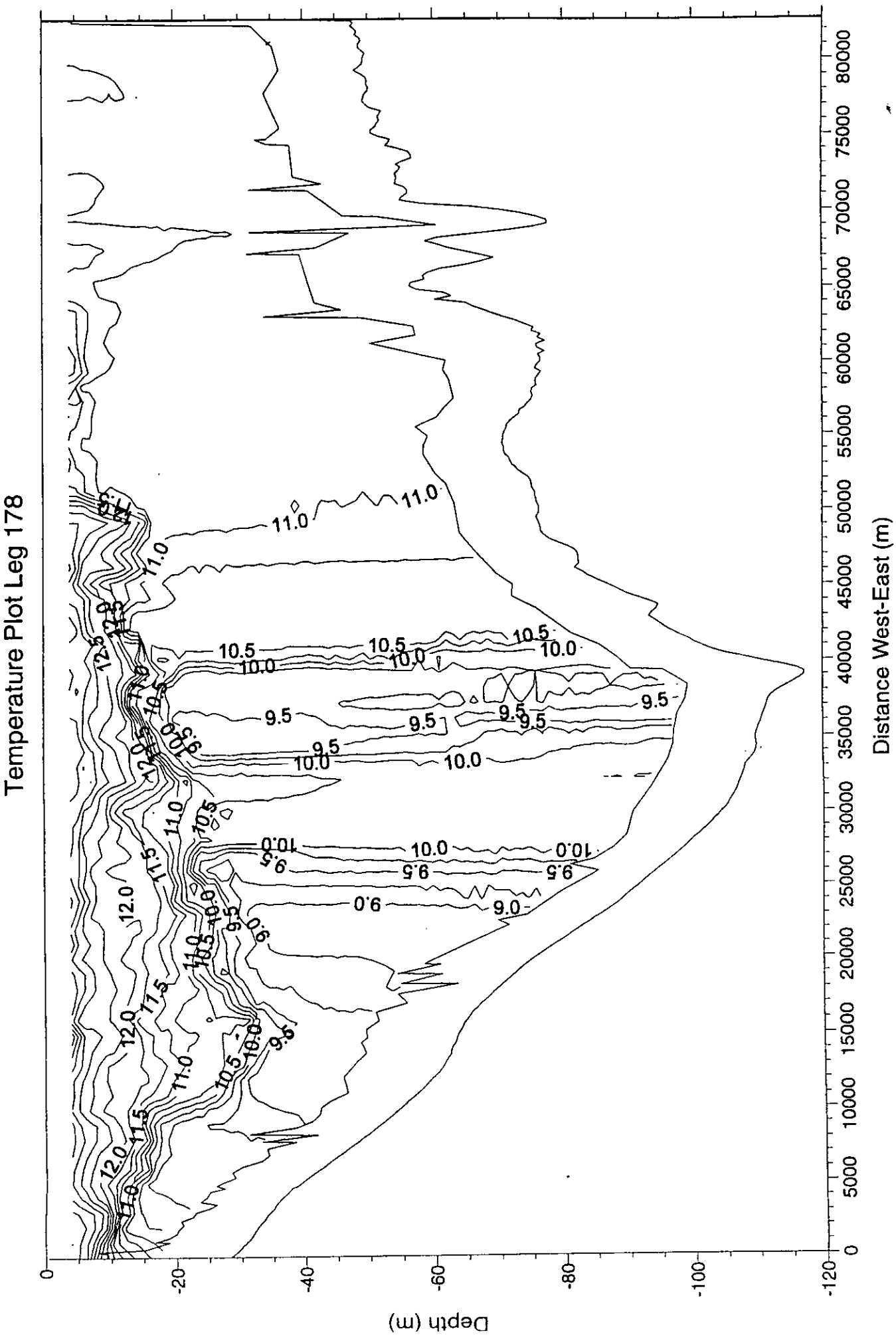
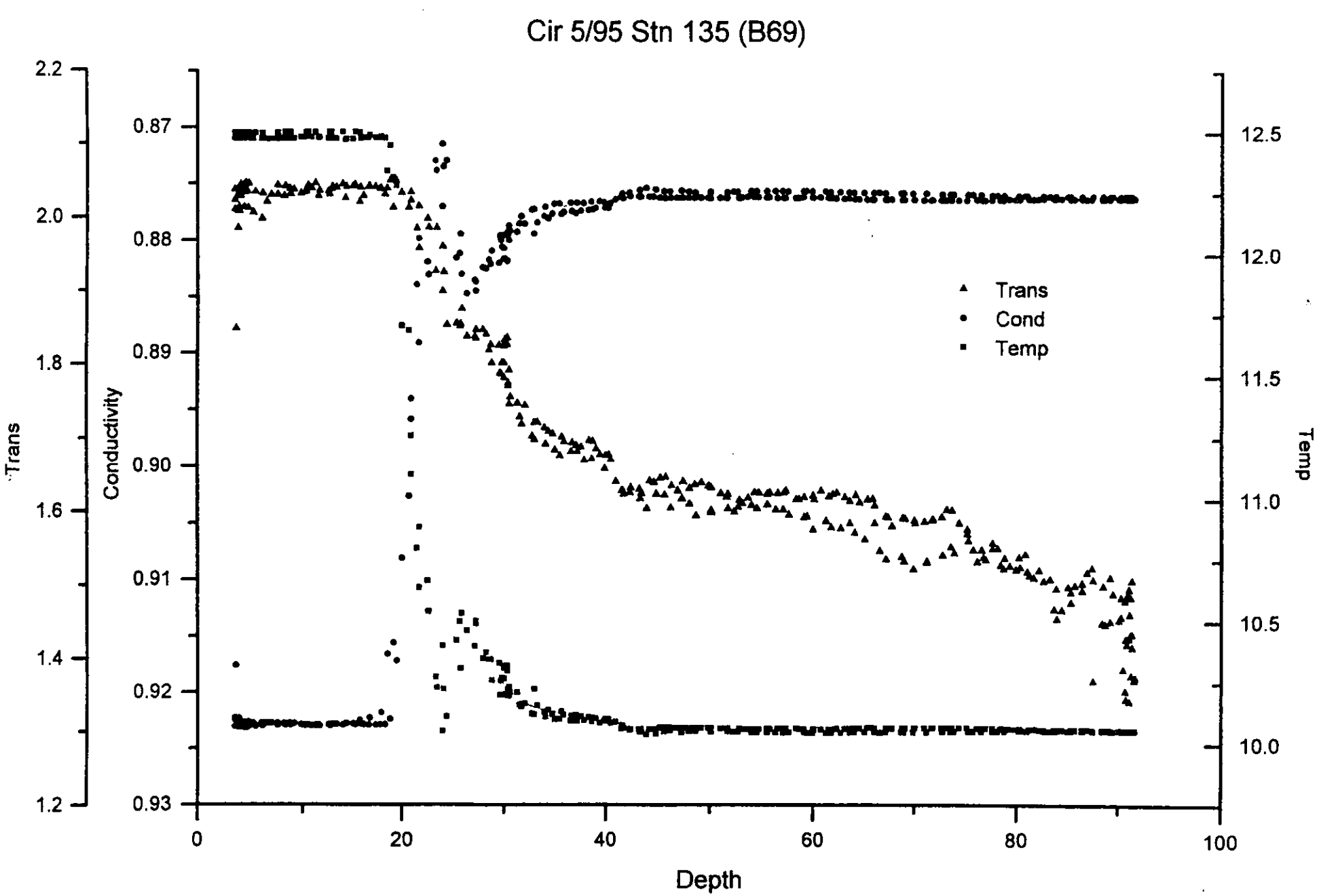


fig 6


Temperature Plot Leg 178
Depth (m)
Distance West-East (m)
0
-20
-40
-60
-80
-100
-120
0
5000
10000
15000
20000
25000
30000
35000
40000
45000
50000
55000
60000
65000
70000
75000
80000


Cir 5/95 Stn 135 (B69)
Trans
Conductivity
Temp
Depth
Trans
Cond
Temp
2.2
2.0
1.8
1.6
1.4
1.2
0.87
0.88
0.89
0.90
0.91
0.92
0.93
12.5
12.0
11.5
11.0
10.5
10.0
0
20
40
60
80
100