PML Cruise: LOIS RACS-2b
RVS Cruise: CH 115b/94

LOIS RACS(C)
HUMBER PLUME AND E. COAST
R.R.S. CHALLENGER 115b
CRUISE REPORT

VESSEL:	RRS CHALLENGER	
PERIOD:	17 - 31 OCTOBER	
PERSONNEL:		
R. Howland	PML	Senior scientist
R. Clifton	PML	
T. Frickers	PML	
S. Widdicombe	PML	
C. Harris	PML	
A. Easton	PML	
G. Westbrook	U of Plymouth	
T. Nickell	DML	
J. Barnes	U of Newcastle	
A. Khouw	U of Newcastle	
R. Cramer	BODC	
A. Jones	RVS	
A. Taylor	RVS	

OBJECTIVES.

1. To quantify hydrodynamical transports and the processes affecting transformations, interactions and fates of particles, biogeochemically important elements and representative contaminants from land sources to the coastal zone.

2. To provide the first integrated environmental data base for a UK coastal region covering seasonal cycles and interannual variability and incorporating measurements of the fluxes of materials and rates of biological productivity.

3. To generate new quantitative understanding of estuarine and coastal zone processes controlling the fluxes and reactivities of both natural and anthropogenic materials.

4. To provide integratable models of these processes as building blocks for comprehensive coastal zone system models which will realistically predict the affects of future environmental change.

ITINERARY:

Mon. 17th Oct:
Scientists travelled to Grimsby, arriving in the late afternoon. Loaded equipment and commenced set up.

Tues. 18th Oct:
Continued settting up equipment in the morning. Sailed at 1600 and commenced the Humber/Wash grid on the way to the first coring and mooring sites. Stations in order, 5, 6, 8, 7, 9, 10, 11, 10, 12, 13.
Wind south easterly 5,6. Seastate, moderate

Wed. 19th Oct:
Reached station 13 in mid morning. Returned to the first mooring site (between stations 12 and 13) and waited for slack water. Deployed first transmissometer/fluorometer package at about 1400. Unfortunately, slack water is very short in this area (only an hour at best) so we were unable to lay the second mooring on the same tide. **This point should be noted for planned deployments on future cruises.** Continued to coring site 9. Tried unsuccessfully to get cores (see notes on box corer in appendix ?). Aborted at 1830 and returned to the grid track. Stations in order: 14, 15, 16, 17, 18.
Wind south easterly 6,7. Seastate, moderate.

Thurs. 20th Oct:
Commenced coring station 8 (south of station 18, Smith's Knoll) at 0800. Good cores but, very slow progress because of marginal seastate. Completed station at about 1500. Returned to grid track towing UOR at six knots. Towed from station 18 towards 15. Recovered UOR at dusk (1745). Continued grid with stations in order: 15, 14, 12, 10, 11.
Wind still south easterly, 4,5 (reduced later to 3), seastate, moderate to rough in morning. Improved later, but still a large swell.

Frid. 21st Oct:
Commenced box coring at 0800 at Silver pit (box core site 4). Very gravelly with lots of shell debris. Very difficult to core! After a number of unsuccessful attempts it was decided to move to box core station 5, close by. At this site the large box corer would not work well on the sandy bottom because it would not seal properly. On about the 20th attempt with the small box corer, its own wire parted while it was on the bottom. The position was marked with a Dan buoy, ready for a future search. We were unable to carry out an immediate search because the tide was too strong.
Continued with the grid track, stations in order: 6, 4, 2, 1, 3, 4, 6, 5.
Wind south easterly, 4. Seastate, moderate.

Sat. 22nd Oct:
Took on a pilot at Spurn at 0750 and steamed up to the Hawke anchorage for our rendezvous with the vessel from Grimsby, bringing out the second autoanalyser. This was accomplished at 0830 and, we then steamed back downestuary to the Bull anchorage where anchored for box core station 6. Coring commenced at 0930 using the remaining corer. Very successful coring station with all requirements for samples fully met. Left the anchor station at 1530 and commenced the coastal grid at station 3.
Wind southerly, 3/4; freshening to 6 later. Seastate, moderate; slight inshore.

Sun. 23rd Oct:
Continuing along the coastal track. Off the Tees during the morning. Commenced the coring station just north of the Tees at 1300. The corer was not functioning at all well and no cores were obtained by dusk when we had to curtail box coring operations. Because the box and spade were not forming an adequate seal, the sample was lost every time; even on muddy substrates. Steve Widdicombe and Andy Jones then glued a fresh layer of neoprene on top of the existing layer in the hope that the spade would then form a better seal. Continued along the coastal grid towards the Tyne box coring transect stations.
Wind, westerly, 5,6. Seastate, moderate.

Mon. 24th Oct:
Commenced grabbing (using the Day grab) at one kilometer intervals along the Tyne Coring Transect (see appendix 1 for station positions). This was completed by 0800. Attempted to box core on the inner (mud and sand) station (see appendix 2 for Tyne box coring transect stations) without success. It was decided to move back to the outer station where the sediment was softer mud and, on the way we paused for a couple of hours to allow ground truth measurements to be made with instruments on the UOR during an overflight by the CASI aircraft. This operation was completed by 1100. Recommenced box coring at the outer site of the Tyne box coring transect at 1230. Six perfect cores obtained without a failure. Requirements at this station fully met. On completion of the box coring station the ship continued on the coastal grid, completing stations 19 to 24.
Wind westerly 2/3, seastate slight.

Tues. 25th Oct:
Ship returned from the coastal grid to coring station 5 on the Tyne transect and box coring commenced at 0700. Completed two box coring stations (TCT 4 & TCT 5) by dark.
Wind, westerly 3/4. Seastate, slight.

Wed. 26th Oct:
Commenced box coring at 0800 on station TCT 3. Broke off at 1130 to steam to the Tyne mouth to pick up rubber sheeting and glue for the box corer spade (see note on the operation of the RVS box corer). Returned to TCT 3 and completed the station at 1600. Spent the night steaming around the grid (stations 20 to 25).
Wind, westerly,3. Seastate, slight.

Thurs. 27th Oct:

Started box coring at 0700 on TCT 2. This is a more sandy site and more attempts were needed to achieve each core. However, this station was successfully completed by mid afternoon and we went in further to TCT 1. Although this site was sandier than TCT 2 we should have been able to core it but, because of the state of the box corer we were unable to get adequate cores. Finally, gave up and ran a monitoring leg out along the transect line. This was completed in the early evening and we started to steam towards Berwick for the final box core station.

Wind, westerly,2/3 freshening to 4 in the afternoon. Seastate, slight.

Frid. 28th Oct:

Arrived off Berwick for an 0800 start on the box core station. Although the site was quite muddy the box corer could not sample it. After about ten attempts we gave up and tried the multicorer. By then the tide was running and we were unsuccessful with this. Finally abandoned the site at 1100. Commenced continuous underway monitoring on the coastal grid, starting at station 26, and towed the UOR until dusk.

Wind, NNW 3. Seastate, slight.

Sat. 29th Oct:

Steaming down the outside leg of the coastal grid. Deployed the UOR at 0700. Recovered the UOR at 1115 and prepared gear for dragging for the small box corer. Started dragging at 1300 and continued until 1700 without success. Carried out a grabbing transect through silver pit (see appendix 3). On completion we returned to continuous underway monitoring on the Humber/Wash grid; stations in order, 12, 14, 15, 16, 17.

Wind, SW 3. Seastate, slight.

Sun. 30th Oct:

Day spent on continuous underway monitoring on the Humber/Wash grid. At 0800 we were at station 17. From there we worked east to station 18, followed by stations 15, 8, 6, 4, 2.

Wind, S/SW, 3; 5 later. Seastate, slight to moderate.

Mon. 31st Oct:

Carried out CTD stations at N4, N2 and S2 and collected samples for Jon Hickson (University of Derby). On completion we steamed to the Humber mouth to pick up the pilot prior to docking at Grimsby at 1330.

Wind, SW, 6-8. Seastate, moderate to rough.

Individual cruise reports:

Radio-isotopes. Sediment content and profiles. Bob Clifton (PML).

Surface sediment samples were taken at 29 points (1km) along the CTC, using the Day grab.
The bed-sediments at 7 stations (2 in the Humber-Wash region and 5 along the TCT) were sampled in duplicate, to a depth of 30 - 60cm, using the large box-corer. These samples were sectioned at 1 to 3cm depth intervals.
All of the above samples will be analysed for ^{7}Be, ^{137}Cs, ^{210}Pb, ^{234}Th and ^{226}Ra.The porosity and surface area of these samples will also be determined.
17 Grab samples of bed sediment, taken along the 'silver pit' transect, were also taken to be analysed as described above.

Collection of SPM from large volume water samples.
In order to determine residence times of the SPM, using ^{234}Th, it is necessary to filter large volumes of sea-water in order to obtain a statistically significant signal from this radio-isotope.
Apart from the inner station (TCT1), water volumes in excess of 200 litres (taken from the non-toxic supply) were filtered (GFF) at all the CTC stations. Apart from one other station (PML3 off the Tweed) it was not generally practical to filter large volumes of sea-water due to the high SPM.
The gravimetric determination of SPM was performed at each site.

Sulphate reduction in bed-sediments.
Duplicate sub-samples of bed-sediments were taken from different box-cores obtained at each of the sites mentioned above. These samples were further sub-sampled to a depth of 23cm, at 5cm intervals, and incubated with $Na_2{}^{35}SO_4$ to determine reduction rates.

H & S
All areas where radio-tracers were used were surveyed for contamination before and after use. No contamination, above background, were observed.

Benthic faunal studies: Steve Widdicombe (PML).

Aims:
1). To revisit sites established on CH99/92, and resampled on CH108B/93, within the Humber Plume Zone as part of the sediment heterogeneity study.
2). To establish a transect, perpendicular to the coast in the Tyne area, consisting of six stations approximately 5km apart.

Sites:
1). Humber plume zone (HPZ) stations 6 and 8.

2). Tyne coring transect (TCT) stations 2,3,4,5,and 6. See appendix 1 and figures 5 and 5a.

Work Carried Out:

1). Grab survey of TCT (Tyne coring transect).

a). 29 grabs were taken, at 1km intervals, and their contents were retained for particle size analysis (Frickers) and radio-nuclides (Clifton).

2). At sites 8 & 6 (HPZ) and 2,3,4,5 & 6 (TCT) 4 box-cores ($0.1m^2$) were deployed. Each was treated as follows;

a) Visual descriptions of sediment type, surface features and obvious fauna.

b) Sediment temperature and depth of core were noted.

c) Contents of box sieved for macrofauna using a 0.5mm square meshed sieve, residue preserved in 10% formaldehyde solution.

3. Extraction and preservation of the faunistic element of microcosm cores (as in 2.c).

4. From each box core recovered on the TCT a 60mm ϕ core was taken, to depth of about 100mm, and preseved in formaldehyde solution. This will be used to quantify the meiofaunal communities at each station.

Notes:

1. Lost the "Barbie" corer at Humber/Wash coring station 5.
2. Unable to recover suitable cores from Stations 1,5 & 9 (HPZ) and Station 1 (TCT).This was due to major problems with the RVS corer (see separate sheet) and the loss of the PML corer.

Nutrient studies: Robb Howland and Alison Easton (PML)

Continuous underway monitoring was carried out for phosphate, silicate, nitrate and nitrite along the tracks of the Humber/Wash and coastal grids, whenever the ship was steaming between stations. Figures 6, a-d show contour plots of dissolved phosphate, silicate, nitrate and nitrite over the whole of the cruise for the Humber/Wash grid area. A number of ammonia profiles were carried out in the vicinity of the major freshwater inputs (Humber, Tyne, Tees) and along the Tyne coring transect. Samples from the various on board experiments (pore water and nutrient flux studies) were analysed for all five determinands.

During the first week of the cruise we used the four channel Technicon autoanalyser but, one of the peristaltic pumps failed and we had to change back to the Alpkem analyser. This operation was carried out very quickly and a minimal amount of underway data was lost.

Additional to the nutrient studies were aluminium analyses, carried out on samples taken at the way points on both cruise tracks. About a hundred stations were covered during the course of the cruise and results show clearly that the main source of aluminium to the coastal zone is anthropogenic. The highest levels of aluminium occurred in the plume zones of the major freshwater inputs and decreased offshore. This is in agreement with the findings on previous cruises in the area.

Airborne remote sensing: Guy Westbrook (PML).

There is a requirement to increase the database of images combining in situ measurements by ship with simultaneous sensor overflights. The purpose of this is to aid the continuing development and validation of the atmospheric correction algorithms pertaining to the CASI (Compact Airbourne Spectrographic Imager) unit which is being widely used in the Humber / Holderness / Wash areas.

Throughout the cruise a state of continual daytime readiness was maintained so that if an overflight was scheduled there would be as much time as possible to liaise with the PSO, crew etc. to ready the vessel and deploy the UOR (Undulating Oceanographic Recorder). This was backed up by continual towing of the UOR whenever underway conditions during daylight hours allowed. In the event, there was one overflight (AM 24-10-1994), during which, in addition to the UOR deploment, a CTD cast was made as well as water sampling for particulate loading and chlorophyll, nutrients and turbidity.

The data gathered over this leg (B) falls short of what was hoped for by the programme organisers but this was not because of any problem aboard the ship. The problems related to the weather or electical/mechanical failure of the CASI or aeroplane. During the one overflight that was achieved, the entire scientific party and the ships crew cooperated fully in support of this work.

Sediment core incubation studies: Thom Nickell (DML)

Objectives: To sample sediment from the Humber/Wash and Tyne/Tees transects and, after incubation, determine dissolved oxygen and nutrient flux from the sediment to overlying water. In addition, sediment will be assayed for organic carbon content with depth.
Methods: Three replicate cores (i.d. = 57 mm, depth = 150 mm) for both dissolved oxygen and nutrient flux experiments were taken at Humber/Wash fixed Stations 8, 5 and 6, and at Tyne coring transect stations TCT 6, TCT 4 and TCT 2. Cores were taken as sub samples from box core samples. Cores were incubated under 100l bottom water obtained from the CTD. After capping the cores with PTFE stirrer heads, water samples (10 ml for dissolved oxygen, 30 ml for nutrient analysis) were taken from the cores via a syringe at 0 and 6 hrs. Water for nutrient analysis was filtered through in-line GG/F filter holders. Samples for dissolved oxygen analysis were fixed with magnesium chloride and alkaline iodide for Winkler titration.

Following the incubation experiments, duplicate core samples were sliced at 0.5 cm intervals to 1 cm depth, then at every 1 cm to a depth of 15 cm. Sub samples (5 ml) were placed in pre-weighed vials and frozen for later laboratory analysis of organic carbon.

Note: Several attempts were made to obtain core samples from both multiple and Craib corers. These attempts proved unsuccessful.

Microcosm studies: Trish Frickers and Carolyn Harris (PML).

Large box cores were taken in the Humber Plume zone at Stations 5,6 and 8. Cores were also taken at five sites along the Tyne box coring transect (all but the inshore site).

The box cores were sub-cored for:
1) microcosm cores for incubation (in duplicate)
2) small cores for redox (in duplicate)
3) small cores for carbon and nitrogen, porosity and particle size

A ten level pore water sampler was inserted into each of the microcosm cores. This enabled pore waters to be extracted at 1cm increments down the core, to a depth of 10cm, for chemical determinations (silicate, phosphate, nitrate, nitrite, ammonia and alkalinity for on board analysis; and Fe, Mn, Ni, Cu, Zn, Cd and Pb for analysis at P.M.L.

Diffusion and resuspension flux determinations (both metals and nutrients) were also carried out on the microcosm cores.

All of the objectives for the Tyne transect were met, but only half the 6 stations in the Humber/Wash area were cored due to the poor performance of the RVS box corer.

Denitrification/Nitrification Studies.
Jonathan Barnes and Abraham Khouw (University of Newcastle).

Denitrification is an important reaction in the marine nitrogen cycle by virtue of its role as the major sink for combined nitrogen. Our objectives were primarily to measure and quantify this process, in particular fluxes of combined/gaseous nitrogen products and their relationship with other variables e.g. sediment characteristics, overlying NO_3 concentration, site geography etc.
Two analytical techniques have been employed including the widely used acetylene block method which relies on inhibiting the final stage of denitrification resulting in the production of nitrous oxide (N_2O).
Using gas chromatographic detection (Electron Capture Detector) nitrous oxide can be meaured down to pmol levels. Unfortunately, equipment failure (faulty valve in the Gas Chromatograph) meant that the collection of gas and storage as discrete samples in gas tight vials was necessary (a total of 169). These samples will be analysed immediately on return to Newcastle to give denitrification/nitrous oxide production rates for all sites studied; station 8 (BC2), station 6 (BC12), Tyne transect stations G29(BC21), G24(BC28), G18(BC39), G11 and G6.
In addition, an isotope pairing method was used to make estimates of denitrification, based on NO_{3-} from overlying water, and coupled nitrification-

denitrification. After addition of seawater spiked with $^{15}NO_3$ to sediment cores and, removal of background nitrogen by purging with oxygen (21%) in Helium, the ^{15}N atoms formed by denitrification of $^{15}NO_3$ may combine with ^{14}N atoms produced by denitrification of $^{14}NO_3$, which is formed within the sediment by nitrification. The nitrification rate can be calculated from the rate of $^{29}N_2$ and $^{30}N_2$ production over a time series using isotope ratio mass spectrometry. Over 700 discrete gas samples have been collected for analysis on return to Newcastle from cores taken at the following sites; station 8 (BC3), station 6 (BC13), and Tyne transect stations G29 (BC20), G24 (BC28), G18 (BC39), G11 and G6.

Chronological list of samples collected on CH115B.

ID	Date/Time	Finish Date/Time	Fixed Station	Comments
DG1	19/10/94 14.49		Station 9	Two rocks
DG2	19/10/94 14.53		Station 9	Sabalaria (?) and hydroid on pebbles
CTD1	19/10/94 15.06	19/10/94 15.13	Station 9	11 water bottles at bottom
BC1	20/10/94 07.16		Station 8	2L + 4S Frickers / 1S Clifton
BC2	20/10/94 08.06		Station 8	6S Nickell / 9S Khouw
CTD2	20/10/94 08.41	20/10/94 08.51	Station 8	11 water bottles at bottom
BC3	20/10/94 09.21		Station 8	15S Barnes
BC4	20/10/94 10.02		Station 8	Clifton
BC5	20/10/94 12.12		Station 8	Replicate 1 Widdicombe
BC6	20/10/94 12.30		Station 8	Replicate 2 Widdicombe
BC7	20/10/94 12.58		Station 8	Replicate 3 Widdicombe
BC8	20/10/94 13.16		Station 8	Replicate 4 Widdicombe
DG3	21/10/94 07.11		Station 4	Fine sand with shell debris
BC9	21/10/94 09.42		Station 5	6S Nickell
CTD3	21/10/94 10.31	21/10/94 10.39	Station 5	11 water bottles at bottom
BC10	21/10/94 13.50		Station 5	1L + 2S Frickers
BC11	21/10/94 14.43		Station 5	1L + 2S Frickers
BC12	22/10/94 08.45		Station 6	6S Nickell / 9S Khouw
BC13	22/10/94 09.31		Station 6	15S Barnes
CTD4	22/10/94 09.53	22/10/94 10.01	Station 6	11 water bottles at bottom
BC14	22/10/94 10.54		Station 6	2L + 4S Frickers
BC15	22/10/94 12.18		Station 6	Replicate 1 Widdicombe / 2s Clifton
BC16	22/10/94 12.45		Station 6	Replicate 2 Widdicombe
BC17	22/10/94 13.15		Station 6	Replicate 3 Widdicombe
BC18	22/10/94 13.40		Station 6	Replicate 4 Widdicombe

BC1922/10/94 14.10Station 6Clifton

CTD523/10/94 19.3423/10/94 19.43C15
CTD623/10/94 21.2523/10/94 21.28C16
CTD723/10/94 22.5523/10/94 23.04C17
DG423/10/94 23.56TTG29 Soft Mud

DG524/10/94 00.18TTG28Ditto
DG624/10/94 00.35TTG27Ditto with worm casts
DG724/10/94 00.54TTG26Ditto with some worm casts
DG824/10/94 01.12TTG25Ditto
DG924/10/94 01.32TTG24Ditto
DG1024/10/94 01.49TTG23Ditto
DG1124/10/94 02.06TTG22Ditto
DG1224/10/94 02.23TTG21Ditto
DG1324/10/94 02.41TTG20Ditto
DG1424/10/94 03.00TTG19Ditto with worm casts
DG1524/10/94 03.17TTG18Mud
DG1624/10/94 03.37TTG17Soft Mud
DG1724/10/94 03.55TTG16Ditto
DG1824/10/94 04.13TTG15Mud, worm casts - bit firmer
DG1924/10/94 04.33TTG14Mud
DG2024/10/94 04.49TTG13Sandier Mud
DG2124/10/94 05.06TTG12Fine sandy mud
DG2224/10/94 05.23TTG11Ditto
DG2324/10/94 05.42TTG10Ditto with tubes
DG2424/10/94 05.59TTG9Silt
DG2524/10/94 06.15TTG8Silt
DG2624/10/94 06.32TTG7Siltier and shelier
DG2724/10/94 06.59TTG6Muddy sand
DG2824/10/94 07.13TTG5Mud
DG2924/10/94 07.25TTG4Mud
DG3024/10/94 07.38TTG3Very fine sand - 0.5 sample box
DG3124/10/94 07.50TTG2Fine sand
DG3224/10/94 08.06TTG1
CTD824/10/94 09.50 Data for Guy and UOR
BC2024/10/94 12.35TCT6 (TTG29)7S Nickell / 14S Barnes / 1L + 1S Clifton
BC2124/10/94 13.14TCT69S Khouw / 1S Clifton / 1L + 4S Frickers
CTD924/10/94 13.2524/10/94 13.37TCT611 water bottles at bottom
BC2224/10/94 13.44TCT6Replicate 1 Widdicombe & LOIS Meiofauna
BC2324/10/94 14.15TCT6Replicate 2 Widdicombe & LOIS Meiofauna
BC2424/10/94 15.09TCT6Replicate 3 Widdicombe & LOIS Meiofauna
BC2524/10/93 15.50TCT6Replicate 4 Widdicombe & LOIS Meiofauna
BC2624/10/94 16.23TCT61L + 4S Frickers
BC2724/10/94 16.46TCT61L Clifton
CTD1024/10/94 17.4624/10/94 17.52C19

BC2825/10/94 07.13TCT5 (TTG24)14S Barnes / 9S Khouw / 1L + 4S Frickers / 1S Clifton
BC2925/10/94 08.11TCT51L + 4S Frickers / 1L + 1S Clifton
CTD1125/10/94 08.2525/10/94 08.36TCT5
BC3025/10/94 08.41TCT5Replicate 1 Widdicombe & LOIS Meiofauna
BC3125/10/94 09.11TCT5Replicate 2 Widdicombe & LOIS Meiofauna
BC3225/10/94 10.17TCT5Replicate 3 Widdicombe & LOIS Meiofauna
BC3325/10/94 10.45TCT5Replicate 4 Widdicombe & LOIS Meiofauna
BC3425/10/94 09.37TCT51L Clifton
BC3525/10/94 13.13TCT4 (TTG18)1L + 1S Clifton / 6S Nickell / 1L + 2S Frickers
BC3625/10/94 13.43TCT4Replicate 2 1L Clifton
CTD1225/10/94 13.5425/10/94 14.05TCT411 water bottles at bottom
BC3725/10/94 14.13TCT41L + 2S Frickers / 1S Clifton
BC3825/10/94 14.43TCT4Replicate 1 Widdicombe & LOIS Meiofauna
BC3925/10/94 16.06TCT413S Barnes / 9S Khouw
BC4025/10/94 16.37TCT4Replicate 2 Widdicombe & LOIS Meiofauna
BC4125/10/94 17.08TCT4Replicate 3 Widdicombe & LOIS Meiofauna
BC4225/10/94 17.33TCT4Replicate 4 Widdicombe & LOIS Meiofauna

BC4326/10/94 08.13TCT3 (TTG11)9S Khouw / 1L + 1S Clifton / 1L + 4S Frickers
BC4426/10/94 08.39TCT312S Barnes / 1S Clifton
BC4526/10/94 09.18TCT3Replicate 1 Widdicombe & LOIS Meiofauna
CTD1326/10/94 09.2826/10/94 09.35TCT311 water bottles at bottom
BC4626/10/94 09.58TCT3Replicate 2 Widdicombe & LOIS Meiofauna
BC4726/10/94 10.59TCT3Replicate 3 Widdicombe & LOIS Meiofauna
BC4826/10/94 11.22TCT3Clifton's Surface scrape
BC4926/10/94 13.48TCT3Replicate 4 Widdicombe & LOIS Meiofauna
BC5026/10/94 14.25TCT31L + 4S Frickers

BC5127/10/94 07.33TCT2 (TTG6)14S Barnes / 9S Khouw /1L + 1S Frickers
BC5227/10/94 08.36TCT26S Nickell / 1S Clifton / 1L + 4S Frickers
BC5327/10/94 08.59TCT2Clifton's Surface scrape
CTD1427/10/94 09.0927/10/94 09.21TCT211 water bottles at bottom
BC5427/10/94 09.32TCT22L + 4S Frickers
BC5527/10/94 10.03TCT2Replicate 1 Widdicombe and LOIS Meiofauna
BC5627/10/94 10.59TCT2Replicate 2 Widdicombe and LOIS Meiofauna
BC5727/10/94 13.21TCT2Replicate 3 Widdicombe and LOIS Meiofauna
BC5827/10/94 14.02TCT2Replicate 4 Widdicombe and LOIS Meiofauna
CTD1527/10/94 15.3327/10/94 15.38TCT1 (TTG1)11 water bottles at bottom

CTD1628/10/94 09.2428/10/94 09.31Station 3Bottom and Middle water for Clifton
CTD17 29/10/94 17.07 29/10/94 17.11SP1Transmittence for Clifton
DG33 29/10/94 17.17 SP1Sand
DG34 29/10/94 17.36 SP2Cobbles
DG35 29/10/94 17.57 SP3Muddy sand and shells
DG36 29/10/94 18.27 SP4Muddy sand
CTD18 29/10/94 18.42 29/10/94 18.50SP5Transmittence for Clifton
DG37 29/10/94 18.53 SP5Muddy sand

DG38 29/10/94 19.17 SP6Muddy sand with rocks
DG39 29/10/94 19.37 SP7Very fine sandy mud (Station 4)
DG40 29/10/94 19.58 SP8Coarse sand with small pebbles
DG41 29/10/94 20.28 SP9Muddy, pebbly sand
CTD19 29/10/94 20.55 29/10/94 21.01SP10Transmittence for Clifton
DG42 29/10/94 21.07 SP10Sand with pebbles and some mud
DG43 29/10/94 21.26 SP11Sand and gravel
DG44 29/10/94 21.45 SP12Stone on sand. No sample
DG45 29/10/94 22.06 SP13Sand and gravel
DG46 29/10/94 22.22 SP14Shell debris and sand
DG47 29/10/94 22.41 SP15Shingle
DG48 29/10/94 23.01 SP16Sand and shells
DG49 29/10/94 23.15 SP17Sandy tubes in mud
CTD20 29/10/94 23.18 29/10/94 23.22SP17Transmittence for Clifton

Legend :
DG - Day Grab
CTD - Conductivity, Temperature & Depth
BC - Box Core

Day Grab and Box Core samples have been corrected to bottom times.

In addition, more continuous samples were taken from the General Non-toxicSupply :
Sample IdDate/TimeFixed StationDeterminantsComments
PG10124/10/94 12.30 - 16.46TCT6234Th250 litres filtered (Filter damaged)
PG10225/10/94 07.10 - 09.30TCT5234Th300 litres filtered (Filter damaged)
PG10325/10/94 14.30 - 15.30TCT4234Th345 litres filtered
PG10426/10/94 07.45 - 09.14TCT3234Th318 litres filtered
PG10527/10/94 07.00 - 09.45TCT2234Th231 litres filtered
PG10628/10/94 09.00 - 10.00(?)Station 3234Th225 litres filtered

An analysis of the Rough Log shows the following number of coring events.

Sample Type :GoodBad/None
Large Yellow corer (Ken)5157
Small PML corer (Barbie)811
DML Multicorer66
DML Craib corer02

The DML Multicorer should have been able to collect two samples per drop, but only single ones were collected. In the event, a turning tide reduced the success rate, and there were insufficient cores for the intended use. Those successfully collected were therefore dumped.

Of particular note for the PML Box Corer were two events where the core came up unfired, due to the cable wrapping around the head mechanism.

RVS Box Corer.

Severe problems were experienced with the use of the RVS box corer during the cruise which resulted in the loss of time and cores from a number of previously visited stations. A separate report concerning this is available from PML.

Ship operation and facilities.

All the operational requirements of the cruise were fully met and no time was lost during the cruise to ships equipment failures. The domestic arrangements were of the usual high standard and the scientific party unanimously agree that the new, more flexible, arrangements for mealtimes fit in better with the science.
It is always a pleasure to work on Challenger. My thanks go to Capt. Robin Plumley and his crew for their support of the scientific programme during this cruise.

Appendix1.

Tyne Coring Transect.
Grabbing Stations.

Station number	Latitude	Longitude
TTG1	55° 09.09'N	01° 29.49'W
TTG2	55° 09.05'N	01° 28.45'W
TTG3	55° 09.05'N	01° 27.52'W
TTG4	55° 08.99'N	01° 26.56'W
TTG5	55° 09.11'N	01° 25.72'W
TTG6	55° 08.99'N	01° 24.64'W
TTG7	55° 09.03'N	01° 20.82'W
TTG8	55° 09.00'N	01° 19.96'W
TTG9	55° 09.02'N	01° 18.99'W
TTG10	55° 09.05'N	01° 18.05'W
TTG11	55° 08.98'N	01° 17.12'W
TTG12	55° 09.02'N	01° 16.13'W
TTG13	55° 08.97'N	01° 15.34'W
TTG14	55° 09 06'N	01° 14.22'W
TTG15	55° 09.06'N	01° 13.40'W
TTG16	55° 09.01'N	01° 12.36'W
TTG17	55° 09.03'N	01° 11.56'W
TTG18	55° 08.99'N	01° 10.73'W
TTG19	"	01° 09 59'W
TTG20	55° 08.98'N	01° 08 65'W
TTG21	55° 08.98'N	01° 07.76'W
TTG22	55° 09.05'N	01° 06.87'W
TTG23	55° 09.01'N	01° 06.03'W
TTG24	55° 08.98'N	01° 05.14'W
TTG25	55° 08.96'N	01° 04.10'W
TTG26	55° 09.07'N	01° 03.24'W
TTG27	55° 09.00'N	01° 02.13'W
TTG28	55° 08.94'N	01° 01.35'W
TTG29	55° 08 98'N	01° 00.06'W

Appendix 2.

Summary Of The Silver Pit Transect.

Day grabs were taken at 17 stations, approximately 1 mile apart, along a transect running the full length of Silver Pit. From each grab, sediment was removed for particle-size analysis and for radionuclides. At 4 stations a CTD was deployed, 2 outside (stations SP1 and SP17) and 2 inside (stations SP5 and SP10).

Station	Latitude	Longitude	Depth (m)	Sediment Description
SP1	53.35.20N	00.52.86E	24	Sand
SP2	53.35.16N	00.50.78E	24	Cobbles
SP3	53.34.96N	00.49.46E	60	Muddy sand and shells
SP4	53.34.71N	00.45.78E	64	Muddy sand
SP5	53.34.54N	00.45.07E	68	Muddy sand
SP6	53.33.79N	00.44.10E	66	Muddy sand and rocks
SP7	53.32.93N	00.43.15E	77	Very fine sandy mud
SP8	53.32.08N	00.42.27E	86	Coarse sand
SP9	53.31.00N	00.41.17E	92	Muddy, pebbly sand
SP10	53.29.97N	00.39.98E	90	Sand with pebbles
SP11	53.28.94N	00.40.06E	90	Sand and gravel
SP12	53.27.88N	00.40.04E	89	Gravel
SP13	53.26.79N	00.40.03E	88	Sand and gravel
SP14	53.25.91N	00.40.07E	83	Sand and shell
SP15	53.24.98N	00.40.10E	74	Shingle
SP16	53.23.98N	00.40.17E	46	Sand and shell
SP17	53.23.53N	00.40.00E	36	Muddy sand

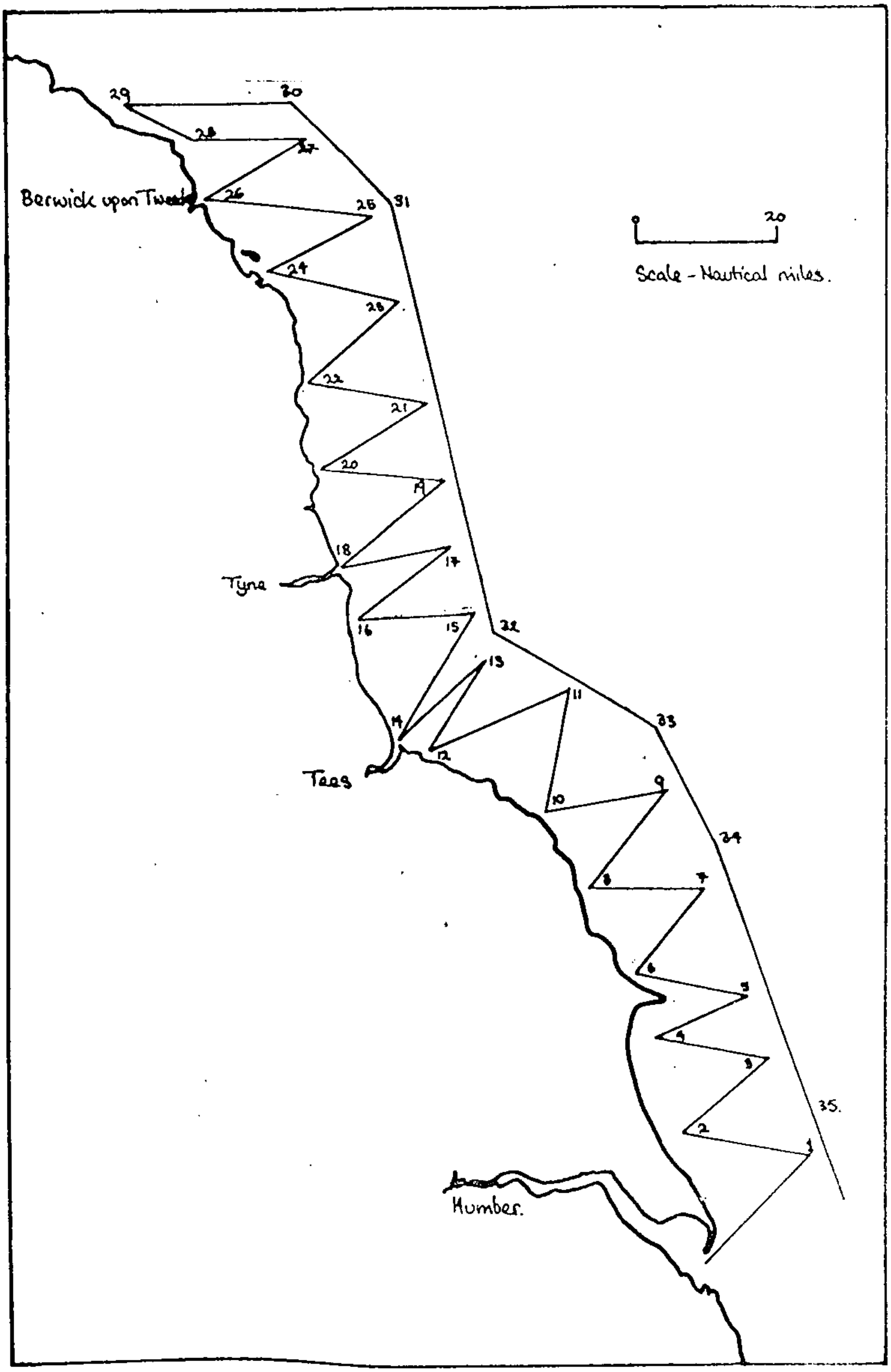
Appendix 3. Humber/Wash grid way points.

Station	Latitude	Longitude
1.	53° 51.5'N	0° 02'W
2.	54° 02'N	0° 31'E
3.	53° 43.5'N	0° 08'E
4.	53° 53.5'N	0° 41'E
5.	53° 33'N	0° 08'E
6.	53° 46'N	0° 50'E
7.	53° 26'N	0° 17'E
8.	53° 39'N	0° 58'E
9.	53° 18.5'N	0° 21'E
10.	53° 25'N	0° 46'E
11.	53° 29'N	1° 00'E
12.	53° 15'N	0° 39'E
13.	53° 00'N	0° 24'E
14.	53° 00'N	1° 04'E
15.	53° 17.5'N	1° 21'E
16.	52° 54'N	1° 31'E
17.	52° 43'N	1° 49'E
18.	52° 47'N	2° 12'E

Appendix 4. North east coastal grid way points.

Way point No.	Latitude	Longitude
1	53° 45.0'N	00° 24.4'E
2	53° 51.8'N	00° 04.0'E
3	54° 02.2'N	00° 18.4'E
4	54° 03.0'N	00° 03.0'W
5	54° 07.5'N	00° 14.0'E
6	54° 11.5'N	00° 13.0'W
7	54° 23.0'N	00° 03.0'E
8	54° 23.2'N	00° 27.0'W
9	54° 38.5'N	00° 13.0'W
10	54° 33.5'N	00° 45.0'W
11	54° 48.0'N	00° 36.0'W
12	54° 38.5'N	01° 02.0'W
13	54° 52.5'N	00° 50.5'W
14	54° 41.4'N	01° 8.5'W
15	54° 57.0'N	00° 55.0'W
16	54° 56.0'N	01° 19.0'W
17	55° 05.0'N	01° 03.0'W
18	55° 00.8'N	01° 22.0'W
19	55° 12.5'N	01° 01.5'W
20	55° 12.5'N	01° 27.0'W
21	55° 20.5'N	01° 03.5'W
22	55° 23.5'N	01° 30.0'W
23	55° 29.5'N	01° 04.0'W
24	55° 34.0'N	01° 33.0'W
25	55° 45.0'N	01° 15.0'W
26	55° 47.5'N	01° 56.0'W
27	55° 55.0'N	01° 35.0'W
28	55° 55.0'N	02° 05.0'W
29	56° 00.0'N	02° 17.0'W
30	56° 00.0'N	01° 36.0'W
31	55° 42.0'N	01° 03.5'W
32	54° 53.5'N	00° 45.0'W
33	54° 45.0'N	00° 18.0'W
34	54° 31.5'N	00° 02.5'E
35	54° 00.0'N	00° 23.0'E

Figure 2. North east coastal grid.



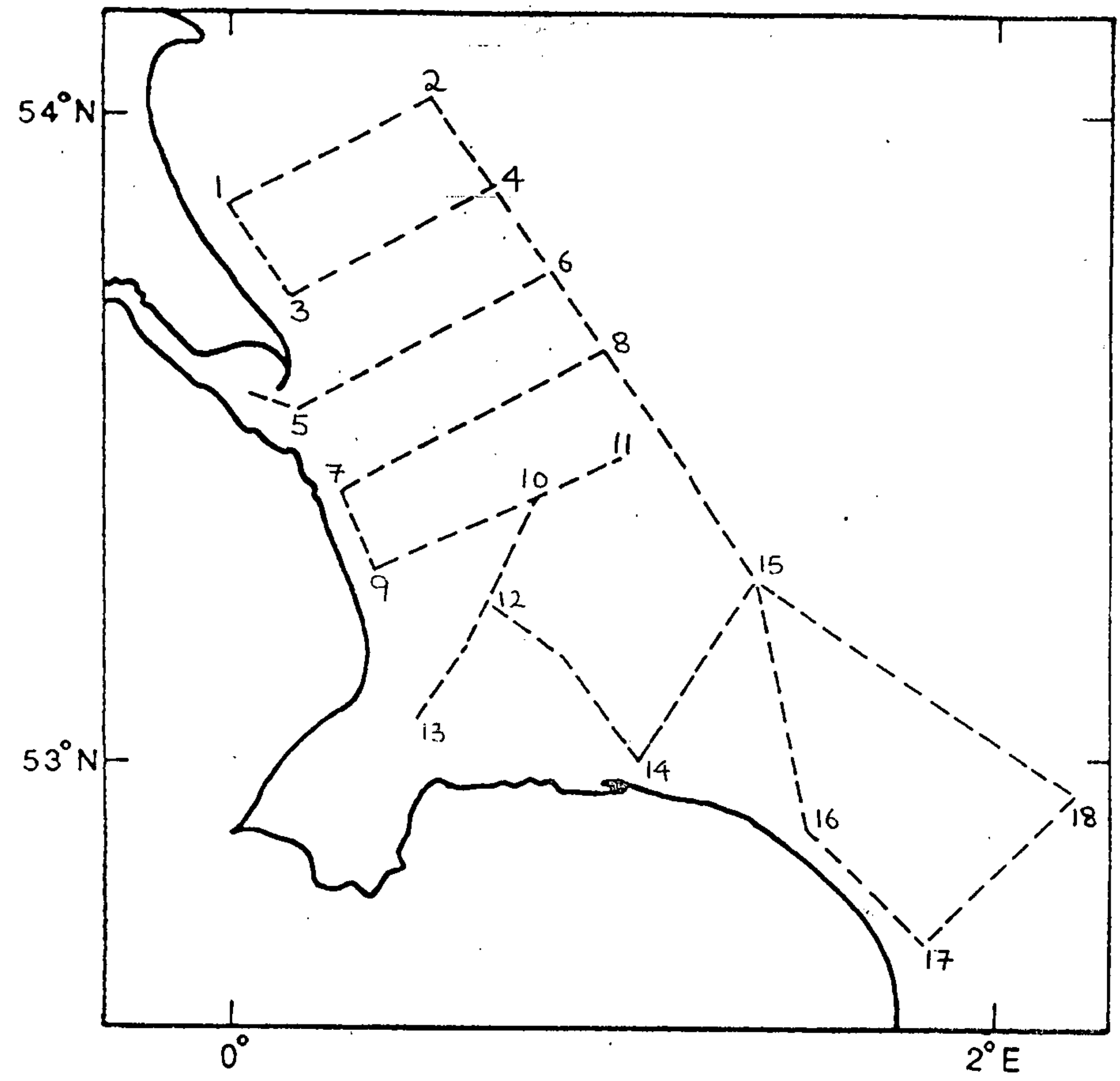
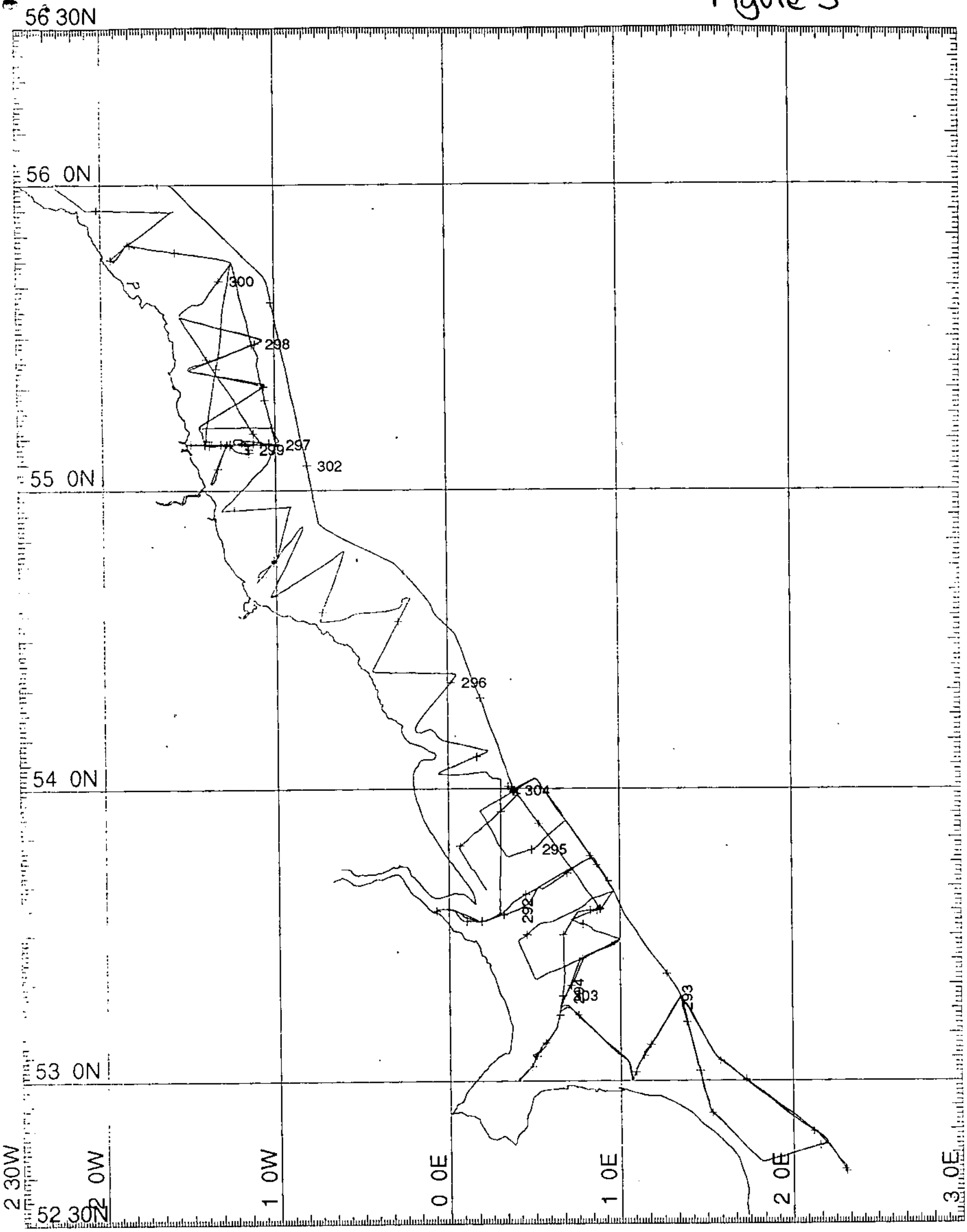


Figure 1. Humber/Wash grid track.

Figure 3



MERCATOR PROJECTION

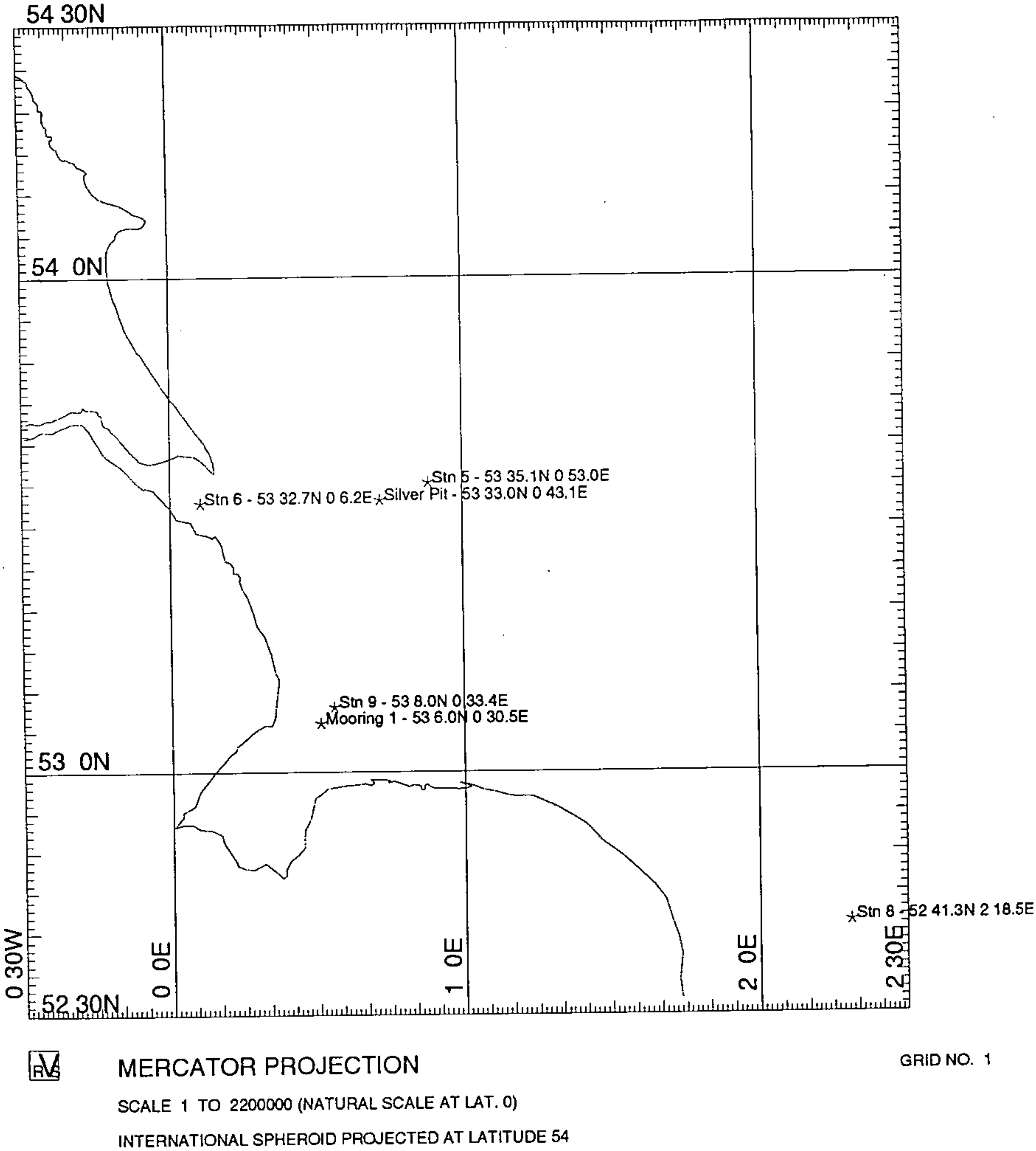
GRID NO. 1

SCALE 1 TO 3500000 (NATURAL SCALE AT LAT. 0)

INTERNATIONAL SPHEROID PROJECTED AT LATITUDE 54

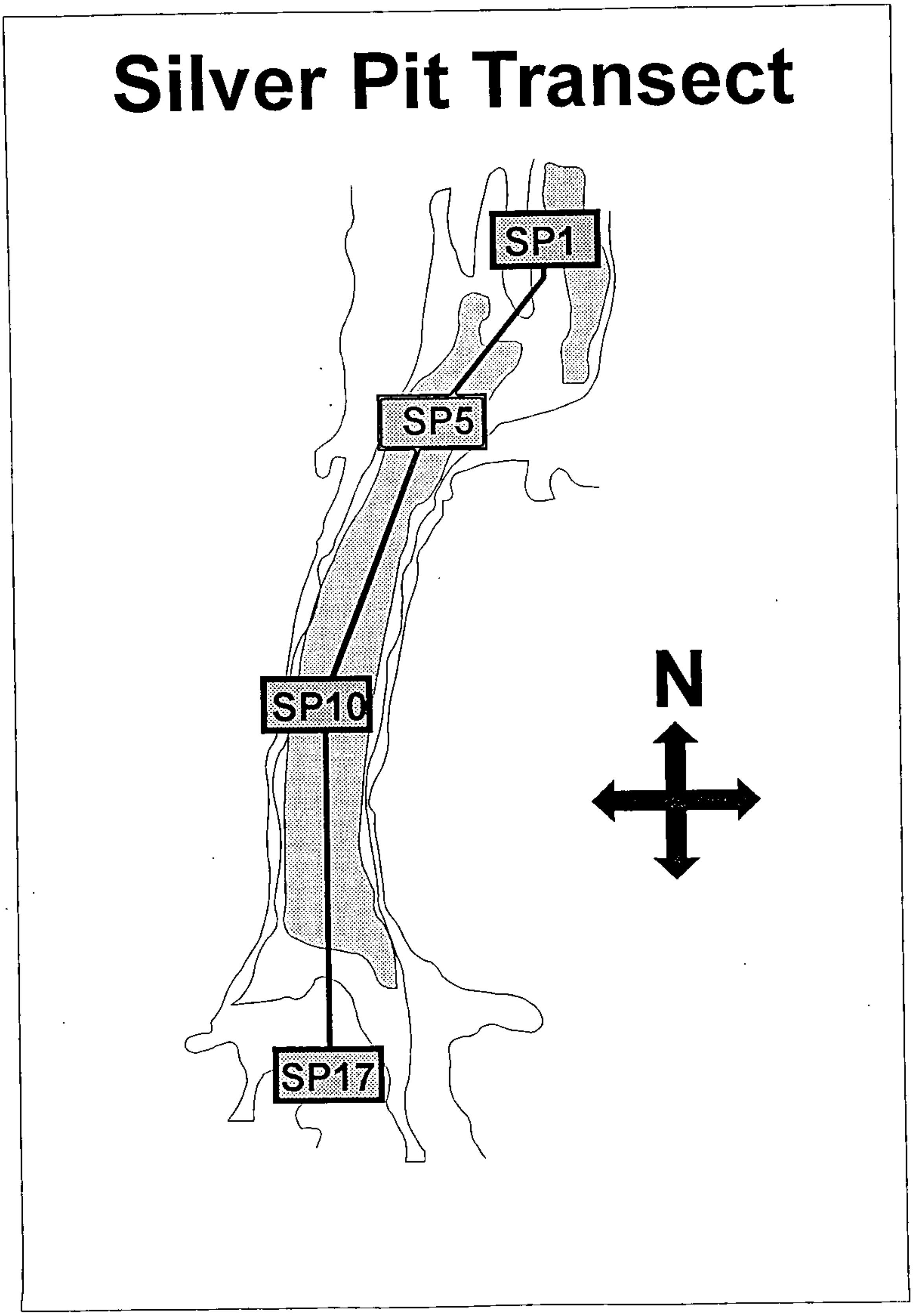
RRS Challenger cruise 115-B Whole Cruise Track.

Figure 4. Positions of the standard box core stations in the Humber/Wash area.



Humber/Wash Stations

Figure 5. The Silver Pit grabbing transect.



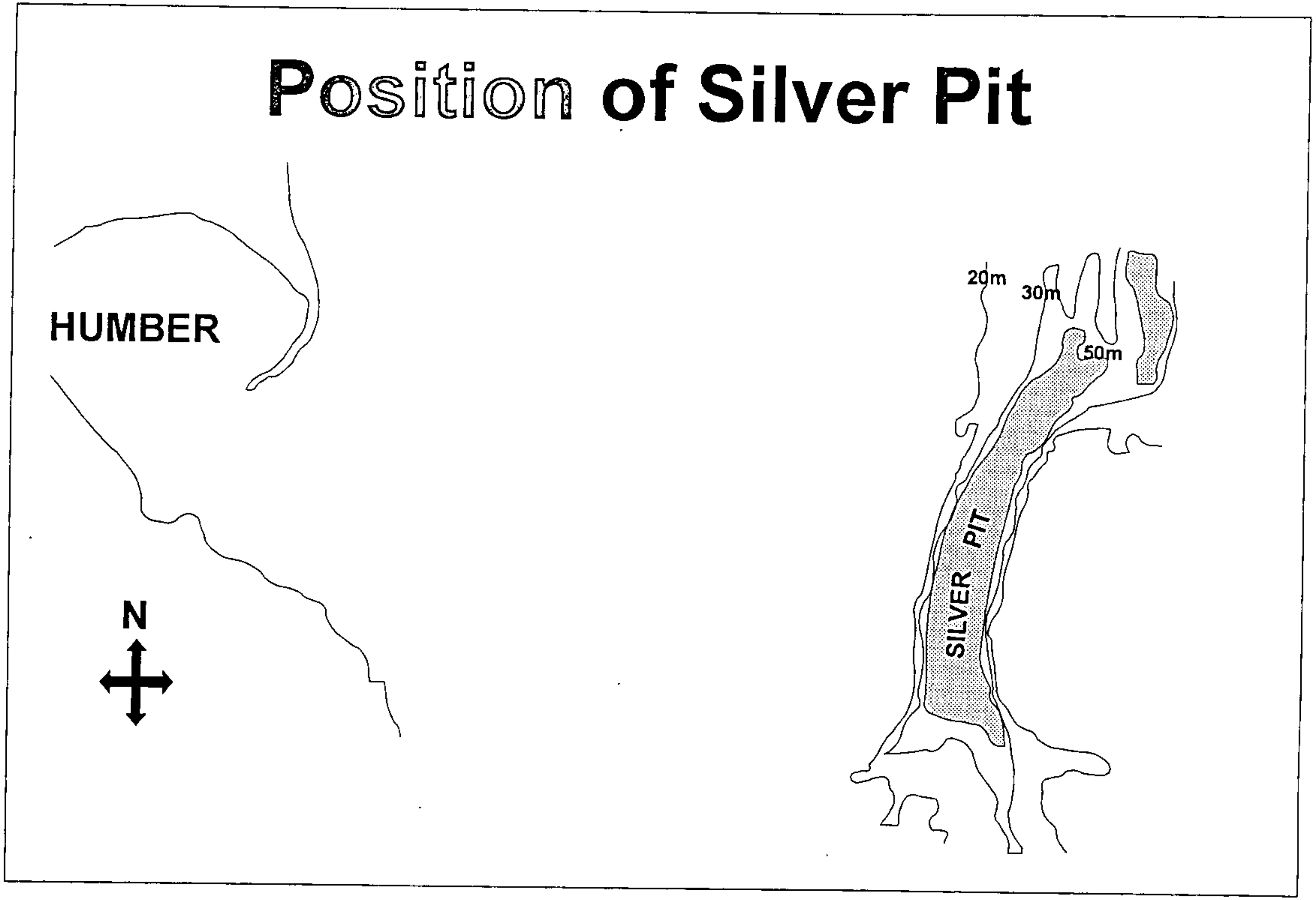
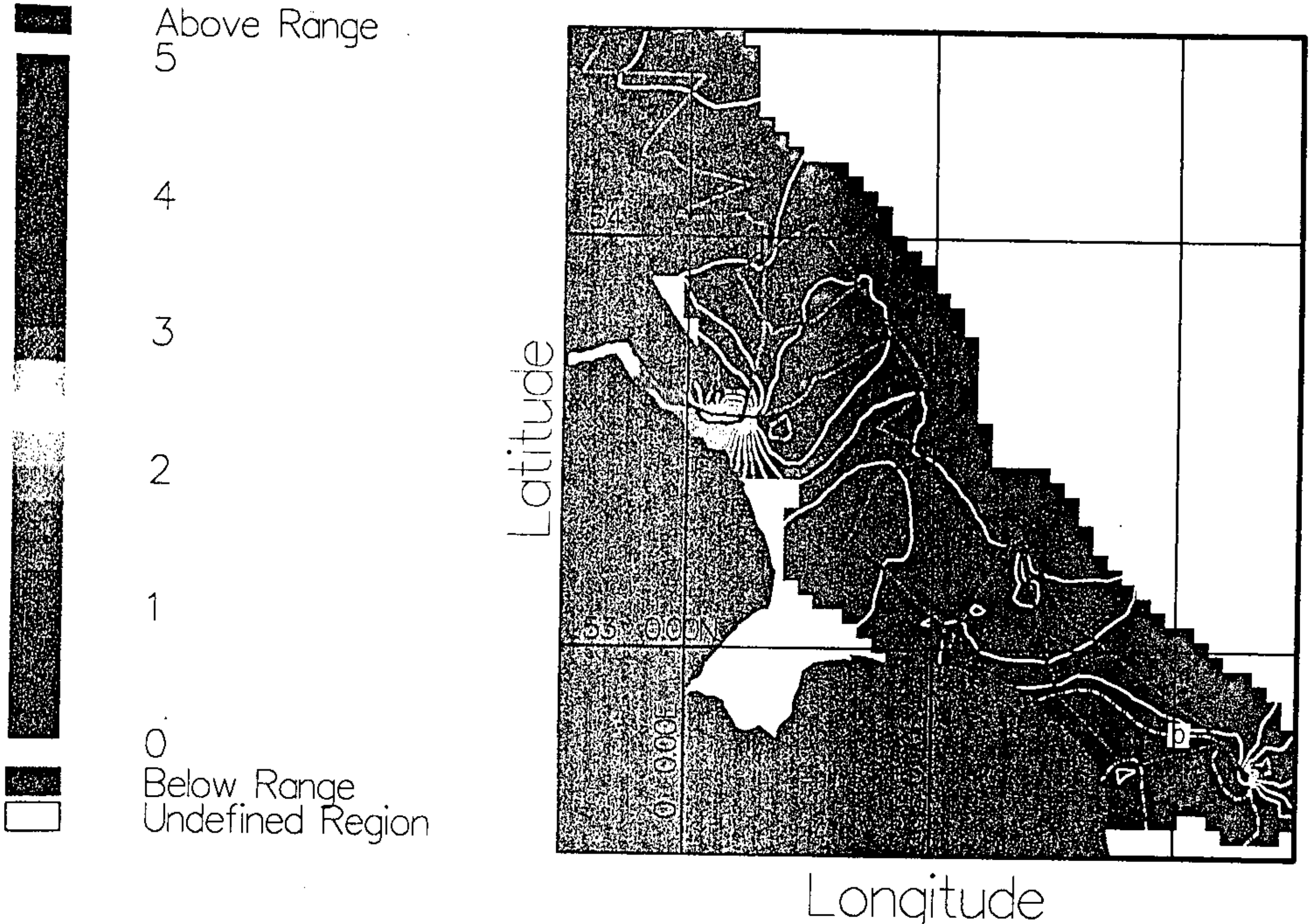


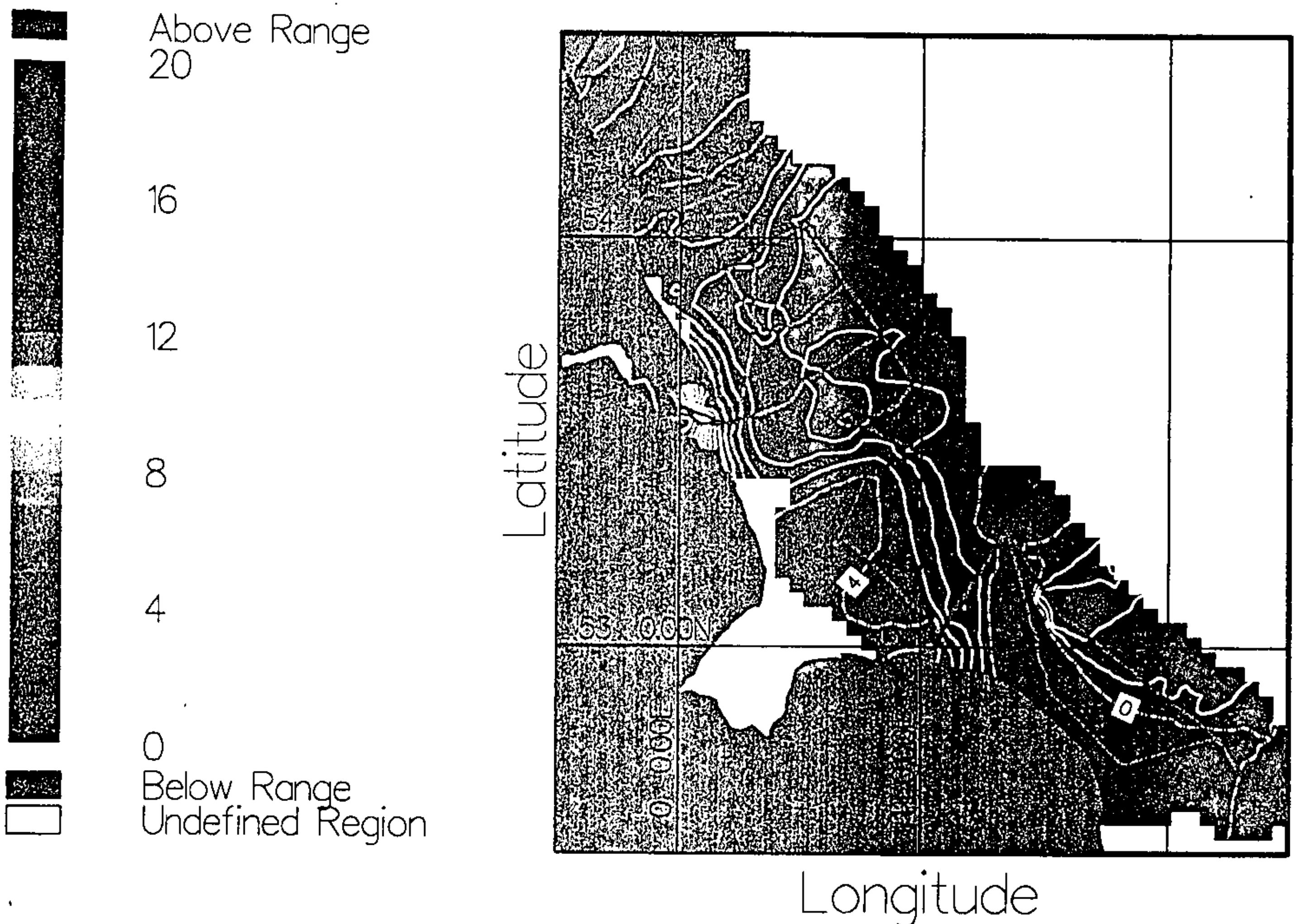
Figure 5a.

Figure 6a



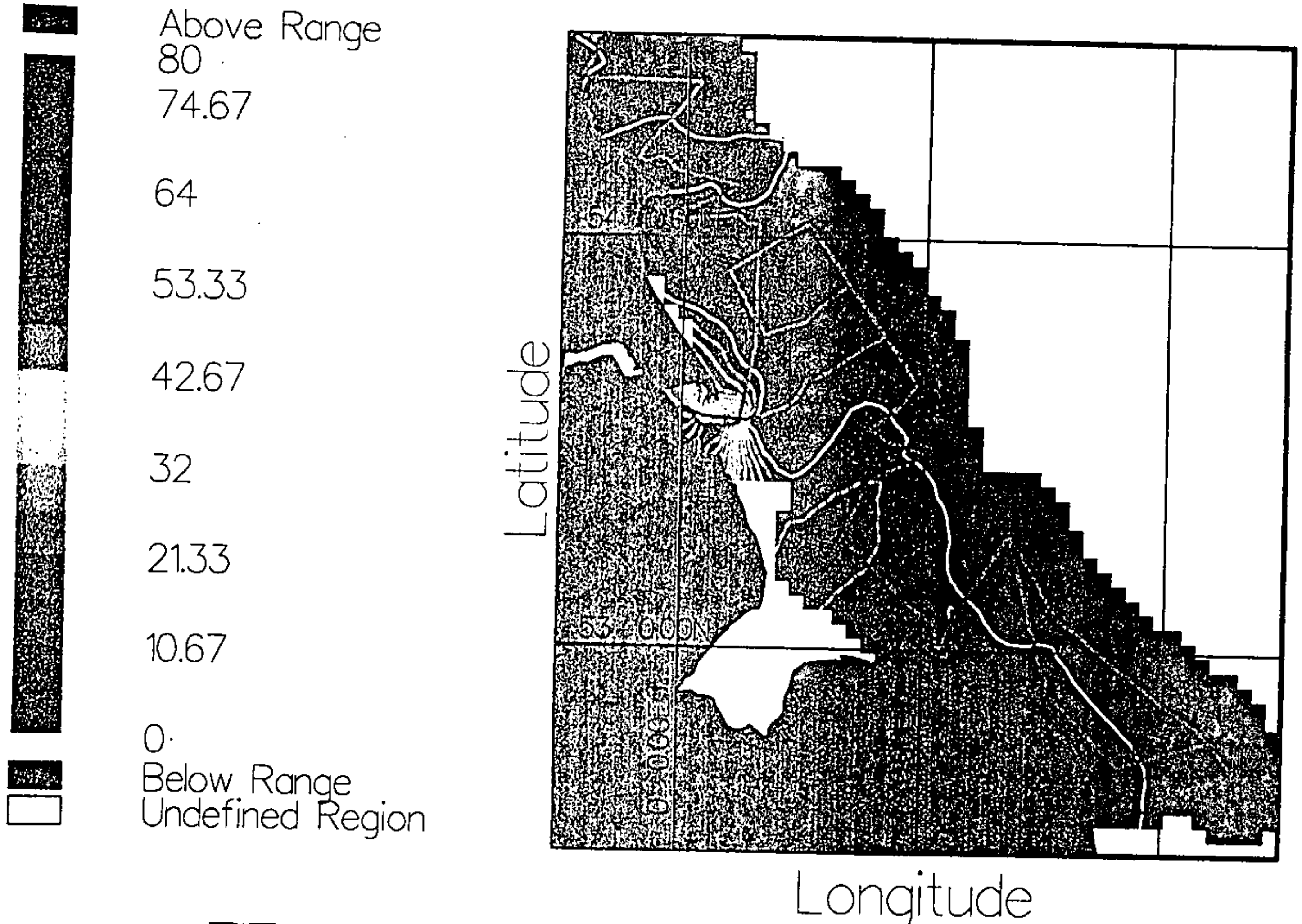
TITLE:— " Phosphate in the Humber/Wash area. "
VARIABLE:—Phosphate

Figure 6b



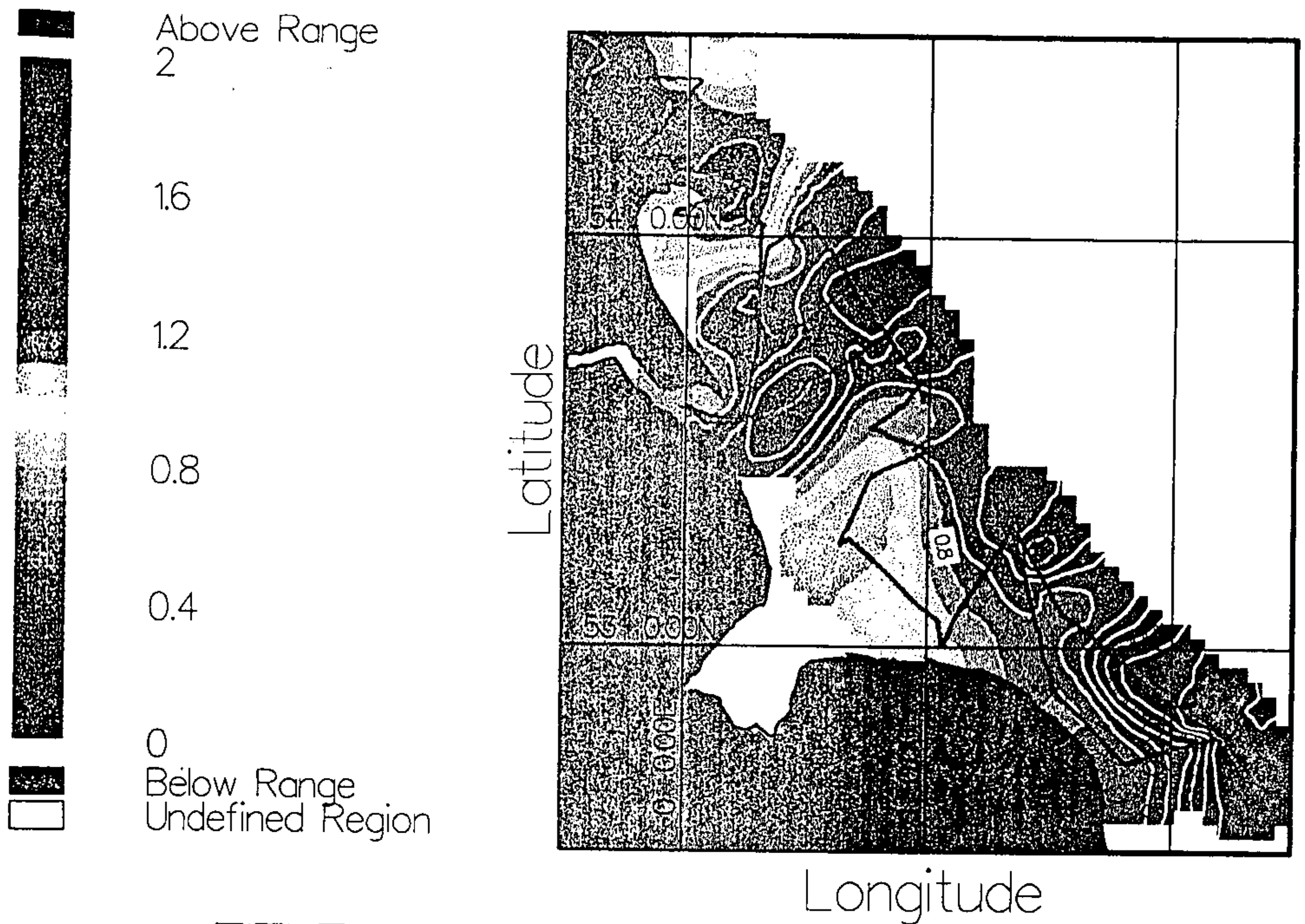
TITLE:– " Silicate in the Humber/Wash area. "
VARIABLE:–Silicate

Figure 6c



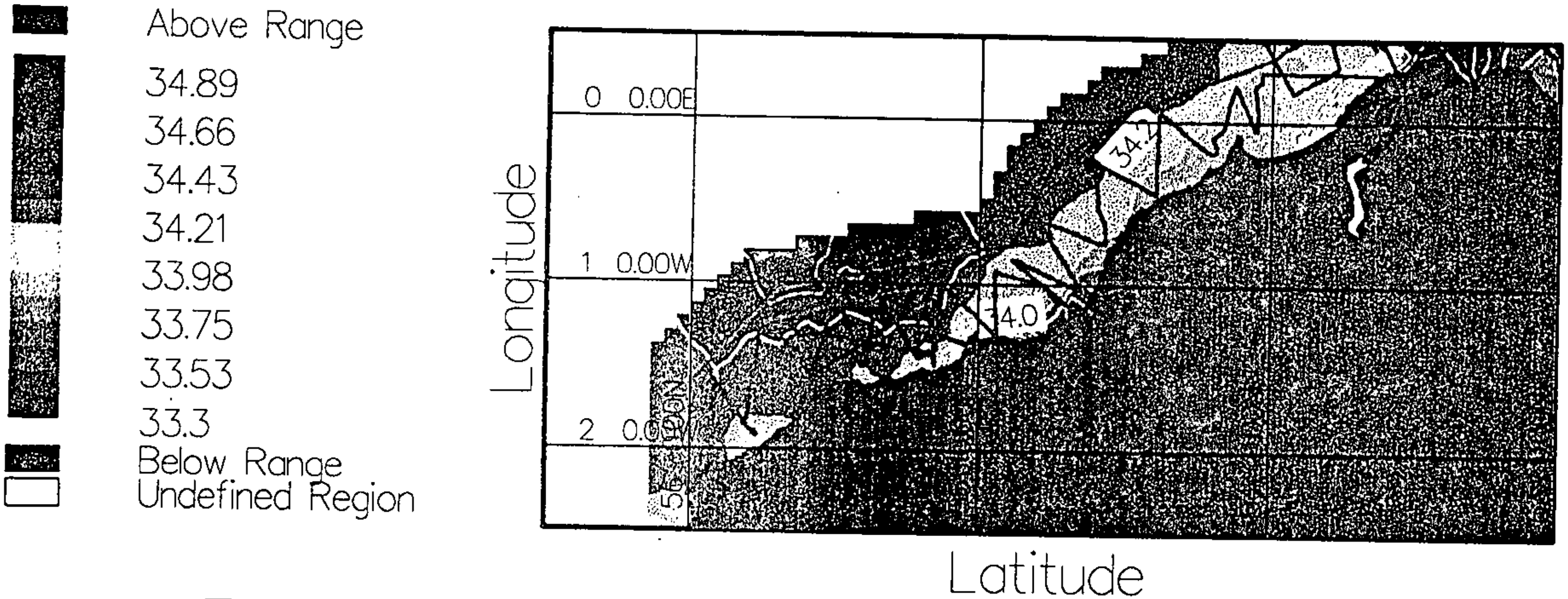
TITLE:- " Nitrate in the Humber/Wash area. "
VARIABLE:-Nitrate

Figure 6d



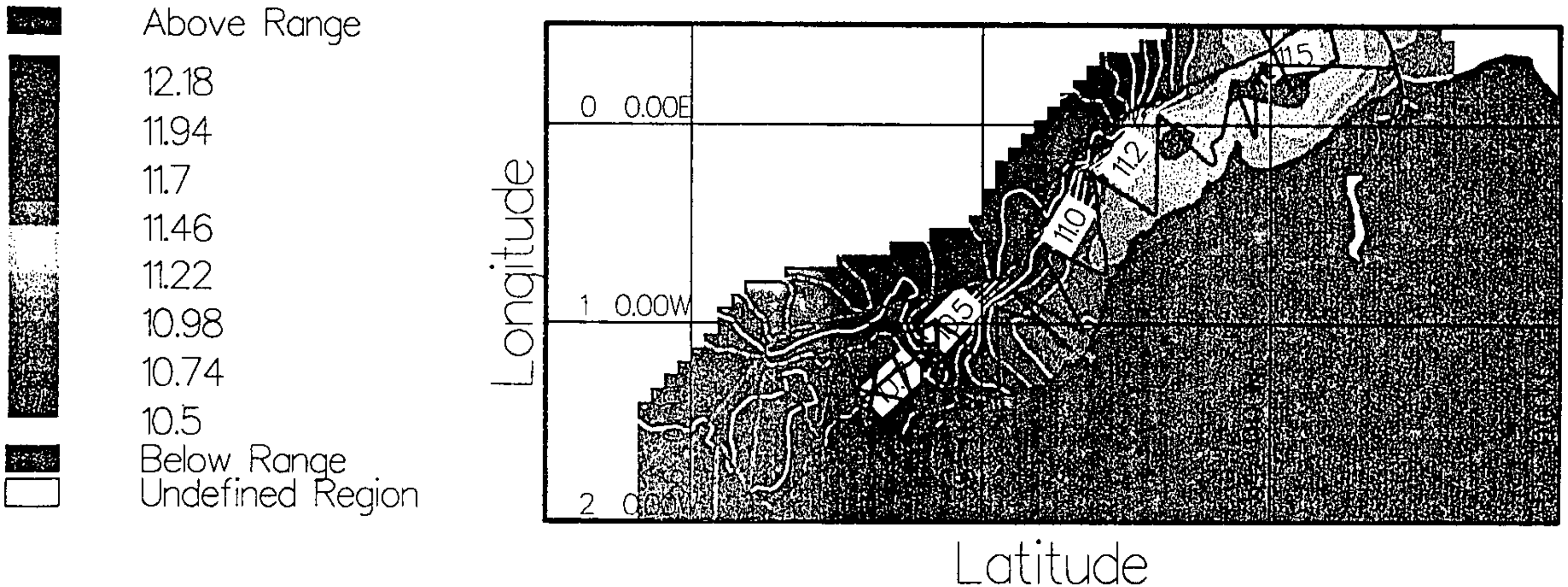
TITLE:– "   Nitrite in the Humber/Wash area. "
VARIABLE:–Nitrite

Figure 7a



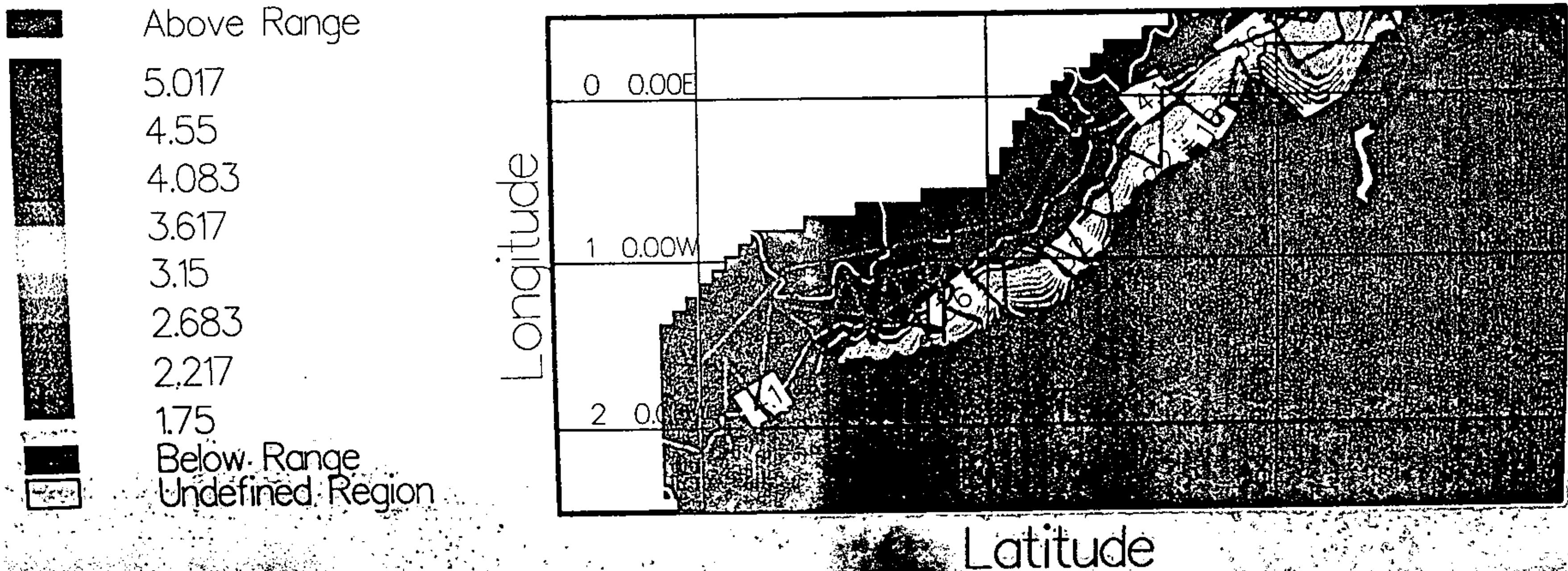
TITLE:— " Salinity in the Humber/Tweed area "
VARIABLE:—Salinity

figure 7b



TITLE:– " Temperature in the Humber/Tweed area "
VARIABLE:–Temperature

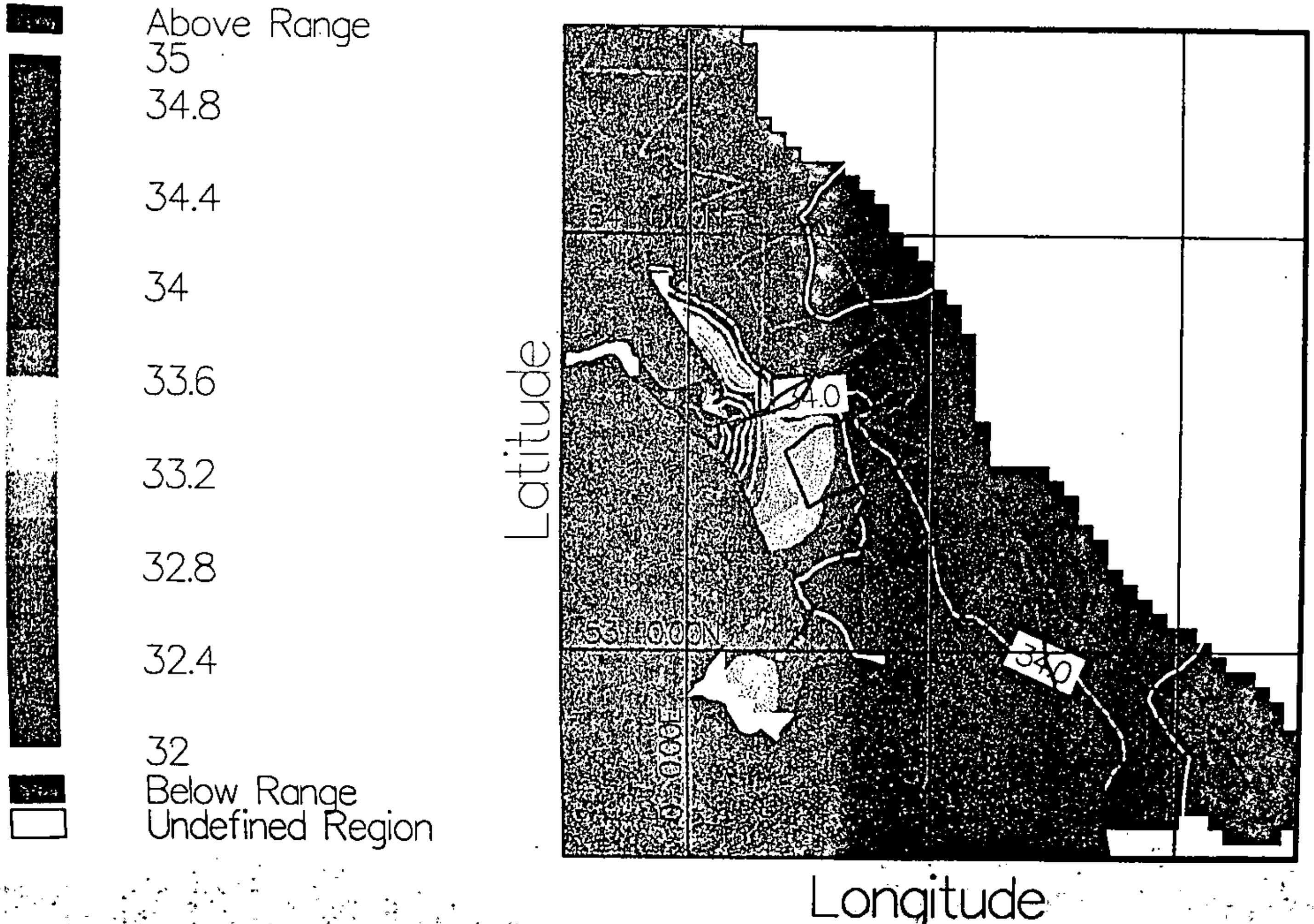
figura 7c



TITLE:- "Transmission in [illegible] Humber/Tweed area"

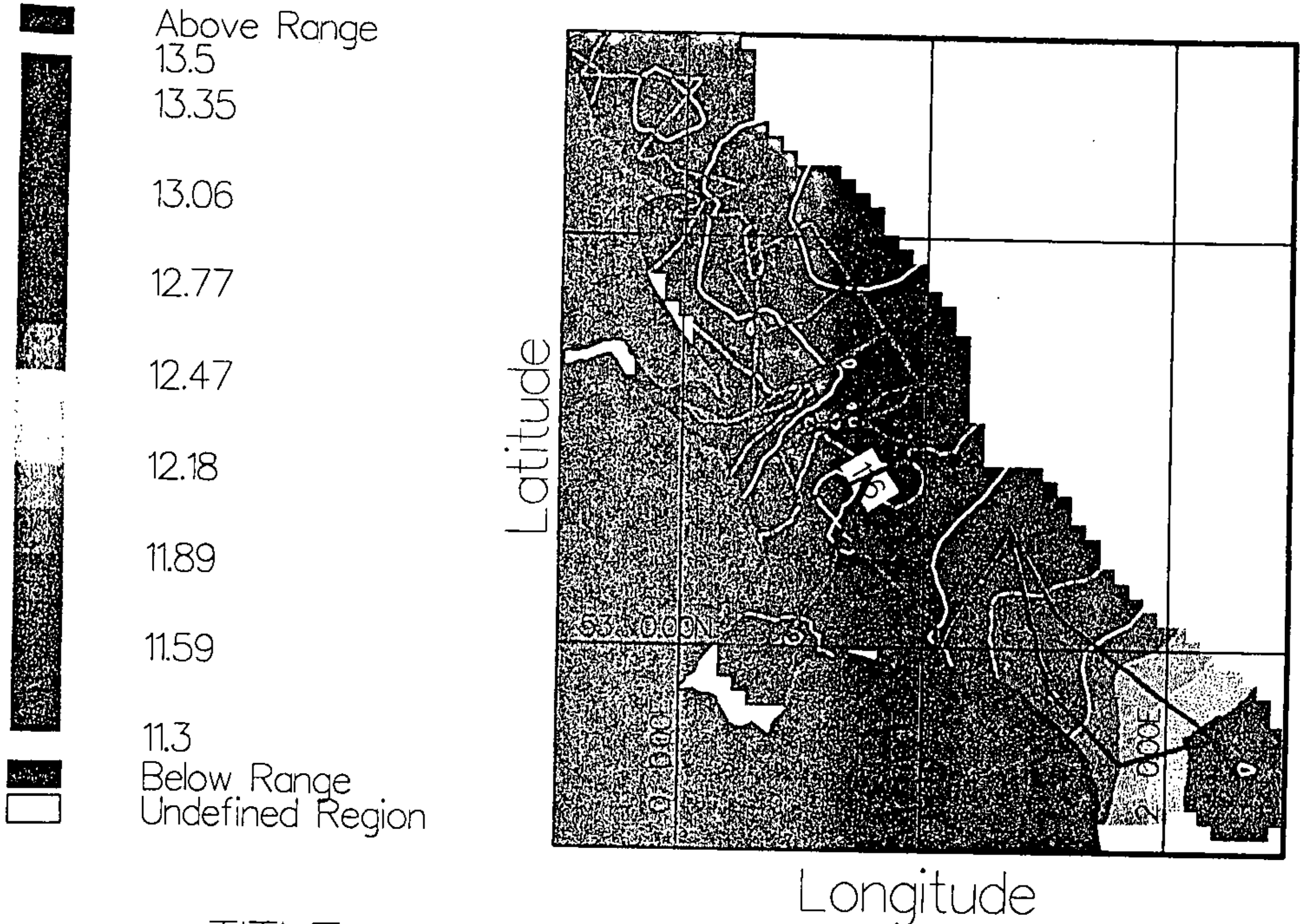
VARIABLE:-Transmission

Figure 8a



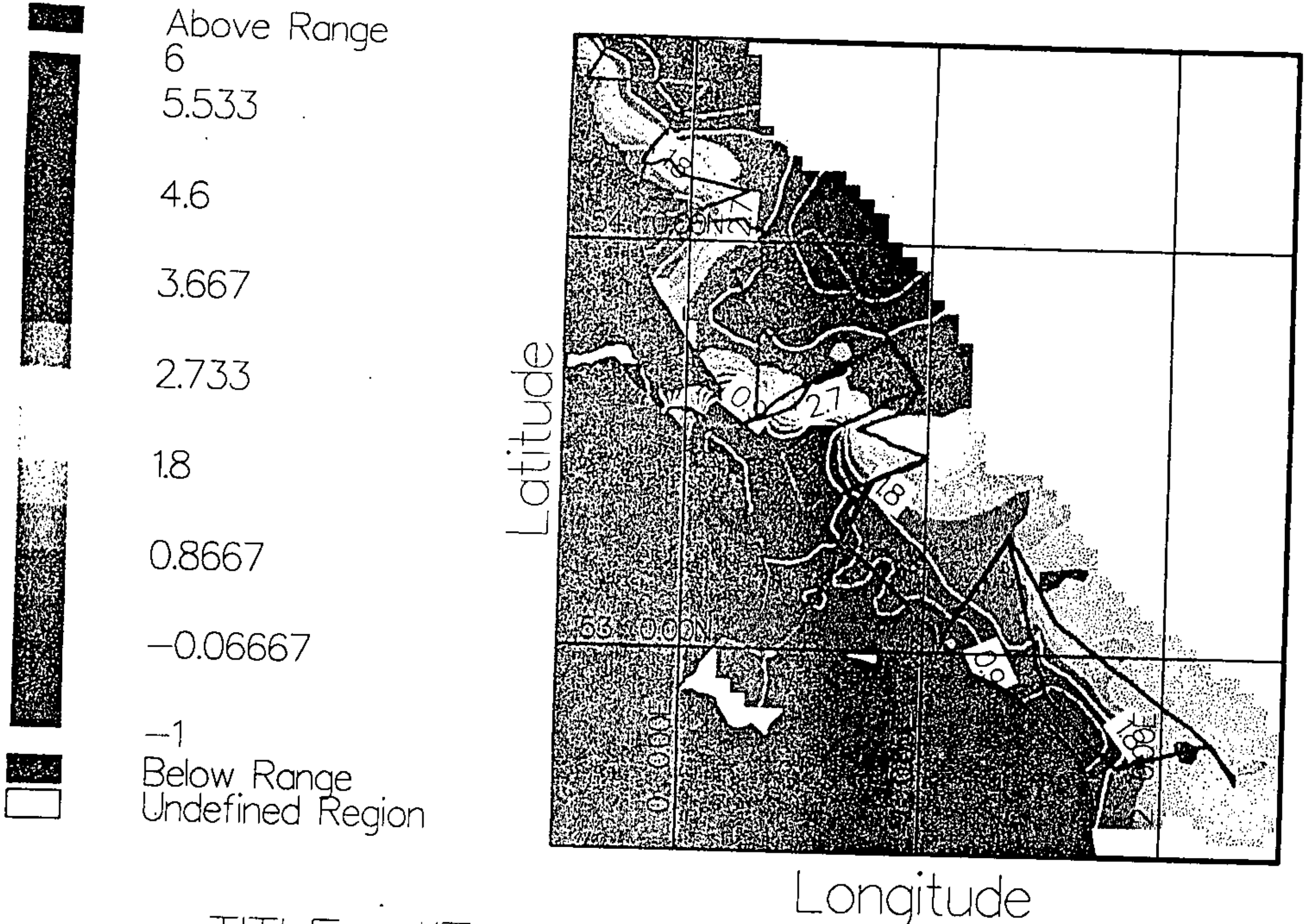
TITLE:– " Salinity in the Humber/Wash area. "
VARIABLE:–Salinity

figure 8b



TITLE:– " Temperature in the Humber/Wash area. "
VARIABLE:–Temperature

figure 8c



TITLE:– "Transmission in the Humber/Wash area."
VARIABLE:–Transmission