

CENTRE FOR ENVIRONMENT, FISHERIES AND AQUACULTURE SCIENCE,
LOWESTOFT, SUFFOLK, ENGLAND

2002 RESEARCH VESSEL PROGRAMME

REPORT: RV CORYSTES: CRUISE 8

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|--------|-------------|---------------|-----------------|
| STAFF: | Mr K Medler | Dr L Fernand | Dr S Dye |
| | Ms A Reeve | Mr P Hudson | Dr G Tattersall |
| | Dr E Young | Ms C Chambers | Dr J Bunt |

DURATION: 26 June – 9 July

LOCALITY: North Sea

AIMS:

The work was directed toward:

- a) A better understanding of the circulation processes of the southern and central North Sea in order to characterise the transport of nutrients from UK waters.
- b) Improved knowledge of the processes that determine areas of strong phytoplankton production in the vicinity of the Frisian Front.

The main sampling aims of the cruise were:

1. Deploy free-floating satellite tracked buoys in order to determine the Lagrangian circulation. Subsequently, a number may be retrieved.
2. To undertake Scanfish and CTD surveys to collect information on the water column structure in relation to nutrient and plankton dynamics.
3. Conduct productivity experiments and assess nutrient uptake.

NARRATIVE (all times GMT):

RV Corystes sailed at 09:09 26 June and made for the start position of a Scanfish section 1 (Figure 1). Stops were made en-route for a test CTD and NIOZ core station in order to trial equipment and establish a sampling strategy. The 90 km Scanfish section commenced at 18:28 and was completed at 00:39 27 June. Scanfish section 2 of 100 km towards Texel was worked between 03:19 and 10:06 and section 3 of 129 km north from Terschelling completed in deteriorating conditions by 2:49 27 June. Plans to continue with a northwest Scanfish section were changed owing to freshening winds and a heavy swell from the northwest. Instead sections 4 and 5 of 83 km and 112 km were worked and completed by 16:31 28 June. Because of the poor weather conditions in the area it was decided to abandon plans for further Scanfish sections to the east and to move further west. Corystes made slow passage overnight and the following morning to the northern end of the Terschelling section in the hope that conditions would have moderated to enable the Scanfish section cancelled the previous day to be worked. But on arrival shortly after mid-day and with a heavy swell still present it was decided to work a 117km section NNW across Clay Deep to the Dogger Tail End (6), completed by 21:15.

The four northern Argos satellite drifting buoys (A1 to A4) were then deployed and Scanfish section 7 of 60 km completed. This indicated the presence of high chlorophyll levels along part of the section. A CTD profile with nutrients, particulate and chlorophyll samples were collected before proceeding to deploy three further Argos buoys (A5 to A7) en-route to the start of Scanfish section 8 (78 km), which had been cancelled earlier. This was completed at 23:51 30 June and two more Argos buoys deployed (A8 and A9). A heavy swell dictated a slow passage to the start of Scanfish section 9 (63 km), completed at 17:07 1 July. Six more Argos drifters (A10 to A15) were released as passage was made to the first of eleven CTD stations situated along Scanfish section 3. Samples were collected for suspended particulate, nutrients, chlorophyll and plankton analyses. Because the CTD transect failed to confirm the thermocline seen earlier during the Scanfish section it was decided to undertake further Scanfish sections in the area and two more, of 149 km and 141 km (10 and 11) were completed by 15:06 3 July. Samples were collected at the NE end of section 10, P1, for a productivity experiment.

Perusal of the section 11 data suggested another west to east crossing would be useful and Scanfish section 12 (186 km) commenced at 17:19 but had to be terminated at 03:57 4 July due to strong winds and heavy seas. These subsided soon after and the Scanfish was re-deployed to complete the section at 9:57. Scanfish sections 13 (154 km), 14 (94 km) and 15 (254 km) were completed by 21:29 5 July and brought Corystes back to the Frisian front region.

Two sediment cores from seven sites approximately 1 mile apart at the end of Scanfish section 15 were collected until the early hours of 6 July for the determination of sediment chlorophyll and pore water nutrients. Scanfish section 16 (126 km) commenced at 03:18 with the aim of locating areas of high chlorophyll levels for further core sites. Two areas along the section were identified and two cores from four sites in each area were collected. Argos buoy A16 was deployed at 21:09 and Corystes then headed for the second productivity site, P2, situated along the track of Scanfish section 16. Samples were collected from this site at 2:20 7 July when Corystes made for the start position of Scanfish section 17.

Scanfish sections 17 (148 km), 18 (94 km) and 19 (58 km) were completed at 08:19 8 July. In deteriorating weather and sea conditions Corystes headed for the site of the NIOZ core stations of 5 July, at the end of Scanfish section 16, and obtained a CTD profile with samples for chlorophyll and nutrient analyses. Corystes then steamed for Lowestoft, deploying Argos buoy A17 en-route, and docked Lowestoft at 06:22 9 July.

RESULTS (provisional)

All scientific aims of the cruise have been completed.

The primary aim of Scanfish and CTD surveys from South of the Dogger Bank to the Dutch coast towards the German Bight was completed successfully. Nineteen Scanfish tows (total 2236km, 1206nm) were completed and the temperature, salinity, density, fluorescence turbidity and light climate features in the area characterised. Evident in the bottom temperature plots (Figure 2) is the cold pool south of the Dogger Bank with strong bottom temperature gradients along the edge of the bank that would potentially drive a flow southwest-wards. Further south at 54° N the bottom temperature contours coinciding with the general area of the surface front initially indicates an easterly transport but at around 6° E promote transport to the north-east. Initial drifter data supports this transport path.

In the eastern half of the area salinity is a more important determinant of the density structure. The surface salinity (Figure 2 b) shows the strong salinity front present at 7° E, which is due to the discharges from the Rhine, Elbe, Jade and Weser rivers. Figure 3, for section 15, shows the relationship between the density structure and salinity in the well-mixed waters to the east of the section where there is clear evidence of the river inflows. In the west is a thermally stratified region, with bottom front temperature gradients at 60 km. The cruise coincided with a period of strong winds and weak heating and consequently temperature stratification was less than expected. Repeat sections in the south of the region towards the Dutch coast showed the variable nature of the front in the transitional zone with the position of the stratified region moving 40 km offshore in 5 days after a period of strong (> 30 knot) north west winds.

Drifters were deployed in 17 locations. While the general positions of these was pre-determined the exact positions were determined by reference to the Scanfish sections to find the areas of likely maximum flow. Other locations were picked as reference locations.

Secondary aims of the cruise were to investigate productivity at a site in a region near the Frisian front and investigate the nutrients in the sediment. A region of higher fluorescence was detected inshore of the front and appeared to be associated with lower salinity water, the origin of this water remains unclear as it was isolated by higher salinity water from the Rhine coastal water. Cores undertaken at this site showed a muddy-sand composition and probably contain a high organic component. A comparison site in the Oyster grounds revealed more compacted muddy-sands but with a much lower cohesive (organic) component. Samples were collected at the productivity station P2, the site of low salinity. The results await assessment but a net haul at the site revealed considerable quantities of plankton.

The co-operation and assistance of the officers and crew of *Corystes* in ensuring that the aims of this cruise were achieved is gratefully acknowledged

Seen in draft:

A Reading (Master)

B Salter (Fishing Skipper)

Ken Medler (SIC)

Liam Fernand

9 July 2002

DISTRIBUTION:

BASIC LIST+

Mr K Medler

Dr J Bunt

Ms A Reeve

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Ms C Chambers

Dr G Tattersall

CORYSTES 8/02 SAMPLING SITES

- SCANFISH SECTION
- A ● ARGOS DRIFTING BUOY
- △ CTD STATION
- P1,P2 PRODUCTIVITY STATION
- C NIOZ CORE SITE

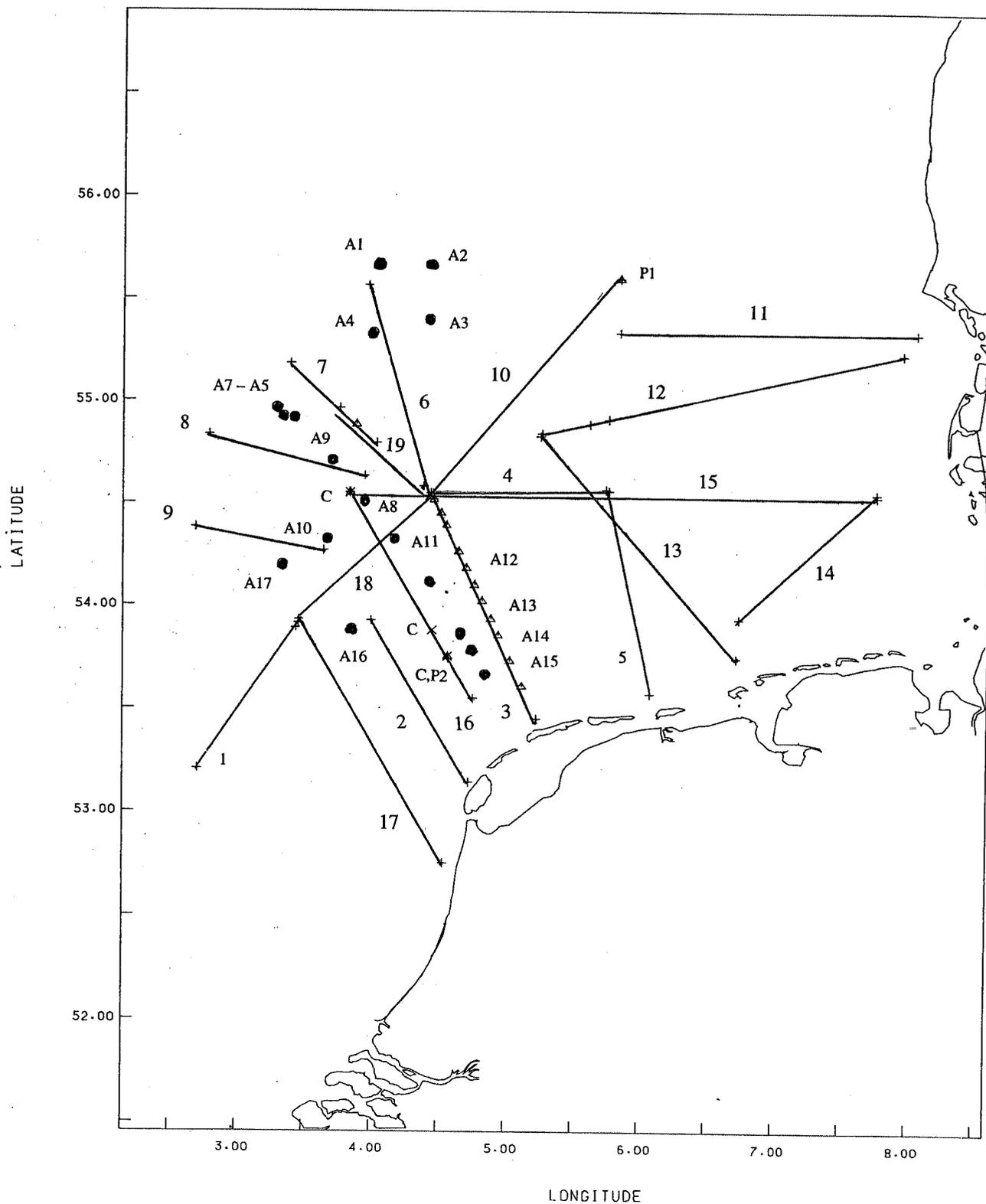
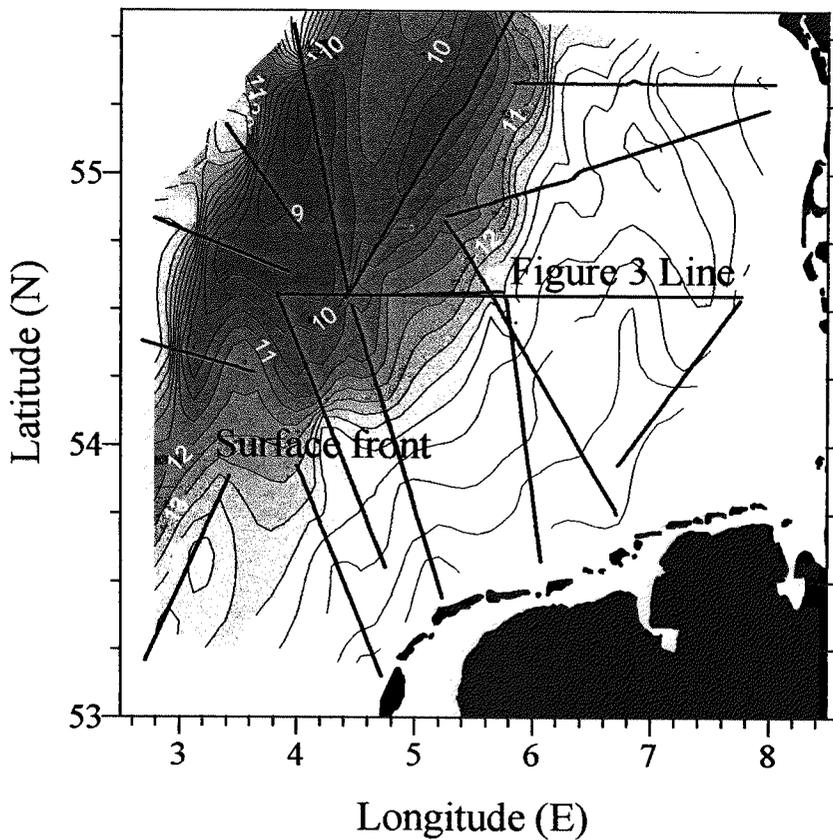


Figure 2 Corystes 8/02 Scanfish Lines

Bottom Temperature



Surface Salinity

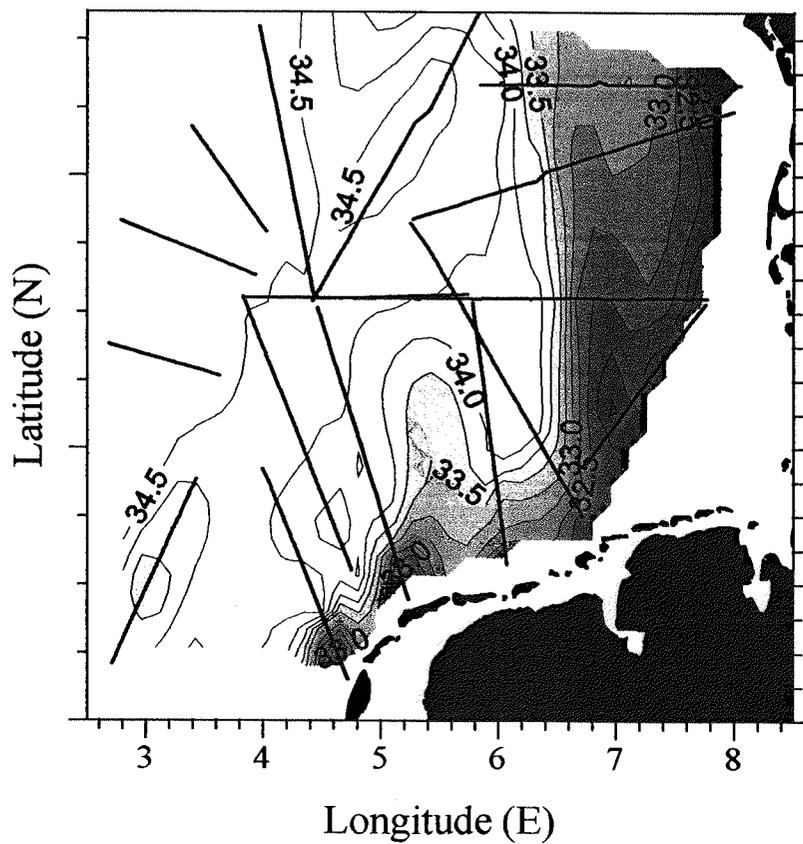
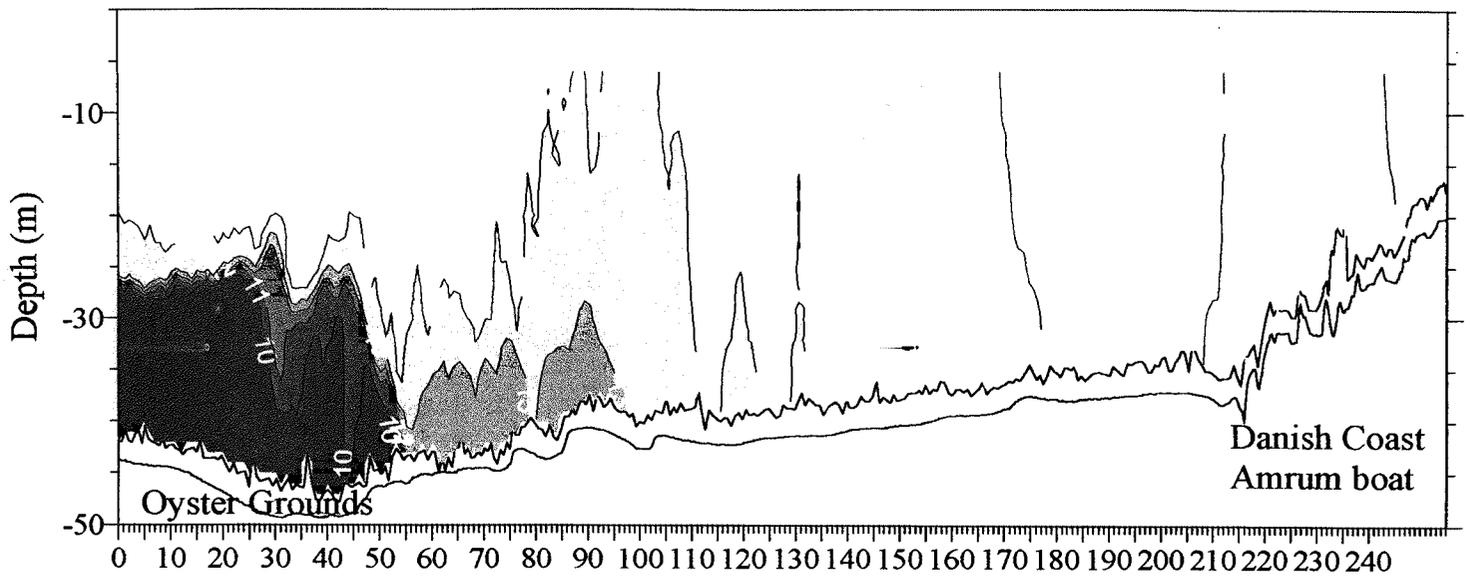
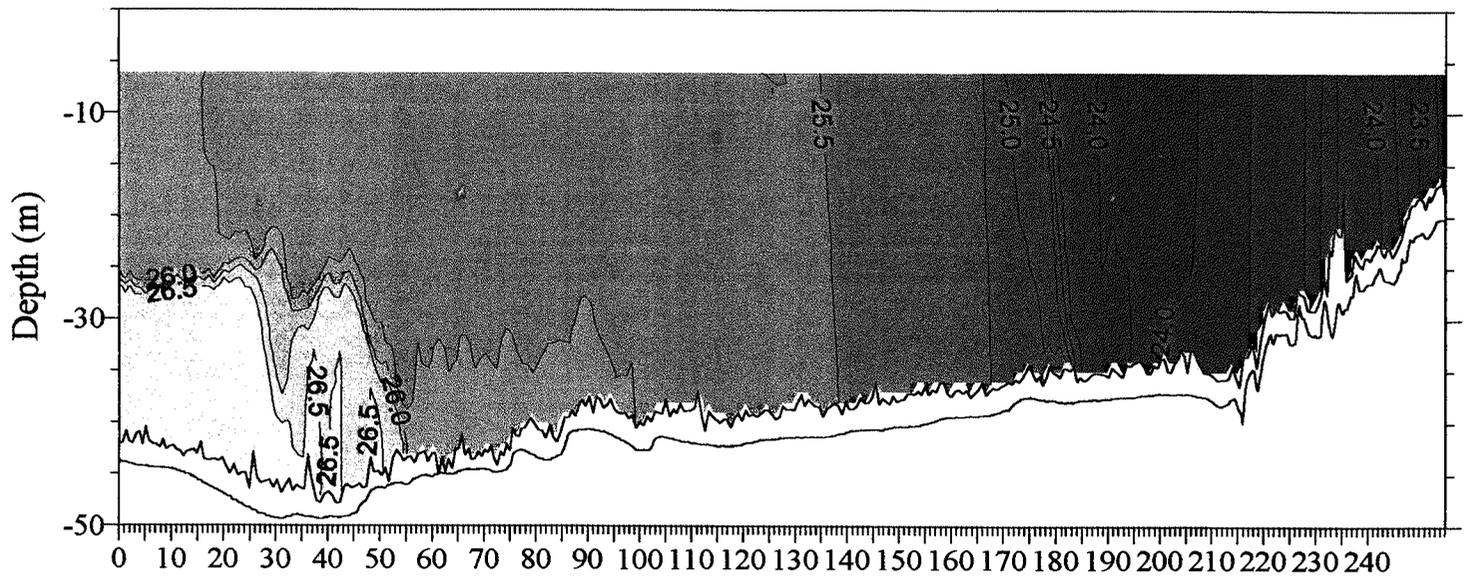


Figure 3 Along 54 33 N



Density Sigma-t Leg co08179



Salinity ppt Leg co08179

