

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

2003 RESEARCH VESSEL PROGRAMME

Draft Report: RV CORYSTES: CRUISE 8

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DURATION: 26th June – 9th July
Sailed Time 08:00 BST (HW 07:20 GMT)
Docked Time 06:00 on 9th

LOCALITY: Western English Channel

AIMS:

The work was generally aimed at achieving a better understanding of the dynamics of the circulation processes of the Western English Channel. In order to characterise the extent and nature of density driven and seasonal jet-like circulation which acts as a direct and rapid pathway for transport of material. The existence of exotic species in the western Channel region is evidence of the potential pathway from the Bay of Biscay or mouth of the Gironde to the UK and Irish coast. The sampling of *Karenia mikimotoi* which is of interest due to links to HABs was a specific cruise aim. Additionally to study the structure of the mixing in the bottom region, and for comparisons with models a thermistor chain and ADCPs were deployed for the period between the cruises

The principle aims of the cruise were completed successfully.

1. To characterise the hydrographic structure associated with the frontal regions and investigate the transport pathways.
2. To undertake sampling to quantify and map the extent of *Karenia mikimotoi* (by water samples from CTD Rosette)
3. Deploy ARGOS drifting buoys to quantify the Lagrangian circulation
4. Deploy Mooring (ADCP and thermistor chain) to study the mixing processes in the transitional region.

Cruise Narrative (all times GMT):

After transit to the Western Channel, a Scanfish line (st 6) was commenced from the middle of the separation zone, towards the south west along the centre of the channel after an abortive CTD cast, a further Scanfish line was undertaken overnight 27th to the Cornish coast near Falmouth. On the 28th ADCP and marker toroids moorings were deployed, the first successfully, the 2nd had to be recovered and was grappled on the 2nd attempt. On the 29th June on performing leg 49 into the French coast, a pair of fishing pots were caught and on recovery of the Scanfish were found to have damaged the cable. 2 CTDs were performed to finish the line. CTDs and net hauls were then commenced north along line 101 and along the Cornish coast and then south until midnight. On the 1st July the Scanfish was deployed shortly after midnight in an attempt to complete the previously aborted Scanfish line. Scanfish lines to the centre line (101) and the Cornish coast (108) and a short Scanfish line (116) were undertaken. Strong near coastal fronts were observed. A further Scanfish line was conducted from the coast to the channel centre line (120). On Wednesday 2nd July after transit to the eastern most ADCP mooring a CTD was performed and the mooring deployed. CTDs were performed along the line of the previous Scanfish section (006). A surface plume of *Karenia mikimotoi* was observed. Comparison CTDs were performed near the thermistor chain moorings. Transit to the southern most Scanfish line was performed overnight. Thursday 3rd July, the southern most line was commenced with Scanfish into the coast, and CTDs were conducted back. Overnight on the 3rd/4th transit was made to the start of leg 165g. This leg continued north and finished very close inshore at the Scilly Isles. Further Scanfish sections were performed overnight and on the 5th July CTDs inshore at high resolution and then at greater spacing were performed. ARGOS buoys were released on the return leg. On the 6th ARGOS buoys were deployed overnight and three closely spaced CTDS near Lands end to investigate the presence of *Karenia mikimotoi* in the inshore jets. Scanfish lines 235 and 241 were then undertaken, very high levels of *Karenia mikimotoi* were observed at the surface.

Monday 7th 2 CTDs were performed, followed by deployment of two ARGOS buoys in the region of Start Point. Further south another CTD was performed and a CTD performed by the thermistor chain mooring. Four CTD and net stations were then occupied from the central area, towards the Guernsey coast across the Hurd Deep. A Scanfish tow was then commenced in return along the line which ended at 18:45 GMT to commence the transit back to Lowestoft. On route to Lowestoft a CTD was performed in the deepest section of the Hurd Deep.

Scientific Results (Preliminary)

A total of 290 stations were logged consisting of 16 scanfish lines, 60 CTDs and 37 Net hauls the remainder being underway stations. Figure 1. Sample for Plankton, Nitrate, Nitrite, Ammonia and Chlorophyll were taken at all CTD stations. During scanfish legs surface underway samples of Chlorophyll and Nutrients and Plankton were taken.

The weather was generally excellent through out the trip leading to very warm surface layers with narrow frontal regions towards the Cornish coast (Figure 2). The bottom temperature clearly shows the coldest water south of the Lizard and the potential pathway for circulation around it. Strong gradients were observed in the area off Ushant with weaker gradients in the around 4° W. A slightly surprising result was that stratification existed in the waters close to Lands End in contrast to typical satellite imagery. Strong flows are likely to exist around the Scilly Isles where strong bottom fronts were observed.

Drifters were deployed in targeted regions, aiming for the jets and some in comparison areas, initially results are consistent with bottom front driven flow.

Phytoplankton

Samples for phytoplankton analysis were taken directly from the CTD rosette bottles, and with a 25-micron mesh net which was hauled vertically from the sea surface to 50 m depth and back at most CTD stations. Samples were preserved in both acidified Lugol's Iodine and neutral formaldehyde. During Scanfish tows, surface samples were also taken periodically from the continuous sea water supply pumped from a depth of 4 m.

The predominant aspect of the phytoplankton during the cruise was an exceptional bloom of *Karenia mikimotoi* that extended over most of the study area. The bulk of the bloom was located in the central English Channel, and had dimensions of the order 60 by 30 nautical miles. Cell densities in this region were 10^5 to 10^7 cells per litre at the sea surface. Surface phytoplankton samples were virtually monospecific within this region, which also extended westwards along the south coast of England towards the Scilly Isles. Surface chlorophyll concentrations within the bloom were 10-70 mg m^{-3} , as indicated from uncalibrated fluorescence data derived from an Aquatracka which was continuously fed from a clean surface (4 m) sea water supply. This distribution is shown in Figure 4

Although the water column within the bloom region was thermally stratified, the shallow depth of the thermocline ($15 \pm 5\text{m}$) confined most of the bloom to the sea surface layer. Sub-surface chlorophyll maxima were however associated with the thermocline when it was deeper than 10 m.

One other feature within the phytoplankton was noted in the more mixed regions towards the southeast of the study region. Net hauls indicated that diatoms dominated here, in particular *Guinardia striata* and *Guinardia flaccida*, the latter being particularly predominant at station 57.

Acknowledgements

Many thanks to the Officers and crew of the RV Corystes whose expertise and enthusiasm greatly aided this successful cruise.

Liam Fernand (SIC)

Liam Fernand
(Scientist-in-Charge)
8 July 2003

DISTRIBUTION:

BASIC LIST+ Those on Cruise

Piers Larcombe

Paul Leonard

Kevin Horsburgh.

David Morris

Corystes 0803 Scanfish Sections and CTD Positions - Western Channel

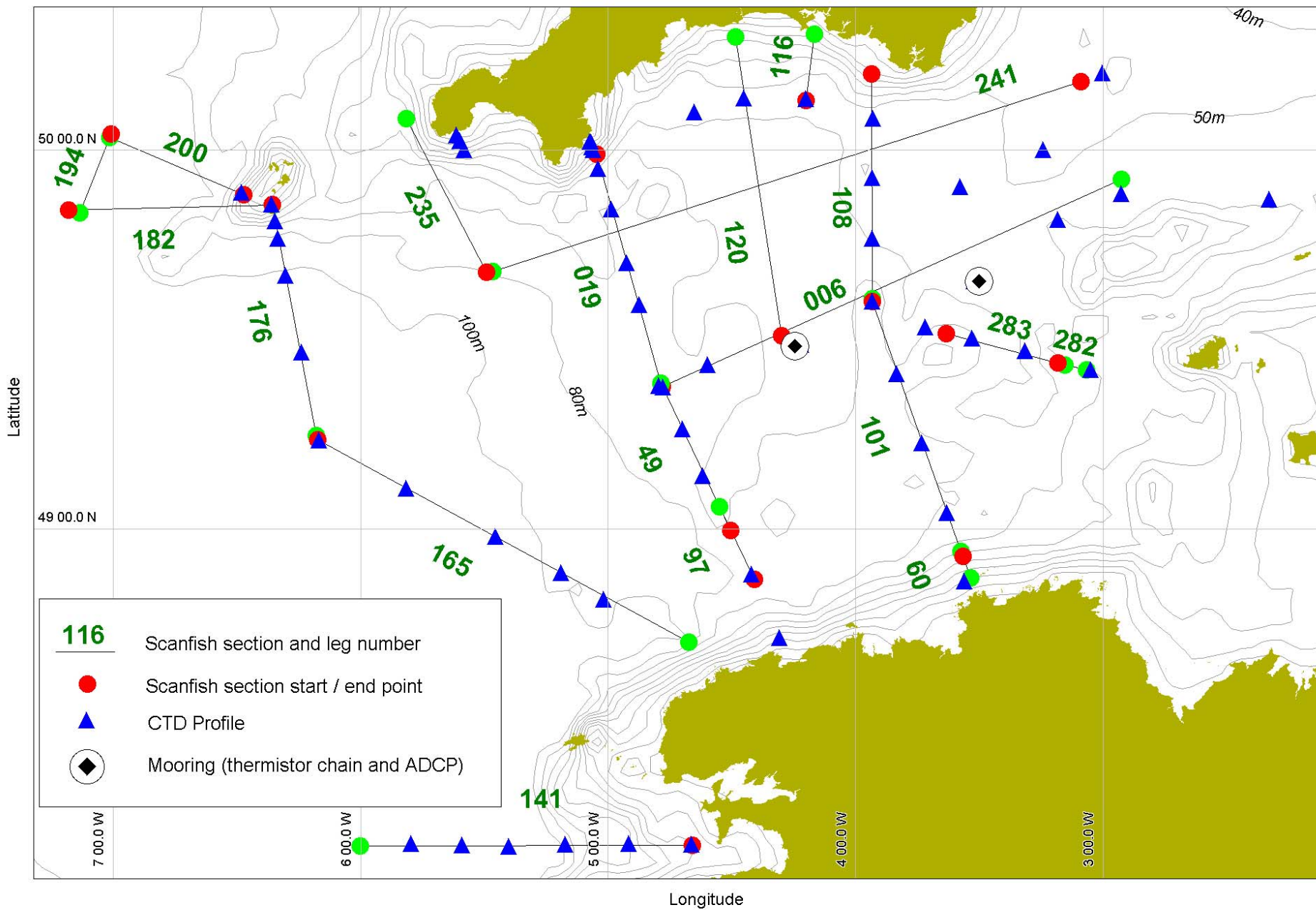
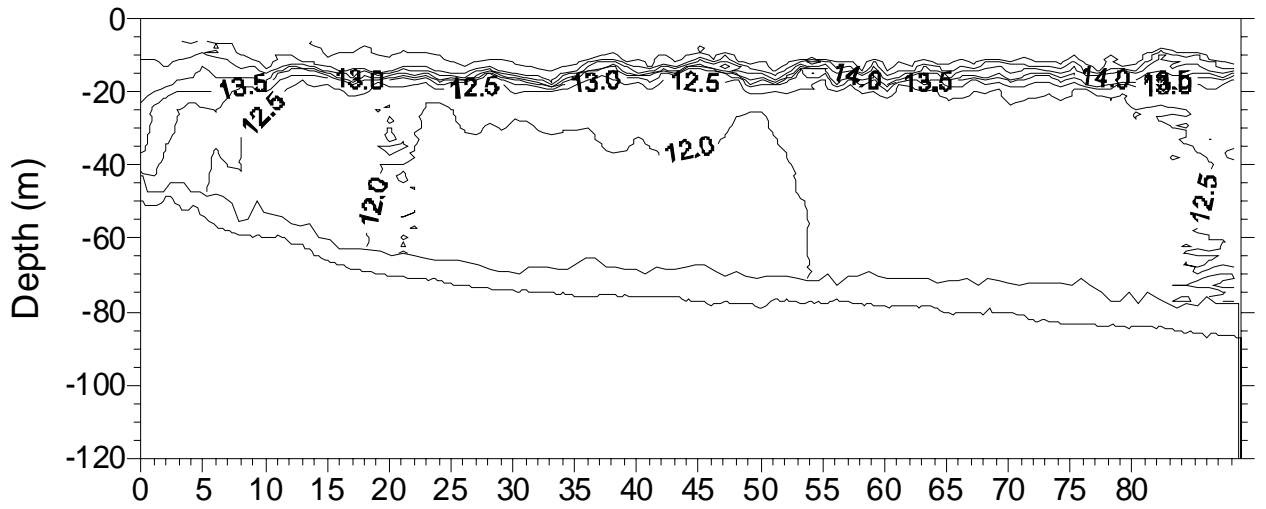
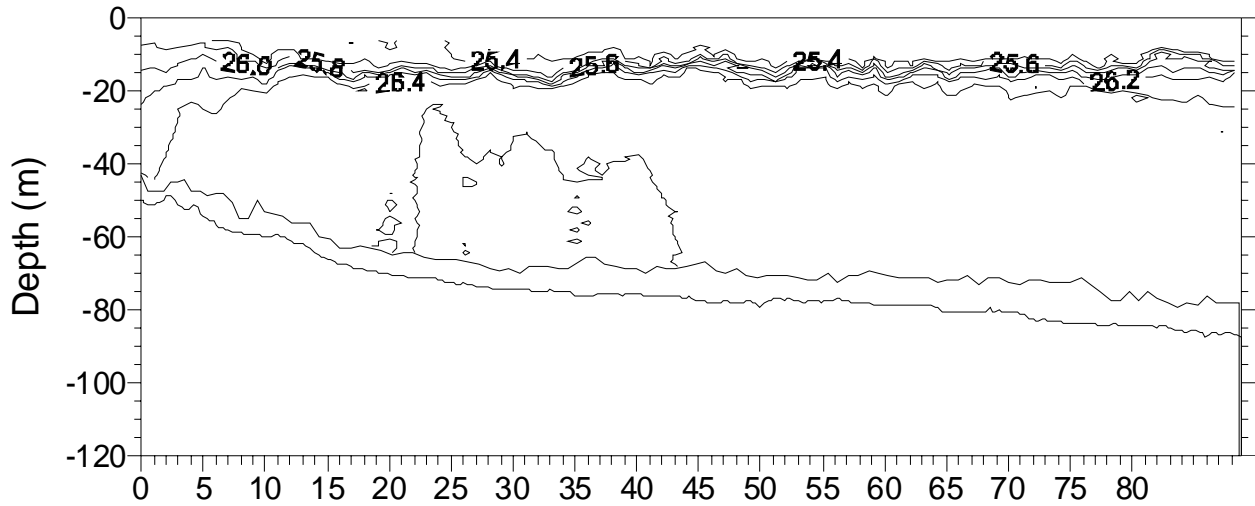


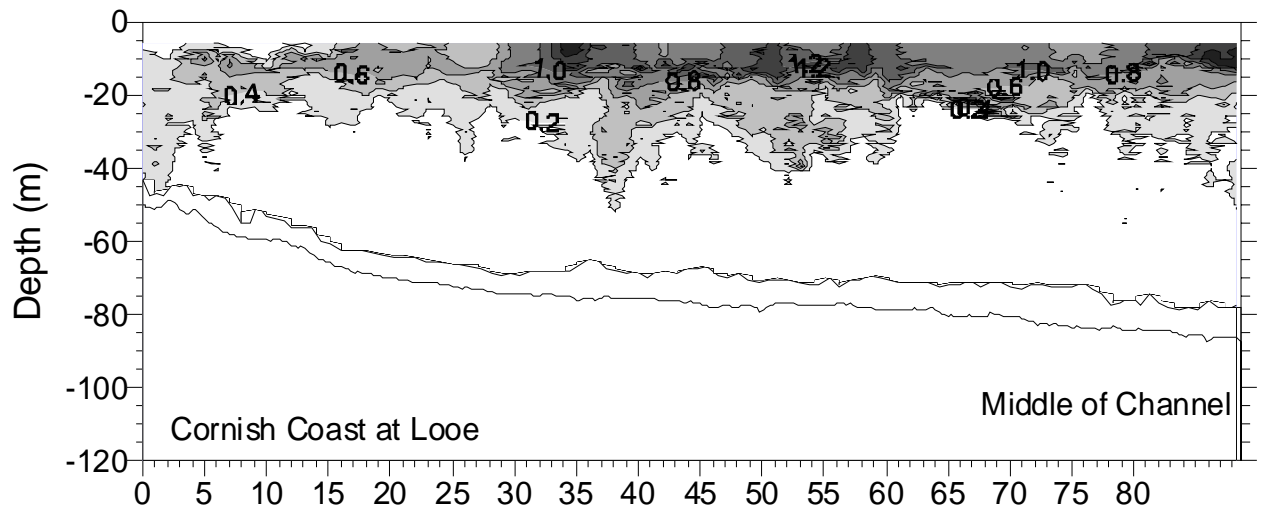
Figure 2 Temperature Plot Leg 120



Density Sigma-t



Fluorescence



Cornish Coast at Looe

Middle of Channel

Distance Northwest - Southeast (km)

Figure 3. Surface chlorophyll fluorescence contours, 29th June to 8th July, 2003, Corystes 8/03. The scale is nominal chlorophyll in mg/cubic metre.

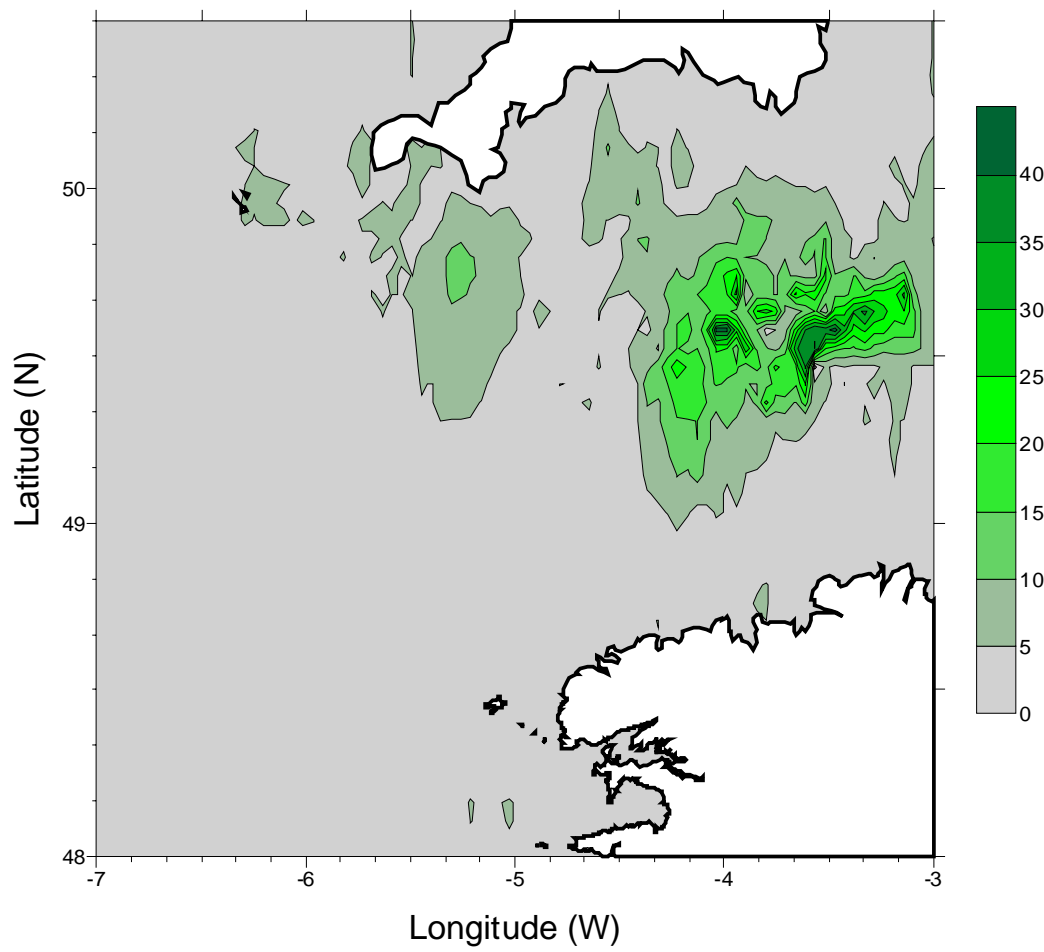


Figure 4 Bottom Temperature From CTD and Scanfish Cory 803

