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MINISTRY OF AGRICULTURE, FISHERIES AND FOOD
FISHERIES LABORATORY, LOWESTOFT, SUFFOLK, ENGLAND

1997 RESEARCH VESSEL PROGRAMME

REPORT: RV CORYSTES: CRUISE 9

STAFF:

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Mr K Medler	Mr B Riches
Dr E Young	Ms J Taylor
Mr K Horsburgh (UWB)	Mr S Jones

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DURATION: 22 August - 3 September

LOCALITY: North Sea

AIMS:

The work is directed at a better understanding of the dynamics of the circulation processes fringing the north east coast of England, between the Firth of Forth and Flamborough Head, and in vicinity of the Dogger Bank. It is intended to characterise the extent and nature of the density driven and seasonal jet like circulation which, from previous work in the Irish Sea and limited historical data, we believe acts as a direct and rapid pathway for transport of material from the coastal region to the central North Sea. Subsequently, the knowledge will be viewed with respect to the nutrient dynamics of the region and concerns that elevated levels of contaminants on the Dogger Bank have originated in the near coastal region. The main sampling aims of the cruise are:

1. To recover three moorings deployed during Corystes 7/97
2. Recover free floating satellite tracked buoys deployed during Corystes 7/97 to determine the Lagrangian circulation.
3. Undertake associated physical and chemical surveys of the region in support of 1) and 2).

NARRATIVE (all times GMT):

RV CORYSTES sailed at 1050 for the Wash (Fig. 1) to recover the toroid marker buoy from the site of the missing Quadrapod. This followed some intense overnight work by the crew and contractors to transfer hydraulic rams from the boat deck crane, which was fortunately not required, to the defective after crane. On recovery of the toroid, Corystes made for the Outer Silver Pit to occupy a line of CTD's (23 August) and deploy five Argos drifters (Fig. 1 and 2). Subsequently an Argos buoy was recovered from the vicinity of the Humber, before proceeding north to lay three drifters along the north east coast. It was then discovered that the towing block for the Scanfish had not been placed on board. With the assistance of the shore based marine staff the block was located, with Mr Balls delivering it to South Shields for collection on Sunday 24 August. Meanwhile, and with relatively little loss to the work

programme, the first of the three moorings was recovered (M1; Fig. 2). Immediately prior to this, the backup recovery system on the ADCP frame was successfully tested.

Reunited with the Scanfish block, and after initial teething problems with the logging PC's, a number of Scanfish legs were completed east from the coast, interspersed with CTD's overnight (Figs. 2 & 3). Slightly disappointing was the need to continually refill the FSI conductivity pressure compensation bladder, despite the recent modification to shield it from the ambient flow. Following a night of comparatively poor weather (28 August) moorings M2 and M3 (Fig. 2) were recovered along with a number of Argos buoys. The retrieval of M3 was hampered as the toroid marking its position was missing. On deployment of the acoustic release transducer the ADCP frame was found to be in position, however, the back-up recovery float failed to come to the surface when the release was triggered. Mr Riches was able to corroborate the position of the ADCP using the Simrad (SM600) echo sounder. On the assumption that the original anchor weights were present, a grapple was deployed which snagged the ground line at the first attempt and the instrument was retrieved. The acoustic release had fired, however, the recovery line had failed to surface despite the frame being upright as determined from subsequent inspection of the ADCP record. It is assumed that the toroid was removed deliberately as the shackle attaching it to the anchor was missing.

The succeeding days were occupied by Argos buoy recoveries, Scanfish deployments and a CTD cast to the north of the Dogger Bank (Fig. 2&3), the latter to calibrate the temperature and conductivity sensors on the Valeport current meters and the Scanfish fluorometer. Of note during this period was the recovery of one Argos buoy in darkness largely through the expertise of the crew during retrieval. This operation saved almost 8 hours ship time which would otherwise have been spent waiting for first light. Poor weather on the 1 September prevented further Scanfish work in the vicinity of the Dogger Bank. However, improving conditions permitted a second Argos buoy retrieval at night, prior to collection of the two remaining instruments on the north east coast and a final Scanfish leg (2 September). Following this, Corystes sailed for Lowestoft.

RESULTS (Preliminary):

1. All three moorings were recovered, despite the loss of the surface marker toroid at M3. Analysis of the data awaits return to laboratory. However, the data will provide estimates of the tidal constituents to aid in the detiding of the shipborne ADCP. In addition, the ADCP data at M1 and M3 will provide information on the vertical structure of the tidal currents in a regions of strong thermoclines and enable improved paramerterisation of 3D models in the presence of pycnoclines.
2. Of the twenty drifters deployed on Corystes 7/97, sixteen were recovered, two were lost and one was recovered prematurely by a fishing vessel. A further eight were deployed at the beginning of Corystes 9/97, and of these all but one were recovered. The majority of the instruments were of a new construction when compared to previous years, attached to new light weight drogues intended to minimise potential impact on other mariners. However, a number of these were badly ripped on recovery and of more concern several had lost their drogues completely. The interpretation of these data will require considerable care and perhaps some faith. Overall, the drifters demonstrated a strong and coherent pattern of flow, passing southward along the north-east coast and turning offshore from the River Tyne southwards. The flow passes eastward around the northern flank of

the Dogger Bank. Tentatively, there is evidence for a westward flow along the southern side of the Dogger Bank. Some drifters appeared to become 'becalmed' to the east of Flamborough Head, whilst two passed to the south of the front into mixed waters. The drifters failed to demonstrate a coherent circulation pattern in the vicinity of the Outer Silver Pit, although out of the five deployed two lost their drogues and one was lost.

3. Scanfish sections showed intense stratification with maximum surface to bottom temperature differences of 11.5°C. Initial interpretation of the data indicates that the flow field described by the drifters is driven largely by the density differentials associated with the bottom fronts. These features generate relatively narrow (> 15 km) jets of flow with velocities in excess of 10 cm s^{-1}. This provides the potential for rapid advection of material along the north east coast, south of the Firth of Forth, to the north and east of the Dogger Bank. Nutrient surveys showed the surface waters to be depleted with low levels (e.g. ToxN < 0.4 µmol l^{-1}) in bottom waters near the north east coast and the Flamborough front. Further offshore and to the north of the Dogger Bank, in the region of coldest bottom water (~ 7.4°C), levels of nutrients were still relatively high (e.g. ToxN 6.4 µmol l^{-1}).

The hard work, enthusiasm and skill of the ships officers and crew, particularly during periods of poor weather, is much appreciated and contributed significantly to the recovery of equipment and overall success of the work.

Finally, the virtually faultless performance of the shipboard computing system made a refreshing change and it is to be hoped that this can be maintained in future.

2 September 1997
Dr Juan Brown
(Scientist-in-Charge)

SEEN IN DRAFT:

D McDarren (Master)
R Graham (Senior Fishing Skipper)

DISTRIBUTION:
BASIC LIST+

Dr J Brown x 10	Mr L Fernand
Miss J Taylor	Mr B Riches
Dr E Young	Mr S Jones
Mr K Medler	

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Fig. 1

Location chart

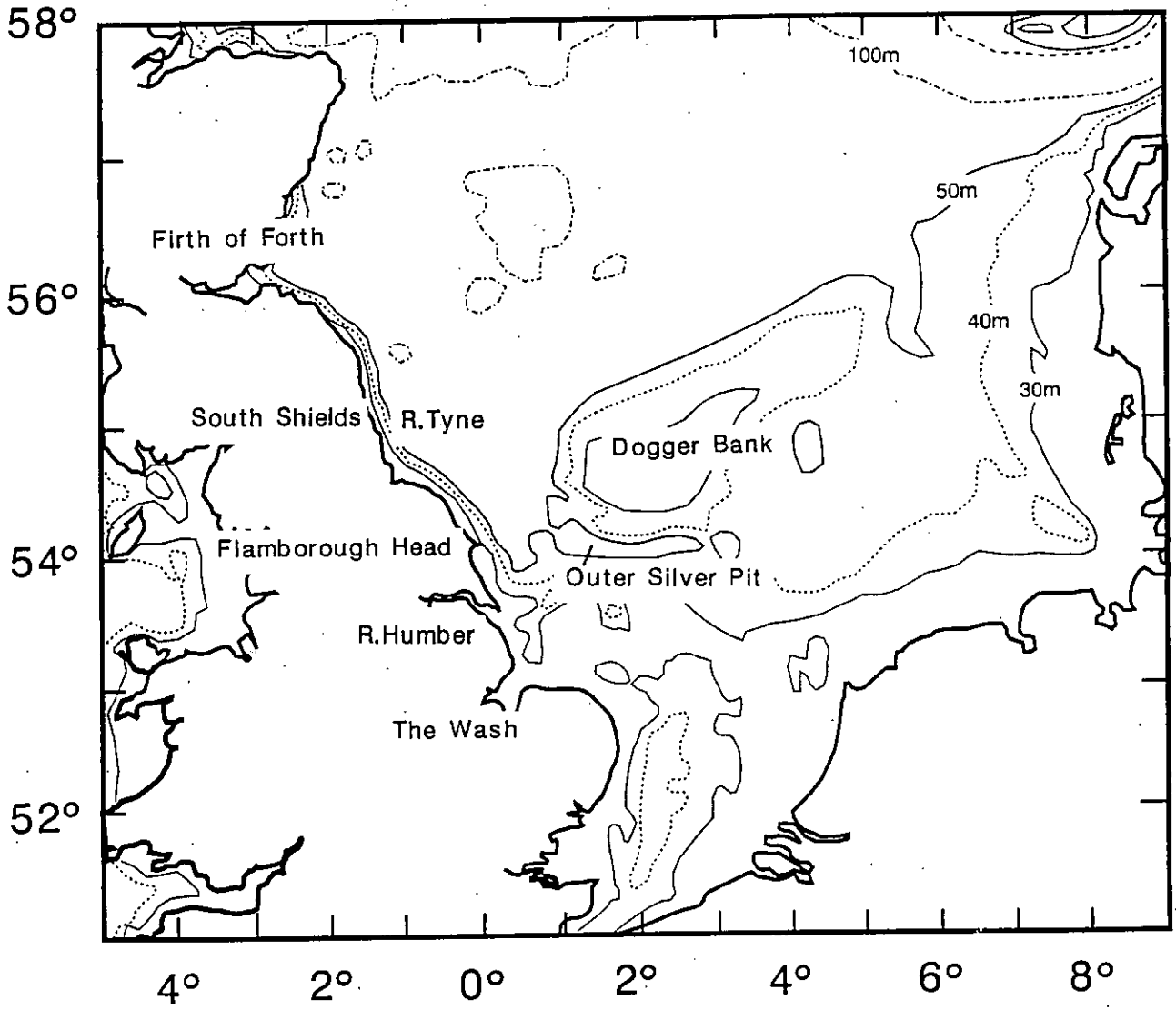

Fig. 2

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Moorings, ARGOS buoys and CTD stations

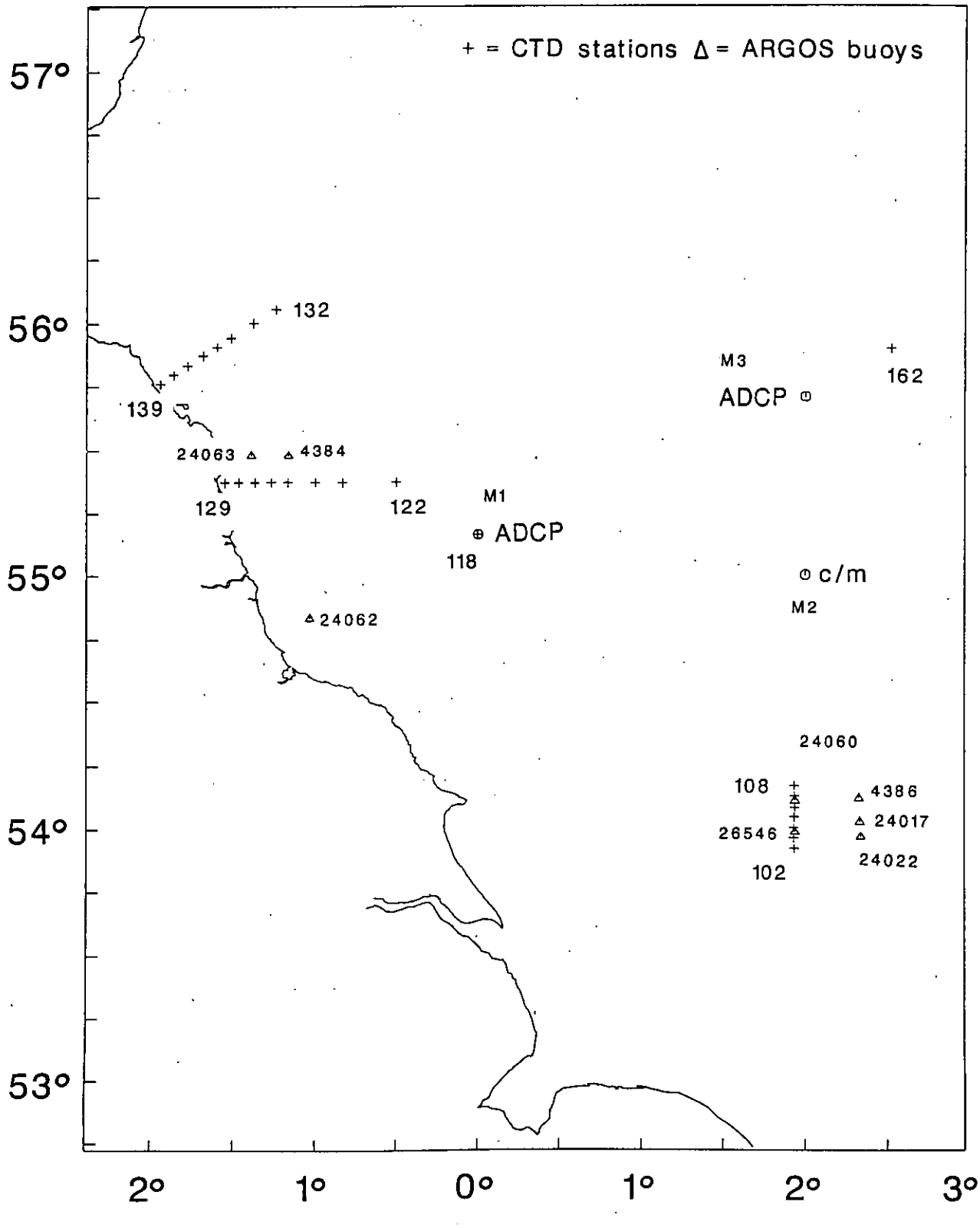

Fig. 3

CORYSTES 9/97

Scanfish tows