5201

MINISTRY OF AGRICULTURE, FISHERIES AND FOOD
THE CENTRE FOR ENVIRONMENT, FISHERIES AND AQUACULTURE SCIENCE

1999 RESEARCH VESSEL PROGRAMME

REPORT: RV *Cirolana*: CRUISE 3b

STAFF:

Part 1: H L Rees (SIC)
W Meadows
D S Limpenny
S Morris
S Boyd
C Brown
P Hudson
M Pendle
M Schratzberger

Part 2: D S Limpenny (SIC)
C Allchin
S Morris
S Boyd
P Hudson
R Kilbride
K Cooper
J Balaam

DURATION:

Part 1: left Swansea 0930h, 22 May; arrived Lowestoft (exchange by sea-rider) 0830h, 1 June

Part 2: 1-10 June (docked Lowestoft 0600h).

LOCALITY:

Part 1: Bristol Channel/English Channel/North Sea
Part 2: North Sea

AIMS:

1. To survey dredged material disposal sites at Swansea Bay, Nab Tower (Isle of Wight), Roughs Tower (outer Thames estuary), Tees and Tyne (Souter Point) for trace metal contaminants, TBT, PAHs, nonylphenols, flame retardants and benthos, using grab and acoustic methods.

2. To conduct a characterisation survey at the Falmouth dredgings disposal site by means of grab, trawl, side-scan sonar and underwater camera.

3. To obtain meiofauna samples at inshore muddy sites near to major estuaries.

4. To sample representative offshore NMMP locations using grab, core and trawl for trace metal contaminants, nonylphenols, flame retardants and the benthic fauna.

5. To sample representative offshore NMMP locations for nutrients, chlorophyll and phytoplankton species.

6. To conduct surveys at aggregate extraction sites off the Isle of Wight and Lowestoft using grab, beam trawl, dredge and acoustic techniques.

7. To conduct pilot sampling at gravely locations in the English Channel for later habitat mapping, including trials with a Rallier du Baty dredge.

8. To conduct a survey of the benthos and sediments at the Thames sewage-sludge disposal site.

9. To sample horse-mussels from the Humber/Wash area for later analyses of contaminants in flesh.

10. To conduct further sampling at an experimentally dredged area off the Norfolk coast, using grab in order to establish the time required for recovery of the sea bed fauna.

11. To sample the sediments and benthos off the Tyne for time-series studies using grab, core, and beam trawl, including extra sampling at the sewage-sludge disposal site and continuation of sampling within a temporal box.

12. To conduct a survey of the Tees estuary for nonylphenols and flame retardants.

NARRATIVE:

Part 1: After leaving Swansea, 4 multicore samples were collected for meiofauna (aim 3), and a series of Day grab stations worked across a dredgings disposal site (aim 1), before sailing for Falmouth. Here, samples of the benthic fauna and sediments for later contaminant analyses were collected by Day grab and scallop dredge (aim 2) along transects through an offshore dredgings disposal site and within the Falmouth Bay SAC. Sea-bed video images were also obtained at selected stations using a 'drop camera' frame. Following a trial of the new Datasonics side-scan sonar system at an inshore site, *Cirolana* sailed for Plymouth Sound where, on 24 May, meiofauna cores were collected at an NMMP station (aim 3). A further NMMP station was worked in Lyme Bay for the benthic infauna and epifauna, and for sediment contaminants (aims 4 and 5), and another test of the Datasonics side-scan sonar system was conducted, before sailing to the eastern Isle of Wight.

On 25 May, a survey of the benthos of gravel deposits was commenced (aim 6) and was completed the following day. A survey of sediments at the Nab Tower dredgings disposal site, and at the 'Nab Hole' inshore was then carried out (aim 1). During the day, the Chief Engineer was put ashore for back treatment, returning that evening. Overnight, video images of the sea bed were obtained at a number of stations in the Owers area (aim 7), followed by sampling of the benthic fauna using a newly-constructed Rallier du Baty dredge (aims 6 and 7). After this, a side-scan sonar survey across the 'Nab Hole' was carried out (aims 1 and 6), and QTC calibration conducted, prior to sailing for Hastings where, on 28 May, stations were worked here and then at the Varne, using the 'drop camera' frame (aim 7). A trial was also conducted using a video camera attached to a Hamon grab (aims 6 and 7). During the day, *Cirolana* engaged in a search of the local sea area along with the Dover coastguard, following sighting of a partly-submerged survival suit by personnel aboard the ship. No further sighting was made and, in the absence of any persons being reported missing in the area, *Cirolana* sailed for the outer Thames estuary. Following another reported sighting of pachyderms (var. *Rosa*) in the mess room, Bill Meadows retired to his cabin for a well-earned rest.

On 29 May, a survey through the Roughs Tower dredgings disposal site was conducted using a Hamon grab for the benthic fauna, and a Shipek grab for sediment contaminants (aim 1). A side-scan sonar survey encompassing the northern part was also carried out, followed by sediment sampling with a Shipek grab for 'ground-truthing'. *Cirolana* anchored overnight to allow work on an engine problem. On 30 May, a transect of Day grab stations was worked through the Barrow Deep (aim 8), the last station having to be abandoned due to NE winds. This was completed later that day, following turn of the tide, but poor weather persisted, and *Cirolana* steamed overnight to a new maintenance dredgings disposal site seaward of Roughs Tower, where stations were successfully worked with a Shipek grab early on 31 May, following moderation in the weather. *Cirolana* then sailed north to commence a grid of Hamon grab stations off the E Anglian coast (aim 6). Work was halted here on the evening of 31 May.

Part 2: Five scientific staff were put ashore, and four brought on board by Searider at Lowestoft during the morning of 1 June. Work then recommenced on the Hamon grab grid off the E Anglian coast. The following morning two 3m beam trawl sites were worked, one at the Cross Sand aggregate extraction site and another at a site to the south of this. Fish from these areas were collected for subsequent analysis of their stomach contents. Later that day, during heavy thunderstorms the Hamon grab survey was completed and *Cirolana* sailed for an experimental aggregate extraction site off North Norfolk where 10 large Hamon grab samples were collected at a treatment and reference box (Aim 10). The Rock dredge was deployed at several sites in the vicinity aiming to collect a sample of the horse-mussel *Modiolus* (Aim 9). Only a single individual was collected and the vessel sailed overnight to another *Modiolus* site at the Humber sewage-sludge disposal site where a number of attempts using both the Rock dredge and the Rallier du Baty dredge succeeded in collecting only a single specimen of this often elusive species.

Cirolana then sailed to the Tyne during 3 June, where that evening work commenced on a transect of 7 stations through the sewage-sludge disposal site, using Day grab and multicore (Aim 11). During the early hours of the following morning grab sampling was carried out on a grid of 27 stations to be used as part of the NMMP programme (Aim 11). At 0830h on 4 June a crew member was put ashore by lifeboat suffering from an injured arm. Grabbing on the transect and the grid recommenced and both aims were completed that morning. A start was made collecting

sediment samples for TBT and other contaminant analyses from a grid of 32 stations at and around the Souter Point dredged material disposal site using the Day grab (Aim 1). At 1900h the work was halted to allow *Cirolana* to steam to the Tyne to collect a replacement crewman and put the 2nd engineer ashore. The Souter Point grid was completed the following morning, and the Tyne NMMP 245 was worked using Day grab, multicore and 2m beam trawl (Aim 4). That afternoon and evening the beam trawling component of the sewage transect was completed, with the successful collection of five samples within and to the south of the disposal site. *Cirolana* steamed overnight to the Tees to arrive on the morning of 6 June.

During the day and early part of the evening, water and sediment samples were collected in the Tees estuary and in shallow parts of Tees Bay using the Searider (Aims 1 and 12). The following morning further samples were collected using the Day grab within Tees Bay generally, and at the inshore dredged material disposal site specifically. Information on the substrates within the disposal site enabled the successful collection of two Reineck core samples for down-core sediment contaminant profiles (Aim 1). NMMP 295 (Off Tees) was worked later the same day for sediment contaminants, infauna, epifauna and water chemistry.

Cirolana steamed to offshore NMMP site 345 (Off Humber/Wash) and collected samples for sediment and water chemistry, infauna and epifauna during the morning and afternoon of 8 June. *Cirolana* then steamed to the Humber *Modiolus* site where three deployments of the Rock dredge were carried out yielding 32 individuals (Aim 9). At 0130h a QTC survey was commenced at Area 107 aggregate extraction site off the Wash. This survey was completed at 1030h and *Cirolana* sailed to an area off North Norfolk where four deployments of the Rock dredge were carried out. Forty nine *Modiolus* were collected thus completing aim 9. *Cirolana* sailed for Lowestoft, anchoring in Corton Roads overnight and docking at 0700h on 10 June.

RESULTS:

Part 1: Four aims (2,3,7 and 8) were successfully completed, and a further four (1, 4, 5 and 6) addressed in part. No sampling was conducted at the 'Gabbard' NMMP station due to lost time arising from poor weather that day. Good video images were obtained at the Falmouth dredgings disposal site (shortly to be in receipt of larger than usual quantities of dredged material) and inshore within the Falmouth Bay SAC, where maerl deposits predominated. Scallop dredge samples revealed a similar species-rich assemblage at three offshore stations, including the dredgings disposal site, while the inshore (SAC) station supported a much lower variety of epifaunal species. Several items of litter occurred at the disposal site but not elsewhere.

Trials of the new Datasonics side-scan sonar system were disappointing as a result of excessive interference during recording which indicated a problem with the towed fish. As a result, the older (EG and G) system was used for field surveys; however, the new data-processing software was successfully applied to mosaic some of the output. Records were obtained using QTC (an acoustic sea bed classification system) at a number of survey areas and, after applying cluster analysis to the raw data, provided useful descriptions of habitat variability. Some intercomparison records were also taken with QTC operating from the bathymetric sounder.

For the second year, samples were successfully taken in the eastern Isle of Wight area, for an evaluation of the scope for cumulative effects of aggregate dredging activity. Exposed clay was again encountered within a heavily-dredged part of the Owers concession, in an otherwise gravelly area.

The Rallier du Baty dredge was successfully deployed at 11 stations in the eastern Isle of Wight area corresponding with those worked by L Cabioch (Roscoff) in the 1970s and, on completion of sample analysis, should provide an indication of any changes in the intervening period which might be connected with aggregate dredging or other man-made influences. At the last station which was sampled, the dredge briefly came fast on a chalk outcrop, which resulted in bending of the central shaft. A more efficient weak link should reduce the risk of future damage or loss of the gear.

Camera work in the Owers revealed within-station consistency in substratum type, but appreciable variability between inshore and offshore stations. This information, along with images of the sea bed at higher-energy locations off Hastings and the Varne, will prove useful in identifying locations for habitat-mapping during CEFAS cruises in July and August 1999. The attachment of a video camera to a Hamon grab provided clear images of the sea bed immediately adjacent to the sample collection point, and now requires an integral grab/video deployment cable for routine application.

Sampling of the benthic fauna at the Roughs Tower disposal site followed the same pattern as that employed in 1995 and, on completion of sample analysis, will allow the effects of the current major capital disposal operation to be evaluated. (Over 10 million tonnes are in the process of being deposited at the site over a period of months, after which the site will be effectively closed). A side-scan sonar survey concentrated on the northern part of the site, as a result of fears that had been expressed about the possibility of slumping of the clay bund and transport of released fine material to the north. The images provided no evidence of structural failure; a depiction of the sharply-defined boundary at the north-western part of the licence is shown in Figure 1.

Shipek grabs collected at a new maintenance dredgings disposal site seaward of the Roughs Tower site revealed the presence of deposited material in the form of clay lumps. The persistence of such material in an area of high tidal and wave energy will need to be assessed against the outcome of future surveys, and following laboratory analysis of the physio-chemical properties of the samples.

A second year of sampling of a transect of stations along the Barrow Deep will, on completion of sample analysis, allow an evaluation of any consequences arising from the cessation of sewage-sludge disposal (amounting to some 4 million tonnes p.a.) at the end of 1998.

Part 2:

Aims 1, 4, 5, 6, were continued from Part 1 and completed on Part 2. Aims 9, 10, 11 and 12 were completed on Part 2. A Questor Tangent survey at an aggregate extraction area off North Norfolk was completed as an additional aim. The CTD continuous flow water supply was running throughout the cruise and salinity samples were collected twice daily where possible.

Sampling using the Hamon grab was successful at and around the Cross Sand aggregate extraction area off the Suffolk and Norfolk coast with a total of 65 samples being collected. 3m beam trawls for the same aim produced small numbers of fish for analysis of stomach contents. Sampling at an experimentally dredged site off North Norfolk continues to show recovery of this site. A number of deployments with the Rock dredge early in the cruise at sites off North Norfolk and the Humber sewage sludge disposal site, failed to produce sufficient numbers of the horse mussel *Modiolus*. These sites have been successful in previous years, and this experience highlights the spatially patchy nature of this species. Towards the end of the cruise the area surrounding each of these sites was further sampled with the Rock dredge, and good numbers of *Modiolus* were collected for contaminant analysis.

The annual survey of sites along a transect at the Tyne sewage-sludge disposal site was carried out in this the first year after cessation of sludge disposal. Infaunal, epifaunal, meiofaunal and contaminant samples will be analysed at the Burnham laboratory. Beam trawl data provided evidence of enrichment at the disposal site, and also showed a gradient of litter away from the disposal site. A grid of stations at and around the Souter Point dredged material disposal site was sampled with the Day grab for TBT and metals analysis. A selection of the sites visited in the Tyne area was also sampled for sediment APE's.

Three NMMP sites were sampled on part 2 of this cruise. At each site samples were collected at a nine-point grid for metals, PSA and TOC and at the central site five samples were collected for infauna, and a further five samples were collected for the analysis of sediments for OC's, PCB's, TBT's, APE's, PBDE's and PAH's. The multicorer was used to collect a number of meiofaunal cores from the NMMP sites at the Tyne and the Tees. In addition to sediment sampling, water samples were collected for APE's, nutrients, chlorophyll, salinity and phytoplankton. At the Tyne and off Humber/Wash NMMP sites a 2m beam trawl sample was collected for epifaunal enumeration and species diversity. The species composition appeared to be similar to samples collected at these two sites in previous years. 27 sediment samples were collected from a previously sampled box off the Tyne as part of the NMMP programme.

Forty-three surface sediment samples were collected in Tees estuary and in Tees Bay for PBDE analysis. A further 17 samples were collected from two Reineck cores collected from the inshore Tees dredged material disposal site.

A Questor Tangent survey was carried out over an area where previous sediment sampling has ensured that the substrate distribution is well known. This will allow an assessment to be made on the effectiveness of this relatively new ground discrimination system.

The scientific staff appreciated the efforts made by the ships crew that ensured that the multidisciplinary aims, which are routinely requested each year, were successfully and efficiently completed on this cruise.

H L Rees (part 1)
D S Limpenny (part 2)
17 June 1999

SEEN IN DRAFT: R Williams (Master)

R Graham (Senior Fishing Mate)

DISTRIBUTION:

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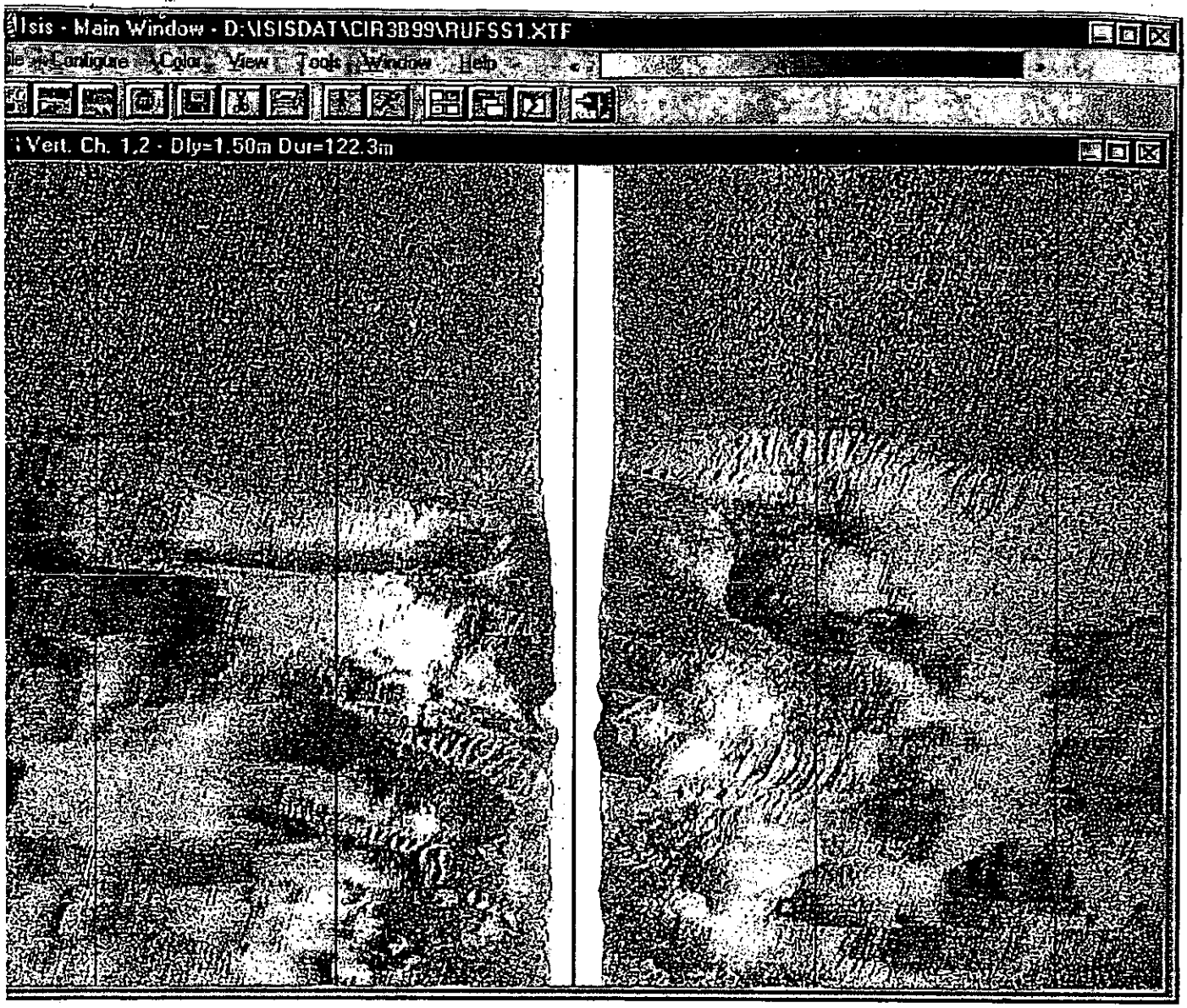

Figure 1. Output from a side-scan sonar survey of the western edge of the Roughs Tower disposal site conducted during *Cirolana* cruise 3b/99, revealing a sharply-defined boundary dividing a topographically complex area in receipt of a large amount of capital dredgings (shown in the lower half of the plot) and a relatively smooth sea-bed profile to the west (shown in the upper half of the plot).