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

1997 RESEARCH VESSEL PROGRAMME

REPORT: RV *CIROLANA*: CRUISE 5a

STAFF:

H L Rees (SIC)
R Law
C Allchin
W Meadows (to 25 May)
A J Kenny (to 27 May)
S Morris
D S Limpenny
P Hudson
M Pendle
R Hamer
S Boyd

DURATION:

Left Lowestoft 22.00 hrs, 23 May
Arrived Swansea 06.05 hrs, 6 June

LOCALITY:

North Sea/English Channel/Celtic Sea

AIMS:

1. To conduct further sampling at an experimentally dredged area off the Norfolk coast, using grab, side-scan sonar and underwater camera in order to establish the time required for recovery of the sea bed fauna.

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

3. To survey dredged material disposal sites off the Tees and at Roughs Tower (outer Thames estuary) and Nab Tower (Isle of Wight), using grab and side-scan sonar.

4. To collect sediment samples at the Tees dredgings disposal site for later bioassay work.

5. To sample the sediments and benthos off the Tyne for time-series studies using grab, core and beam trawl.

6. To conduct characterisation studies at representative offshore NMP locations using grab, core, trawl and underwater camera, and to collect core samples for PCB and PAH analysis.

7. To collect water samples for the analysis of HCHs along a transect through the Channel, as part of the continuing monitoring following the loss of MV Perintis in 1989.

8. To collect samples of fish livers at selected coastal sites for various biomarker studies.

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

10. To collect beam trawl samples at representative locations for the analysis of litter content.

NARRATIVE:

An approximate cruise track is attached.

The ship sailed at 22.00 hrs, 23 May to a Yarmouth 'calibration box' for setting up the RoxAnn sea bed discrimination system. A side-scan sonar survey was then carried out in the vicinity of the Cross Sands complex of aggregate dredging areas (aim 9), finishing on the morning of 25 May. The RoxAnn and 'Quester Tangent' acoustic systems were run concurrently, as at other occasions during the cruise.

After putting W Meadows ashore at Lowestoft, the ship sailed to an experimentally dredged site off Norfolk (aim 1), collecting horse-mussels at a station on the way (aim 2). Five Hamon grabs were collected at the dredged site and at a nearby reference site, followed by a side-scan and underwater camera sledge survey. On the following day, samples of sea bed sediments were collected by Day grab, mini-corer and Reineck corer for sediment contaminants, particle size and the benthic macro- and meio-fauna at NMP 345 (outer Silver Pit). Following deployment of a video camera on a circular frame for visual characterisation of the substrate type, the ship sailed overnight to the Tees area, where a transect of Day grab stations was worked on the morning of 27 May for later sediment bioassay studies (aim 4).

Sampling was then conducted in the Tees estuary by sea-rider (aim 11), following the transfer of Dr Kenny ashore. At the same time, a grid of stations around the dredgings disposal site was commenced, collecting sediments for later analyses of trace metals (aim 3) and polybrominated diphenylethers at inshore sites (extra aim). On completion, a water sample was collected at NMP 295 (off Tees : aim 11), and the ship sailed to the Tyne area for collection of sediment, macro- and meio-fauna samples at long-term monitoring sites (aim 5). On the morning of 29 May, three 3-m beam trawl hauls were made at NMP 245 (off Tyne) for examination of litter content (aim 10), followed by a sequence of Day grab, mini-corer and Reineck corer samples for later anayses of sediment contaminants and the benthic fauna. Video and still images were obtained from the location using the 'drop' camera frame.

RV *Cirolana* then sailed to the Humber area, collecting a water sample off Scarborough on the way (aim 11). A Rock dredge was deployed at three stations for collection of horse-mussels (aim 2), followed by three 3-m beam trawls in the Inner Dowsing area (aim 10). The

ship then sailed via Lowestoft (for collection of scientific gear via sea-rider) to the Roughs Tower area off Harwich (aim 3), where, on 31 May, samples of sediment with a Shipek grab were collected for trace metal contaminants and 'groundtruthing' against the later output from acoustic sea-bed mapping systems. Replicate Hamon grab samples were also collected for the benthos at a depositional location to the north of the dredging site, to supplement an earlier survey. An acoustic survey of the sea bed was completed on the morning of 1 June, but plans for further sampling by Day grab had to be abandoned due to deteriorating weather, and the ship sailed south to the Isle of Wight area, collecting water samples *en route* (aims 7 and 11).

On 2 June, samples of sea bed sediments for later contaminant analyses, and for 'ground-truthing' against acoustic survey methods, were collected by Shipek grab around the Nab Tower dredgings disposal site (aim 3). On the following day, Hamon grab samples were collected for the benthos, followed by commencement of a side-scan sonar survey in the same area. The sea-rider was deployed in the afternoon for water sampling in Southampton Water (aim 11) while the sonar survey continued. On completion, the 'drop' camera frame was deployed at the disposal site. Following collection of a water sample to the SE of the Isle of Wight (aim 7), Day grab samples were collected on 4 June in the area of the disposal site for the benthic meiofauna. The ship then sailed via water sampling stations in the Channel (aim 7) to Lyme Bay, for sampling at a muddy sand location using grab and core, to investigate its utility as a potential longer-term monitoring station within the NMP programme (aim 6).

On arrival at the Celtic Deep the following day (5 June) via further water sampling stations (aim 7), sediments and benthos were sampled at the NMP site using large and small corer and Day grab. Video and still images were also obtained using the 'drop' camera frame. In view of worsening weather prospects, the ship sailed for Swansea Bay where, into the following day, a series of Day grab samples were collected around a dredgings disposal site for later bioassay studies (supplement to aim 4). With gale-force winds forecast for later that day, *Cirolana* docked at 06.05 hrs on 6 June.

RESULTS

Aims 1, 3-7, 10 and 11 were successfully achieved, along with aim 2 in part (insufficient numbers of mussels were obtained at one of five locations) and aim 9 in part (no work was conducted at Hastings owing to weather conditions at the time). Aim 8 was deferred to Cruise 5b. 3 additional aims were also achieved, including a PAH 'spike' recovery at offshore water stations (R Hamer).

Full results will only become available following laboratory analysis of samples and processing of acoustic and photographic records.

An acoustic survey of the Cross Sands area provided information on the complex sea bed topography and substrate type at and to the south of a large commercial aggregate dredging area off Yarmouth, as a first stage in the evaluation of any cumulative consequences of dredging activity for the biota and fisheries of the region. Within the dredging area, differences in the intensity of dredging could be clearly identified.

Side-scan sonar traces at a gravelly site off Norfolk which was experimentally dredged in 1992 indicated that dredge tracks had almost completely disappeared through natural re-distribution of sediments, and that the sea bed surface had reverted to an even profile. Underwater video images revealed abundant epigrowth on exposed gravel, with colonies of the hydroid *Nemertesia*, the large anemone *Urticina* and a variety of small fish being noticeably common. Observations during processing of Hamon grab samples suggested that diversity at the 'treatment' site surpassed that at the nearby 'reference' location, but this remains to be confirmed through follow-up laboratory analysis.

In addition to samples of the macrofauna, meiofauna and sediments for later trace metals analyses at NMP stations, a Reineck core was also collected for analysis of any depth-varying concentrations in PAHs and PCBs (aim 6). Video images of offshore muddy locations east of the Humber and Tyne, and in the Celtic Deep revealed a comparable uneven micro-topography, with numerous excavations, suggesting substantial bioturbation by benthic organisms. The latter two sites were distinguished by the frequent occurrence of *Nephrops* burrows and, off the Tyne, the hagfish *Myxine glutinosa*.

The accumulated information at these 'depositional' NMP sites supports the view that these are suitable candidates for the longer-term monitoring of temporal trends in contaminants and the biota. A muddy location in Lyme Bay also appears suitable for comparative purposes, given that most Channel sites are sandy or gravelly in nature.

The litter content from 3-m beam trawl samples at an NMP station off the Tyne, and a location in the Wash area (aim 10) was minimal.

Collection of Day grab samples for later sediment bioassay studies along a transect through the Tees dredgings disposal site (aim 4) indicated that the disposition of substrate types within the dredged area was similar to previous years. Significant oil contamination of sediments at the outer disposal site was noted, and a sub-sample collected for later HC analysis.

A comprehensive 'baseline' of information has now been collected at the Roughs Tower dredgings disposal site (aim 3), in anticipation of a likely increase in the quantities to be disposed of here in the near future. The survey at the Nab Tower dredgings disposal site (aim 3) was, in contrast, aimed at evaluating the status of the sea bed in the immediate aftermath of substantially increased disposal activity over the last year. Acoustic techniques identified a clear imprint at the licensed site; there was little visual evidence of significant dispersion of material beyond here, from these and grab samples collected. Samples of the benthos around the disposal site were successfully obtained using the small Hamon grab (which samples an area equivalent to $0.1m^2$), although locations of consolidated coarse or clay deposits yielded only small quantities of material. The Nab Tower acoustic survey also extended to observations of dredge tracks within an area licensed for commercial aggregate extraction (aim 9).

H L Rees
19 June 1997

SEEN IN DRAFT

D McDarren (Captain)
R Graham (Senior Fishing Mate)

INITIALLED

DISTRIBUTION:

Basic list +
B Robinson
M Waldock
S Malcolm
L A Murray
R Law
C Allchin
A Kenny
D Limpenny
P Hudson
M Pendle
R Hamer
S Boyd
S M Rowlatt
C Vivian
A Franklin
A J Murray (Crown Estates Commission)

Approximate cruise track for Cirolana 5a/97