

DEPARTMENT FOR ENVIRONMENT, FOOD AND RURAL AFFAIRS.

2002 RESEARCH VESSEL PROGRAMME

REPORT
PROGRAMME: RV CIROLANA: CRUISE 3a

STAFF:

Part 1 : D Limpenny (SIC)
 W Meadows
 S Boyd
 K Cooper
 R Kilbride
 A Hewer
 P Whomersley
 M Schratzberger
 L Mead
 R Dyer
 E Garnacho

Part 2 : S Boyd (SIC)
 D Limpenny
 W Meadows (until 13th June)
 M Schratzberger
 S Bolam
 K Cooper
 R Kilbride
 E Garnacho
 H Bates
 C North
 S Lucas
 N Lyman (from 13th June)

DURATION:

Part 1 : 30 May – 7 June
Part 2 : 7 June – 15 June

Changeover at sea off Harwich

LOCALITY:

North Sea/E. Channel/Celtic Deep/Bristol Channel

AIMS:

1. To survey dredged material disposal sites at the Souter Point (Tyne), North Tyne (Tyne), Tees Bay, Inner Gabbard (outer Thames estuary), Roughs Tower (off Harwich), Nab Tower (Isle of Wight), and Rame Head (off Plymouth) for trace metal contaminants, TBT, PAHs, PCB's and other organic contaminants and benthos, using grab, corers and acoustic methods.
2. To sample representative NMMP locations using grab, core and trawl for trace metal contaminants, PAHs and other organic contaminants, litter and the benthic fauna.
3. To sample surface waters at representative offshore and intermediate NMMP locations for nutrients, chlorophyll and for phytoplankton species.
4. To sample the benthos and sediments for time-series studies using the Hamon grab in the vicinity of aggregate extraction sites off the Isle of Wight and Lowestoft.
5. To conduct time-series studies at gravelly locations following cessation of aggregate dredging.
6. To sample horse-mussels from the Humber/Wash area for later analyses of contaminants in flesh.
7. To sample the sediments and benthos off the Tyne for time-series studies using grab, core and beam trawl and continuation of sampling within a temporal box.
8. To carry out sampling at a selection of stations previously worked as part of the ICES 1986 North Sea Benthos Survey.
9. To conduct habitat mapping surveys at a range of sites impacted by anthropogenic activities including scallop dredging disturbance (off Falmouth), disposal of dredged material and aggregate extraction.

NARRATIVE

Cirolana sailed from Aberdeen at 1600hrs on 30th May to a series of North Sea Benthos Stations (NSB Sites 34, 35, 39, 40, 44 & 7) off the Forth, where samples for benthos and contaminants were collected (Aim 8). *Cirolana* then sailed to the off Tyne/Tees National Marine Monitoring Programme site (NMMP 285), where sediment samples were collected for sediment-bound heavy metal contaminants and organic compounds, and surface waters were collected for nutrients, salinity, suspended load and phytoplankton species (Aims 2 & 3). Replicate samples for the collection of epifauna and litter were also collected at this site (Aim 2). Overnight, *Cirolana* sailed towards the Tyne, and throughout the morning of 1st June sampled the Off Tyne (NMMP 245) site for macrofauna, meiofauna, microbiota, sediment-bound heavy metal contaminants and organic compounds using a Day grab. An epifaunal sample was collected here using a 2 m Beam trawl. Meiofaunal and microbiota samples were

successfully collected using the Multiple Corer (Aim 2). Surface water samples were also collected for nutrients, salinity, suspended load, chlorophyll and phytoplankton species (Aim 3). *Cirolana* then sailed inshore carrying out 2m Beam trawls at two sites and collecting Day grab samples for benthos and contaminants at three sites on the time series transect through the historic Tyne sewage-sludge disposal site (Aim 7). Overnight, a sidescan sonar and QTC survey was completed over the North Tyne dredged material disposal site TY070 (Aim 9). The following morning, nine randomly distributed Day grab samples for trace metal analysis were collected from within a temporal box close to the historic sewage sludge disposal site off the Tyne (Aim 7). Later that morning, a transect of four sites through dredged material disposal site TY070 was sampled with the Day grab, and samples were collected for macrofauna, sediment metals and organics (Aim 1). During the afternoon, Hamon grab samples were collected for macrofaunal analysis within distinct acoustic areas as defined from the sidescan survey of TY070 (Aim 9). A Dahn belonging to CEFAS, which had disappeared from the Souter Point disposal site earlier in the year, was recovered but was found to be attached to whelk pots of unknown provenance.

Two 2m Beam trawl samples were then collected within and outside of the impacted area of TY070 (Aims 1 & 9). A 2m Beam trawl sample was then collected at the Souter Point dredged material disposal site (TY081) for later analysis of contaminants from the collected biota (Aim 1). Following this, Hamon grabbing was completed at TY070 and Day grab samples (Aim 9) were collected from a temporal transect of 4 sites across the Souter Point disposal site for macroinfauna, meiofauna, microbiota and sediment contaminants (Aim 1). Overnight, samples for sediment metals and organics analysis were collected from a single site within the Wearmouth dredged material disposal site (Additional aim), two sites within the inner Tees Bay dredged material disposal site and also at a NMMP site in the Tees (NMMP 295) [Aim 1].

During the remainder of the day, samples for macrofauna, meiofauna, microbiota, sediment-bound heavy metal contaminants and organic compounds were collected using a Day grab, from the Offshore Wash NMMP site (NMMP 345) [Aim 2]. A sample of the epifauna and litter at this site was collected using a 2 m Beam trawl. Deployment of a Hamon Grab with attached video camera was undertaken in order to collect images of the seabed. Surface water samples were also collected for nutrients, salinity, suspended load, chlorophyll and phytoplankton species (Aim 3).

Cirolana then sailed to an aggregate extraction site (Area 408) off the Humber, where samples were collected using a Hamon Grab with an attached camera within the site and at 2 reference boxes in the near vicinity (Aim 5). Work was completed by 1430h, and the vessel sailed to an historic Humber sewage sludge disposal site where a Newhaven Scallop dredge was deployed to collect horse mussels (*Modiolus*) for contaminant analysis (Aim 6).

Cirolana then sailed to the repositioned Humber NMMP site (NMMP 376) where sediment samples were collected for sediment-bound heavy metal contaminants and organic compounds, and surface waters were collected for nutrients, suspended load, salinity, chlorophyll and phytoplankton species (Aims 2 & 3). The vessel sailed overnight to the Lynn Deep NMMP site (NMMP 386) which was sampled in the early hours of the morning for sediment-bound heavy metal contaminants and organic

compounds (Aim 2). Surface water samples were also taken (Aim 3). On completion of sampling here, *Cirolana* sailed to a reference site off the North Norfolk coast where a sample of horse mussels was collected for contaminant analysis. This work was completed by 0530h (Aim 6).

On the morning of 5th June, sampling using the Hamon grab commenced on a widely spaced grid of stations between Cromer and Southwold (Aim 4).

Cirolana then steamed to the Inner Gabbard NMMP site (NMMP 475). On arrival, a 2m beam trawl haul was taken, followed by a sequence of Day grab samples for later analyses of sediment contaminants and the benthic fauna (Aim 2). This was supplemented by surface water samples for nutrients, chlorophyll, salinity, phytoplankton and suspended load (Aim 3). This was followed by a sidescan sonar and QTC survey of the Inner Gabbard disposal site on 6th June (Aim 9). *Cirolana* then sailed to the Roughs Tower dredged material disposal site off Harwich where samples of sediment and the benthos were collected using Hamon and Shipek Grabs (Aim 1). A series of surface water samples were also collected for analysis of suspended load (Additional aim).

The next morning, following the tragic news of the death onboard of the steward Bill Webster, all work was temporarily suspended. Our sincere condolences are with the members of Bill's family.

Later, a changeover of scientific staff was completed at Felixstowe with A. Hewer, P. Whomersley, L. Mead and R. Dyer leaving the vessel, and S. Bolam, H. Bates, S. Lucas and C. North joining. The remainder of the day was spent collecting a series of Hamon and Shipek grab samples within and in the vicinity of the Roughs Tower disposal site (Aim 1). Overnight, the sidescan sonar and QTC survey of the Inner Gabbard dredgings disposal site was completed (Aim 9). The following morning, samples of the benthos and sediments were collected at and in the vicinity of the disposal site using a Ham-Cam and Shipek grab within acoustically distinct regions defined from the output of the sidescan sonar survey (Aim 9). The next day, the Oaze Deep NMMP station (NMMP 466) was sampled for sediment particle size analysis and trace contaminants followed by water samples for nutrients, chlorophyll, salinity, phytoplankton and suspended load (Aims 2 & 3).

On arrival at the new Dungeness NMMP station (NMMP 484), the following day (9th June), sediments and benthos were sampled using the Day grab and 2m Beam trawl, followed by the collection of surface water samples (Aims 2 & 3). Meiofauna samples were also collected using a Multiple Corer. On completion, the *Cirolana* sailed to the Isle of Wight area, commencing a sidescan sonar and QTC survey of the Nab Tower dredged material disposal site (Aims 1 & 9). Sampling for the benthic fauna and sediment contaminants then followed using the Hamon and Shipek grabs within and in the vicinity of the Nab Tower Disposal Site (Aim 1 & 4). Sampling with the Hamon Grab was curtailed due to a combination of worsening weather conditions and difficulties with the control of the port in hauler winch. However, sampling with the Shipek grab for trace contaminants continued for the rest of the day over a widely spaced grid of stations around the Nab Tower disposal site (Aim 1).

Cirolana then sailed to Lyme Bay overnight, for sampling at a muddy sand NMMP (NMMP 536) station using a 2m beam trawl, Day Grab and a Bowers and Connelly Multiple-Corer to meet various objectives (Aim 2). Surface water samples were also collected here (Aim 3). The 'drop' camera was also deployed to obtain video images of the seabed. On the following day (11th June), a series of Hamon and Shipek grabs were collected around the Rame Head dredgings disposal site for macrofauna, trace metal contaminants, TBT, PAHs and other organic contaminants (Aim 1). Grabbing was halted at 2030h due to a problem with the Ship's steering capability. Scientific work recommenced at 0030h with a sidescan sonar and QTC survey of the Rame Head disposal site. The next day (12th June), grabbing continued at the disposal site, followed by the collection of a series of video images of the seabed using the 'drop' camera frame. The ship later developed a problem with the autopilot, which was investigated during the voyage to an area of seabed, off Falmouth known to be fished by scallop dredgers. A sidescan sonar survey commenced on arrival at this site (Aim 9).

The following morning, Bill Meadows departed and Nigel Lyman joined the Ship at Falmouth. *Cirolana* continued to have problems with steering on the morning of the 13th June and this was investigated *en route* to the Scallop dredging site. Once the fault with the ship's steering had been corrected, a sidescan sonar survey of this site resumed and was followed by a number of deployments of the 'drop' camera frame with attached digital video camera (Aim 9). Samples of the macrofauna were then collected from an area of seabed observed from the sidescan sonar survey to be heavily scarred by dredge tracks and from a nearby reference box. On completion, *Cirolana* sailed overnight to the Celtic Deep NMMP site (NMMP 605).

The next day, the Celtic Deep NMMP site was sampled for macrofauna, meiofauna, microbiota, sediments, trace contaminants followed by surface water samples for nutrients, chlorophyll, salinity, suspended load (Aims 2 & 3). Video images of the seabed were obtained in order to characterise the nature of the seabed. A 2m beam trawl was also collected for the analysis of epifauna and litter content.

Cirolana then headed to Swansea via a dredged material disposal site off Milford Haven, where a transect of stations were sampled for trace contaminants (Additional aim), before docking on the morning tide at on the 15th June.

RESULTS:

Excepting Aim 4, which was only achieved in part due to rough weather in the English Channel, all aims were successfully realised. Three additional aims were also completed including the collection of surface water samples for suspended load analysis at various locations around the coast. Water samples for the determination of suspended particulate matter were also obtained in the vicinity of the Roughts Tower and Rame Head dredgings disposal sites. A dredged material disposal site off Milford Haven used for the disposal of sandy dredgings was also sampled for trace contaminants.

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

A number of muddy NMMP stations were sampled for macrofauna, meiofauna and sediments for later contaminant analyses as part of the long-term monitoring of temporal trends in contaminants and biota. These stations are intended to augment the time-series of information on environmental quality status around the England and Wales coastline. In addition, samples of the microbiota were collected at a number of the NMMP sites. These samples will be analysed by a PhD student at Essex University in order to evaluate whether the molecular techniques routinely employed in soil ecological studies can be applied to marine sediments. In addition, video images of the seabed were collected at a number of NMMP sites to further characterise the seabed environment at these sites.

Additional sampling of the benthic fauna and sediments from a grid of stations previously worked as part of the ICES 1986 North Sea Benthos Survey were collected. These samples will contribute to an international programme designed to establish the environmental quality of the North Sea.

Acoustic surveys conducted at the Roughs Tower Disposal site in marginal weather conditions indicated that capital dredgings remained within the boundaries of the disposal site but the quality of the record made it difficult to discern any transport of material beyond the site. In contrast, material indicative of dredgings disposal was apparent to the south of the licensed boundaries of TY070 both from acoustic surveys and beam trawls.

Good quality images were obtained with a hired digital video camera which was tested at a number of surveyed locations.

The litter content from a number of 2-m beam trawl hauls at offshore NMMP stations was minimal. In contrast, the quantity of litter recorded in the vicinity of the North Tyne and Souter Point dredged material disposal sites was more substantial and included sewage derived material and an old pair of dirty pants!

Habitat mapping techniques developed in a previous DEFRA funded research contract (A0908) were successfully applied at a number of sites exposed to the effects of dredged material disposal and at a site thought to be impacted by the effects of fishing. Acoustic techniques proved effective in discriminating areas impacted by anthropogenic activities. Ultimately it is envisaged that these techniques will improve knowledge regarding the status of sites disturbed by anthropogenic activities as well as assisting in the design of cost-effective surveys.

Further sampling of the benthic fauna and sediments at sites formerly used for the disposal of sewage sludge off the Tyne was conducted to provide additional information on the contaminant and biological status since the cessation of disposal in 1998. The amount of sewage-derived litter obtained from hauls taken within the Tyne site using a 2m beam trawl were reduced compared to that obtained whilst disposal activity was ongoing.

Sediments and samples of the benthic macrofauna from an area where dredging has recently ceased off the Humber ('Area 408') were successfully sampled using a 0.1m² Hamon Grab. The sampling strategy was designed after reference to information recorded on board dredgers ('black box' data) on the location and intensity of dredging activity. The design consisted of two treatment groups varying in the level of dredging intensity and three reference areas located away from the impacts of extraction-activity. Data arising from this design will ultimately provide a comparative evaluation of the effects of dredging intensity on the biological and physical recovery of extraction sites on cessation of dredging and will contribute to a time-series of information.

**D S Limpenny
S E Boyd
15-06-02**

INITIALLED:

(SEEN IN DRAFT).

CAPTAIN:

SENIOR FISHING SKIPPER:

DISTRIBUTION:

Basic list +
M Waldock
R Law
C Kelly
C Allchin
H Rees
W Meadows
D Limpenny
S Boyd
M Schratzberger
S Bolam
R Kilbride
K Cooper
A Hewer
L A Murray
C Vivian
R Waldock
A Kenny

S M Rowlatt
A Franklin
J Thain
S Malcolm
D Morris
J Rees
A Reeve
E Garnacho
P Whomersley
L Mead
R Dyer
H Bates
C North
S Lucas
P Leonard (DEFRA)
R Emmerson (DEFRA)
G Boyes (DEFRA)
A Murray (Crown Estates Commission)
R Orpin (DTLR)

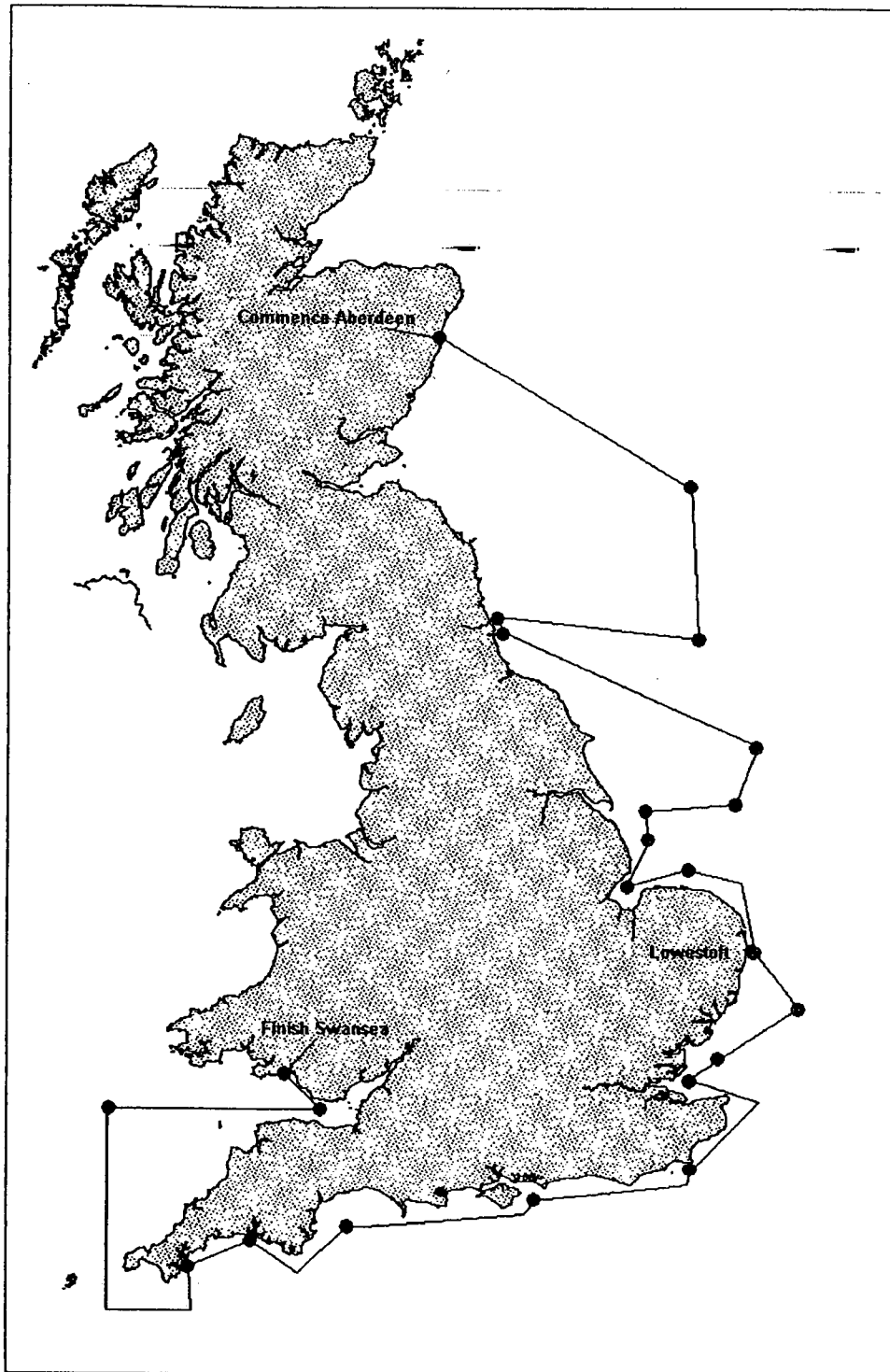


Figure 1 Route of *RV Cirolana* during the research programme Cir 3a/02.