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

1993 RESEARCH VESSEL PROGRAMME

REPORT: RV CORYSTES: CRUISE 1(a) - GEAR TRIALS

STAFF:

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A Egan (USP RoxAnn)

DURATION:

8-16 January 1993 (Planned 8-18 January 1993)

LOCALITY:

Chiefly Southern North Sea (Lat 52°25'N to 55° 40'N)

AIMS:

1. Trials with RoxAnn seabed evaluator - evaluation of system using camera sled (TV and still cameras) and day-grab.

2. Trials with ADCP and E, G & G 400kHz Sidescan sonar - evaluation and familiarisation and identification of any operational problems.

3. Trials with SRD gear marker and SM600 sonar - range tests and ease of location.

4. Sector scanner trials with telemetry pressure tags and switch-mode tag - range and stability trials, and remote control of pulse length.

5. Corystes noise spectra trials in 'loaded' mode - trawl tows past a remote hydrophone and spectrum analyser in the ship's boat at a measured range.

6. Additional Sector Scanner calibration trials (dependent on time and final outcome of recent trials).

NARRATIVE:

CORYSTES sailed from Lowestoft at 0900h on Friday 8 January 1993 and steamed a few miles off shore for commencement of the RoxAnn (seabed evaluator) trials. We had with us for the first few days, Tony Egan (RoxAnn engineer) to modify the system, calibrate it according to 'ground truth' data (grab samples), establish a routine calibration site 16 miles off Great Yarmouth, and give instructions on the use of the software. We then steamed NW to known herring spawning grounds off Flamborough Head to provide RoxAnn with bottom gravel sediments, and to survey the extent of the gravel regions; the TV camera sled and side-scan sonar systems were used as necessary to check their operation and validate the RoxAnn assessment of the seabed. The winds were now intensifying and dictated the direction of survey of the most NW of the two herring boxes, precluded any work in the SE box, and finally forced us to seek shelter in Scarborough Bay where we subsequently put Tony Egan ashore.

The shelter in the Bay was used for telemetry tag trials with the sector scanning sonar. Although shallow for the depth tag trials (only 8m) much useful work was accomplished. Continuing high winds severely restricted work but the opportunity was taken to survey a 6km by 3km area off Bridlington which had been surveyed previously as a potential site for oil exploration. The survey used sidescan sonar and grab samples to define the site as free from the gravel favoured for herring spawning, and composed mainly of medium fine sand and shell.

Strong winds curtailed further off-shore work and forced us to the comparative shelter of Withernsea Bay where we conducted range tests on long-life gear marker tags by allowing CORYSTES to drift away from moored rigs and attached tags. A track of the ship's operation is attached at figure 1.

The cruise was finally aborted when the persistent strong winds increased to southerly gale force 9 gusting to force 10 with more of the same forecast. CORYSTES sailed into Lowestoft on the afternoon tide of 16 January 1993.

RESULTS:

1. The RoxAnn engineer replaced all circuit boards with the new version 9 production boards, and reduced the operating depth to its minimum of 4m to enable the system to be tested in harbour conditions. RoxAnn was then operated continually on the way to the new calibration site off Great Yarmouth where calibration 'box' files were installed using the results from grabs and sidescan records - low RoxAnn indices were obtained due to the mud/fine sediment. The engineer noted that the associated Simrad narrow beam 120kHz sonar provided greatest variation in the E2 (hardness) values, and only limited variation in the E1 (roughness) values. The trials continued at an area of sand/gravel and rocky outcrops off Flamborough Head where several transects were made, 'ground truth' data were obtained from grab samples and sidescan sonar records. Finally, a potential herring spawning area (surveyed previously as dominantly fine sand) was surveyed in a close grid pattern with consistent E1 and E2 values indicating fine sand. However, a number of grab samples taken throughout the site gave coarse sand, shell and stones. The RoxAnn results are to be analysed further since the measurements were performed in deteriorating weather conditions and a 2 knot cross tidal stream. All grab samples were photographed and retained, and the RoxAnn track data stored on disk (E1, E2, depth, time, and position). The TV sled was deployed but the turbulent conditions prevented any observations of the seabed. Considerable benefit was gained from the presence of Tony Egan: his patient advice on all aspects of the RoxAnn system was much appreciated by all.

2. The EG&G sidescan sonar was used very effectively to survey a number of sites. The towed body was deployed on 200m of cable with the recorder located in the conning room. Initial trials off Great Yarmouth gave good records on both 100kHz and 500kHz frequencies. Swathe coverage was 150m for 100kHz and 70m for 500kHz with a towed body altitude of 12m. Bottom track and slant range correction worked well with no loss of bottom lock. The towed body was lighter than its predecessor and required up to 120m of cable to give a dive depth of 25m. Surges from the ship were noticeable on the sidescan record in swells in excess of about 2-3m. A navigation interface board was installed during the cruise and a position fix (from the ship's GPS receiver) successfully annotated to the sidescan record. The GPS receiver also supplied ship's speed enabling automatic control of the recorder paper speed; this reduces the uncertainty of the towed body position between fix marks, and the distortion caused by incorrect paper speeds.
The sidescan was used over a previously surveyed area to check for uniformity of seabed. During the tow the charted 7.5m high wreck was clearly displayed on the sidescan record (figure 2). A later survey was made to compare the 100kHz with the new 500kHz frequency. This showed finer detail in the wreck structure emphasising the sidescan's superior resolution at 500kHz.
The 150kHz ADCP (Acoustic Doppler Current Profiler) was operated periodically during the cruise, and in association with the sector scanning sonar. Initially there was a problem installing the ADCP software due to a fault on the host PC computer. The software was easy to use and displayed in tabular and graphical form water current (in three dimensions) and fluid flow in successive layers of the sea (settings of 4m depth layers down to 50m were selected). Interference to the sector scanner was severe and unacceptable for tracking exercises. Hopefully the problem will be resolved when the ADCP is converted to a wide band system, and the facility to reduce the acoustic output power installed.

3. The Simrad SM600 sonar took an excessively long time to set up for correct operation with the 34kHz long-life gear marker tags. A "quick start" menu procedure was prepared to allow future users to set this sonar quickly to the optimum parameters for a tag search.
The tag trials were carried out in a water depth of 30m with the tags attached in mid water to a fixed mooring (two Dhan buoys, a radar reflector, 35m of rope and two lengths of heavy chain). The ship was allowed to drift away from the mooring whilst presenting a beam attitude to the tags. The three tags tested (two commercial tags and one MAFF tag) gave good results with detection ranges in excess of 3000m, the MAFF tag recorded a range of 3300m.

4. The sector scanner was prepared and operated correctly in the shallow water conditions, the bottom appeared to be featureless. The usual test rig was used to suspend a telemetry tag 7m down in the water column. A long-life transponding pressure tag was attached to the rig and floated out to a range of 200m. Good signals were obtained from the tag which also confirmed satisfactory operation of the sector scanner.
Each of two pressure tags (PTAG3 and PTAG13) was then attached to the above rig and floated out to 400m where a faint intermittent signal was observed on the sector scanner - tag signals were good out to a range of 350m. The tag range was reduced to 260m so that an accurate depth measurement could be taken from the scanner display and compared against the laboratory calibration. The observed depth from the telemetered signals was within the specification of the tag (±1m). Look-up charts were prepared from the calibration data for each tag for use on CORYSTES 1b/93.

A switch-mode tag had been designed to assess the benefits of a longer duration pulse for long range tracking (about 400m). The duration of the tag's transmission pulse is changed from 3ms to 6ms on receipt of a 500μs command pulse from the ship's sector scanner. The mode switching was consistent out to 400m range where the longer duration transmission pulse could be seen to give a dramatic improvement in tag location . The tests were considered very successful and will be demonstrated to FSM3 on Corystes 1b/93. It is anticipated that a longer duration tag transmission pulse will be useful when tracking under the following conditions: (a) poor propagation; (b) searching for a lost tag; and (c) long range tracking. Use of the long pulse duration will need to be restricted since it will reduce considerably the battery life of the tag.

5. CORYSTES noise spectra trials could not be performed due to the high winds and adverse sea states which precluded the use of the ship's boat to deploy and operate the sensitive hydrophone and associated recording equipment.

6. Additional sector scanner calibration trials were not possible, again due to the adverse weather conditions. However, the sector scanner sonar beam pattern was measured due to an interference problem on the sector scanner displays. It was caused by the 3rd stage of the sector scanner receiver and appeared after this board had been in use for more than 5 minutes. Beam patterns from the original 3rd stage board and a replacement board were compared (figure 3) and the latter left installed. The sonar performed satisfactorily and gave good results with telemetry tag signals. However, the incident highlighted the general very poor state of the sector scanner electronics and the absence of adequate replacement units or circuit diagrams: a replacement sonar should be considered urgently.

M H Beach
16 January 1993

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M J REEDER (Senior Fishing Mate) M J Reeder

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CORYSTES 1a/93 - GEAR TRIALS LOCATION

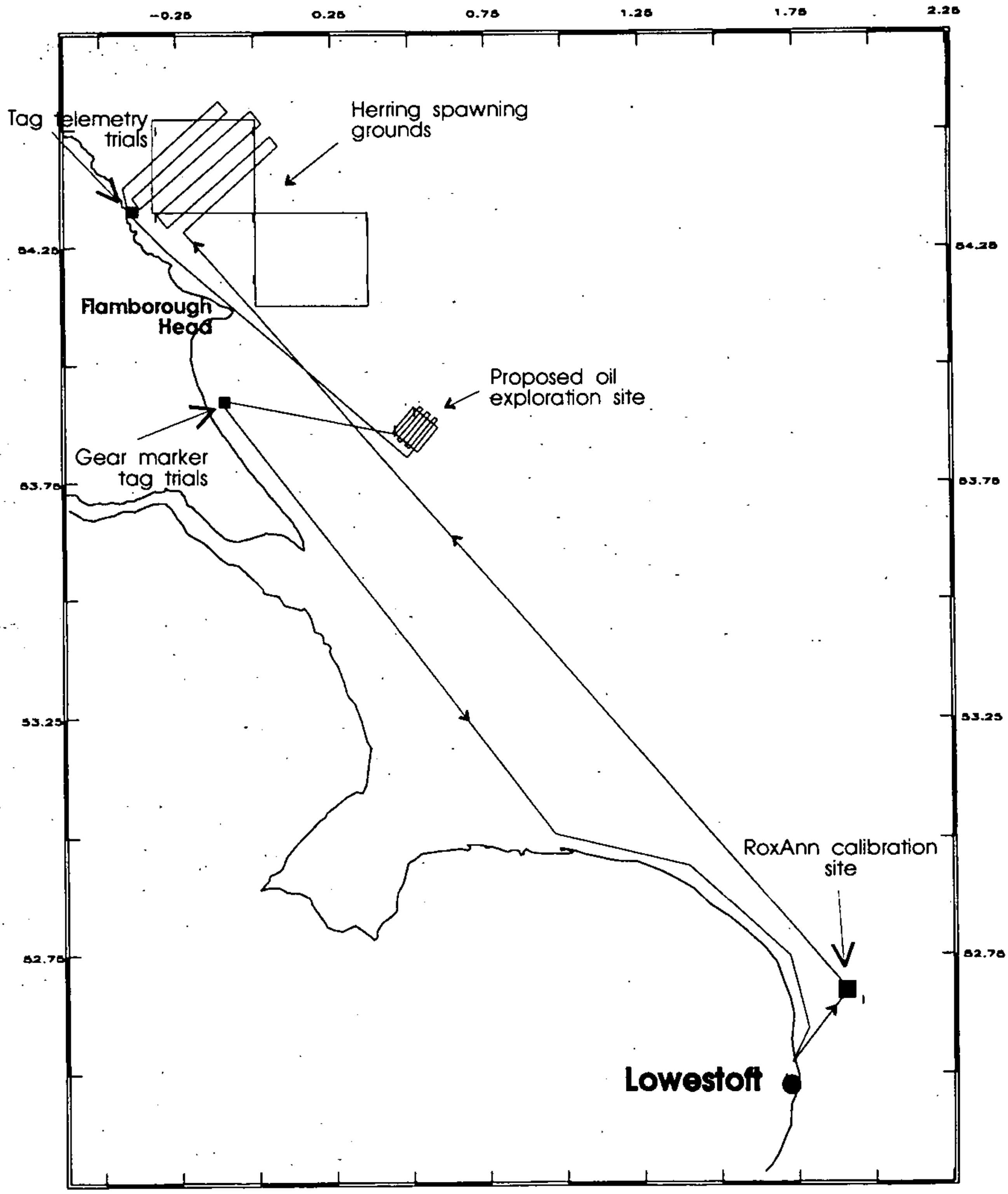

Figure 1

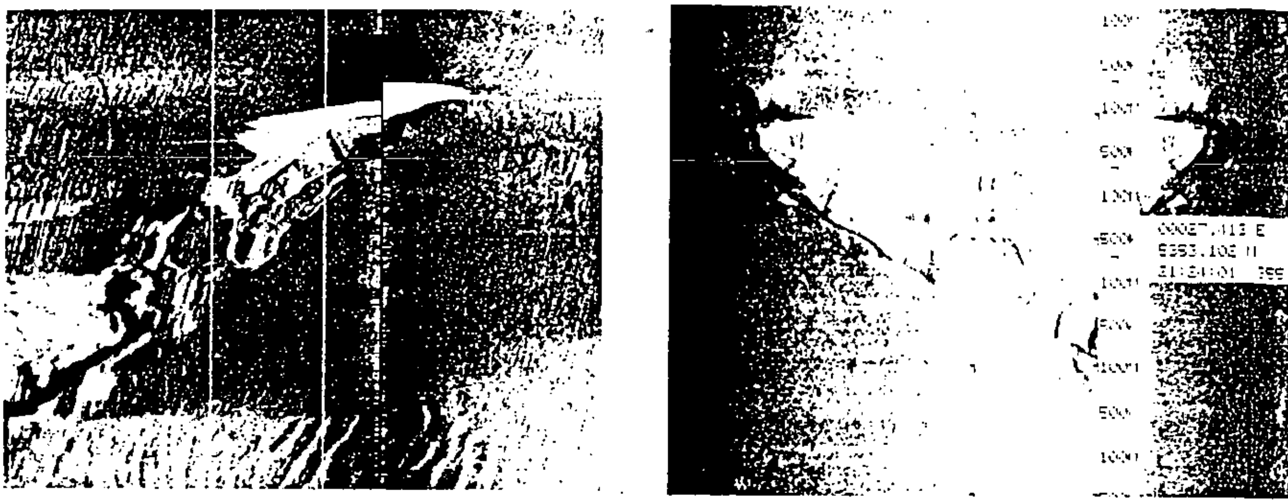

Figure 2 A charted wreck is seen clearly on the Sidescan record. The LHS view is scanned at 100kHz, and the RHS view at 500kHz; neither reproductions do justice to the quality of the original records. (The traces are annotated automatically with scan frequency, time ship's head, and position fix).

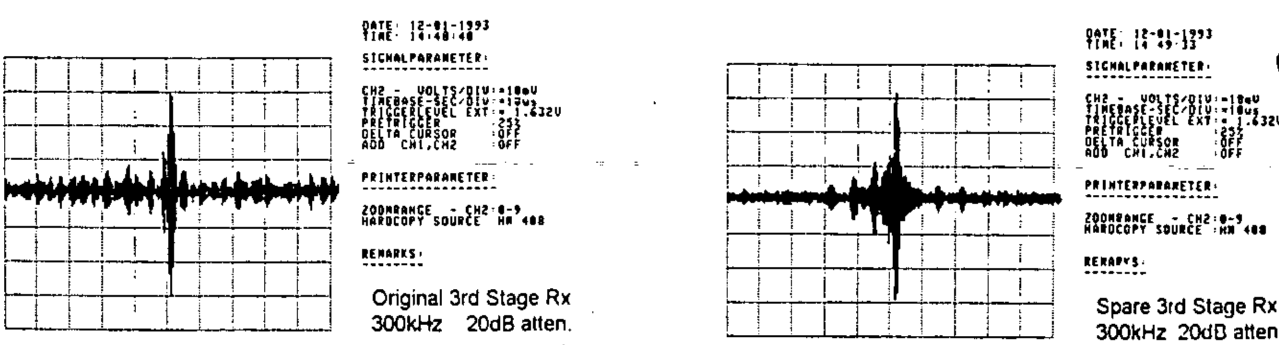

Figure 3 Sector Scanner sonar beam pattern measurements. The LHS view shows the original 3rd-stage's asymetrical beam and severe interference. The RHS view shows improved symetry and reduced interference.