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MINISTRY OF AGRICULTURE FISHERIES AND FOOD
FISHERIES LABORATORY LOWESTOFT SUFFOLK ENGLAND

1974 RESEARCH VESSEL PROGRAMME

REPORT: RV CIROLANA: CRUISE 4

(Provisional: Not to be quoted without prior reference to the author).

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DURATION: Left Grimsby 1000 h, 29 April
Arrived Grimsby 1010 h, 14 May
All times are Greenwich Mean Time

LOCALITY: Northern North Sea

AIMS:
1. To test deep current meter mooring techniques and acoustic release systems
2. To measure primary production parameters.

NARRATIVE: Cirolana sailed at 1000 h, 29 April and proceeded to the deep mooring test site at 62 deg N, 3 deg E. Continuous chlorophyll fluorometry plus half-hourly sampling for surface salinity and nitrate analysis were conducted en route; in addition algal cultures, direct preparations for the electron microscope, algal counts and photography were carried out at irregular intervals, while acetone extracts of chlorophyll and filtered seawater samples provided direct and indirect fluorometer calibrations. During passage through the area of Dr Steele's primary production experiment (58 30'N to 61 deg N along 0 30'E) these observations were supplemented with hourly XBT dips.

On arrival in the deep mooring test site a five hour bathymetric reconnaissanc of the area was carried out and a mooring identical to that deployed in the Bay of Biscay during Cirolana 10/73 was laid by 1951 h, 1 May in 419 m depth. This mooring incorporated two acoustic releases on the main mooring wire together with a third on a test frame and an empty current meter casing was placed in wire to test the free fall capabilities of the Bergen meter. On release it was clear that the water depth had been overestimated so that the upper subsurface float lay awash, and an attempt was immediately made to recover the mooring. However, of the two main releases on the mooring wire, one failed to respond to interrogation and neither cut the wire on command. (The third acoustic release on the test frame was successfully interrogated). The surface toroid was picked up to confirm that it was solidly anchored (not merely moored on a partially severed wire), and with rising wind and swell but with a fair forecast the buoy was again released and recovery was abandoned until the following day. On 2 May winds of 30-35 knots and a heavy swell prevented any attempt at recovery and Cirolana remained laid alongside the buoy. At 0730 h 3 May in similar weather conditions the toroid was seen to break adrift and by 0848 h 3 May the toroid and the upper subsurface float were recovered. In worsening weather with winds of up to 40 knots Cirolana then dodged until the wind and swell moderated

on the morning of 5 May. Following a visual and acoustic search of the area between 0800 and 1300 h, 5 May, Cirolana unsuccessfully dragged for the mooring using creeper and chain from 1400 h to 1900 h. From 1930 h - 2143 h the three remaining acoustic releases were tested at 400 m depth on the hydrowire. Of the three, two were successfully interrogated and cut the wire while the third failed repeatedly to respond to interrogation or 'cut' commands, despite earlier successful bench tests. (In this, both shipboard control units were used in case overheating in one control unit was a contributory cause of the failure).

On 6 May a detailed intercalibration of the ship's echo sounders was made as a continuation of similar observations on 2 and 5 May. In calm conditions, a second but simplified mooring (toroid, 1 subsurface float, 1 weight) accurately measured using the 'Bay of Biscay' formula was laid by 1155 h again confirming that this formula overestimated the water depth. The formula was therefore adapted to take proper account of the local sound velocity correction and from 1515 h 6 May to 1312 h 8 May, six moorings of increasing complexity were laid successfully in water depths of from 300 to 750 m. With the exception of the third mooring (where the guillotine wire snagged and broke during paying away or freefall) the single acoustic release on each mooring was successfully interrogated and cut the wire. (Acoustic releases Nos. 200 and 250 were used throughout these tests). Following the laying of the 3rd mooring (7 May; 403 m depth) the acoustic release was interrogated at increasing range intervals up to 3 nmi to determine the maximum interrogation and cutting range. In addition to these trials, a total of 4 guillotines (2 having failed during earlier cruises) were tested at 400 m depth on hydrowire.

On completion of these tests Cirolana made four unsuccessful trawl hauls through the site of the lost mooring between 1815 h 8 May and 0110 h 9 May. In increasing wind and swell the search was then abandoned and Cirolana proceeded to the Fladen Ground, to continue the monitoring of primary production parameters in the area. From 1300 h 9 May to 0830 h 10 May the sampling programme described earlier was repeated along 0 30'E from 61 deg N to 58 30'N. To obtain the two dimensional distribution of phytoplankton patchiness seven east-west survey legs each 60 nmi in length were then worked at 10 nmi spacing between 58 30'N and 59 30'N thus covering the area of the proposed Fladen Experiment of JONSDAP 76. At the four corners and centre of this 480 mile grid, hydrocasts were used to assess the depth distribution of chlorophyll in relation to the thermocline depth. (Samples taken at 0, 10, 20, 40, 60 and 80 m). This grid was completed by 1022 h 12 May.

Cirolana then proceeded to the location of Mr Talbot's mooring off the Tyne, reported to have been damaged by fishing gear. The toroid was located by 1150 h, 13 May and after picking up two observers from the Tyne River Authority by pilot boat the mooring and one current meter were recovered together with a complete trawl. The observers were disembarked at 1540 h and Cirolana continued to Grimsby, anchoring in the Humber at 2330 h 13 May and docking at 1010 h 14 May.

RESULTS:

1. Deep water moorings were developed to the point where they can successfully be tailored to water depth.

2. Of the six acoustic releases, two performed well from first use but later became temperamental; one failed throughout, two failed to cut their mooring wire and were lost and the performance of the sixth (also on lost mooring) is unknown.

3. The guillotines appeared to perform satisfactorily throughout. Failure to cut was due to acosutic release interrogation difficulties and the guillotines used on these occasions cut successfully on subsequent tests. The performance of the

three guillotines on the lost mooring was unknown and two of these may conceivably have contributed to the failure to cut the mooring wire.

4. Intercalibration of the ship's sounders showed significant differences between them. The PDR x 1 scale (0-750 m) agreed with the MS 44 and these were used with success to set the majority of moorings which lay in the middle of this depth range. At greater depths the MS 44 developed a large difference from the PDR (15 m difference in 750 m). In intermediate depths the MS 29 consistently showed 6 m less depth than the MS 44, while the SIMRAD showed 8 m less depth than the MS 44. The Fishgraph in 402 m water depth was in agreement with the MS 44 on the 0-600 m range but failed to find bottom on the 300-420 m range and recorded a clear bottom echo at 502 m on the 400-520 range.

5. The need for further development work on the moorings, the lack of trustworthy acoustic releases, and the adverse weather prevented the laying of the triangle of moorings planned for the Test Site and the Fladen Ground.

6. The AANDERAA casing and fin showed no adverse effects of free fall to 156 m and 66 m. (Moorings 6 and 7 respectively).

7. The paired subsurface floats showed evidence of tangling despite their brief mooring time and the calm conditions prevailing. This suggests that in future, they are either connected with rigid bridles or are replaced by single larger units.

8. Repeated measurements showed the coiler to have an error of 1% (overestimated) compared with the tape.

9. The space scales of phytoplankton variability were successfully measured via the Fluorometer. Further results await analysis.

Robert R Dickson
21 May 1974

Seen in Draft: T H Finn - Master
G W Argumont - Fishing Skipper.

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