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FISHERIES LABORATORY, LOWESTOFT, SUFFOLK, ENGLAND

1976 RESEARCH VESSEL PROGRAMME

REPORT: R V CIROLANA, CRUISE 4

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R N Tucker  
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L S Emerson  
S E Blanchflower (Student)  
S H Coombs (IMER, Plymouth)

DURATION: Left Grimsby 2225 h 22 March  
Arrived Grimsby 1500 h 11 April

LOCALITY: West coast of British Isles ( $51^{\circ}$  to  $61^{\circ}$ N)

AIMS:

- 1 To make an acoustic survey of the distribution and abundance of the spawning stock of blue whiting.
- 2 To test the deep-water transducer and to make short range observations of blue whiting.
- 3 To sample plankton and neuston throughout the survey using continuous and Longhurst-Hardy plankton recorders (LHPR).
- 4 To take biological samples of blue whiting, mackerel and some deep water demersal species.

NARRATIVE:

The acoustic survey grid (Figure 1) was commenced at 0100 h 26 March following a brief stop in the western channel in order to calibrate the deep water transducer. By midday, however, gales halted the survey and this situation persisted throughout most of the cruise. From 26 through 31 March CIROLANA mainly dodged, but a break in the weather enabled a midwater trawl haul and a water sample (at station 4) to be made on 1 April. Contact was made with HAVDRON (Norway) and CHALLENGER (SMBA) and relevant cruise information was exchanged. On 2 April a second sample of blue whiting was obtained with the midwater trawl (station 7), and SIR WILLIAM HARDY (TRS) and G O SARS (Norway) were contacted and daily schedules arranged. After dodging westwards all night it was found possible to survey with the wind (Force 7) astern, in towards the edge of the shelf. Here a Granton trawl haul (Station 9) was made in 800-900 m, and then the deep water transducer was used to observe a scattered layer of blue whiting at 420 m. This population was sampled with the mid water trawl (Station 11).

In view of the forecast (24 hours of gales) it was decided to find shelter in order to complete transducer calibrations, and CIROLANA entered Broad Bay, Isle of Lewis on the evening of 5 April. The ship steamed to take up the survey grid again at 1830 h 6 April in rather better conditions, and the survey continued until a forecast of storm force 10 prompted a return to Grimsby 12 hours ahead of schedule. A midwater trawl haul (Station 13) and a bottom trawl haul (Station 16) were completed in this time, and the survey was terminated 30 miles short of the planned finish.

## RESULTS

Aim 1. Figure 2 shows the density distribution of blue whiting determined from a preliminary analysis of the integrator records. This distribution is typical for the end of March/early April, with the highest concentrations off the edge of the continental shelf from 52°N to 58°N, at the north end of the Rockall Channel, and on the south east edge of the Rockall Bank. The fish were in a fairly continuous layer, usually between 420 and 480 m below the surface. In addition to the Lowestoft gear the Aberdeen integrator and towed body were deployed throughout most of the survey. It appears that there is good correlation between the two instruments, and that the abundance of blue whiting is comparable with estimates for previous years.

Aim 2. The deep water transducer (DWT) was calibrated under good conditions, and its efficiency was found to increase with soaking time and water pressure. However, satisfactorily consistent results were obtained with standard targets down to 350 m depth. The DWT was lowered to within 10 m of a scattered layer of blue whiting (sampled with the Engel trawl), and returned signals were recorded by pulse height analyser and on tape for later analysis. A provisional analysis of peak voltage readings suggests a target strength of -38 dB for 29-30 cm fish.

Aim 3. Adverse weather conditions curtailed the IMER programme, but the CPR was towed for 1400 miles and towing trials with the neuston sledge (unfortunately in water unlikely to yield blue whiting eggs) were successful. Ripe blue whiting eggs were obtained at two trawl stations, artificially fertilised, and reared to hatching at a range of temperatures. Incubation time varied between 12 days at 1.5°C and 3 days at 15°C, and temperatures above 15°C proved lethal. Observations were made on the developing eggs at regular intervals. The LHPR was not used.

Aim 4. Again weather conditions limited the amount of midwater trawling for blue whiting during the cruise, but 4 hauls (1/10, 1, 11 and 1/5 baskets) provided the necessary biological material. 154 otoliths were taken from a length range of 18-35 cm and 200 further fish were frozen whole for length/weight measurements. The modal length varied between hauls (as low as 21-22 cm at station 13), but overall it was 29-30 cm. A total of 589 fish were measured. Only fish from station 7 contained food (mainly euphausiids). The majority of both male and female blue whiting were at maturity stage 0 or 1, and approximately 5% were spent.

Samples of 50 fish were frozen from 2 stations for parasite analysis, and 1 basket of blue whiting was frozen for testing trials. Muscle samples from 44 fish covering the length range and weighted towards the larger individuals were preserved in buffered glycerol for adenosine triphosphate analysis, and a further 20 samples were preserved for electron microscopy, 30 for light microscopy, and muscle, heart and liver samples from 56 fish were deep frozen. Sixteen samples of female gonads were preserved for fecundity analysis.

The single deep water Granton haul on the edge of the shelf produced 41 Grenadiers for a similar sampling regime to the above. These fish were otolithed and had muscle samples removed and preserved. Only 2 mackerel were caught during the cruise. Muscle samples were taken from 2 Chimaera monstrosa and 2 Black Scabbard fish for electron microscopy.

## ADDITIONAL WORK

a. Regular radio contact was maintained with G O SARS and SIR WILLIAM HARDY, and information on the cruise's progress was exchanged with the former. SIR WILLIAM HARDY had asked CIROLANA to help obtain some 2-3 tons of fresh blue whiting, but this proved impractical, and G O SARS offered to help. 2 tons were transferred on 6 April.

b. Seven expendable bathythermograph casts were made (marked O on Figure 1) and surface temperatures were recorded over the grid. Water samples for a salinity profile were taken in only one position. Surface temperatures ranged from 11.1°C in the south to 8.2°C north of the Wyville-Thomson Ridge, and the vertical temperature profile showed a decrease of 0.2 - 1.0 deg C from surface to 500 m over the cruise area.

M G Pawson  
23 April 1976

SEEN IN DRAFT: R A T (Master)  
W J S (Fishing Skipper)

INITIALLED: A J L

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Figure 1

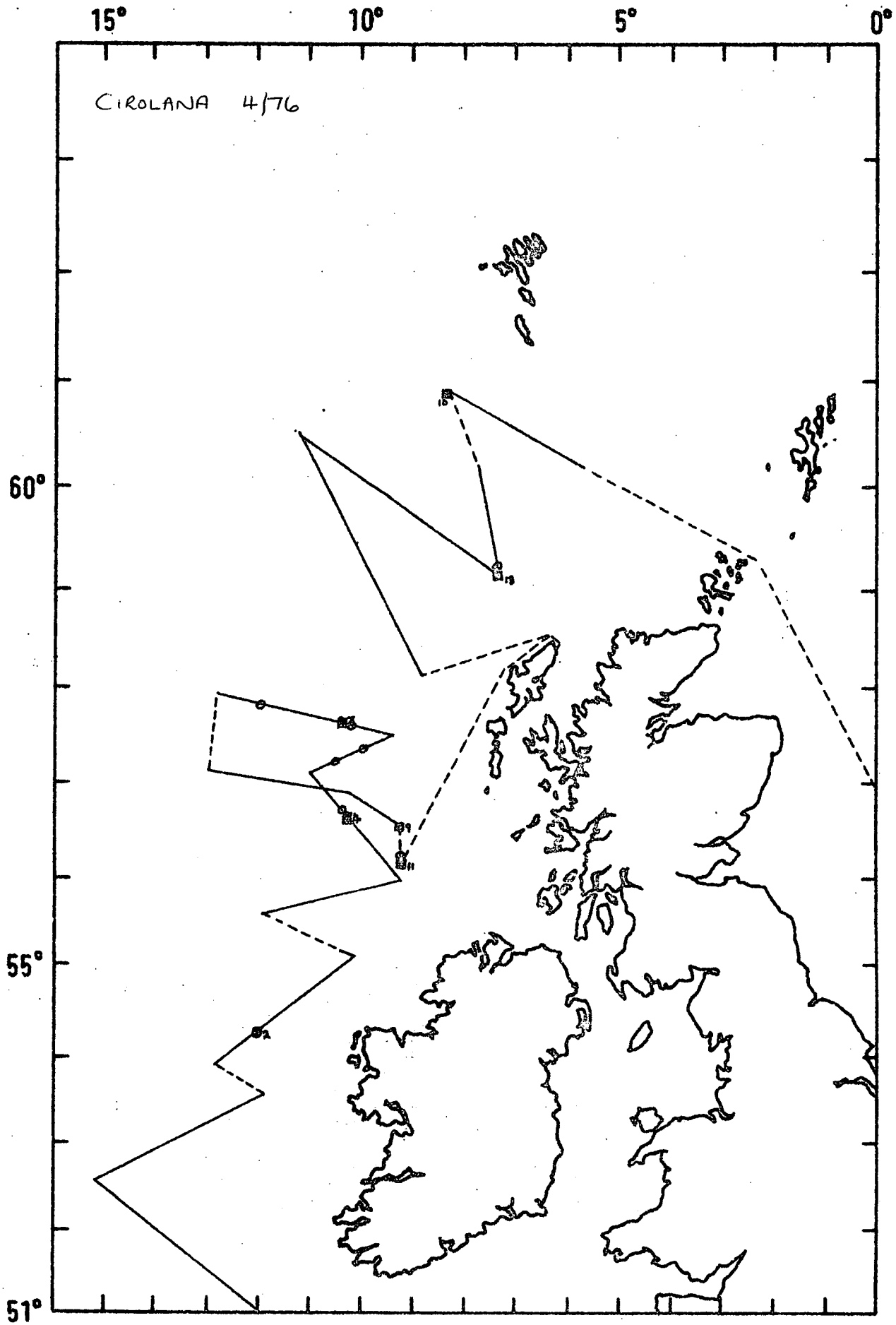


Figure 2

