

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

1989 RESEARCH VESSEL PROGRAMME

REPORT: RV CIROLANA: CRUISE 5

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 S Flatman  
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DURATION: Left Lowestoft 0815 h 19 May ) All times GMT  
 Docked Lowestoft 0410 h 12 June )

LOCALITY: Western Approaches, Celtic Sea, Bristol Channel

AIMS:

1. To participate in the international mackerel egg survey of the western stock, assessing the production of mackerel eggs in the area between latitudes 48°N and 52°N.
2. To take samples of mackerel by 'feathering' in daylight over a representative area of the plankton survey grid for fecundity studies.
3. To examine diurnal periodicity in mackerel spawning from five staging of eggs in relation to a linked shipboard incubation experiment, and sampling adult mackerel.
4. To sample on a grid of 62 stations in the Bristol Channel and its western approaches for sole eggs and larvae.

NARRATIVE

RV CIROLANA sailed at 0815 h 19 May and immediately after clearing the harbour an engine fault developed resulting in a complete loss of power. The vessel was anchored off Lowestoft and remained there for 15 hours while repairs were carried out. The steam south began at 2300 h, arriving off Start Point at 0400 h on the following day. Rod and line fishing (feathering) for mackerel was carried out in this area and around the Eddystone until 1215 h when course was set for the first plankton sampling station in the Celtic Sea (48°15'N 5°45'W). Sampling with the new 53 cm sampler began at 2215 h 21 May and continued in good weather until completion of the first grid (Figure 1) at 0200 h 2 June (52°45'N 12°45'W). An average of nine to ten plankton stations and two 1 hour 'feathering' stations were completed on each day. Four stations, sampled on the first grid, were repeated before a series of plankton sampling and 'feathering' stations was begun at 1200 h 2 June (51°45'N 11°45'W). This

position had been identified as the one with the highest density of early-stage mackerel eggs over the sampled area. Sampling at this position continued for 27 hours in an attempt to describe the diurnal pattern of spawning in mackerel. On completion, a second grid of plankton stations was begun, working southwards close to the shelf edge (Figure 2). These were in rectangles where the highest abundances of stage I mackerel eggs were found on the first survey, as recommended by the Mackerel Egg Workshop report. This grid was completed at 1000 h 6 June (49°15'N 7°15'W). RV CIROLANA then steamed to a position east of the Scilly Isles to begin 'feathering' for small mackerel required for fecundity studies from ICES region VIIIE. Fishing was carried out at six stations across to the Lizard and completed in Mounts Bay at 2100 h.

The sole egg survey of the Bristol Channel and approaches was started at 2330 h 6 June (50°07'N 05°52'W) and progressed in reasonable weather apart from a brief southerly gale during the night of 9/10 June. The survey was completed off St Ives at 0940 h 10 June (Figure 3) and the vessel steamed to a position 8 nml. off the Lizard to begin 'feathering' for mackerel. Fishing was completed off Start Point at 2100 h on the same day and the return passage to Lowestoft was begun. RV CIROLANA docked in Lowestoft at 0410 h 12 June.

## RESULTS

1. A total of 104 plankton stations were sampled on the first grid and 28 stations on the second grid. There was an overlap of only two rectangles at the northern end, sampled by MV EMER MARIE (Republic of Ireland), whilst 26 rectangles were sampled twice by RV CIROLANA. Attempts to make contact with the French RV CRYOS were not wholly successful and cooperation during the survey was limited, by poor radio reception, to a tentative arrangement to dovetail sampling at latitude 48°15'N.

Preliminary estimates of mackerel egg abundance indicate lower numbers of stage I eggs in the southern part of the survey area compared with the same period in 1986. This was particularly noticeable along and just off the shelf edge. North of latitude 51°30'N, stage I eggs were more abundant. As a result of some high values along latitude 52°15'N it was decided to sample the Porcupine Bank area at the expense of some duplicate sampling further south. Reasonable numbers of stage I eggs were found in all ten rectangles in this area which had not been previously sampled by MV EMER MARIE.

Comparison of the provisional data on surface temperatures and temperature at 20 m depth, with data for the same period in 1986, showed a general increase of about 2°C over the whole area. This temperature pattern was similar to that found at the end of June in previous years and supports early indications that mackerel spawning in Biscay was about three weeks earlier than previous observations.

2. A total of eighteen 1 hour 'feathering' stations was worked over the area of the first plankton grid at the positions indicated on Figure 1. Four rods were used with six hooks, at each station. The catch of mackerel varied between 0 kg and 147 kg. The highest catches were made at the northern end of the grid between latitudes 51°30'N and 52°30'N, coinciding with the maximum number of stage IA eggs recorded. Relatively large numbers of one year old fish were caught in this area, possibly recruiting from the west of Ireland.

Ovary samples were collected in area VIIJ from pre-spawning fish below 30 cm in length, to extend the 1989 mackerel fecundity estimate.

Ovaries were collected from length stratified samples of two year old mackerel to assess the contribution of this year class to total egg production. A total of 50 ovaries were collected from area VIIJ and 12 from area VIIE.

3. Artificially fertilised mackerel eggs were reared through the blastodisc stage at eight temperatures between 8°C and 18.4°C. Their rate of development up to the 64-cell stage was observed at one to two hourly intervals. At 8°C, first cleavage occurred after 4 hours and the 64-cell stage was reached in 14.5 hours. At 18.4°C the times were 1.5 hours and 4.5 hours respectively. These data will be used to back-calculate the early egg stages found in the plankton, to their respective spawning times.

At the 27 hour station to examine diurnal periodicity of spawning, at least 100 stage IA eggs were sorted live from each of the 14 plankton sampler tows. They were categorised into undifferentiated, 2 cell, 4 cell, 8 cell, 16 cell, 32 cell, 64 cell and multi-cell stages. Provisional results indicate that there is no detectable diurnal periodicity of spawning in mackerel. Undifferentiated and 2-cell stages occurred throughout the day and night (Table 1). This observation was confirmed by 'feathering' for adult mackerel between plankton hauls from dawn to dusk. The fraction of spawning fish caught at each session is shown in Table 2. The criterion used to estimate this fraction was the proportion of mature females with hydrated eggs in the lumen of the ovary that could be extruded by light manual pressure.

Unfortunately it was not possible to meet up with MV KINGS CROSS for these diurnal observations, and thus sample the fish at night. However, they were able to sample at the same position 3 days later and ironically experienced one of their lowest catch rates, with less than one basket of mackerel for a 1 hour tow.

4. All 63 planned stations were sampled on the sole egg survey but none of the samples were analysed at sea. Phaeocystis became a problem along the South Wales coast and was abundant over the whole of the Bristol Channel east of a line from St Anns Head to Trevoise Head. The 270 micron standard net was changed for a 500 micron mesh net for most of the survey. This reduced the sample size and made washing down a little less difficult.

5. The Guildline surface temperature and salinity monitoring system was run throughout the whole cruise. Bottle samples for salinity calibration and check readings of the hull-mounted thermistor were taken four times daily.

6. Mackerel egg incubations were done on board primarily in order to define the duration of blastodisc stages (3). However, at six temperatures between 9.9°C and 18.4°C their development was taken through to hatching. The time to 50% hatch confirms the 1977 observations, whilst the temperature range was extended to 18.4°C. These observations have allowed a better definition of the morphology and development time of the later stages which will be used in egg mortality estimates in future.

Two batches of mackerel eggs were reared and samples of each stage measured and fixed. This will provide Adrian Rijnsdorp (RIVO, Netherlands) with data on size changes during development and shrinkage after fixation.

J H Nichols

19 June 1989

Seen in draft: G Sinclair

Initialled: JGS

Distribution:

Basic list +	S Flatman
J H Nichols	R P Flatt
M Greer Walker	S Warnes
D J Symonds	Ms G M Haynes
L E Woolner	Ms A Sutcliffe

Table 1 Percentage contribution of < 3 hours old mackerel eggs to total stage IA egg abundance per haul

Haul time	1200	1400	1600	1800	2000	2200	0000	0200	0400	0600	0800	1100	1300	1430
% undifferentiated + 2 cell stage	11	30	15	19	16	9	15	20	22	22	28	31	15	22
Total stage IA per m <sup>3</sup>	4.8	5.8	6.3	6.8	5.4	7.4	4.7	2.9	3.5	2.8	3.9	7.1	6.7	6.3
	<----- Daylight ----->			Dusk	<---- Dark ---->			Dawn	<----- Daylight ----->					

Table 2 Spawning periodicity

Feathering time GMT	Number mature female mackerel caught	Percent spawning
1247-1347	50	8
1441-1541	30	33
1637-1737	24	46
1833-1933	51	35
2045-2145	10	30
0458-0558	37	43
0642-0742	56	46
0841-0941	27	44
1148-1248	46	58
1330-1430	35	31

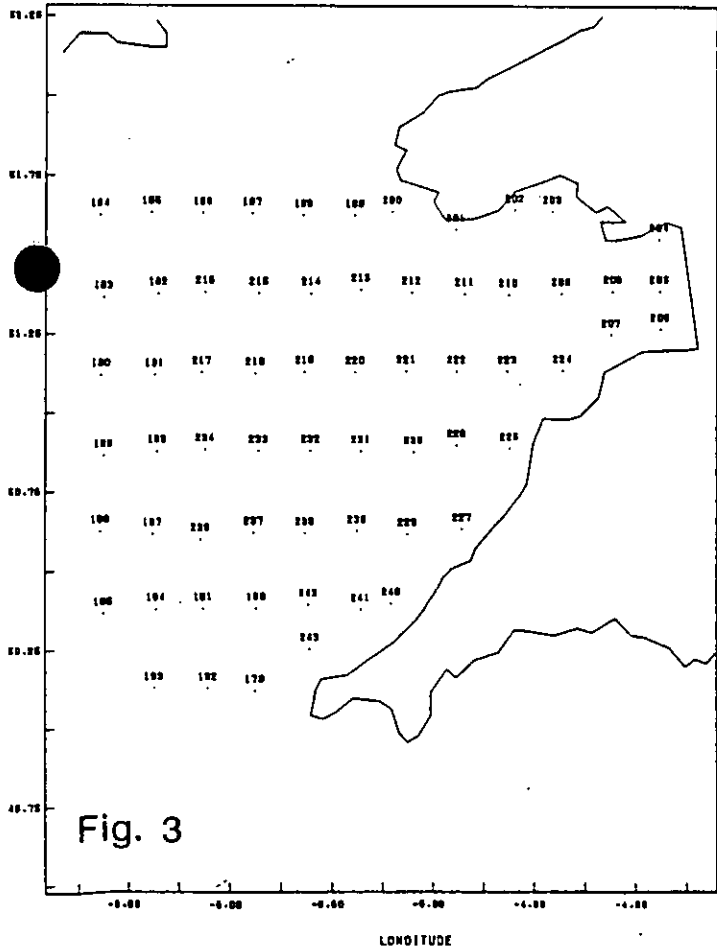
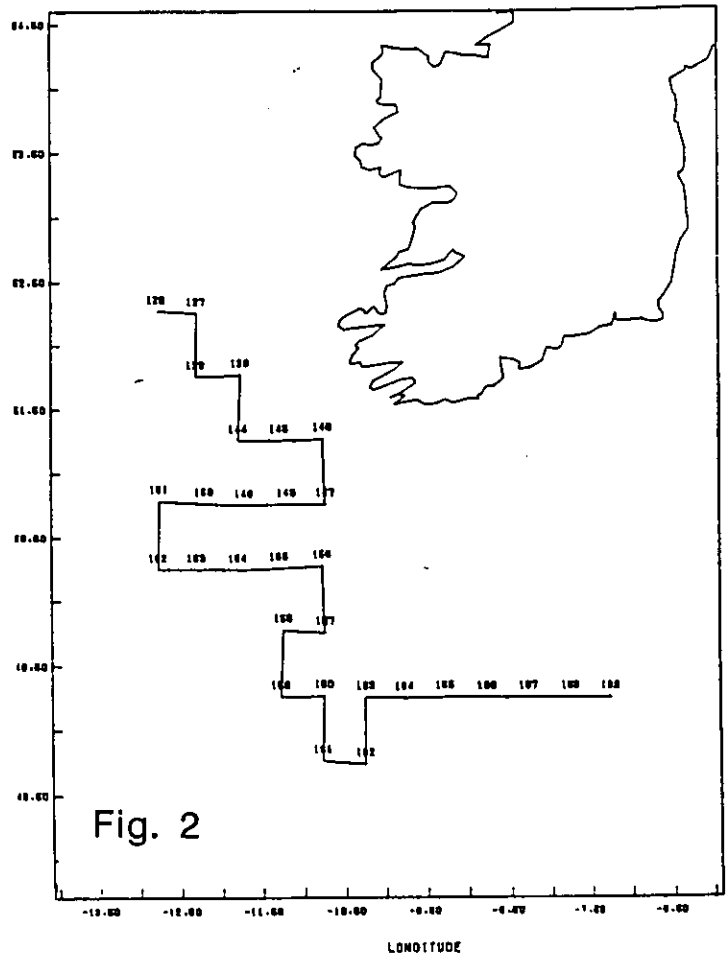
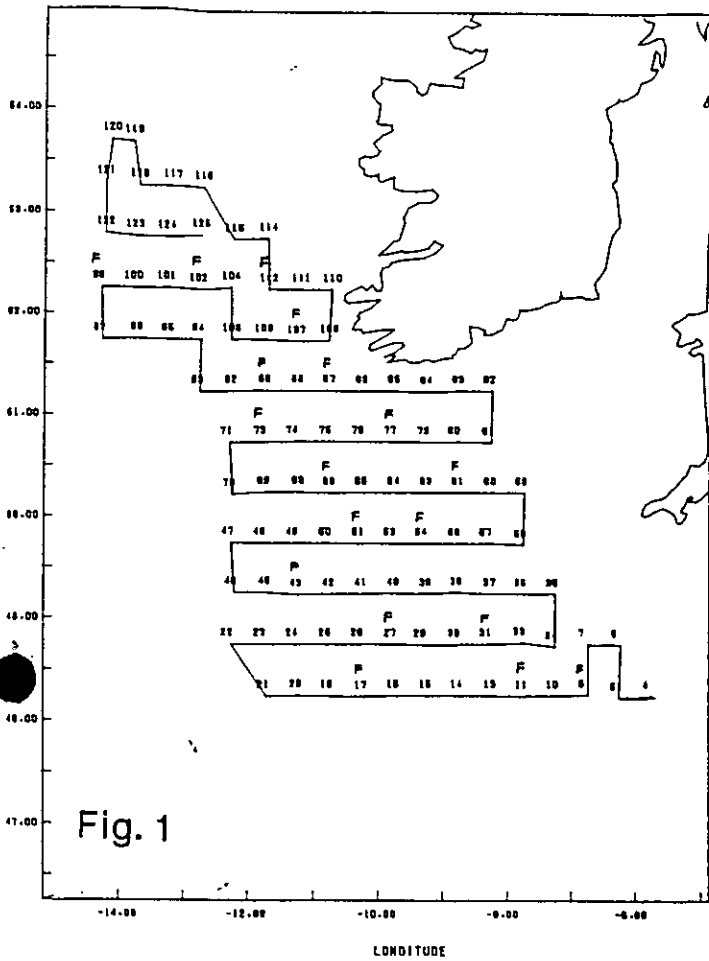


Fig. 1 MACKEREL EGG SURVEY GRID 1

Fig. 2 MACKEREL EGG SURVEY GRID 2

Fig. 3 SOLE EGG GRID