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

1993 RESEARCH VESSEL PROGRAMME

REPORT: RV CORYSTES: CRUISE: 6B

STAFF: M Greer Walker
P R Witthames
S P Milligan
C L Whiting
R P Flatt
Ms R T Harrop

DURATION: Left Lowestoft 1630 h 14 June
Arrived Lowestoft 0900 h 4 July
All times are GMT

LOCALITY: Western Approaches, west of Ireland

AIMS:

1. To investigate the vertical distribution of spawning mackerel by day and by night using the Danish FOTO midwater trawl and rod and line.

2. To investigate the diurnal and vertical distribution of egg production using the Longhurst Hardy plankton sampler.

3. To estimate the rates of oocyte atresia in ovaries from captive mackerel.

4. To collect ovaries from spawning mackerel in order to estimate annual changes in the batch fecundity for Dr I Priede, Zoology Department, University of Aberdeen.

NARRATIVE:

RV CORYSTES sailed from Lowestoft at 1730 h 14 June and having made good progress through the Channel arrived at the Great Sole Bank (50°N 11°W) on the continental shelf edge during the morning of 17 June. This area was identified from the 1992 mackerel egg survey as having a high density of eggs at this time. The remainder of the day was spent familiarising the officers and crew with the operation of the FOTO trawl, first with the cable-linked transducer and then with the Scanmar system attached to it. Mackerel ovaries from these trial hauls were fixed for batch fecundity studies (aim 4) and otoliths were collected for stock separation studies (M Walsh, SOAFD, Aberdeen). Rod and line stations were interspersed with the gear trials as convenient; their purpose was to obtain live mackerel which were placed in the large circular deck tanks and subsequently used to estimate the rates of oocyte atresia (aim 3) over a 14-day period. The following morning (18 June) rod and line stations were resumed and good catches enabled us

to fill both the deck tanks with live mackerel, a total of about 240 fish. Further gear trials were found to be necessary during the afternoon and by the end of the day the gear was working satisfactorily and consistent records of spread (39 m), height (18-20 m) and depth of the trawl were obtained from the Scanmar system.

Trawling with the FOTO trawl (aim 1) commenced in earnest at 0900 h 19 June and continued over the following three days and three nights. During each day and night hauls of one hour were worked with the headline at 100 m, 50 m and the surface. After each haul the net was thoroughly shaken down to prevent contamination of subsequent hauls. Each evening a further sample was taken close to the surface by rod and line and a plankton sample was obtained using the 1.5 m ring net. Some of the rod-and-line-caught fish were placed in the deck tanks and used to replace those that had already been used in the atresia experiment. It was soon apparent that both the trawl catches of mackerel and the incidence of spawning fish were lower than in 1991 (CORYSTES 6B) and 1992 (CIROLANA 6), particularly during the day. Also, plankton samples from the 1.5 m ring net contained mainly early stage boarfish (*Capros aper*) and scad (*Trachurus trachurus*) eggs. Most of the mackerel eggs appeared, from their developmental stages, to be between 7 and 12 days old indicating that the current level of spawning was low. It was therefore decided to conduct an egg survey with the 1.5 m ring net northwards towards the Porcupine Bank where higher densities of mackerel eggs had been found in previous surveys, with a view to moving to a different working area.

The egg survey began at 0730 h 22 June and samples were taken in the ICES statistical squares along the shelf edge (see attached chart) to latitude 52°45'N and then westward to the southern edge of the Porcupine Bank (52°45'N 13°45'W). There were fewer early stage mackerel eggs in all these samples than there were in samples from the Great Sole Bank and a rod and line station close to the Porcupine Bank confirmed the absence of spawning mackerel.

CORYSTES then steamed southwards back towards the Great Sole Bank sampling for mackerel eggs at four further stations (see chart) to the east of the shelf edge. At the second station (51°11.94'N 10°45.14'W) significant traces were seen on the echo sounder and a surface haul with the FOTO trawl yielded about 120 baskets of scad and mackerel. Ovaries from spawning mackerel were collected from this haul and the batch fecundity sample completed (aim 4). The trawling commenced again on the Great Sole Bank and between 0931 h 24 June and 0200h 26 June two day-time and a single night-time series of hauls were completed together with the daily rod and line and ring net stations. On the 26 June a number of calibration tows were carried out with the 53 cm TTN at a range of speeds in order to compare the performance of external flowmeters. The trawling was resumed at 1700 h 26 June and a further two day-time and two night-time series of hauls were worked ending at 0900 h 28 June.

The 76 cm TTN was calibrated in the same manner as the 53 cm TTN during the remainder of the day and in the evening an attempt was made to replace the mackerel in one of the deck tanks that had been used in the atresia experiment. However, insufficient fish were caught to begin a fresh experiment and following a night-time surface haul with the FOTO trawl feathering was resumed the following morning (0600 h 29 June). Most of the day was spent feathering at several different stations in the vicinity and by 2030 h a sufficient number of fish (150) had been caught. That night (28/29 June) the weather deteriorated and with no sign of any immediate improvement it was decided to steam back towards the Scilly Isles and accommodate a late request to return live *Lophius* sp. to the laboratory. A 4 m beam trawl was substituted for the FOTO trawl and four hauls were made on the Labadie Bank (50°30'N 8°15'W) during the morning of 1 July. None of

these hauls was successful and CORYSTES continued eastwards reaching a position (50°39'N 5°50'W) north of the Scilly Isles at 1920 h 1 July. Six hauls were made in this area and 14 live anglerfish placed in a deck tank. Beam trawling finished at 0013 h 2 July and CORYSTES then steamed for Lowestoft docking at 0900 h 4 July.

AIM 1 (see attached table)

A total of 40 valid hauls was made with the FOTO trawl and 18 rod and line stations were worked during the cruise. On each occasion, where numbers permitted, ovaries from the first 30 fish were preserved for histological analysis. A preliminary inspection of the data suggests that there was a relatively low level of spawning, a higher proportion of spent fish and lighter catches than in previous years (CORYSTES 6B/91 and CIROLANA 6/92). Also, there was a higher proportion of male fish in the samples and catches by day, particularly on the surface, were much lower than in 1991 and 1992. these results are concomitant with the cruise taking place later in the spawning season than on previous occasions. Rod and line stations were most productive in the early morning (0500-0700 h) and evening (1800-2100 h), few fish were taken during the day.

These results, together with the fact that heavier catches of mackerel were taken in the night-time trawl hauls, are consistent with mackerel being distributed at the surface during the night and close to the bottom during the day.

AIM 2

This aim was not attempted because at no time was there a sufficient density of early stage mackerel eggs to make it worth while.

AIM 3

Mackerel were caught on rod and line close to the Great Sole Bank and approximately 120 were kept alive in each of the two 2 m diameter deck tanks. The resulting stress induces atresia. Ovaries were sampled every 2 days over a 14-day period to estimate the duration of the alpha atretic stage and preserved in formalin. However, as the male to female ratio in the tanks was often as high as 4:1 the tanks had to be replenished on four separate occasions. These results will provide a correction to the annual egg production method for estimating the spawning biomass of mackerel. One of the deck tanks full of mackerel was transported to the laboratory after docking and the fish transferred to laboratory tanks for further sampling.

Egg traps were attached to the outflows from the deck tanks and these worked well. One of the traps yielded 340 g on the day after the fish were captured (19 June), declining to zero after 5 days. When the tanks were restocked later in the cruise, fewer eggs were produced.

AIM 4

A total of 56 mackerel ovaries containing hydrated oocytes was preserved in formalin for the estimation of the batch fecundity. This parameter is used in the daily egg production method for

estimating the biomass of mackerel and this collection of ovaries will be used to study annual changes in the batch fecundity.

CALIBRATION OF TTN FLOWMETERS

Both the 53 cm and 76 cm diameter plankton samplers were deployed eight times over a range of speeds (3-6 knots) to study the effect of moving the external flowmeters from their original position, mounted on the side of the samplers, to a position beneath the sampler body. A preliminary analysis of the results indicates a reduction in flowmeter revolutions of between 5% and 8% when placed beneath the sampler. The acoustic doppler current profiler was run during each of these stations to give accurate water speed measurements.

1.5 m RING NET STATIONS

Early stage mackerel eggs were identified by towing a 1.5 m ring net slowly on the surface and a total of 19 stations was worked. Large numbers of fish eggs were collected on some stations, the majority of which were boarfish (*Capros aper*). Few mackerel eggs were found at any of the stations but most were found in the area of the Great Sole Bank. Nearly all the eggs were in later stages of development. Three stations were carried out in hours of darkness and all gave plankton abundances in excess of ten times that found during the day.

A total of 68 mackerel eggs in all developmental stages was individually removed from samples, placed in solvent and frozen for lipid analysis (C Fox).

OTOLITHS

Otoliths were collected from 50 mackerel below 25 cm in length and 50 mackerel above 25 cm in length for mineral analysis and stock discrimination studies (M Walsh, SOAFD).

MISCELLANEOUS OBSERVATIONS

1. Twelve blue sharks (*Prionace glauca*), weighing 5-27.5 kg, were caught on rod and line. The stomach contents of three were investigated and two were feeding on mackerel.

2. Half a basket of the salp *Thetys vagina* (Salpidae) was caught in deep water close to the Great Sole Bank.

M Greer Walker
(SIC)
7 July 1993

SEEN IN DRAFT: R Taylor
W May

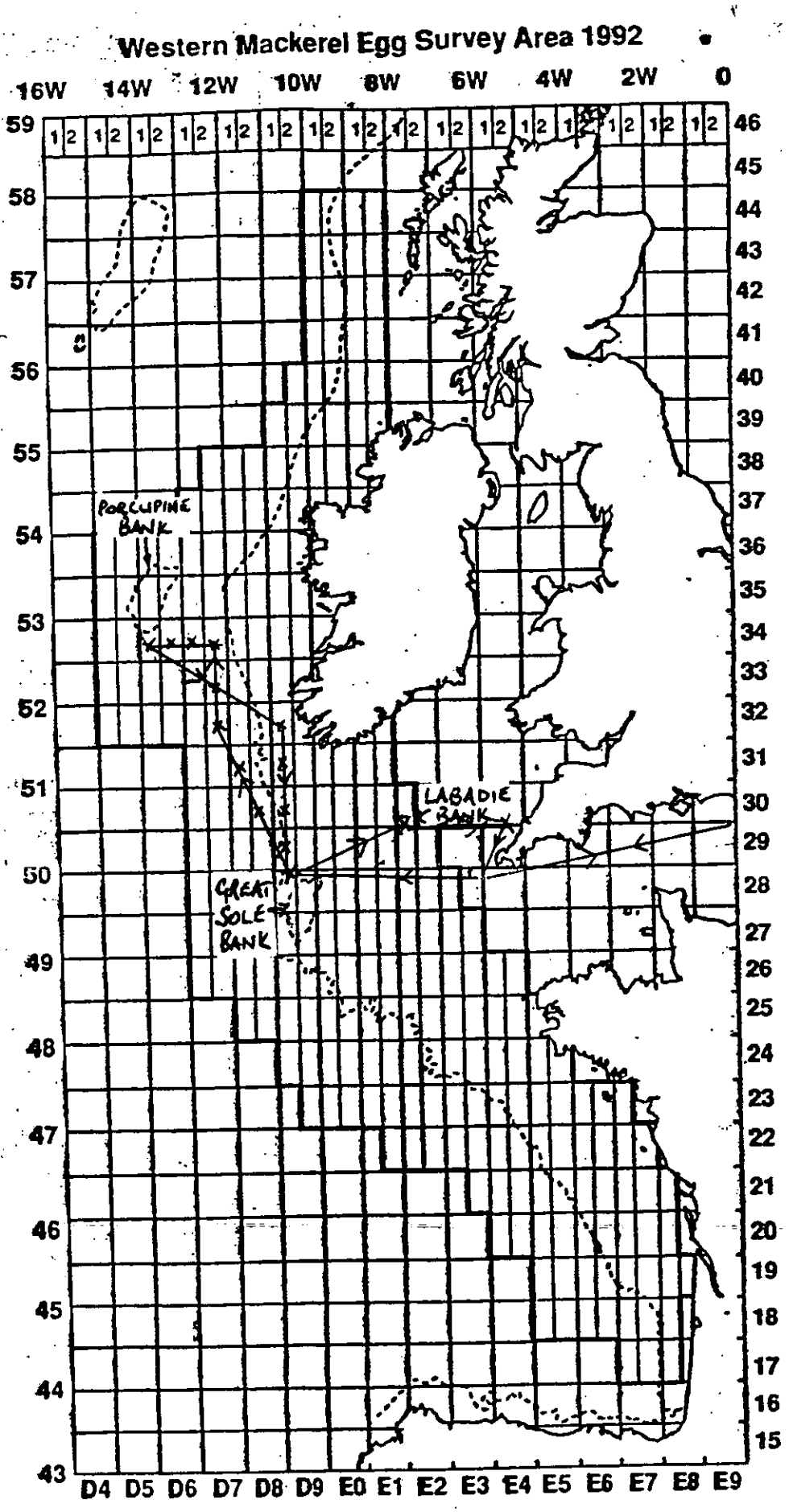
INITIALLED: JH

DISTRIBUTION:

Basic list +
M Greer Walker
P R Witthames
S P Milligan
C L Whiting
R P Flatt
Ms R T Harrop
C Fox
M Walsh, SOAFD
M Priede, University of Aberdeen
J Molloy, Dublin
G Eltink, RIVO

Table: The weight (kg) of mackerel caught by FOTO trawl at the surface, 50 and 100 m depth by day and by night

Day			Night		
Depth (m)	No. of hauls	Mean weight (kg)	Depth (m)	No. of hauls	Mean weight (kg)
0	6	1.5	0	8	240.0
50	9	1.3	50	4	25.1
100	9	1.8	100	4	12.3


Western Mackerel Egg Survey Area 1992
16W 14W 12W 10W 8W 6W 4W 2W 0
59 58 57 56 55 54 53 52 51 50 49 48 47 46 45 44 43
46 45 44 43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15
D4 D5 D6 D7 D8 D9 E0 E1 E2 E3 E4 E5 E6 E7 E8 E9
PORCUPINE BANK
LABADIE BANK
GREAT SOLE BANK