CRUISE: CIRO 4_01

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DURATION: 24 April – 20 May 2001 (All times are GMT)

LOCATION: Shelf edge west of Ireland, Celtic Sea and northern Biscay

AIMS:

1. To conduct a plankton survey using a 53cm Gulf VII plankton sampler to determine the distribution and abundance of mackerel (*Scomber scombrus*) and horse mackerel (*Trachurus trachurus*) eggs in the western spawning area.
2. To sample adult mackerel for the estimation of fecundity and atresia using pelagic and semi-pelagic trawls.
3. To take ovary and otolith samples from all mature hake (*Merluccius merluccius*).
4. To study the production of atretic oocytes in captive populations of live mackerel caught with barbless hooks.
5. To study the effect of post mortem changes on the histology of mackerel ovaries.

These aims are in support of the ICES co-ordinated international mackerel and horse mackerel egg survey. This cruise is partially funded by the EU (C1237) in support of the tri-ennial assessment of these stocks.

NARRATIVE:

RV CIROLANA sailed from Lowestoft at 10:00h 24 April. A phone call from the Scottish vessel, RV Scotia, shortly after sailing indicated that two lines of plankton stations had not been surveyed between 48ºN and 49ºN by either RV Scotia (working to the north), or the Dutch vessel (RV Tridens, working to the south). RV CIROLANA therefore headed towards a line of plankton stations crossing the shelf edge at latitude 48º 45'N.
A trial deployment of the FOTO trawl was carried out the following morning, south of the Isle of Wight. The opportunity was taken to attach new roller bearing swivels to each of the six bridles and Scanmar fixings to the wing ends and headline. After a successful deployment of the trawl, course was set for the first plankton station at 49º 15'N, 06º 15'W, *en route* to the first transect line (Figure 1).

Slow progress was made overnight and the following day, heading into a westerly swell on one engine. RV CIROLANA eventually arrived at the first station at 18:00h 26 April, but problems with power to the plankton winch delayed shooting for about one hour. During the first deployment it was apparent that there was not enough cable on either drum of the plankton winch (1000m had been requested) to enable the sampler to attain depths of 200 metres. This was a major problem which was only partially alleviated by reducing the towing speed to 4 knots on all subsequent stations.

Progress remained slow on the first transect line of stations until a second engine was switched in as the wind and swell increased during the 27 April. An attempt was made on the shelf break that evening, to catch live mackerel using lines and feathers (Stn 8) for aims 4 and 5. After 30 minutes only a few mackerel had been caught and with a deteriorating weather forecast it was decided to continue with the plankton grid.

Progress was slowed the following day by strong to gale force NW winds until the western end of the second line of plankton stations was reached at 49º 45'N, in the early evening. Plankton sampling continued during the 29 April until another feathering station (Stn 26) failed to catch any live mackerel at the eastern end of this transect. The FOTO trawl was deployed (Stn 27, Figure 2) at the surface after dark but few mackerel were caught and sampled.

Uncomfortable progress was made on 30 April as RV CIROLANA again headed west into a large NW swell and increasing winds at 50º 45'N. The FOTO trawl was deployed (Stn 36) after dark, off the shelf break. Five baskets of mackerel were caught which provided a useful fecundity/atresia sample from this area (Table 1).

Plankton sampling continued throughout the next few days as RV CIROLANA worked north, sampling on alternate east-west transects, reaching the most northerly row of stations (54º 15'N) on 3 May. The trawl was deployed at two stations (Stns 53 and 64) *en route* but catches were extremely light and no mackerel were sampled. Fair weather enabled good progress to be maintained on the northern half of the grid and RV CIROLANA then headed south completing the alternate rows of plankton stations not sampled on the steam north. The Foto trawl was deployed on the evenings of the 4 and 5 May (Stns 73 and 81) and although catches of mackerel were light, reasonable ovary samples were collected.

Fine weather enabled good progress to be maintained as RV CIROLANA worked her way west along latitude 52º 15'N, then south and east along 51º 15'N. A feathering station (Stn 89) was completed on the evening of 6 May but few fish were caught. During the afternoon of the 7 May it was decided to break from the plankton grid and steam back west in the hope of finding more fish on the shelf edge that evening. Only 13 mackerel were caught whilst feathering (Stn 96), but a Foto trawl (Stn 97) after dark produced 43kg of mackerel and 37 ovary samples were collected (Table 1). A further four plankton stations were completed the following day before RV CIROLANA docked in Cobh, Ireland at 16:00 to take on fresh water and exchange scientific staff.

RV CIROLANA sailed from Cobh at 09:30h 10 May and steamed south to the next plankton station at 50º 45'N, 07º 45'W heading towards the eastern end of a transect at 50º 15'N. One feathering station (Stn 104) was completed at dusk in an attempt to catch fish for aims 4 and 5, but no fish were caught. Plankton sampling continued the next day in slowly increasing southerly winds and swell. Feathering for mackerel (Stn 112) at dusk produced about 25 mature female fish which were kept alive in the deck tank for subsequent histological sampling. A Foto trawl (Stn 113) after dark over deep water off the Shelf enabled 22 ovary samples to be collected.

Plankton sampling continued in moderate SE winds over the next few days. Further feathering (Stn 130) and trawl stations (Stn 131) were completed close to the Shelf edge on 13 May but few fish were caught and sampled. Sampling progressed steadily southwards on east / west transects until 16 May when a trawl station planned for 04:00h, close to the Shelf edge had to be cancelled because of gale force SW winds and a large swell. Progress was slow overnight but the winds began to ease at daybreak as RV CIROLANA worked westwards over the shelf edge at 47º 15'N. Only 3 fish were caught at a feathering station (Stn 157) at dusk but the subsequent trawl station (Stn 158) captured 1.8 tonnes of fish, mainly horse mackerel but also nearly 400kg of mackerel.

The western end of the most southerly row of stations (46º 45'N) was reached in the early hours of 17 May. A feathering station (Stn 164) close to the Shelf edge in the afternoon produced about 25 small female mackerel which were kept alive in a deck tank and returned to Lowestoft. The following trawl station (Stn 165) caught few mackerel but did capture a 23kg sunfish (*Mola mola*) which was returned to the sea alive.

RV Cirolana continued plankton sampling the following day, working generally north-west up the eastern edge of the survey area, close to the coast of Brittany. The final station (48º 45'N, 06º 15'W) was completed at 19:45h, 18 May and RV Cirolana set course for Lowestoft, docking at 18:30h, 20 May.

RESULTS:

AIM 1: Plankton sampling.

A Gulf III type plankton sampler, fitted with a 20cm aperture nosecone and 270μm mesh net was used during this survey. A Guildline CTD attached to the sampler provided 'real time' flowmeter data as well as salinity and temperature profiles for each double oblique plankton station. Sampler deployment was limited to 150m depth and a towing speed of 4 knots because of lack of towing cable on the plankton winches (see above). It is therefore possible that some mackerel and horse mackerel eggs were not sampled.

150 plankton stations were completed, covering a large part of the 'Western' mackerel spawning area from 46º 45'N to 54º 15'N (Figure 1). Catches of plankton were heavy at times, particularly on the northern part of the grid, on the continental shelf where phytoplankton was abundant and off the shelf where large quantities of salps and jellyfish were encountered. Crude estimates of mackerel egg abundance were made at sea, which showed that highest egg densities appeared to be over deep water to the west of the shelf, particularly north of 51º N and south of 48º 30'N.

Discrete surface seawater samples were taken at alternate plankton stations to provide a salinity calibration for the Guildline CTD.

<u>AIM 2: Sampling for fecundity and atresia.</u>

A pelagic FOTO trawl was used throughout the survey to provide samples of mature female mackerel for fecundity and atresia estimations. The trawl was fitted with Scanmar wing-end/distance sensors and either headline height or depth sensors.

The trawl was towed for between 30 and 45 minutes depending on the quantity of fish expected. The FOTO trawl was deployed at 11 stations (Figure 2), throughout the sampling area with effort concentrated towards the shelf edge. The trawl was deployed at night at the

surface at all except one station (Stn 165) when it was deployed in daylight to 100m, on a slow double oblique tow.

Catches were generally very light except for station 158 when nearly 400kg of mackerel were caught. The number of mackerel ovaries collected for histological analysis of fecundity and atresia, are given in Table 1. Otoliths were taken from each fish where ovaries were sampled, and liver and gut weights recorded.

Table 1. Numbers of mackerel ovaries collected for atresia by Foto trawl station.

Station number	Total weight of mackerel caught. (kg)	Total number of mature females caught	**Number of mackerel sampled for atresia and fecundity**				
			<250 g	251 - 400g	401-550g	>550g	**Total**
27	5.48	6	6	0	0	0	**6**
36	124.80	280	3	8	5	4	**20**
53	0	0	0	0	0	0	**0**
64	0	0	0	0	0	0	**0**
73	18.78	29	6	10	6	1	**23**
81	36.50	135	11	10	5	0	**26**
97	43.10	89	11	11	15	0	**37**
113	44.00	31	3	5	10	4	**22**
131	18.44	32	10	3	1	0	**14**
158	387.20	718	5	5	5	5	**20**
165	13.18	5	4	1	0	0	**5**
		Totals	**59**	**53**	**47**	**14**	**173**

AIM 3: To take ovary samples from mature hake.
No hake were caught.

AIM 4: To study the production of atretic oocytes in live mackerel.
Feathering at 9 stations failed to catch sufficient mature female mackerel for the experiment. Instead, the fish caught were killed and used to develop a biopsy method to remove ovary tissue samples from live fish. A few live fish were returned to the laboratory to develop an anaesthetic method for use on later cruises to enable similar experiments to be carried out more effectively with fewer fish.

AIM 5: To study the effect of post mortem changes on the histology of mackerel ovaries.
Ovary samples were taken from each of 4 fish (caught using feathers) in spawning condition at 0, 1, 2, 5, 12 and 24 hours after death to study post mortem changes in histological structure.

Additional Aim: To test new Micro CTD's and compare results with the Chelsea CTD.
New micro CTD's have recently been purchased for use on trawls. Two of these CTD's (and associated software) were trialled, and the results compared to the Chelsea Instruments CTD which was used to continuously log sea surface temperature and salinity throughout the cruise. The micro CTD's were set to log every 10 minutes and were placed in the surface water outflow from the Chelsea instrument. Comparisons were made over 16 time periods of 24 hours throughout the cruise, with graphical results produced for Dr Millner. Unfortunately, aeration in the conductivity cells of the micro CTD's caused the salinity data to be unreliable

and intermittent. This problem proved difficult to overcome but it is hoped that aeration will not occur when these CTD's are deployed on trawls. The temperature data from the micro CTD's showed the same trends as the Chelsea instrument with maximum differences of around ±0.2°C. The two micro CTD's gave extremely comparable results.

S. Milligan
Scientist In Charge
20 May 2001

SEEN IN DRAFT

Master: Capt. A. Reading
Senior Fishing Mate: Mr. B. Salter

INITIALLED: Dr. R. Millner

Figure 1. Cirolana 4/01. Positions of plankton stations (station number above), also showing approximate position of the 200m isobath.

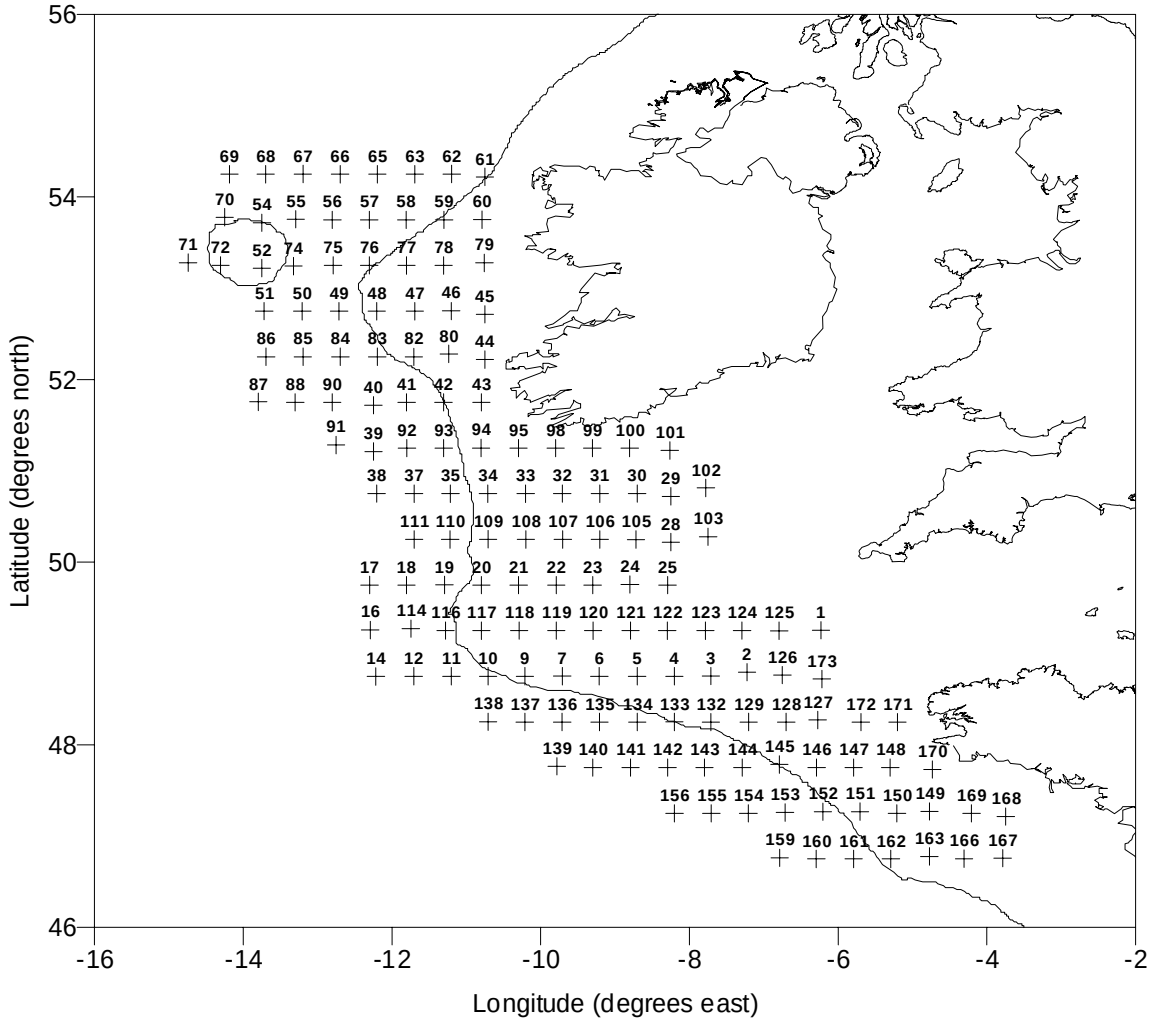

Figure 2. Cirolana 4/01. Positions of Foto trawl (+) and feathering (o) stations. Station numbers are shown to the left of symbols for FOTO trawls and to the right for feathering. Approximate position of the 200m isobath is also shown.