CENTRE FOR ENVIRONMENT, FISHERIES AND AQUACULTURE SCIENCE LOWESTOFT LABORATORY, SUFFOLK, NR33 0HT

2010 RESEARCH VESSEL PROGRAMME

REPORT: RV CEFAS ENDEAVOUR: CRUISE 5/10.

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DURATION: 3 - 14 March 2010

LOCATION: Irish Sea

AIMS:

1. To conduct a plankton survey using a 76cm Gulf VII plankton sampler to determine the distribution and abundance of cod (*Gadus morhua*), haddock (*Melanogrammus aeglifinus*) and plaice (*Pleuronectes platessa*) eggs.
2. To remove fish eggs from fresh plankton samples at sea. To measure, stage and preserve these eggs individually, in ethanol prior to species identification using a DNA technique on return to the laboratory.
3. To sample adult plaice, cod and haddock for the estimation of fecundity and atresia using a semi-pelagic trawl.
4. To sample adult haddocks and carry out incubation experiments on board.
5. To collect surface nutrient and salinity samples at selected plankton stations (every two stations).
6. To collect surface chlorophyll samples at selected plankton stations (every two stations).
7. To collect supplementary sub-surface environmental data using an ESM-2 self-logging package mounted on the Gulf VII plankton samplers.
8. To collect fine mesh (80 micron) PUP net samples for subsequent zooplankton analysis on every Gulf VII deployment.
9. To continuously log sub-surface (3m) salinity, temperature, fluorometry and other environmental data using the 'Ferrybox'.
10. To use multi-beam acoustics to provide information on the distribution of pelagic fish and plankton patches
11. To attempt recovery of data-logger and valeport lost during previous cruise 02/10.

NARRATIVE:

RV CEFAS ENDEAVOUR sailed from Belfast at 10:30h on 3rd March 2010. A test of the Gulf VII plankton sampler was completed before reaching the first station. Both main and external flowmeters seemed to be working perfectly well, however we could not get the Pup flow meter to work during the testing process despite using new cables and flowmeter. The Pup flowmeter proved to be temperamental on the previous two cruises and it was decided to wait till we reach the first station and the Gulf is put in the water.
During that time, the CT room was also prepared in view of incubation experimental work (aim 4).
Plankton sampling with the Gulf VII (aim 1) began at 13:30h 3 March 2010, at 54º 35'N, 05º 25'W (Fig 1, Stn 58). The plankton sampler was equipped with a Valeport CTD, a self-logging environmental package (ESM2 logger) and a fine 80μm mesh, 'Pup' sampler, which collected supplementary environmental data and biological samples at each station (aims 7 and 8). However, this first station had to be aborted in mid-sampling as a result of data feed malfunctioning. The sampler was taken back on board and the Valeport CTD changed. The gear was further tested and after positive results, the same station was sampled again at 14:50h. Although the datafeed proved to be temperamental we managed to complete the sampling of the first station (Fig 1, Stn 58) and the opportunity was taken to show all scientific staff the sample handling process for each of the forthcoming plankton survey stations. Following each plankton station, fish eggs were removed from the fresh sample, then measured and staged. If the eggs were the required size and stage, they were individually preserved in ethanol for subsequent species identification using a DNA technique, back at the laboratory (aim 2). At every second station, surface seawater was taken from the clean seawater supply for subsequent salinity, Chlorophyll-a and nutrient analysis (aims 5 and 6). Unfortunately further testing of the Valeport CDT was unsuccessful and we had to suspend sampling. The problem of data feed loss could not be solved easily and at 18:00h it was decided to head to the location 12 nm away where the CTD and Valeport were lost during cruise Cend 02/10 (Fig 1, Stn 56), and attempt their recovery (aim 11). 2 grapples were lost during the process but at around 23:30h 3 March 2010, the lost sampling unit with complete CTD and data-logger units were recovered. At first sight the electronic equipment seemed to be in good shape but will be tested during the cruise to attempt recovery of the data from the data-logger. Work was stopped for the night and preparations were made to fish for pre-spawning cod, haddock and plaice for fecundity estimation (aim 3) and incubation experiments (aim 4).
On 4th March 2010, trawling started at 7:45h making our way from station 56 to the South of the Isle of Man (Fig 1, stn 47). The first trawl was 30 min long and 1 mature female adult cod was caught, from which ovary tissue was sampled (aim 3). Another 3 bottom trawls were carried out; each lasting 30-45 mins. On the last trawl (near stn 47, Fig 1), 2 pairs of haddocks were caught and incubations experiments were started at about 13:00h (aim 4). Incubations were carried out in a CT room throughout the course of the cruise. Following fertilization, developing haddock eggs were kept in tubes at temperatures ranging from about 3.8°C to 11°C. A few eggs were extracted and staged every 6-8 hours from each tube to follow their development. Once development stage 2 in most eggs was achieved, eggs were checked every 12 hours until the end of the cruise. 9 mature haddock females, 1 adult cod and 1 adult plaice were also caught and ovary samples were taken from these fish (aim 3). Throughout the morning effort were also directed to fix the Valeport CTD and after the last successful fishing trawl it was decided to revert back to plankton sampling. A first test dip was carried out at 13:10h. Most equipment, including data-feed and Main, external and Pup flowmeters were

working satisfactorily. However the altimeter was not working but it was decided to resume sampling along the grid stations, starting with Stn 47 at 15:00h. We started our way eastward through stations 48, 49, 3, 4, 1, 2, 50. The Pup flowmeter stopped working after a few stations and it was decided to keep on taking Pup samples, thinking we should be able to estimate these from the internal and external flowmeter counts. In the meantime incubation work continued but proved extremely time consuming and was slowing down sampling on the grid far to much for us to continue in the same way. In the morning of 05 March 2010 we decided to revise slightly the experimental protocol for the incubation experiments so as to be able to go through the grid at an acceptable pace: observations of egg development were made every 8 hours until they reached stage 2 and we only checked one of the replicated tubes. We carried out working under perfect weather conditions through stations 51, 52, 53, 54, 55, 56, 57, 59. On March 6 2010 we reached station 60 and carried on in South of Scotland, still under perfect weather conditions going through stations 61, 72, 63, 66, 67, 68, 65, 64, 71, 70, 69, 77, 76, 75. On March 7, we continued making our way South, going through stations 74, 73, 46, 83, 82, 81, 80, 79, 78, and toward Liverpool bay through stations 89, 88, 87, 86, 85, 84, 95. On station 94, the Valeport software crashed for 30 seconds in mid flight, but after looking into the file it was decided not to redo the station as flowmeter rates for the missing time can easily be extrapolated. We continued on March 08 2010 during the day through stations 93, 92, 91, 90, 101. It was decided to move station 102 a few miles north-west as a result of it being too shallow in low tide. Stations 100, 103, 104, 99, 98, 105, 106, 97, 96, 107 were sampled. We then moved north toward the Isle of Man sampling through stations 30, 37, 45. We continued west south of the Isle of Man towards the Irish coast going through stations 44, 43 and 42. We carried on working going through stations 8, 7, 6, 11, 10, 9, 41, 40; and by morning of March 10, 2010 we were at station 39, still working our way south and east to west. Stations 36, 35, 34, 14, 15, 19, 13, 12, 17, 18, 19, 20 were sampled on that day still under exceptional weather conditions. On March 11 2010, we reached station 33 and completed our last stretch of the grid going through stations 32, 31, 29, 28, 27, 21, 22, 23, 24, 25. The plankton grid was completed on March 11, 19:40h with station 26 (Fig. 1).

On 12th March 2010, trawling started at 6:45h at position 53°29’365N, 005°46’499W (Fig 1) in order to obtain more fecundity samples from female cod, haddock and plaice (aim 3). The first trawl was 1hr long and 2 female cod, 1 female plaice and 20 female haddock were caught and their ovaries sampled. Another 6 bottom trawls were carried out in the same area; each lasting 1hr. Very large female cod were caught in the course of the day. A final oberservation was carried out on incubated haddock eggs and in both sets of incubation eggs were hatching in the warmest tubes. Work was completed at 20:36h.

CEFAS ENDEAVOUR then steamed overnight towards Swansea where she docked at 15:15h, 13 March 2010.

RESULTS:

Aims 1 & 8:

A Gulf VII plankton sampler, fitted with a 40cm aperture nosecone and 270μm mesh net was used during this survey, with an auxiliary 80μm mesh ‘Pup’ net attached. A Valeport CTD mounted on the sampler, provided ‘real time’ flow-meter data as well as salinity and temperature profiles for each double oblique plankton haul.

106 plankton stations were completed, covering the whole Irish Sea from 53º 00'N to 55º 00'N (Fig. 1), with 270μm samples being collected on each station. The pup sampler flowmeter

data were only available on the first few stations unfortunately, but it thought possible to model the Pup flow rate using the data from the main and external flowmeter and Pup flowmeter rates from previous surveys. The Valeport CTD system was controlled and logged by new Lab-view software developed by A. Emery.

Aim 2:

The 270μm net samples were examined whilst still fresh at sea. Fish eggs in early development stages and between 1.1 and 1.75mm diameter were removed and individually preserved in ethanol (Fig. 2). A total of 3997 eggs were obtained during this cruise, for subsequent species identification using a DNA technique.

Aim 3:

A Portuguese High Headline Trawl (PHHT) was used on 12 occasions (Figure 1) to try to provide samples of mature female cod, plaice and haddock for fecundity estimations. The trawl was towed for 30min to 1hr each time and overall we collected 25 Cod, 40 haddock and 6 plaice fecundity samples.

Aim 4:

2 pairs of haddock were caught on 4th March 2010. From these eggs and sperms were extracted and mixed in a bowl in 2 batches. Fertilization started at about 1:00pm and the 2 sets of eggs with sperm left to rest for 1 hour. Eggs were put in tubes in the incubation block in the CT room, with temperature ranging from about 3°C to 11°C. 2 replicates were done for each set of eggs. Regularly, a few eggs should be removed from each tube, all staged and preserved in formalin. The experiment ran throughout the cruise and on 12th March 2010, eggs in the warmest tubes were hatching.

Aims 5 & 6:

A total of 53 discrete sub-surface seawater samples were taken from the ships clean seawater. They were taken at every ESM2 logger, profile station and at every other plankton station. These samples were collected for subsequent nutrient, salinity and chlorophyll analysis back at the laboratory.

Aim 7:

The ESM2 was mounted on the plankton sampler. This logger records a wide range of environmental parameters (temperature, salinity, fluorescence, oxygen, turbidity and light) together with some information on Gulf VII performance (pitch and roll).

Aim 9:

The Ferrybox was run continuously throughout the cruise, logging several environmental parameters (including temperature, salinity and fluorescence) from the ships sub-surface seawater supply. Discrete samples were taken automatically every day for subsequent nutrient analysis back at the laboratory.

Aim 10:

The 38 kHz, 120 kHz and 200 kHz echo-sounders were logged almost continuously (excluding very shallow areas) during the cruise to provide information on the distribution of pelagic fish and plankton patches.

Aim 11:

The datalogger, Valeport and Gulf-VII frame lost during cruise Cend02/10 as recovered on March 3rd 2010. All equipment was found to be in working order.

S. Pitois
Scientist In Charge
13 March 2010

SEEN IN DRAFT

Master: Capt. A. Simpson
Senior Fishing Mate: Mr. R. Reynolds

INITIALLED: Dr. M. Armstrong

DISTRIBUTION:
Basic List
M. Armstrong (Cefas, Lowestoft)
S. Milligan (Cefas, Lowestoft)
Steven Beggs (AFBINI, Belfast)
Pieter-Jan Schon (AFBINI, Belfast)
FCO (for Republic of Ireland)
MFA (Wales)

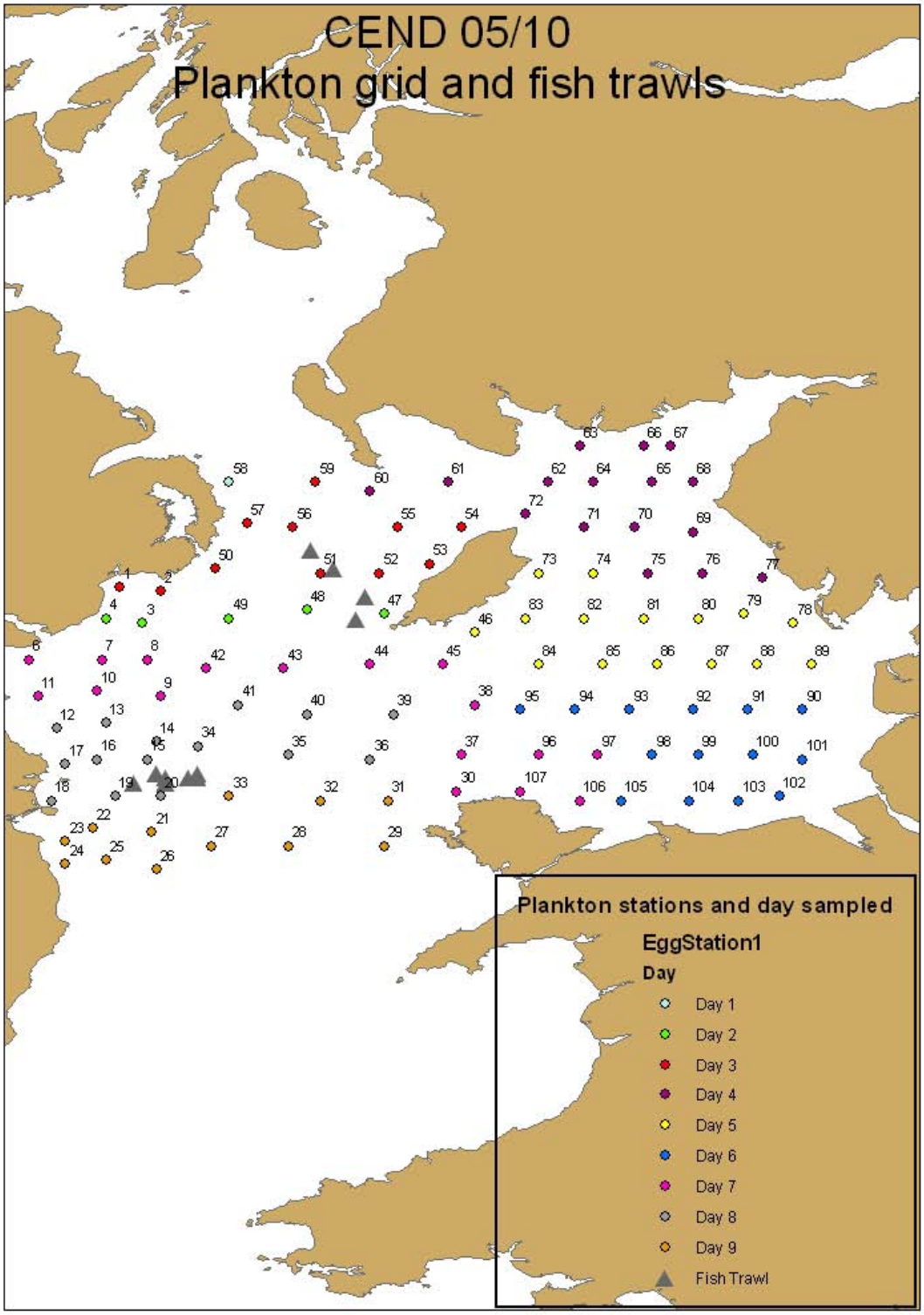
CEND 05/10
Plankton grid and fish trawls
Plankton stations and day sampled
EggStation1
Day
Day 1
Day 2
Day 3
Day 4
Day 5
Day 6
Day 7
Day 8
Day 9
Fish Trawl

Figure 1

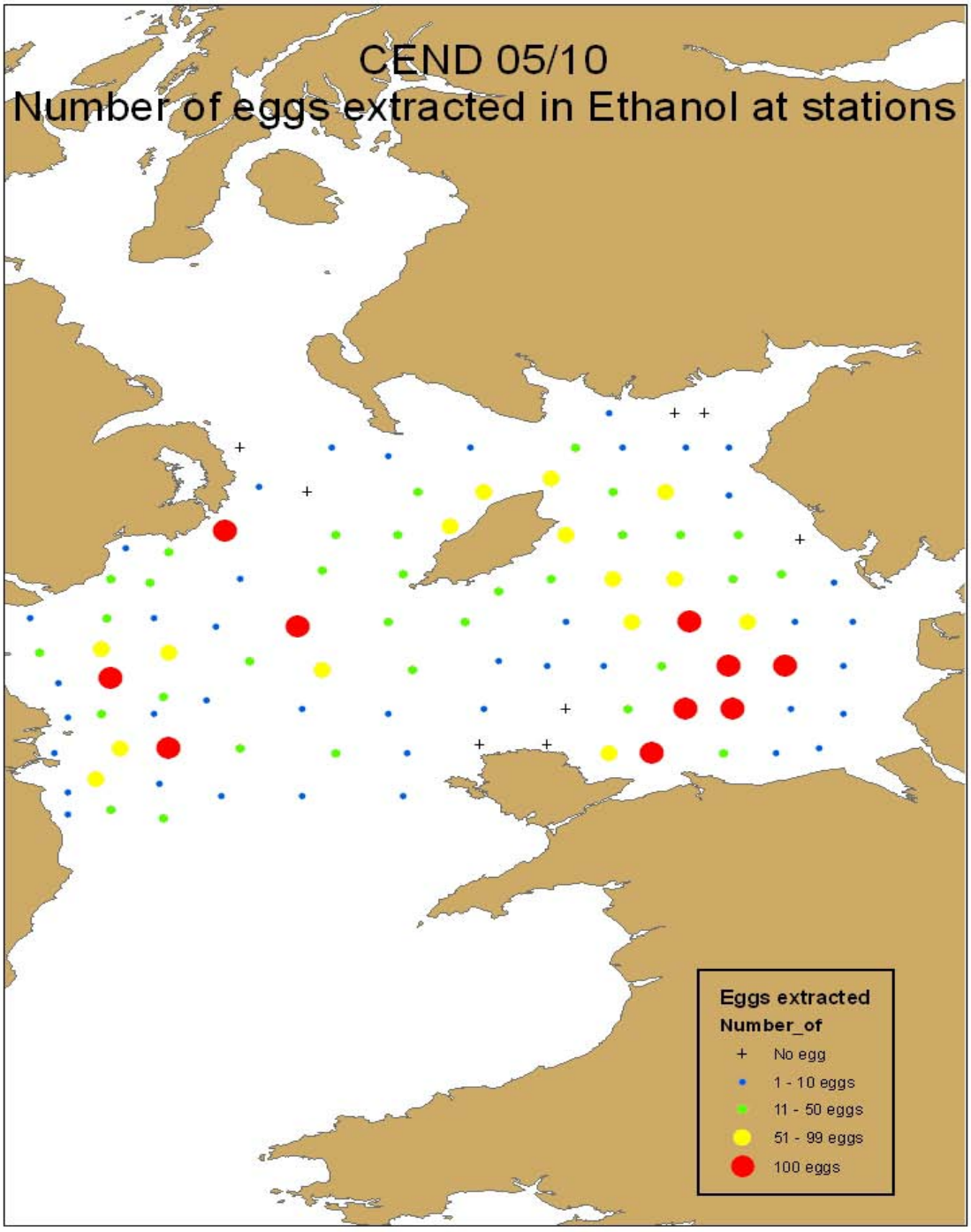
CEND 05/10
Number of eggs extracted in Ethanol at stations
Eggs extracted
Number_of
No egg
1 - 10 eggs
11 - 50 eggs
51 - 99 eggs
100 eggs

Figure 2