

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

**2009 RESEARCH VESSEL PROGRAMME**

**REPORT: RV CEFAS ENDEAVOUR: CRUISE 3/09.**

**STAFF:**

S. Milligan (SIC)  
M. Eade(2IC)  
S. Pitois  
N. Taylor  
C. Crisp  
C. Stewart  
W. Meadows  
J. van der Kooij  
O. Williams  
K. May  
S. Pearson  
C. Fox (SAMS)  
A. Albaina (Bangor University)  
A. Lewis (University of Southampton)  
C. Mangan (National University of Ireland – Galway)  
P. Tuffy (Irish whale and dolphin group)

**DURATION:** 19 - 28 February 2009

**LOCATION:** Irish Sea

**AIMS:**

1. To conduct a series of plankton surveys using a 76cm Gulf VII plankton sampler, Bioness multinet and hyperbenthic sledge to estimate the abundance and distribution of plaice eggs and larvae in the plaice spawning area in Liverpool Bay.
2. To use various trawls and acoustics to estimate the abundance and distribution of predators of plaice eggs and larvae in the plaice spawning area in Liverpool Bay.
3. To sample potential predators for detection of plaice eggs and larvae prey, using genetic probes.
4. To collect 60 live plaice (for return to Lowestoft) in an attempt to identify spawning signals in blood and otolith chemistry.
5. To collect and freeze '0' group cod for otolith studies.

**NARRATIVE:**

RV CEFAS ENDEAVOUR sailed from Belfast at 09:30h, 19 February and steamed towards a sheltered position off Dundrum Bay, N. Ireland, where calibration of the 38, 120 and 200KHz echo-sounders was begun at 14:00h. Favourable weather and tidal conditions allowed

successful completion of the calibrations by 20:30h when passage was made towards the main working area in Liverpool Bay.

Plankton sampling began at 06:00h, 20 February, north of Anglesey, and continued on short, north south transects, working east along the coast of north Wales (Fig 1, Aim 1). Persistent and irritating problems with the Valeport software logging system delayed progress. Eventually 8 plankton stations were completed before it was decided to abandon the plankton sampling until the problems could be resolved. A fine scale acoustics grid consisting of six NW-SE transects, 12nml long and 2nml apart was then begun at 23:30h (Figs 2&3, Aim 2). This was a repeat of a similar grid conducted last year on CEnd 4/08, and it continued until 12:00h, 21 February.

One further plankton station, and a Valeport test deployment were conducted before fishing with a Sandeel trawl began at 14:45h in an area of highest fish densities, around 53° 33'N, 03° 45'W (Fig 1) as indicated by the acoustics (Aims 2 & 3). Nothing was caught in the first trawl haul and a second haul at 18:00h captured only a few kilograms of sprats. Trawling (45min duration) continued both day and night every 4 hours, interspersed with trials of the Valeport software. Catches with the Sandeel trawl were generally very light, consisting mainly of sprat, and stomach samples were taken from each haul for subsequent DNA analysis (Aim 3). Fishing with the Sandeel trawl continued, in fine weather, until 07:00h, 23 February, when it was decided to swap to a Portuguese High- Headline Trawl (PHHT) in an attempt to capture a greater variety of fish species to sample for predation studies.

The PHHT was deployed for 20-30 minutes in the same area as the Sandeel trawl but produced much larger catches with over 1 tonne of fish, mainly herring and whiting being captured in each of the first two deployments. Trawling continued with good catches and stomach samples being taken every 4 hrs until a final haul was made at 14:00h, 25 February. The Bioness, multi-net plankton sampler was prepared during the day and was ready for deployment by 17:30. Several mechanical problems prevented samples being collected on the first three attempts. Eventually samples of plankton were obtained from 4 vertically discrete nets and samples frozen for subsequent DNA analysis of potential predators of plaice eggs or larvae. A second fine scale acoustics grid which overlapped the first grid, was begun at 22:30h (Figs 2&3).

The second fine scale acoustics grid was completed by 07:00h, 26 February. A final 12 station plankton grid was begun at the most NE station (Fig 1) at 08:30 to hopefully confirm the distribution of the plaice egg patch found during the first grid. Most of the Valeport software problems had been resolved in the mean time and a new SOP had been produced. Ten stations were successfully completed, working west along short north-south transect before a third fine scale acoustics grid was begun at 23:30h (Figs 2&3).

The third, fine scale acoustics grid was completed by 10:30h, 27 February close to a beam trawling position in Red Wharf Bay, Anglesey. Two short (15 minute), 4m beam trawl tows were made to capture live plaice for studies to identify spawning signals in blood and otolith chemistry. A successful Bioness deployment was made during the afternoon, before three further beam trawl tows were made on two positions off the N. Wales coast. These were completed by 19:45h with good numbers of live fish being collected as well as further stomach samples. The final two plankton sampling positions were then completed north of Anglesey by

23:15h and course was set for Swansea where RV Cefas Endeavour docked at 19:30h 28 February.

## RESULTS:

### Aim 1:

A Gulf VII plankton sampler, fitted with a 40cm aperture nosecone and 270µm mesh net was used on two grids of 9 and 12 stations respectively during this survey (Fig 1). A Valeport CTD mounted on the sampler, provided 'real time' flowmeter data as well as salinity and temperature profiles for each double oblique plankton haul. The Valeport CTD system caused numerous problems throughout the first grid, with valuable time being lost on almost every deployment and resulting in 3 stations not being completed.

The plankton samples from the first plankton grid were sorted roughly at sea to estimate the numbers of plaice eggs in each sample and to provide information on the likely distribution of predators. Relative egg densities are shown in figure 2.

An ESM2 environmental data-logging package was mounted on the rear of the plankton sampler. It provided an environmental data back-up to the Valeport CTD and will enable some cross-calibration of both systems. It also recorded a wide range of environmental parameters (temperature, salinity, fluorescence, oxygen, turbidity and light) together with some information on Gulf VII performance (pitch and roll).

A Bioness, multi-net plankton sampler was deployed on six occasions with good samples being collected on two of these. This is a complicated piece of equipment which requires careful handling. The good weather, which prevailed throughout the survey allowed safe deployment and several mechanical faults were discovered and rectified. Good standard procedures have been produced and the Bioness will become a valuable addition to Cefas' plankton sampling capabilities.

### Aim 2:

A pelagic Sandeel Trawl, which was towed for 45 minutes, was used to try to capture feeding sprats, herring and other potential predators in mid-water. The catches were extremely light from all 10 deployments and this gear did not appear to be any more efficient at capturing feeding fish than the PHHT.

A Portuguese High Headline Trawl (PHHT), which was towed for 20-30 minutes in areas of high egg and predator abundance (determined by the plankton and acoustics data), was fitted with a tickler chain and fine mesh liner. It was used on 14 occasions to estimate the distribution and abundance of predators of plaice eggs and larvae. The catches from both trawls were sorted into species, weighed and a representative length distribution obtained using the electronic data capture (EDC) system.

Recordings from the newly calibrated (this survey) EK60 scientific echosounder were used to describe the spatial distribution of relative density of fish and plankton during the plankton grids and during three high-resolution mini surveys covering the known spawning distributions of plaice in Liverpool Bay. Using the new virtual echogram module software, a number of algorithms were developed to distinguish between clupeid marks (herring and sprat) and two types of plankton. Figure 2 shows the distribution of clupeid schools and plankton densities for each nautical mile recorded during the plankton grid. Fisheries acoustics were also used *in situ* to locate high densities of pelagic species, targeted with the Sandeel and PHHT trawls to collect stomach samples of predators.

Single- and multi-beam acoustic data of the seabed were recorded continuously during the plankton and high-resolution acoustics grids. The data will be analysed at Cefas and used in combination with hydrographic data to define the prey (plaice egg) and predator (clupeid) environment.

Aim 3:

The stomachs of 1,752 individual fish, over the length range of each species, were removed and 375 whole invertebrate animals and 632 planktonic organisms frozen for subsequent DNA analysis to identify potential predators of plaice eggs and larvae. A summary of the numbers of stomachs taken by station, by species is given in Table 1.

In addition, approximately 30 sprats, 30 whiting and 30 herring were frozen whole from most trawl stations for visual examination of stomach contents at SAMS.

Aim 4:

About 160 plaice of both sexes and all stages of maturity were collected from both the PHHT and 4m beam trawl tows. These were returned alive to Cefas, Lowestoft to enable blood samples and otolith micro-chemistry to be examined for spawning signals.

Aim 5:

Two 'O' group cod were frozen for otolith studies being conducted by Dr C. Fox (SAMS).

Miscellaneous:

- a) A new 'Ferrybox' environmental monitoring system was run throughout this survey. This continuously logged a number of environmental parameters (including temperature, salinity, fluorescence) from the sub-surface (3m) seawater supply to the shipboard computer. It also sampled water automatically once every 24 hours for subsequent nutrient analysis. This equipment did appear to be reasonably robust and needed little attention. However, the in-line flowmeter did become blocked with sediment on one occasion which resulted in some loss of data before the system was thoroughly cleaned. Some improvements to the data screen, water filtration requirements and cleaning procedures will be suggested.
- b) Salinity sample were taken at each plankton station to provide samples for calibration of the Valeport CTD and ESM2 logger.
- c) An observer from the Irish Whale and Dolphin Watch group was on the lookout for cetaceans throughout daylight hours during the survey. No cetaceans were seen.

S. Milligan  
Scientist In Charge  
28 February 2009

SEEN IN DRAFT

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

INITIALLED: Dr. E. Hunter

DISTRIBUTION:

Basic List +

FCO (for Republic of Ireland)

Sea Fisheries Committees:

Cumbria

North Western and North Wales

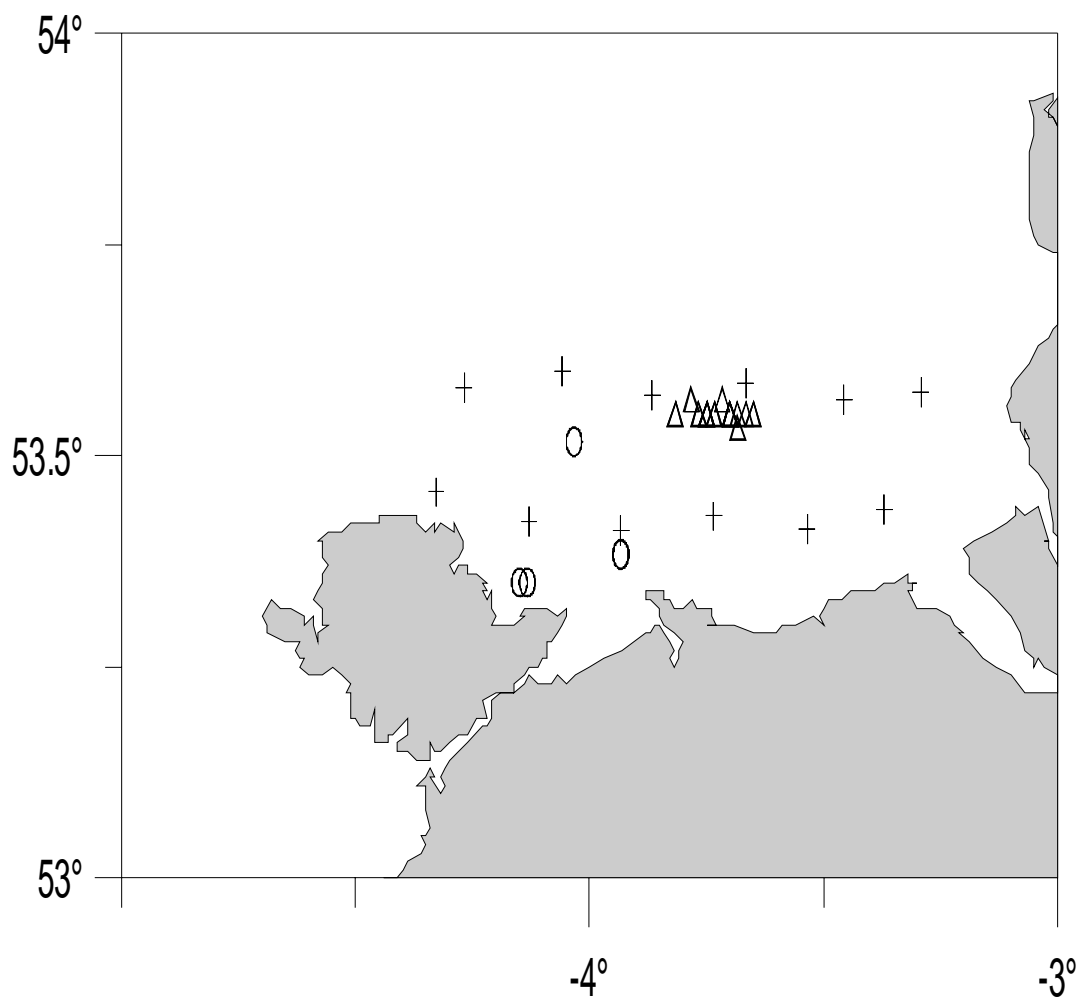
South Wales

Figure 1.

C Endeavour 3/09 19 - 28 Feb 2009

Plankton stations (+), Sandeel and PHHT Trawl stations (triangles)

4m Beam trawl positions (circles)



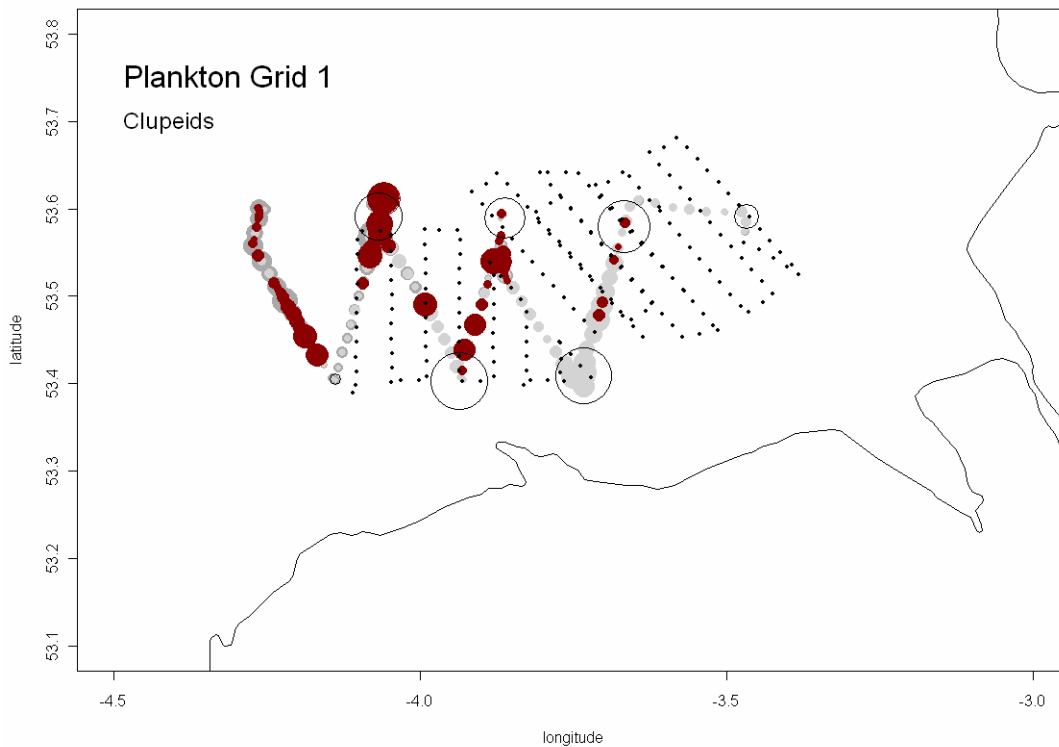


Figure 2. Acoustically derived Clupeid schools (red) and “plankton A” (dark grey) and “plankton B” (light grey) densities for each nautical mile as recorded during the plankton survey. Open circles represent the total uncorrected number of plaice eggs found in the plankton samples. Black dots represent the acoustic mini surveys undertaken afterwards (see Fig. 3, below).

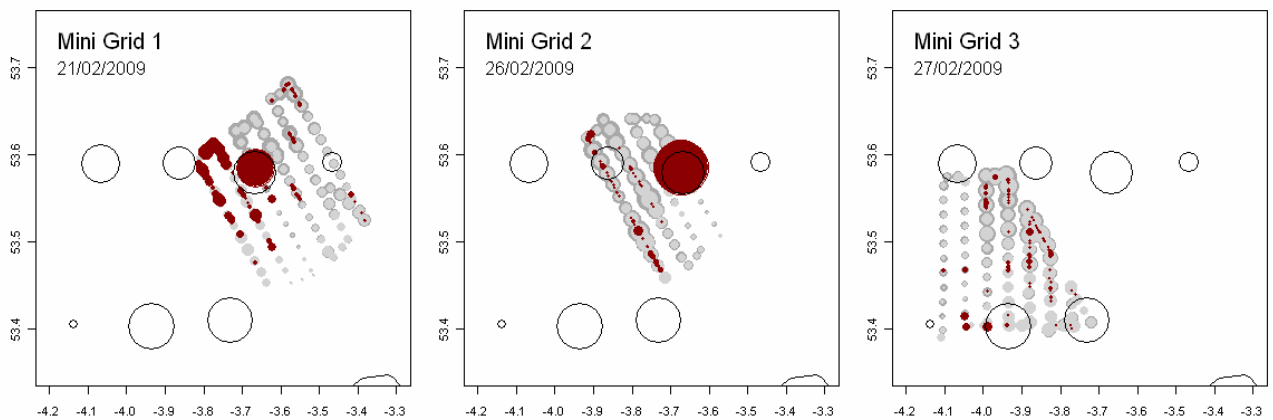


Figure 3: Acoustically derived Clupeid schools (red) and “plankton A” (dark grey) and “plankton B” (light grey) densities for each nautical mile as recorded during the mini acoustic survey 1, 2 and 3. Open circles represent the total uncorrected number of plaice eggs found in the plankton samples.

