

CRUISE REPORT

PROGRAMME: RV CEFAS CORYSTES: CRUISE 09/04

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DURATION: Sunday 4th July – Monday 19th July

LOCALITY: North Sea

AIMS:

1. To use acoustic & fishing survey methods to estimate the abundance and distribution of sandeels on sandeel fishing grounds on the North West Riff (Dogger Bank) & The Hills.
2. To use fishing survey methods to estimate the abundance and distribution of predatory fish feeding on sandeels on the on the North West Riff & The Hills.
3. To use fishing survey methods (Bongo net) to estimate the abundance and distribution of plankton on the sandeel fishing grounds on the North West Riff & The Hills.
4. To use QTC to aid in describing sediment type in relation to sandeel distribution and abundance on the sandeel fishing grounds on the North West Riff & The Hills.
5. To perform seabird surveys at sampling stations.
6. To perform side-by-side comparative sampling with RV Endeavour 08_04. Work will involve comparing the performance of biological sampling gears in shallow water (~20m; Grid 1, transects 1K & 1L), mid water (20-40m; Grid 1, transect 1G & 1H) and deep water (40m+; Grid 2, transect 2A & 2 B) water.

NARRATIVE: (All times are British Summer Time)

CORYSTES sailed at 1015 h on Sunday 4th July and steamed overnight to the Hills. A systematic survey for sandeels (Aim 1), sandeel predators (Aim 2), plankton (Aim 3) and seabirds (Aim 5), commenced at 0500 h the following day (5nd July) on Grid 2. Poor catches at the first four trawl stations resulted in the following adjustments being made to the Granton trawl before it was fishing satisfactorily: (i) altered door towing position, (ii) addition of a tickler chain, (iii) increasing the depth to warp length ratio (usually 3:1, but tried over 5:1), (iv) changed bridles from 10 to 15 fathom after a breakage of one 10 fathom (see also Fishing Skipper Report, B. Salter). Stations G1 to G3 and I1 were re-sampled over the subsequent two days.

Due to a storm, work stopped at 2100 hrs 7th July and recommenced 04:30 hrs on 9th July. An additional (minor) delay occurred due to the necessity for repairs after both the port and starboard side stops parted during Granton trawling. The decision was made to continue with the original work schedule and catch up on the missed stations during the side-by-side comparisons with CEFAS Endeavour.

On the morning of 10th July, Corystes headed to the North east to commence sampling on Grid 1. Westerly winds reduced the swell, considerably improving conditions for the acoustics survey. The belly of the Granton trawl was torn at station 1-E2, causing a delay while repairs were made.

The decision was made to cut out stomach sampling from station 1-C2 so that the trawl samples were completed before dredging started.

Work was curtailed again on the 11th July due to strong NW winds (5-6) and large swell making trawling unsafe. Corystes headed for overnight shelter in the lee of Flamborough head. Granton trawling recommenced at 1530 hrs the following day, with the survey continuing unhindered prior to the rendezvous with RV Endeavour on the evening of the 15th. After the transfer of staff, Corystes steamed to Grid 2 to continue sandeel dredging. Side-by-side comparisons between Corystes and Endeavour began on the acoustic line at Grid 2- H3, 0400 GMT on 16th. Low Granton trawl catches at stations H3 to H1 appeared to be due to poor bottom contact of the trawl doors. It is suspected that the new Dan Green trawl doors used by Corystes are considerably lighter than the ones on the Endeavour (see Fishing Skipper Report, B. Salter), which raises questions regarding the validity of comparison of vessels effects.

Side-by-side comparisons were completed at 07:30, 19th July, after which Corystes and Endeavour headed for Lowestoft, docking on the evening tide at 22:00 hours

METHODS

The survey area and strategy

Two survey grids were sampled independently. Grid 2 (54 6.0 N, 0 36.708 E to 54 16.8 N, 1 0.186 E) on the hills, and Grid 2 (54 29.4 N, 1 13.489 E to 54 40.2, 1 43.884 E) on the south western edge of the Dogger bank (Figure 1 & 2). Survey legs each 10.8 nm (20 km) long, spaced 1.9 nm apart (3.6 km) running north-south, with sampling stations space every 5.4 nm apart were defined for each grid.

Grid legs were surveyed alternately (i.e, C, E, G, I). Acoustic surveying for fish shoals was carried out using a split beam, dual frequency (38 & 120 kHz) scientific echosounder (EK500, Simrad) starting at 0400 h GMT (just after dawn) and proceeding at speeds of between 4 and 7 kts depending on weather. Ten minutes prior each sampling station, observations of birds numbers and activity was recorded. At each sampling station, CTD casts were taken in combination with plankton hauls made with a 0.5 m ring net (60 mpi) at each plankton station.

Following each acoustic survey, the sampling stations were sampled for potential sandeel predators (groundfish) using a standard Granton trawl with a 12 mm mesh liner, towed at 4 kts for 20 minutes through each trawl station. Starting at 22:00 hrs, each station was subsequently sampled using a 1.2 m sandeel dredge, towed for approximately 10 minutes at 3 to 4 kt. Accurate estimates of the duration of each tow were obtained from a temperature and depth recording data storage tag, programmed to record data every 10 s, attached to the head of the dredge.

Processing and recording

All samples were recorded adhering to defined protocols. Data was entered in to a central database and quality controlled by subsequent independent checking.

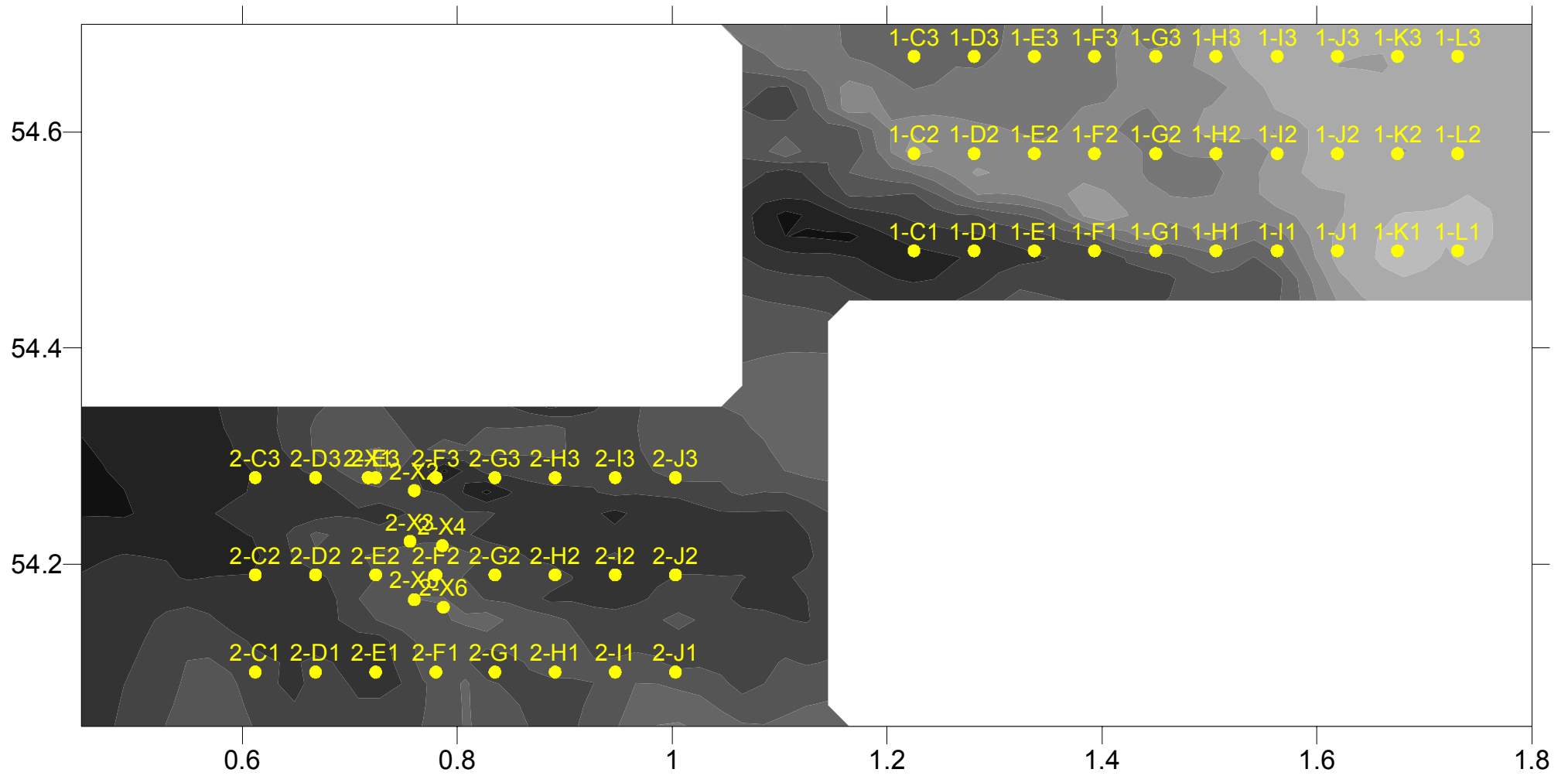
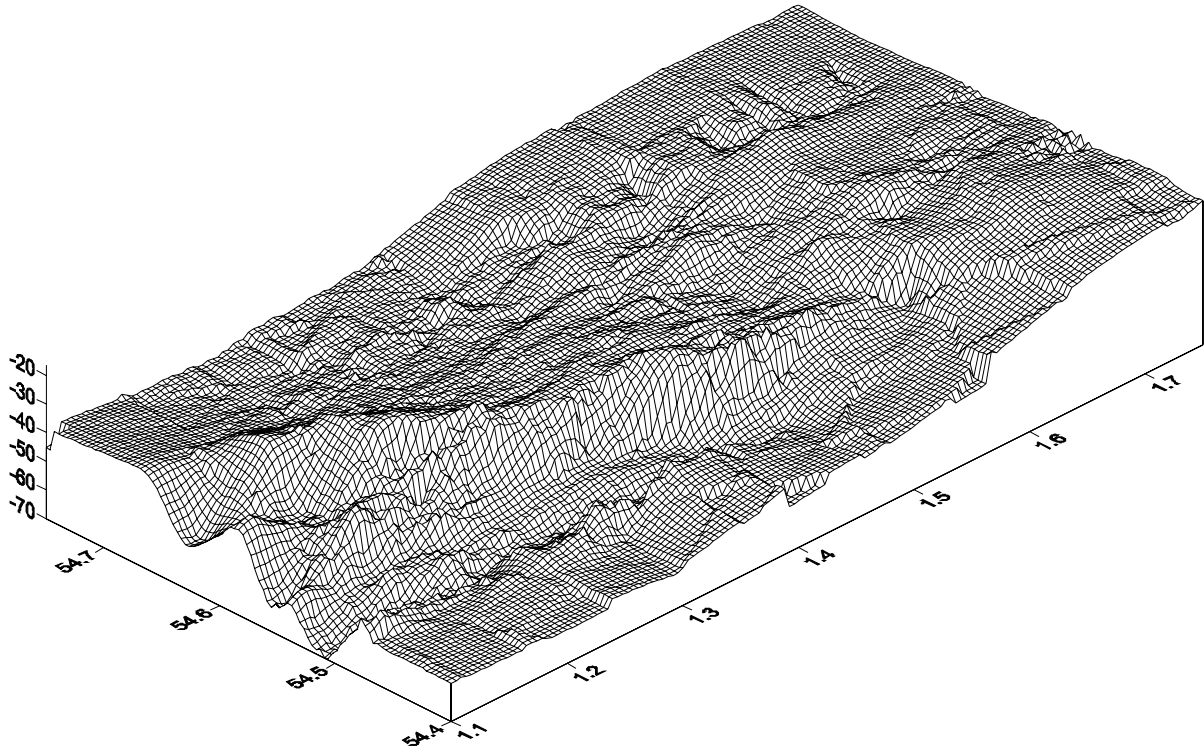


Figure 1. Survey transects and sampling stations

GRID 1 – Southwestern Dogger Bank



GRID 2 – The Hills

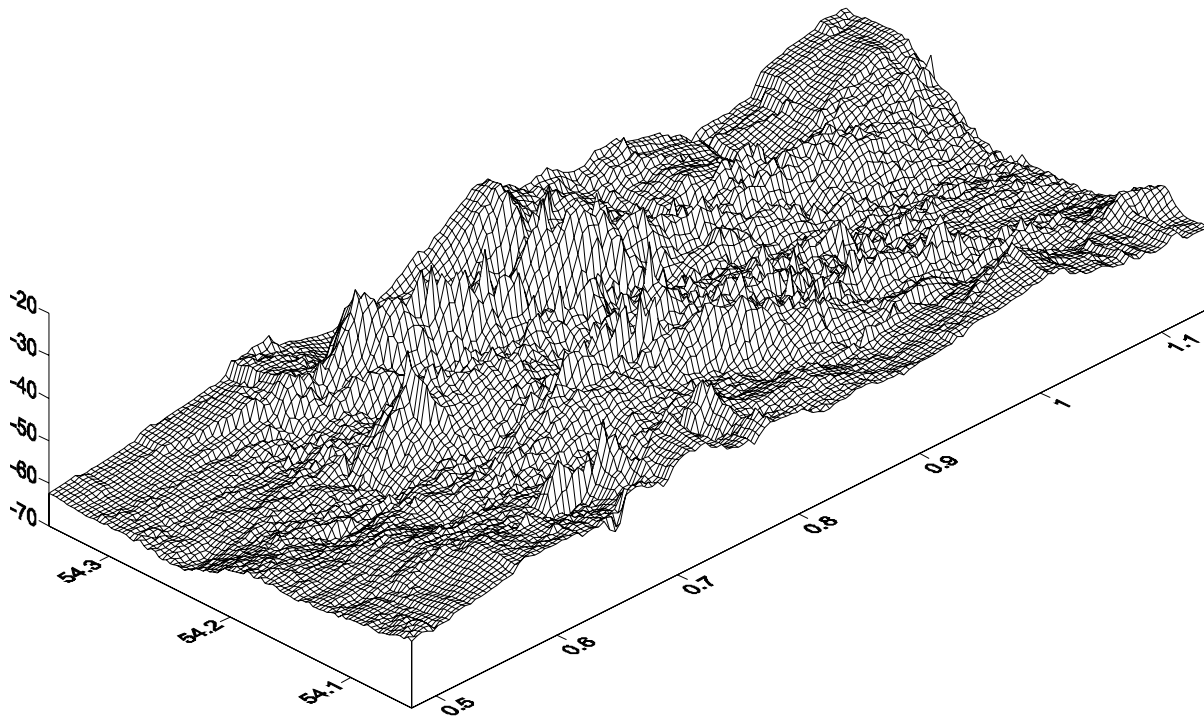


Figure 1. Bathymetry of survey grids recorded by Simrad EK500 echosounder. X-axis=Longitude, Y-axis=Latitude, Z-axis=Depth (m)

RESULTS

1. Acoustic survey

Acoustic methods were used to estimate the distribution and number of sandeels and other fish schools in mid-water in the study area (Table 1). There were no sandeel schools identified on Grid 2, and only a few (92) on Grid 1 (Fig 2). Using a mean sandeel weight of 8.35 g (from trawl and dredge samples) and measured in situ target strength of -64.16dB , sandeel biomass in Grid 1 was 946 t.

Table 1. Number of schools recorded in the water column during daytime

Acoustic class	Grid 1	Grid 2
Sandeel	92	
Clupeids	247	
Unknown	139	1213
Gadoid		21

In general, the acoustic ‘picture’ is very different to what has been observed in previous years during surveys conducted between April and June. The overall acoustic backscatter is very much higher, suggesting the presence of large volumes of small targets, probably comprising of fish larvae, crab larvae, zooplankton and squid. With the exception of discrete fish schools, many of the bands/ layers of acoustic targets are expected to comprise a ‘soup’ of all of the above. The typical descriptive ‘hallmarks’ used to help identify fish targets and classify them to species has not applied very well during this survey, and as such the acoustic estimates are subject to large uncertainty. To reduce this uncertainty it is essential that subsequent surveys perform directed fishing on acoustic marks for the purpose of identification.

On the afternoon of the 14th, Grid 1 H&K, an attempt was made to record single target echoes (TVG = 40LogR) at 120kHz, for use in sandeel biomass calculations. An estimate of -64.14dB @ 120kHz was derived, although once again there is large uncertainty in this estimate due to the difficulty in discriminating sandeel schools from other acoustic marks. Literature estimates suggest the target strength of sandeels at 120kHz may be lower at approximately -68dB . It is recommended that in the future, the analysis of acoustic surveys for sandeels is conducted at 38kHz, because of the better ability to identify single target echoes at this frequency and the availability of comparative estimates from the scientific literature. Discrimination of species should continue to involve the comparison of targets at both 38 and 120kHz.

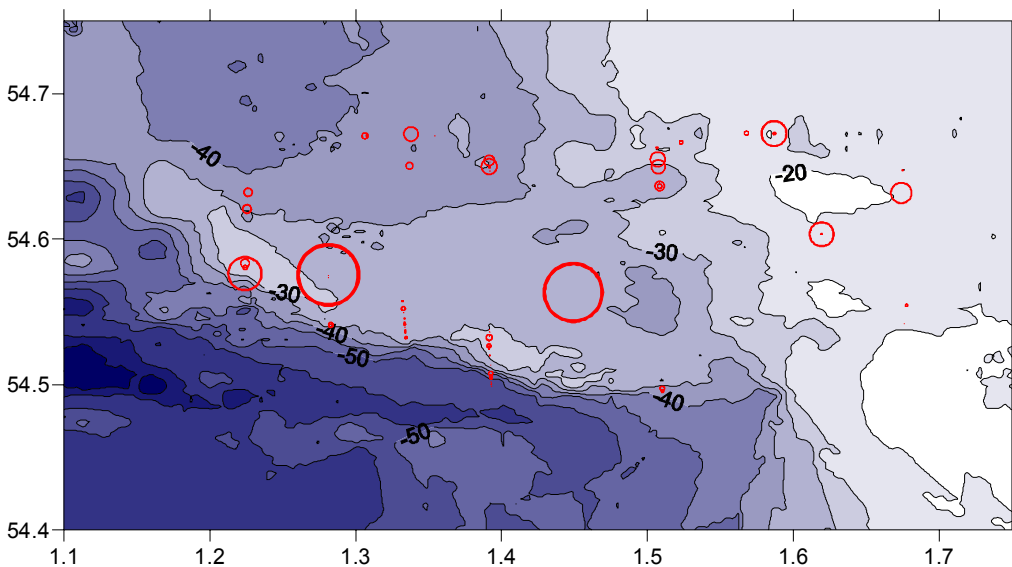


Figure 2. Sandeel schools on Grid 1. Size proportional to acoustic backscatter.

2. Birds, plankton and CTD

Observation on the number and activity of birds was recorded for each sampling station. Samples from plankton hauls were fixed in buffered formaldehyde for analysis at the lab. CTD records were downloaded and stored for later analysis of temperature and salinity profiles. Due to constraints resulting from loss of time due to poor weather, we were not able to take bird, plankton or CTD samples at the following stations: Grid 1 (J1-3, L1-3), Grid 2 (J-1-3, H1-3).

3. Granton trawl survey

Table 2 shows the catch numbers of most abundant species caught on the sampling grids in the Granton trawl. Overall, dabs were by far the most abundant. Twice as many dabs were caught on grid 1. Lesser weavers were second most abundant. An interesting feature is on grid 1 weavers were four times less common than dabs, whilst on grid 2 they were found in equal abundance to dabs. The relative abundance of species caught are shown in Figure 3.

Table 2. Catch numbers of most abundant species

Species	Grid 1	Grid 2
Dab	11410	5744
Leeser weever	2410	4857
<i>Gymnodytes semisquamatus</i>	1828	
Grey gurnard	1619	1787
Sprat	994	954
Solenette	893	28
Whiting	399	1082
Haddock	215	59
Lemon Sole	203	59
Plaice	141	391

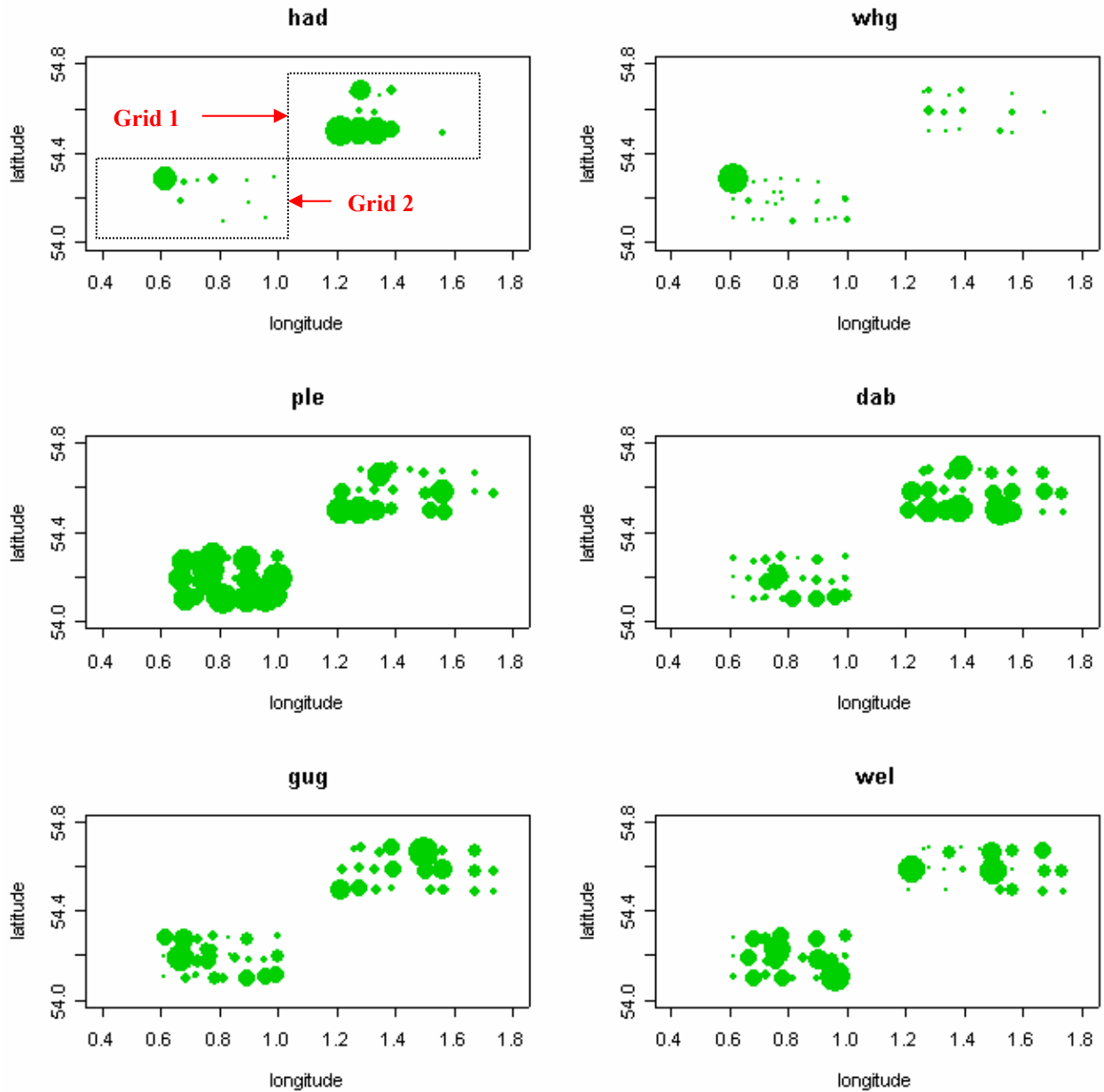


Figure 3. Relative numbers of haddock (had), whiting (whg), plaice (ple), dab (dab), gurnard (gug), lesser weever (wel) caught at each Granton haul station. Maximum size of circles represents largest numbers/tow within each species.

Over 3,600 individual fish were sampled for stomach content analysis, of which approximately 1/3 rd were empty. Table 3 provides a breakdown for the most abundant species sampled. Of those fish with full stomachs, plaice and weavers had the highest occurrence of sandeels.

Table 3. Number of stomachs sampled, empty and containing sandeels.

Species	code	number gutted	% empty	% sandeels in full stomachs
Grey gurnard	gug	1527	12%	6%
Lesser weever	wel	636	44%	11%
Plaice	ple	580	19%	15%
Whiting	whg	385	27%	8%
Haddock	had	172	17%	
Dab	dab	102	50%	
Cod	cod	58	7%	2%
Mackerel	mac	44	45%	
Greater sandeel	sal	41	93%	100%
Red mullet	mur	28	14%	
Poor cod	pod	15	13%	
Horse mackerel	hom	9	78%	
total		3612		

4. Dredge survey

Not confirming the results of the acoustic survey, more sandeels were found on Grid 2 (2683) than Grid 1 (1703) (Figure 4). Length frequency analysis revealed little differences in the sizes of sandeels caught on Grid 1 and Grid 2 (Figure 5). Otoliths samples for age/length determinations (5 otoliths per 0.5 cm size class) were taken.

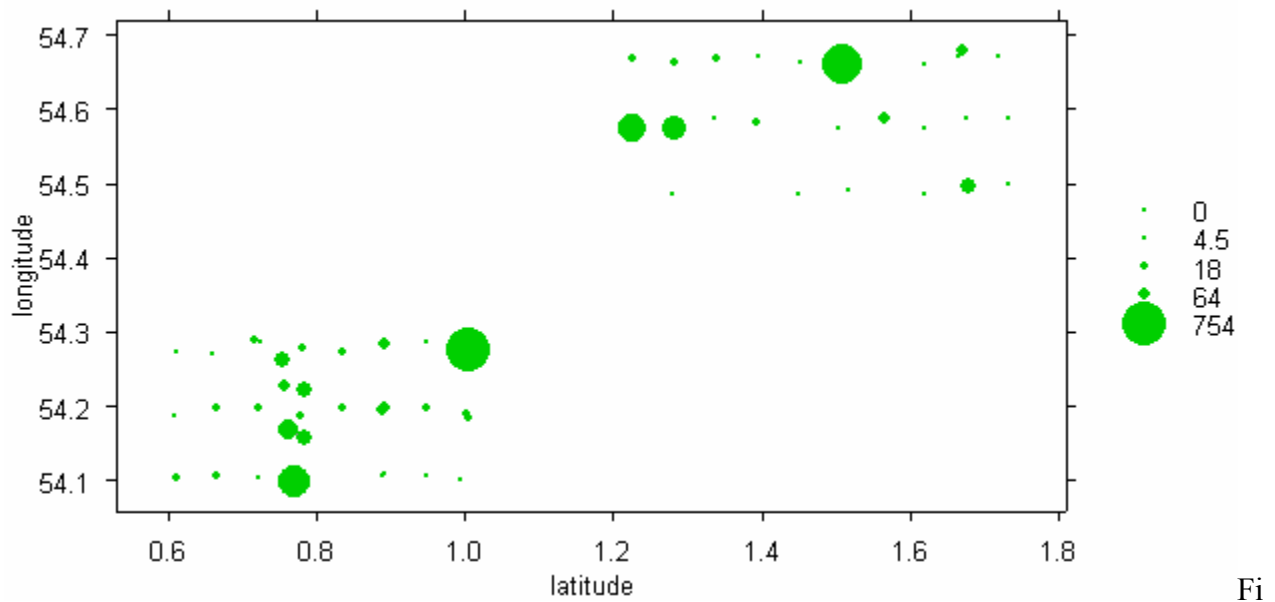


Figure 4. Numbers of sandeels caught per dredge station, symbol size scaled to the maximum numbers caught in dredge (maximum =754).

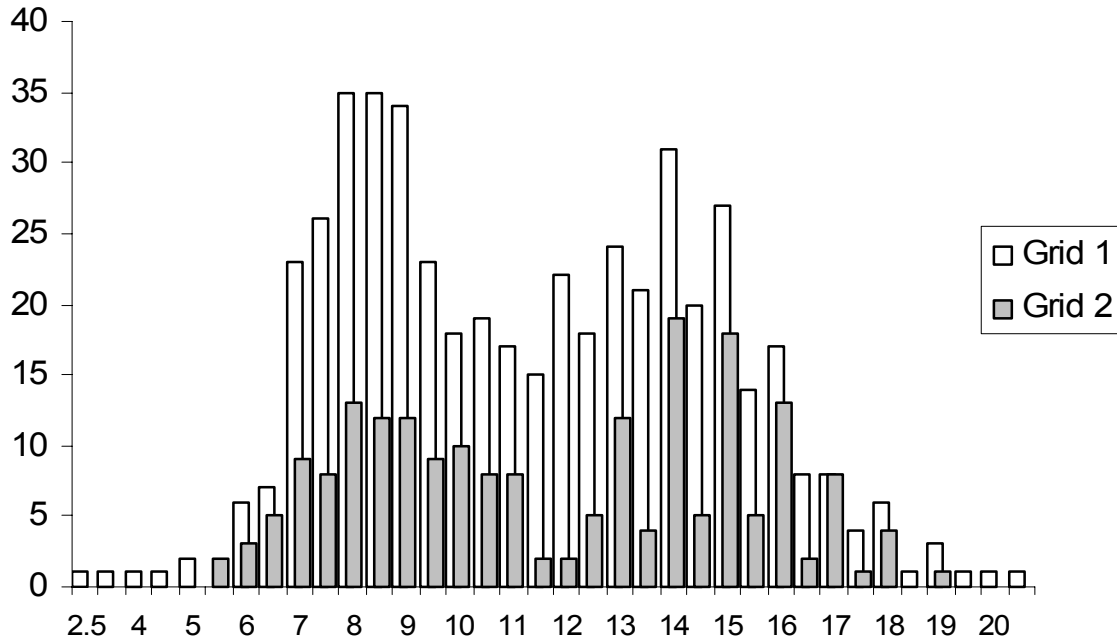


Figure 5. Length frequency distributions of sandeels (*Ammodytes marinus*) caught in the dredge grids 1 and 2, respectively. Note that frequencies do not reflect total numbers caught.

S. Mackinson
 19th July 2004

SEEN IN DRAFT: J Still, (Master)
 B Salter, (Senior Fishing Mate)

INITIALLED: ECEP

DISTRIBUTION:

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