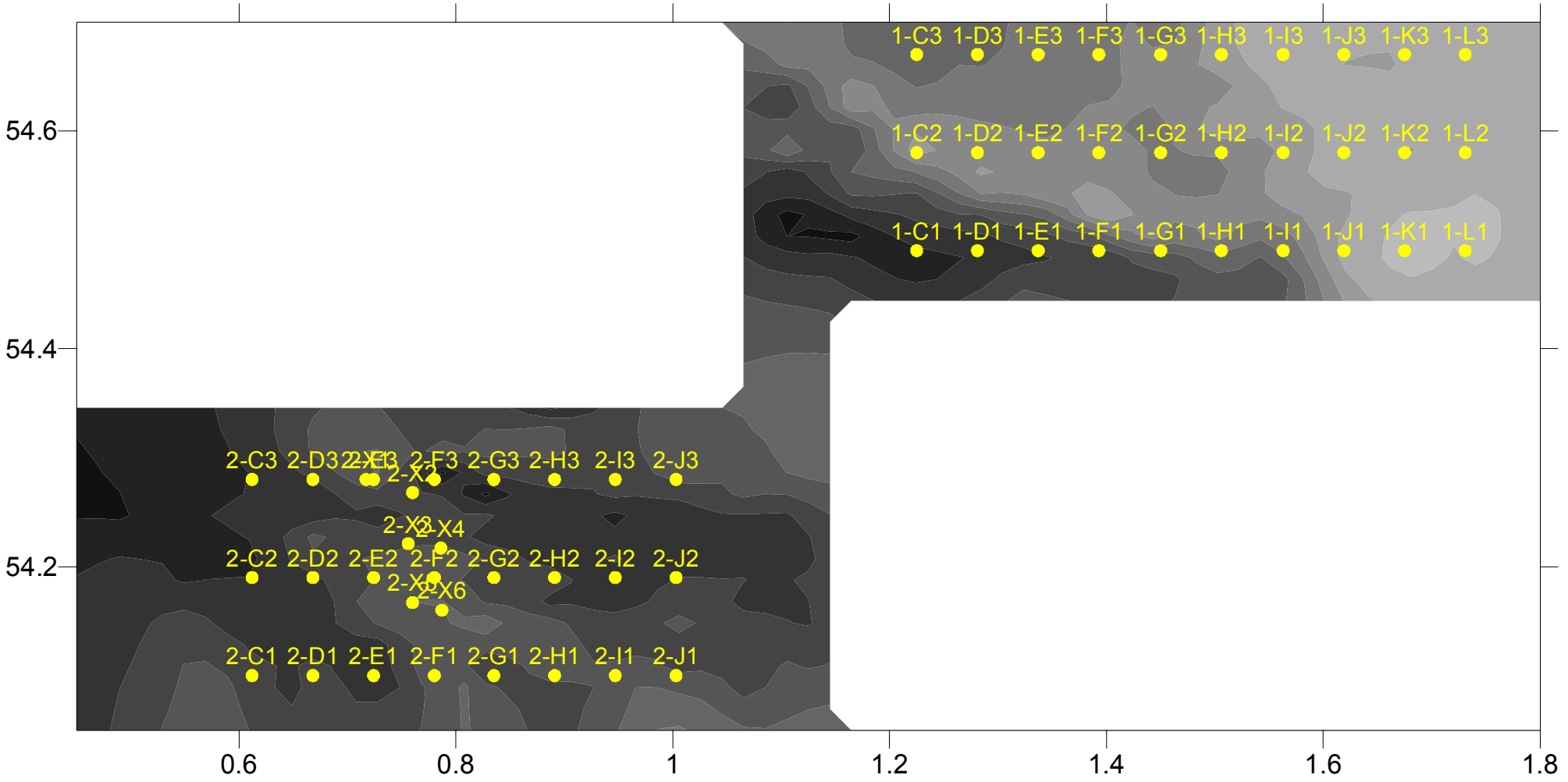
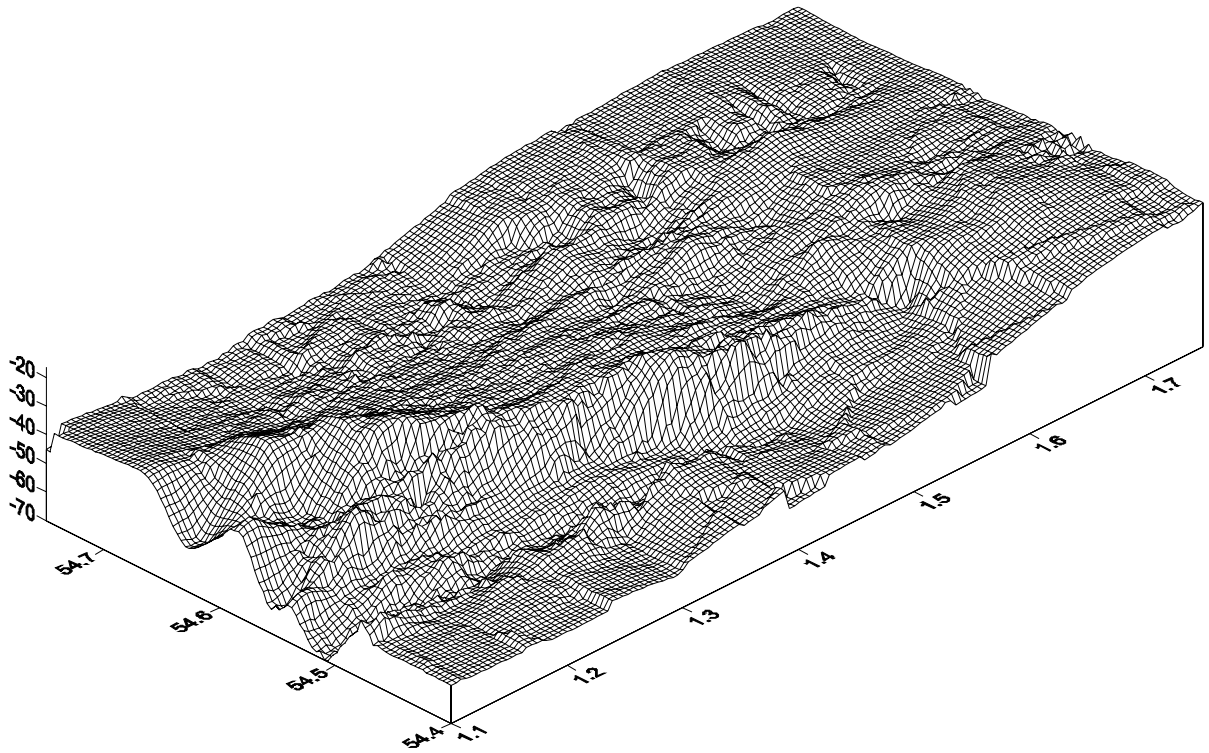


Figure 1. Survey transects and sampling stations

GRID 1 – Southwestern Dogger Bank



GRID 2 – The Hills

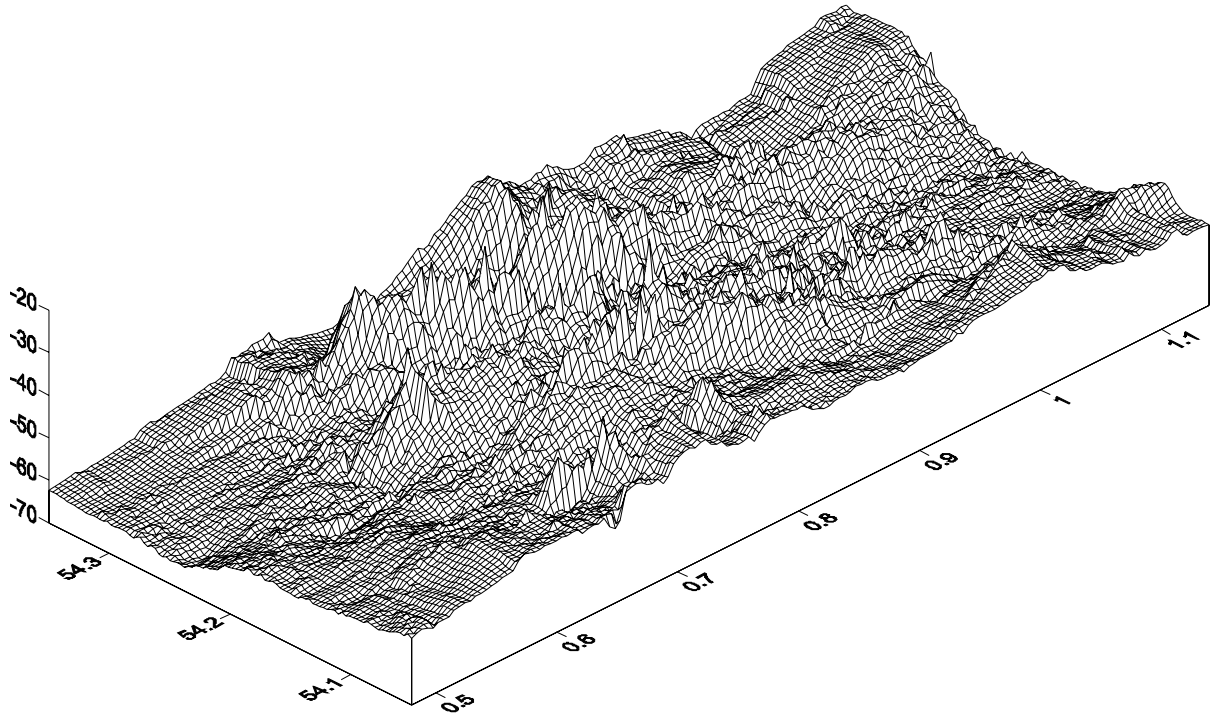


Figure 1. Bathymetry of survey grids recorded by Simrad EK500 echosounder. X-axis=Longitude, Y-axis=Latitude, Z-axis=Depth (m)

RESULTS

1. Acoustic survey

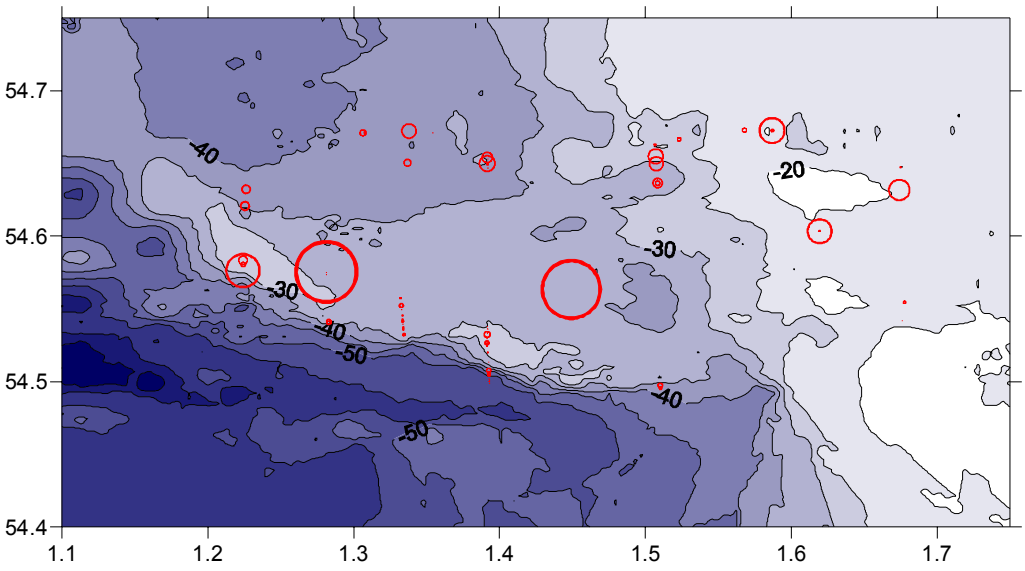
Acoustic methods were used to estimate the distribution and number of sandeels and other fish schools in mid-water in the study area (Table 1). There were no sandeel schools identified on Grid 2, and only a few (92) on Grid 1 (Fig 2). Using a mean sandeel weight of 8.35 g (from trawl and dredge samples)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



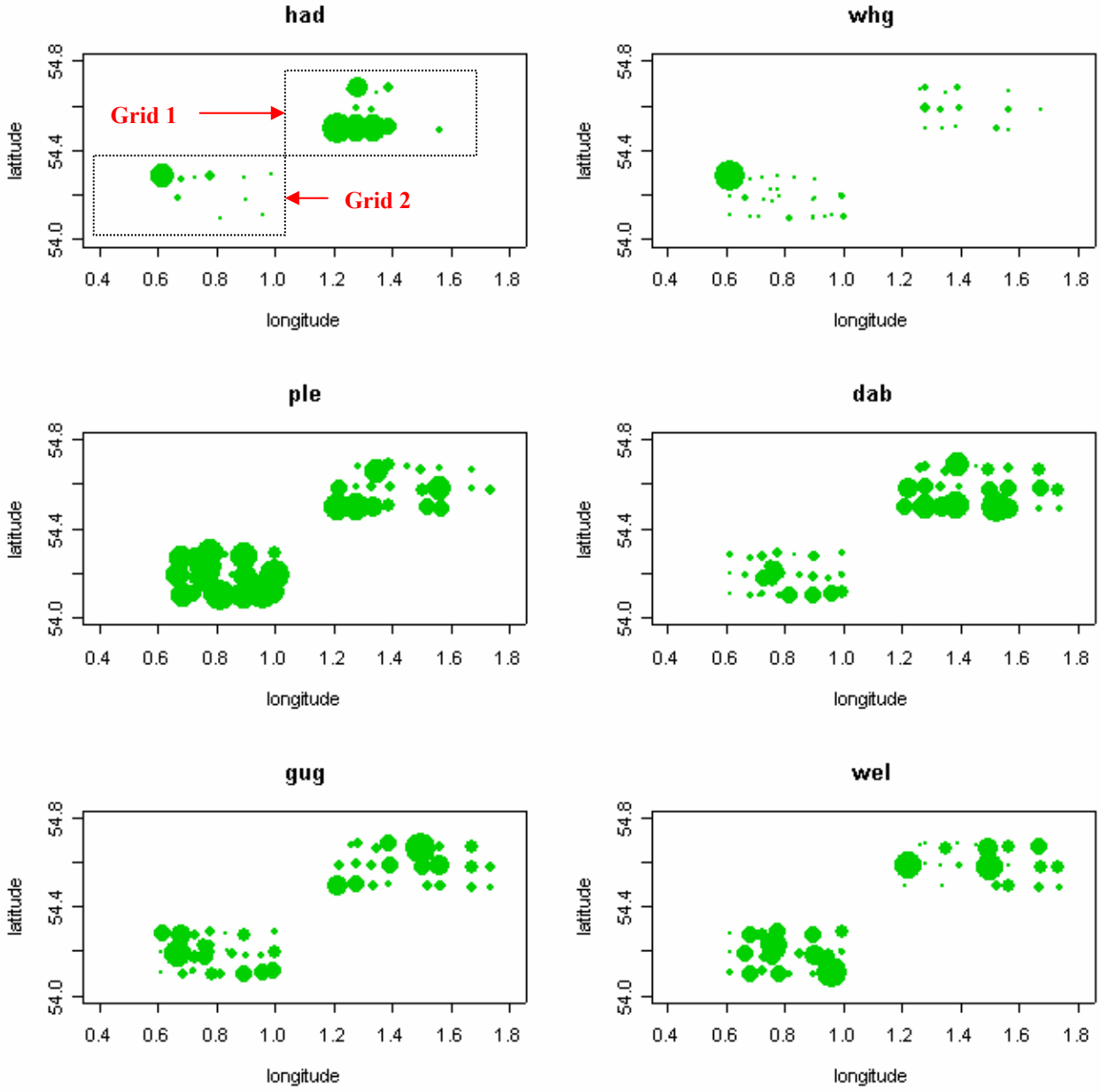


Figure 3. Relative numbers of haddock (had), whiting (whg), plaice (ple), dab (dab), gurnard (gug), lesser weever (wel) caught at each Granton haul station. Maximum size of circles represents largest numbers/tow within each species.

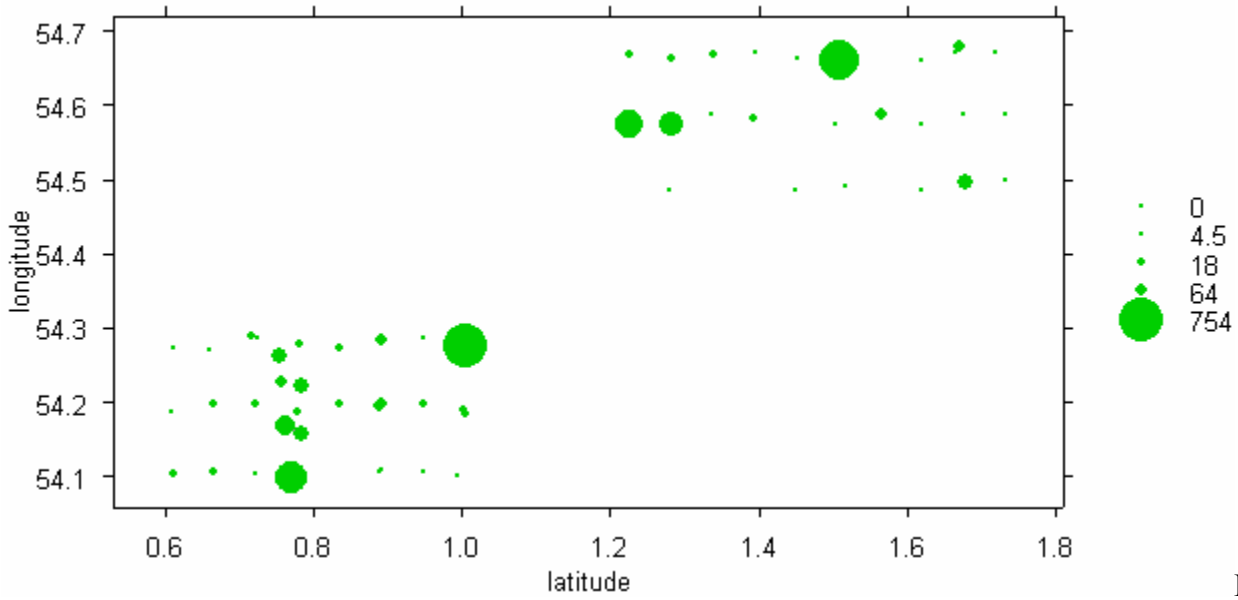
Over 3,600 individual fish were sampled for stomach content analysis, of which approximately 1/3 rd were empty. Table 3 provides a breakdown for the most abundant species sampled. Of those fish with full stomachs, plaice and weavers had the highest occurrence of sandeels.

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.



Fi

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

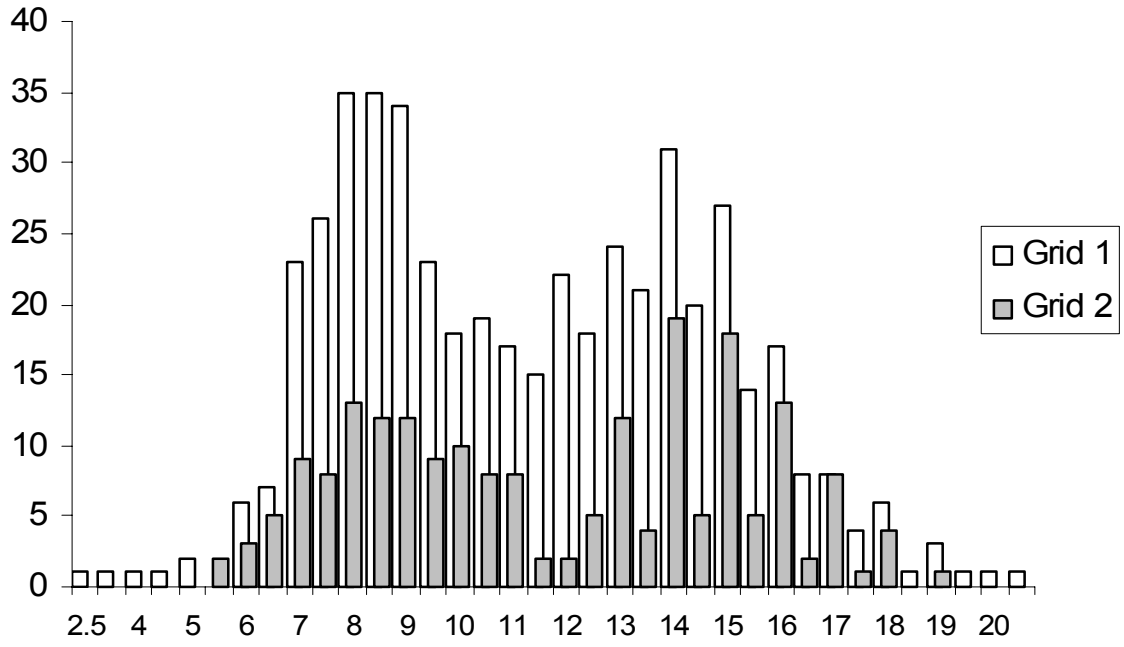


Figure 5. Length frequency distributions of sandeels (*Ammodytes marinus*) caught in the dredge grids 1 and 2, respectively. Note that frequencies do not reflect total numbers caught.

S. Mackinson
19th July 2004

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

DISTRIBUTION:

Basic list +	D. Righton	J. Blanchard	K. Turner-Welsby
	M. Eade	G. Daskalov	C Stewart
	C. Firmin	Clerk, Eastern Sea Fisheries Committee	