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

2006 RESEARCH VESSEL PROGRAMME

PROGRAMME: RV CEFAS ENDEAVOUR 18/06

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	Ewen Bell	Peter Walker
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DURATION: 19th October – 1st November 2006

LOCATION: Western English Channel (VIIe)

AIMS:

1. To carry out a survey of scallops (*Pecten maximus*) in an area of the western English Channel (VIIe) to quantify sampling and spatial variability of scallop size and age structures in dredge catches.
2. To collect data on scallop spawning condition in order to investigate spatial variations in spawning cycles.
3. To characterise sediment types at scallop survey stations using a remote acoustic seabed discrimination system (multi-beam swathe bathymetry & QTC).
4. To collect data on fish by-catch and epibenthos in scallop dredges.

ADDITIONAL AIMS:

5. To collect water samples from the ships supply for the Defra funded AE001 project (Provision of Advice in Relation to Radiological Matters). Two x 25 litre carboys (for ^{137}Cs analysis) and one x 1 litre polybottle (for ^{3}H analysis) with seawater from the ships supply will be collected at each of 10 stations.
6. Guest scientists from UEA may travel onboard and use the constant temperature facilities to carry out experimental work. This will not impact on the scallop survey schedule.

Item 6 was not required, but two further additional aims were added subsequent to release of the pre-cruise plan

7. To collect and preserve samples of edible crab tissue for genetic studies.
8. To collect and preserve samples of scallop tissue for genetic studies.

NARRATIVE (all times in GMT):

CEFAS ENDEAVOUR departed from Lowestoft at 0700 on Thursday 19th October. Strong south-westerly winds and poor sea conditions in the English Channel delayed transit to the first station, but weather conditions had moderated sufficiently to allow deployment of the gear by arrival at the first of the 'hard' ground stations (48.88°N 3.08°W) at 1710 on Friday 20th October.

Eight spring-loaded scallop dredges were deployed, each fitted with round tooth bars at a tension of 6m.kg – the gear configuration for 'hard ground'. The survey

continued working the 'offshore' waters from Start point westward to the Scilly Isles, the area that had not been covered last year. Progress was relatively slow due generally poor weather conditions, but these were not severe enough to prevent fishing activities and 56 scallop tows, were completed by 1320 on Wednesday 25th October. However, the starboard winch failed while towing station ref. 13 (48.86°N 5.72°W), just to the south of Lands End.

Attempts to rectify the faulty winch were unsuccessful, so contingency arrangements were made to tow the starboard dredge set from the starboard net drum. The gear was deployed using this arrangement at around 20:00, but the starboard net drum lost power before the dredges reached the seabed, and they were subsequently recovered without fishing. This second starboard hauling gear failure assisted with the diagnosis of the faulty winch electronics and enabled the ships engineers to bring the main starboard winch back into service.

The survey continued after a loss of around 6 hours and the remaining 9 'hard ground' stations were completed by 1406 on Thursday 26th October.

The gear was re-configured for 'soft ground' before the next station (50.12°N 4.59°W), – 'French'-style tooth bars at a tension of 10m.kg. During the second week of the survey the weather was relatively fine and good progress was made with the remaining 39 'soft ground' stations. The survey grid was completed at around 0020 on Monday 30th October, after which Cefas Endeavour headed south and carried out 5 replicate tows on station ref. 55 where good catch rates had been achieved previously. This provided a set of 3 replicated stations (refs. 37, 55 & 92), with a range of catch rates for variance estimation.

With around one day of the survey remaining it was decided that this time could be usefully spent carrying out a multi-beam bathymetric survey in Lyme Bay. This area contains some ecologically important areas and voluntary no dredging zones and currently has a high profile. The multi-beam data may also be useful for future research projects.

Multi-beam surveying continued through the night and until 11:30 on Tuesday 31st October after which time Cefas Endeavour returned to Lowestoft docking at around 1700 on Wednesday 1st November.

RESULTS:

Aim 1

The scallop survey grid was fully completed despite relatively poor weather during the first week of the survey. A total of 116 valid scallop tows were achieved at all the planned 104 sampling positions (Figure 1). The problem experienced last year of the starboard dredge set turning over was not experienced to any significant extent this year.

Catch rates were initially in the eastern offshore area high, but then declined and in the western offshore area were generally lower than the 2004 survey and slightly higher than those obtained in 2005, which was to be expected given the weather conditions. Average catch rate was 25.1 scallops per tow, with higher catch rates on the hard than on the soft ground (Table 1). Good numbers of pre-recruit size-classes were noted throughout the survey grid, but more particularly in the hard ground areas. This is reflected in the proportion of the scallop catch above commercial size (≥ 90 mm shell height) (80%), which is lower than last year (90%). The proportion of

commercially sized scallops was substantially higher on the soft ground (97%) than on the hard ground (77%) (Figure 2). Mean shell height was 105.4mm on the soft ground and 94.8mm on the hard ground. As last year highest catch rates (peak 150 scallops per tow) were recorded on the Cornish inshore grounds (Figure 1). Just over 2900 scallops were captured during the survey. Shell heights were measured and the flat shells were retained for ageing. With an improved data capture system and a great deal of dedication from those involved, ageing of all scallops was completed during the survey. Age distributions by hard and soft ground types (Figure 3) confirm the relatively high proportion of 3 year olds (and low proportions of 4 and 5 year olds) that were particularly apparent on the hard ground stations.

Aim 2

Scallops were sorted into three categories with the aim of identifying 1) scallops that had recently spawned, 2) scallops that were ripe or ripening and thought likely to spawn next spring and 3) scallops that were considered immature and did not show signs of ripening. This simple scale was not intended to fully characterise the spawning condition, but rather to provide a means to investigate the spatial distribution of potentially different spawning cycles. Categorising scallops that were neither immature nor ripe proved difficult with a relatively continuous range of gonad conditions. Nonetheless the clear differences in the spawning cycles of the population were apparent in different areas of the survey area (Figure 4).

Aim 3

The QTC ground discrimination system was inoperable for the cruise, however multi-beam swathe bathymetry was run at all stations and during transits between stations. The system was calibrated for sound velocity variations by taking conductivity, temperature and depth (CTD) profiles at intervals when it was considered likely that there would be a change in the structure of the water column. An additional small survey was carried out inshore in Lyme Bay.

Twenty seven CTD profiles were taken during the survey. These showed a pronounced thermocline (4^{o}C) at around 30m-40m deep in the waters to the far southwest of the sampling grid, which became progressively less marked in shallower waters and further east (Figure 5). Coastal water and those to the east of the grid appeared fully mixed.

Aim 4

Qualitative abundance scores were recorded at each scallop survey station for around 50 taxa of benthos (Table 2). Echinoderms, crustaceans and molluscs were the most consistently recorded groups. Multivariate analysis may provide a basis for classification of community type. Some physical characteristics of the dredge contents were also recorded qualitatively (dredge fullness, rocks, stones and dead shells).

A total of 17 fish species, 2 cephalopod species and 2 commercial crustacean species were identified in the dredge contents (Table 3). Otoliths were retained for anglerfish, plaice and sole and all fish were measured. The most consistently occurring by-catch species were cuttlefish, edible crabs, anglerfish and spider crabs.

Four species of rays were recorded, together with 6 commercially taken species of flatfish.

Aim 5

Ten water samples were collected during the survey at the locations requested with one exception; for logistical reasons the most southerly station (DM8, 49.4^{o}N 3.15^{o}W) was renamed and relocated to the west of the sampling grid (DM11, 49.75^{o}N 6.41^{o}W).

Aim 6

Guest scientists did not travel with the survey.

Aim 7

Samples of crab tissue were taken and preserved in alcohol for genetic studies from 57 stations dredge deployments.

Aim 8

Samples of scallop tissue (from 50 to 100 scallops) were taken and preserved in alcohol for genetic studies from 6 stations at locations from various parts of the sampling grid.

Acknowledgements

As always it was a great pleasure to be with the officers and crew of RV CEFAS ENDEAVOUR and their professionalism must be acknowledged. Their support and flexibility at all times was appreciated and their ingenuity in repairing the starboard winch was vital to ensuring the successful completion of the survey.

M T Smith

30 October 2005

SEEN IN DRAFT:

Captain A Reading, Master
B Salter, Senior F/M

DISTRIBUTION:

Basic List +
M T Smith
D W Palmer
P Walker
E Bell
C Firmin
P Whelpdale
E Potter
J T Addison
D McCubbin
Sea Fisheries Committees:
Cornwall
Devon
Isles of Scilly
States of Guernsey
Service Hydrographique et Oceanographique de la Marine

TABLE 1. Catch rates of scallops in the western English Channel.

(a) Catch per 15 minute tow

Ground type	N	Average	SD	Maximum
Hard	70	35.2	32.2	150
Soft	46	9.7	11.1	52
Total	116	25.1	28.8	150

(b) Catch per dredge km

Ground type	N	Average	SD	Maximum
Hard	70	3.4	3.2	17
Soft	46	1.0	1.2	5
Total	116	2.4	2.8	17

TABLE 2. Species recorded in the scallop dredge catches

Group	Species	Total of abundance scores	Proportion of scallop stations where present %
Echinodermata	*Astropecten irregularis*	42	28
	Luidia sarsi	10	6
	Luidia ciliaris	57	32
	Porania pulvillus	10	9
	Anseropoda placenta	3	3
	Crossaster papposus	9	5
	Asterias rubens	81	44
	Marthasterias glacialis	48	27
	Ophiura ophiura	17	12
	Psammechinus miliaris	6	4
	Echinus esculentus	39	22
	Spatangus purpureus	2	2
	Henricia sanguinolenta	10	6
	Ophiura affinis	1	1
	Ophiocomina nigra	1	1
	Ophiothrix fragilis	1	1
Mollusca	*Pecten maximus*	206	90
	Aeqipecten opercularis	38	22
	Artica islandica	1	1
	Glycimeris glycimeris	3	3
	Crepidula fornicata	8	3
	Ostrea edulis	1	1
	Sepia officinalis	64	39
	Eledone cirrhosa	7	6
Crustacea	*Pagurus spp.*	14	9
	Maja squinado	30	21
	Cancer pagurus	57	45
	Liocarcinus depurator	2	2
	Galathea sp. (dispersa)	4	3
	Inachus dorsettensis	2	2
	Xantho incisus	1	1
	Unknown crab	1	1
	Macropodia tenuirostris	*2*	*2*
	Goneplax rhomboides	*1*	*1*
	Pycnogonids	1	1
Bryozoa	Unknown	1	1
	Flustra foliacea	8	7
	Alcyonidium sp.	9	7
Hydroids	*Nemertesia spp.*	5	4
	Sertularia spp.	15	12
	Unknown (often *Plumularia sp*.)	73	43
	Cellaria sp.	3	2
	Devonshire cup coral	6	3
	Sertularella spp.	1	1
	Eunicella verrucosa	3	2
Ascidia	Unknown	3	3
Polychaeta	*Pomatoceros spp.*	17	10
	Chaetopterus variopedatus	5	4
	Aphrodite aculeata	1	1
Anthozoa	*Alcyonium digitatum*	21	13
	Sponge unknown	3	3

TABLE 3. Commercial species recorded in scallop dredge catches

Species	Total number caught	% occurrence	Mean number per tow	Maximum number per tow
Pecten maximus	2915	91	25.13	150
Sepia officinalis	107	45	0.92	6
Elodone cirrhosa	5	4	0.04	1
Maja squinado	46	20	0.40	10
Cancer pagurus	74	45	0.64	4
Pleuronectes platessa	6	6	0.05	1
Solea solea	12	8	0.10	3
Scophthalmus rhombus	2	2	0.02	1
Microstomus kitt	3	3	0.03	1
Limanda limanda	1	1	0.01	1
Lepidorhombus whiffiagonis	13	9	0.11	3
Lophius piscatorius	61	30	0.53	7
Melanogrammus aeglefinus	1	1	0.01	1
Aspitrigla cuculus	1	1	0.01	1
Scyliorhinus canicula	5	3	0.04	2
Trisopterus luscus	1	1	0.01	1
Raja clavata	2	2	0.02	1
Raja naevus	9	5	0.08	3
Raja montagui	2	2	0.02	1
Raja fullonica	2	2	0.02	1

FIGURE 1. Station positions and catch rates of scallops in the western English Channel. Circle area is proportional to catch rate. Superimposed circles of different sizes indicate port and starboard samples differing in catch rate

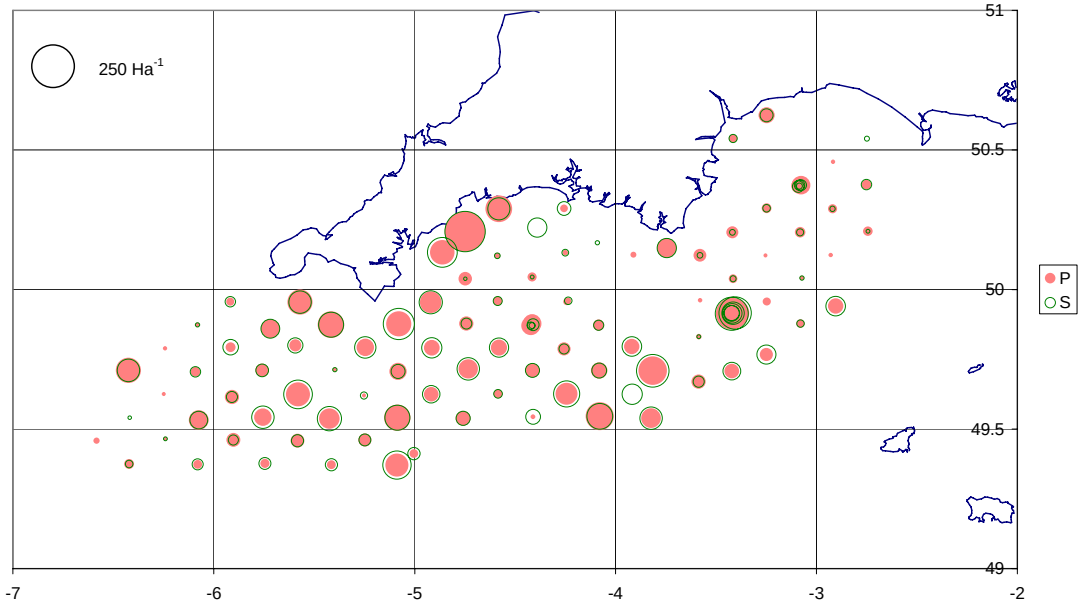

FIGURE 2. Size-frequency distributions of scallops caught on ‘soft’ and ‘hard’ ground in the western English Channel

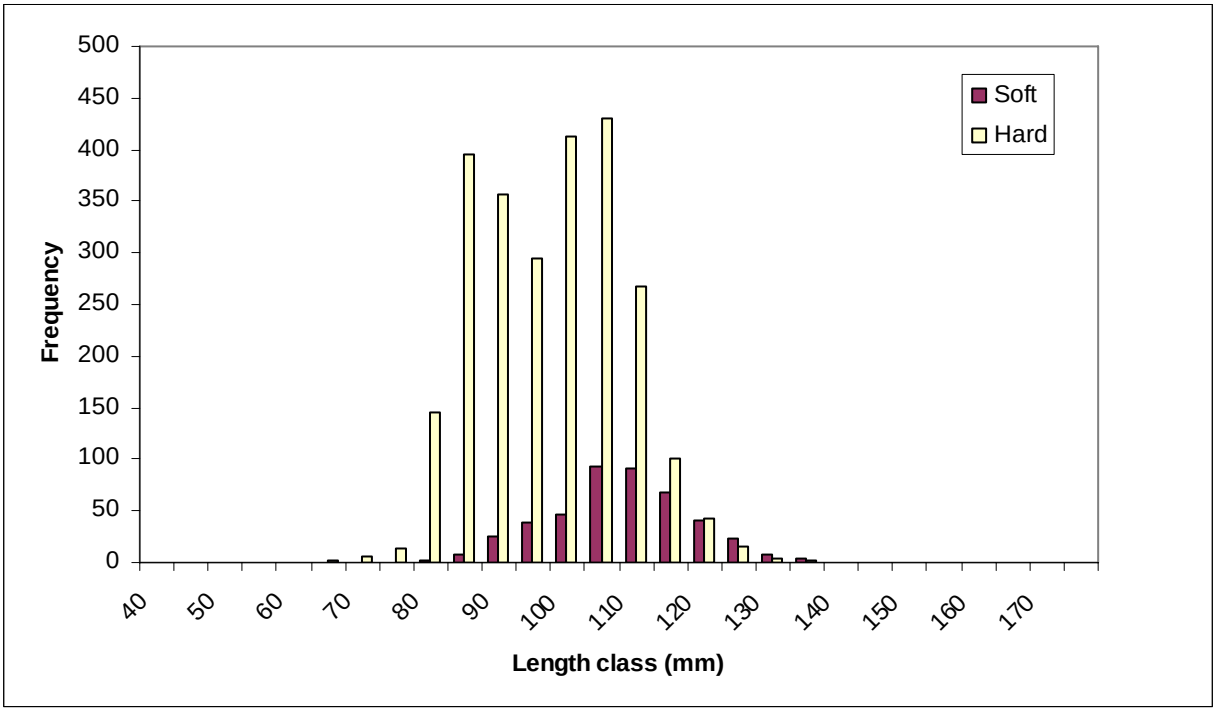

FIGURE 3. Age distributions of scallops caught on ‘soft’ and ‘hard’ ground in the western English Channel

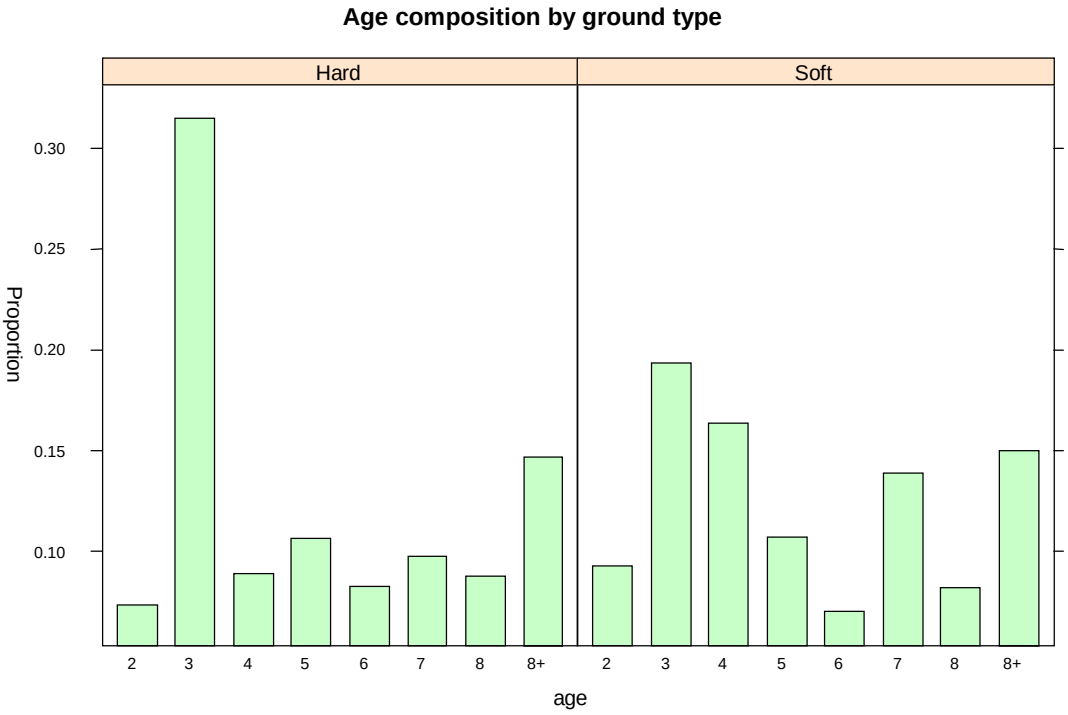

Figure 4. Spatial distribution of scallops at different stages of their reproductive cycle

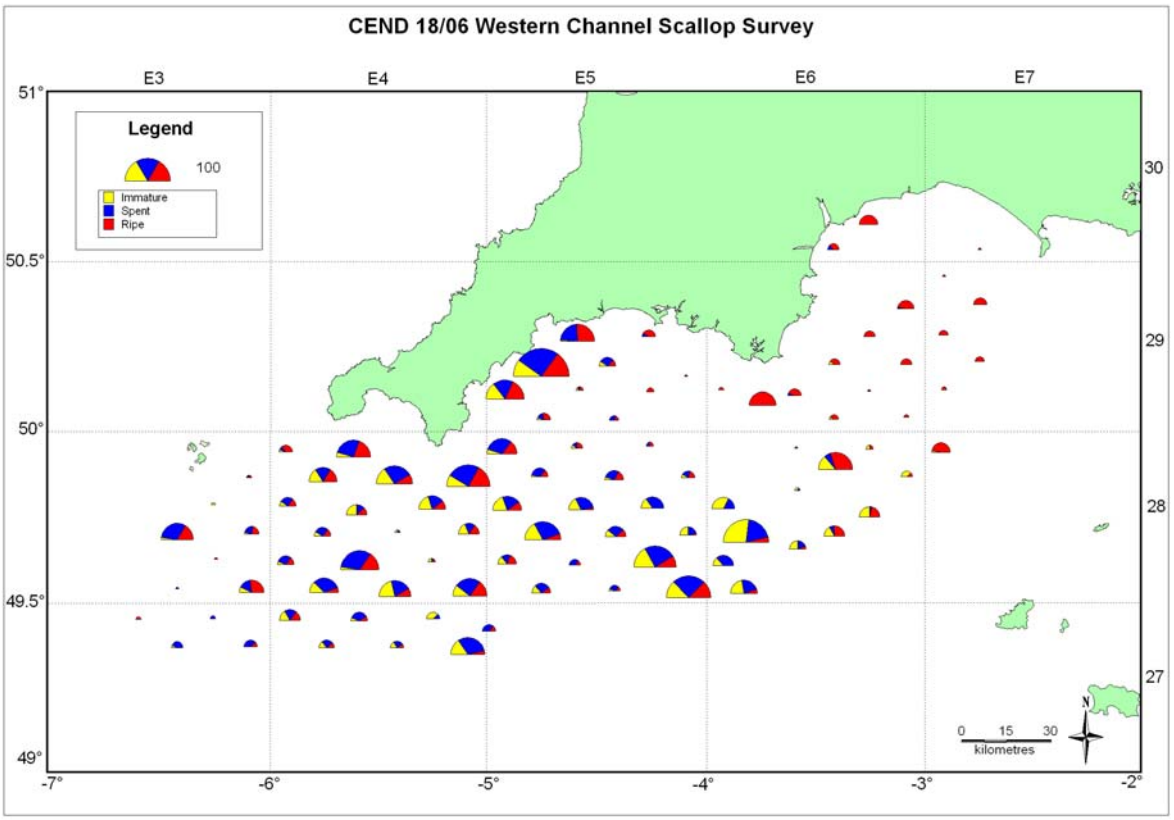

Figure 5. Spatial distribution water column temperature profiles