

## LOWESTOFT LABORATORY, LOWESTOFT, SUFFOLK, NR33 OHT

### 2010 RESEARCH VESSEL PROGRAMME

#### REPORT: RV CEFAS ENDEAVOUR: SURVEY 14/10

#### STAFF:

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DURATION: 10 September – 2 October 2010

LOCATION: Irish Sea (VIIa); Bristol Channel & Celtic Sea (VIIf&g)

#### AIMS:

1. To carry out a 4m beam-trawl survey of groundfish (Figure 1) to i) obtain fisheries independent data on the distribution and abundance of commercial flatfish species, and ii) derive age compositions of sole (*Solea solea*), plaice (*Pleuronectes platessa*), cod (*Gadus morhua*) and whiting (*Merlangus merlangius*) for use in the assessments of stock size.
2. To collect biological data including maturity and weight at age of sole, plaice, lemon sole (*Microstomus kitt*) and other commercially important finfish species as part of CEFAS' requirements under the EU Data Collection Framework.
3. To determine the distribution and relative abundance of juvenile and adult sole and plaice.
4. To collect surface & bottom temperature/salinity data using CTD and Niskin Bottle.
5. To quantify epibenthos using 4m beam trawl by-catch.
6. Collect length/weight & maturity information using individual fish measurements, in support of the EU Data Collection Framework.
7. To collect surface sea-water samples for processing on return to Lowestoft for the analysis of tritium (AE001) (C Smedley - Cefas).
8. To collect fish samples in support of other Cefas projects and training courses.
9. To collect photographic images of brill (*Scophthalmus rhombus*) and turbot (*Scophthalmus maximus*) gonads for the Workshop on Maturity Staging of brill and turbot in 2012.
10. To sample fishes and queen scallops (*Chlamys opercularis*) for stable isotope analysis in support of food web studies (M1001) (S Jennings – Cefas)

NARRATIVE: (All times GMT)

Cefas scientists joined the vessel at 0730h 10 September in order to undertake safety inductions and 'toolbox' talks with the ship's officers/crew. Cefas Endeavour sailed at 1000h 10 September.

At a known 'clean' fishing tow off Benacre, the fishing gear was deployed, towed for 15 minutes and successfully retrieved to ensure that all was in good working order. The catch was also sorted and processed in order to adequately test the EDC system and FSS upload functions. During the passage through the channel, Cefas Endeavour held a very informative emergency drill using 'running aground' as the scenario.

The survey commenced in the Bristol Channel Inner (BCI) sector at prime station 133 at 0600h 12 September. A further seven valid tows were successfully fished within this sector on this day. On 13 September, plans to fish the inshore stations in Carmarthen Bay were thwarted by MOD live 'firings' from the Pendine gunnery range. This activity was due to occur from 0700-1700hrs on each of the following five days.

A total of 9 BCI stations were successfully fished on 13 September. On 14 September, strong south-westerly winds and an associated heavy swell ensured that no fishing took place until 1646hrs after which three BCI stations were fished. On 15 September, a further 9 BCI stations were fished. On 16<sup>th</sup> September, Cefas Endeavour was able to successfully fish the two stations in BCI that were previously unworkable due to live firings at the Pendine gunnery range as a 'gap' in the MOD firing schedule was identified and exploited. The BCI sector of stations was completed at 1423h the same day. The day ended with two offshore Bristol Channel Outer (BCO) stations. On 17 September, the day was spent fishing the 6 Cardigan Bay stations in St George's Channel (SGC) en-route to begin the Irish Sea South (ISS) priority survey grid.

Work in the ISS sector began at 0543h 18 September starting at prime station 40 in Red Wharf Bay. This station was fished for the full 30 minutes based on the catch processed on the 2009 survey.

At prime station 32 (ISS), the winch brakes 'screeched' after just 11 minutes towing and the gear was immediately hauled to assess any damage and the tow treated as invalid. The damage was found to be only 2 shackles on the chain mat and these were replaced. The winch brakes were checked and adjusted and the tow was re-fished for 20 minutes further west along the normal tow without further problems. This tow can be fished for the full 30 minute duration in future. At prime station 49, approximately 40 baskets of broken shell was caught (estimated to weigh 2.4 tonnes). This station had a recent record of similar catches and therefore should be considered for a 15 minute tow in future. On 19 September, a further 8 ISS stations were fished. At prime station 54, where the station had been moved in 2009 to avoid heavy catches of broken shell/sand, the new tow was fished, and an estimated 1.5 tonnes of shell/sand was caught once again. This tow should also be considered for a reduced tow duration on future surveys.

On the morning of 20 September, Cefas Endeavour made an unscheduled diversion to Douglas IOM in order to drop off a member of the crew. This meant that the plans for the following three days before the planned survey break were altered. The rest of that day was spent picking up stations from a position south-west of the IOM working east into the stations off Barrow-in-Furness. At ISS prime station 53, the beam was hauled after just 25 minutes due a heavy catch (1.6 tonnes) of broken shell and sand. This was

a new tow identified and fished successfully on the 2009 survey after similar heavy catches and associated gear damage at the original position in previous surveys. The gear suffered minimal damage (small area where the liner had become detached from the main net). This was very quickly fixed and no survey time was lost as a result. This tow should be considered for a reduced tow duration on future surveys. The final ISS station was hauled at 1547hrs that day. At prime station 12 in Irish Sea North sector (ISN), the tow had to be moved 0.8nm SW along the same track in order to avoid a newly laid wind-farm power cable. On 21 September, eight stations south of Scotland from Luce Bay across to the Solway Firth were fished. The remaining five ISN stations off the Cumbrian coast were fished on 22 September.

At this point, the survey was paused and Cefas Endeavour headed in to Douglas IOM for a mid-survey break to take on fresh supplies and to accommodate a change to both the scientific and the ships personnel, docking at 1454h that day.

Cefas Endeavour sailed again at 0600h 24 September and headed for the nearest unfished station. Fishing recommenced at 0837h that day at ISW prime station 425. With this station having a history of heavy catches of broken shell, load tests were carried out at 15 minutes and again at 18 minutes. At this point of the tow, the gear was hauled due to the significant increase in the load being registered. On hauling, it became clear that it would be impossible to get the catch aboard despite much of the weight being 'streamed' away. Eventually, a large bag of broken shell was brought aboard and once the cod-end had been opened, the catch was dumped over the stern and the tow declared invalid. The gear was examined for damage and none found. An alternate tow was located within the same depth contour, 4 miles southwest of the original tow. This was fished initially for 5 minutes to determine the by-catch and then again for a valid 15 minutes tow. This will become the fished tow on future surveys. Between 24-25 September, the remaining 12 ISW stations were fished without incident completing this sector at 1745h, 24 September.

On 26 September, fishing recommenced in SGC, starting in Caernarfon Bay. Once the survey stations had been completed, 3 additional 5-minute tows were fished at SGC prime station 229 in order to catch and retain live dabs (*Limanda limanda*) to keep for the Cefas breeding stock. A total of 28 live mature dabs were kept from these tows. On the following day, the remaining 4 SGC survey stations were successfully fished, completing the last of these at 1414h. Cefas Endeavour then headed into the Bristol Channel to complete a 'grid' of tritium water sampling. With time 'in-hand' before this needed to commence, 2 further additional live dab collection tows were fished at BCI station 138. This station had produced many dab earlier in the survey, and two short tows totalling just 10 minutes caught the required number of dabs, with an additional 123 suitable specimens being retained.

The tritium water sampling began at 2331h 27 September and was completed at 1114h the following day and a total of 28 samples were collected. Samples were not collected from two Cardiff Bay stations (W23 & W31) because of lack of water depth, and plans to collect two further samples close to the Avon Bridge (W13 & W14) were abandoned due to increasing fog cover. Between the 28-29 September, the remaining BCO fishing stations were successfully fished. At prime station 512 off Padstow, the gear was hauled at 15 minutes duration due to the load tests indicating that there was either a heavy catch or that the beam was 'digging-in' to the substrate. As this station had a

history of heavy catches of broken shell and sand, it was hauled early. The final survey fishing station was hauled at 1759h 29 September.

With the full survey fishing grid now complete, Cefas Endeavour headed towards a position in Weymouth Bay in order to recover a Cefas Smart-Buoy due for recovery in early October. With strong southerly winds forecast for late on 30 September that would make the recovery impossible, Cefas Endeavour hastily headed to this position to facilitate the recovery. The Smart-Buoy was successfully retrieved at 1000h 30 September.

During this period, CEFAS scientists began the process of cleaning up and packing away all scientific equipment in readiness for docking.

On 1 October, a further six 5-minute hauls with the beam trawl were carried out in order to catch further live dab as those caught previously had not survived. Despite fishing on the Channel beam trawl surveys most productive dab tows (around Dungeness), only an additional 12 dab were caught and retained.

At 1030h 1 October, the survey was declared complete, and Cefas Endeavour headed back to Lowestoft, docking at 0206h 2 October.

## RESULTS:

### Aims 1, 2 & 3

The survey gear was the standard 4m-beam trawl (number 3) with chain mat, flip-up ropes and the net was fitted with a 40mm cod-end liner. All fish and selected commercial shellfish were identified to species, weighed and measured (large catches of an individual species were sub-sampled beforehand).

A SAIV Micro CTD unit was attached to the 4m-beam trawl in order to record the temperature and salinity depth profile at each station fished. In addition, surface water was taken at each station and at the first and last fishing station on each working day a surface sample was taken simultaneously with a Niskin bottom water sample and a CTD profile.

All catch details and sample data were entered directly into the Electronic Data Capture (EDC) system and uploaded directly into the Fishing Survey System (FSS). Station details were manually entered into the FSS using information collected from the Transas bridge logging system and bridge logbook. The total number of survey otoliths/scales taken in each ICES Division is shown in Table 1. In addition to the survey otoliths, an additional 8 pairs of otoliths were collected for other survey aims.

Table 2 shows the top 10 species by both weight (kg) and number of individuals caught in core survey tows. Table 3 shows a list of measured species caught during the survey and number of stations at which they were recorded.

The trawl survey covering the Irish Sea and Bristol Channel is divided up into six sectors consisting of 108 beam trawl tows, of which all 108 were successfully fished (Figure 1),

including all 65 ISN, ISS and BCI stations used for tuning data for the Working Group of the Celtic Seas Eco-region (formerly the Northern and Southern Shelf Working Groups).

A total of 7 Prime stations – numbers 27 (Morecambe Bay), 313 (Tremadoc Bay), 203 (Dundrum Bay), 214 and 220 (north of Dublin), 233 (south of Wicklow), 501 (southwest of Milford Haven) were reduced from the standard 30-minute to 15-minute tows because of expected large catches of weed, shell/small flatfish. Following a successful 30 minute tow in Red Wharf Bay (prime 40) in 2009, this was again fished for the full 30 minutes. In addition, 8 prime stations were reduced to 15 or 20-minute tows as a precautionary measure following invalid tows due to damaged gear, new tow positions or exceptionally large catches seen on previous surveys. A few other stations were moved short distances to avoid snagging undersea cables (an increasing problem in this busy sea area) or to avoid static gear.

Table 4 shows the number of gear deployments undertaken on the survey.

**Table 1:** Numbers of fish otolithed by ICES division

	VIIa	VIIb	VIIg	Total
Anglerfish ( <i>Lophius piscatorius</i> )	7	5	30	42
Anglerfish ( <i>Lophius budegassa</i> )	0	0	1	1
Brill	23	4	2	29
Cod	86	20	1	107
Dab	238	241	2	481
Bass	0	8	6	14
Haddock	37	13	60	110
Hake	2	1	7	10
John Dory	4	11	6	21
Lemon Sole	64	45	31	140
Megrim	0	1	60	61
Plaice	1402	367	42	1811
Red Mullet	0	5	1	6
Sole	259	321	66	646
Turbot	7	27	2	36
Whiting	133	29	20	182
<b>Total</b>	<b>2262</b>	<b>1098</b>	<b>307</b>	<b>3697</b>

**Table 2:** Summary of the main species caught over the entire survey

	Weight caught (kg)				Number caught		
	2010	2009	2008		2010	2009	2008
Plaice	703	773	662	Dab	11228	11787	8792
Lesser spotted dogfish	664	729	650	Plaice	7948	7239	6296
Dab	557	561	432	Solenette	4776	6217	5926
Sole	185	192	207	Common dragonet	2399	2241	2647
Thornback ray	174	178	140	Poor cod	2227	3470	6436
Common dragonet	100	102	117	Lesser spotted dogfish	1522	1712	1448
Poor cod	69	82	116	Scaldfish	1351	1958	2044
Solenette	61	83	81	Sole	1214	1736	1913
Edible Crab	78	74	44	Whiting	1212	1778	4666
Tub gurnard	53	48	41	Grey gurnard	726	1045	1520
<b>TOTAL (All species)</b>	<b>3246</b>	<b>3443</b>	<b>3075</b>	<b>TOTAL (All species)</b>	<b>39956</b>	<b>45751</b>	<b>47107</b>

**Table 3:** List of measured species caught during the survey and number of stations at which they were recorded.

Species	Stations	Species	Stations
<i>Agonus cataphractus</i>	58	<i>Microchirus variegatus</i>	54
<i>Ammodytes tobianus</i>	10	<i>Micromesistius poutassou</i>	2
<i>Arnoglossus imperialis</i>	3	<i>Microstomus kitt</i>	40
<i>Arnoglossus laterna</i>	61	<i>Molva molva</i>	3
<i>Aspitrigla cuculus</i>	31	<i>Mullus surmuletus</i>	6
<i>Blennius ocellaris</i>	15	<i>Mustelus asterias</i>	27
<i>Buenia jeffreysii</i>	2	<i>Myoxocephalus scorpius</i>	8
<i>Buglossidium luteum</i>	69	<i>Nephrops norvegicus</i>	13
<i>Callionymus lyra</i>	94	<i>Pegusa (solea) lascaris</i>	21
<i>Callionymus maculatus</i>	1	<i>Pholis gunnellus</i>	5
<i>Callionymus reticulatus</i>	6	<i>Phrynorhombus norvegicus</i>	10
<i>Cancer pagurus</i>	53	<i>Phrynorhombus regius</i>	1
<i>Centrolabrus exoletus</i>	1	<i>Platichthys flesus</i>	11
<i>Ciliata mustela</i>	3	<i>Pleuronectes platessa</i>	88
<i>Clupea harengus</i>	1	<i>Pollachius pollachius</i>	1
<i>Conger conger</i>	2	<i>Raja brachyura</i>	13

<i>Ctenolabrus rupestris</i>	3	<i>Raja clavata</i>	50
<i>Dicentrarchus (morone) labrax</i>	4	<i>Raja microocellata</i>	12
<i>Diplecogaster bimaculata</i>	2	<i>Raja montagui</i>	38
<i>Enchelyopus cimbrius</i>	1	<i>Raja naevus</i>	11
<i>Eutrigla gurnardus</i>	67	<i>Scophthalmus maximus</i>	18
<i>Gadus morhua</i>	24	<i>Scophthalmus rhombus</i>	18
<i>Gaidropsarus vulgaris</i>	2	<i>Scyliorhinus canicula</i>	88
<i>Glyptocephalus cynoglossus</i>	8	<i>Scyliorhinus stellaris</i>	10
<i>Gobius niger</i>	1	<i>Solea solea (s.vulgaris)</i>	81
<i>Gobius paganellus</i>	1	<i>Spondyllosoma cantharus</i>	1
<i>Hippoglossoides platessoides</i>	4	<i>Sprattus (clupea) sprattus</i>	1
<i>Homarus gammarus</i>	6	<i>Syngnathus acus</i>	9
<i>Hyperoplus lanceeolatus</i>	2	<i>Taurulus bubalis</i>	3
<i>Labrus mixtus</i>	1	<i>Trachinus (echiichthys) vipera</i>	18
<i>Lepadogaster candollei</i>	2	<i>Trachinus draco</i>	3
<i>Lepidorhombus whiffiagonis</i>	9	<i>Trigla lucerna</i>	55
<i>Limanda limanda</i>	91	<i>Trigloporus lastoviza</i>	1
<i>Liparis liparis</i>	5	<i>Trisopterus esmarki</i>	9
<i>Lophius budegassa</i>	1	<i>Trisopterus luscus</i>	23
<i>Lophius piscatorius</i>	18	<i>Trisopterus minutus</i>	48
<i>Melanogrammus aeglefinus</i>	27	<i>Zeugopterus punctatus</i>	2
<i>Merlangius merlangus</i>	80	<i>Zeus faber</i>	15
<i>Merluccius merluccius</i>	7	<i>Zoarces viviparus</i>	1

**Table 4:** Summary of gear deployments

Gear	Valid	Additional	Replicate	Invalid	Total
Standard 4m Beam trawl with cod end liner	108	6	0	2	116
Water sample for Tritium analysis	37	0	0	0	37
Surface salinity samples	133	0	0	0	133
Niskin sea-bed water samples	30	0	0	0	30

Abundances of pre-recruit and recruited plaice and sole in the Irish Sea and Bristol Channel are shown in Figures 2 and 3. As with last year's survey, pre-recruit plaice were most abundant off the east coast of Ireland and in inshore waters off North Wales and northwest England. Pre-recruit sole were most abundant in the Bristol Channel, particularly Carmarthen Bay and in inshore waters off north Wales and Liverpool Bay. Abundances of pre-recruit and recruited dab and lemon sole are shown in Figures 4 and 5.

Plaice: Abundance by number was up in all survey sectors in comparison to last year's survey but by weight, are down in the most abundant sectors and up in the least

productive sectors. In BCI, plaice abundance increased for the fifth year running. Abundance by both number and weight caught in this year's survey is at the survey series high over the period 2001-10 with increases observed of 25% (numbers) and 22% (weight). Catch numbers of juvenile plaice (<21cm) in BCI has remained at the high levels seen in 2009, with 206 caught this year compared to 250 in 2009. In BCO, there was an increase in the number and weights of 31% and 47% respectively.

In the Irish Sea, ISN plaice abundance increased in terms of numbers caught (23%), whereas the total weight caught fell (7%). Both numbers and weights caught remain at, or close the survey high (2001-10). In ISS, plaice numbers caught were similar to those observed in 2009. Catch numbers of juvenile plaice (<21cm) in ISS/ISN increased this year by 70%, with most of these juvenile fish coming from the ISN sector. However numbers of recruited plaice caught in these areas fell by a similar amount. Catches in ISW increased this year and are the highest since 2007 whereas catches in SGC are at similar levels observed in 2009. Trends in survey catch rates over recent surveys are shown in Figure 6.

Sole: Abundance by number are down in all survey sectors in comparison to last year's survey. Catch weights are down in most sectors but saw notable increases in BCI and SGC. Catch numbers of sole caught are down by 26% in BCI, but catch weights are up by 19%. Catch numbers are close to the series low 2001-10. Catch numbers of juvenile sole (<21cm) in BCI have fallen by 88% from those caught in 2008 but numbers of recruited sole caught have increased by 60% in the same period.

In the ISS and ISN sectors, both catch numbers and catch weights of sole have fallen to a series low (2001-10) with a fall in numbers caught this year of around 38% and weight caught by around 45%. Numbers of juvenile sole in ISS/ISN (<21cm) have fallen by 72% since 2008 and numbers of recruited sole ( $\geq$ 21cm) have also fallen by 30% over the same period. In BCO and SGC catches were similar to those observed in 2009, but in ISW catch numbers and weights fell by 63% and 72% respectively and are now close to the series low (2001-10). Trends in survey catch rates over recent surveys are shown in Figure 7.

Dab: Dab catches in BCI increased from the levels seen in 2009 and are now at series high levels (2001-10). Numbers of juvenile dab in BCI (<16cm) have increased by 37% since 2009, but are still 47% lower than that observed in 2007 (691 in 2007; 366 in 2010). In BCO, abundance was similar to that observed in 2009.

Catches in ISS, ISN and SGC remained relatively stable whereas in ISW, an increase in catch numbers and weights was observed (78% & 74% respectively). The number of juvenile dab in ISS/ISN (<16cm) has decreased by 22% since 2009 but remain above the levels observed in 2008 (2523 in 2010; 2026 in 2008). Trends in survey catch rates over recent surveys are shown in Figure 8.

Lemon sole: Catch rates of lemon sole remain low in all survey sectors but did show increases in BCO and SGC sectors. Trends in survey catch rates over recent surveys are shown in Figure 9

Noteworthy changes to the catch rates of other main species are increases in the abundance of 1-grp cod in BCI (>21cm) from 1 fish in 2008 to 5 fish in 2010, following



on from high catches of 0-grp cod in this area in 2009. In ISS and ISN, small numbers of fish deemed older than 0-grp were also caught in 2010 (10 fish). Cod of this size are rarely seen in the catches on this survey. On the entire survey, a total of 69 cod >21cm were caught compared to 5 in 2009 and just 2 in 2008.

Catches of haddock were similar to that of cod as the numbers of fish >21cm and deemed older than 0-grp were 147 fish in 2010 compared to 19 in 2009 and 13 in 2008. Whiting catches are down in 2010 in all survey sectors except SGC where a modest increase in both catch numbers and catch weights was observed. The catch weights in ISW also showed an increase but still remains at a low level.

Catches of thornback ray are generally down in most sectors with the exception being ISS where catch numbers and catch weights increased by 85% and 23% respectively. Small-eyed ray catches are down in BCI and are close to the lowest levels observed over the period 2001-10. Catches of lesser-spotted dogfish fell in all survey sectors except SGC and ISW.

#### Aim 4 - Surface and bottom water sampling

At each fishing station, a surface water salinity sample was taken using on-board seawater supply taken from a depth of 5m. The starboard gantry with the 'hydrographic' wire was used in the collection of bottom water samples with a SAIV Micro CTD unit (S/N 717) and a niskin sampler. The sample was routinely taken at around 3m off the seabed. A total of 30 bottom water samples and associated CTD data were collected. On two of these collections, the CTD unit failed to collect the profile.

#### Aim 5 - Epibenthos

At 25 selected fishing stations, samples of the epi-benthic by-catches were sorted and 32 'core species' identified and quantified. A standard operating procedure (SOP) for the processing of this by-catch was provided. Some non-SOP benthic species were identified where on-board expertise allowed.

At all fishing stations on the survey, catches of 9 sentinel taxa of benthic invertebrates were recorded. The total weight of the remaining by-catch of epi-benthic invertebrates was recorded on all except 4 stations where the by-catch was very heavy and had to be estimated. The weight of rocks caught in the trawl was also recorded at each station. In addition, benthic observations were recorded from the catches at non-benthic stations.

#### Aim 6 - Length weight & maturity information

A total of 2218 length/weight measurements were collected on the survey in addition to the length weight information routinely collected with survey otoliths. Species were targeted this year to supplement those measurements taken on the 2009 survey. The main species sampled in 2010 are shown in Table 5.

**Table 5:** Main species sample for length/weight

<b>Species</b>	<b>No of length/weight measurements.</b>
Solenette ( <i>Buglossidium luteum</i> )	555
Pogge ( <i>Agonus cataphractus</i> )	301
Edible Crab ( <i>Cancer pagurus</i> )	204
Lesser Weever ( <i>Trachinus vipera</i> )	193
Scaldfish ( <i>Arnoglossus laterna</i> )	185
Nephrops ( <i>Nephrops norvegicus</i> )	95
Starry Smooth-hound ( <i>Scyliorhinus stellaris</i> )	93
Sand Goby ( <i>Pomatoschistus minutus</i> )	85
Thick-back Sole ( <i>Microchirus variegatus</i> )	80
Bullrout ( <i>Myoxocephalus scorpius</i> )	55

Aim 7 – Tritium water sampling

1 litre surface seawater samples were collected from 37 stations in the Bristol Channel & Severn Estuary for Tritium H-3 analysis for Carol Smedley. (Cefas, Lowestoft).

Aim 8 - Additional sample collection

Additional samples were taken in support of other CEFAS projects:

A) All monkfish had illicia taken to supplement the otoliths collection. S Songer (CEFAS, Lowestoft).

B) No rare or unusual species were caught on this survey.

C) A total of 15 Bullhuss (*Scyliorhinus stellaris*) were tagged and released. J Ellis (Cefas, Lowestoft).

D) A total of 12 sightings of Cetaceans were recorded during the survey. Details of location, date/time and identification were noted on each occasion. Ten sightings were of common dolphin (*Delphinus delphis*) and one was of minke whale (*Balaenoptera acutorostrata*). Details were collected for the Sea Watch Foundation. The remaining sighting was of an unidentified dolphin.

E) A total of 56 fin clips were taken from Brill and turbot in support of a study into the comparative population genetic structure. S Vandamme (IVLO, Belgium).

F) Details of the by-catch of litter caught at all fishing stations were recorded. In total, litter by-catch was categorized by 'type', weighed and categorized by size at a total of 83 fishing stations. In addition details of any attached organisms were recorded. Photographs of some litter items were also taken. A total of 220 pieces of litter weighing 10.542 kg were collected during the survey, the majority of which classified as being plastics. These accounted for around 83% of the total items caught and for 68% of the

total litter weight and were primarily identified as being either plastic bags or plastic sheeting. Full analysis of the litter by-catch is shown in Figure 10.

G) No specimens of sea trout or any other diadromus species were caught and retained as part of the EU Interreg – Celtic Sea Trout Project (Ted Potter)

H) A total of 51 specimens of ray species were tagged and released after a period in excess of 4 hours (Jim Ellis). This delay in the release of these rays was in order to determine the survivability of these fish after capture. These rays can be broken down by sub-species in the following order: 19 thornback ray; 6 blonde ray; 4 small-eyed ray; 5 cuckoo ray and 17 spotted ray. A further 7 specimen of ray were tagged but did not survive the time in the deck tank – these tags were removed and the fish discarded.

I) Samples of dab, lesser spotted dogfish, spider crabs (*Maia squinado*), thornback ray, Edible crab and octopus (*Eledone cirrhosa*) were collected for the radiological monitoring programme from the northern part of the Irish Sea. No specimens of cuttlefish (*Sepia officinalis*) were caught in the required sea areas. P Rumney (Cefas, Lowestoft).

J) Four samples of benthic material and 1 un-identified fish were frozen for post-survey identification.

K) A total of 25 measurements of jellyfish caught were taken. These were identified to species and measured across the ‘umbrella’ disc. D Righton (Cefas Lowestoft)

L) Detailed photographs of otolith extraction techniques were taken for 14 species.

M) Six photos were taken of the beam trawl being deployed – for use in FD technical reports.

#### Aim 9 - Maturity photographic collection

A total of 3 photographic sets from individual specimens were taken. For each individual, 4-6 images were captured. This comprised 3 Brill and 0 turbot. B Harley (Cefas, Lowestoft).

#### Aim 10 – Stable Isotope Sample Collection

A total of 1130 finfish and 88 queen scallops samples for stable isotope analysis were taken in support of the food web studies contract (M1001) (S Jennings – Cefas). This collection comprised:

Area	Fin-fish samples	Queen scallop samples
IS (Irish Sea South)	455	19
INE (Irish Sea North-East)	335	43
IC (Irish Sea Central)	340	26

## Micro CTD

The SAIV Micro CTD unit number 596 was attached to the 4m-beam trawl in order to record the temperature, salinity and depth profile at each station fished and this was successful in recording data on all fishing days and a total of 108 successful CTD data collections were made.

Finally, our thanks go to all the officers and crew of RV Cefas Endeavour for their help, support and advice given during this survey. As a result of their skill and co-operation, all survey aims were achieved.

I D Holmes  
1st October 2010

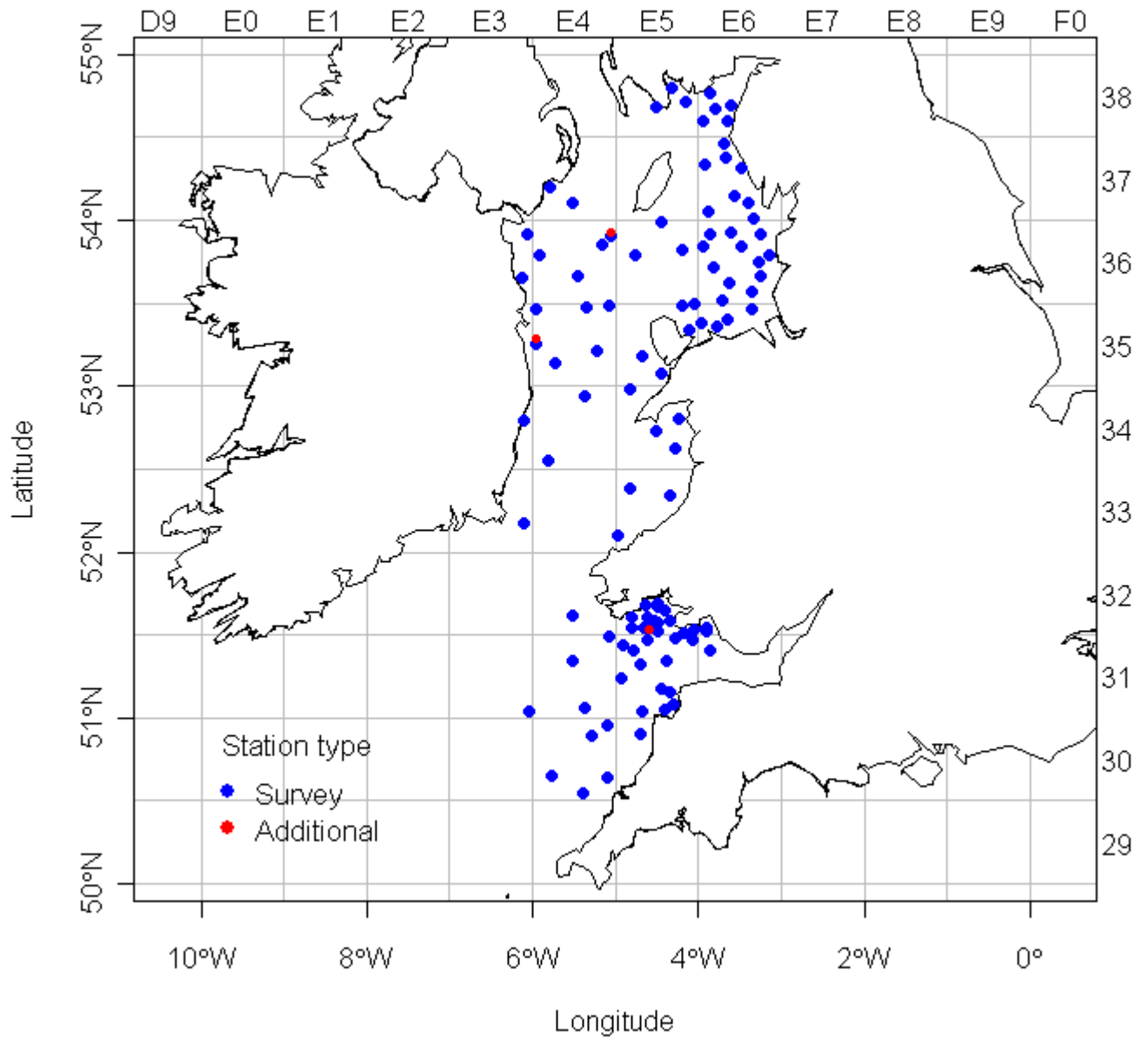
INITIALLED: B Harley

SEEN IN DRAFT: Master: Capt. N Fagan  
First Officer: B Salter

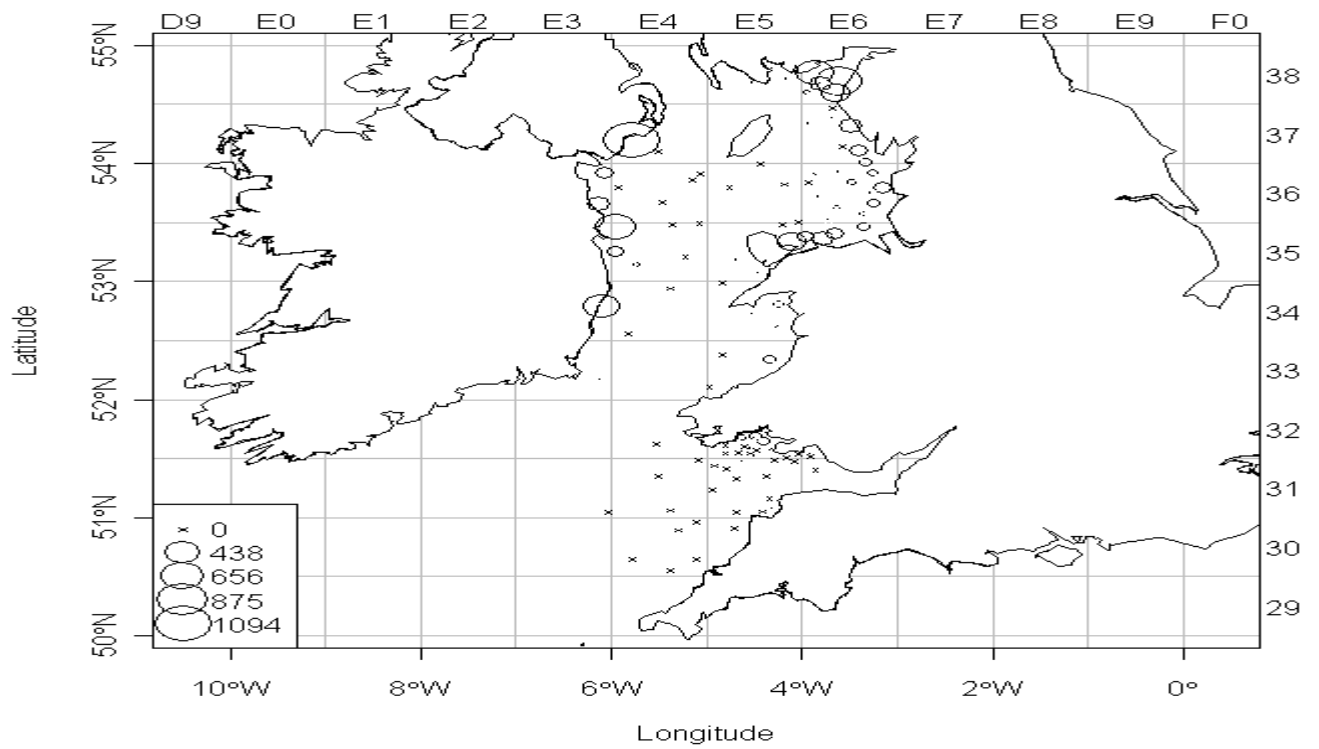
DISTRIBUTION:  
Basic List +

I Holmes	T Owen (P&O)
M Etherton	Master (Cefas Endeavour)
R Bush	B Harley
J Silva	S Kupschus
J Pettigrew	Cefas Intranet
A Leocadio	R Briggs (AFBI NI, Belfast)
D Duggan (Irish Observer)	P Connolly (DOM, Dublin)
M Parker-Humphreys	FCO (for Republic of Ireland)
J Smith	Sea Fisheries Committees:
K Moreau (Belgian Observer)	Cumbria
L Readdy	North Western and North Wales
	South Wales
	Devon
	Cornwall

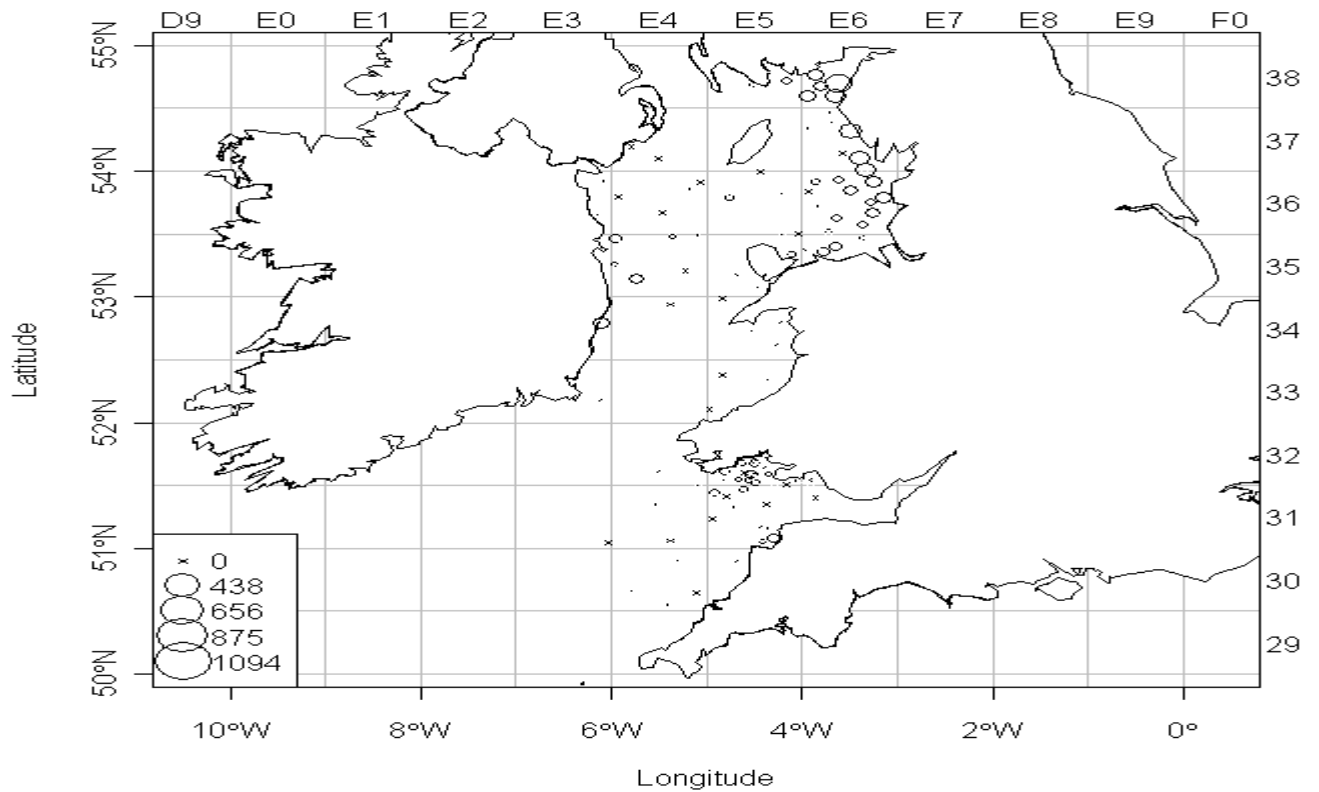
**Figure 1 - Station Positions for CEND 14/10. Blue dots represent survey station positions; red dots represent additional tows.**



**Figure 2 - Abundance (number caught per 30 minute tow) of pre-recruit (a) (<21 cm TL) and recruited (b) ( $\geq 21$  cm TL) - plaice.**  
**a)**

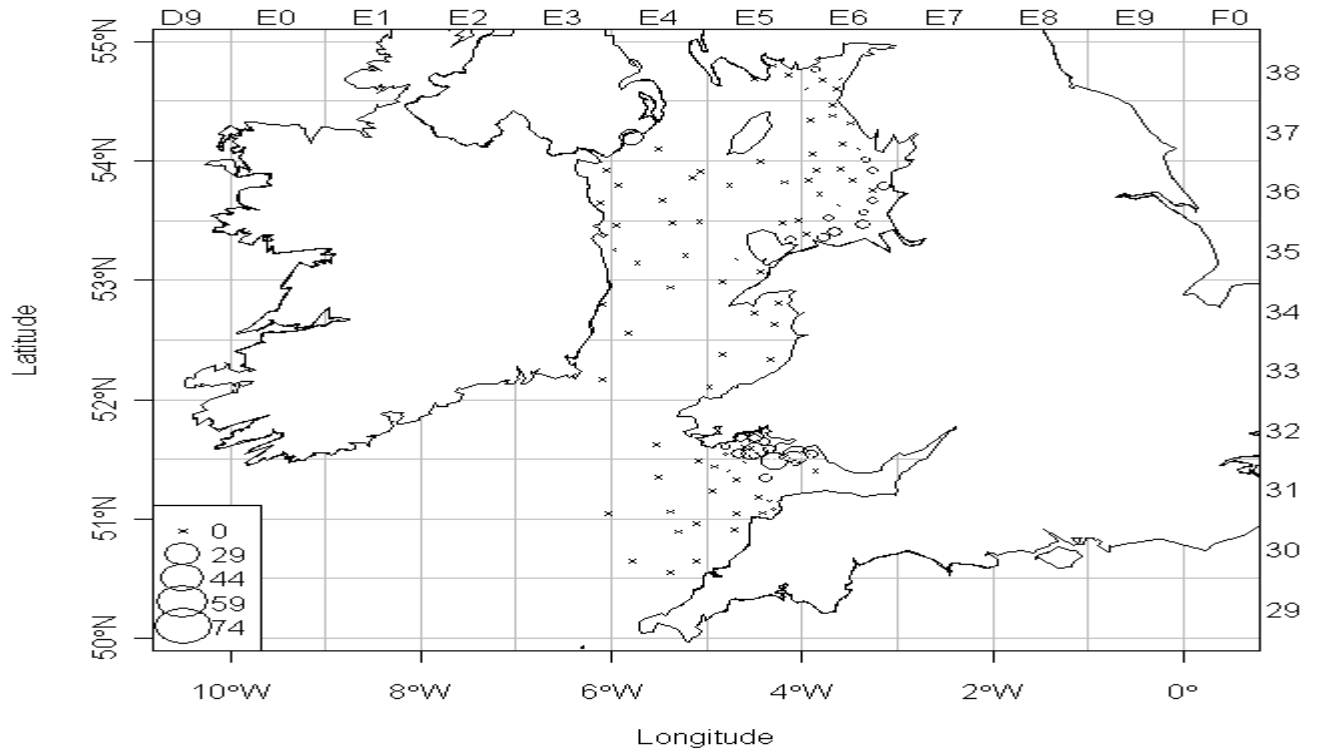


**b)**

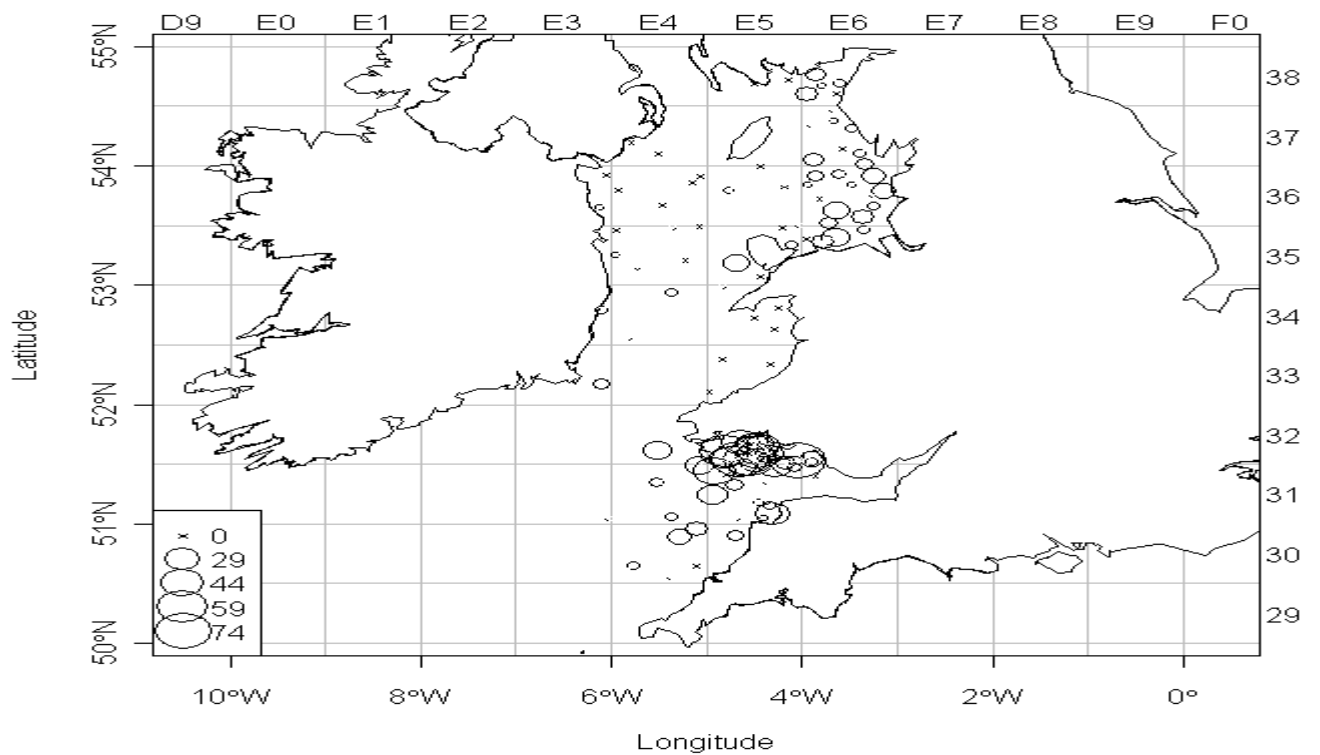


**Figure 3 - Abundance (number caught per 30 minute tow) of pre-recruit (a) (<21 cm TL) and recruited (b) ( $\geq 21$  cm TL) - sole.**

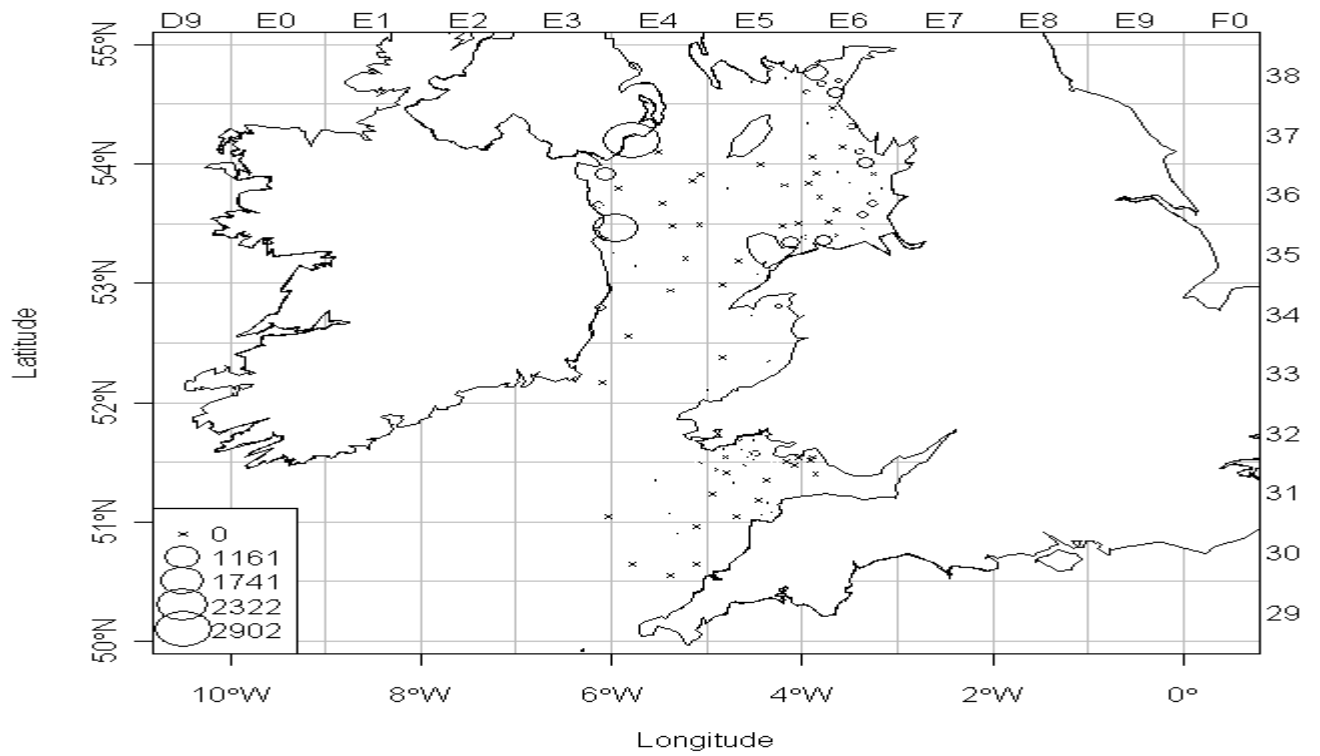
**a)**



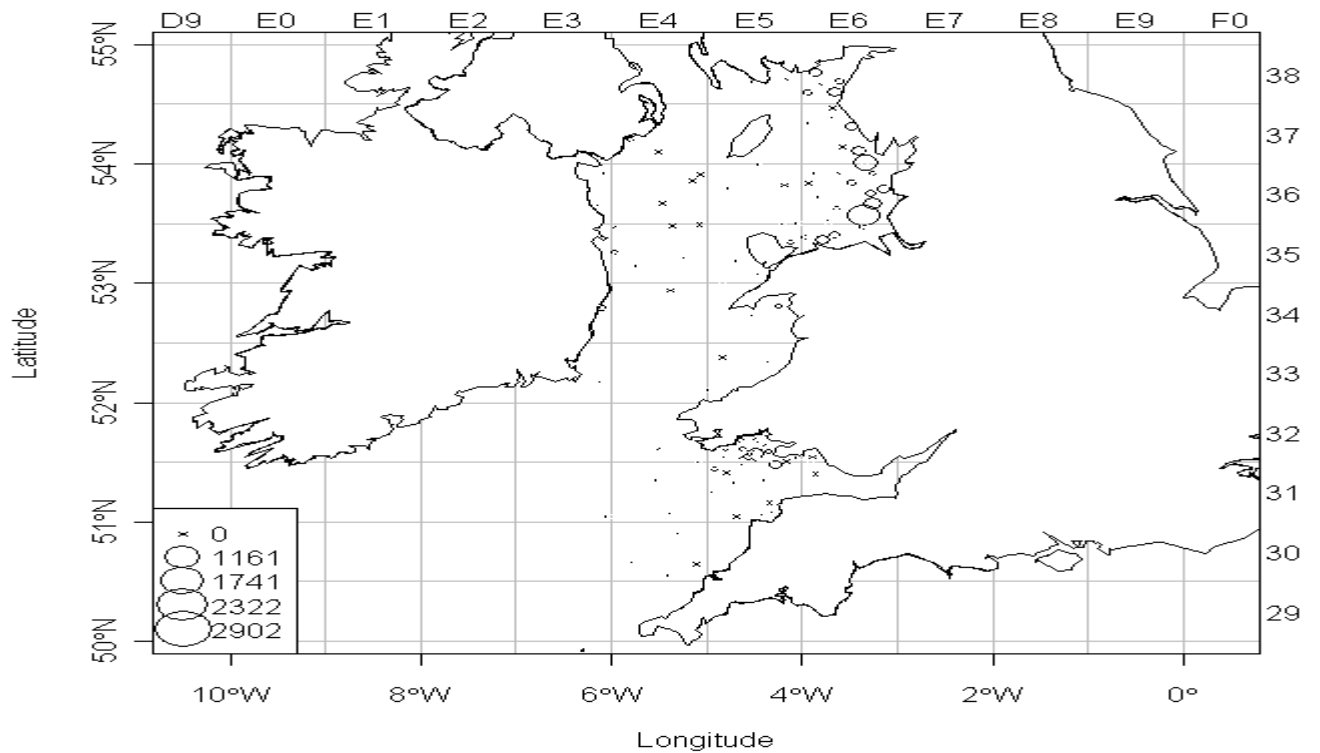
**b)**



**Figure 4 - Abundance (number caught per 30 minute tow) of pre-recruit (a) (<16 cm TL) and recruited (b) ( $\geq 16$  cm TL) - dab.**  
**a)**

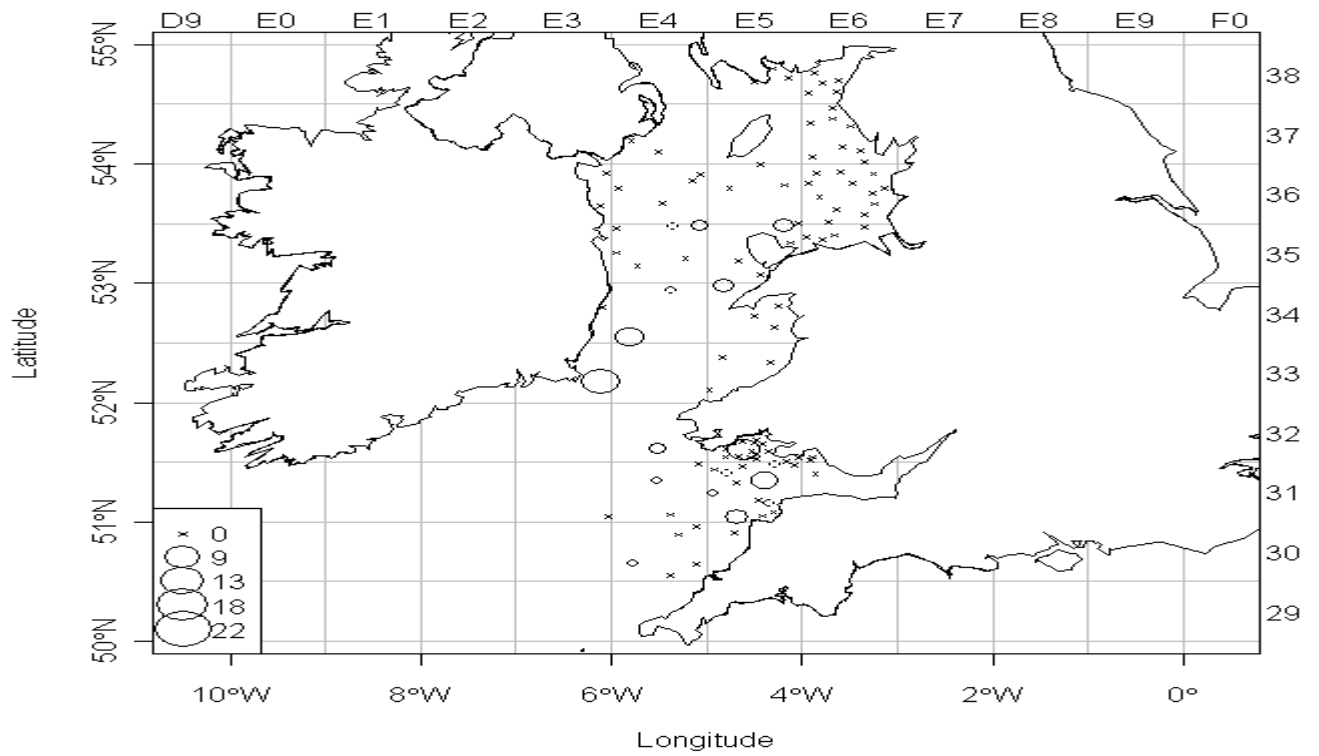


**b)**

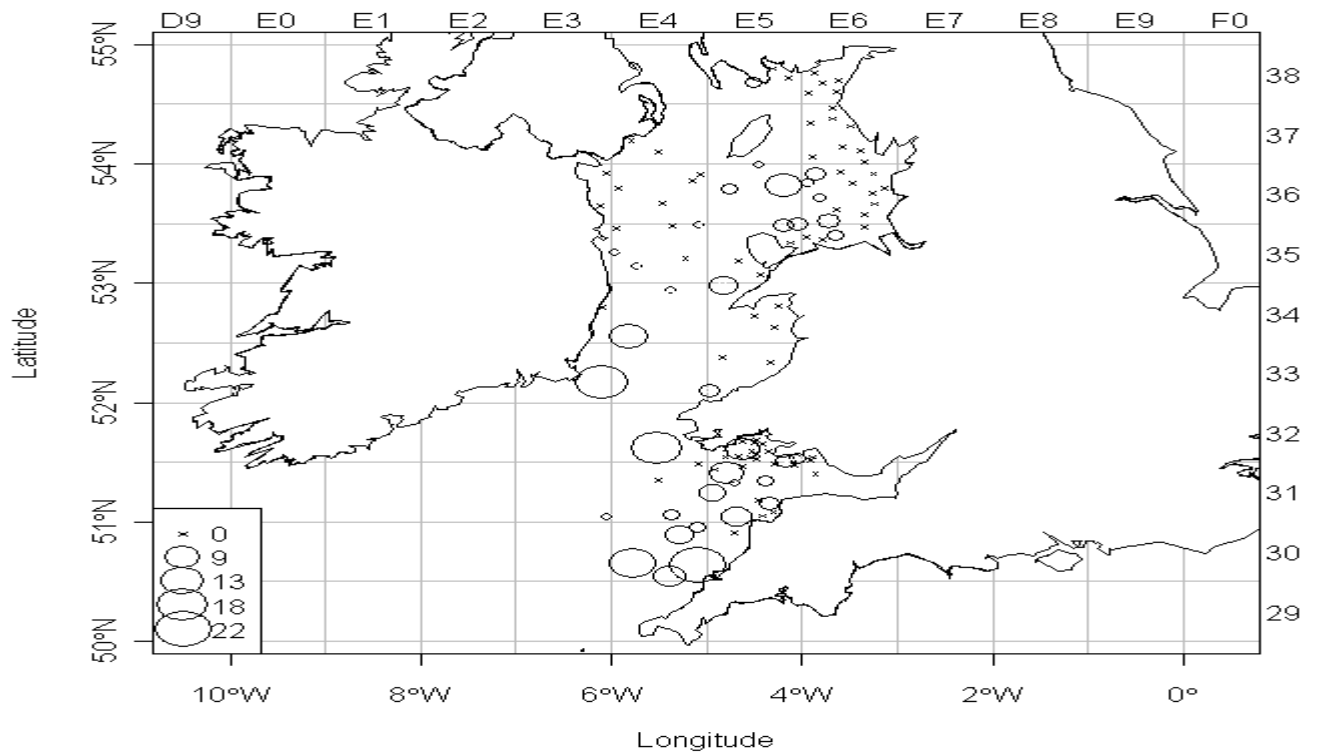




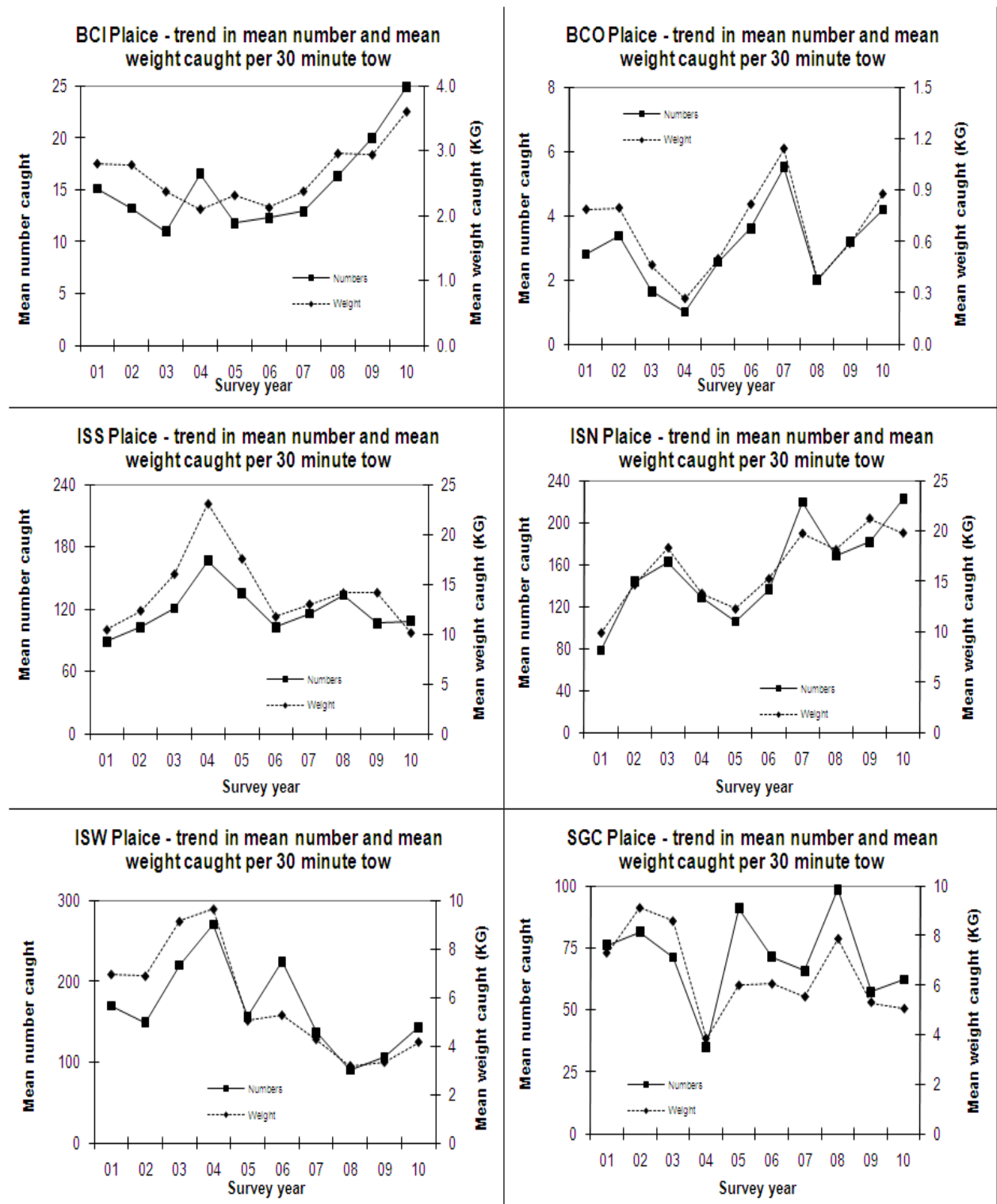
**Figure 5 - Abundance (number caught per 30 minute tow) of pre-recruit (a) <19 cm TL) and recruited (b) (≥19 cm TL) - lemon sole.**  
a)



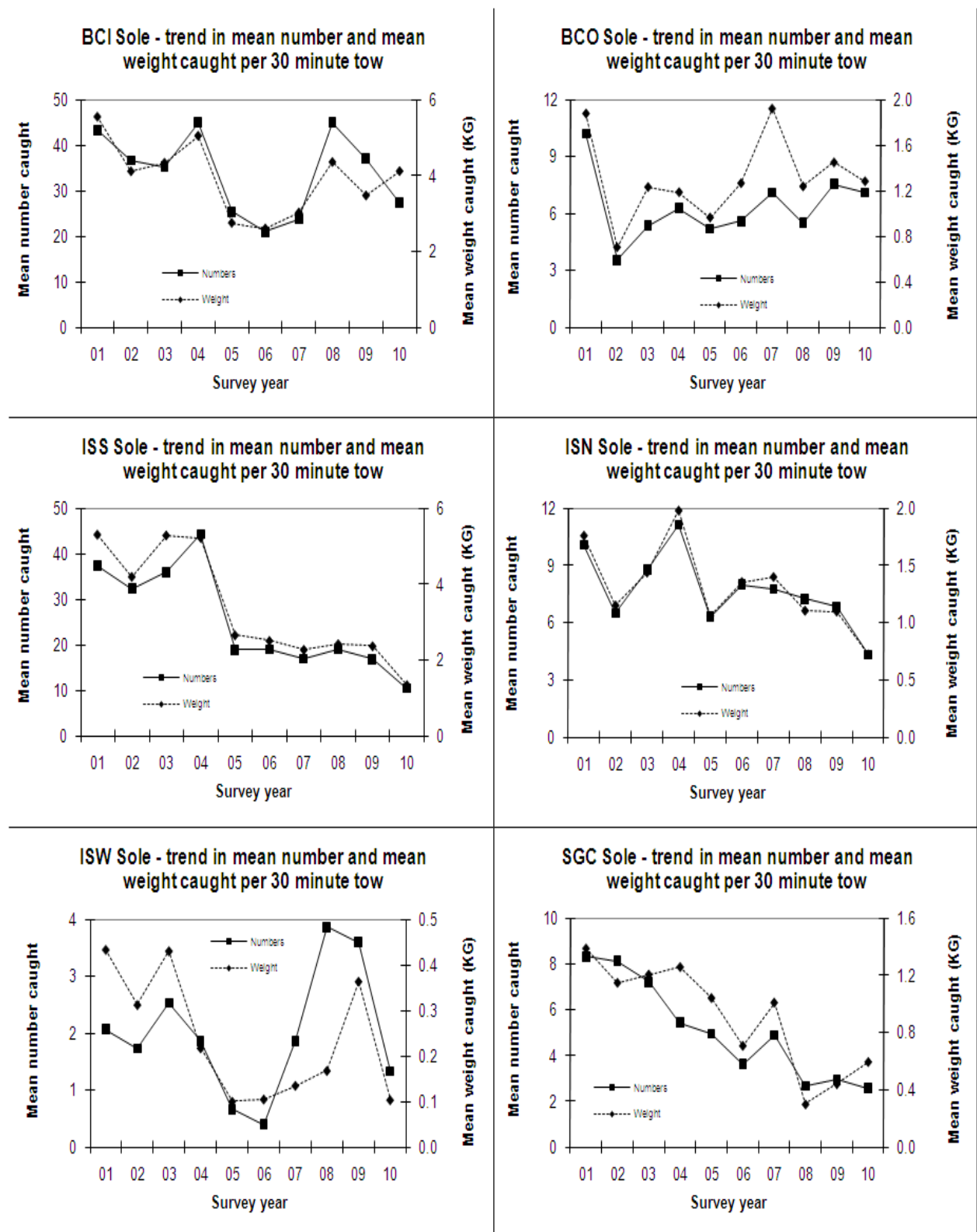
b)



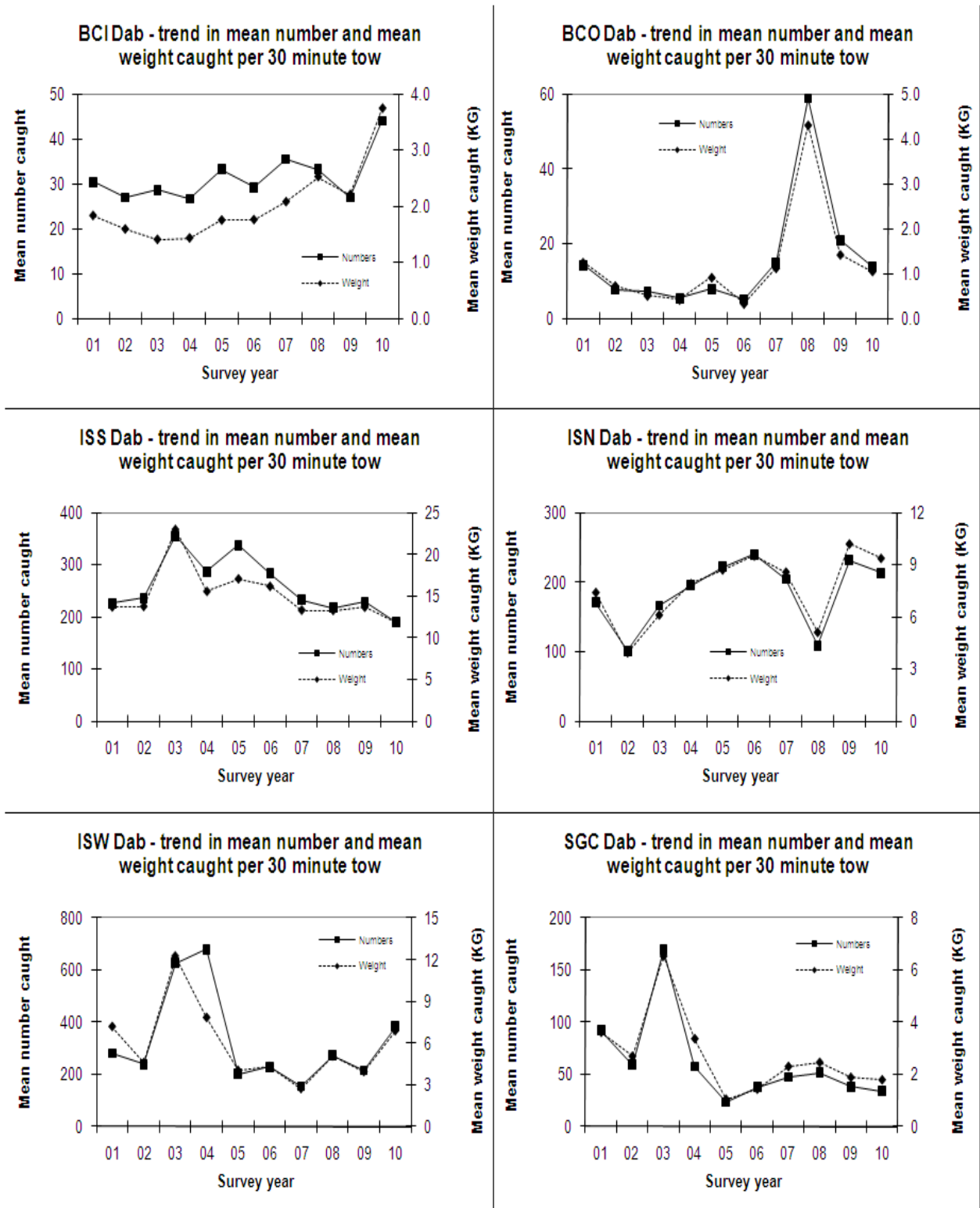
**Figure 6 – Mean number and weight of plaice (*Pleuronectes platessa*) caught per 30-minute tow - by survey area**



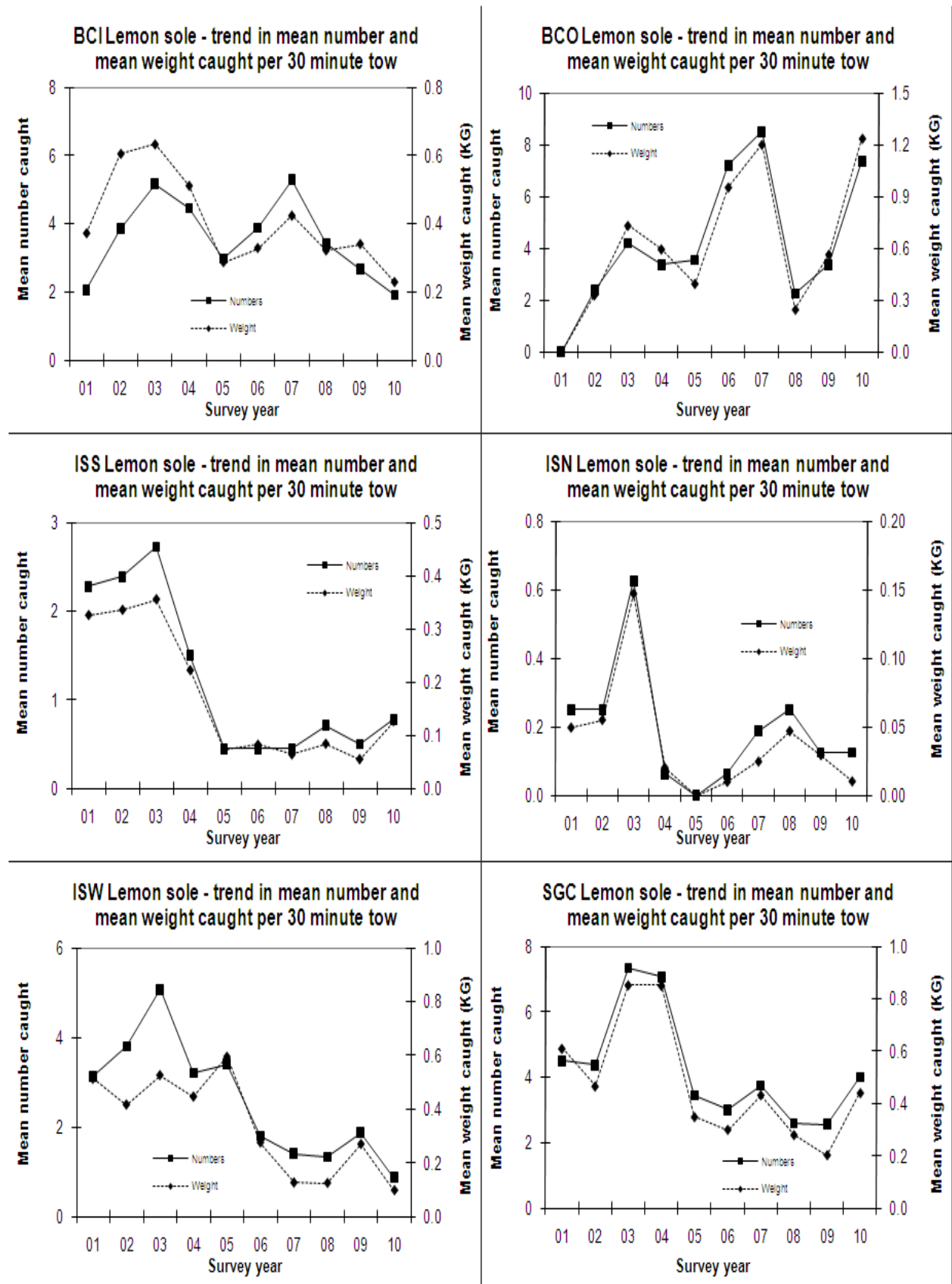
**Figure 7 - Mean number and weight of sole (*Solea solea*) caught per 30-minute tow - by survey area.**



**Figure 8 - Mean number and weight of dab (*Limanda limanda*) caught per 30-minute tow - by survey area per 30-minute tow.**



**Figure 9 - Mean number and weight of lemon sole (*Microstoma kitt*) caught per 30-minute tow - by survey area per 30-minute tow.**



**Figure 10 – Analysis of the litter by-catch caught on the survey.**

