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

2009 RESEARCH VESSEL PROGRAMME

PROGRAMME: RV CEFAS ENDEAVOUR: SURVEY 12

STAFF:

Part A	Part B
B Harley (SIC)	B Harley (SIC)
S McCully (2IC)	S McCully (2IC)
R Humphreys	R Humphreys
B Hatton	B Hatton
L Cox	L Cox
M Eade	M Eade
M Parker-Humphreys	S Elliott

Students:
H Young from the University of Southampton – Part A
Plus 3 students from the University of Exeter – Part B

DURATION: Part A: 5 August – 21 August
Part B: 22 August – 7 September

LOCATION: North Sea

AIMS:

1. To carry out a groundfish survey of the North Sea as part of the ICES coordinated IBTS, using a standard GOV trawl in order to obtain information on:
   a) Distribution, size composition and abundance of all fish species caught.
   b) Age – length distribution of selected species.
   c) Distribution of fish in relation to their environment.
   d) Distribution of macrobenthos and anthropogenic debris.
   e) Surface and bottom temperature and salinity data using SAIV miniCTD.
   f) Length weight & maturity information using individual fish measurements, in support of the EU Data Regulation.

2. Post-mortum changes to length of dogfish

3. Collection of 0-group cod (frozen)

4. Collection of following species - various sizes 9 of each species (frozen)
   Callionymus lyra: Dragonnet
   Clupea harengus harengus: Atlantic herring
   Gadus morhua: Atlantic Cod
   Trisopterus luscus: Pouting

Microstomus kitt: Lemon sole
Ammodytes marinus: Lesser sandeel
Trachurus trachurus: Atlantic horse mackerel

5. To bring back 1-2 whole specimens of selected fish species ;
   hagfish, saithe, brosme, 2 of each Sebastes, wolffish, butterfish, snake blenny, plus any species of eelpout or sea-scorpion

6. Maturity photos (using protocol) of lemon sole and dab

NARRATIVE:
(All times GMT)

RV Cefas ENDEAVOUR sailed from Lowestoft at 1030h 5 August. Onboard, were 7 Cefas fisheries staff, and 1 student from the University of Southampton. Before work on the primary stations commenced, a 'shakedown' tow was carried out to allow for the deployment of the gear, to check that all sensors were working correctly and to allow scientists and crew to familiarise themselves with their particular work areas. A standard station consisted of a cast with a CTD and a 10-litre Niskin bottle, followed by a 30-minute tow with the standard IBTS rigged GOV, with a miniCTD attached. At the start of the survey, on every station, fisheries acoustic data were continuously collected at three operating frequencies (38kHz, 120kHz and 120kHz), using the Simrad EK60 split beam sounder for Hannah Young of the University of Southampton. The shakedown tow was carried out at prime station 1. Initial problems with twisted bridles, and incorrect attachment of the lazy-deckie were rectified, and when the net was shot good readings were obtained from all Scanmar units. On hauling, however it was found that the codend liner had become detached, thus making the tow invalid was a prime station tow. This tow was repeated and fished successfully, completing prime station 1, before the end of the first day. The following day (6 August) we moved into the southern North Sea and fished 4 stations (Primes 2, 3, 6 and 5), with the catch mainly consisting of mackerel. On 7 August, we moved to the southern central North Sea, and fished Prime stations 4, 10 and 9. The first tow of station 9 showed a catch of whiting in excess of 10 tonnes, which resulted in bursting the codend liner, and thus the tow was invalid, and the fish had to be 'slipped'. After 2hrs net mending time, the tow was repeated. Fifteen minutes into the tow, the decision was made to haul, given the size of the previous catch, and the tow was valid, consisting of 2.8t of whiting. The following day 3 stations were fished, (Prime 8, 7 and 13). On hauling of the second tow, 2 panels had been ripped through and the belly was out, as it appeared that we had towed through rough ground, making the tow invalid. After 2.5hrs mending time, the tow was moved and repeated, but hauled after 25mins as high load readings were recorded, however it was a valid tow. During steaming to the final station, Cefas Endeavour encountered some problems with the engines overheating and cutting out several times, however we made it to the last tow before sunset and it was fished successfully. The following 2 days ran smoothly with 4 stations being fished each day successfully around the central North Sea and Dutch coast (Primes 14, 15, 16, and 17 on 9 August, and Primes 12, 11, 18 and 19 on 10 August). The following day we moved up to fish off the Danish coast, and fished prime stations 20, 21, 30 and 29. The first tow, notorious for problems and net damage, was hauled after 16mins (valid tow) due to erratic Scanmar readings.

Upon hauling it was found that a string of abandoned lobster pots had attached themselves to the bridle. These were successfully removed and no damage was done to the net. The following day we fished the northern Danish / southern Norwegian prime stations of 39, 38, 37 and 36 successfully. The weather freshened to around 25 knots of wind in the morning, but this caused no problems. We then moved to the northern central North Sea, and fished prime stations 28, 27, 26, and 25 the following day. During the second tow, the lower wing section of net was ripped through, so this whole section was replaced quickly and we continued to fish without incident. The wind reached 29 knots in the morning, but this only hampered steaming time between stations. On 14 August, we fished prime station 24, 23 and 22 heading westward towards the northern UK coast. The following day the sea conditions deteriorated slightly with winds gusting up to 36 knots, but stations 33, 41, 32 and 31 off the eastern Scottish coast were fished successfully. However the following day the weather worsened with gale force winds of 45 knots. With it being unsafe to work, fishing had to be abandoned for the day. Overnight the winds calmed and on 17 August we fished stations 34, 35, 44 and 43. The third tow had to be repeated after the liner became detached from the codend, but was fished correctly the second time. The following day 4 stations (Prime 48, 56, 55 and 54) in the northern central North Sea were fished correctly. On 20 August prime stations 47, 42 and 46 were fished. On 21 August, prime station 40 was fished in the early morning. Following this we steamed into Aberdeen for the mid-cruise break. We docked at the fuel berth at 1230h, where we spent 3.5 hours taking on fuel, before moving to our berth at 1630h.

We left Aberdeen docks on Saturday 22 August at 0545h where we steamed northeast and arrived on station at 1230h to fish prime station 45, followed by station 53. The following day prime station 52, 51 and 59 were fished despite the weather deteriorating slightly, with winds of 26 knots. At prime station 59, the first tow was deemed invalid as the twine securing the codend liner became undone, and thus fish were lost. This was repeated successfully. On 24 August prime stations 60, 61 and 62 east of the Shetland Isles were fished. Again on the second tow of the day, the codend liner became detached, and thus the tow was deemed invalid, and had to be repeated. The following day prime stations 66, 67, 68 and 69 were fished. We then steamed to the most northerly stations, above the Shetland Isles for 26 August, where prime stations 71, 72, 73 and 74 were fished. The following day we worked down the west coast of Norway and fished stations 75, 70 and 65. On 28 August we completed the Norwegian coastal stations and fished stations 50, 49, 58 and 57, with the weather deteriorating by late afternoon, with 29-knot winds. That evening, the wind and swell increased significantly with force 8-9's, therefore on 29 August no fishing could be undertaken. Overnight we slowly dodged the weather and made our way to the final 2 prime stations of 63 and 64, which were fished successfully on 30 August.

The net was then changed over to the polyethylene GOV on the afternoon of 30 August, in preparation of repeating several fishing stations as comparative tows for the remainder of the survey. In the following few days, 15 prime stations (see Figure 1), were re-fished with alternative net, before the final station was shot at 0541h on 5 September. The result from this exercise will be analysed on return to the Lowestoft Laboratory and will be reported at a later date. On completion of this tow, Cefas Endeavour steamed for Lowestoft, were she docked at 0010h on 6 September.

Results

Aim 1: A valid GOV trawl haul was successfully completed at all of the 75 primary station positions (Table 1). Also shown in Table 1 is the number of additional stations fished using the polyethylene GOV net. There were 6 invalid tows, which were all repeated to obtain valid samples. A SAIV miniCTD was used, attached to the starboard wing of the trawl to obtain temperature and salinity data. The survey was fished using GOV trawl number 12, and the gear trials were fished using the poly GOV net number 3. A chart indicating the position of each trawl station is attached (Figure 1). SCANMAR equipment was used to monitor headline height, wing width and door spread. At each station, the catch of each species was weighed and all fish, or representative samples, were measured. Table 2 lists the species caught that are sampled for length and Table 3 ranks the top 15 species by weight compared with the last two year's survey. Samples of otoliths for age determination were taken (Table 4) as specified in standard instructions. Benthos and crustacea were identified to the species wherever possible and recorded as present. The resultant data were input to computer database using the Cefas Electronic Data Capture System. This data will be analysed at Cefas Lowestoft and will provide a major input to the ICES assessment of North Sea gadoids and pelagic species. Once checked and validated, all data will also be input to the ICES Datras database.

Surface and bottom salinity samples and a water column CTD profile were taken on all but one of the primary stations fished. These samples will be forwarded to EI in order that the CTD profile can be calibrated.

Species of note caught this year during the survey are *Anguilla anguilla, Pollachius pollachius, Cyclopterus lumpus, Phycis blennoides, Sebastes viviparous, Helicolenus dactylopterus, Hippoglossus hippoglossus,* and *Brosme brosme.*

Figures 2-10 show distribution and relative abundance (kg per hour) of cod (*Gadus morhua*), haddock (*Melanogrammus aeglefinus*), whiting (*Melangius merlangus*), saithe (*Pollachius virens*), Norway pout (*Trisopterus esmarkii*), herring (*Clupea harengus*), mackerel (*Scomber scombrus*), sprat (*Sprattus sprattus*) and plaice (*Pleuronectes platessa)*, respectively, over the last 4 years. The total weight of cod caught has decreased from last year (442kg in 2009, 595kg in 2008), while the number of stations that cod were caught at has also dropped slightly from 48 stations in 2008 to 44 stations in 2009. The catch of herring has doubled from last year, while whiting catches were over 1 tonne more than 2008, and over double the catch of Norway pout was seen in 2009 from 2008. The mackerel catch was less than half that seen in 2008, but was on par with that seen in 2007, and the large catch seen in 2008 was attributable to just one or two very high catches, as a result of their pelagic, schooling behaviour. Haddock catches were on the same level as seen in 2008.

In addition, length-weight measurements were taken of non-otolithed species, in order to obtain length-weight curves specific to this survey. These were taken for up to 1000 specimens of each species. Figures 11-20 show the length-weight curves obtained for the following top 10 otolithed species: cod, haddock, whiting, saithe, Norway pout, herring, mackerel, plaice, dab and lemon sole. Figures 21-25 show the length-weight curves achieved for the top 5 non-otolithed species: horse mackerel, grey gurnards, long-rough dab, weever fish and hake.

Table 1.

Gear	Valid	Additional	Invalid	Total
GOV (IBTS Standard gear)	75	0	6	81
Niskin Bottle + CTD	74	0	0	74
Poly GOV stations	0	15	0	15

Table 2. List of measured species caught during the survey and number of stations at which they were recorded.

Species	**Stns.**	**Species**	**Stns.**
Agonus cataphractus	13	*Merluccius merluccius*	36
Alloteuthis subulata	22	*Micromesistius poutassou*	8
Alosa fallax	3	*Microstomus kitt*	54
Ammodytes marinus	2	*Molva molva*	8
Anarhichas lupus	5	*Mullus surmuletus*	6
Anguilla anguilla	1	*Mustelus asterias*	1
Argentinidae	30	*Myoxocephalus scorpius*	2
Arnoglossus laterna	13	*Myxine glutinosa*	5
Aspitrigla cuculus	3	*Nephrops norvegicus*	18
Brosme brosme	1	*Octopodidae*	1
Buglossidium luteum	14	*Ommastrephes eblanae*	16
Callionymus lyra	26	*Pecten maximus*	4
Callionymus maculatus	17	*Phycis blennoides*	1
Callionymus reticulatus	8	*Platichthys flesus*	4
Cancer pagurus	19	*Pleuronectes platessa*	57
Clupea harengus	50	*Pollachius pollachius*	1
Cyclopterus lumpus	2	*Pollachius virens*	17
Eledone cirrosa	1	*Raja clavata*	3
Enchelyopus cimbrius	8	*Raja montagui*	1
Engraulis encrasicolus	2	*Raja naevus*	12
Entelurus aequoreus	1	*Raja radiata*	28
Eutrigla gurnardus	65	*Rossia macrosoma*	2
Gadiculus argenteus	8	*Sardina pilchardus*	3
Gadus morhua	44	*Scomber scombrus*	56
Galeorhinus galeus	1	*Scophthalmus maximus*	7
Glyptocephalus cynoglossus	10	*Scophthalmus rhombus*	1
Helicolenus dactylopterus	1	*Scyliorhinus canicula*	16
Hippoglossoides platessoides	53	*Sebastes viviparus*	1
Hippoglossus hippoglossus	3	*Sepiola atlantica*	3
Homarus gammarus	1	*Solea solea*	6
Hyperoplus lanceeolatus	10	*Sprattus sprattus*	16
Lepidorhombus whiffiagonis	13	*Squalus acanthias*	1
Limanda limanda	62	*Styela partita*	2
Lithodes maja	20	*Trachinus vipera*	13
Loligo forbesi	20	*Trachurus trachurus*	29
Lophius piscatorius	13	*Trigla lucerna*	8
Lumpenus lampretaeformis	1	*Trisopterus esmarki*	30
Maia squinado	1	*Trisopterus luscus*	1
Maurolicus muelleri	2	*Trisopterus minutus*	22
Melanogrammus aeglefinus	50	*Zeus faber*	2
Merlangius merlangus	66		

Table 3. Top 15 species by weight compared with the last two year's surveys

Species common name	Scientific name	2009 weight (kg)	2008 weight (kg)	2007 weight (kg)
Herring	Clupea harengus	5526.396	2668.001	9365.861
Whiting	*Merlangius merlangus*	4507.874	3530.802	2496.269
Norway Pout	*Trisopterus esmarkii*	3383.579	1485.302	1734.222
Mackerel	*Scomber scombrus*	2800.200	5860.274	2730.282
Haddock	*Melanogrammus aeglefinus*	2277.232	2276.911	3688.231
Dab	*Limanda limanda*	2052.979	3159.940	5193.865
Horse Mackerel	*Trachurus trachurus*	1440.914	908.818	1199.281
Sprat	*Sprattus sprattus*	1204.149	1983.870	334.755
Grey Gurnard	*Eutrigla gurnardus*	1002.812	742.686	1389.313
Cod	*Gadus morhua*	441.754	594.468	530.331
Saithe	*Pollachius virens*	416.447	811.436	4694.575
Plaice	*Pleuronectes platessa*	378.922	392.701	776.000
Hake	*Merluccius merluccius*	289.832	297.422	155.673
Lemon Sole	*Microstomus kitt*	173.898	175.790	291.776
Long Rough Dab	*Hippoglossoides platessoides*	148.760	265.039	389.476

A total of 5958 biological samples were taken for the primary target species (Table 4). In addition, a total of 316 samples were also taken from elasmobranchs captured during the survey.

Table 4.

Species	**Number of samples taken**
Herring	1163
Whiting	987
Plaice	964
Haddock	850
Norway Pout	489
Dab	394
Mackerel	369
Cod	288
Lemon Sole	211
Saithe	160
Sole	58
Monkfish	16
Turbot	7
Brill	1
Pollack	1

Aim 2: 12 dogfish had post-mortem changes in length taken.

Aim 3: 0-group cod were collected from 9 stations.

Aim 4: The following samples were taken:

Callionymus lyra: Dragonnet (9)
Clupea harengus harengus: Atlantic herring (9)
Gadus morhua: Atlantic Cod (9)

Trisopterus luscus: Pouting (9)
Microstomus kitt: Lemon sole (9)
Ammodytes marinus: Lesser sandeel (3)
Trachurus trachurus: Atlantic horse mackerel (9)

Aim 5: Whole specimens of the following fish were collected and frozen: hagfish (*Myxine glutinosa*), bullrout (*Myoxocephalus scorpius*), redfish (*Sebastes viviparous*), twaite shad (*Alosa fallax*), sars' eelpout (*Lycenchelys sarsi*), snake blenny (*Lumpenus lampretaeformis*), tusk (*Brosme brosme*), blue-mouth redfish (*Helicolenus dactylopterus*), catfish (wolffish, *Anarhichas lupus*).

Aim 6: 39 maturity photos of lemon sole, and 37 photos of dab were taken.

	Dab			**Lemon Sole**		
	M	F	Total	M	F	Total
0-10 cm	3	2	5			
11-20 cm	11	8	19	2	7	9
21-30 cm	1	14	15	7	10	17
31-40 cm				3	8	11

Special thanks are given to the officers and crew of Cefas ENDEAVOUR and the scientists for their enthusiasm, hard work, and positive attitude allowing this cruise to be successfully completed in good time, and thus allowing additional tows with the Poly GOV to be carried out.

S. McCully
7 September 2009

DISTRIBUTION:
Basic List+

B Harley	M Parker-Humphreys
S McCully	S Elliott
R Humphreys	R Wilson, Exeter Uni
B Hatton	
L Cox	
M Eade	

Figure 1.
Station positions CEFAS Endeavour 12/09.

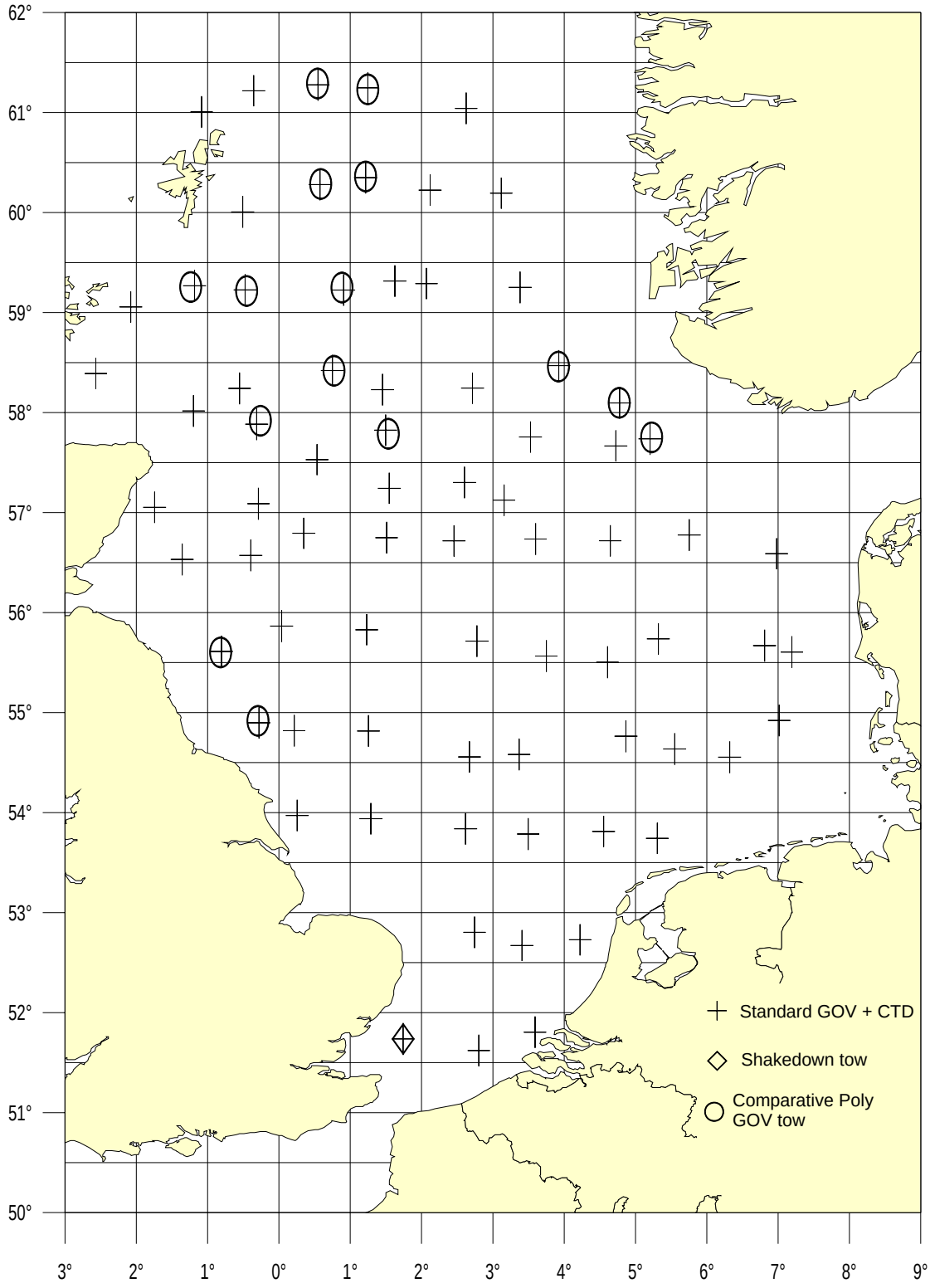

Figure 2.
Distribution and relative abundance (kg) of cod for 2006 to 2009.

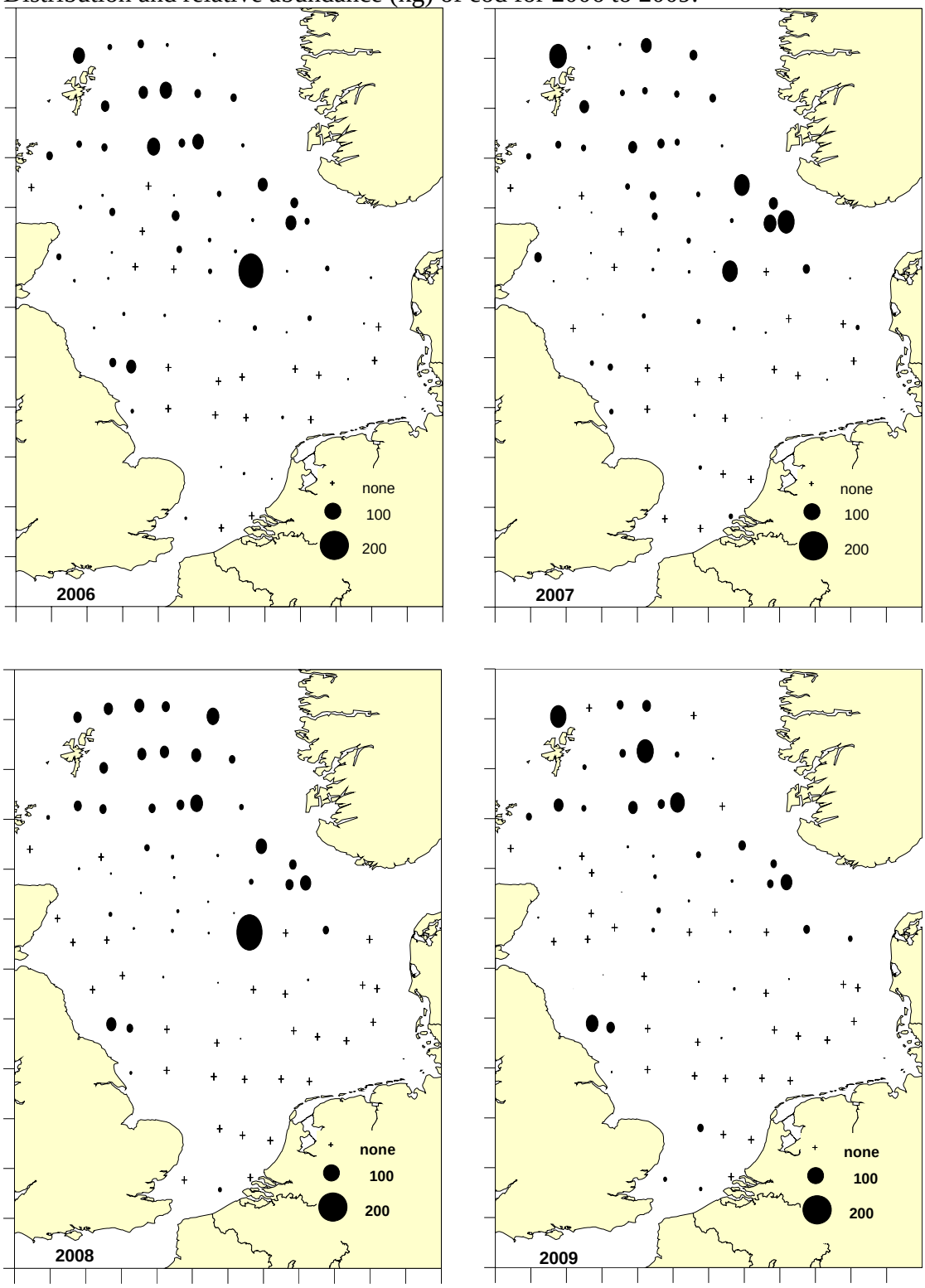

Figure 3.
Distribution and relative abundance (kg) of haddock for 2006 to 2009.

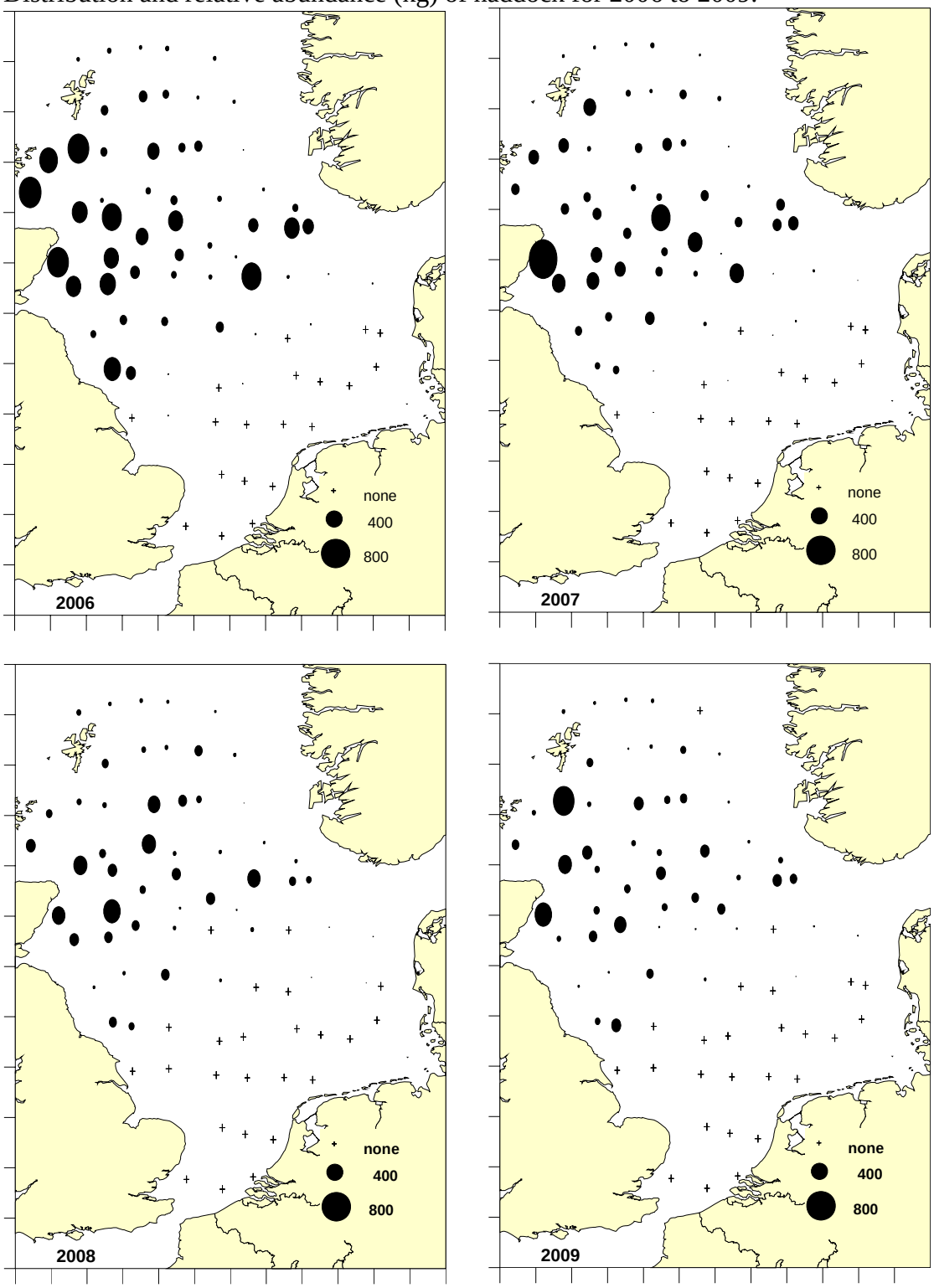

Figure 4.
Distribution and relative abundance (kg) of whiting for 2006 to 2009.

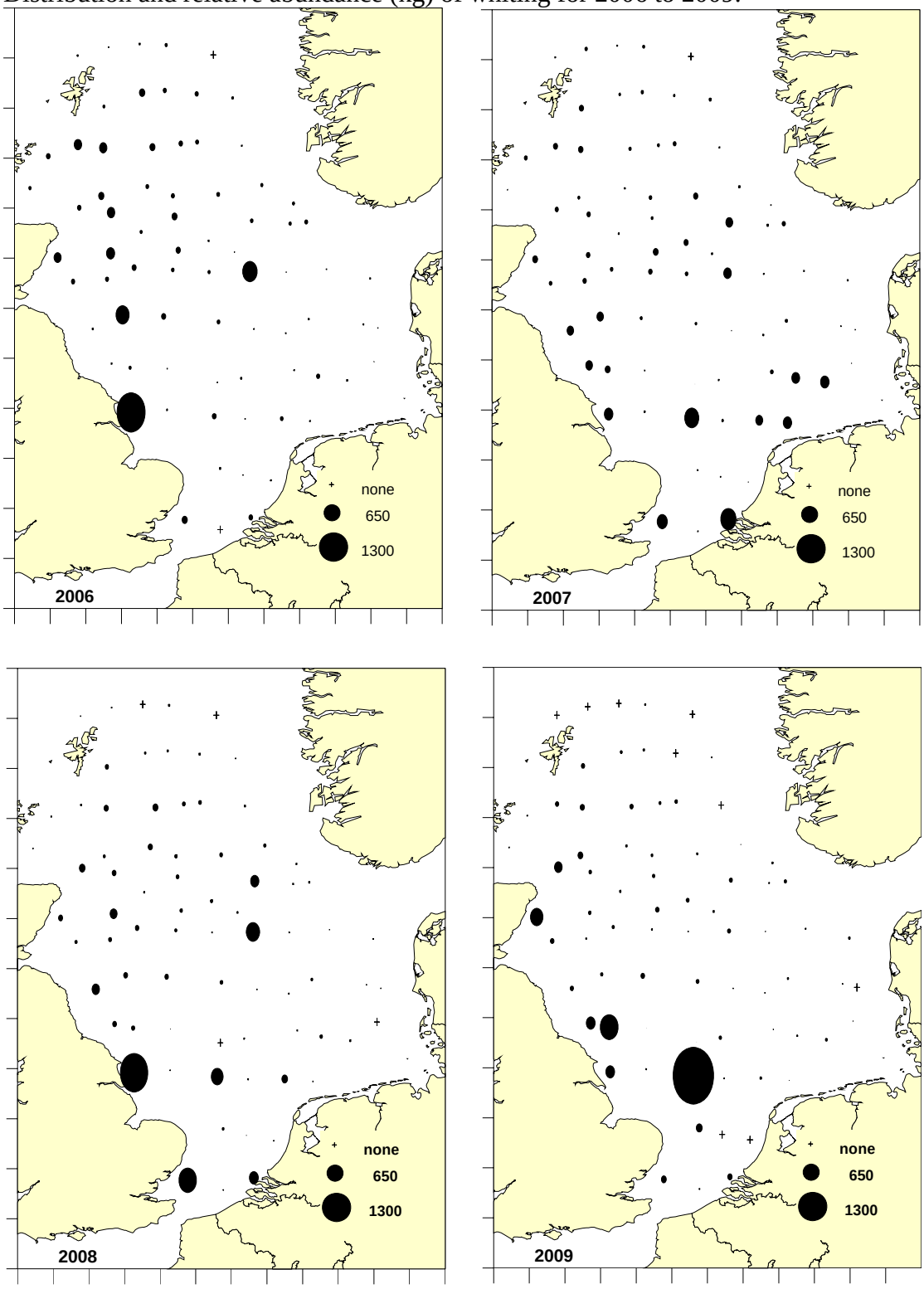

Figure 5.
Distribution and relative abundance (kg) of saithe for 2006 to 2009.

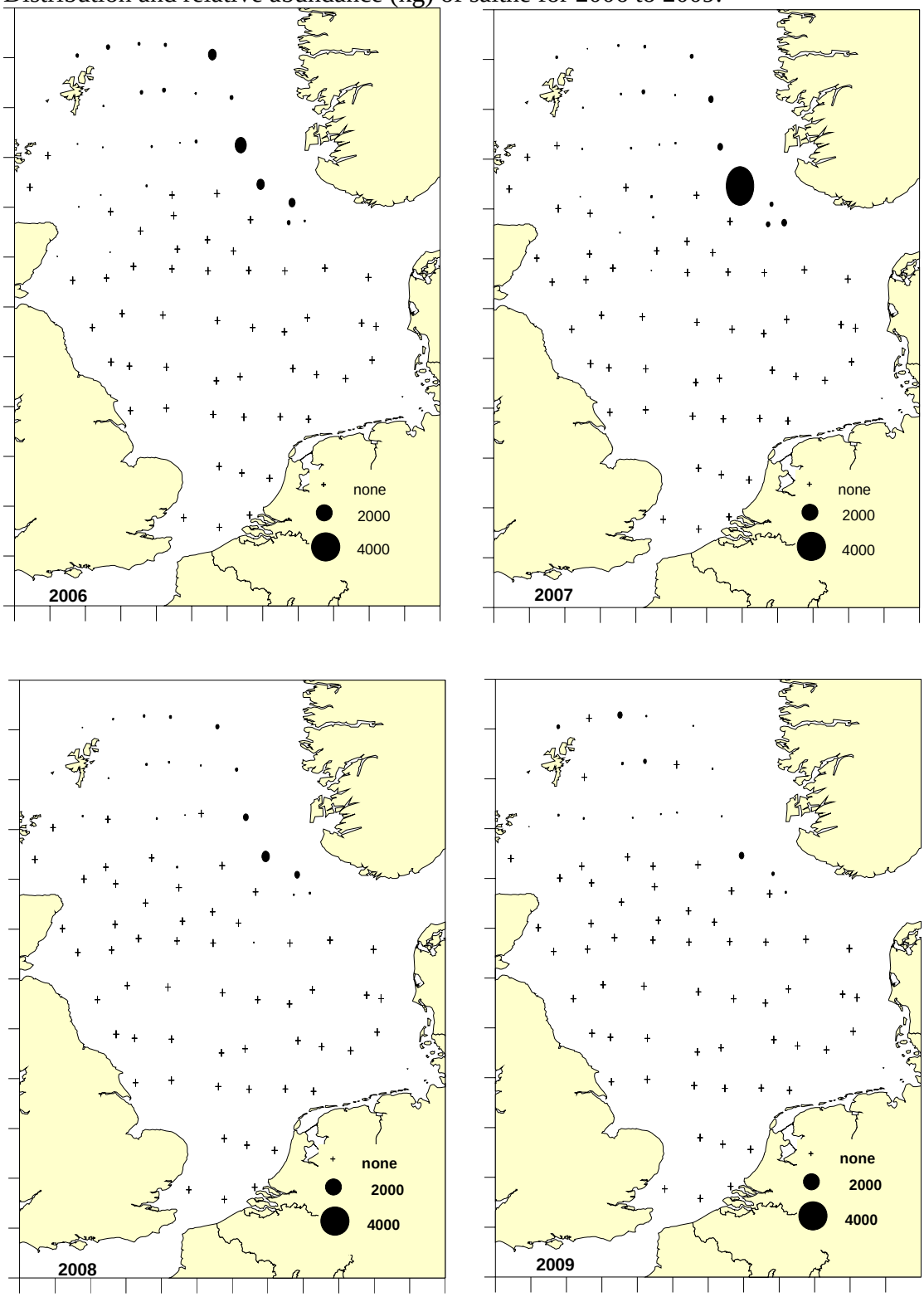

Figure 6.
Distribution and relative abundance (kg) of Norway pout for 2006 to 2009.

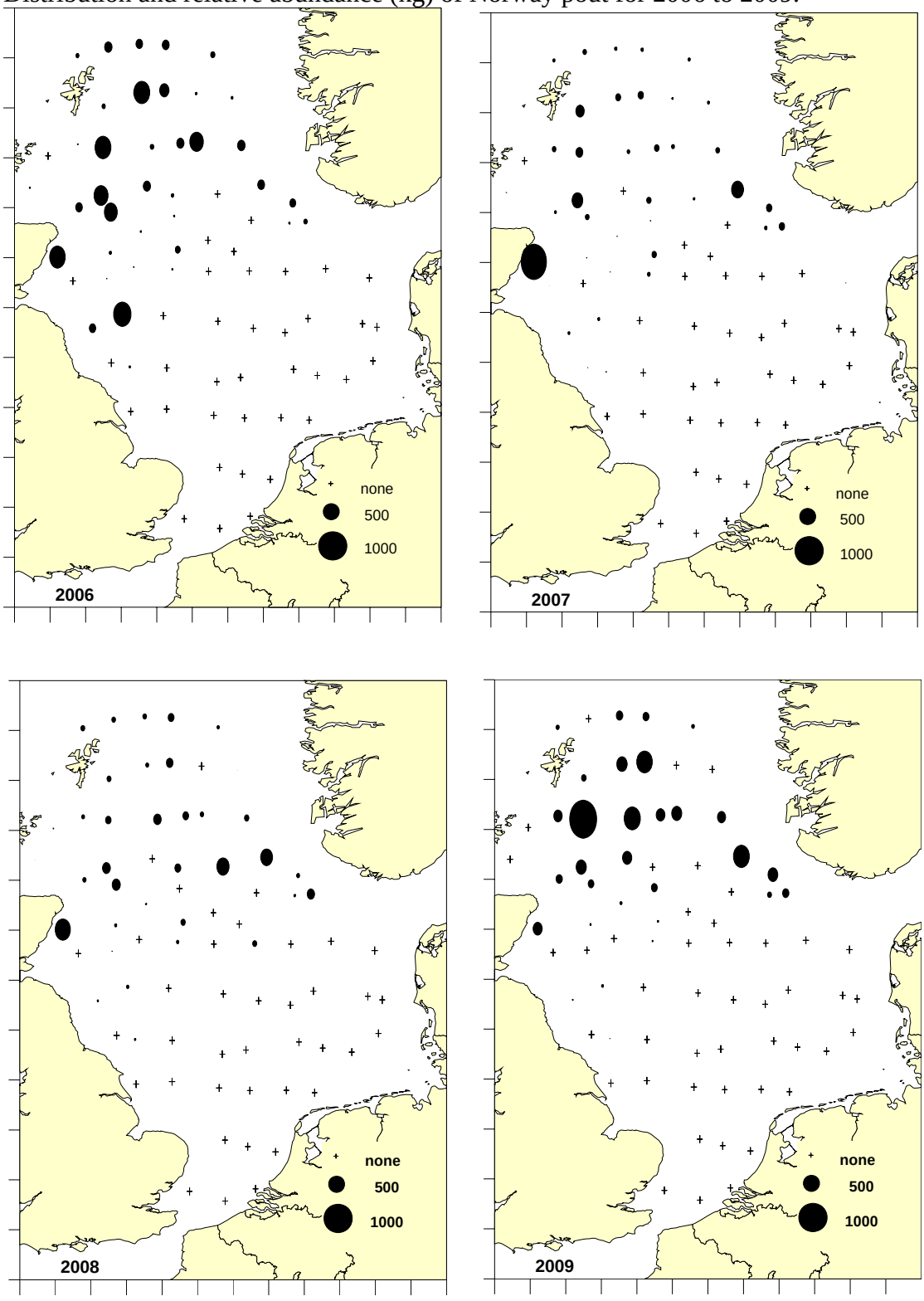

Figure 7.
Distribution and relative abundance (kg) of herring for 2006 to 2009.

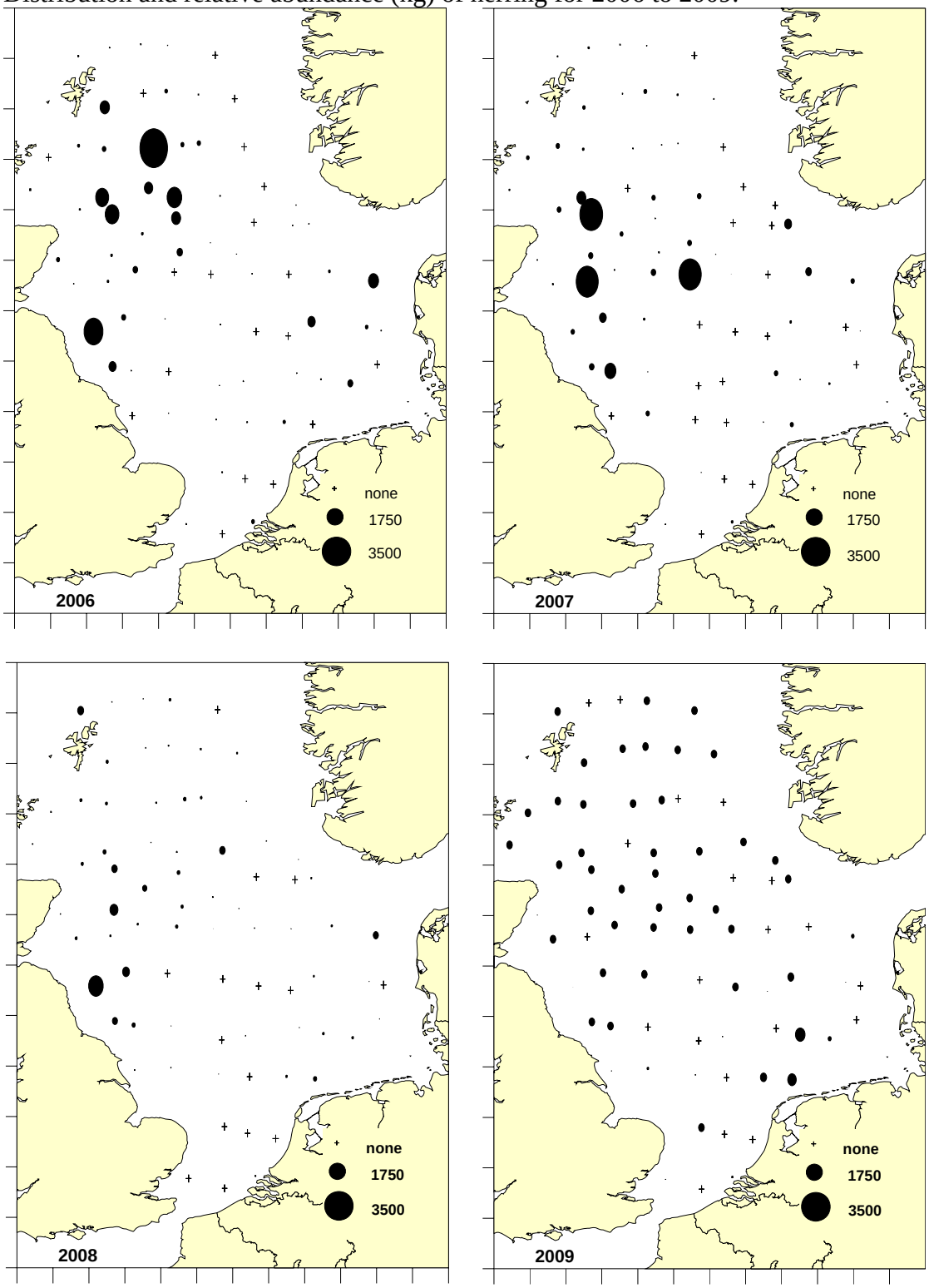

Figure 8.
Distribution and relative abundance (kg) of mackerel for 2006 to 2009.

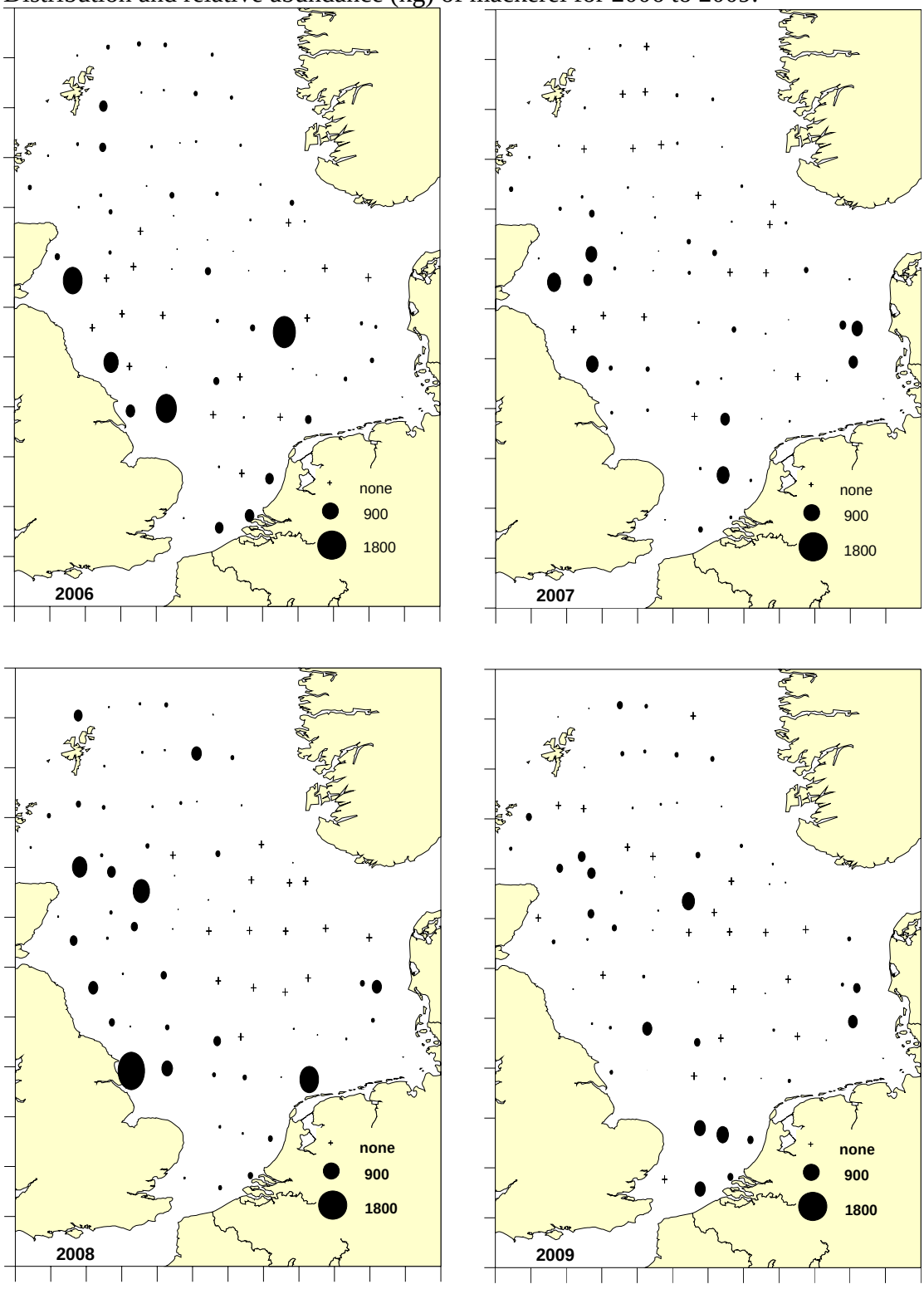

Figure 9.
Distribution and relative abundance (kg) of sprat for 2006 to 2009.

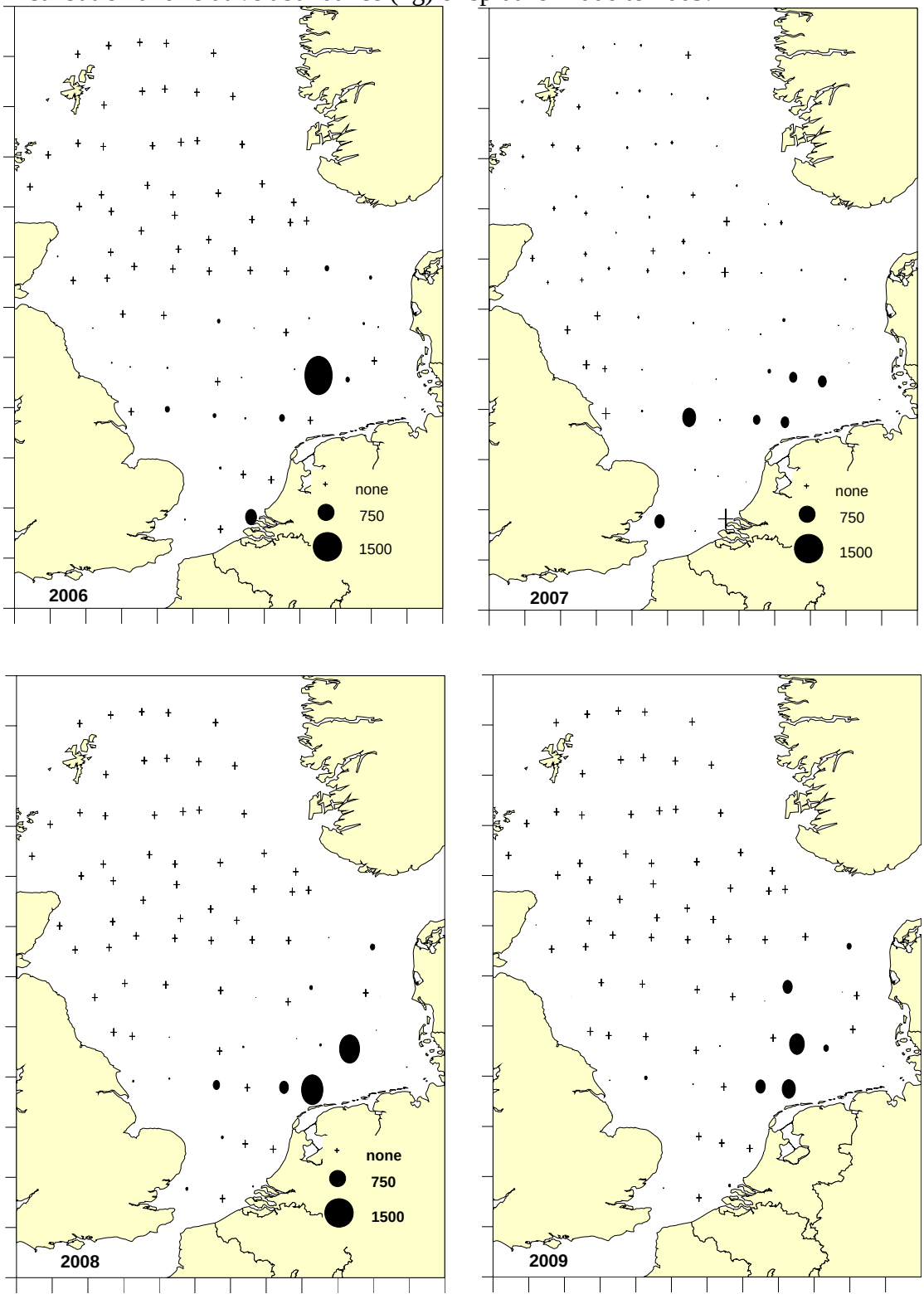

Figure 10.
Distribution and relative abundance (kg) of plaice for 2006 to 2009.

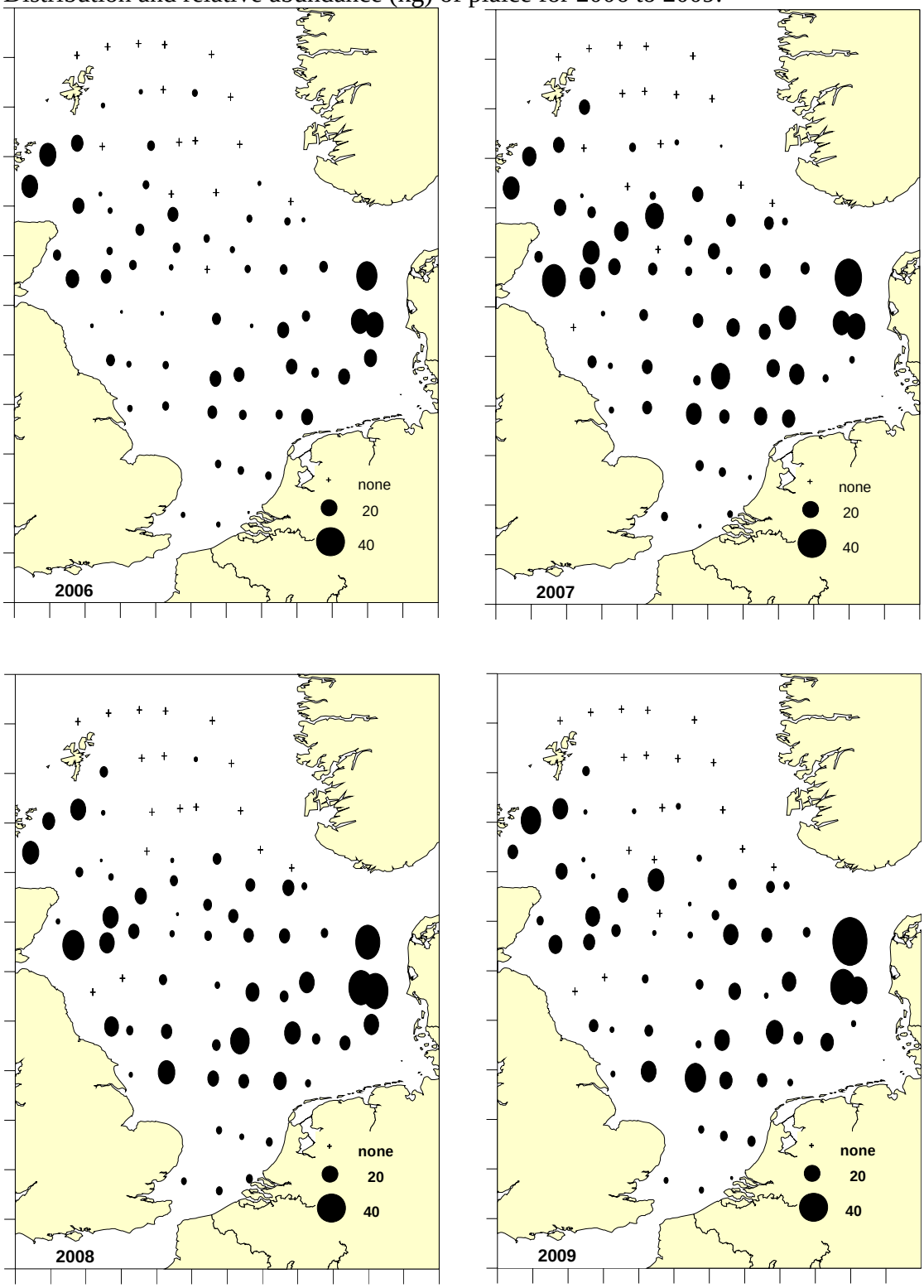

Figure 11: Length-weight distribution for cod in 2009

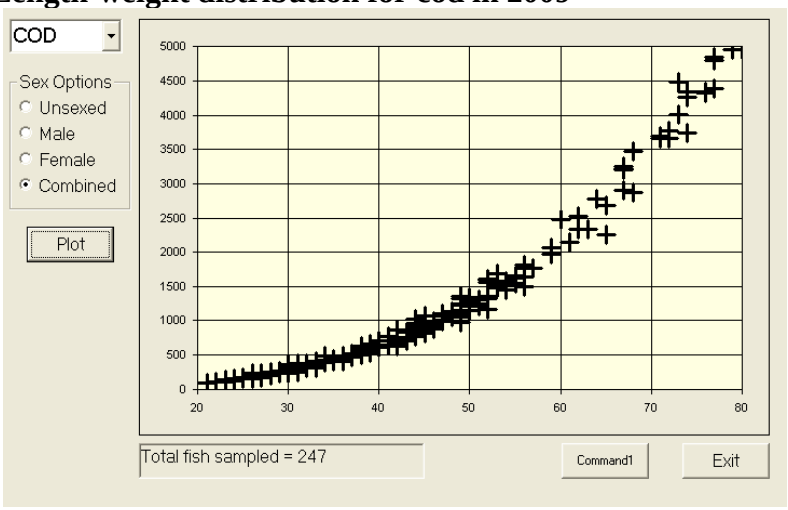

Figure 12: Length-weight distribution for haddock in 2009

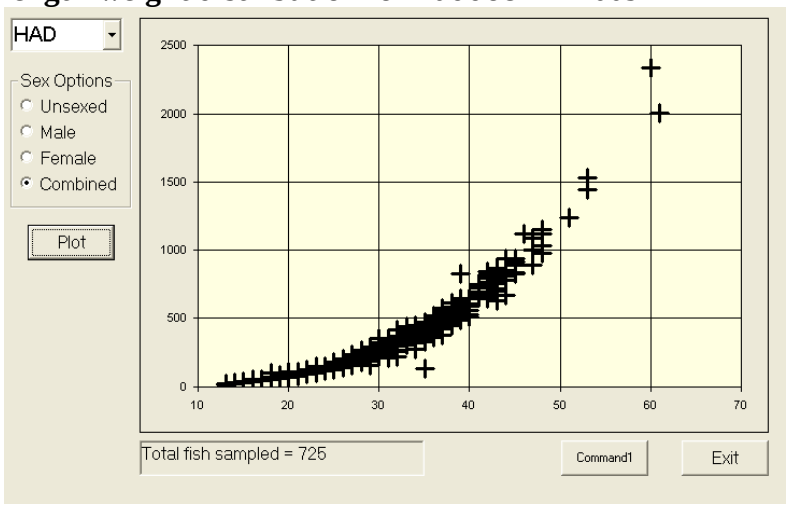

Figure 13: Length-weight distribution for whiting in 2009

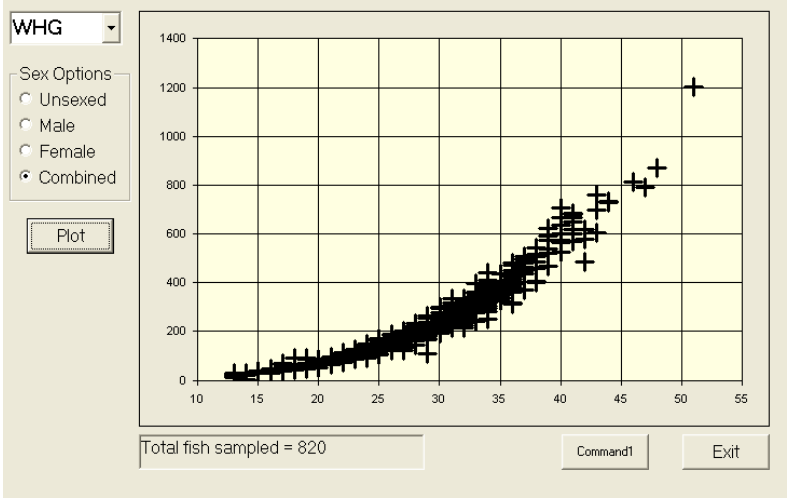

Figure 14: Length-weight distribution for saithe in 2009

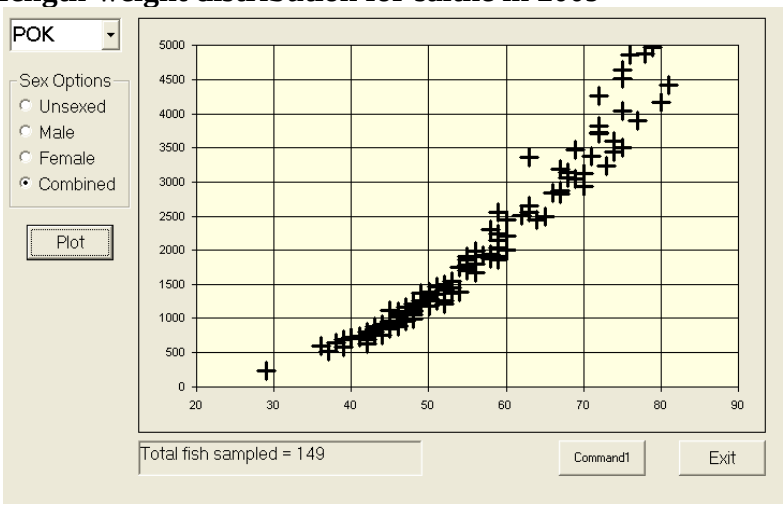

Figure 15: Length-weight distribution for Norway pout in 2009

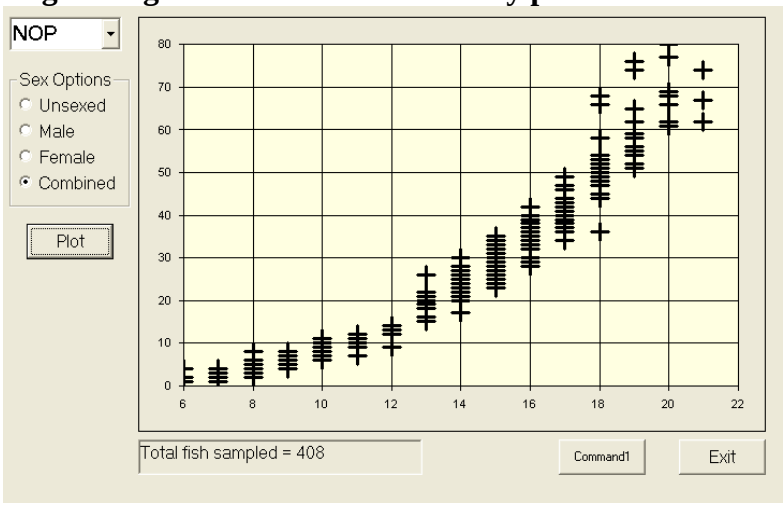

Figure 16: Length-weight distribution for herring in 2009

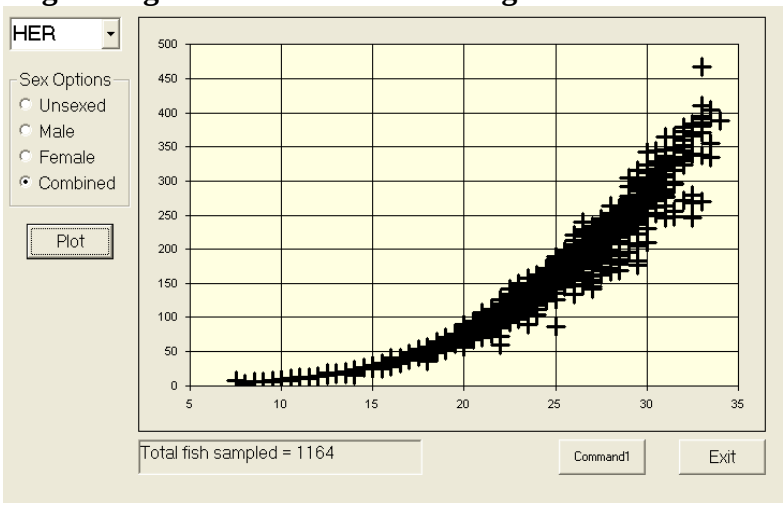

Figure 17: Length-weight distribution for mackerel in 2009

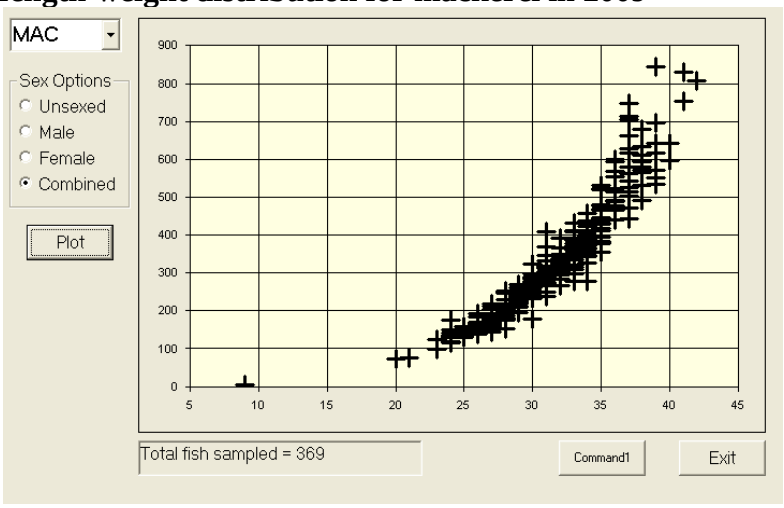

Figure 18: Length-weight distribution for plaice in 2009

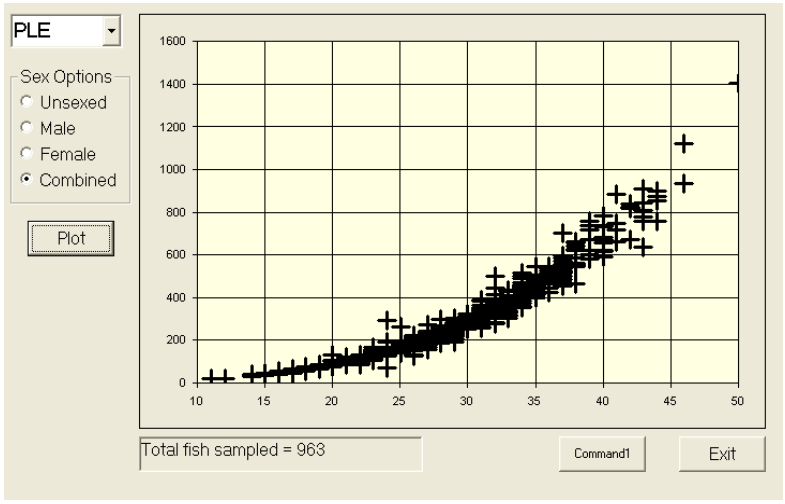

Figure 19: Length-weight distribution for dab in 2009

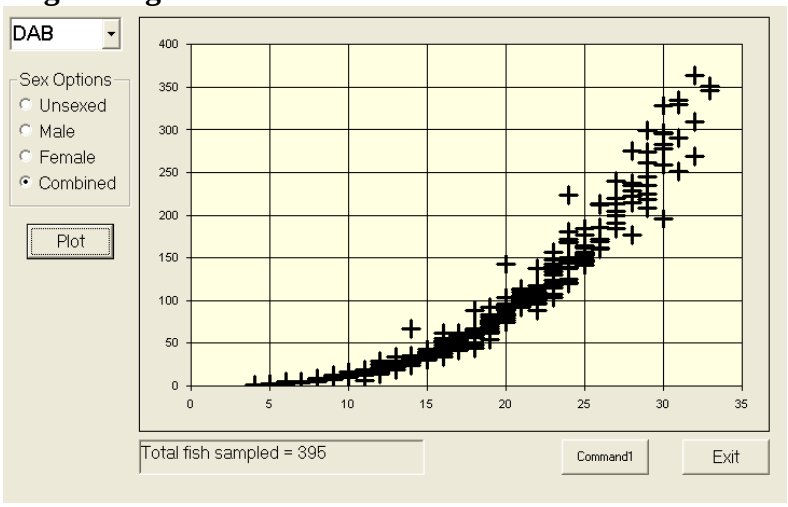

Figure 20: Length-weight distribution for lemon sole in 2009

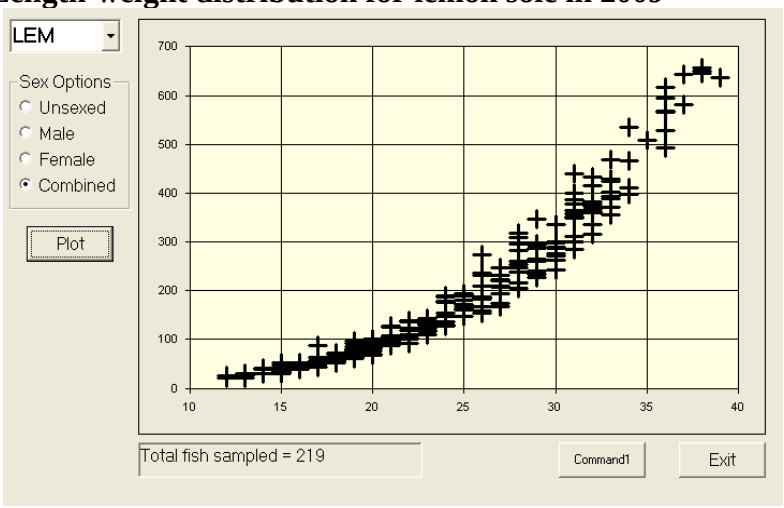

Figure 21: Length-weight distribution for horse mackerel in 2009

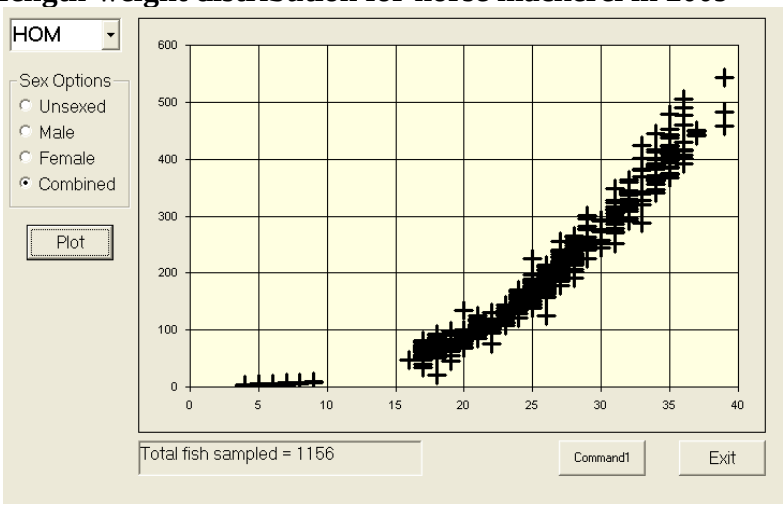

Figure 22: Length-weight distribution for grey gurnards in 2009

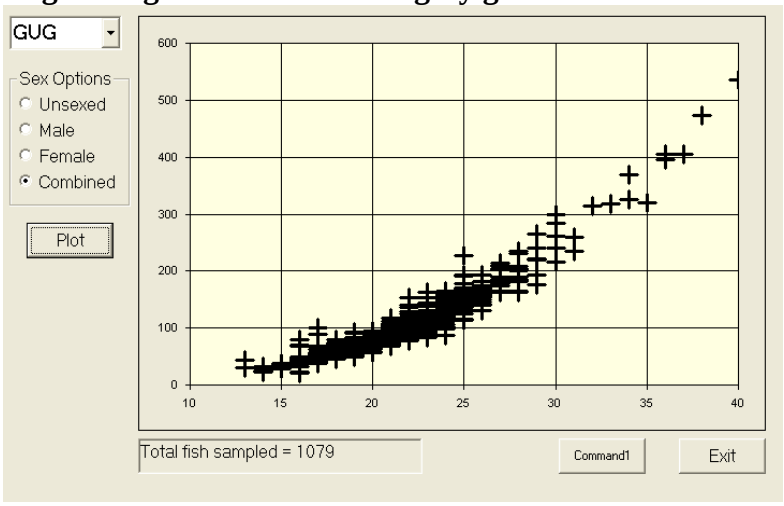

Figure 23: Length-weight distribution for long-rough dab in 2009

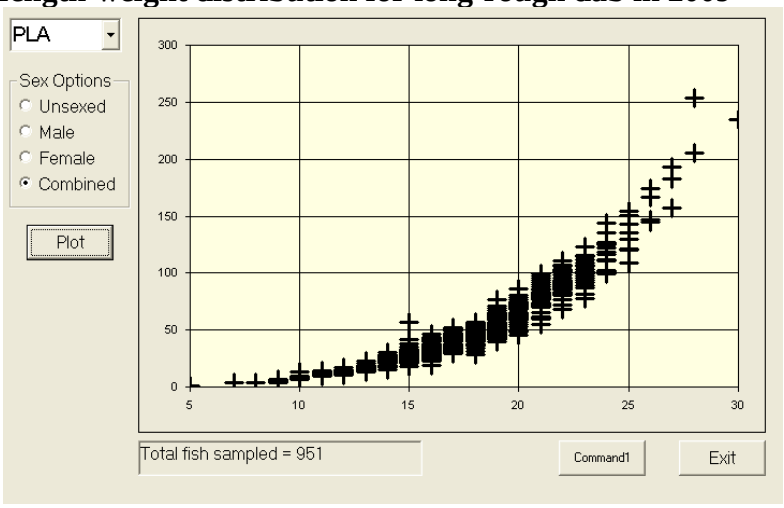

Figure 24: Length-weight distribution for weever fish in 2009

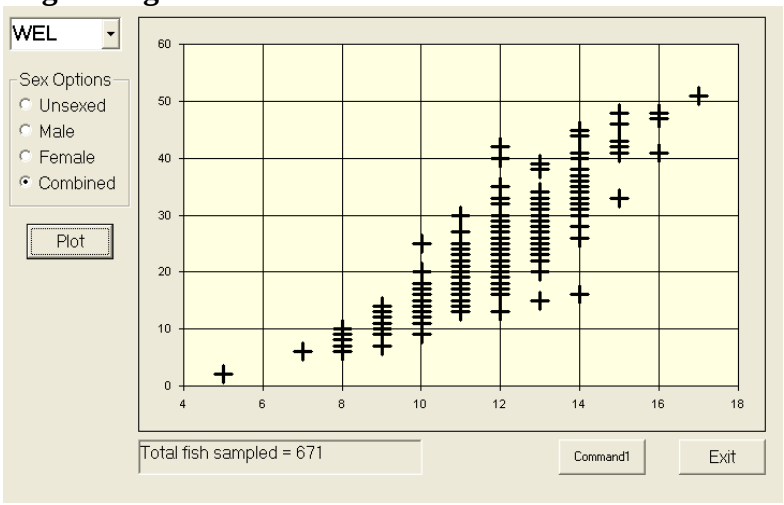

Figure 25: Length-weight distribution for hake in 2009