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## REPORT OF THE STUDY GROUP ON BEAM TRAWL SURVEYS IN 1991

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## 1. INTRODUCTION

### 1.1 Terms of reference

At the 1991 Statutory Meeting of ICES it was resolved (C. Res. 1991/2:14) that the Study Group on Beam Trawl Surveys will work by correspondence to:

- a) prepare a report summarising and evaluating the results of annual beam trawl surveys conducted in Sub-areas IV and VII;
- b) review available information on relative catchabilities of beam trawls with and without attachments (flip-up ropes, tickler chains, and chain mats);
- c) prepare modifications, if necessary, to the survey designs.
- d) record the abundance of benthos species in the catch in a standardised form.

### 1.2 Participants by correspondence

R de Clerck	Belgium
U Damm	Fed Rep Germany
R Millner (Chairman)	United Kingdom
A Rijnsdorp	Netherlands
D Symonds	United Kingdom

## 2. 1991 SURVEY REPORTS

### 2.1 Belgium

Survey area: ICES Division IVb+c; Southern North Sea west of 3° east (Fig 2.1c).

Dates: 19-29 August 1991

Ship: RV BELGICA

Length: 50 m

Trawl beam length: 8 m

Number beams fished: One

Trawl duration: 30 min

Cod-end mesh: 75 m with 40mm liner

Attachments: 8 tickler chains, flip-up ropes

Year Survey started: 1985

Alterations from previous surveys: None

### 2.2 Germany

Survey area: ICES Division IVb; German Bight (Fig 2.2)

Dates: 27 May-17 June 1991; 2-18 September, 1991

Ship: RV SOLEA

Length: 35 m

Trawl beam length: 7 m

Number beams fished: two

Trawl duration: variable

Cod-end mesh: 75 mm

Attachments: tickler chains

Year survey started: Spring survey 1976; autumn survey 1991

Alterations from previous surveys: Autumn survey daylight hauls only

### 2.3 Netherlands

Survey Area: ICES Divisions IVb+c; south of 56 ° 30° N (Fig 2.1d).

Dates: 26 August-19 September 1991

Ship: RV ISIS

Length: 28 m

Trawl beam length: 8 m

Number of beams fished: two

Trawl duration: 30 min

Cod-end mesh: 75 mm with 40 mm liner

Attachments: 8 tickler chains

Year survey started: 1985

Alterations from previous surveys: samples taken in rectangles 37-39 F8 as in 1990

### 2.4 United Kingdom

#### 2.4.1 Survey area: ICES Division VIIId; (Fig 2.1a)

Dates: 14-29 August 1990

Ship: RV CORYSTES

Length: 53 m

Trawl beam length: 4m

Number of beams fished: one

Trawl duration: 30 mins

Cod-end mesh: 75 mm with 40 mm liner

Attachments: Chain mat and flip-up ropes

Year survey started: 1988

Alterations from previous surveys: extra stations worked

#### 2.4.2 Survey area: ICES Division VIIa; VIIf&g (Fig 2.1b)

Dates: VIIa, 18-24 Sept; VIIf 12-13 and 27-28 Sept;

Ship: RV CORYSTES

Length: 53 m

Trawl beam length: 4 m

Number of beams fished: one

Trawl Duration: 15 min in VIIa; 30 min in VIIf&g

Cod-end mesh: 75 mm with 40 mm liner

Attachments: chain mat and flip-up ropes

Year started: VIIa, f&g , 1988;

Alterations from previous surveys: None

### 2.4.3 Survey area: ICES Division VIIe (Fig 2.1b)

Dates: 30 September-6 October, 1991

Ship: FV CARHELMAR

Length: 22 m

Trawl beam length: 4 m

Number of beams fished: two

Trawl duration: 30 min

Cod-end mesh: 75 mm with a 40 mm liner + one trawl without liner

Attachments: Chain mat and flip-up ropes

Year survey started: 1988

Alterations from previous surveys: some new stations but overall reduction in number of stations worked since 1989

## 3. SURVEY METHODS

A detailed description of the survey design and methods has been given previously (ICES CM1990/G:59). In the Netherlands, Belgium and UK surveys the survey period has been restricted to the third quarter of the year and hauls are taken during daylight only. Tow speed has been standardised to approximately 4 knots and haul duration to 30 minutes. However, in the Irish Sea and Bristol Channel surveys haul duration was restricted to 15 minutes because of the high catch rate of some species. The German Spring survey is designed to sample sole during the main fishery in the German Bight. Fishing takes place at night and haul duration varies depending on the ground. The autumn survey was the same gear but haul duration is restricted to 30 minutes, if possible, and fishing is during daylight only. Attempts to standardise the gear between national surveys proved impossible because of difference in the grounds being fished and the main features of the trawls are given in section 2.

Data were analysed by converting catches to numbers per hour and for comparison between the Netherlands, Belgium and UK surveys standardised to an 8m beam width. German data was standardised to a 7m beam equivalent. Catches of the abundant commercial species were separated into age groups but other species were analysed unaged. Arithmetic mean catch rates per hour were calculated for each rectangle, sub-area or area from  $C_A = \Sigma R_i/n_A$

where  $C_A$  is the catch per hour in area/sub-area A,  $R_i$  is the mean catch in the  $i$ th rectangle and  $n_A$  is the number of rectangles in the area/sub-area A. The mean catch per rectangle is the unweighted average of all stations in the rectangle. For comparison with future surveys, the North Sea and eastern Channel have been divided into 6 sub-areas (Figure 3.1) and mean catch rates calculated for each sub-area.

In rectangles where surveys by Belgium, Netherlands and the UK overlap a mean catch has been calculated from the different surveys but no correction has been made for differences in gear efficiency. The data from the German Survey in May and September has been analysed separately because it is not directly comparable with the autumn surveys by other countries.

## 4. SURVEY RESULTS

### 4.1 Rectangle Abundance and Distribution

The abundance by species and rectangles is shown in Figures 4.1-4.55.

#### 4.1.1 Sole (Figures 4.1-4.6)

The distribution of 1-group sole was similar to previous surveys with higher catch rates in the shallow coastal rectangles predominantly along the western coast of the North Sea and eastern Channel. High catch rates were also found in the Bristol Channel and in Morecambe Bay (VIIa). 1-group sole was scarce in the western Channel both on the UK coast and in the Baie de Mont St Michel on the French coast.

The 1989 year class appeared to be abundant in all areas surveyed with peak catches up to 283 per hour in VIIa and up to 147 per hour in the eastern Waddensea. Catches of 3+ sole were lower in most rectangles than in the 1990 survey, reflecting the effect of fishing on the 1987 year class.

The German survey results indicate that 1 and 2-group sole are not big enough to be retained effectively in the 75mm cod-end in the spring survey. The increase in catch rates of 2-group sole in the autumn suggests that they have moved further offshore and grown sufficiently to be retained by the survey trawl. The high catch of 3+ sole in the spring reflects the fact that mature fish are aggregated for spawning at this time and the survey includes night time fishing when catches are expected to be higher.

#### 4.1.2 Plaice (Figures 4.7-4.10)

The 1990 year class of plaice was abundant in the Waddensea where mean catches of up to 2048 per hour were recorded. Elsewhere catches were mainly below 200 per hour. The low catches in the western North Sea probably reflect the absence of sampling close to the UK coast. Two and 3+ group plaice were widely distributed within all the survey areas but were most abundant in the eastern North Sea, north of 54°N.

#### 4.1.3 Dab (Figures 4.11-4.15)

The distribution of dab was available by age group in the North Sea and VIId only. In other areas dab was not aged and the catches are given as totals for all age groups combined. There was no clear difference between the distribution of 1, 2 and 3+ dab and all groups were abundant and widely distributed in the North Sea. North of 53°N, dab were the numerically dominant flatfish species in the North Sea. There was a similar increase in abundance from the western Channel northwards to the Irish Sea.

#### 4.1.4 Other fish species (Figures 4.16-4.54)

The distribution and abundance of a range of flatfish and other mainly bottom living species is shown for comparison with the abundant commercial species and to allow any changes to be monitored in future years. As in previous surveys, turbot and brill occur in low numbers in the North Sea and eastern Channel (Figures 4.15-4.18). Turbot was absent from trawls along the English east coast and scarce in the Channel. Catch rates of both turbot and brill in the Irish Sea and Bristol Channel varied from 0 to 8 per hour and



were similar to the North Sea, excluding coastal rectangles in the Waddensea where catches reached 14 per hour for turbot.

Flounder, lemon sole and long rough dab show characteristic distribution patterns (Figures 4.20-4.25). Flounder were only caught in high numbers in the Waddensea while lemon sole were one of the few species with peak abundance along the English east coast associated with hard sediments. Long rough dab occurs mainly in the north of the survey area in both the North Sea and VIIa.

Solenette and scald fish show similar distributions (Figures 4.26-4.29). Both were widely abundant except in the western Channel, around the Thames and Scheldt estuaries and along the western Waddensea coast. One difference was in the Bristol Channel where solenette occurred in high numbers whereas scaldfish were scarce.

Haddock was not taken in any hauls, as in previous surveys. Cod was caught in low numbers north of 53° 30'N both in the North Sea and Irish Sea but largely absent in the south of the survey area. The abundance of whiting showed a strong decline from the 1990 survey in the North Sea and remains in low numbers in the eastern Channel.

The distribution of poor cod, bib, dogfish and rays show a mainly southerly and westerly distribution tending to be more abundant in the Irish Sea and Bristol Channel and largely absent from the eastern North Sea rectangles.

#### 4.1.5 Edible crabs (Figure 4.55)

Peak catch rates occurred off the Wash and North East coast of England and in the north of Morecambe Bay in VIIa.

#### 4.2 Indices of abundance by sub-area

Indices of abundance were calculated for 6 sub-areas in the North Sea and eastern Channel and for the survey areas in VIIa,e,f&g (Figure 3.1). The results for the most abundant species are given in Table 4.1. There were marked differences in the catch rate of sole and plaice in the sub-areas. 1-group sole were more abundant in the eastern Channel and southern North Sea (areas 1, 2 and 3) than in the German Bight and Waddensea (area 5). Whereas catch rates of 1-gp plaice were substantially higher in the north of the survey region (areas 4 and 5) than in the south. The mean catch rate of 1gp sole and plaice was high in both the Irish Sea and VIIf&g. By contrast, VIIe was of minor importance for juvenile plaice and sole but catch rates of 3+ sole was similar to the eastern Channel and southern North Sea.

The 1989 year class of sole as 2-group fish was abundant in most areas sampled suggesting some common feature affected recruitment over a wide area. The strength of the 2-group was evident from the fact that it was more abundant than either the 1-group or the combined 3+group in each of the separate areas surveyed.

The dominant species in the Channel (areas 1,2 and VIIe) were dragonet, poor cod and bib together with solenette in the eastern Channel. In the German Bight and Waddensea (area 5) flatfish were the most abundant groups. Areas 3,4 and 6 in the central and western North Sea were intermediate between these. The survey area in VIIa and VIIf&g appeared similar to the German Bight and Waddensea with high catch rates of flatfish

especially juvenile sole. In addition both areas had relatively high catches of poor cod, bib and whiting.

#### 4.3 Trends in abundance between surveys

##### 4.3.1 Sole

The historic series of abundance indices for sole by age group for each survey is shown in Table 4.2 and Figure 4.56-4.57. The strong 1989 year class is evident in each survey and is the second highest on record in the North Sea surveys at age two and the strongest in the series in the east and western Channel. In VIIa and VIIf+g, the 1989 year class at age two appears to be nearly twice as big as previous two group indices.

##### 4.3.2 Plaice

The historic series of abundance indices for plaice by age group and survey is shown in Table 4.3 and Figure 4.58-4.59. The Netherlands surveys show a declining trend in abundance at age groups 1, 2 and 3 since 1985 and this is matched by the Belgium and UK (VIId) surveys at age 3. In VIIa, VIIf & g and in VIIe there was also a declining plaice index starting with the strong 1986 year class.

#### 5. OTHER TERMS OF REFERENCE

Insufficient data was available to review the catchabilities of trawls with and without attachments or to evaluate the of data on benthos and these items should be considered when additional information is available.

#### 6. RECOMMENDATIONS

1. The Study Group should meet early in 1993 at Cuxhaven to:
  - (a) Carry out a detailed evaluation of the historic data series which is now available.
  - (b) Compare the between year and area variations in catch rate of plaice and sole.
  - (c) Assess the survey designs and prepare modifications if necessary.
2. The survey in VIIe should be extended to include areas not adequately sampled.

Table 4.1. Mean abundance of species (no/hr/8m trawl) by sub-area in the North Sea and eastern Channel and by survey area in V11a,e,f&g in 1991

	AREA						VIIa	VIIe	VIIf&g
	1	2	3	4	5	6			
Sole 1	7.7	4.1	10.4	2.6	2.4	0.6	13.2	0.6	16.9
Sole 2	26.2	15.2	22.5	9.2	26.3	22.2	105.2	8.6	40.6
Sole 3+	6.2	5.9	7.4	7.6	12.6	10.8	17.1	5.5	8.2
Plaice 1	6.7	4.9	14.4	23.8	380.7	0.0	60.4	0.3	43.2
Plaice 2	3.4	4.6	15.7	37.9	219.9	34.0	59.8	0.5	1.8
Plaice 3+	19.5	9.7	15.5	17.1	86.2	9.4	7.5	4.2	2.5
Dab 1	2.2	2.6	68.0	365.1	733.5	78.6	ND	0.0	ND
Dab 2	2.4	1.4	36.8	199.1	230.7	165.6	ND	0.3	ND
Dab 3+	2.3	1.6	21.1	84.6	377.9	40.2	ND	1.7	ND
Dab	24.5	7.6	131.5	651.5	1366.9	284.4	369.7	7.5	35.2
Turbot	0.0	0.1	0.9	1.5	3.9	0.0	0.6	0.0	2.4
Brill	1.0	1.0	0.7	0.7	1.3	1.0	2.3	0.5	1.2
Scaldfish	1.6	4.7	26.4	88.6	62.4	4.0	24.9	1.5	0.4
Lemon sole	1.8	1.0	8.4	2.9	2.7	6.8	1.4	0.9	0.8
Long rough dab	0.0	0.0	0.5	0.9	7.7	0.0	0.3	0.0	0.0
Flounder	2.8	0.0	2.9	0.1	23.0	0.2	1.1	0.0	0.8
Solenette	87.9	155.3	50.3	47.0	47.5	42.6	146.0	0.0	120.8
Tub gurnard	1.2	1.3	5.1	3.0	4.5	7.0	5.1	0.6	4.4
Grey gurnard	1.0	0.2	9.4	32.2	34.5	7.6	45.7	3.5	29.2
Red gurnard	11.2	9.5	5.9	0.2	0.0	0.0	5.1	10.4	2.0
Pogge	49.8	4.0	37.0	14.1	104.9	4.8	36.6	0.2	0.8
Lesser weaver	4.4	0.1	55.9	21.2	1.2	35.2	15.7	0.0	2.0
Dragonet	401.4	39.2	63.1	27.6	47.3	62.0	135.4	224.8	18.8
Dogfish	8.7	1.7	3.1	0.3	0.0	0.0	17.4	6.4	43.6
Rays	3.4	6.0	3.2	1.3	0.7	20.8	16.3	3.4	14.0
Cod	0.0	0.0	0.5	1.2	12.9	2.4	10.9	0.0	0.8
Haddock	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Poor cod	235.3	170.2	34.4	1.7	0.3	0.0	37.1	156.0	221.2
Bib	106.5	30.7	36.2	17.4	0.3	11.4	30.9	34.3	74.4
Whiting	0.7	0.1	11.6	80.4	93.3	6.2	49.1	6.7	58.8
Edible crab	1.2	4.3	1.5	4.1	2.5	19.1	10.0	1.0	3.6

Table 4.2. Catch rate of sole from Belgium, German, Netherlands and UK surveys in the North Sea and V11d,a,e,f&g

Belgium (No/hr/8m trawl) North Sea

Age	0	1	2	3	4	5	6	7	8	9	10+
Year											
1986		1.9	1.7	2.7	2.0	1.0		0.2			0.3
1987		0.0	5.1	1.4	1.3	1.4	0.5	0.1	0.3	0.1	0.2
1988	1.3	4.7	2.2	14.3	3.6	2.9	0.8		1.7	2.1	1.0
1989		8.8	17.2	1.9	3.3	0.8	0.2	0.4	0.2		0.5
1990		21.8	5.8	7.5	1.7	1.8	0.8		0.5	0.9	1.2
1991		7.6	12.1	3.8	4.7	0.5	0.4	0.2	0.1		0.3

Germany (No/hr/7m trawl) German Bight

Age	2	3	4	5	6	7	8	9	10+
Year									
1976	0.7	31.5	22.7	10.6	1.6	2.9	1.4	1.2	2.9
1977	59.8	16.3	31.0	15.9	4.6	0.5	0.4	0.2	0.5
1978	36.0	34.4	2.5	6.5	2.0	0.3	0.1	0.1	0.3
1979	9.2	54.3	48.9	29.5	2.5	6.5	3.2	1.0	1.5
1980	4.2	28.6	20.0	14.4	0.6	1.6	0.6	0.2	0.0
1981	42.2	1.9	10.3	6.1	2.9	0.5	0.9	1.1	0.5
1982	39.1	76.1	2.3	8.8	4.6	3.4	0.6	1.7	1.1
1983	129.7	77.1	38.4	1.4	4.0	2.2	2.1	0.4	1.2
1984	24.8	147.1	55.6	22.8	0.6	2.4	2.3	1.2	1.4
1985	10.9	77.8	87.9	18.6	6.0	0.5	0.6	0.5	0.7
1986	7.6	10.8	11.4	10.4	2.9	0.9	0.0	0.2	0.4
1987	22.0	29.8	13.5	6.8	3.6	1.0	0.2	0.0	0.1
1988	8.5	24.6	13.1	2.4	1.7	1.1	0.1	0.0	0.1
1989	17.9	20.3	16.6	3.9	1.2	1.0	0.8	0.2	0.1
1990	9.5	66.2	9.2	3.1	0.9	0.4	0.2	0.1	0.1
1991	10.7	26.3	63.6	6.6	4.8	0.8	0.3	0.1	0.3

Netherlands (No/hr/8m trawl) North Sea

Age	0	1	2	3	4	5	6	7	8	9	10+
Year											
1985	0.0	2.3	6.4	3.6	1.7	0.7	0.2	0.0	0.0	0.0	0.02
1986	0.0	6.6	4.9	1.5	0.8	0.5	0.2	0.1	0.0	0.02	0.05
1987	0.1	6.2	11.1	1.6	0.5	0.5	0.2	0.2	0.05	0.0	0.02
1988	0.0	75.2	12.1	2.6	1.0	0.1	0.2	0.1	0.10	0.02	0.11
1989	0.0	8.0	60.4	3.9	3.6	0.6	0.1	0.2	0.0	0.04	0.03
1990	0.1	19.0	20.9	18.3	0.6	0.6	0.5	0.1	0.05	0.01	0.01
1991	1.0	3.2	21.2	5.1	5.2	0.1	0.1	0.1	0.02	0.01	0.03

United Kingdom (No/hr/8m trawl) Eastern Channel (VIId)

Age	0	1	2	3	4	5	6	7	8	9	10+
Year											
1988	0.0	8.2	14.2	9.9	0.8	1.3	0.6	0.1	0.10	0.20	0.20
1989	0.0	2.6	15.4	3.4	1.7	0.6	0.2	0.2	0.03	0.01	0.70
1990	0.0	12.1	3.7	3.4	0.7	0.8	0.2	0.1	0.20	0.0	0.07
1991	0.0	8.9	22.8	2.2	2.3	0.3	0.5	0.1	0.17	0.08	0.10

Table 4.2 (continued)

## United Kingdom (No/hr/8m trawl) Irish Sea (VIIa)

Age	0	1	2	3	4	5	6	7	8	9	10+
Year											
1988	0.2	8.8	24.3	23.3	43.8	8.6	4.6	0.1	0.0	0.0	0.0
1989	2.0	15.8	25.9	22.1	9.9	25.0	4.9	1.8	0.0	0.0	0.2
1990	0.9	122.7	53.8	12.1	4.0	9.5	15.2	2.6	1.4	0.6	0.1
1991	0.3	13.2	105.2	17.0	2.8	1.1	2.1	8.4	2.3	0.2	0.3

## United Kingdom (No/hr/8m trawl) Bristol Channel (VIIIf&amp;g)

Age	0	1	2	3	4	5	6	7	8	9	10+
Year											
1988	2.2	6.7	26.6	3.7	1.8	0.9	0.0	0.0	0.0	0.0	0.4
1989	18.6	19.7	27.0	18.7	2.2	2.4	1.2	0.4	0.1	0.1	0.0
1990	6.9	30.8	18.2	6.2	1.9	1.0	3.4	0.5	0.0	0.0	0.5
1991	4.0	16.9	40.6	8.8	2.9	4.3	0.4	0.0	0.1	0.3	0.3

## United Kingdom (No/hr/8m trawl) Western Channel (VIIc)

Age	0	1	2	3	4	5	6	7	8	9	10+
Year											
1989	0.0	0.2	2.5	4.9	4.3	1.5	1.6	0.7	0.3	0.3	0.4
1990	0.0	0.6	1.7	3.1	1.3	1.0	0.3	0.6	0.1	0.2	0.5
1991	0.0	0.3	7.9	2.9	2.1	1.0	0.8	0.3	0.7	0.2	0.7

Table 4.3 Catch rate of plaice from Belgium, Netherlands and UK surveys in the North Sea and VIIId,a,e,g&f.

Belgium (No/hr/8m trawl) North Sea

Age	0	1	2	3	4	5	6	7	8	9	10+
Year											
1986	0.0	0.5	6.0	5.3	5.0	1.5	0.0	0.2	0.0	0.0	0.0
1987	0.0	4.0	11.3	6.6	2.0	1.6	0.1	0.1	0.1	0.0	0.0
1988	0.0	0.2	4.0	21.5	3.2	0.4	0.1	0.2	0.0	0.0	0.0
1989	0.1	3.6	3.4	6.7	6.7	0.8	0.2	0.1	0.2	0.0	0.1
1990	0.0	2.8	4.8	4.4	5.2	7.5	0.9	0.0	0.0	0.0	0.0
1991	0.0	0.5	7.0	3.5	0.8	1.0	0.2	0.0	0.0	0.0	0.0

Netherlands (No/hr/8m trawl) North Sea

Age	0	1	2	3	4	5	6	7	8	9	10+
Year											
1985	129.7	113.5	184.9	44.8	17.5	2.4	1.3	0.4	0.2	0.2	0.6
1986	37.5	596.0	121.4	52.8	14.4	6.9	0.7	0.5	0.2	0.2	0.3
1987	50.6	203.8	710.8	30.0	6.4	3.1	1.1	0.5	0.2	0.1	0.2
1988	89.9	541.7	134.4	188.0	13.4	3.6	1.8	1.1	0.5	0.2	0.4
1989	73.2	398.0	340.2	51.3	55.0	6.6	0.8	0.4	0.6	0.1	0.3
1990	15.4	123.5	112.8	68.8	32.0	8.6	0.8	0.2	0.5	0.2	0.2
1991	6.1	174.7	133.6	32.3	12.4	4.2	5.8	0.2	0.2	0.1	0.2

United Kingdom (No/hr/8m trawl) Eastern Channel (VIIId)

Age	0	1	2	3	4	5	6	7	8	9	10+
Year											
1988	0.0	26.5	31.3	43.8	7.0	4.6	1.5	0.8	0.70	0.60	1.21
1989	0.0	2.3	12.1	16.6	19.9	3.3	1.5	1.3	0.54	0.30	1.65
1990	0.6	5.2	4.9	5.8	6.7	7.5	1.8	0.7	0.97	0.75	0.37
1991	0.0	11.7	9.1	7.0	5.3	5.4	3.2	1.2	0.99	0.06	1.24

United Kingdom (No/hr/8m trawl) Irish Sea (VIIa)

Age	0	1	2	3	4	5	6	7	8	9	10+
Year											
1988	2.9	72.6	145.3	30.8	1.2	6.8	1.2	0.5	0.0	0.1	0.8
1989	5.9	41.3	67.6	64.8	11.3	1.4	3.4	0.3	0.0	0.0	0.1
1990	63.4	146.9	36.7	19.9	9.1	4.8	4.1	0.2	0.1	0.9	0.3
1991	6.7	60.4	59.8	8.1	4.4	0.1	0.9	1.8	0.1	0.0	0.4

Table 4.3 (continued)

## United Kingdom (No/hr/8m trawl) Bristol Channel (VIIf&amp;g)

Age	0	1	2	3	4	5	6	7	8	9	10+
Year											
1988	0.4	10.9	26.2	7.5	0.0	0.7	0.7	0.0	0.0	0.2	0.0
1989	0.5	15.1	26.5	7.4	2.1	0.8	0.0	0.1	0.0	0.0	0.0
1990	0.9	11.4	15.8	6.4	2.5	0.4	0.0	0.0	0.3	0.0	0.3
1991	0.1	43.2	1.8	3.6	1.4	0.5	0.3	0.0	0.3	0.0	0.0

## United Kingdom (No/hr/8m trawl) Western Channel (VIIe)

Age	0	1	2	3	4	5	6	7	8	9	10+
Year											
1989	0.0	0.8	2.2	10.6	7.5	1.4	0.2	0.3	0.2	0.1	0.3
1990	0.0	0.8	1.1	7.0	3.4	2.4	0.0	0.2	0.1	0.1	0.3
1991	0.0	0.6	0.8	1.4	2.7	2.1	1.6	0.7	0.1	0.0	0.3

**Figure 2.1** Survey area and number of hauls in each rectangle. a. UK, VIId, b. UK, VIIa, c. Belgium, d. Netherlands.

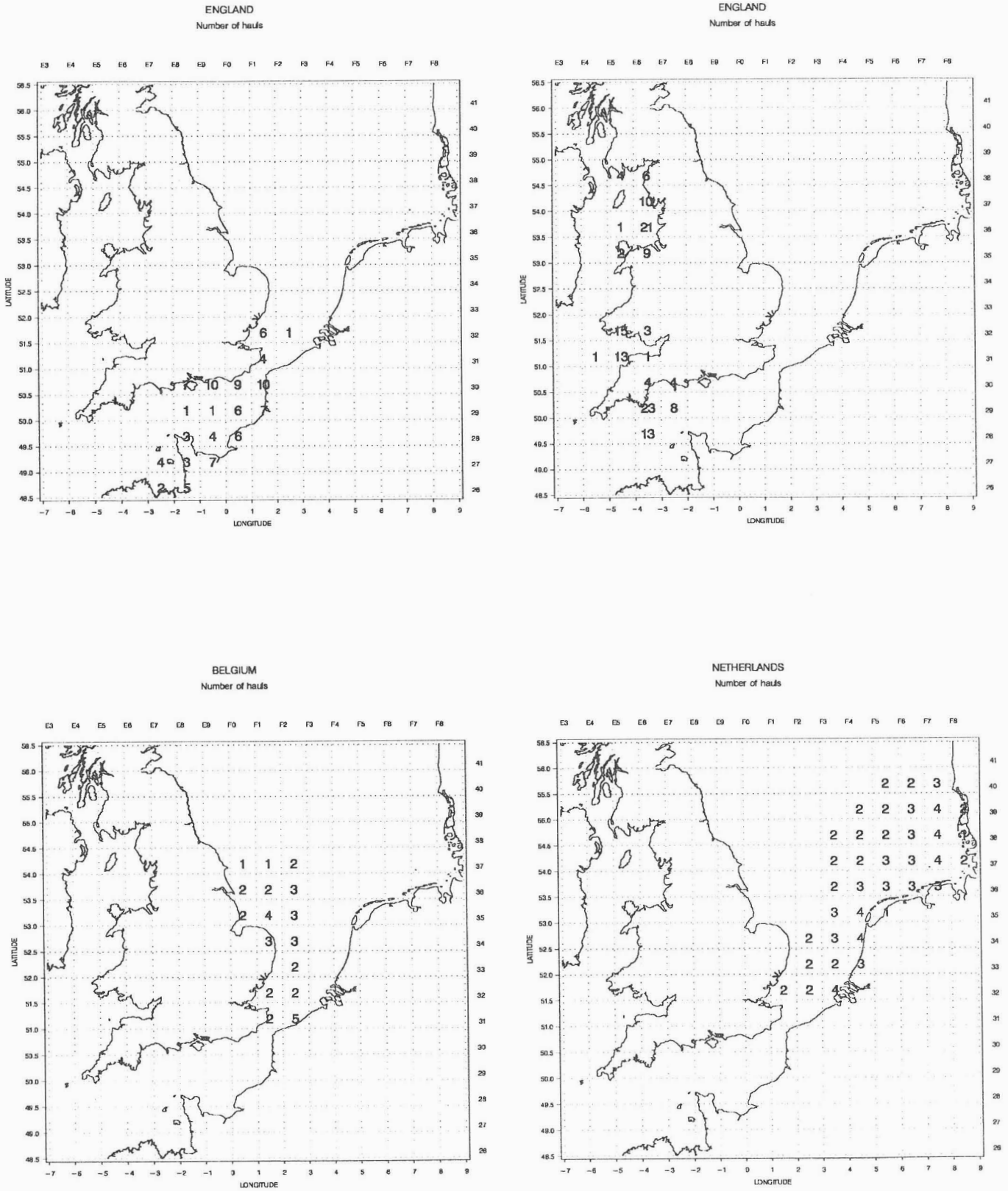
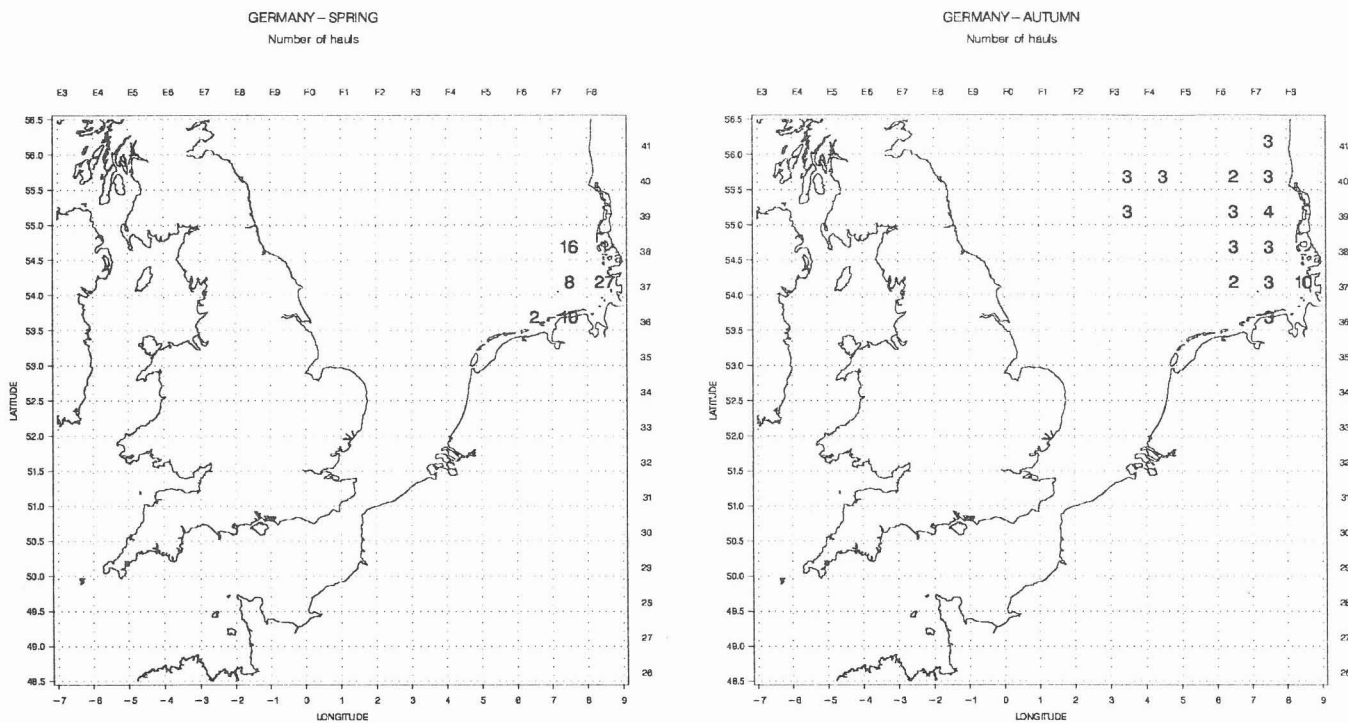




Figure 2.2 Area of German surveys in the German Bight.



**Figure 4.1** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.

BEAM TRAWL SURVEY 1991  
SOLE 1 Gp

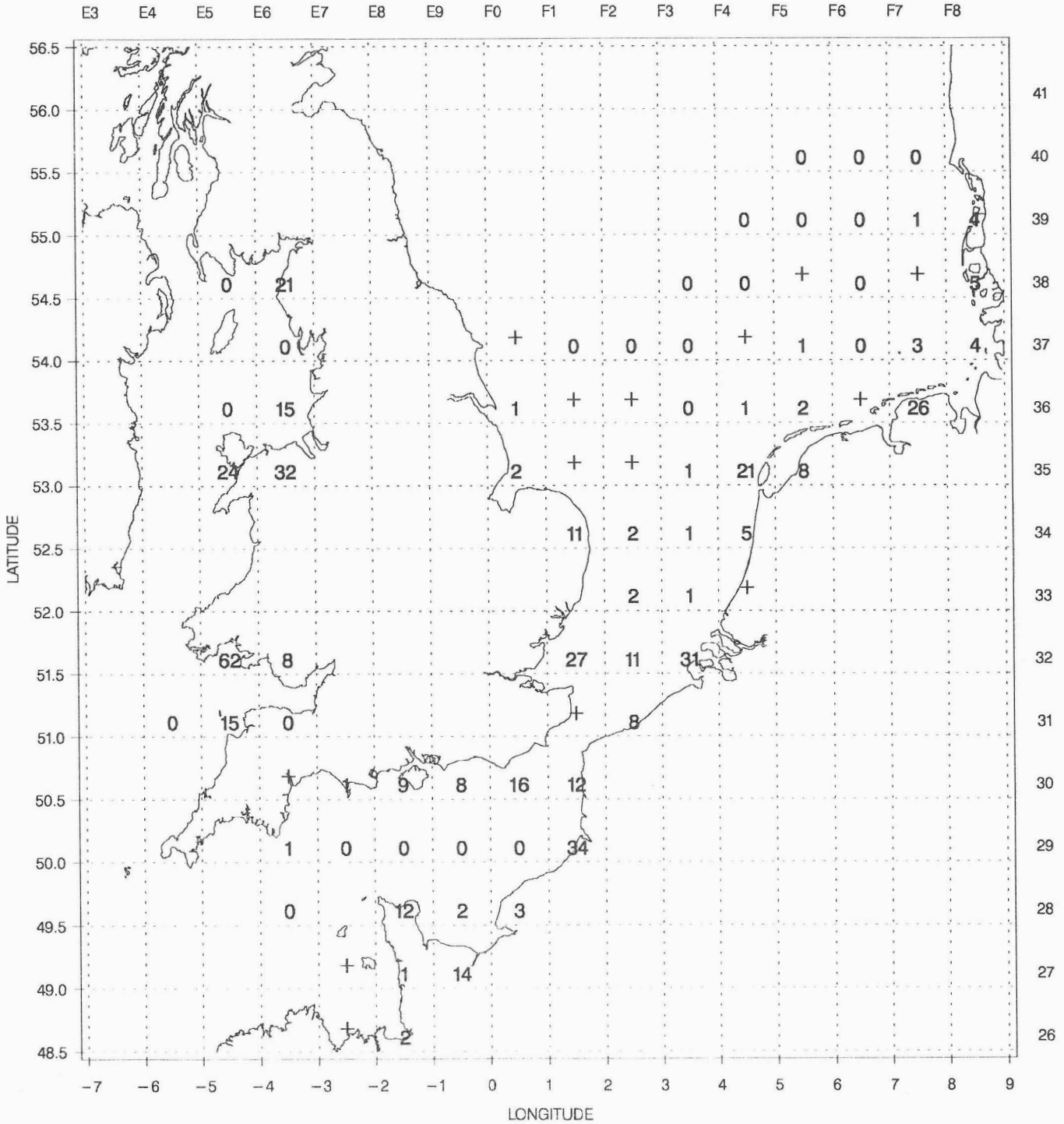
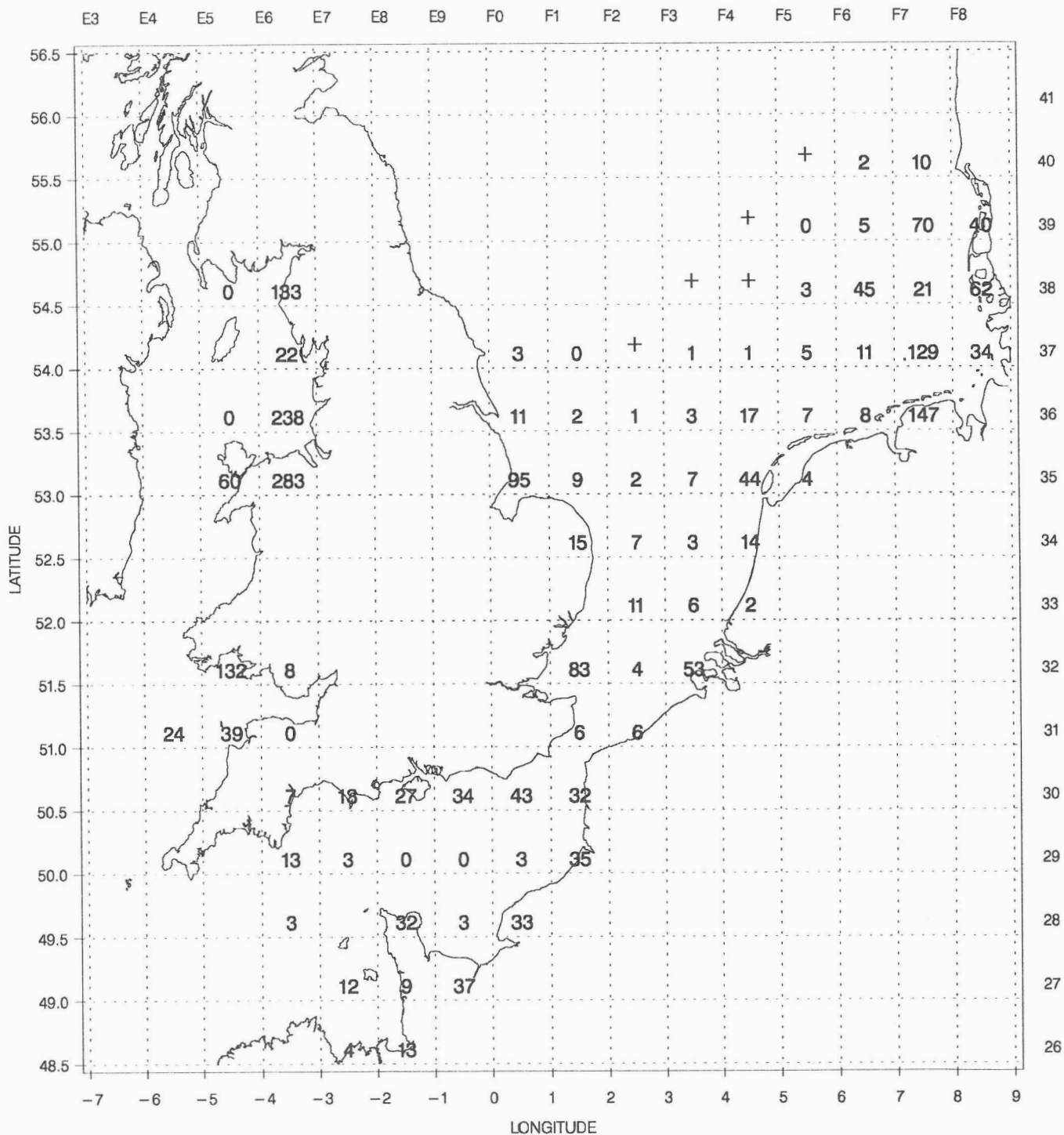


Figure 4.2 Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.

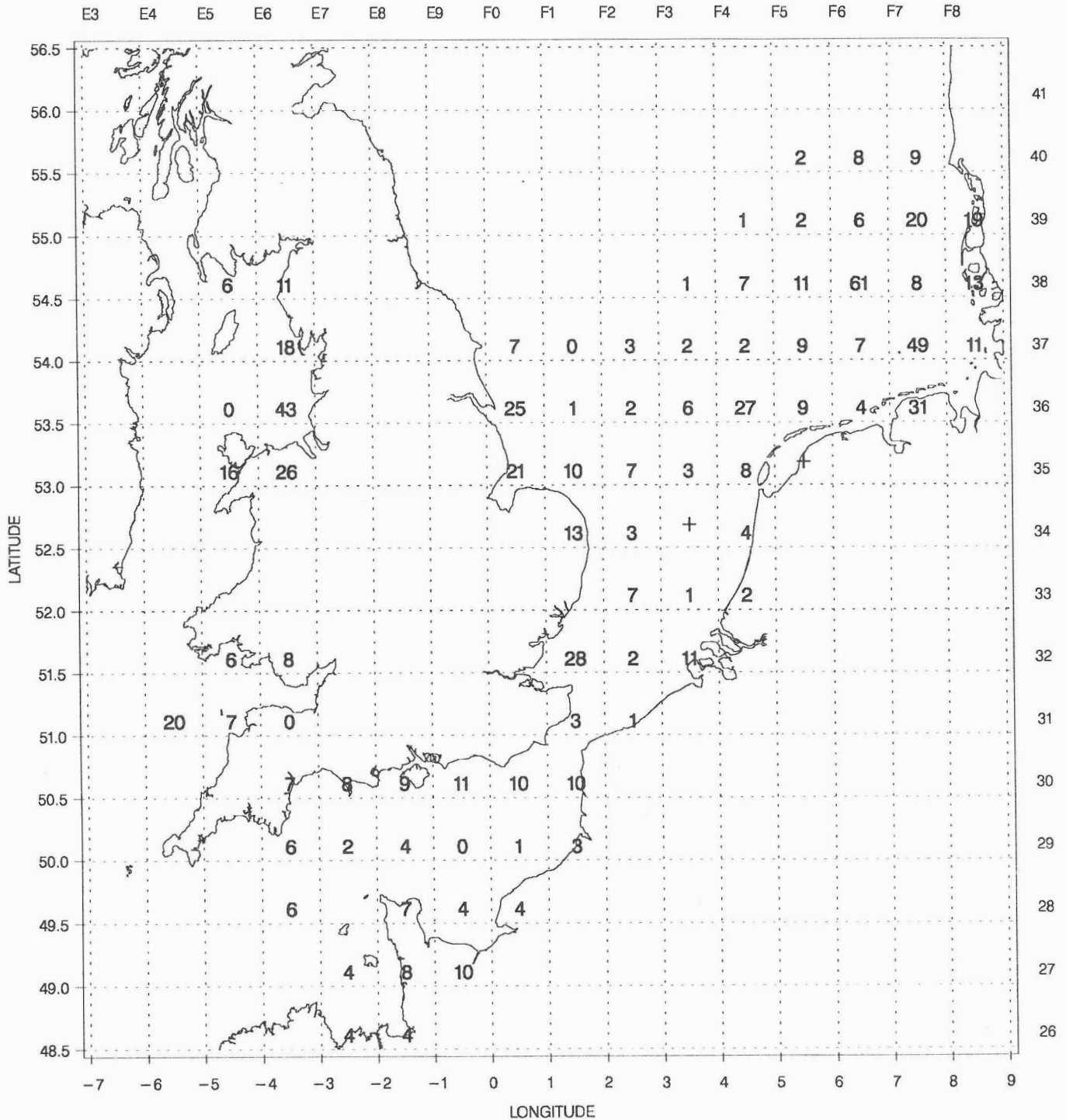
## BEAM TRAWL SURVEY 1991

SOLE 2 Gp

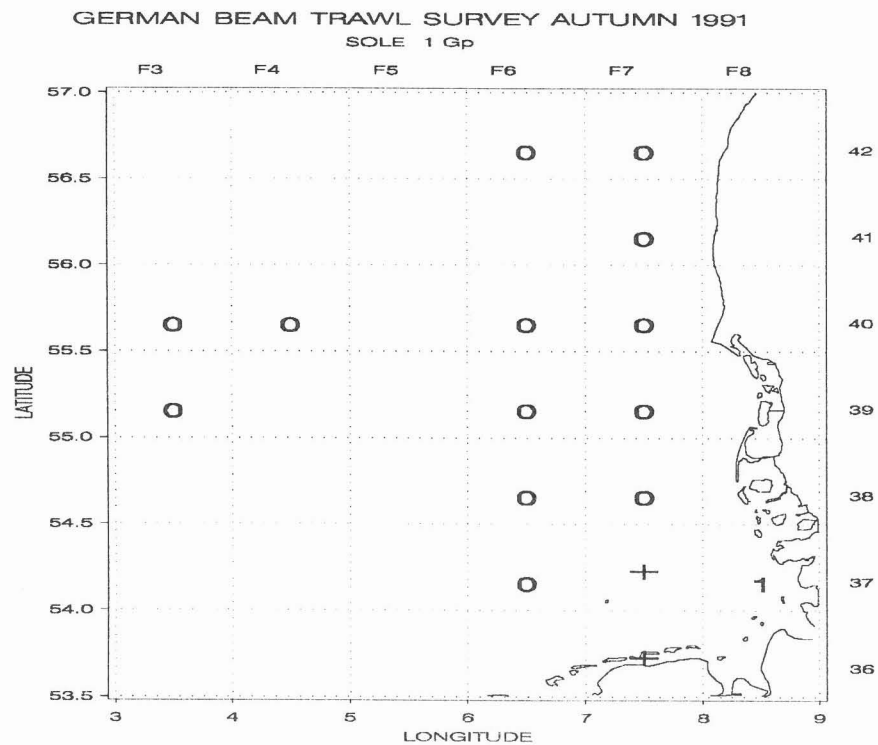
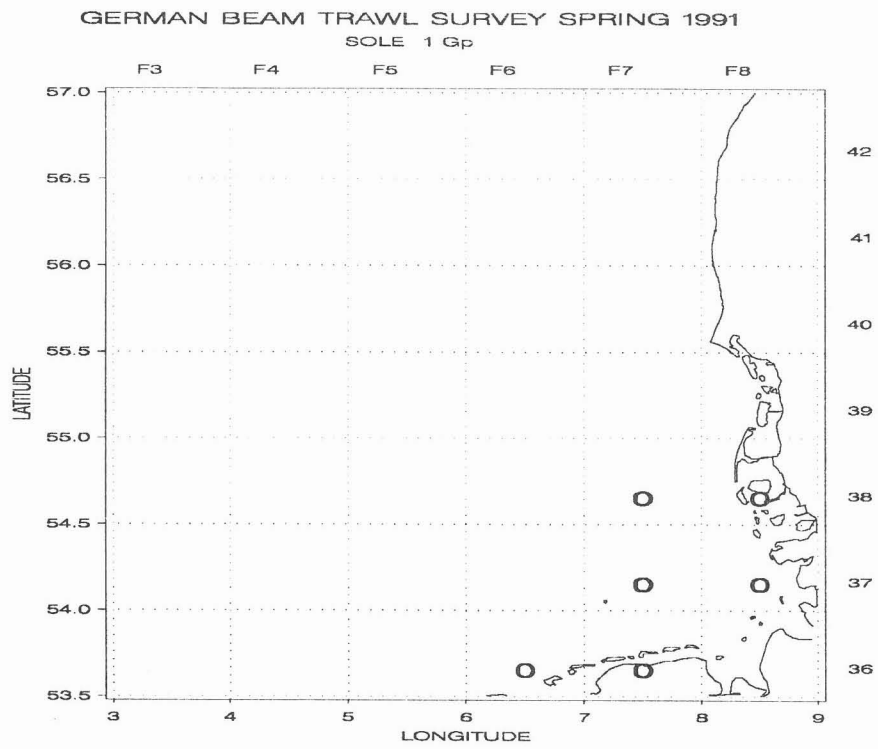


**Figure 4.3** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.

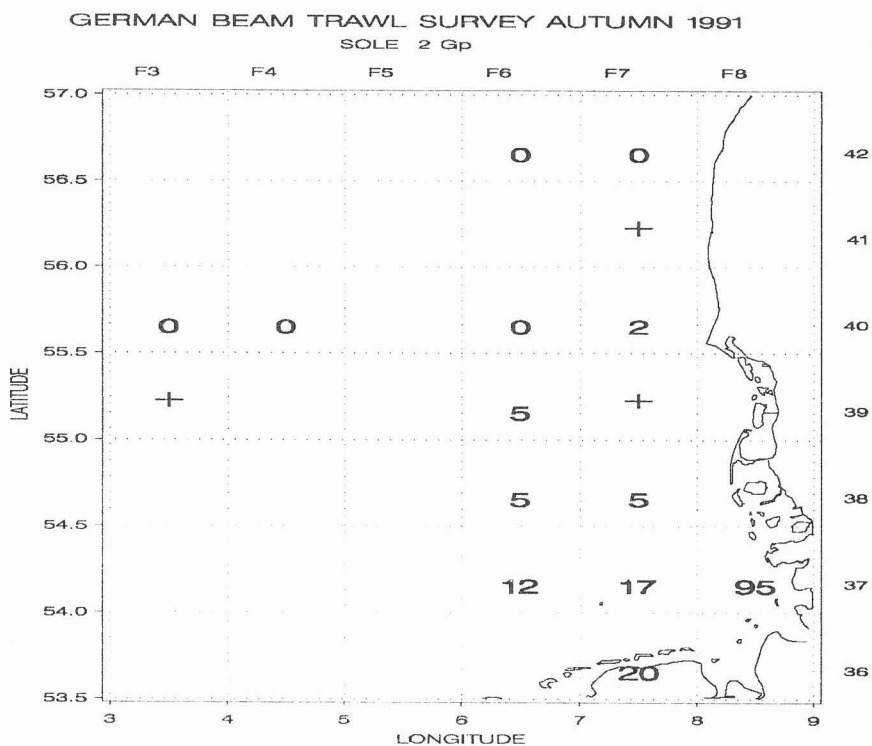
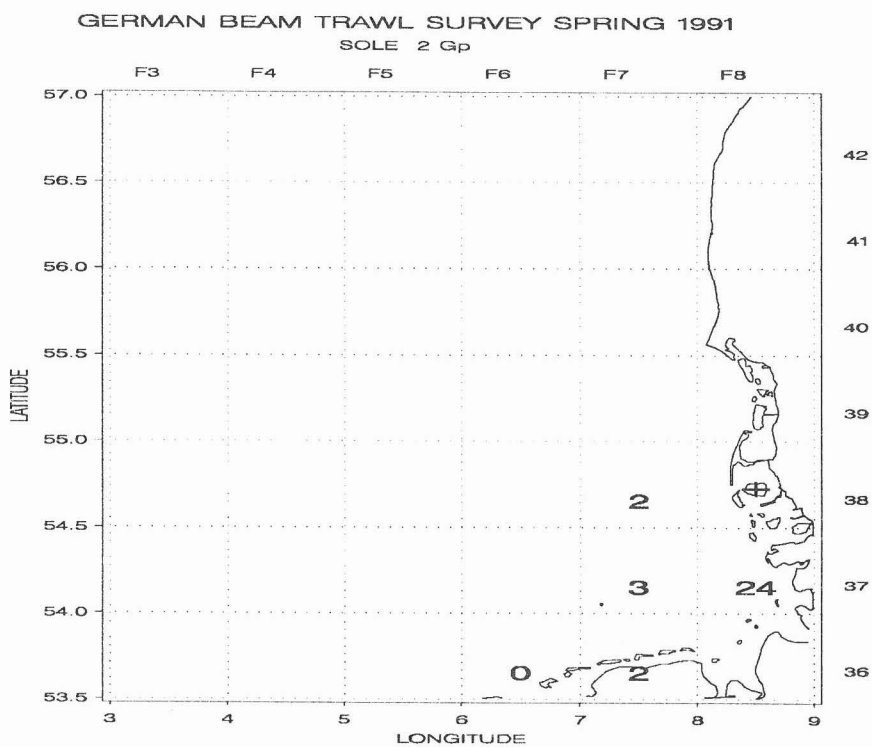
BEAM TRAWL SURVEY 1991  
SOLE 3+ Gp



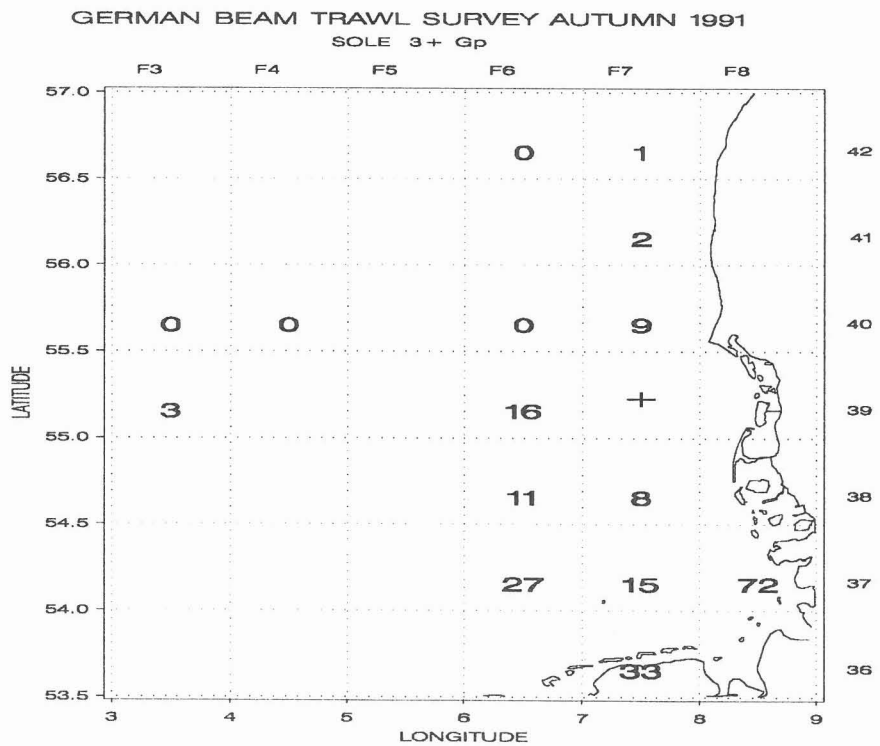
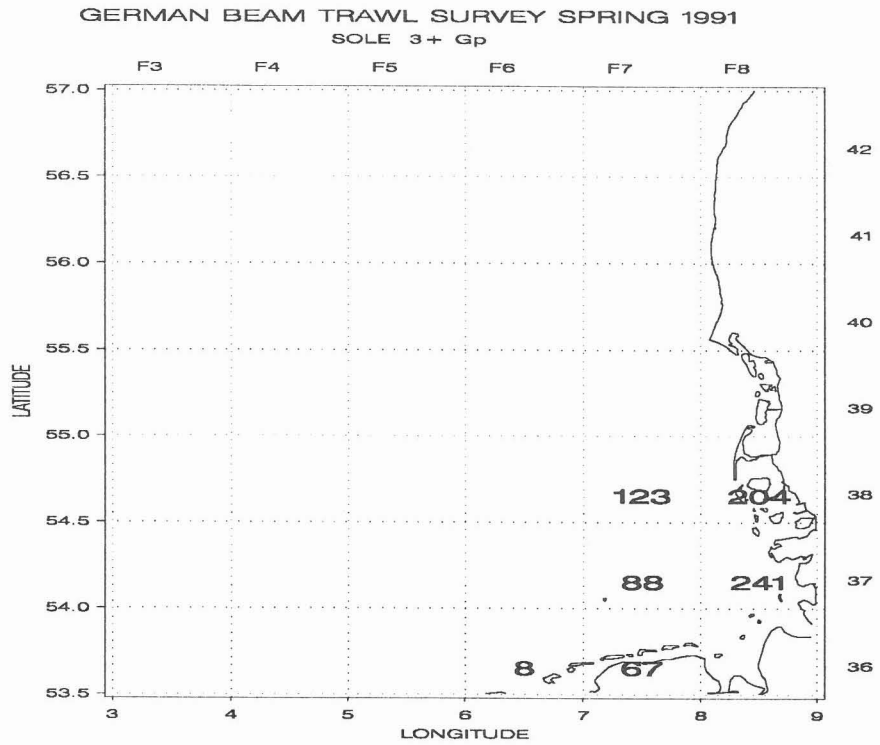
**Figure 4.4** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.



**Figure 4.5** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.



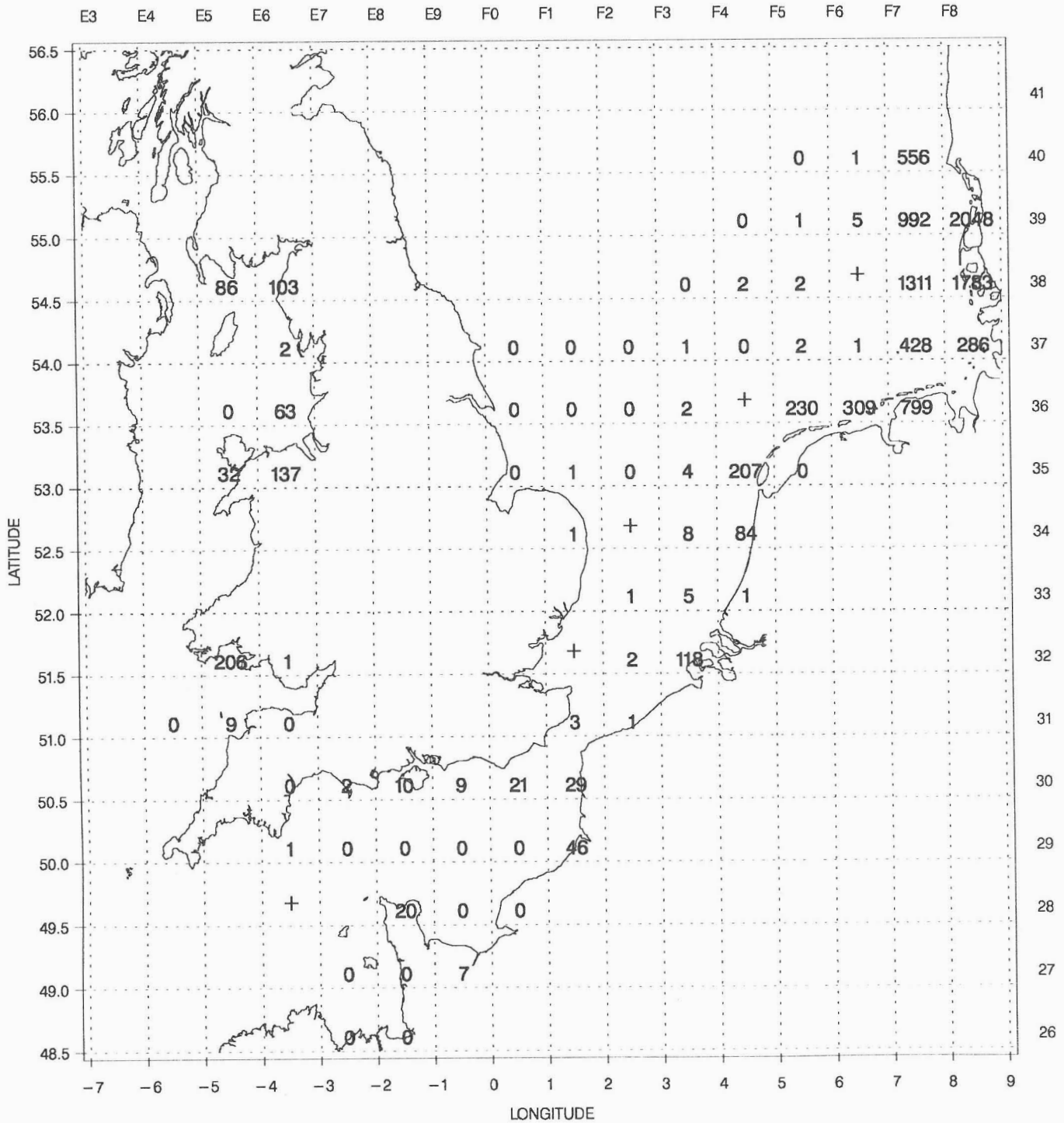
**Figure 4.6** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.



**Figure 4.7** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.

## BEAM TRAWL SURVEY 1991

### PLAICE 1 Gp

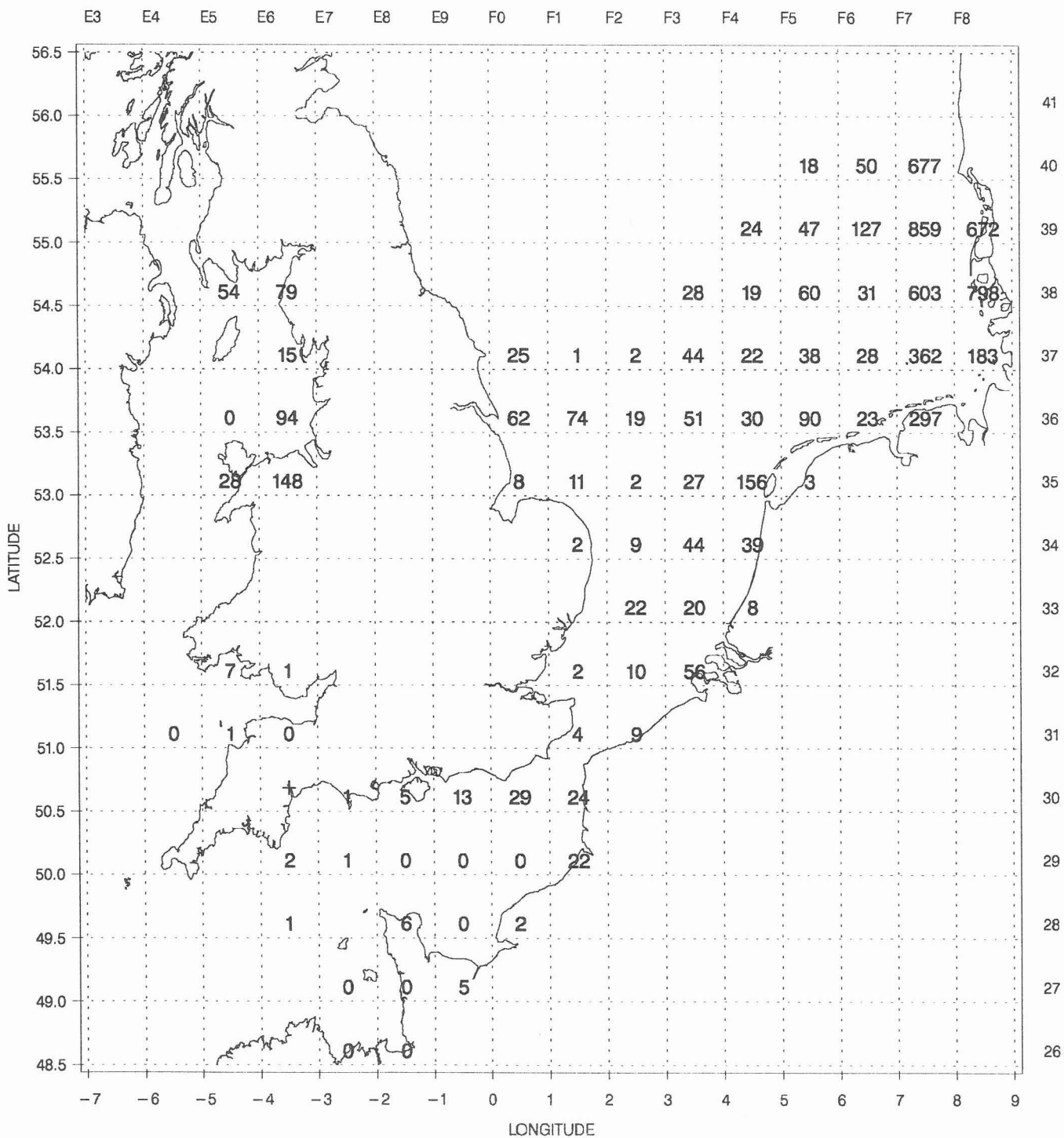




**Figure 4.8** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.

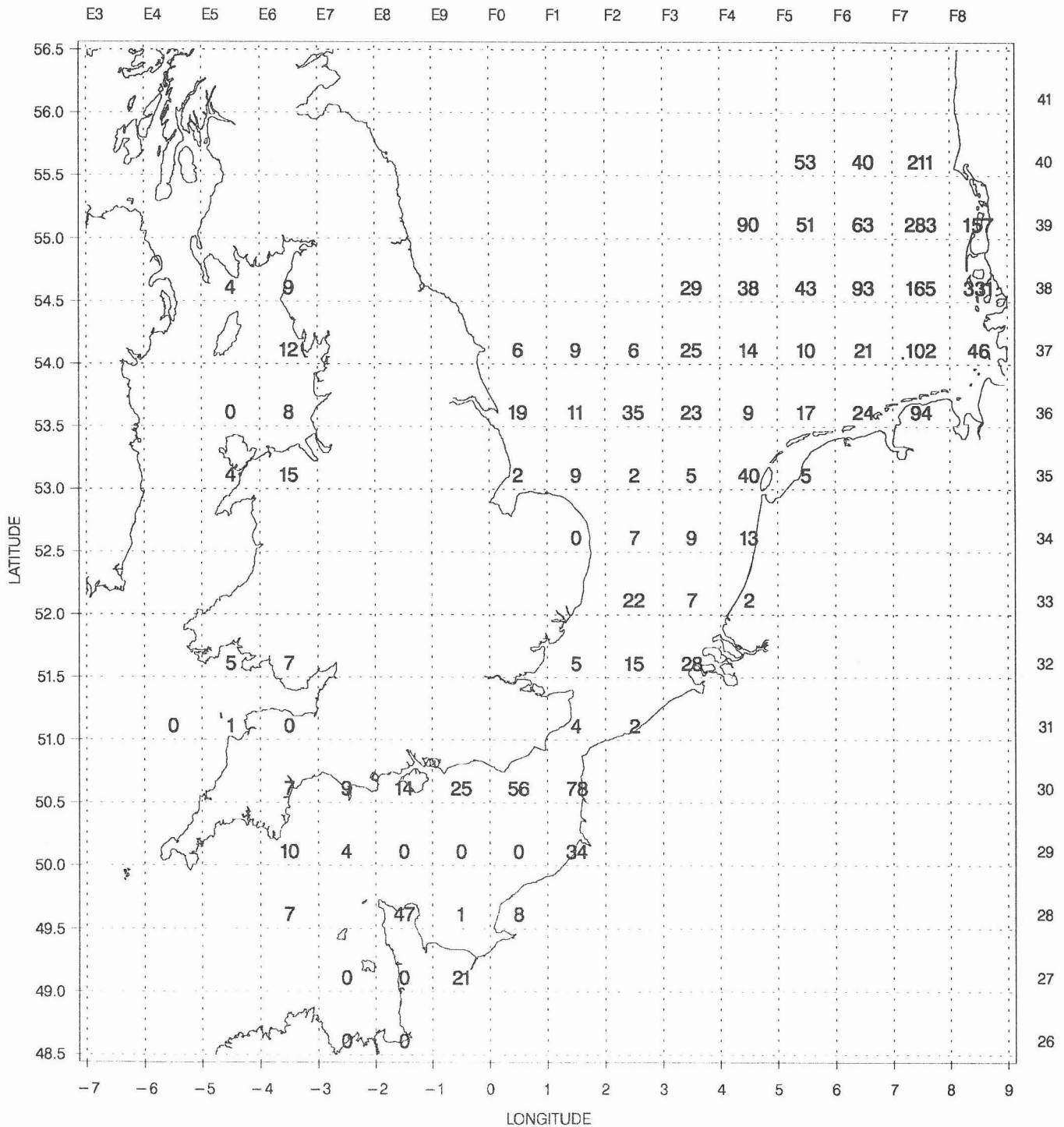
### BEAM TRAWL SURVEY 1991

PLAICE 2 Gp

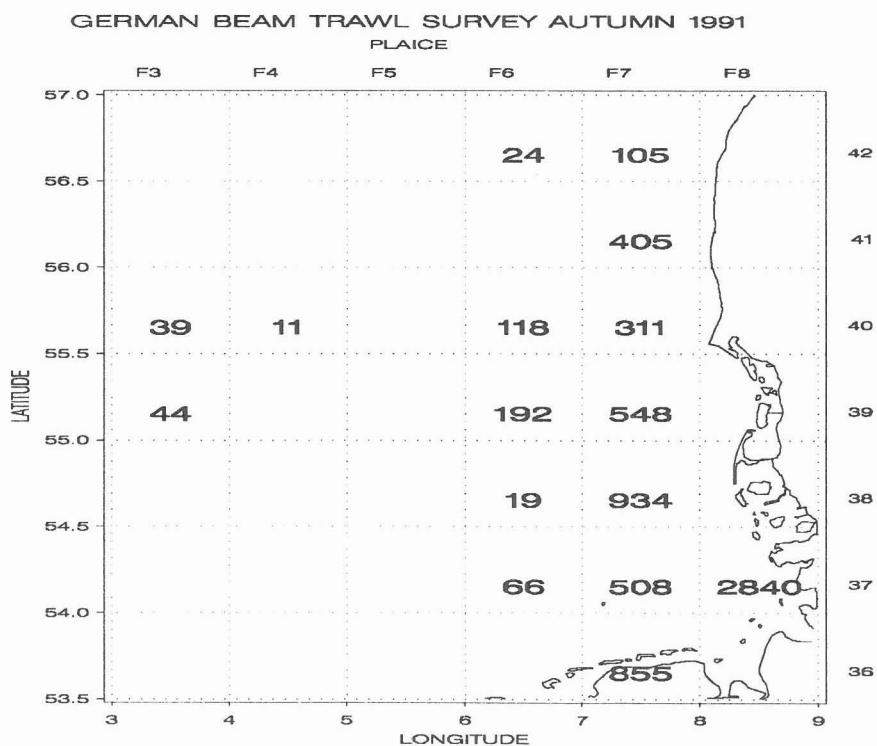
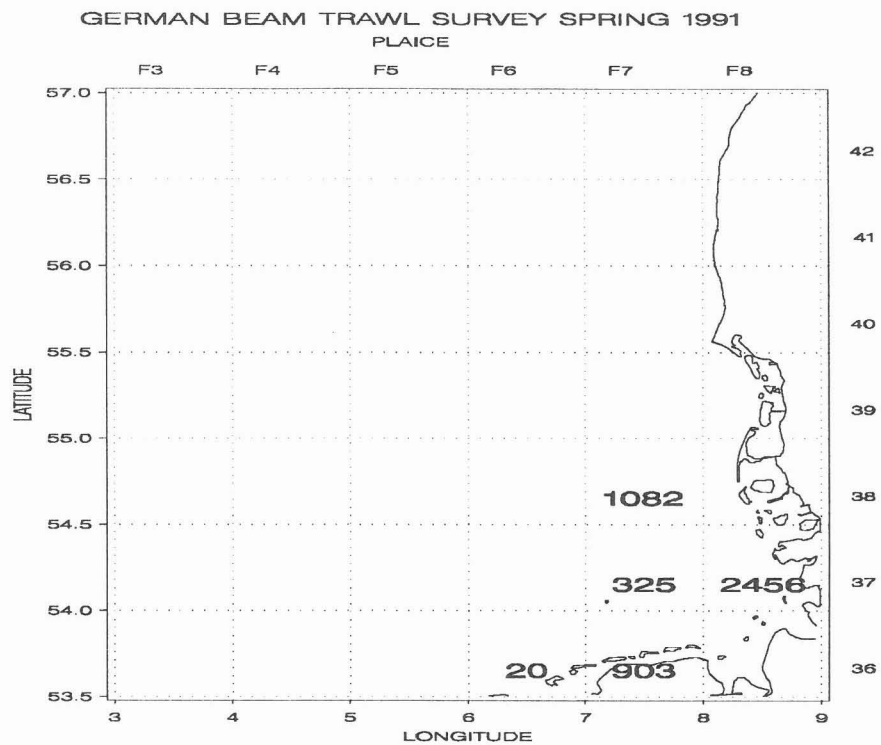


**Figure 4.9** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.

BEAM TRAWL SURVEY 1991  
PLAICE 3+ Gp



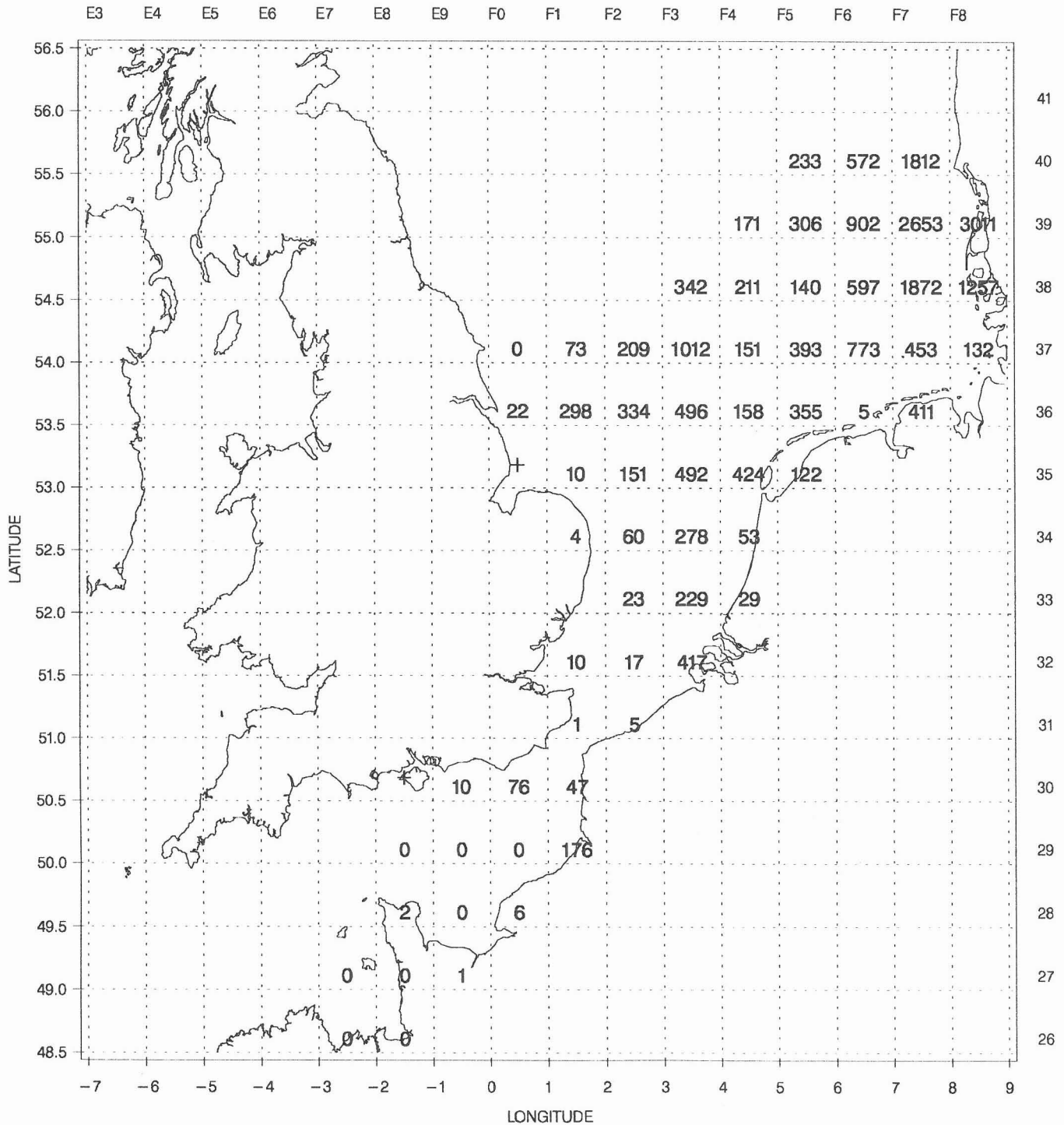
**Figure 4.10** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.



**Figure 4.11** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.

## BEAM TRAWL SURVEY 1991

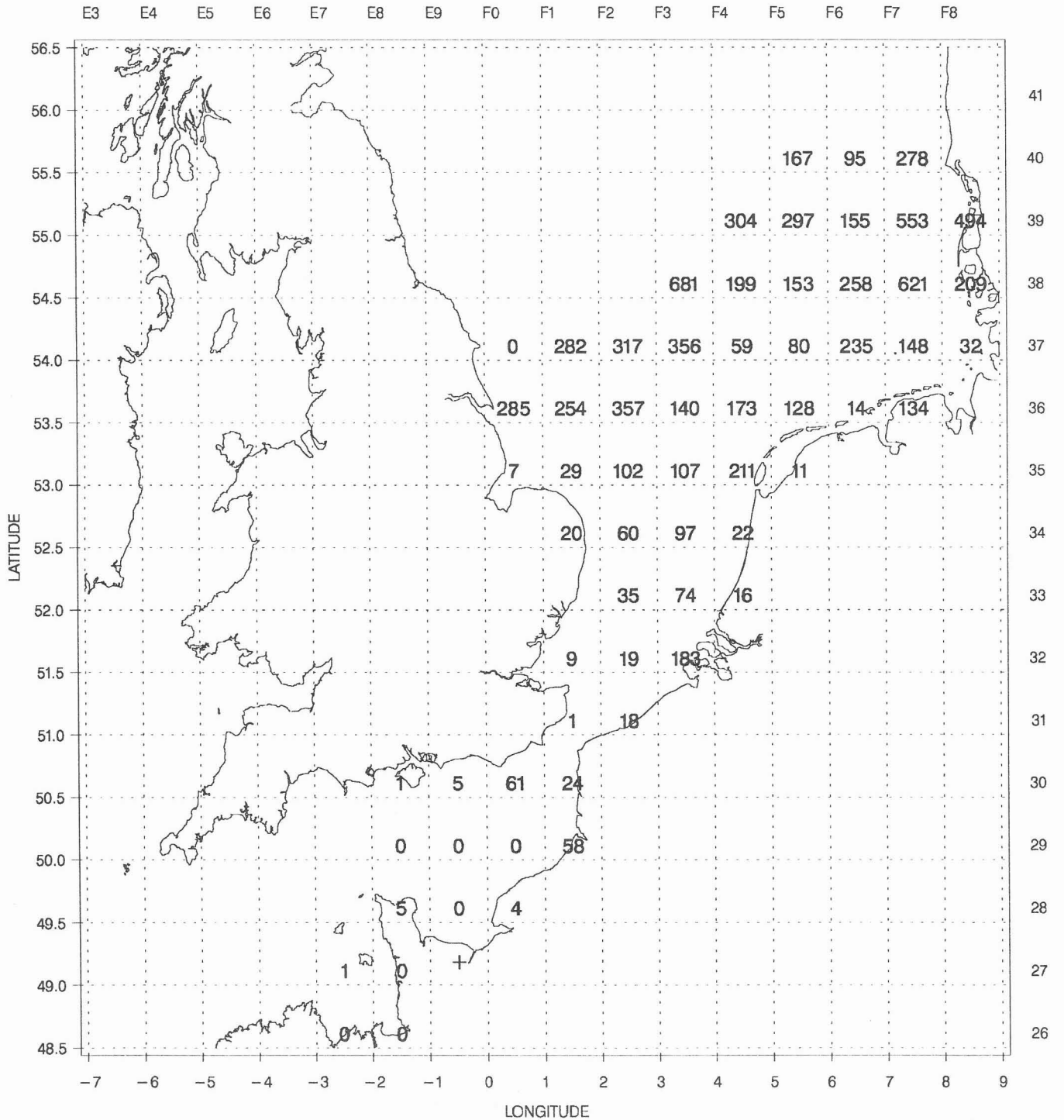
DAB 1 Gp



**Figure 4.12** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.

## BEAM TRAWL SURVEY 1991

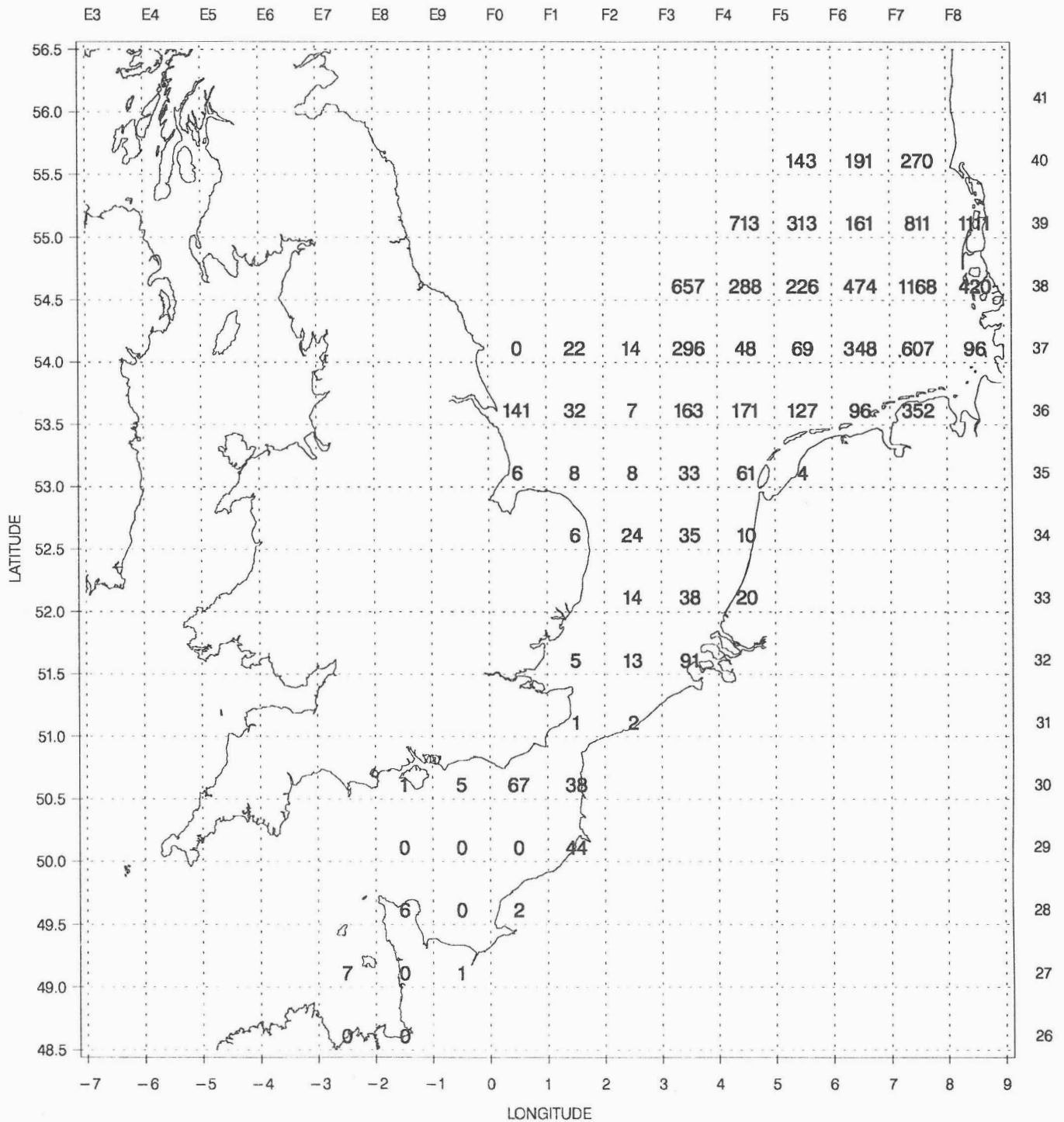
DAB 2 Gp



**Figure 4.13** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.

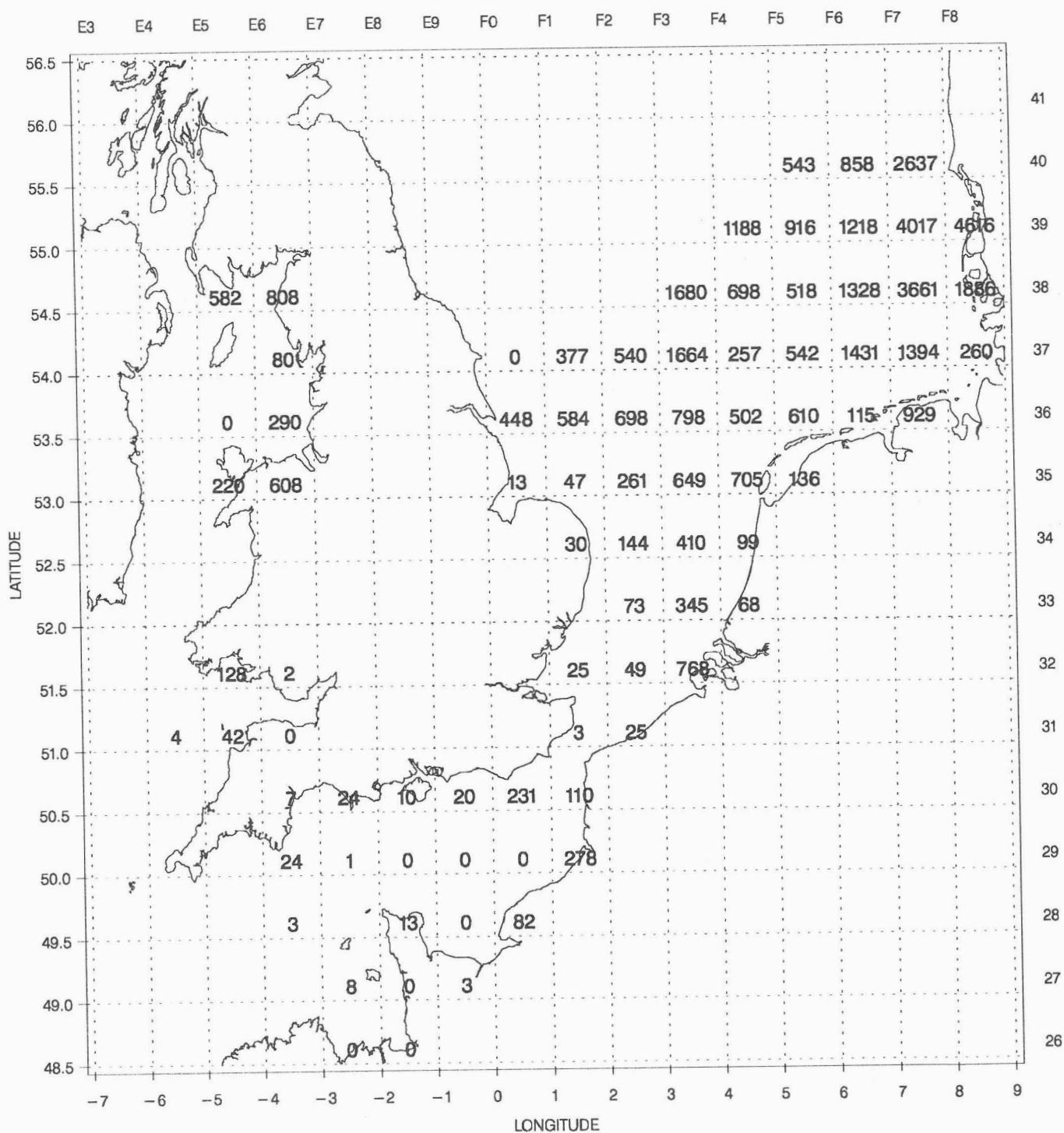
### BEAM TRAWL SURVEY 1991

DAB 3+ Gp

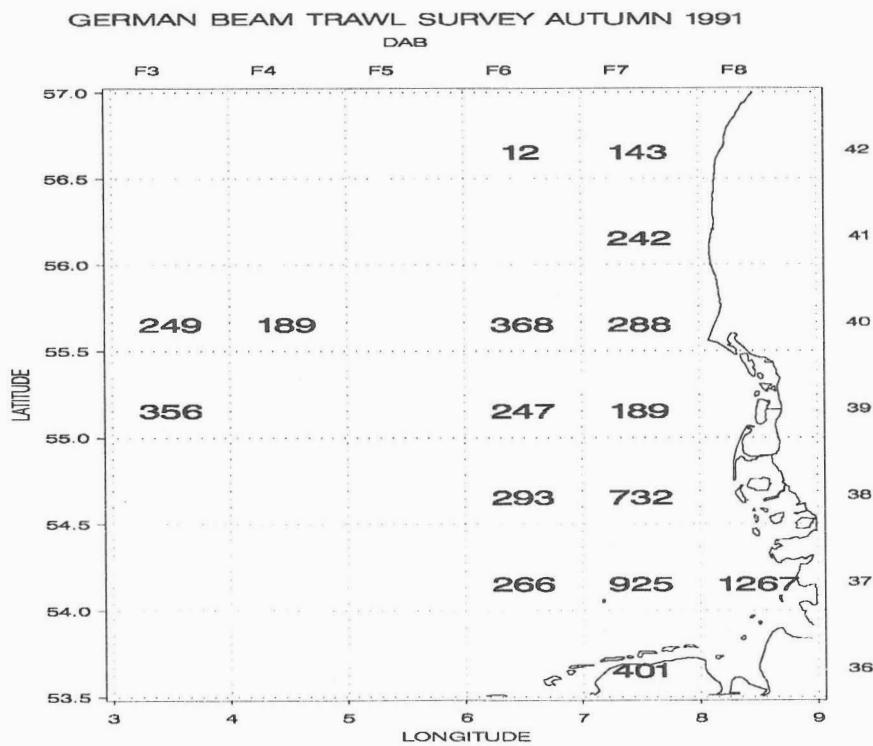
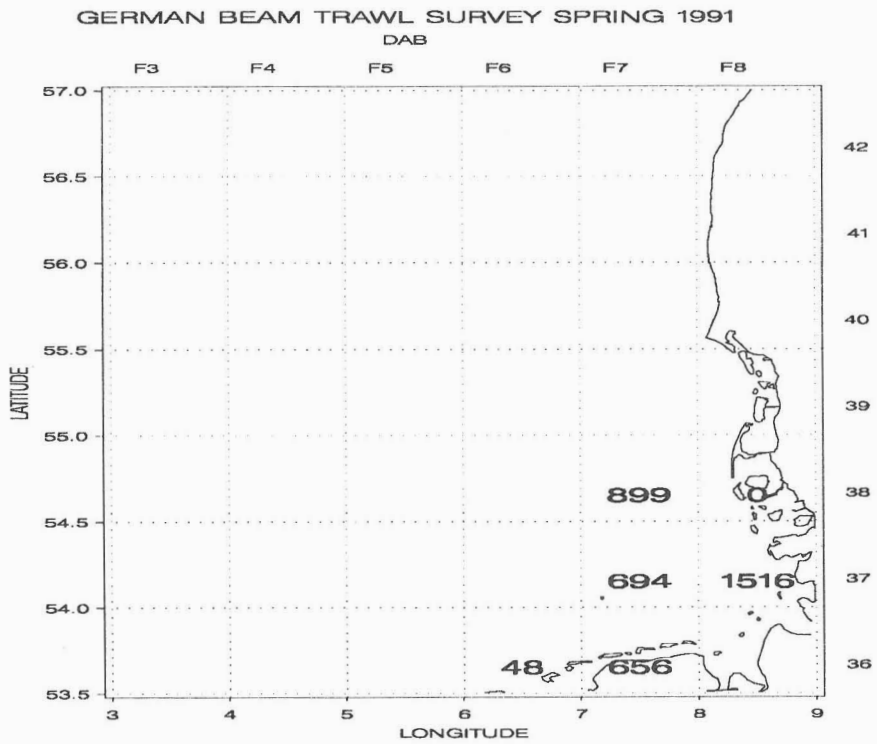


**Figure 4.14** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.

### BEAM TRAWL SURVEY 1991 DAB (UNAGED)



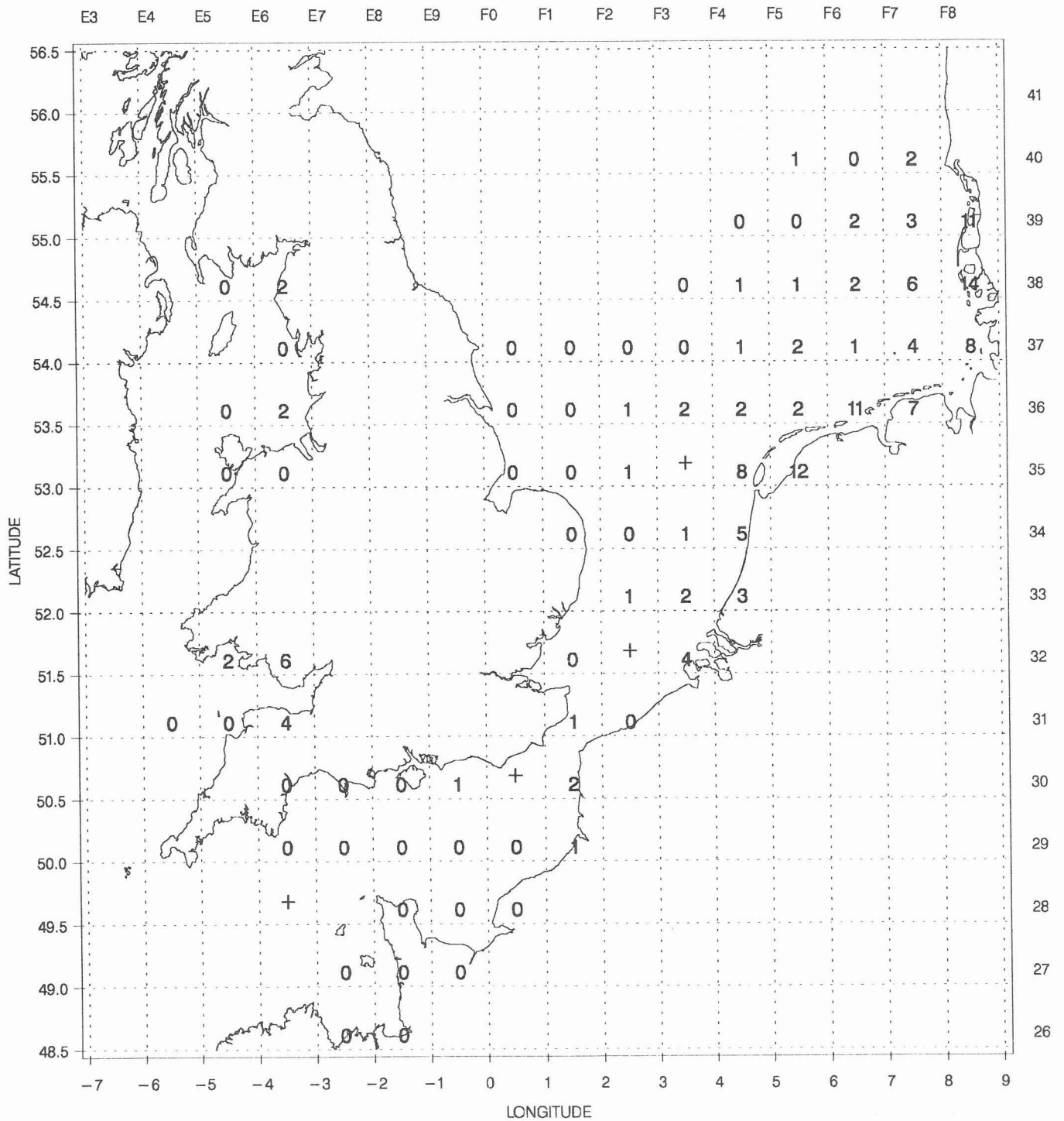
**Figure 4.15** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.



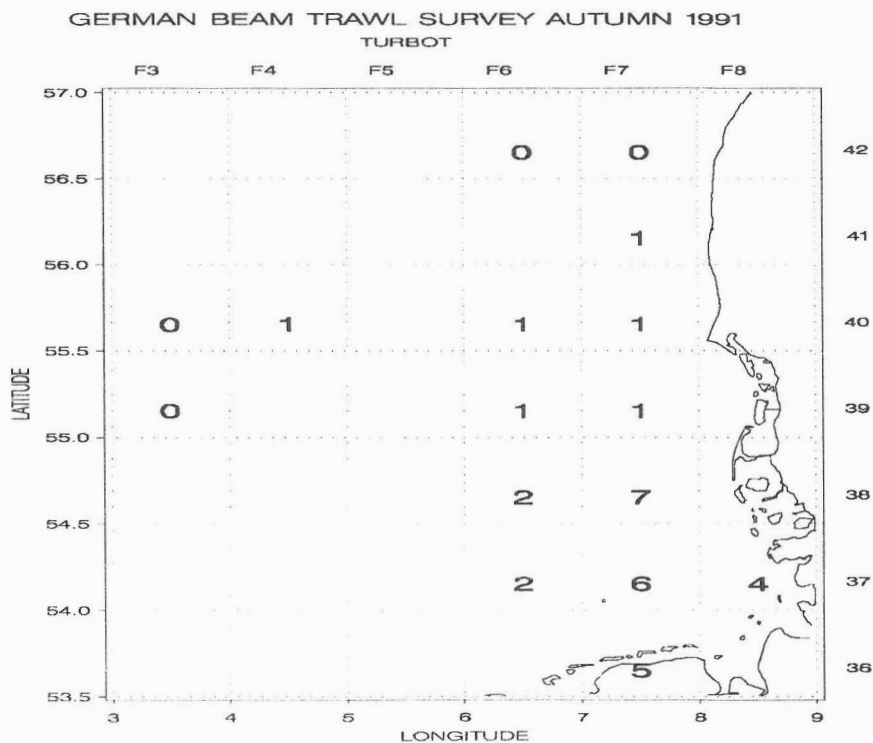
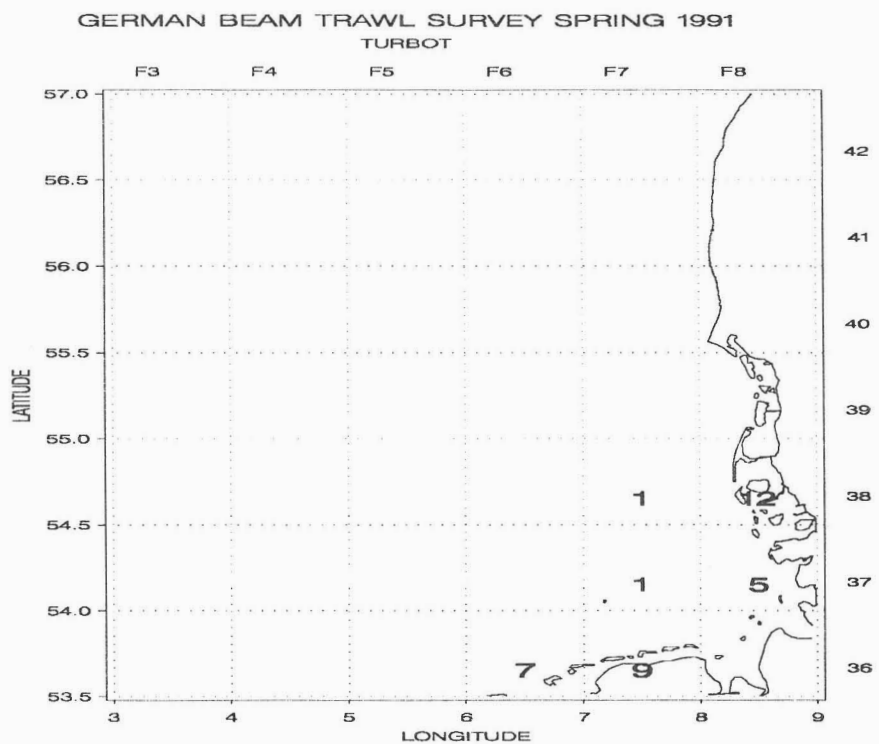


**Figure 4.16** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.

## BEAM TRAWL SURVEY 1991 TURBOT



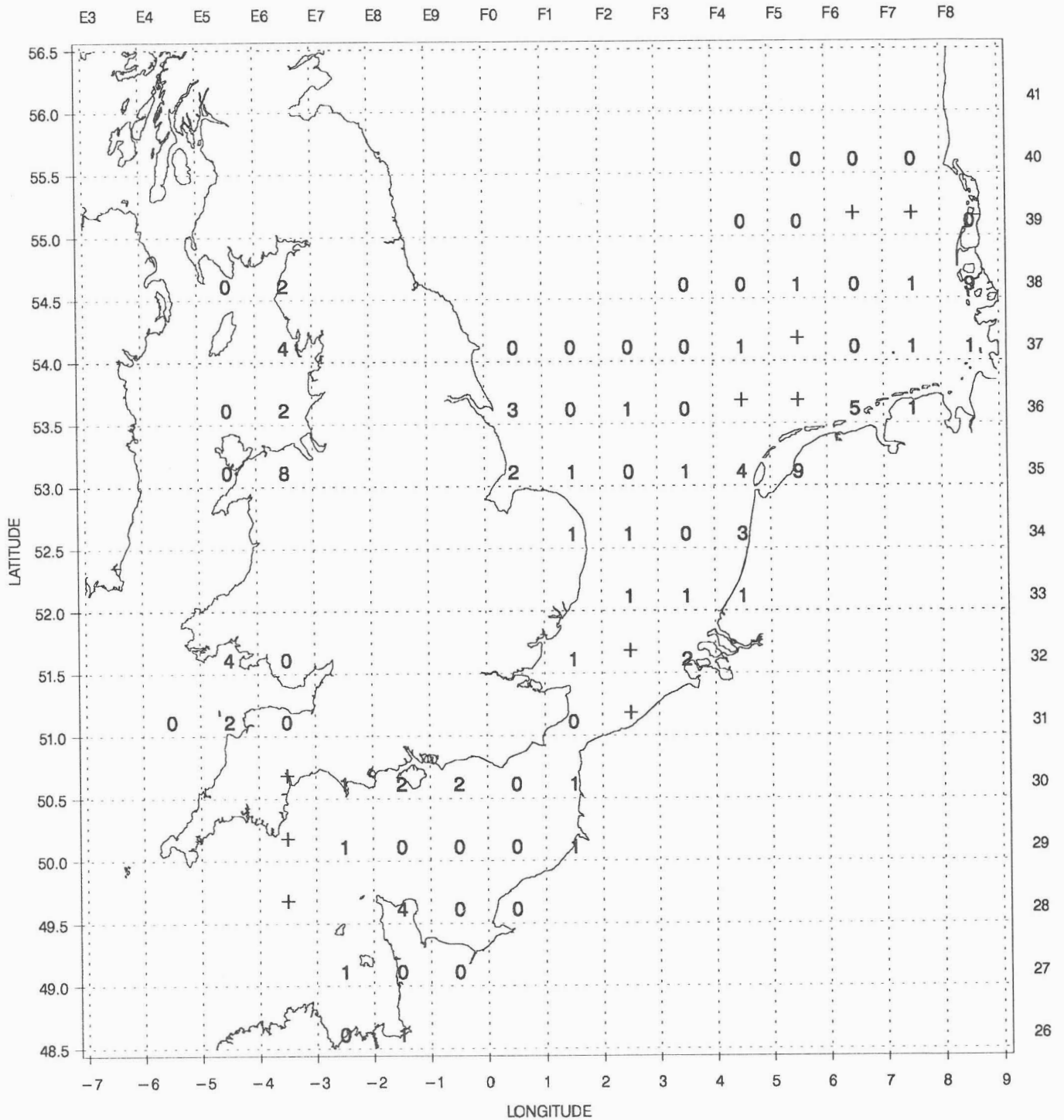
**Figure 4.17** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.



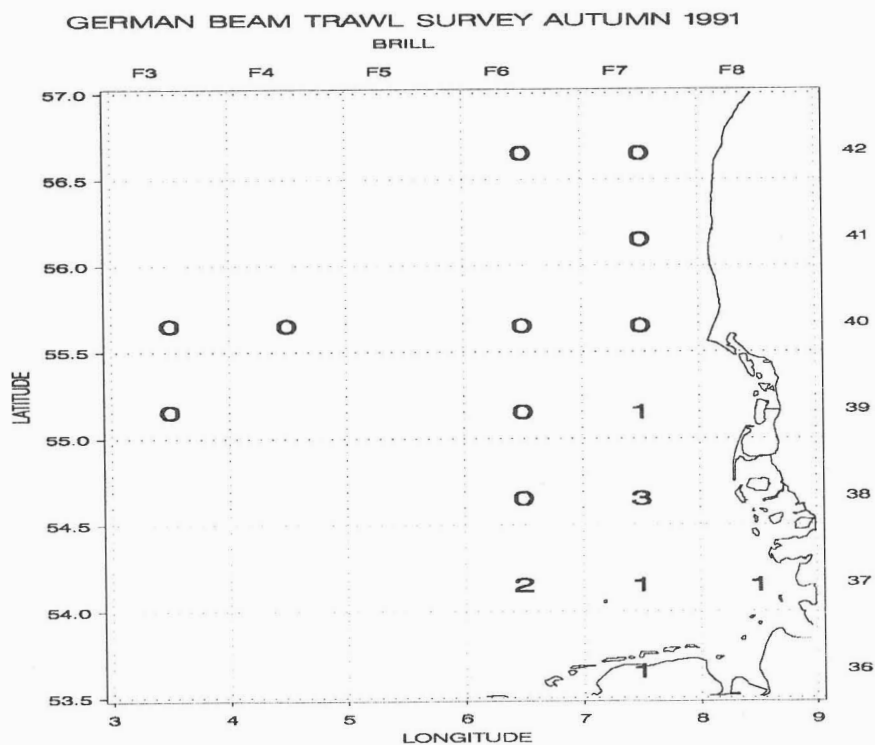
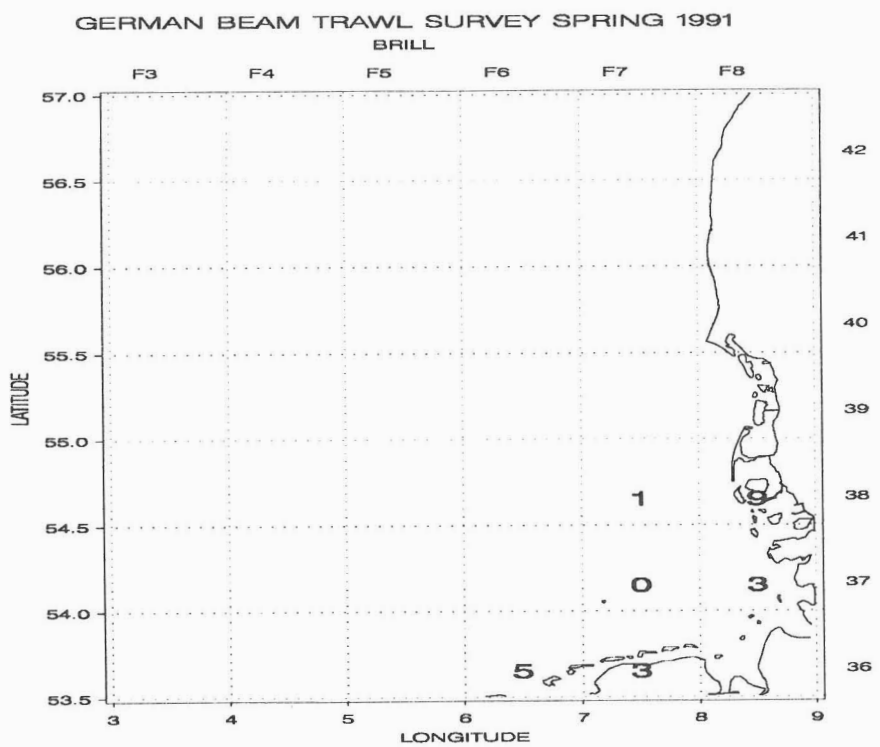
**Figure 4.18** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.

## BEAM TRAWL SURVEY 1991

### BRILL

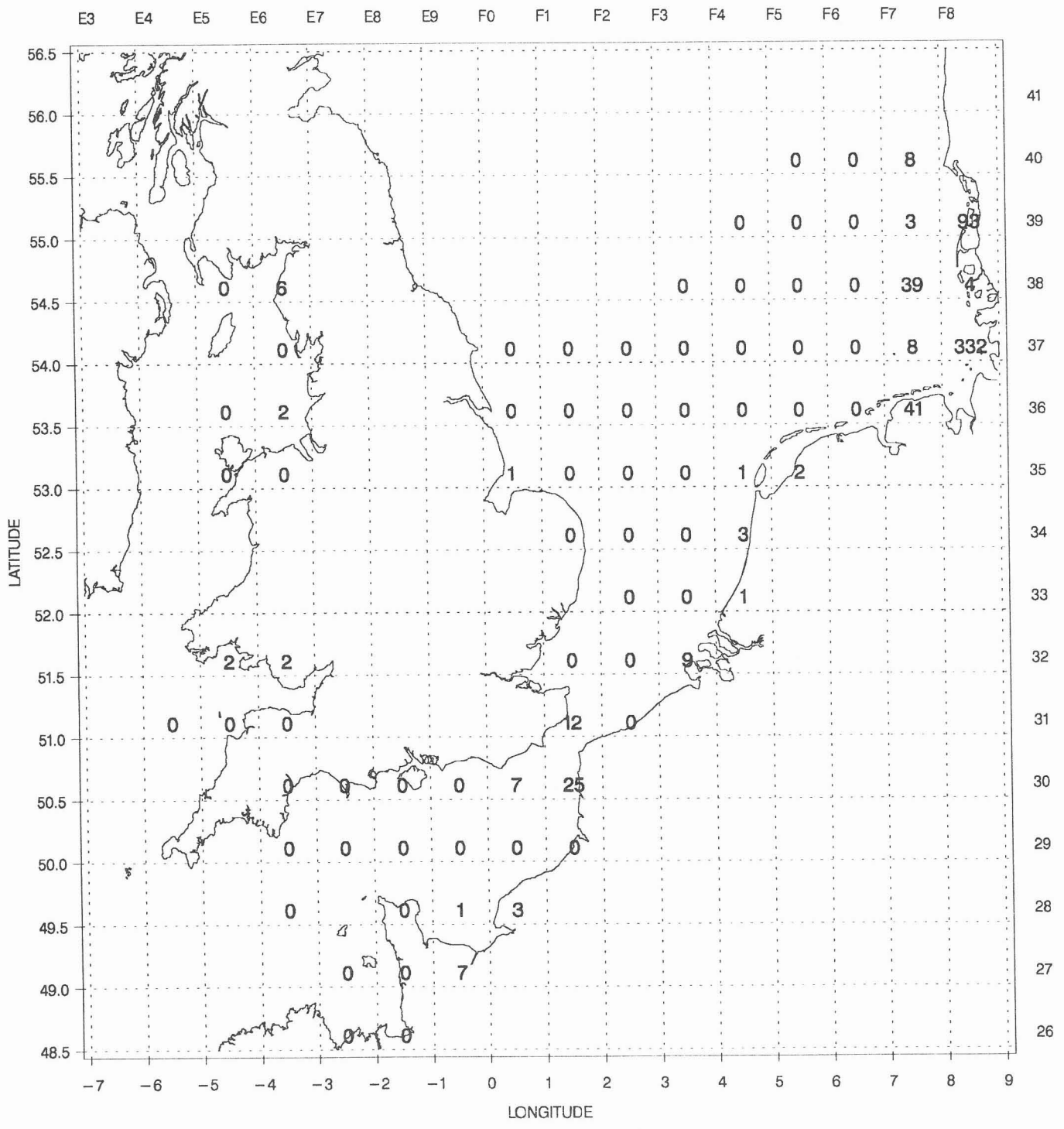


**Figure 4.19** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.

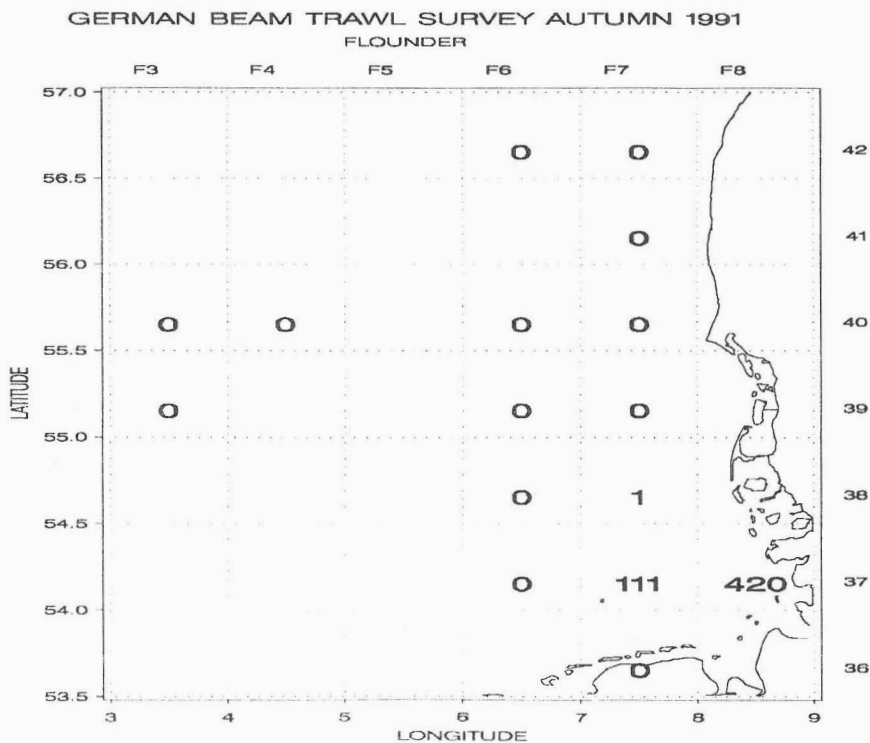
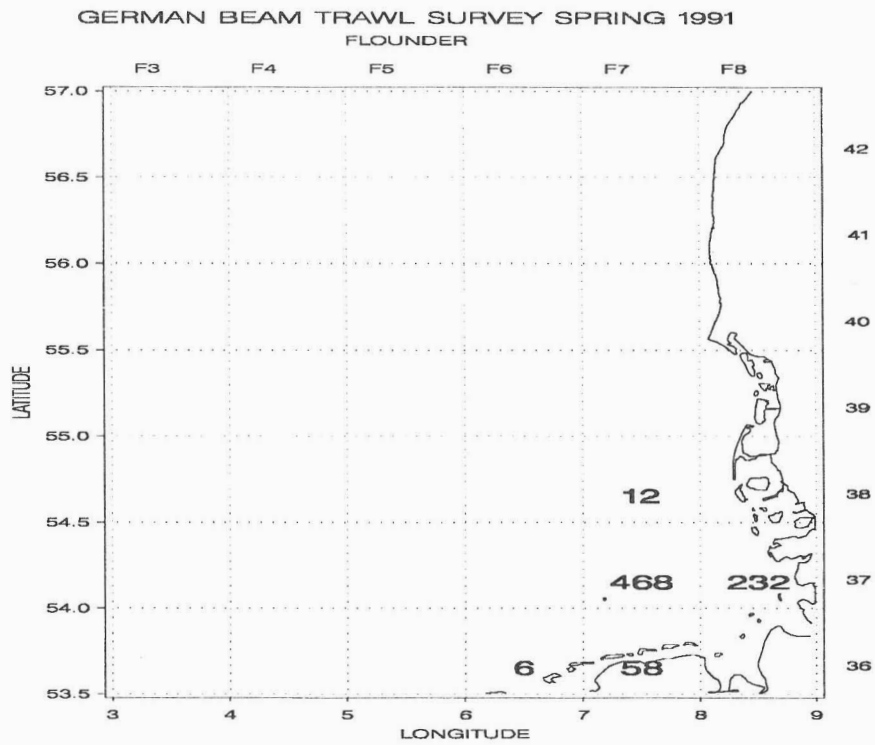


**Figure 4.20** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.

BEAM TRAWL SURVEY 1991  
FLOUNDER

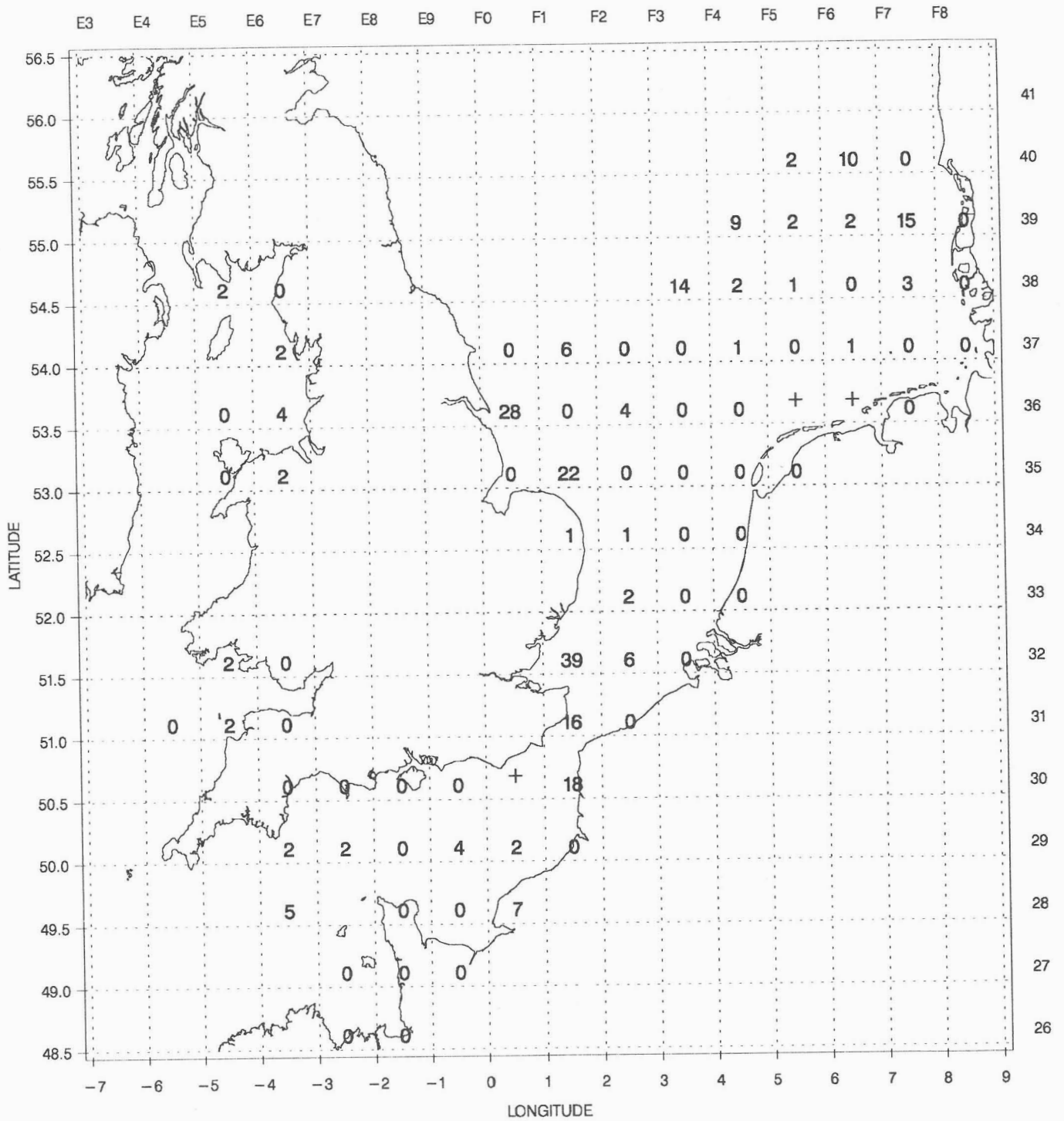


**Figure 4.21** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.

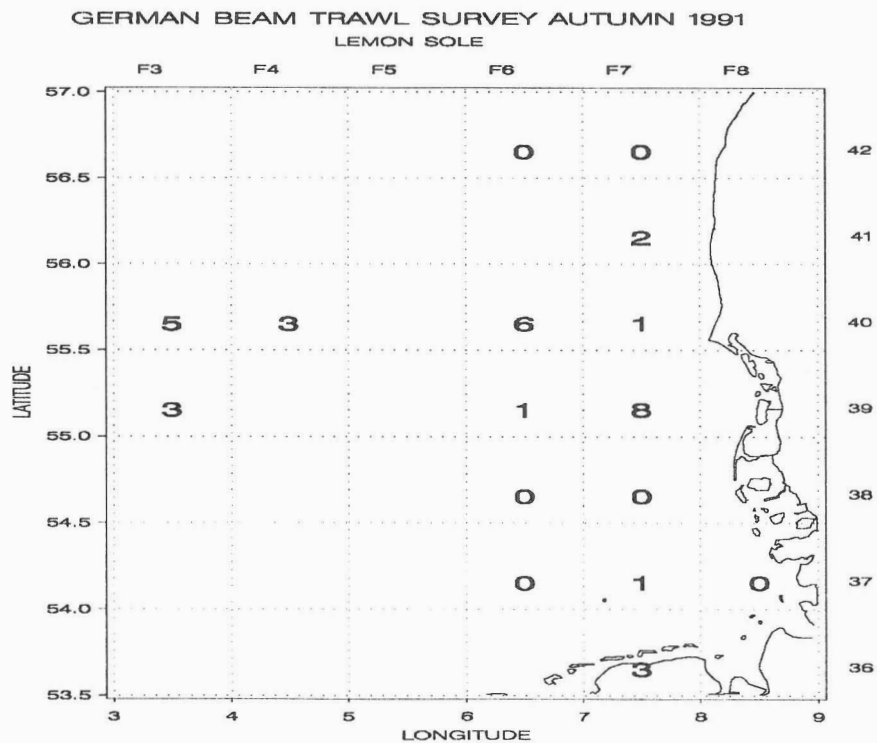
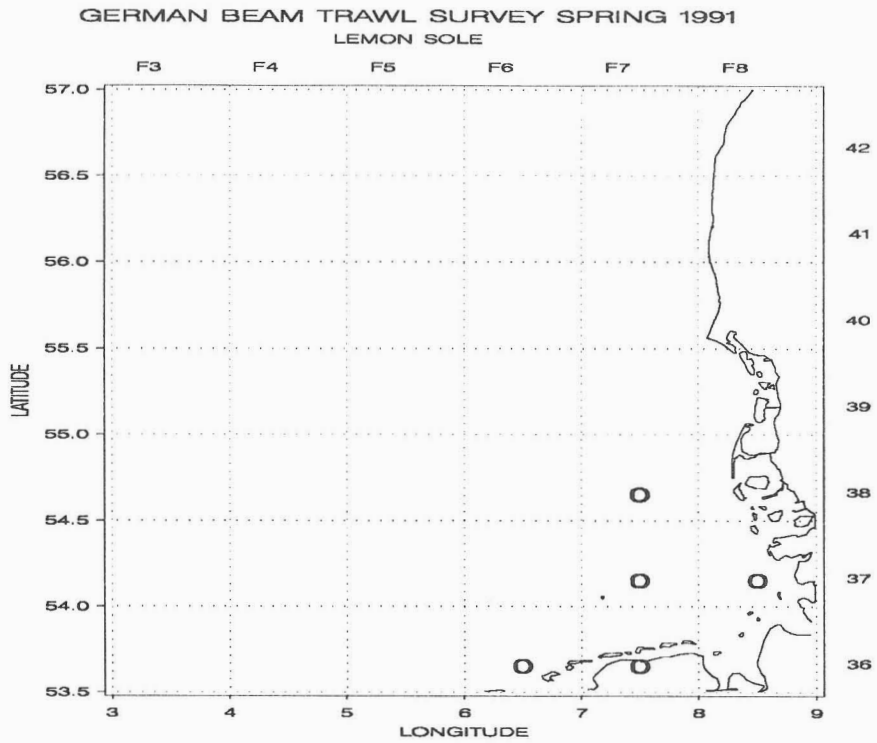


**Figure 4.22** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.

BEAM TRAWL SURVEY 1991  
LEMON SOLE



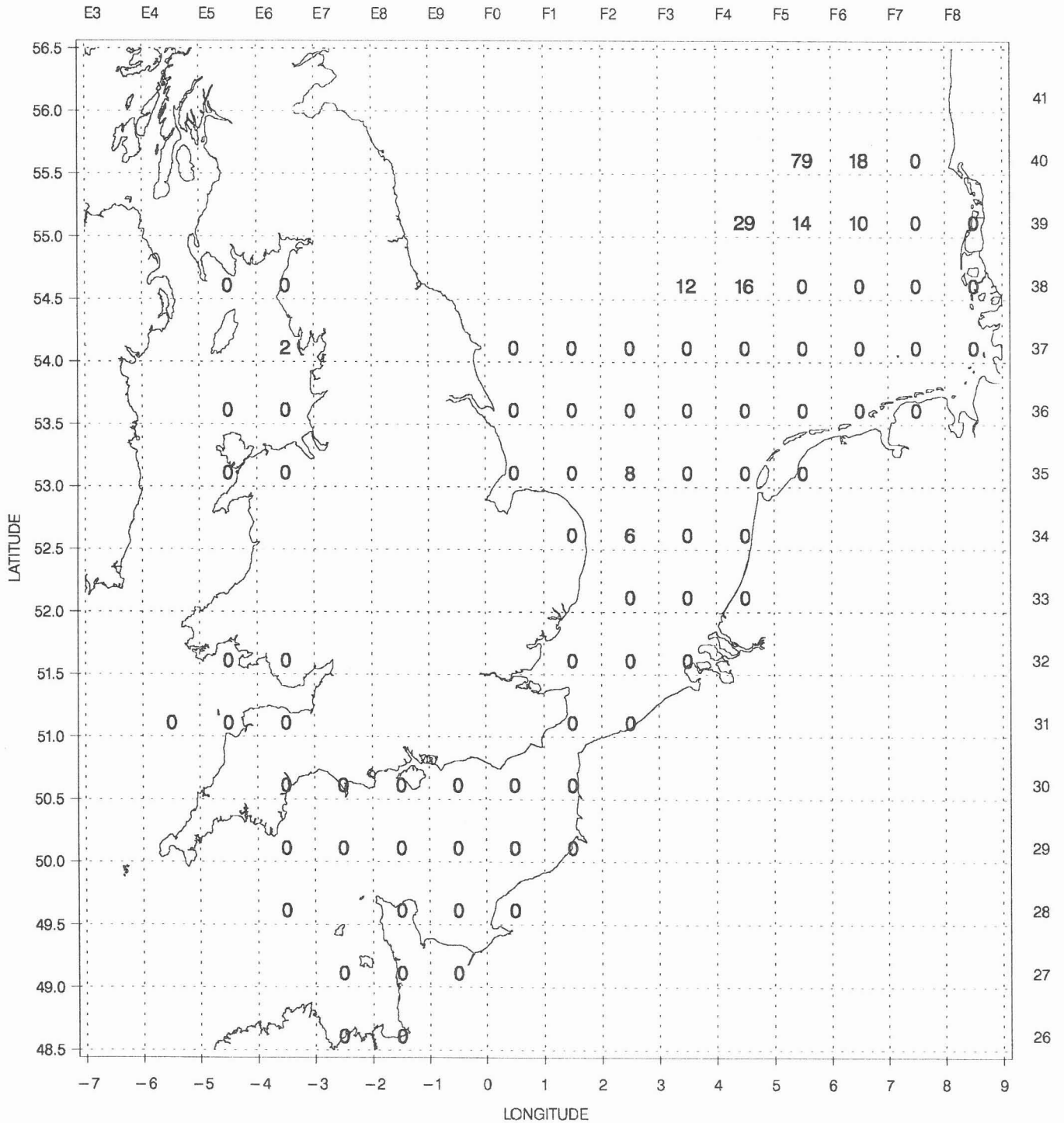
**Figure 4.23** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.



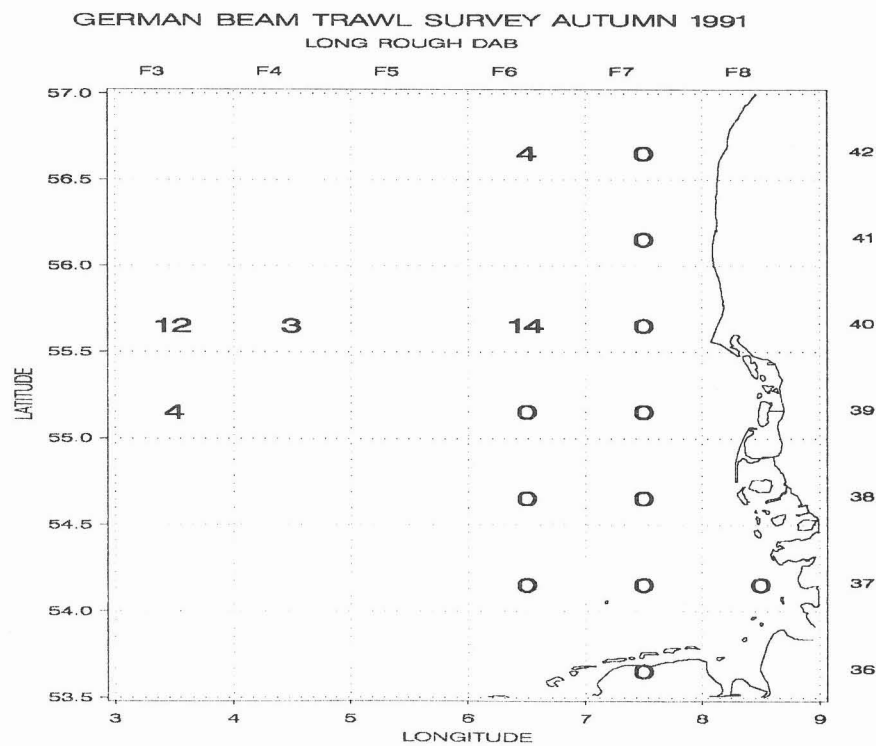
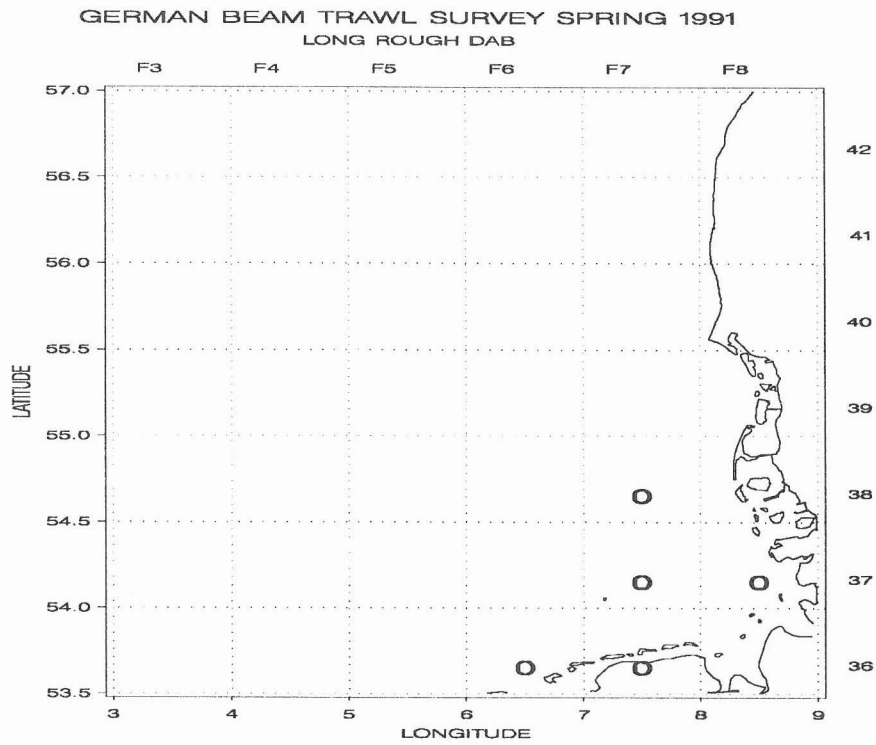


**Figure 4.24** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.

BEAM TRAWL SURVEY 1991  
LONG ROUGH DAB

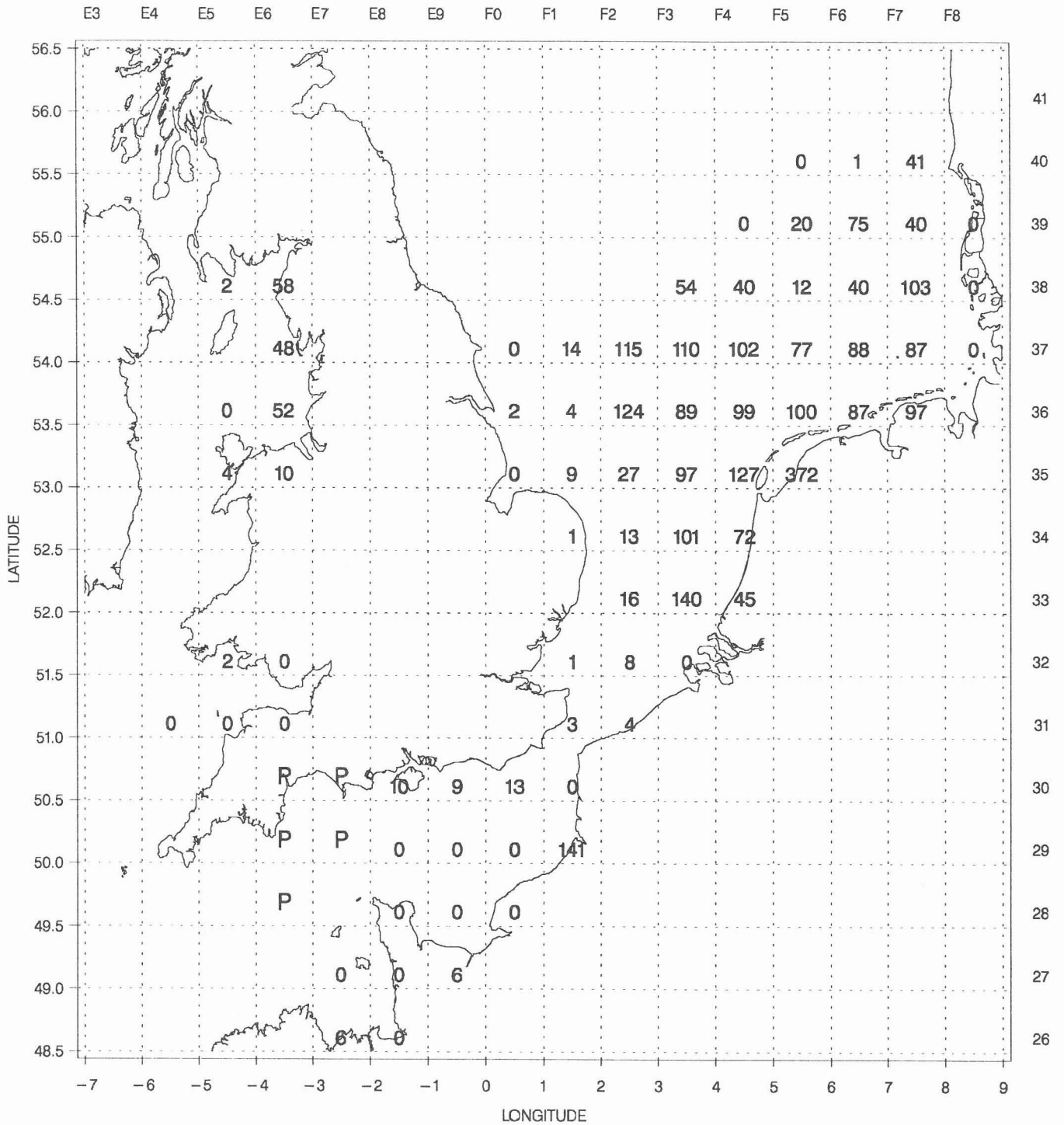


**Figure 4.25** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.

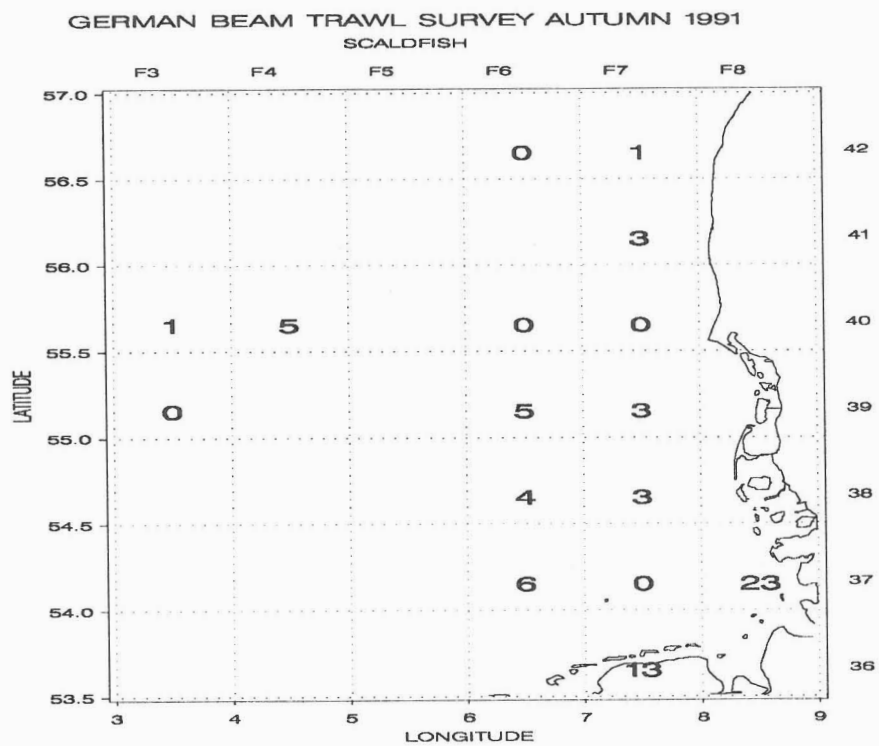
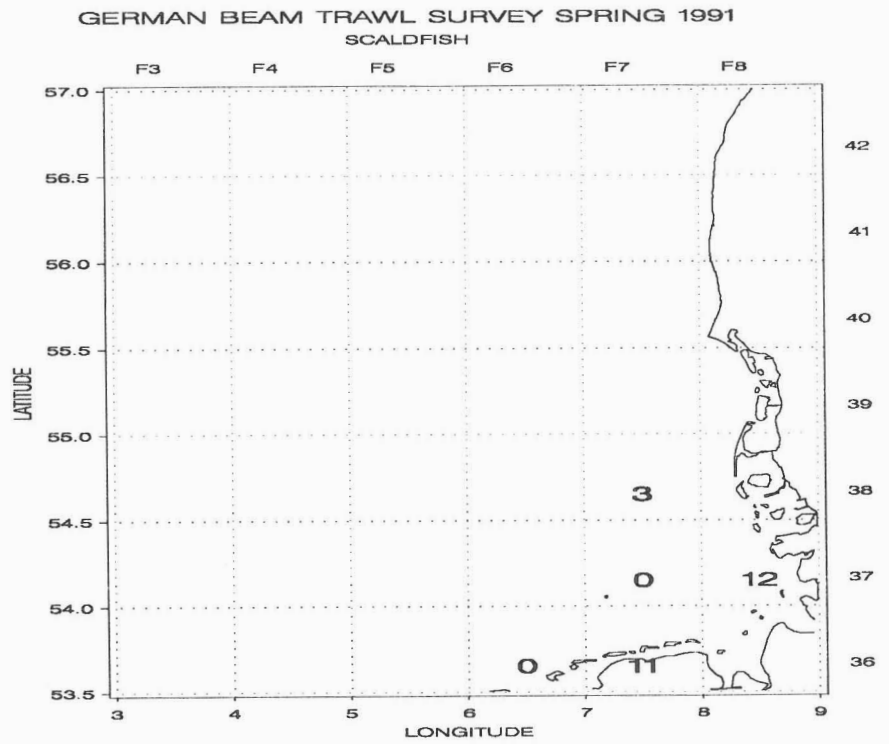


**Figure 4.26** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.

### BEAM TRAWL SURVEY 1991 SCALDFISH

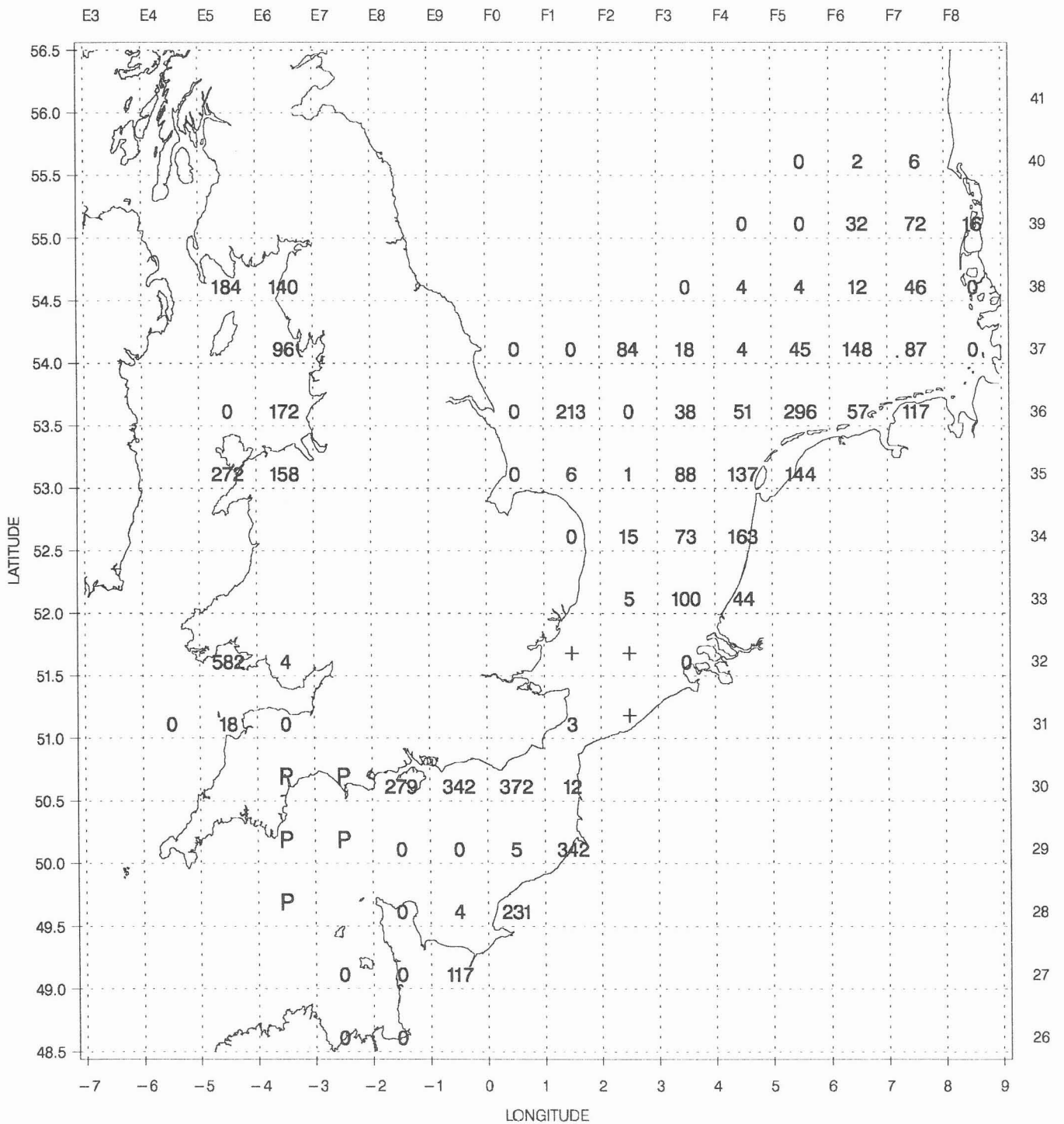


**Figure 4.27** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.

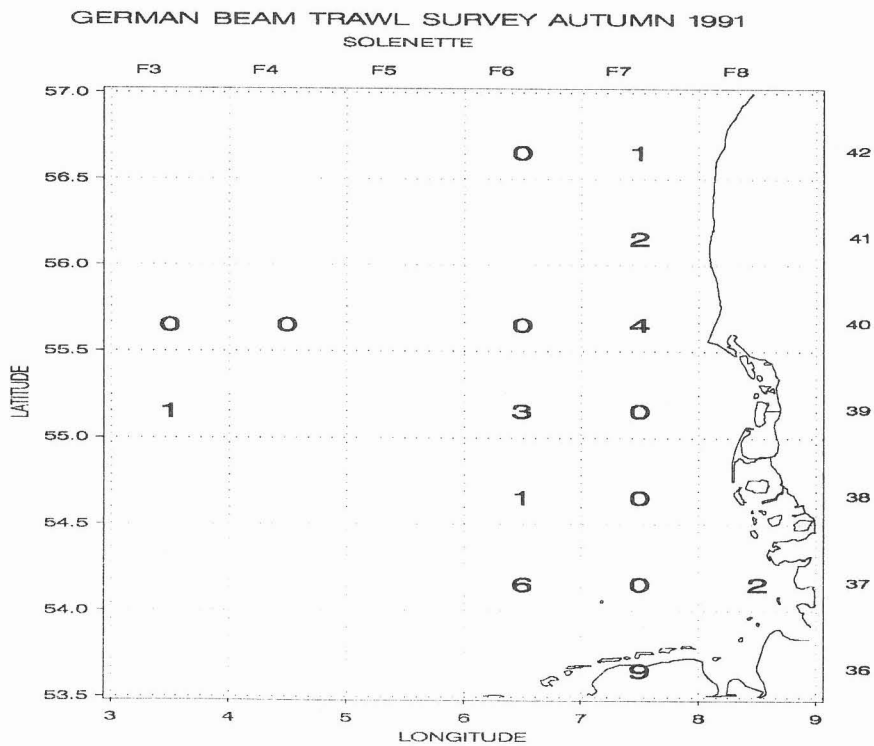
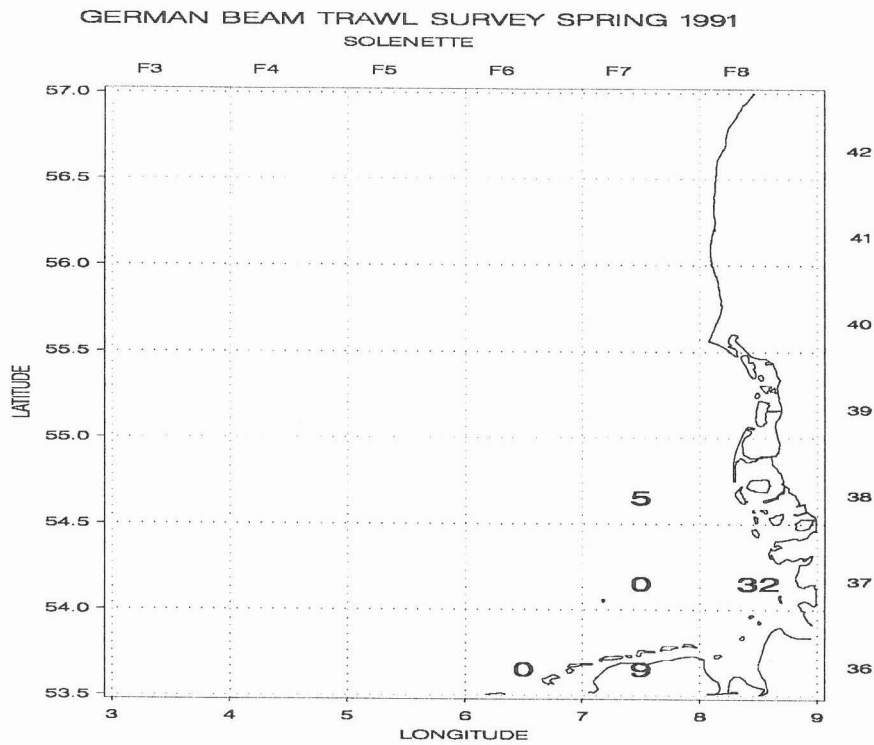


**Figure 4.28** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.

## BEAM TRAWL SURVEY 1991 SOLENETTE

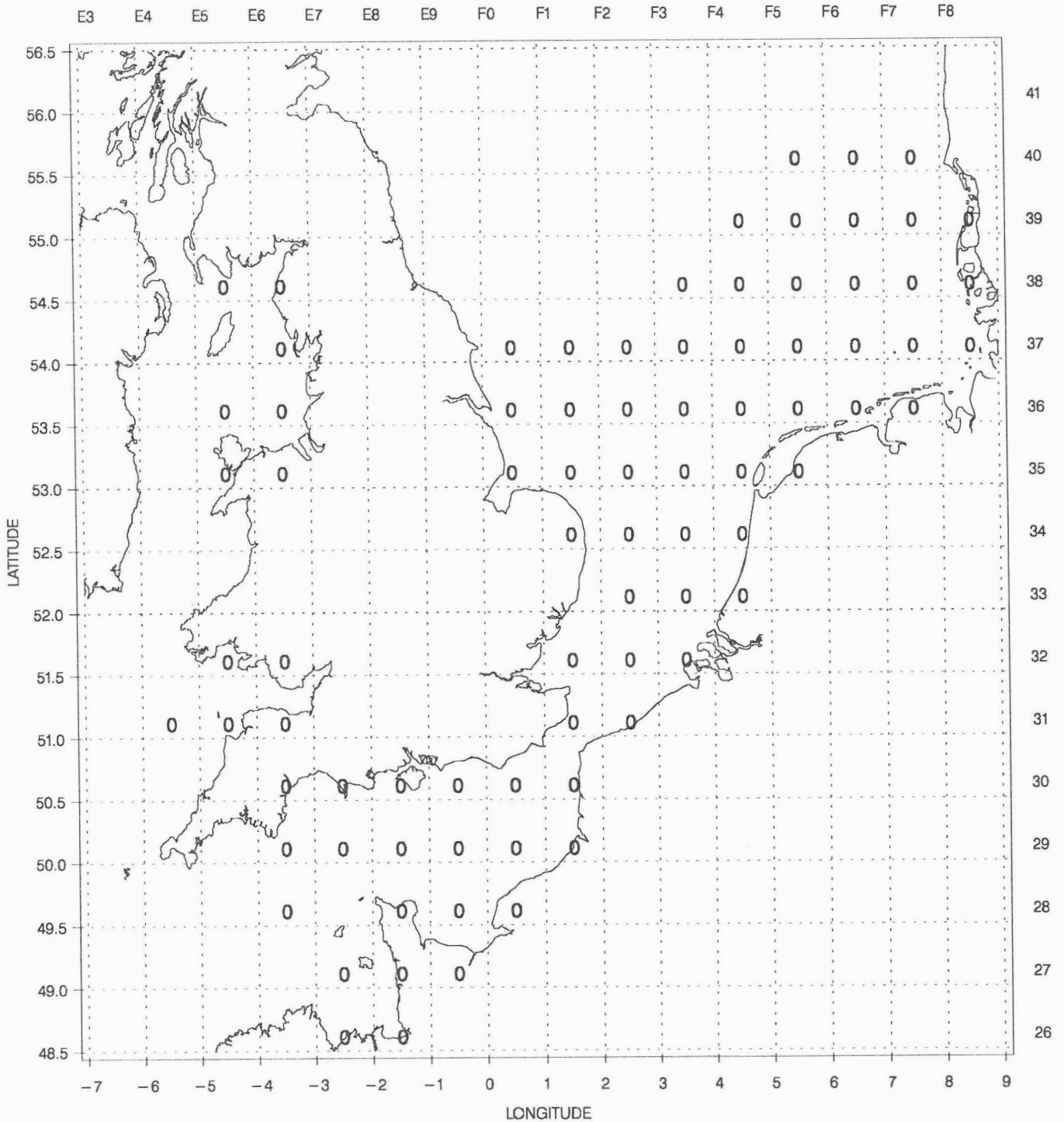


**Figure 4.29** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.

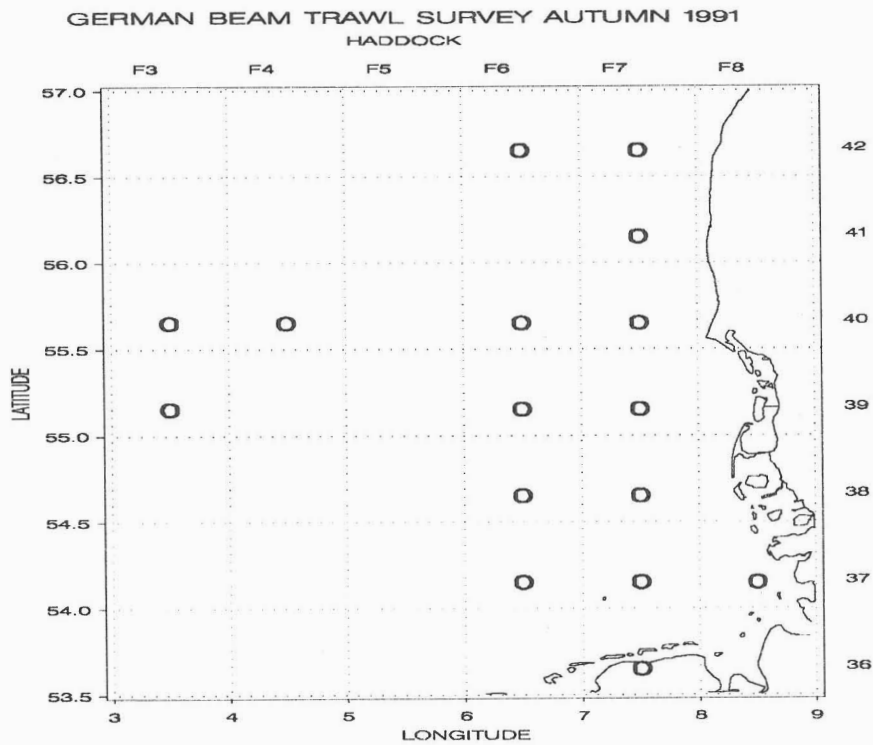
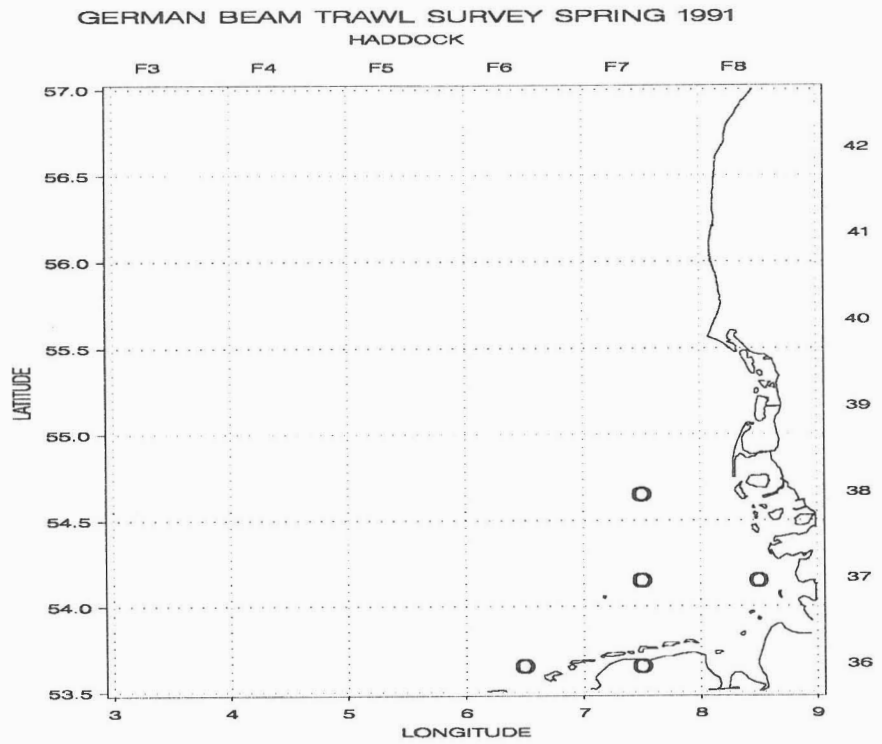


**Figure 4.30** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.

### BEAM TRAWL SURVEY 1991 HADDOCK



**Figure 4.31** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.

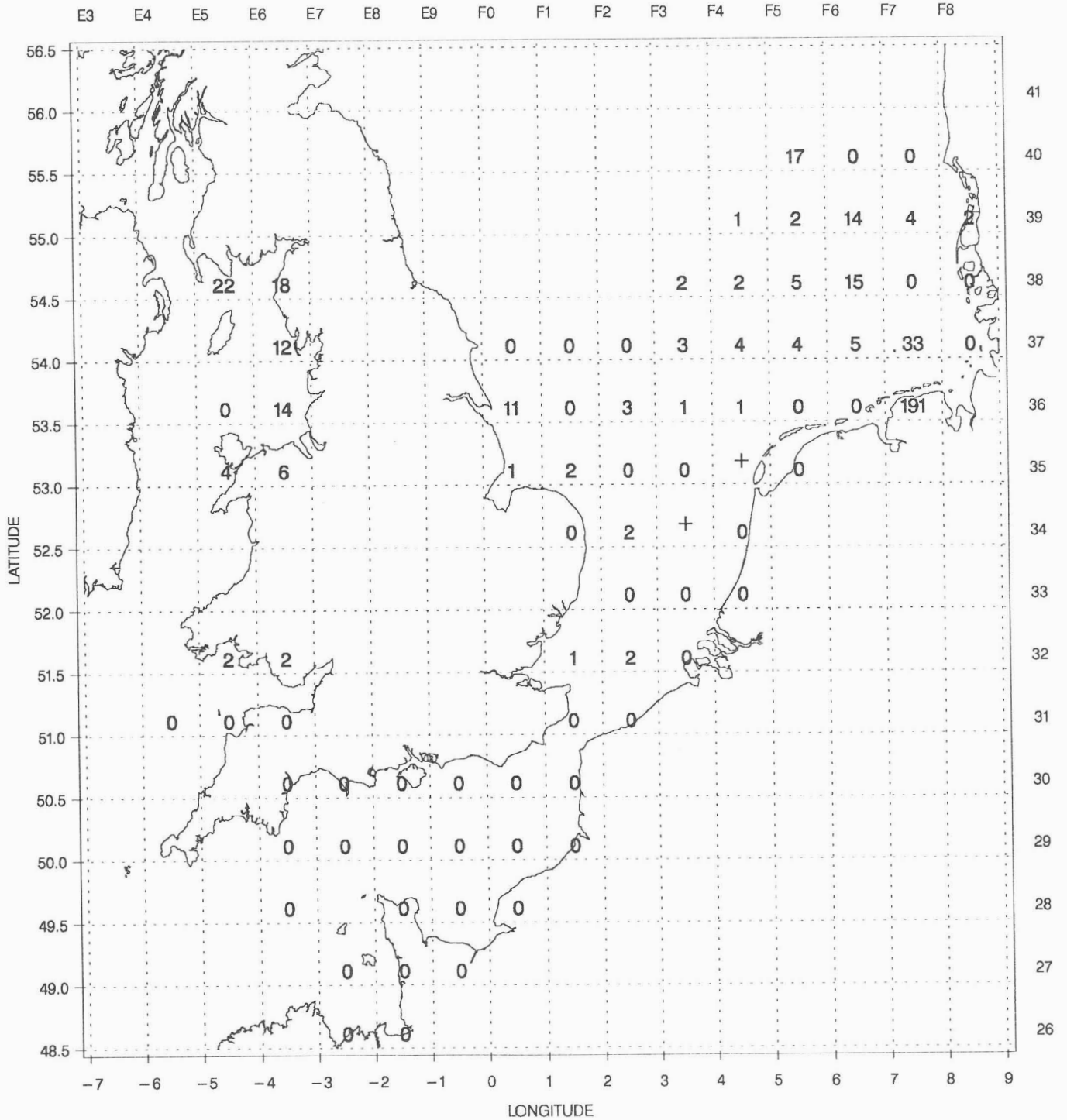




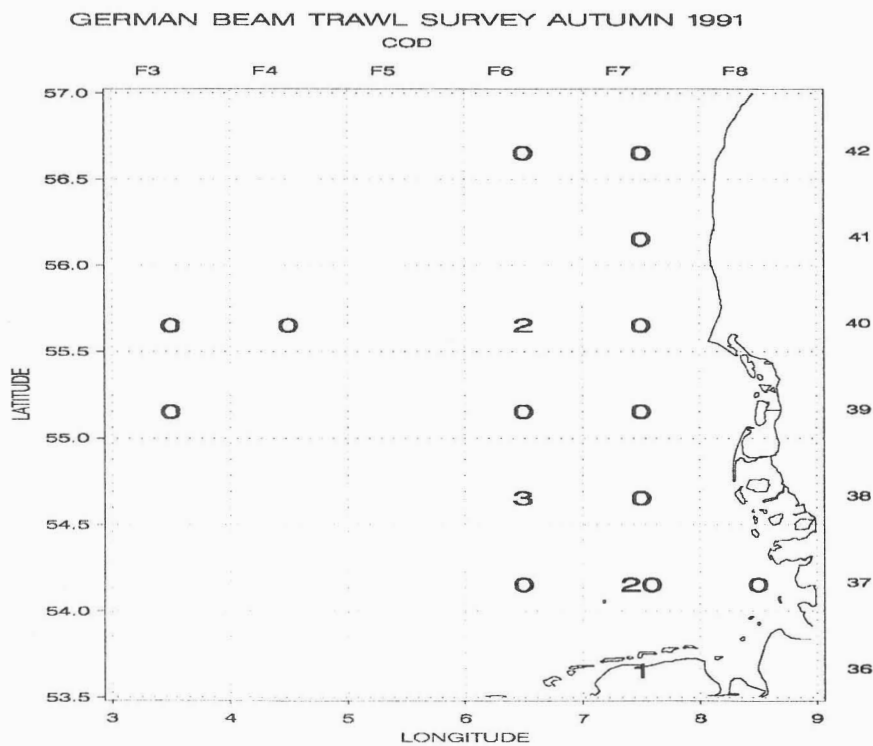
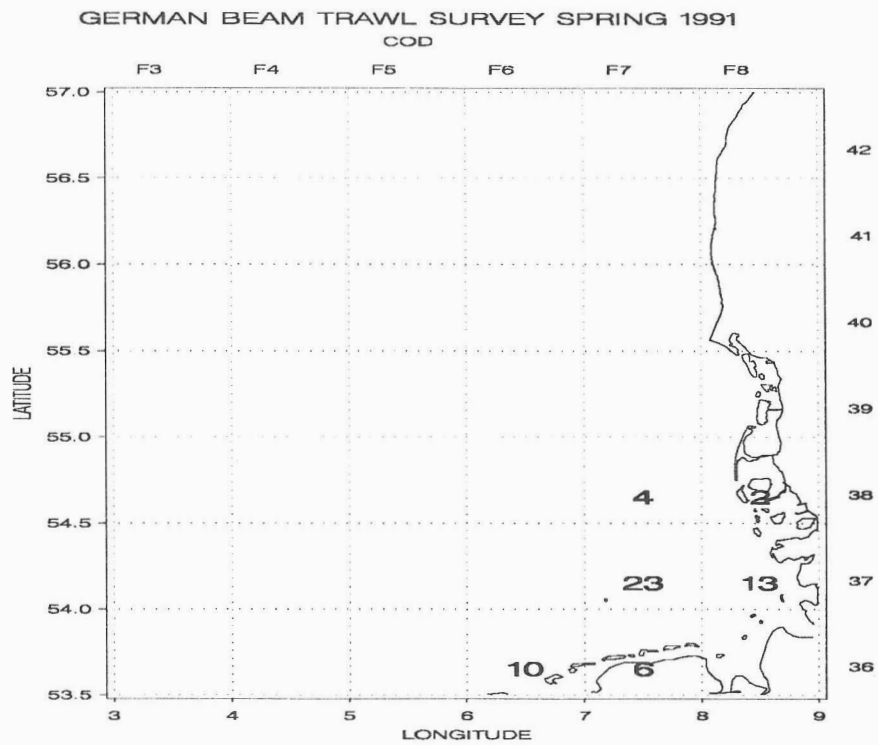
**Figure 4.32** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.

## BEAM TRAWL SURVEY 1991

COD

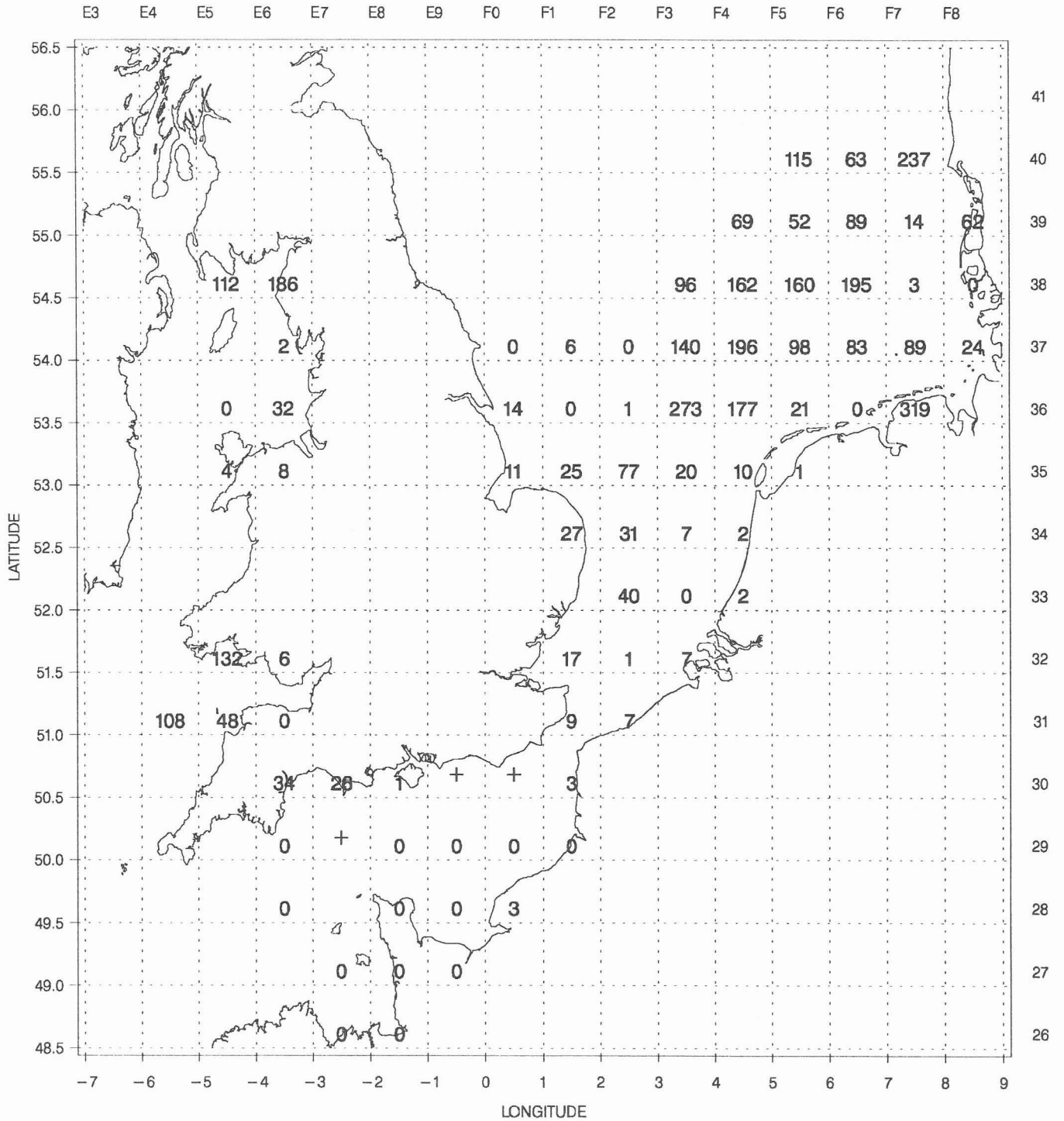


**Figure 4.33** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.

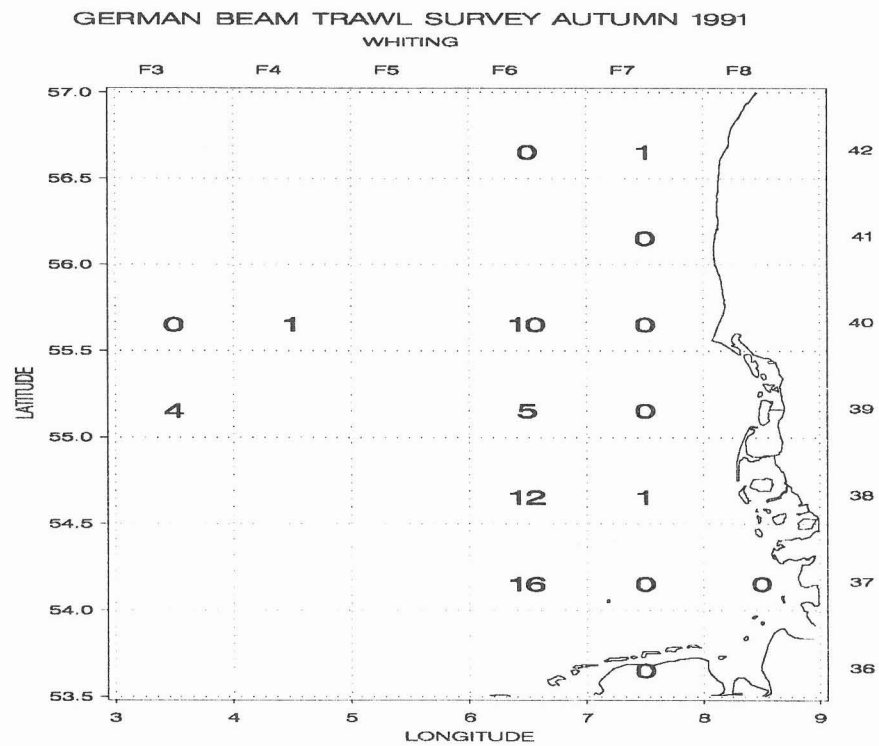
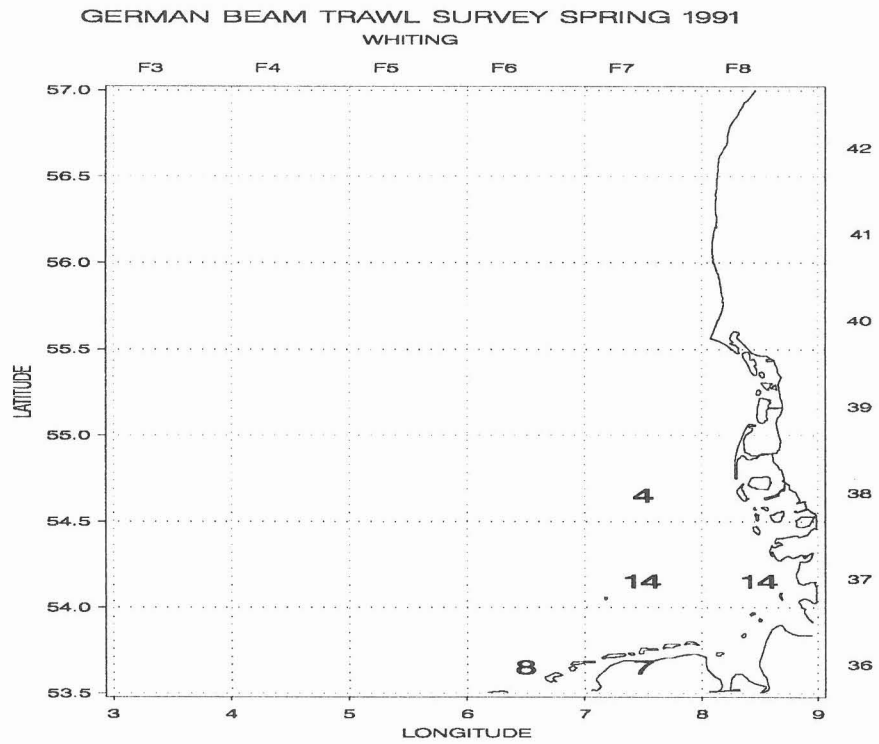


**Figure 4.34** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.

### BEAM TRAWL SURVEY 1991 WHITING

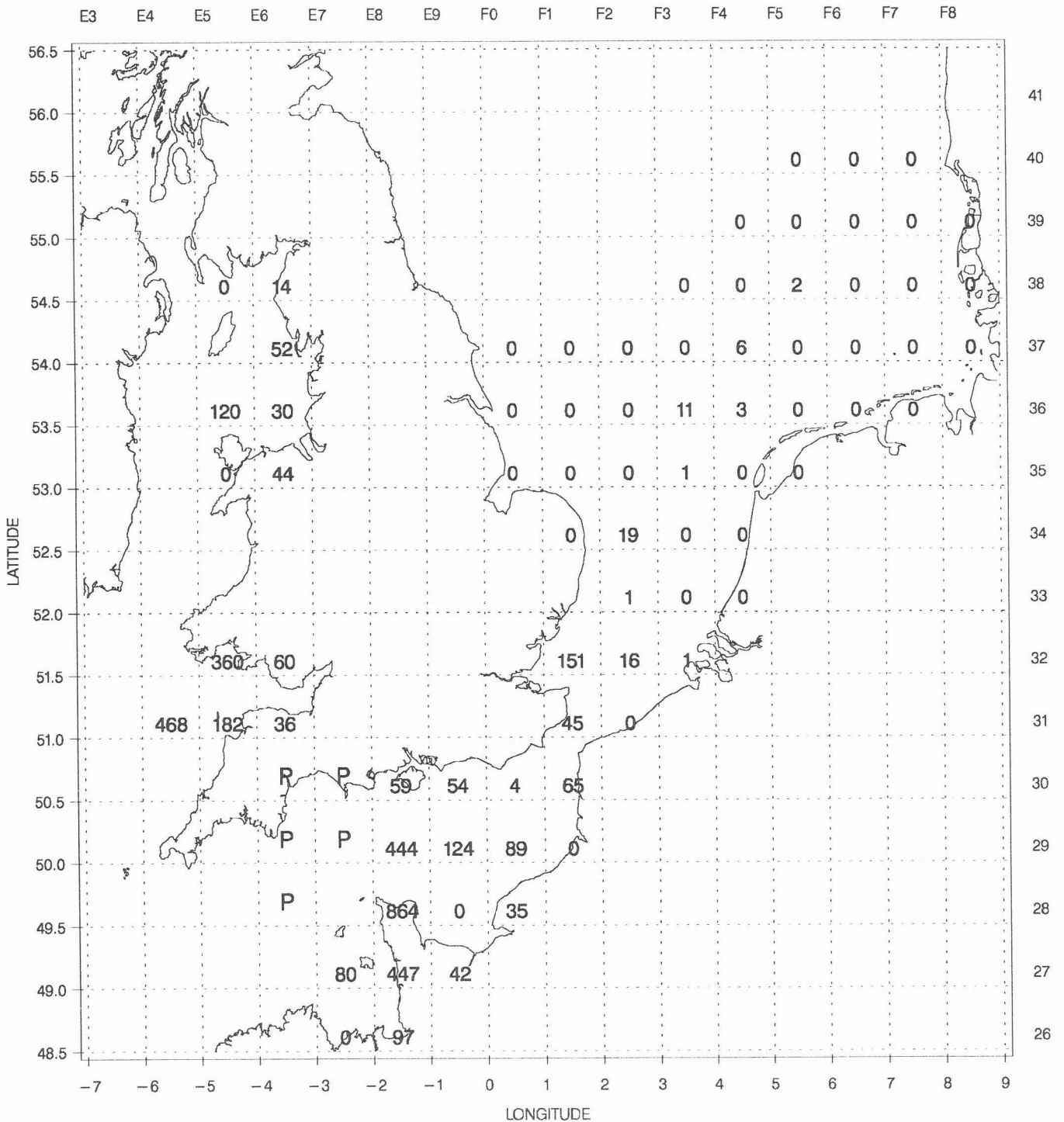


**Figure 4.35** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.

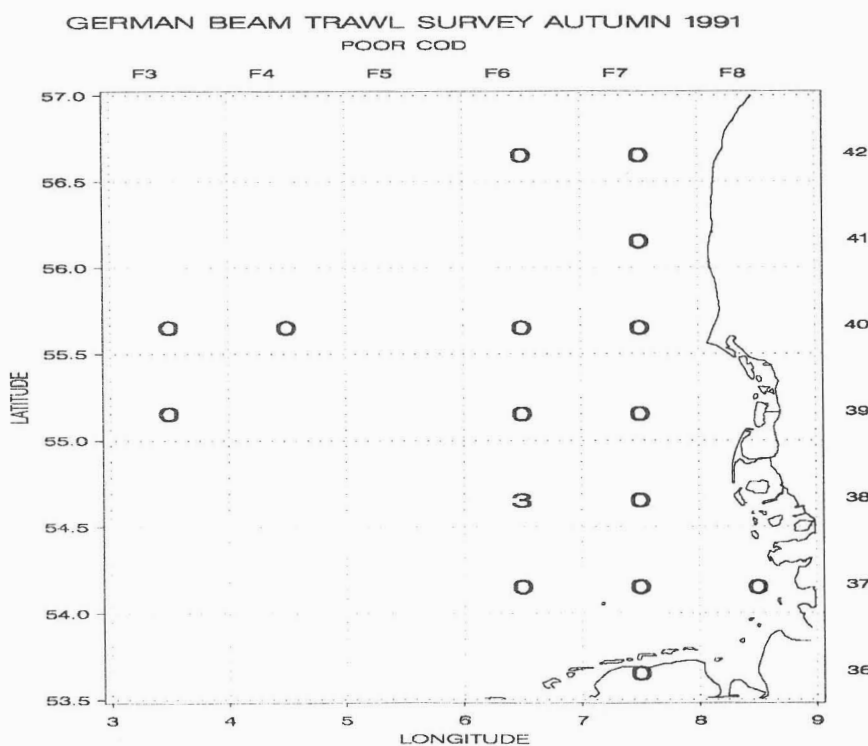
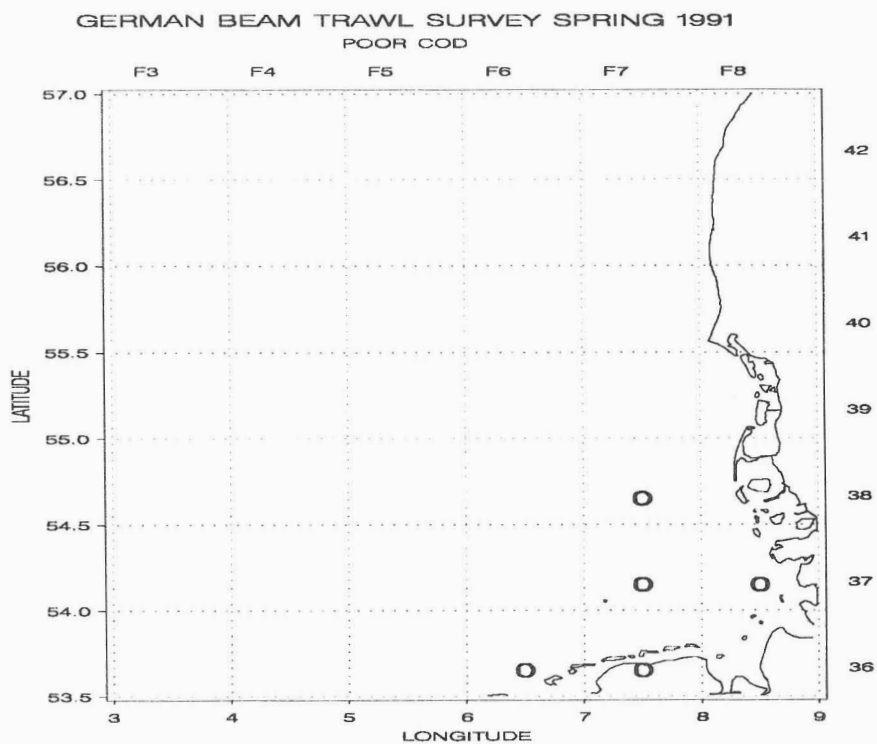


**Figure 4.36** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.

BEAM TRAWL SURVEY 1991  
POOR COD



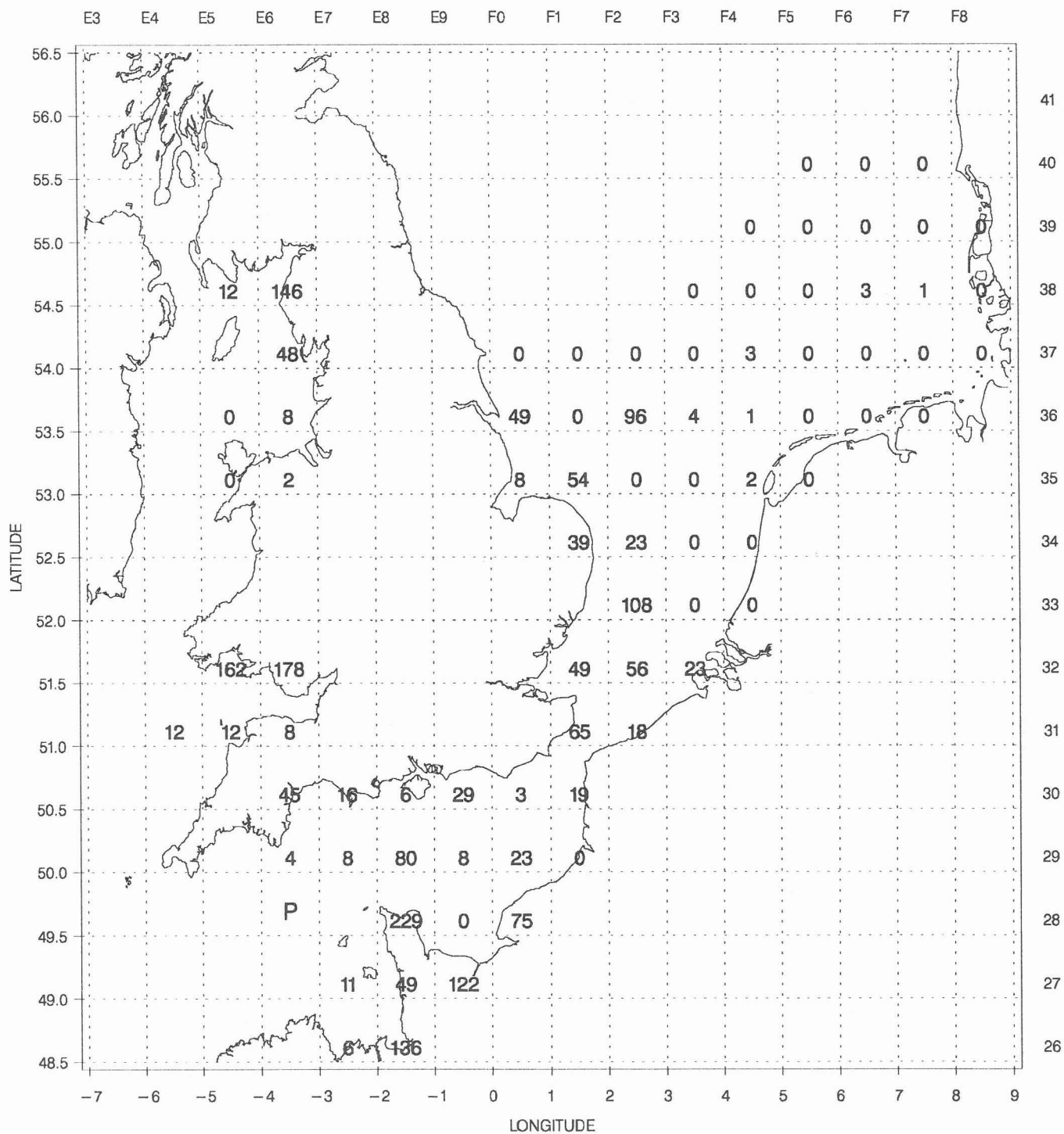
**Figure 4.37** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.



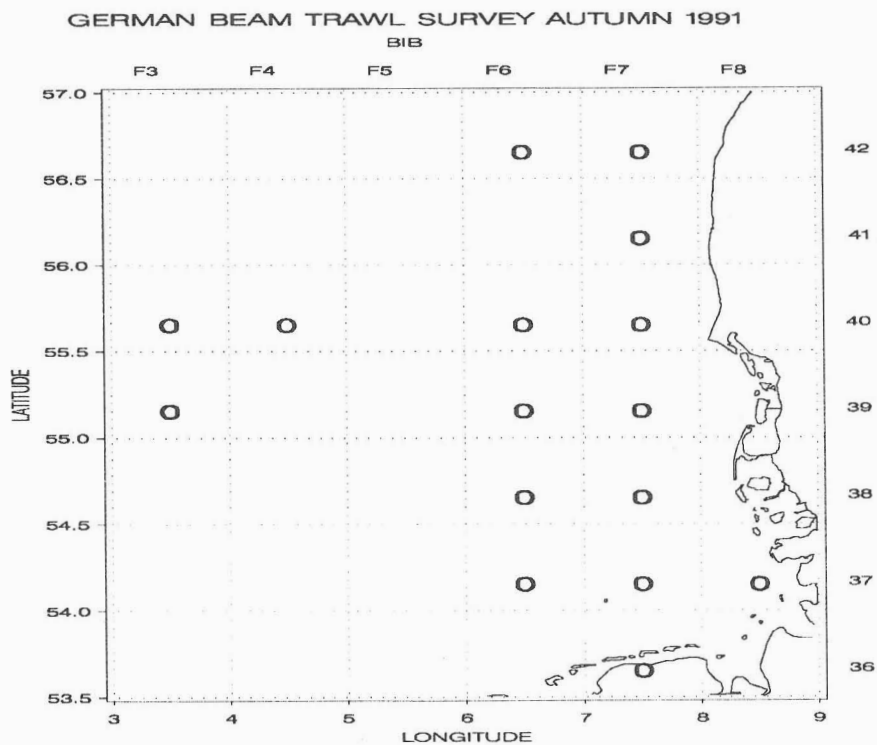
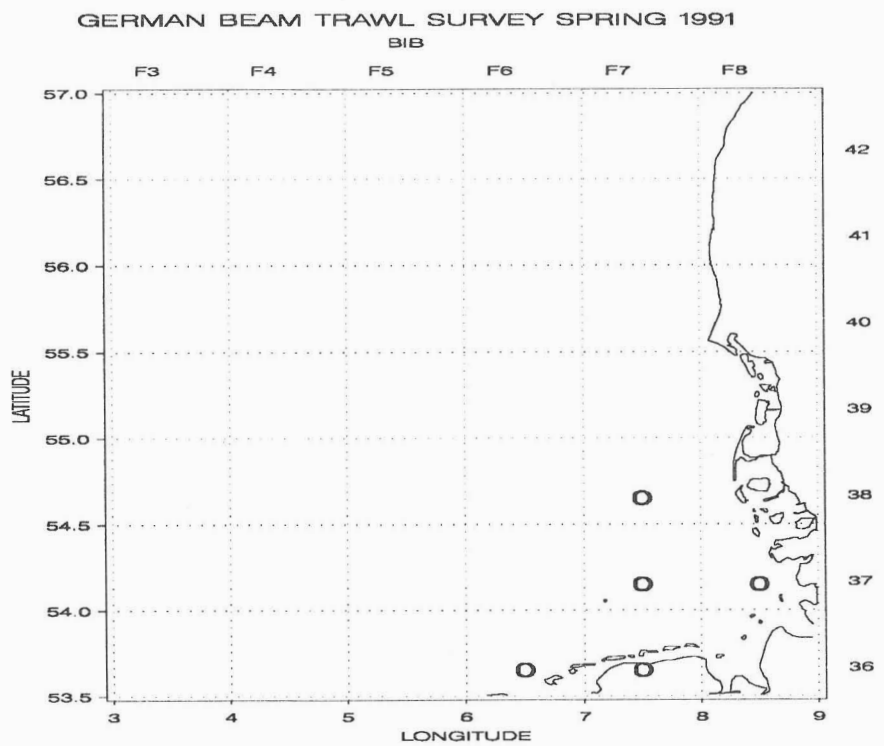
**Figure 4.38** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.

## BEAM TRAWL SURVEY 1991

BIB



**Figure 4.39** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.

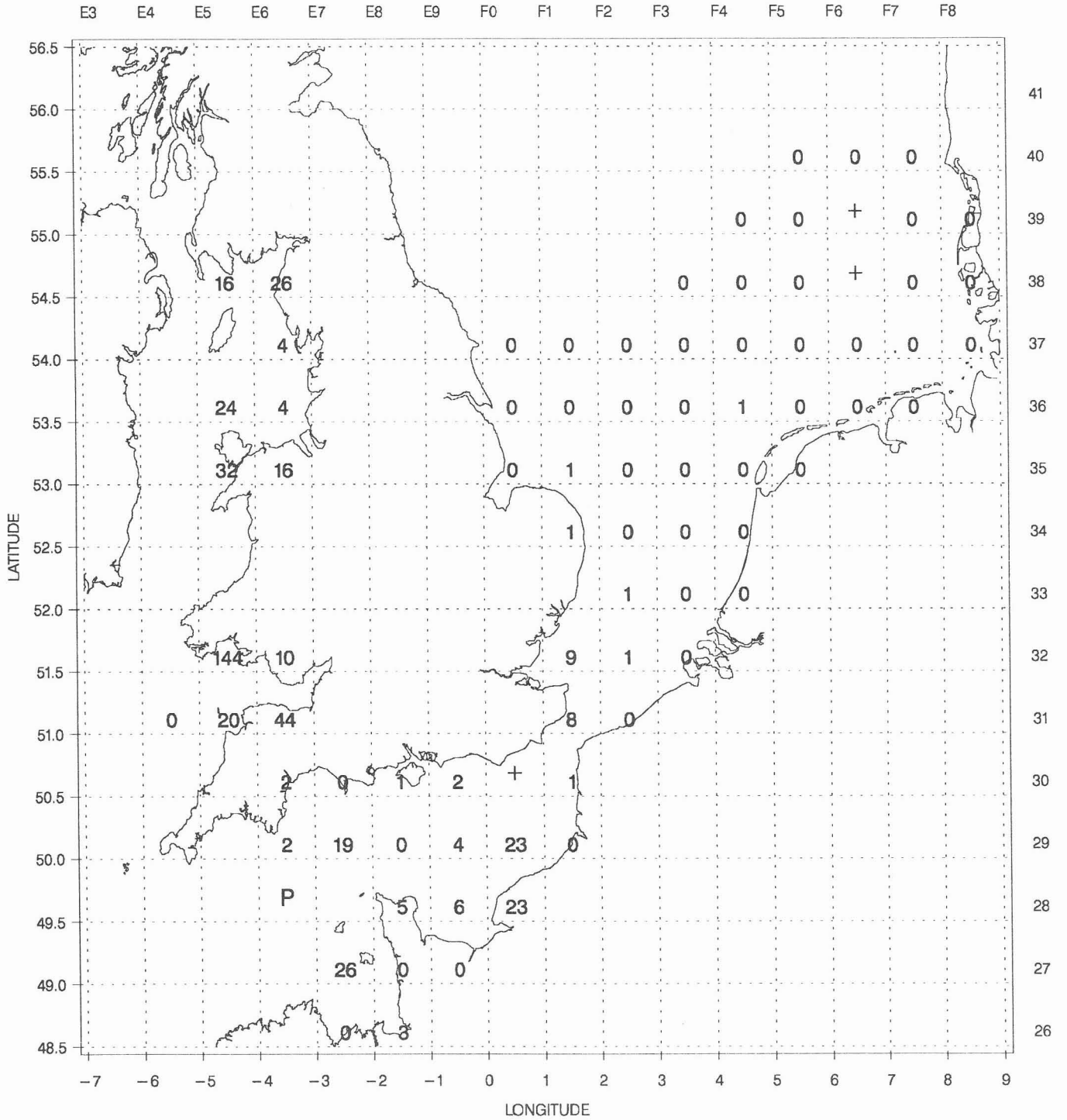




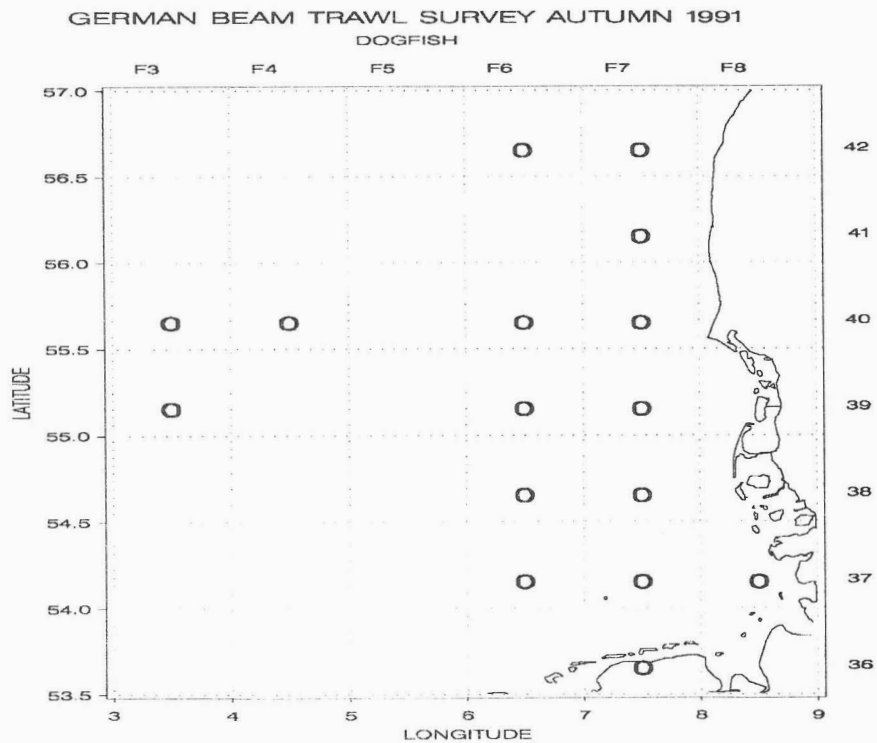
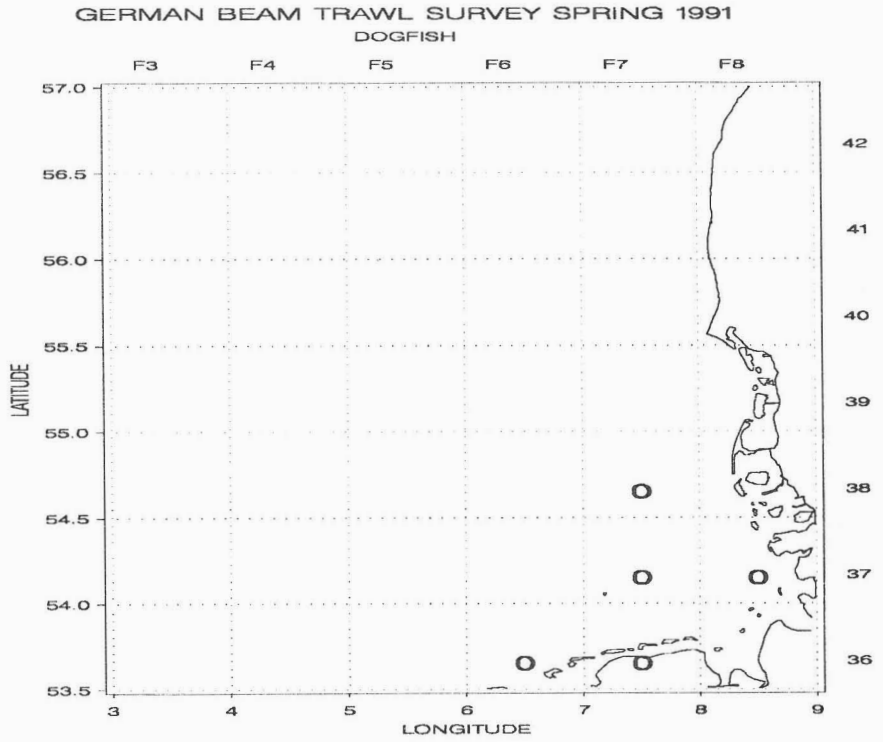
**Figure 4.40** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.

## BEAM TRAWL SURVEY 1991

### DOGFISH



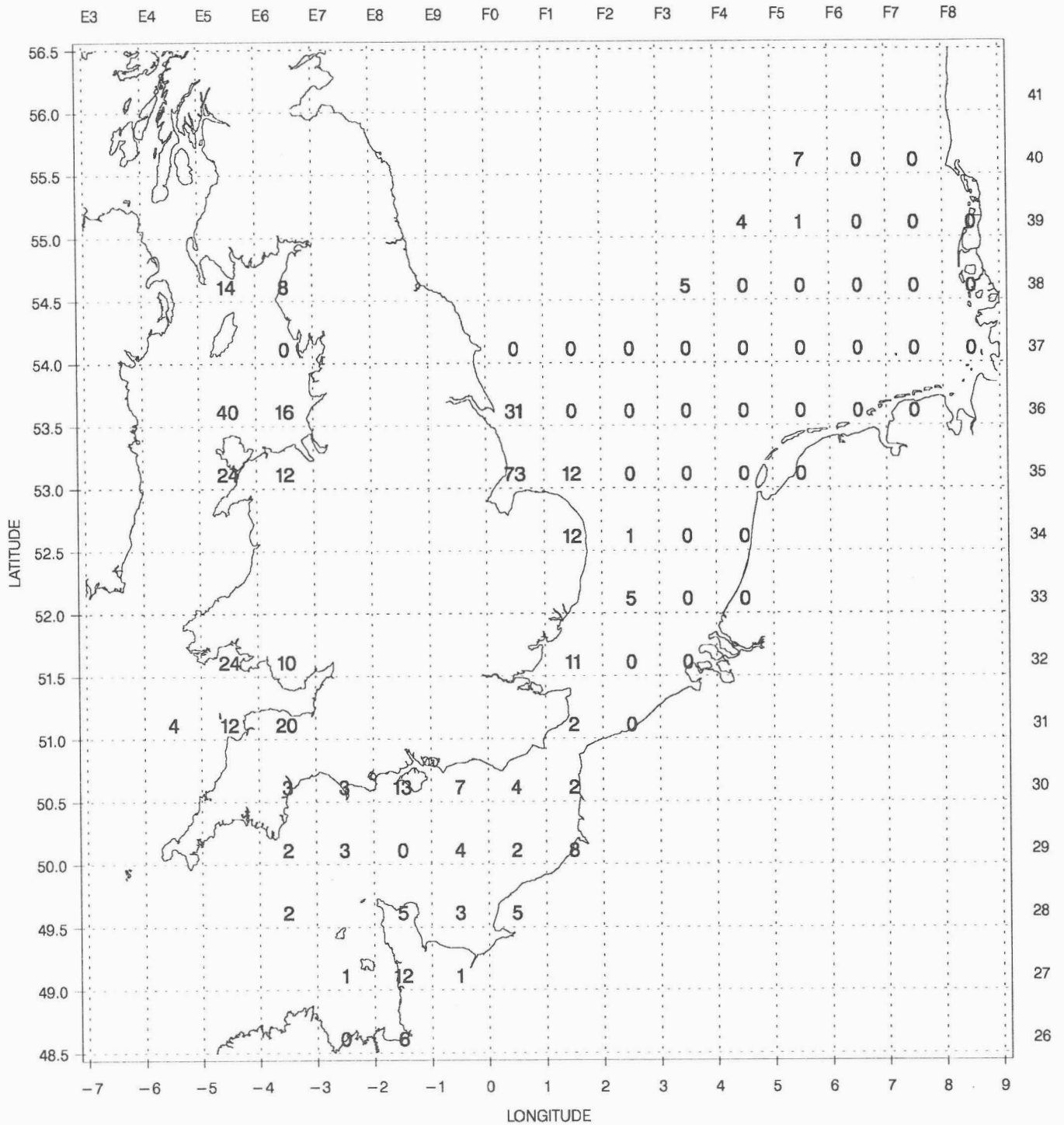
**Figure 4.41** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.



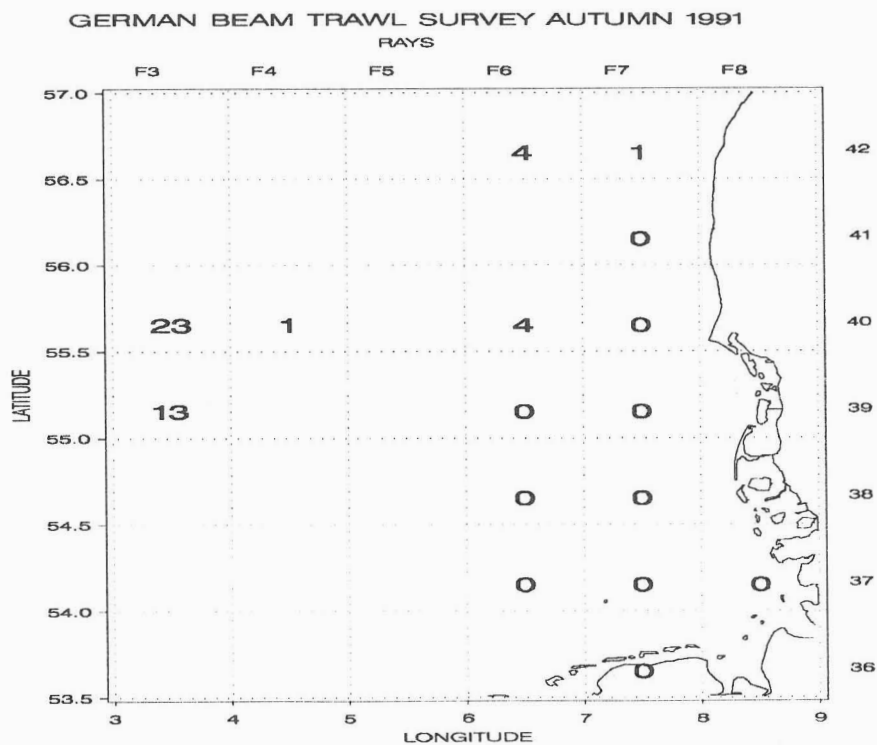
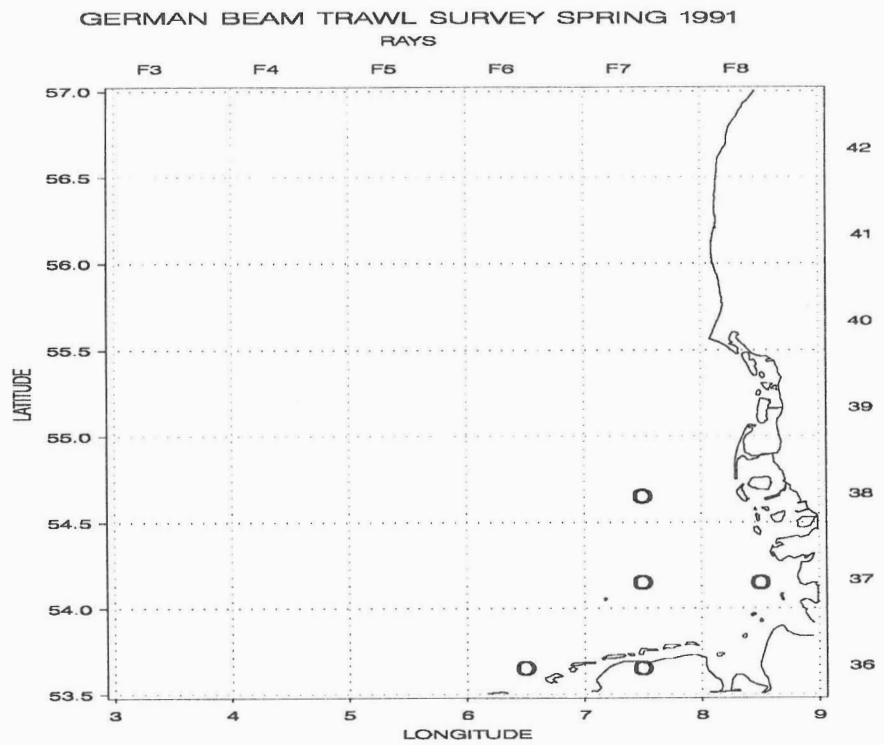
**Figure 4.42** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.

## BEAM TRAWL SURVEY 1991

### RAYS

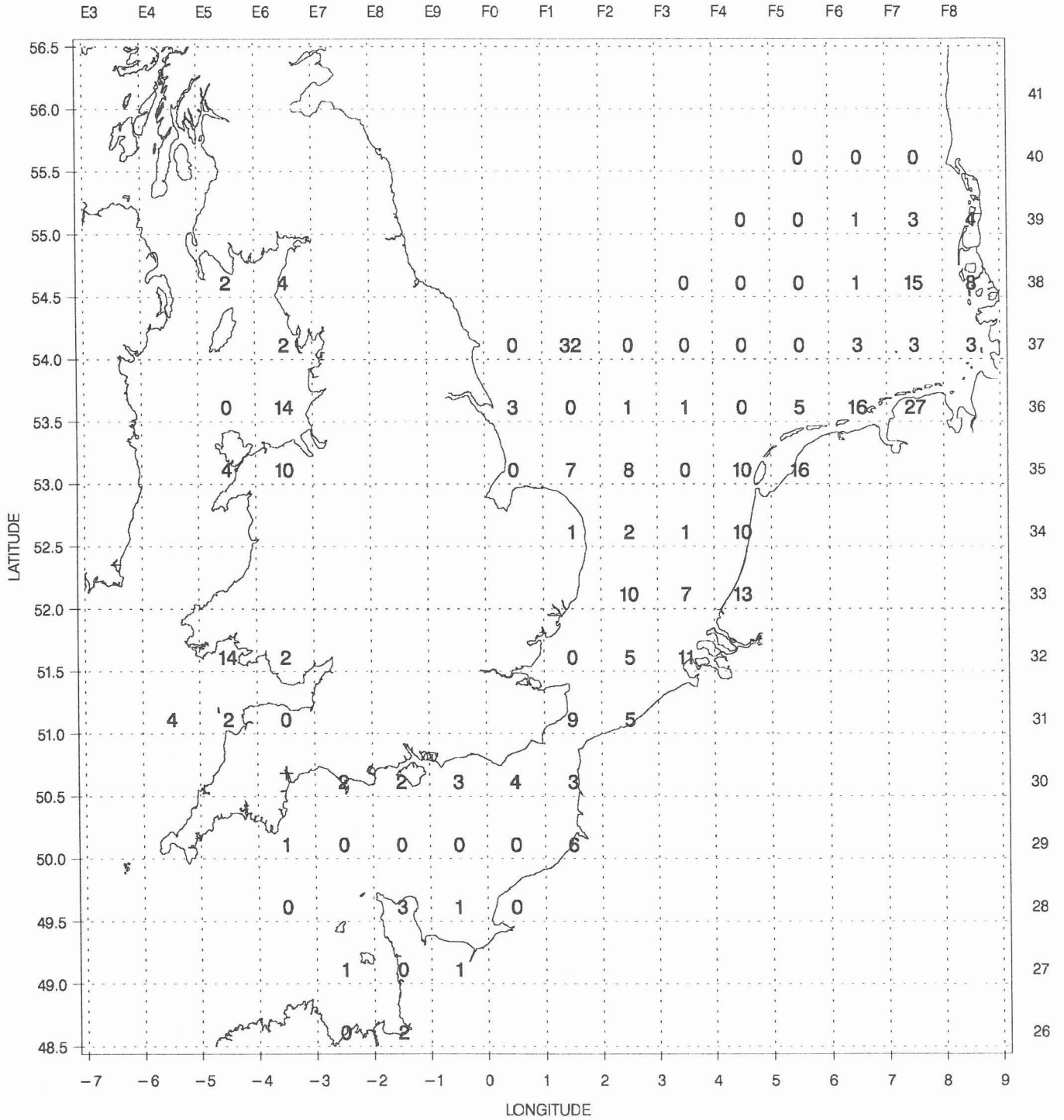


**Figure 4.43** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.

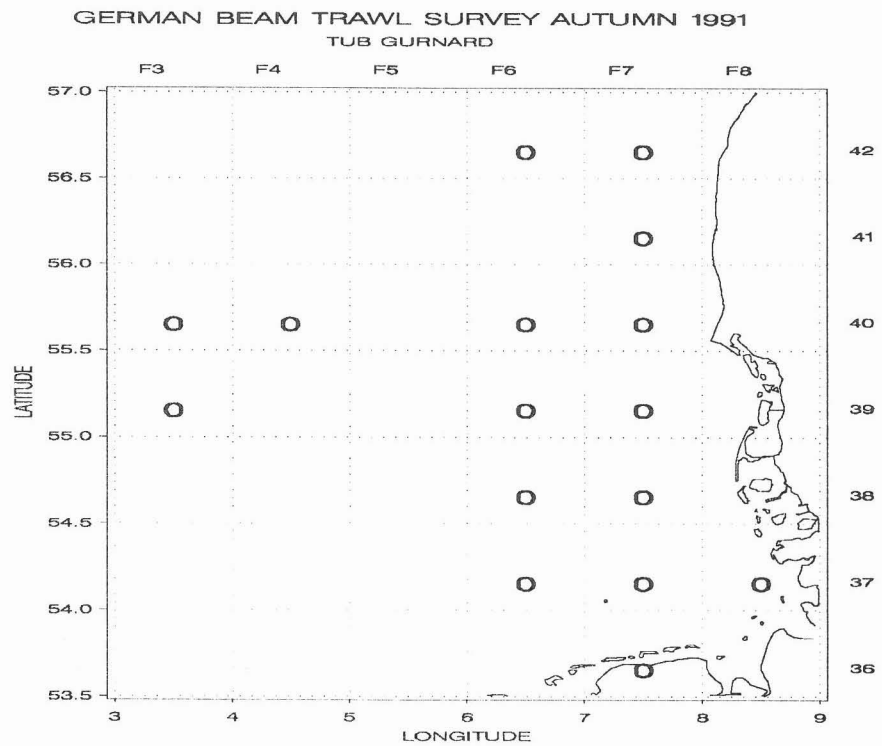
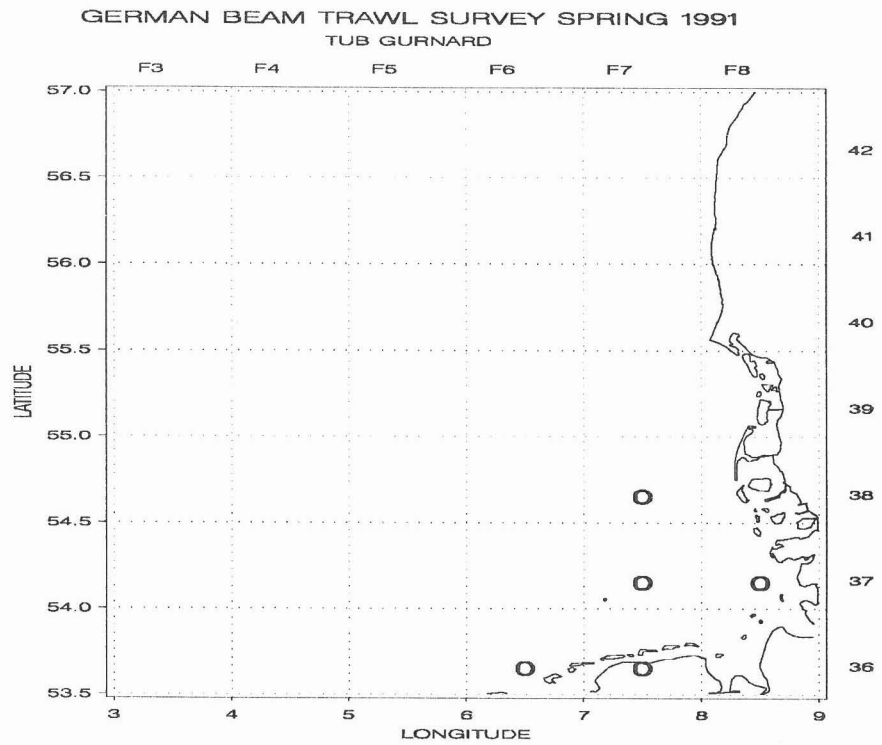


**Figure 4.44** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.

BEAM TRAWL SURVEY 1991  
TUB GURNARD

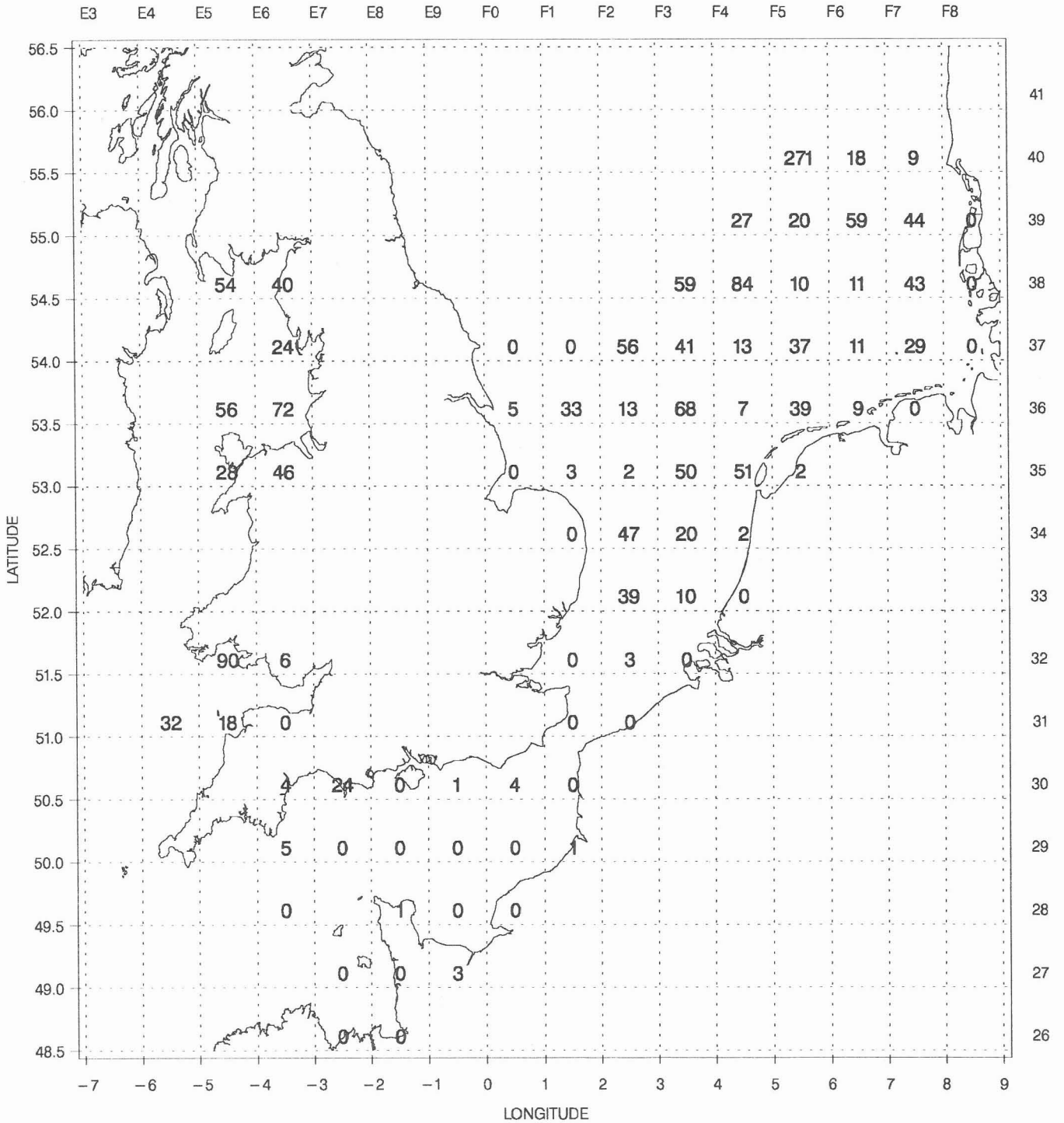


**Figure 4.45** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.

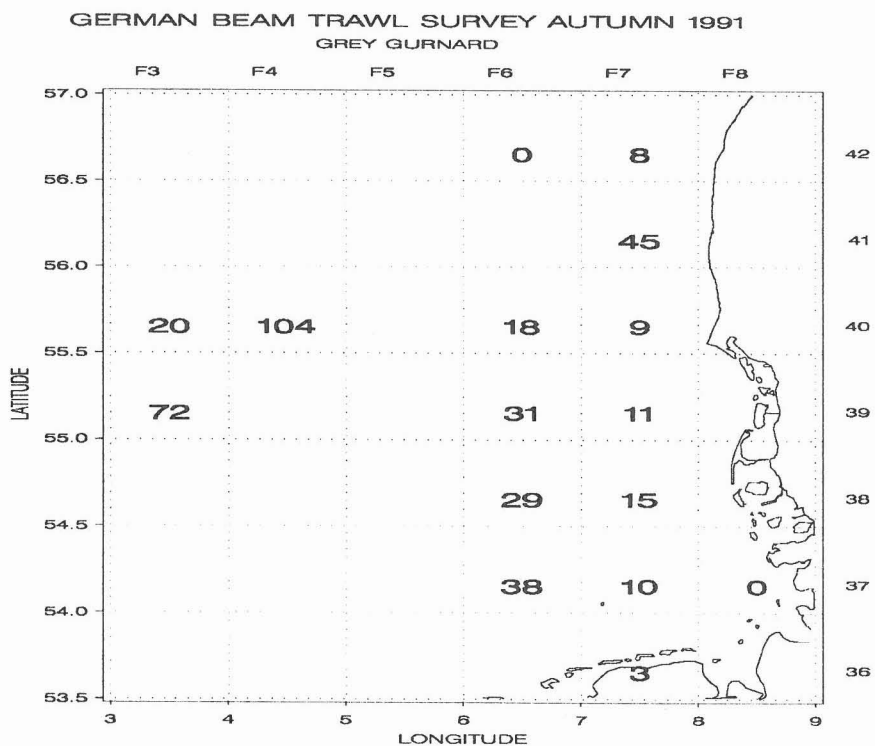
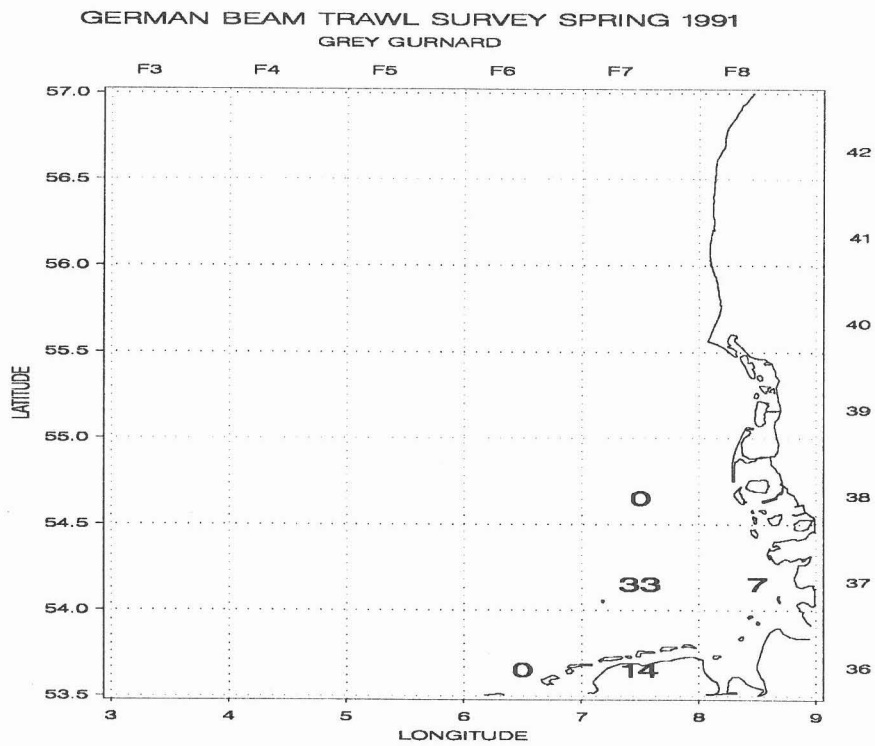


**Figure 4.46** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.

### BEAM TRAWL SURVEY 1991 GREY GURNARD



**Figure 4.47** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.

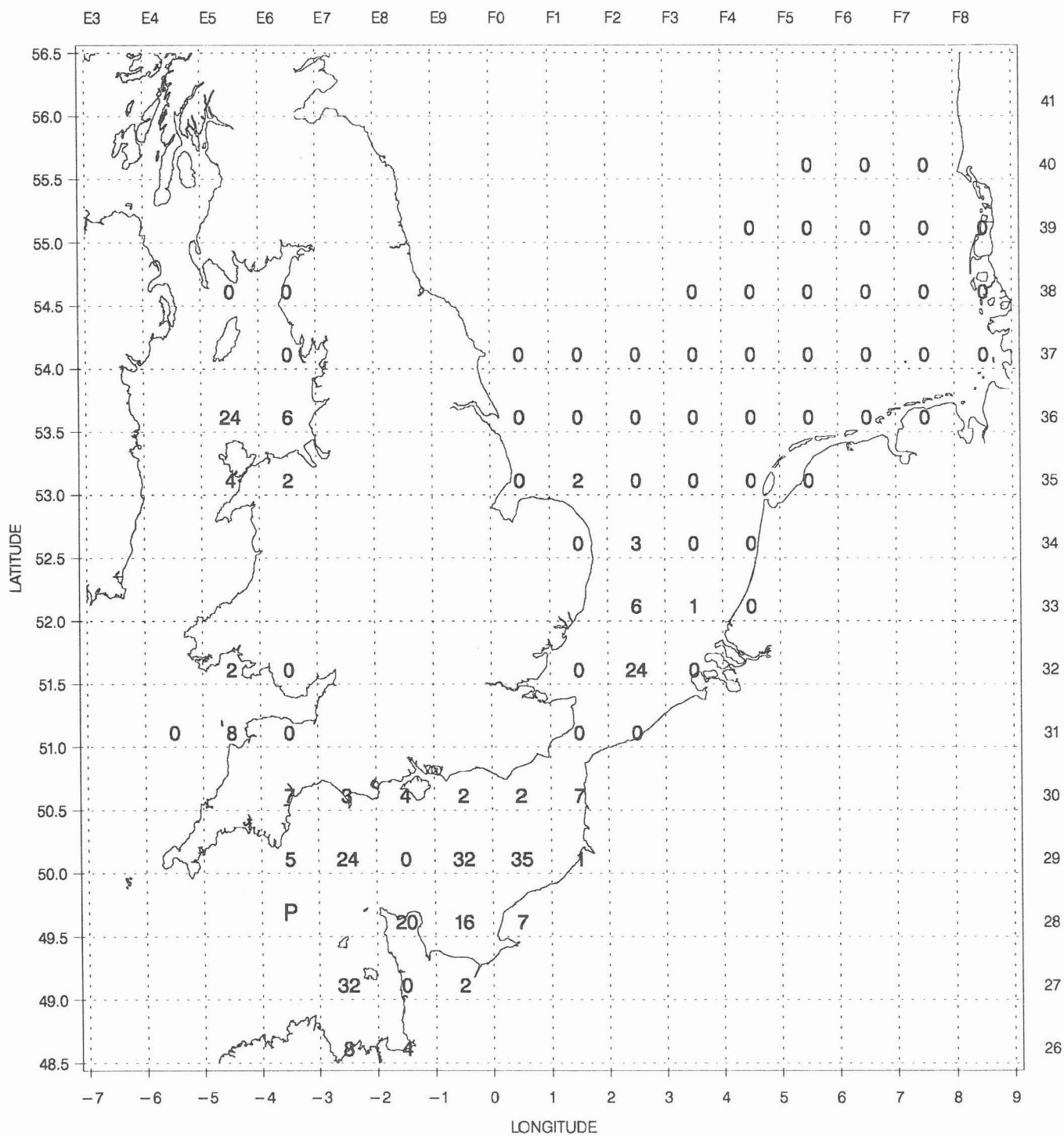




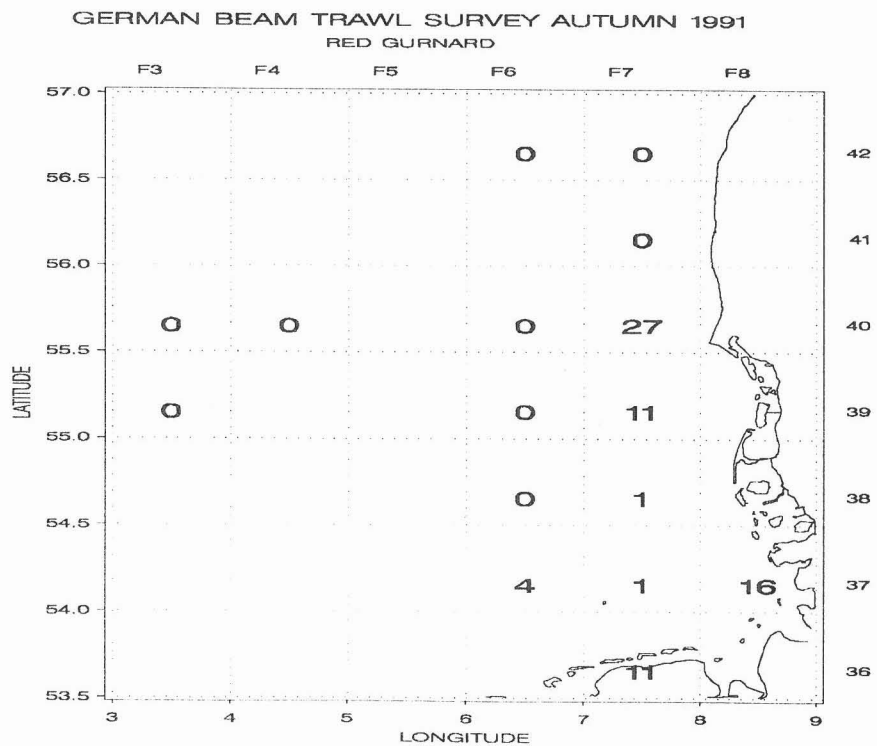
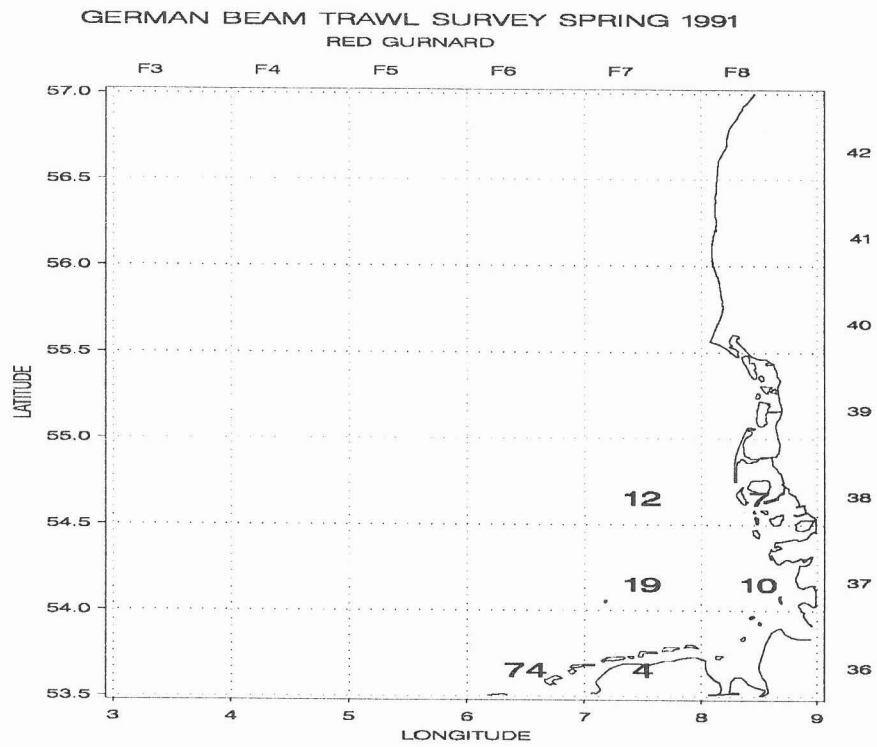
**Figure 4.48** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.

### BEAM TRAWL SURVEY 1991

#### RED GURNARD

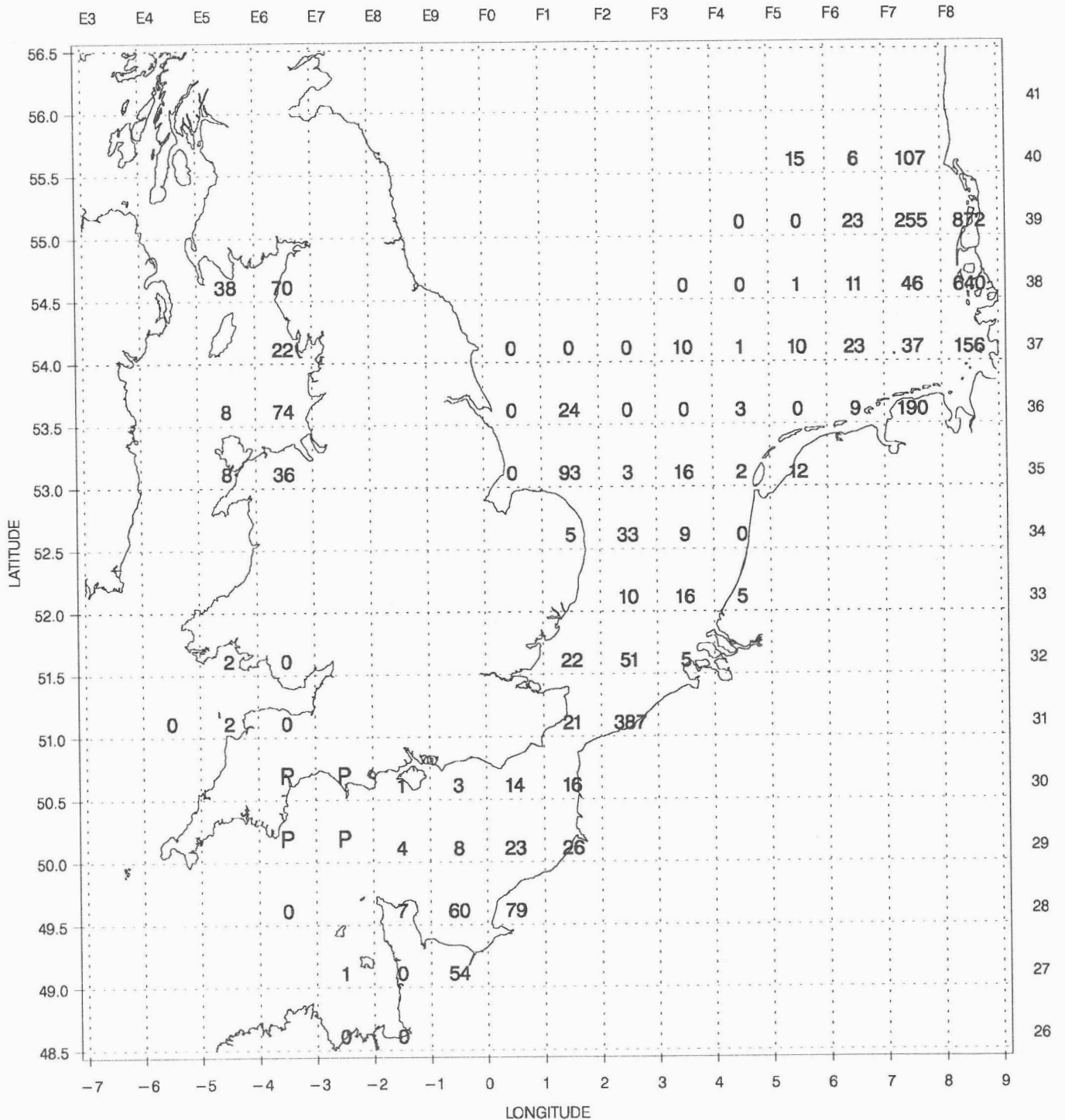


**Figure 4.49** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.



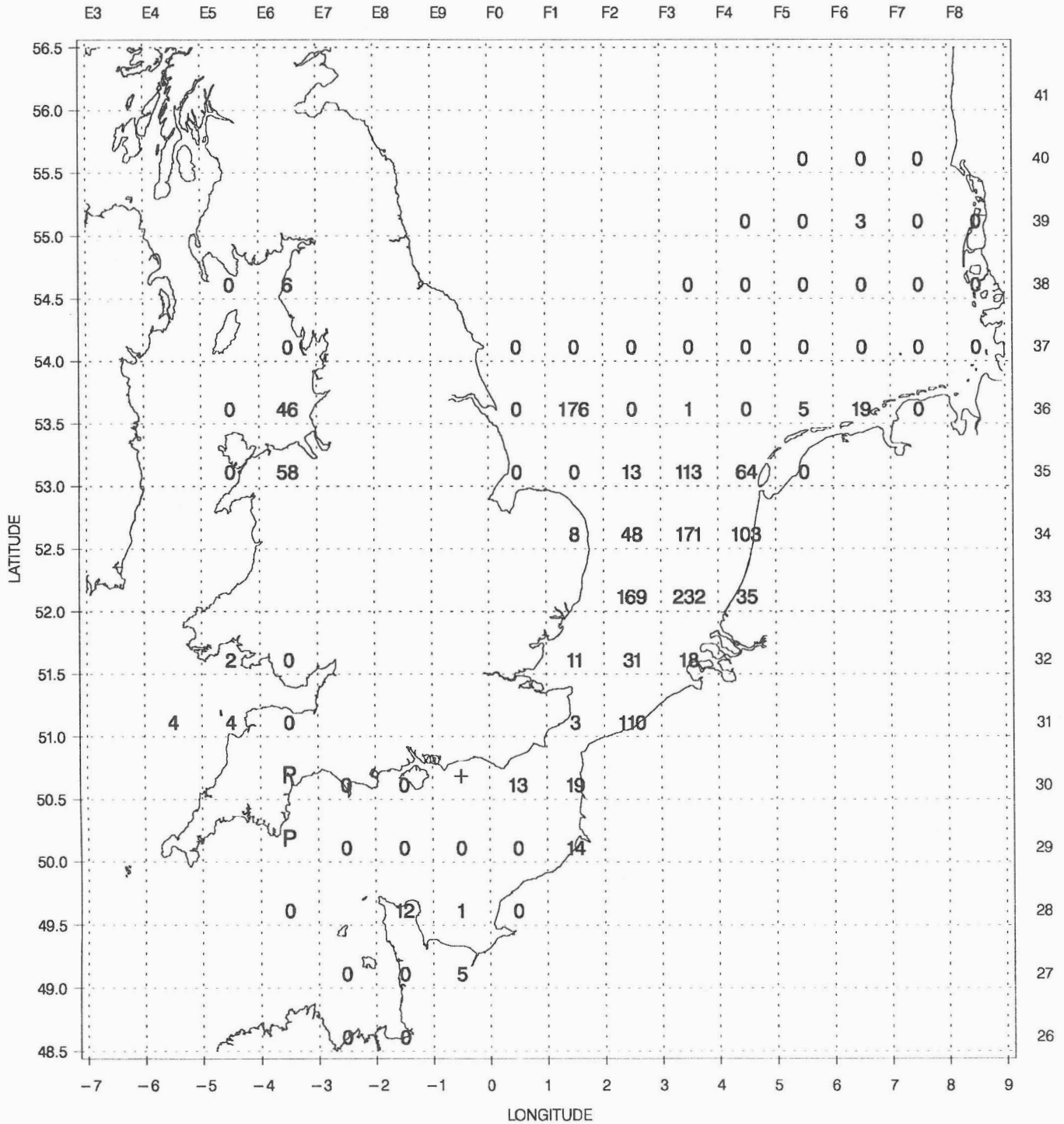
**Figure 4.50** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.

BEAM TRAWL SURVEY 1991  
POGGE

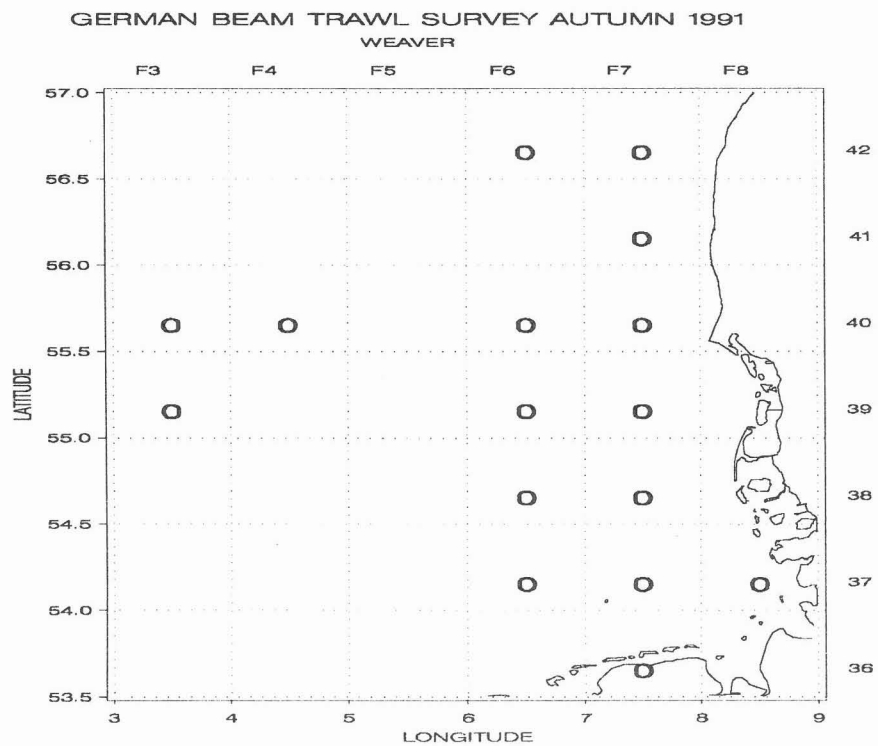
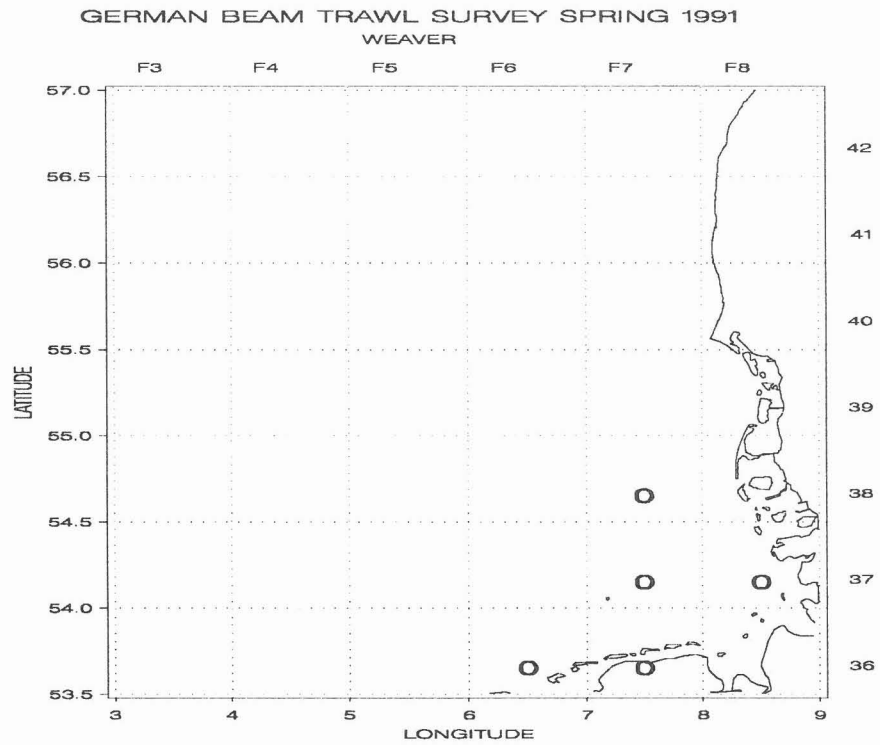


**Figure 4.51** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.

### BEAM TRAWL SURVEY 1991 WEAVER

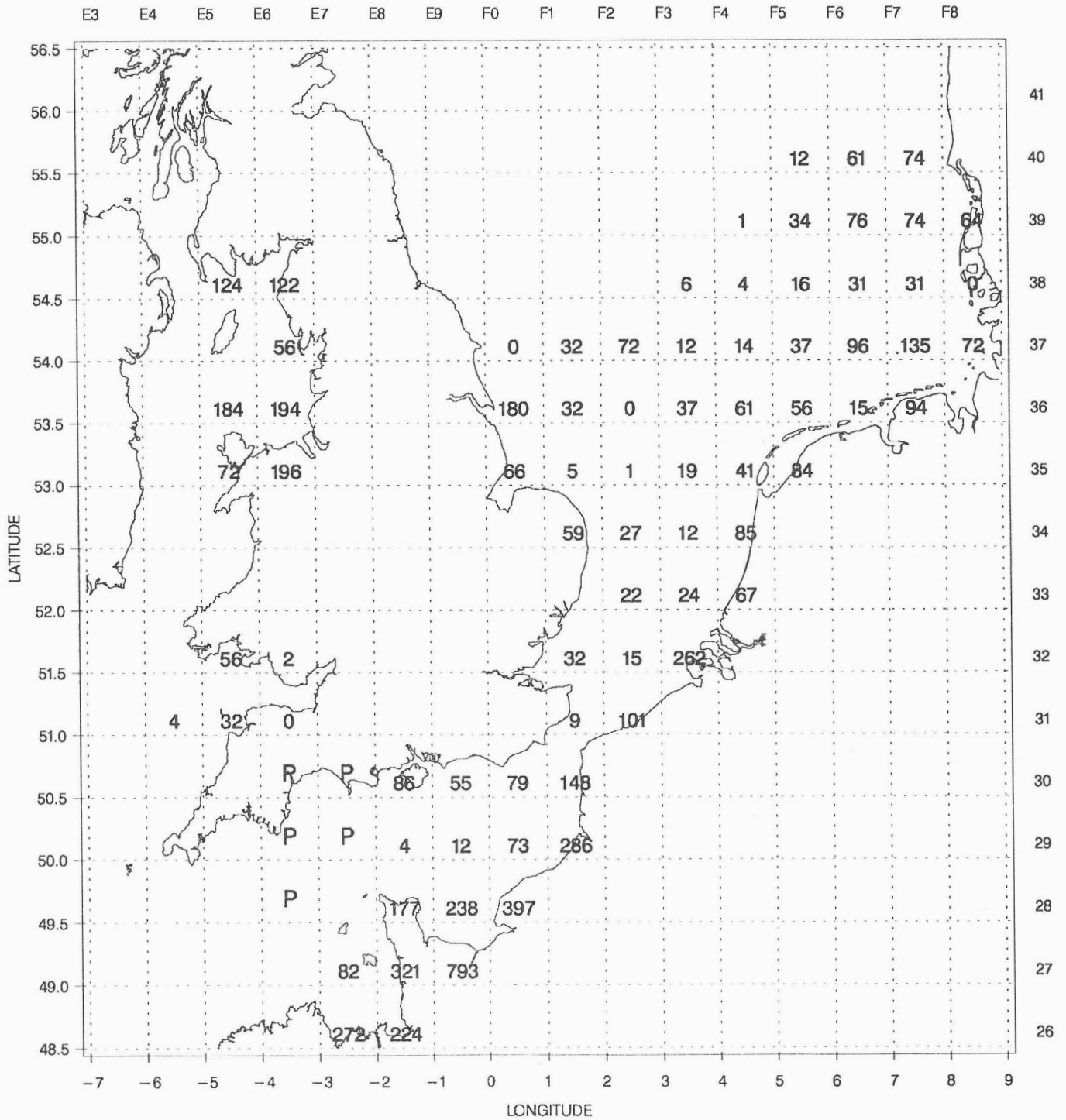


**Figure 4.52** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.

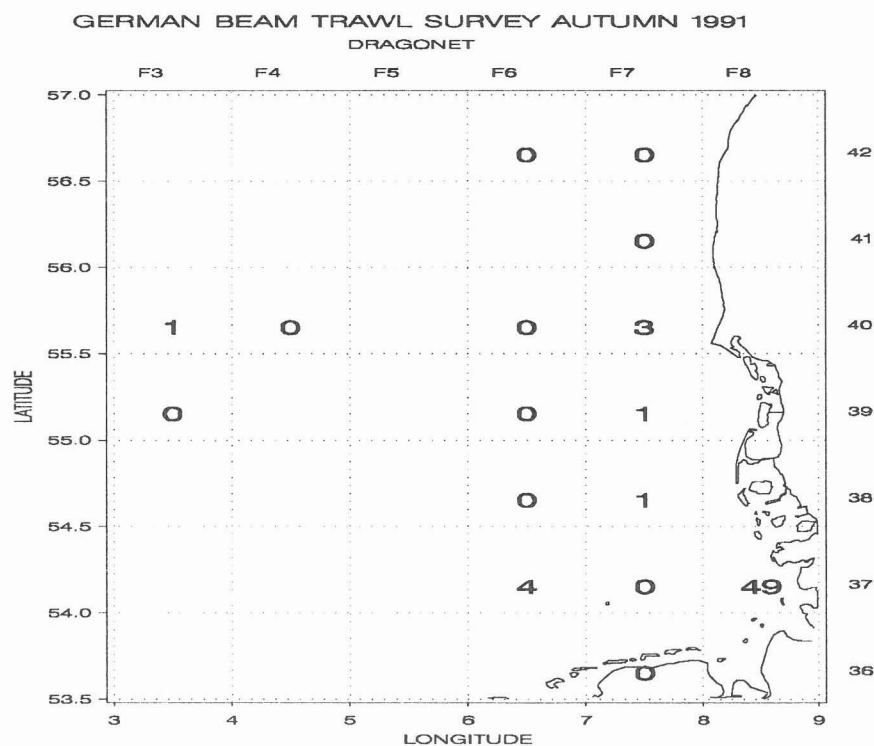
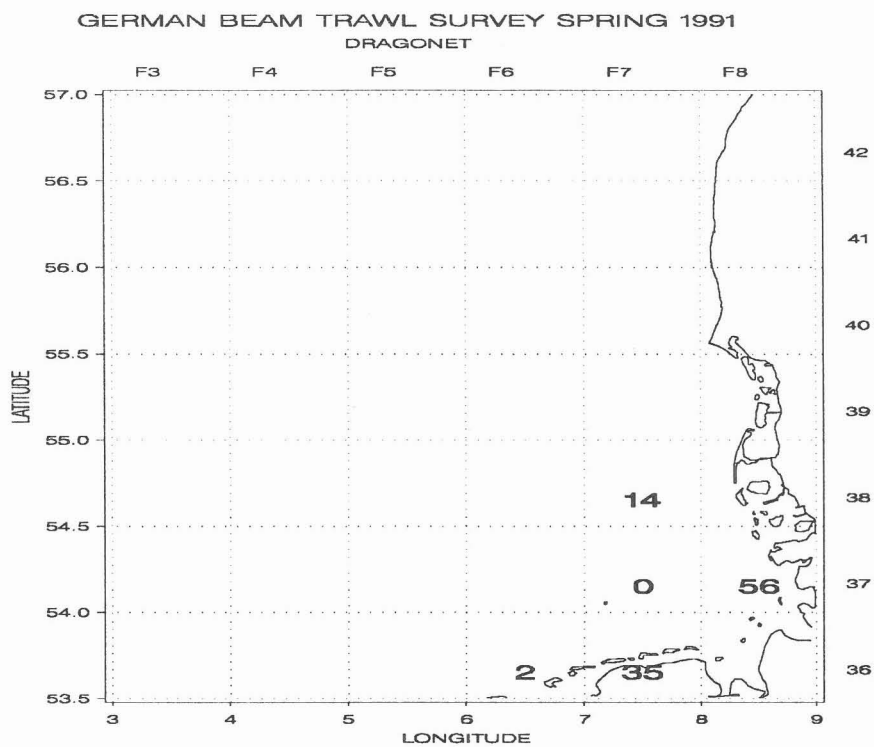


**Figure 4.53** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.

## BEAM TRAWL SURVEY 1991 DRAGONET

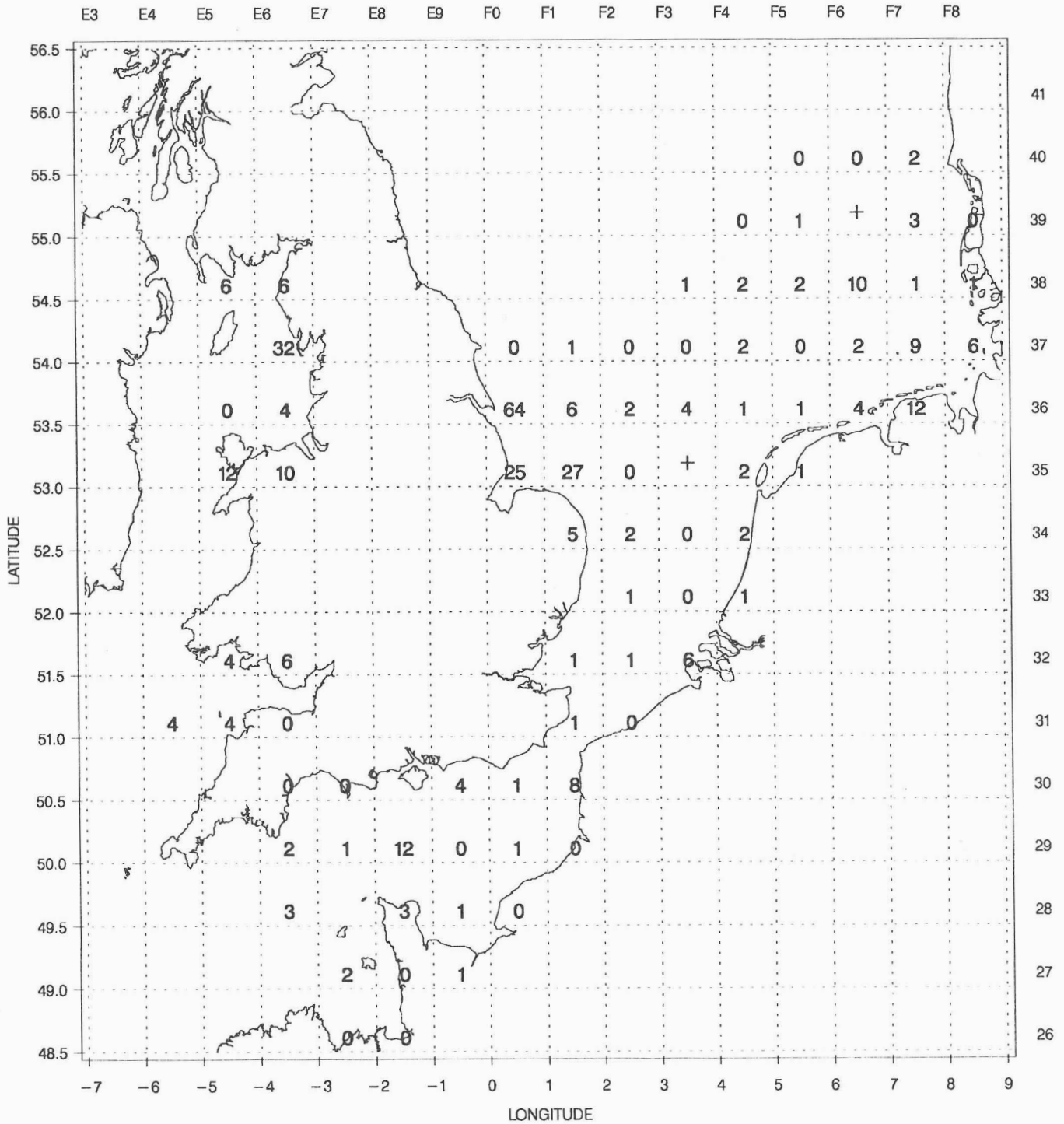


**Figure 4.54** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.



**Figure 4.55** Distribution of different species shown as mean catch per hour fished in each rectangle. P = present but not counted; + = less than 0.5 per hour.

BEAM TRAWL SURVEY 1991  
EDIBLE CRAB





**Figure 4.56** Trends in abundance of sole in surveys by Belgium, Germany, Netherlands and the UK in the North Sea and eastern Channel.

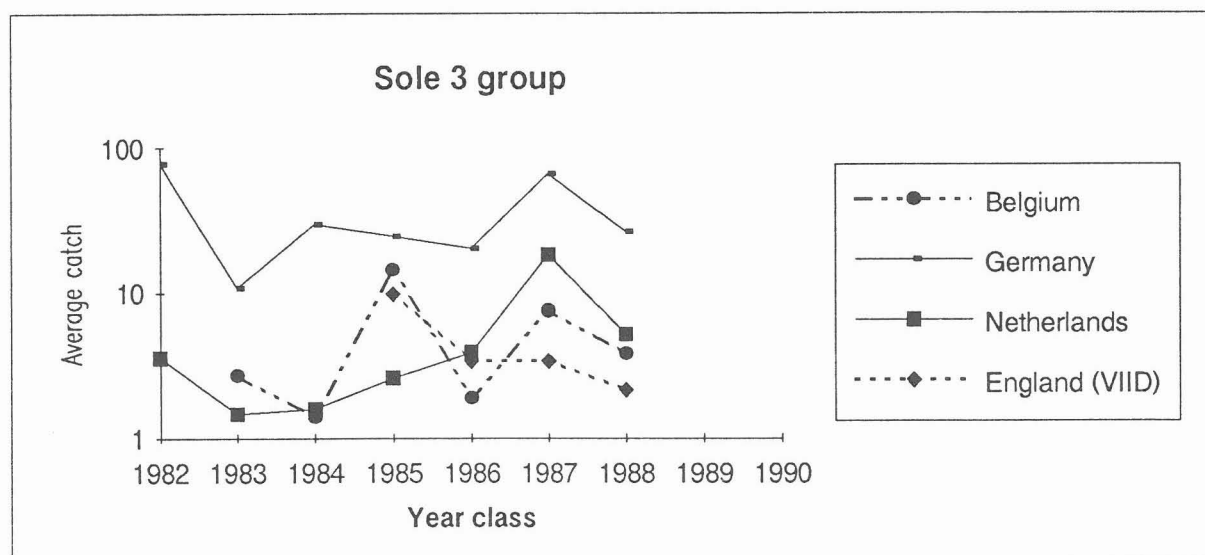
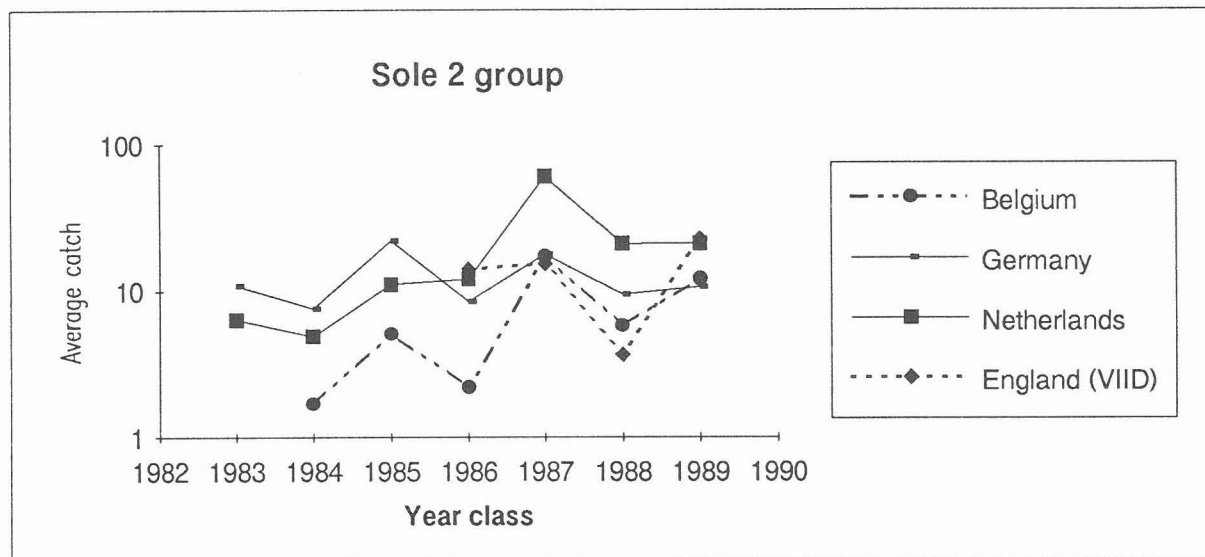
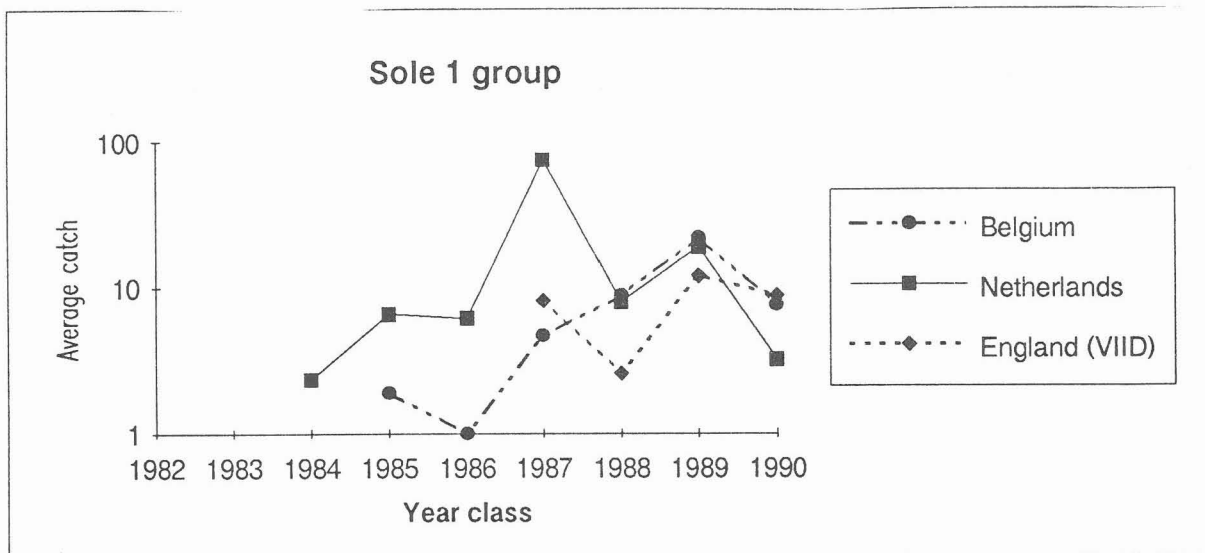
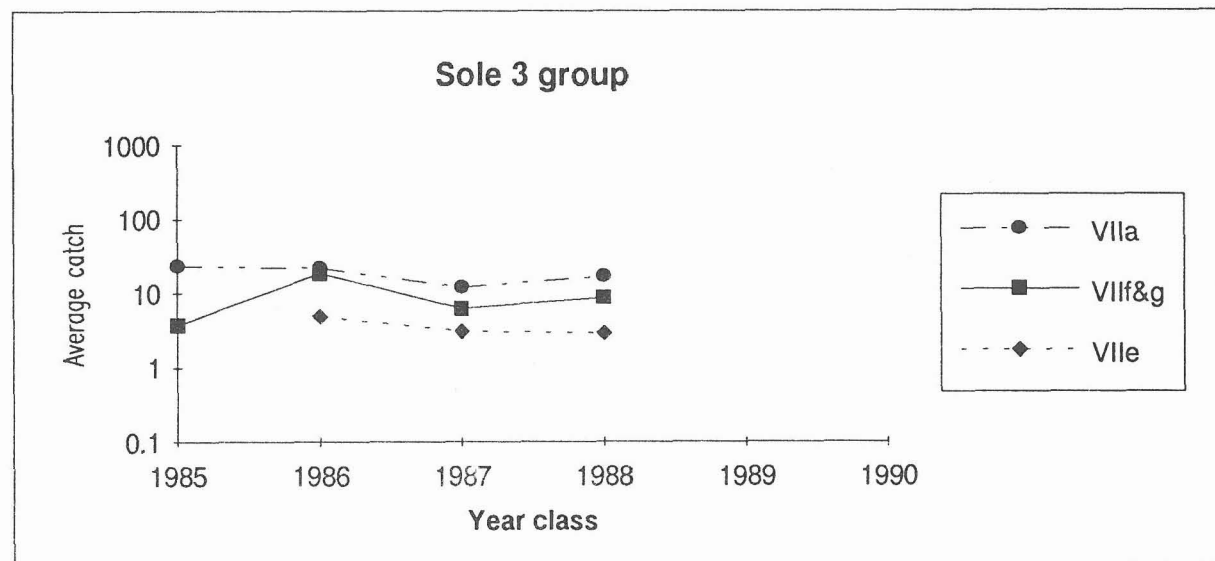
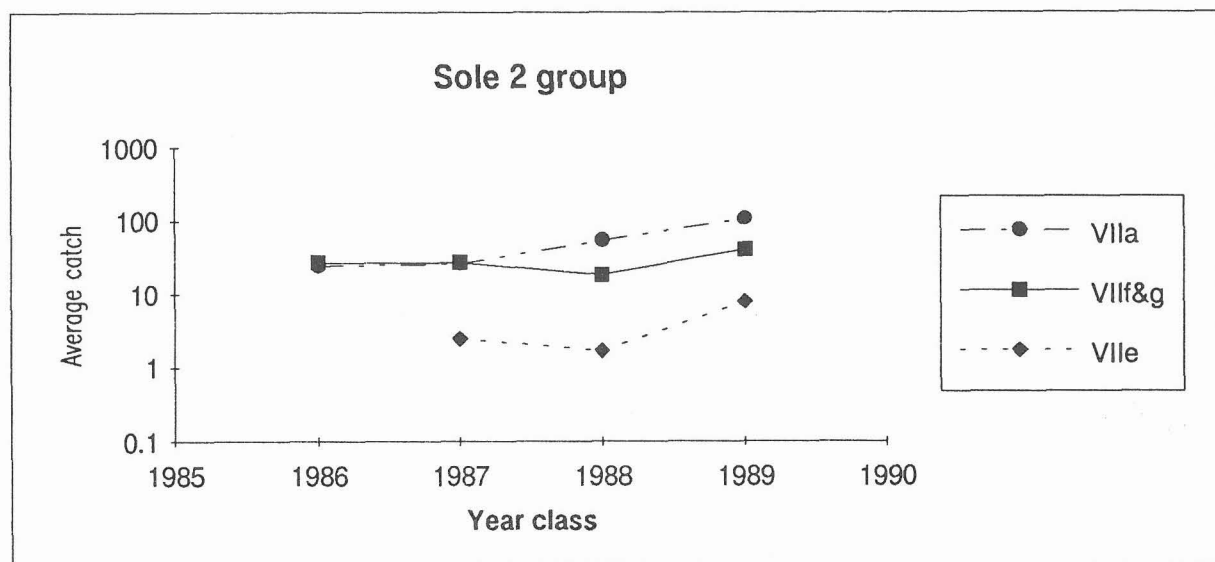
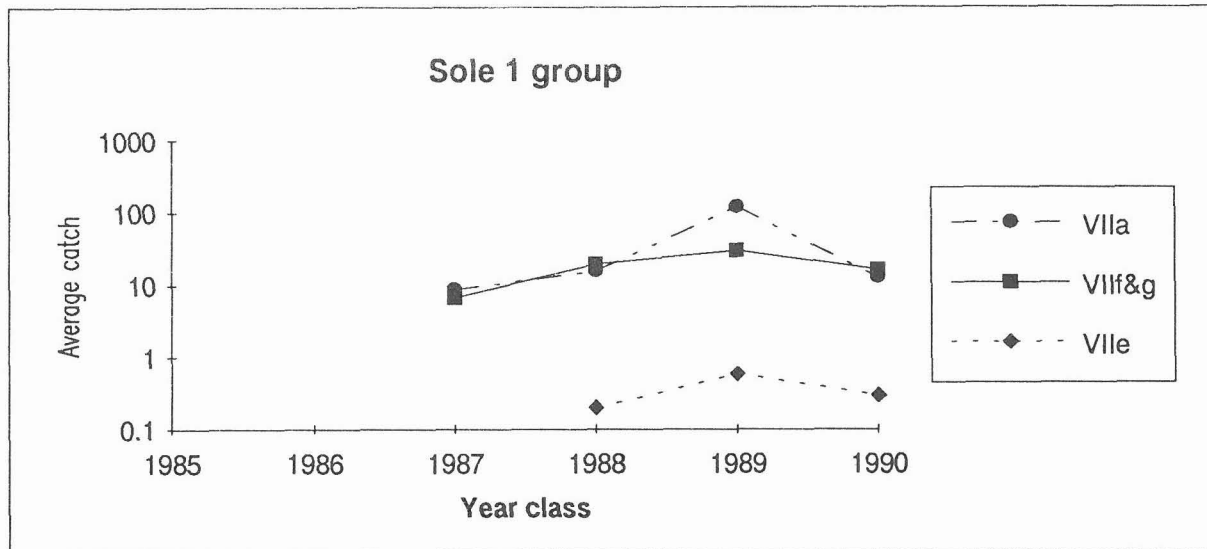
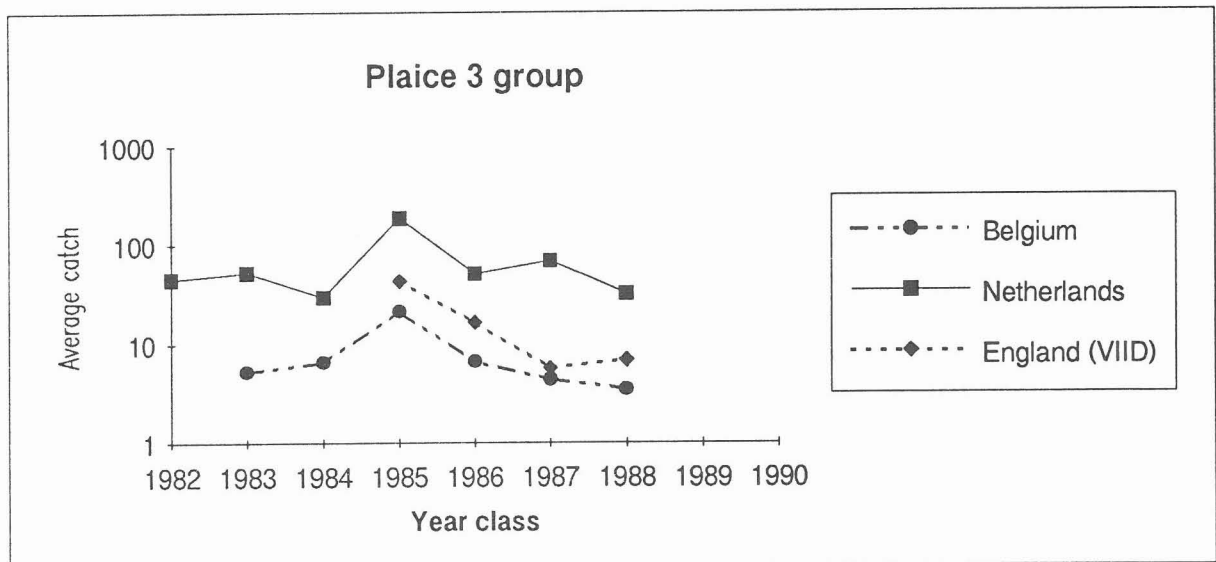
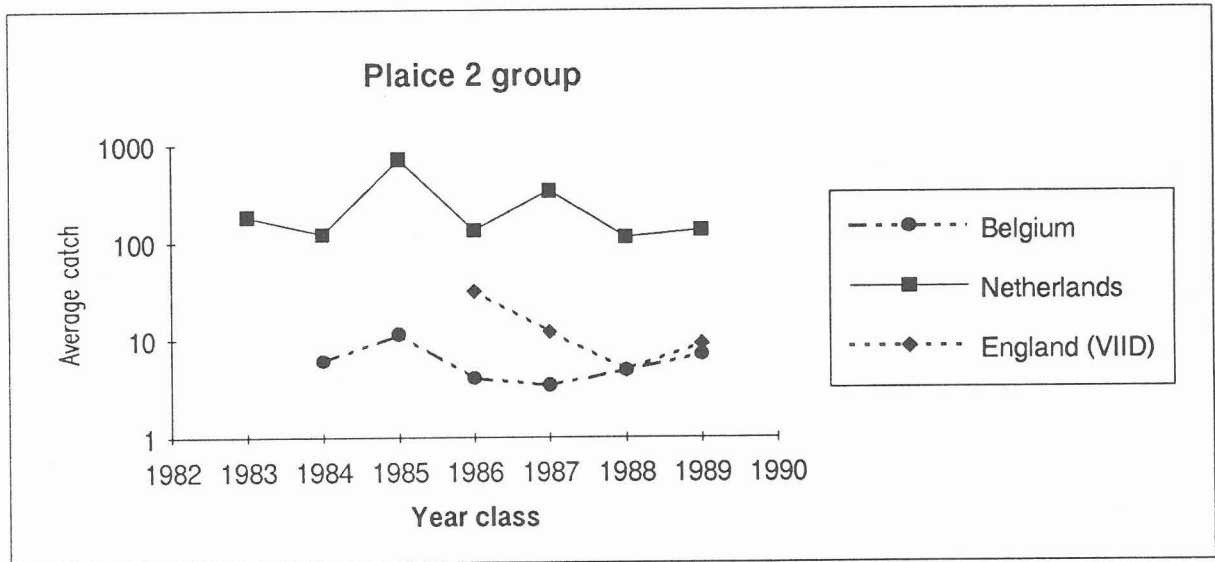
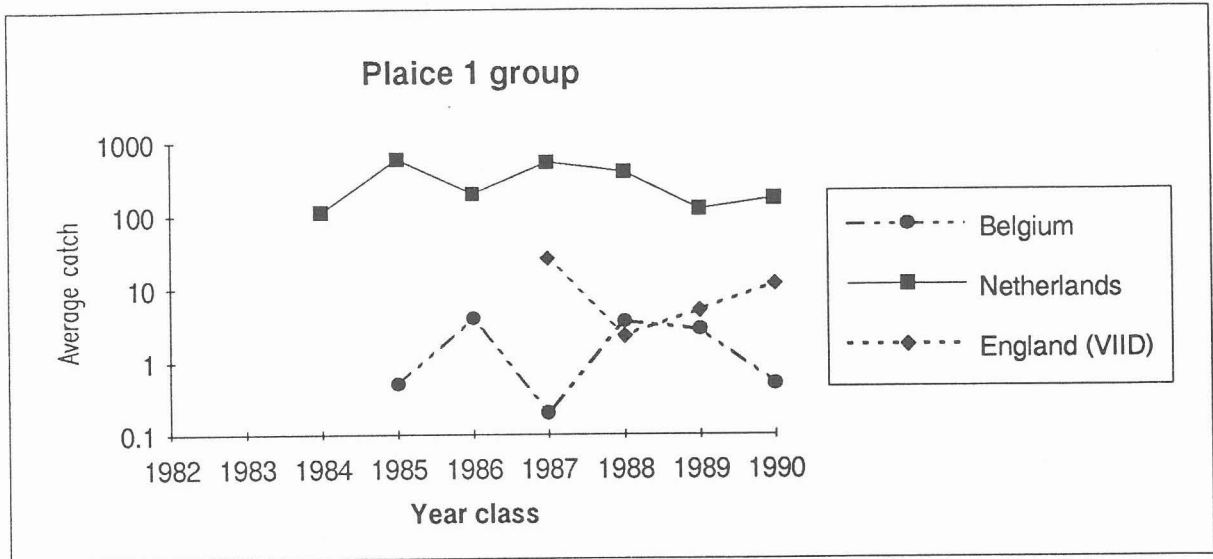


Figure 4.57 Trends in abundance of sole in surveys by the UK in VIIa, VIIf,g and VIIe.



**Figure 4.58** Trends in abundance of plaice in surveys by Belgium, Netherlands and the UK in the North Sea and eastern Channel.



**Figure 4.59** Trends in abundance of plaice in surveys by the UK in VIIa, VIIf,g and VIIe.

