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REPORT OF THE STUDY GROUP ON BEAM TRAWL SURVEYS IN 1993

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TABLE OF CONTENTS

Section	Page
1. INTRODUCTION	1
1.1 Terms of reference	1
1.2 Participants	1
2. SURVEY DETAILS	1
2.1 Belgium	1
2.2 Germany	1
2.3 Netherlands	2
2.4 United Kingdom	2
3. SAMPLING PROCEDURES	3
3.1 Belgium	3
3.2 Germany	4
3.3 Netherlands	4
3.4 UK (VIId, VIIa, f + g)	5
3.5 UK (VIIe)	5
3.6 Survey design and methods	6
4. 1993 SURVEY RESULTS AND COMPARISON WITH SURVEY MEAN .	6
4.1 Distributions and abundance by rectangle	7
5. INDICES OF ABUNDANCE BY SUB-AREA	10
6. YEAR CLASS STRENGTH INDICES FOR SOLE AND PLAICE	11
6.1 North Sea	11
6.2 Eastern English Channel	11
6.3 Western English Channel	11
6.4 Bristol Channel	12
6.5 Irish Sea	12
7. RECOMMENDATIONS	12
8. REFERENCES	13
9. GLOSSARY OF ENGLISH AND SCIENTIFIC NAMES OF MAIN FISH SPECIES	13
TABLE 3.1.....	14
TABLES 5.1 - 6.2.....	15
FIGURES 2.1 - 5.1.....	22

1. INTRODUCTION

1.1 Terms of reference

At the 1993 Statutory Meeting of ICES it was resolved (C.Res. 1993/2:31) that the Group on Beam Trawl surveys will work by correspondence to:

- a) carry out a detailed evaluation of the data series;
- b) compare the variation in catch rates of plaice and sole among years and areas;
- c) evaluate the survey designs and prepare modifications, if necessary.

1.2 Participants by correspondence

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

2. 1993 SURVEY DETAILS

The survey areas and numbers of hauls in each rectangle are shown in Figure 2.1.

2.1 Belgium

Survey area: ICES Division 1Vb+c; Southern North Sea west of 3° east

Dates: 16-27 August 1993

Ship: RV BELGICA

Length 50m

Trawl beam length: 4m

Number beams fished: one

Trawl duration: 30 min

Cod-end mesh: 40mm liner

Attachments: chain mat

Year survey started: 1985

First year used in distribution chart averages: 1989

Alterations: 1985-91 8m beam trawl with tickler chains; 1992 8m trawl with tickler chains and 4m trawl with chain mat; 1993 4m trawl with chain mat.

Benthos: Sub-sample counted at each station since 1985.

2.2 Germany

Survey area: ICES Division 1Vb; German Bight

Dates: 14-23 September 1993

Ship: RV SOLEA
Length 35m
Trawl beam length: 7.2m
Number beams fished: two
Trawl duration: 30 min
Cod-end mesh: 44mm liner
Attachments: 5 tickler chains
Year survey started: 1991
First year used in distribution chart averages: 1993 (1992 data not yet in database)
Alterations: Autumn survey started in 1992 using 7.2m trawl with fine mesh cod-end.
Trawling limited to 30 min hauls during daylight only.
Benthos: sampled at each station since 1992.

2.3 Netherlands

Survey area: ICES Division 1Vb+c; south of 56°30'N
Dates: 23 August-22 September 1993
Ship: RV ISIS
Length 28m
Trawl beam length: 8m
Number beams fished: two
Trawl duration: 30 min
Cod-end mesh: 75mm with 40mm liner
Attachments: 8 tickler chains
Year survey started: 1985
First year used in distribution chart averages: 1989
Alterations: Up to 4 additional stations taken in each rectangle along the continental coast, since 1991. Stations were allocated at equal intervals along a horizontal transect from the coast.
Benthos sampled at each station since 1985.

2.4 United Kingdom

a) Survey area: ICES Division VIIId

Dates: 2-16 August 1993
Ship: RV CORYSTES
Length 53m
Trawl beam length: 4m
Number beams fished: one
Trawl duration: 30 min
Cod-end mesh: 80mm with 40mm liner
Attachments: Chain mat and flip-up ropes
Year survey started: 1988
First year used in distribution chart averages in 1992 report: 1988
Alterations: None
Benthos: log scale of abundance 1991 & 92; weighed and counted at selected stations 1993.

b) Survey area: ICES Division VIIa; VIIf&g

Dates: VIIa, 8-22 September; VIIf&g, 4-7, 23-24 September 1993

Ship: RV CORYSTES

Length 53m

Trawl beam length: 4m

Number beams fished: one

Trawl duration: 30 min

Cod-end mesh: 40mm liner

Attachments: Chain mat & flip-up ropes

Year survey started: 1988

First year used in distribution chart averages in 1992 report: 1988

Alterations: Trawl duration changed from 15 to 30 minutes in VIIa, 1992; Survey grids extended into western Irish Sea and St Georges Channel in VIIa and into Celtic Sea in VIIf+g in 1993

Benthos: selected species estimated on log scale of abundance since 1992

c) Survey area: ICES Division VIIe

Dates: 6-13 October 1993

Ship: FV CARHELMAR

Length 22m

Trawl beam length: 4m

Number beams fished: two

Trawl duration: 30 min

Cod-end mesh: 80mm with 40mm liner

Attachments: Chain mat & flip-up ropes

Year survey started: 1984

First year used in distribution chart averages 1991

Alteration: 1984 to 1989 6m trawl; 1990-1993 4m trawl

Benthos: Presence/absence of main species recorded with estimate of total benthos bulk.

3. SAMPLING PROCEDURES

3.1 Belgium

a. Commercial fish

When the catch comes on board the first step is to pick up and collect all commercial fish species. This fraction is then immediately measured to the nearest cm. When the catch of one particular species is too big the measurements are reduced to a subsample (half, one fourth, etc.). This is mainly the case for dab and bib in some areas.

Since 1992 survey an electronic bar-code measuring board ("Ichtyometre") has been used for the length measurements. This automatically produced length distributions for all species.

In each length group numbers of sole, plaice and dab are kept apart for otolith sampling. The otolith extraction is generally carried out at the end of each day. A scheme is set up to ensure the collection of a minimum three otoliths per cm-class. For all brill and turbot catches the otoliths are taken and weight and sex are also recorded.

b. Non-commercial fish and benthos

The by-catch of non-commercial fish and benthos is sorted into baskets of about 40 l. One basket is chosen at random from which a subsample of a bucket (approximately 13 l) is taken. The species composition of the entire subsample is noted and the numbers of each species recorded. The numbers in the sub-sample are raised to the total for the catch at each station.

3.2 Germany

a) Fish

Sole, turbot and brill are sorted from the two beam trawls. Other fish are taken from one trawl and identified to species or species group. Sole, plaice and dab are measured to the nearest cm below and otoliths collected for ageing. All other fish species are measured and for abundant species, a sub-sample may be measured.

b) Benthos

The catch from one trawl (usually the portside) is sorted and if necessary a 35 l basket taken as a sub-sample. Benthos are classified to species, genus or family and counted, optionally by means of a subsample if occurring in large quantities (e.g. heart urchins, starfish or brittlestars).

3.3 Netherlands

a) Fish and benthos

The catches of both port- and starboard side are dumped separately in two containers on deck. The catch of one net is analysed for all fish species and epibenthic animals. The net is chosen at random at the beginning of the survey. For a selected number of species (sole, turbot, brill, rays) the other net is sorted as well. The total volume of the catch is determined in fish baskets (30 l) which are counted during the sorting process.

The catch is processed on a conveyor belt from which the larger specimens are sorted. The remaining catch is collected in fish baskets (30 l). In general the total catch volume is between 2 and 10 baskets with exceptional catches of up to 20-30 baskets on some stations mainly due to starfish or sea urchins. Smaller fish specimens and benthic animals are sorted from a sub-sample of 1 basket, which is a mixed sample from the 1 to 3 baskets selected from the catch at the beginning, middle and end of the sorting process.

All fishes are sorted from the (sub-) samples, measured to the cm below and then raised to the catch number per hour fishing. The benthic animals are counted. A selected number of species, generally species or species groups which are dominant, have been recorded since the start of the surveys in 1985 (Table 3.1).

3.4 UK (VIId, VIIa, f+g)

a) Fish and commercial crustacea

After the catch has been emptied into the pound, all fish and commercial crustacea (edible crabs, lobsters and Nephrops) are separated from the benthos. Fish are identified to species (except gobies, sandeels and small clupeidae which are identified to genus or family), weighed in bulk and individuals measured to the cm below. Plaice, sole, megrim and elasmobranchs are weighed and measured by sex. Subsampling (by weight) is occasionally necessary when the catch of a species is large (e.g. dabs and poor cod). Length stratified samples of major species including plaice, sole, lemon sole, megrim, turbot, brill, dab, whiting, cod and monkfish are taken for age determination.

Crustacean species are weighed by sex and the carapace lengths are recorded to the mm below.

b) Benthos

VIId: Since 1993, a sub-sample of benthos is removed at selected stations and sorted to species where possible. Bulk weight of each species is recorded.

VIIa,f+g: After the removal of fish the numbers of selected benthos species or groups is assessed visually and recorded using a log scale of abundance (0, 1-10, 11-100, 101-1000, 1001-10000, 10000+). A photograph is taken of the total unsorted benthos catch for later reference.

3.5 UK (VIIe)

a) Fish and commercial crustacea

The catch from port and starboard trawls is dropped into deck pounds and an estimate of total catch (i.e. fish + debris) is made for each trawl. The catch in the pounds is transferred to a conveyor belt where each trawl is sorted separately. All commercial fish species are picked out and measured from both nets on every haul. On selected hauls, non-commercial fish species are also picked out and measured or counted. Length stratified samples of otoliths are taken from sole, plaice, lemon sole and monkfish. Since 1991, otolith samples have been further stratified on the basis of distance from the coast into 5 zones, comprising 0-3, 3-6, 6-12 and two zones greater than 12 miles from the coast. Edible crab (*Cancer pagurus*), lobster and scallops are measured on all hauls.

b) Benthos

Only an approximate estimate of the total catch is made, together with a list of the most obvious component species.

3.6 SURVEY DESIGN AND METHODS

A detailed description of the survey design and methods has been given previously (Anon, 1990). Because the distribution of juvenile flatfish is related to depth, a depth stratified survey design was used in area VII where considerable variation in depth was found within the survey area. Stations were allocated to three depth zones, 0-19.9m, 20-39.9m and >40m. In the North Sea surveys, depth variation was less important and station positions were allocated either randomly within rectangles or on the basis of set positions within the rectangle, independent of depth. In the North Sea the majority of samples fall into the middle depth zone, 20-39.9m. On the eastern margin, samples have also been taken in the 0-19.9m zone but along the English coast where shallow water occurs close to the coast, this zone is poorly sampled.

In the eastern English Channel and Irish Sea, the majority of samples are taken in the shallow near-shore zone while in the Bristol Channel and western English Channel, most samples are in the two deeper zones. Standardisation of survey methodology in these areas has been more uniform and all surveys were restricted to the third quarter of the year and most hauls taken during daylight only. Tow speed was standardised to approximately 4 knots and haul duration to 30 minutes. In the Irish Sea, the haul duration was restricted to 15 minutes in the 1988-91 surveys because of the high catch rates of some species. For the surveys since 1992, hauls were standardised to 30 minutes.

Data were analysed by converting catches to numbers per hour and for comparison between all countries, standardised to an 8m beam width, assuming a linear increase in catch with beam width. 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:

$$Ca = \sum R_i / nA$$

where Ca is the catch per hour in area or sub-area A;

R_i is the mean catch in the i th rectangle

nA is the number of rectangles in the area or sub-area A.

The mean catch per rectangle is the unweighted average of all stations in the rectangle. In rectangles when surveys by Belgium, Netherlands and the UK overlap, a mean catch rate has been calculated for the different surveys, but no correction has been made for differences in gear efficiency.

4. 1993 SURVEY RESULTS AND COMPARISON WITH SURVEY MEAN

4.1 Distribution and abundance by rectangle

The abundance of each species by rectangle is shown in Figures 4.1-4.34 and a glossary of the English and Scientific names given in Section 9. The top figure in each rectangle gives the result for the 1993 survey and the lower figure is the mean for the available historic data series. In VIIa,d,f+g, the means were taken over the period 1988 to 1993 although in some rectangles data will have been collected over a shorter time series. In VIIe, means were from 1991. In the North Sea, means were calculated over the survey period 1989-1993.

4.1.1 Sole (Figures 4.1-4.3)

The abundance 1 and 2-gp sole were generally below average across most of the regions surveyed except for sub-areas 3 and 4 (Fig. 5.1, intermediate area and southern Bight). The abundance of 3+ sole was also lower than the average in most of the North Sea, reflecting the fishing down of the stock since the strong 1987 and 1989 year classes respectively. In area VIId the stock of 3+ sole is at a relatively high level compared with the average.

4.1.2 Plaice (Figures 4.4-4.6)

The main concentration of juvenile plaice occur in coastal rectangles along the Danish and Dutch coasts and in the Irish Sea. The abundance of 1-gp plaice was substantially below the average in the coastal rectangles in the North Sea but above average in most of the coastal rectangles in the Irish Sea. The abundance of 2-gp plaice showed a similar pattern to that of the 1-gp fish but the pattern of 3+ catches suggest that the plaice population is below the recent average in most of the area surveyed. Substantial numbers of 1, 2 and 3+ group plaice were caught along the coast of Ireland in positions which were surveyed for the first time in 1993.

4.1.3 Dab (Figures 4.7-4.10)

The information on the distribution per age group was limited to the North Sea and the eastern English Channel. In other areas, a distribution of all ages combined was presented.

As with plaice, highest abundances of juvenile dab occurred in coastal rectangles along the southern part of the Danish coast and in the German Bight. The abundance of 1-gp dab remained at a high level but below the survey mean in most rectangles. 2 and 3+ dab showed an increasing abundance in rectangles away from the coast and catch rates were generally close to the survey average value. The abundance of dab was low in the Southern Bight and English Channel. In the Irish Sea peak catch rates of over 2000 per hour fishing were found along the coast of Ireland.

4.1.4 Turbot (Figure 4.11)

Turbot was widely distributed but at a low density throughout the survey area. Peak abundances of up to 20 per hour were found in the Waddensea and along the Danish coast south of 55°30'N and were close to the long-term survey average.

4.1.5 Brill (Figure 4.12)

Brill showed a similar distribution and abundance to turbot.

4.1.6 Scaldfish (Figure 4.13)

Scaldfish abundance appears to have increased over much of the survey area and the 1993 values in the North Sea were 2-3 times the long-term survey average. The highest catch rates in area VII (up to 444 per hour) were found inshore along the south-east coast of Ireland.

4.1.7 Lemon sole (Figure 4.14)

Abundance of Lemon sole was substantially below the long-term survey average in the eastern North Sea north of 53°30'N but generally above average on the western North Sea coast and in area VII.

4.1.8 Long Rough Dab (Figure 4.15)

Long rough dab was absent from most of the survey area except for the northern and western parts of VIIa and the north-west boundary of the survey grid in the North Sea. Abundances in 1993 were similar to the survey average.

4.1.9 Flounder (Figure 4.16)

Flounder were found only along the western coastal rectangles of the survey area and abundances were mostly similar to or below the survey average.

4.1.10 Solenette (Figure 4.17)

Solenette were abundant and widely distributed except north of 56°30'N. The high catch rates found in 1992 were maintained and many rectangles were above the historic survey average.

4.1.11 Thickback sole (Figure 4.18)

Widely distributed in area VII but absent from the North Sea with the exception of the outer Thames estuary. Thickback sole were more abundant in all areas in 1993 compared with the survey average.

4.1.12 Monkfish (Figure 4.19)

Monkfish were widely distributed in area VII but found only in the western edge of the survey grid in the North Sea. Abundance was close to survey mean.

4.1.13 Tub Gurnard (Figure 4.20)

Widely distributed in coastal rectangles. Catch rates in 1993 were generally above the survey mean.

4.1.14 Grey Gurnard (Figure 4.21)

Widely distributed throughout the survey area but rare in area VIId. There was no clear pattern of abundance compared to survey mean.

4.1.15 Red Gurnard (Figure 4.22)

Only found in the southern North Sea and in area VII. Abundance was similar to the survey mean.

4.1.16 Lesser Weever (Figure 4.23)

Rare north of 54°N in the North Sea but caught throughout area VII except in the NW rectangles of area VIIa and VIIg. Abundance was substantially above the survey mean in most areas.

4.1.17 Dragonet (Figure 4.24)

Widely distributed and abundant in all areas with peak catch rates of > 500 per hour in individual coastal rectangles. Abundance was mainly lower than the survey mean in North Sea coastal rectangles and southern part of VIId but higher offshore. In the western area catch rates were close to survey means.

4.1.18 Pogge (Figure 4.25)

Widely distributed and with peak abundance in the Danish Waddensea and SW coast of Ireland. The 1993 catch rates were above the survey mean in most areas.

4.1.20 Rays and dogfish (Figure 4.26 and 4.27)

The two groups showed similar distribution patterns, being virtually absent from the eastern half of the North Sea and occurring throughout the rest of the survey area. Dogfish were more abundant in 1993 than the survey mean. The catch rate of rays was similar to or less than the survey mean except in a few rectangles on the English east coast.

4.1.21 Cod (Figure 4.28)

Cod abundance was low in all areas except the rectangles along the Irish coast in VIIa. The 1993 survey abundance was mainly below the survey mean in all areas.

4.1.22 Poor cod and bib (Figure 4.29 and 4.30)

These two species have a mainly western distribution with high catch rates of poor cod from the English Channel through to the Irish Sea. Catch rates of poor cod were generally above the survey mean whereas bib were below.

4.1.23 Whiting (Figure 4.31)

Whiting were abundant in the North Sea and most of area VII except for VIIId. Abundance in 1993 was generally below the survey mean.

4.1.24 Red Mullet & John Dory (Figure 4.32 and 4.33)

Found only south of 54°N and at low catch rates (<10 per hour). The 1993 catch rates were similar to the survey mean.

4.1.25 Edible crab (Figure 4.34)

Distributed in low numbers throughout the survey area but with localised patches of abundance such as off the Norfolk Banks on the English east coast.

5. INDICES OF ABUNDANCE BY SUB-AREA

The sub-areas covered by the survey are shown in Figure 5.1. Mean indices of abundance were calculated by averaging all the stations within each sub-area. The results for selected species for the period 1991-1993 are given in Table 5.1.

Sub-Area 1: This remains the dominant sub-area in the North Sea for most flatfish species except sole. Catch rates of 1 and 2-gp plaice were substantially lower than in 1991 and 1992. Older plaice were at a similar level to 1992 but well below the 1991 average. The abundance of scaldfish has increased steadily since 1991 from a mean of 62.4 per hour to 111.4 in 1993, which dabs and pogge have both declined.

Sub-Area 2: This area contains high catch rates of 3+ sole but is less important than area 1 for plaice and other flatfish. Striking changes in numbers of species such as solenette, pogge, lesser weaver and dragonet in 1993 are probably the result of the reduced sampling level in this area, particularly along the English coast. The highest catch rates of edible crab occur in area 2 associated with a small number of rectangles off the English east coast.

Sub-Area 3: This area is similar to sub-area 1 which it borders although abundances of 1 and 2-gp plaice were higher than in the previous two years.

Sub-Area 4: Catch densities of 1 and 2-gp sole are higher than elsewhere in the North Sea but 3+ gp sole abundance tends to be lower than in area 2 and some of the western sub-areas such as area 9. Densities of other flatfish are intermediate between area 1/3 and the other English Channel areas.

Sub-Areas 5 & 6: These two sub-areas make up the western end of VIIId and are dominated by solenette, dragonet, poor cod and bib. 3+ sole showed a peak compared with the previous 2 years in both sub-areas.

Sub-Area 7: Abundances of most flatfish remain low in the western English Channel compared with adjacent sub-areas. 3+ sole were at a peak in 1993 as in sub areas 5+6.

Sub-Area 8 and 9: Additional stations in these two areas particularly long the Irish coast have resulted in substantial increase in 1993 in the catch rate of 1 and 2-gp plaice. This has also caused increases in a number of other species such as dab and scaldfish in sub-area 8 and poor cod in sub-area 9. One, 2 and 3+ gp sole in both areas were low compared with the previous 2 years.

6. YEAR CLASS STRENGTH INDICES FOR SOLE AND PLAICE

Estimates of year class strength up to age 10+ were calculated for each survey and the results are shown in Table 6.1 and 6.2.

6.1 North Sea

6.1.1 Sole

The 1991 year class of sole which as 1-gp was the strongest on record in the Belgian series and second strongest in the Netherlands survey appears as only slightly above average as 2-gp in both surveys. The 1990 year class which was weak as 1-gp but about average as 2-gp in both surveys, subsequently appears to be the weakest in the Netherlands series at age 3 and about average in the Belgian results.

6.1.2 Plaice

The last 4 year classes of plaice have appeared to be weak based on the Netherlands survey data. The Belgian survey indicates that spawning may have been more successful in the south of the survey area with the 1991 year class identified as strong both as 1-gp and at age 2.

6.2 Eastern English Channel

6.2.1 Sole

The 1989 year class at age 1 was the strongest in the series since 1985 and remained dominant up to age 4. The 1990 year class also appears to relatively strong at age 4. Recent year classes have been poor and the 1992 year class at age 1 appears to be the poorest in the series.

6.2.2 Plaice

The estimates of plaice year class strength are very variable at age 0-2 years old. At age 3 the year class estimates appear similar to the Netherlands results in the North Sea with poor year classes since 1987.

6.3 Western English Channel

6.3.1 Sole

The catch rates of all age groups are low and 0 and 1-gp indices are poorly sampled. At age 3 only the 1989 year class appears to be strong.

6.3.2 Plaice

The plaice indices are similar to those in the North Sea and suggest that there have been no strong year classes since 1987.

6.4 Bristol Channel

6.4.1 Sole

The strong 1989 year classes which was evident in all area VII surveys was the strongest in the series from age 0 up to age 4. The 1991 and 1992 year classes appear to be particularly weak.

6.4.2 Plaice

The 1992 year class at age 1 appears to be extremely weak but, as with the western Channel, the indices were rather variable at age 0 and 1.

6.5 IRISH SEA

6.5.1 Sole

As in the Bristol Channel, the 1989 year class was estimated to be the strongest in the series at all ages except age 4. The 1990, 1991 and 1992 year classes appear to be extremely weak.

6.5.2 Plaice

The inclusion of new rectangles off the Irish coast has resulted in a marked increase in the index of year class strength particularly at age groups 1 and 2. Previous survey results show only the 1989 year class as substantially above average.

7. RECOMMENDATIONS

1. To improve the survey coverage, sampling should be extended along the English North Sea coast.
2. Benthos samples should be collected on all surveys using a standardised methodology.

3. Further work should be carried out to compare the efficiency of different beam trawls by use of overlapping stations and comparative fishing exercises.
4. Otoliths of all flatfish species should be collected where possible.
5. The Study Group should meet by correspondence in 1995 to analyse and report on the 1994 surveys and should meet in Ijmuiden in 1996 to carry out a further evaluation of the survey data and methodology.

8. REFERENCES

Anon, 1990. Report of the Study Group on beam trawl surveys in the North Sea and Eastern Channel. ICES CM1990/G:59.

9. GLOSSARY OF ENGLISH AND SCIENTIFIC NAMES OF MAIN FISH SPECIES

Fish

Sole	<i>Solea solea</i>
Plaice	<i>Pleuronectes platessa</i>
Dab	<i>Limanda limanda</i>
Turbot	<i>Scophthalmus maximus</i>
Brill	<i>Scophthalmus rhombus</i>
Scaldfish	<i>Arnoglossus laterna</i>
Lemon sole	<i>Microstomus kitt</i>
Long rough dab	<i>Hippoglossoides platessoides</i>
Flounder	<i>Platichthys flesus</i>
Solenette	<i>Buglossidium luteum</i>
Thickback sole	<i>Microchirus variegatus</i>
Monkfish	<i>Lophius spp.</i>
Tub gurnard	<i>Trigla lucerna</i>
Grey gurnard	<i>Eutrigla gurnardus</i>
Red gurnard	<i>Aspitrigla cuculus</i>
Pogge (armed bullhead)	<i>Agonus cataphractus</i>
Lesser weever	<i>Echiichthys vipera</i>
Dragonet	<i>Callionymus lyra</i>
Lesser spotted dogfish	<i>Scyliorhinus canicula</i>
Rays	<i>Rajidae</i>
Cod	<i>Gadus morhua</i>
Poor cod	<i>Trisopterus minutus</i>
Bib (pout)	<i>Trisopterus luscus</i>
Whiting	<i>Merlangius merlangus</i>
Red mullet	<i>Mullus surmuletus</i>
John dory (dory)	<i>Zeus faber</i>
Edible crab	<i>Cancer pagurus</i>

Table 3.1 Summary of (epi)benthos species recorded on the Beam Trawl Survey of the Netherlands since 1985

ECHINODERMATA

Asterias rubens
Astropecten irregularis
Cancer pagurus
Echinocardium spp.
Ophiuridae
Psammechinus miliaris

MOLLUSCA

Sepia officinalis
Sepiolo atlantica
Loligo forbesi
Allotheuthis spp.
Arctica islandica
Buccinum undatum

CRUSTACEA

Carcinus meanas
Corystes cassivelaunus
Homarus vulgaris
Hyas araneus
Liocarcinus depurator
Liocarcinus puber
Nephrops norvegicus
Pagurus bernhardus

POLYCHAETA

Aphrodite aculeata

ANTHOZOA

Alcyonium digitatum

Table 5.1 Mean abundance of species (no/hr/8m trawl) by subarea 1991 - 1993

	1			2			3		
	1991	1992	1993	1991	1992	1993	1991	1992	1993
Sole 1	2.4	56.8	3.9	0.7	1.7	4.0	2.6	23.1	6.1
Sole 2	26.3	5.0	18.6	22.2	18.7	4.0	9.3	12.8	29.9
Sole 3 +	12.6	15.0	9.8	20.8	70.9	45.0	8.7	9.2	10.0
Plaice 1	380.7	445.1	174.2	0.0	3.2	12.0	23.8	52.0	135.9
Plaice 2	219.9	215.0	180.6	34.0	34.6	12.0	37.9	35.2	62.9
Plaice 3 +	86.2	49.4	51.1	41.8	54.0	23.0	20.5	21.2	16.5
Dab 1	733.6	478.9	352.0	78.7	223.1	14.0	365.1	384.5	177.2
Dab 2	230.7	451.7	295.9	165.6	291.5	124.0	199.1	362.4	315.4
Dab 3 +	377.9	340.3	332.4	96.6	79.8	96.0	96.5	168.9	129.8
Dab	1366.9	1307.4	994.6	340.8	596.0	234.0	663.4	971.6	688.2
Turbot	3.9	4.5	2.5	0.0	1.4	0.0	1.5	0.9	1.9
Brill	1.3	3.7	1.4	1.0	0.8	5.0	0.7	1.1	2.6
Scaldfish	62.4	72.9	111.4	4.0	91.2	0.0	88.6	124.8	273.9
Lemon sole	2.7	0.6	1.2	6.8	3.4	22.0	2.9	3.4	17.9
Long rough dab	7.7	2.1	9.1	0.0	0.0	0.0	0.9	0.0	0.0
Flounder	23.0	7.0	11.9	0.2	0.0	0.0	0.1	0.2	0.4
Solenette	47.5	92.1	98.0	42.6	66.6	1.0	47.0	242.6	253.4
Tub gurnard	4.5	15.6	7.5	7.0	0.2	7.0	3.0	2.1	9.0
Grey gurnard	34.5	42.5	43.7	7.6	94.8	0.0	32.2	26.5	16.8
Red gurnard	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0
Pogge	104.9	88.9	43.0	4.8	31.4	82.0	14.1	13.5	32.1
Lesser weever	1.2	3.0	3.1	35.2	75.2	0.0	21.2	41.4	76.2
Dragonet	47.3	151.5	65.7	62.0	44.8	199.0	27.6	32.7	297.4
Dogfish	0.0	0.0	0.0	0.0	0.4	0.0	0.3	0.2	0.3
Rays	0.7	0.4	0.5	20.8	19.3	44.0	1.3	3.5	7.7
Cod	12.9	3.4	3.9	2.4	0.8	8.0	1.2	2.6	0.5
Poor cod	0.3	0.7	0.3	0.0	0.0	0.0	1.7	0.4	0.3
Bib	0.3	0.9	1.4	11.4	1.2	11.0	17.4	1.4	2.9
Whiting	93.3	40.8	85.7	6.2	144.8	22.0	80.4	141.9	67.8
Monk	0.0	0.0	0.2	0.2	0.1	0.0	0.1	0.1	0.0
John dory	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Red mullet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0
Thickback sole	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Edible crab	2.5	11.2	3.0	19.1	32.8	52.0	4.1	8.2	42.9

Table 5.1 continued

	4			5			6		
	1991	1992	1993	1991	1992	1993	1991	1992	1993
Sole 1	10.4	74.3	35.1	4.1	0.4	0.0	7.7	2.4	0.7
Sole 2	22.5	42.1	54.7	15.2	3.9	3.6	26.2	12.0	25.4
Sole 3+	8.8	21.4	13.6	5.8	8.4	12.9	6.2	14.8	18.4
Plaice 1	14.4	50.5	17.4	4.4	3.6	1.0	6.7	7.1	1.9
Plaice 2	15.8	13.7	21.3	4.7	2.4	4.3	3.4	6.3	2.5
Plaice 3+	16.7	14.4	8.3	9.9	5.4	6.4	19.5	35.2	13.2
Dab 1	68.0	83.8	34.8	2.6	4.9	1.2	2.2	70.9	11.3
Dab 2	36.8	45.1	55.2	1.4	1.3	0.5	2.4	10.1	4.1
Dab 3+	23.2	22.7	35.3	1.6	0.7	0.4	2.3	9.2	3.3
Dab	133.6	203.5	129.6	7.6	7.1	2.0	24.5	98.9	23.1
Turbot	0.9	1.0	0.9	0.1	0.1	0.0	0.0	0.6	0.5
Brill	0.7	1.0	0.9	1.0	0.7	0.8	1.0	1.5	1.7
Scaldfish	26.4	32.5	40.9	4.7	3.9	6.3	1.6	2.7	8.3
Lemon sole	8.4	3.9	11.7	1.0	2.4	2.6	1.8	0.8	0.0
Long rough dab	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Flounder	2.9	3.0	0.8	0.0	0.0	0.0	2.8	2.7	0.7
Solenette	50.4	58.8	60.1	155.3	141.5	143.3	87.9	88.2	157.8
Tub gurnard	5.1	4.2	5.5	1.3	3.5	6.9	1.2	7.4	8.5
Grey gurnard	9.4	16.8	15.0	0.2	0.3	0.3	1.0	0.1	0.0
Red gurnard	5.9	3.4	3.5	9.5	9.7	9.9	11.2	7.1	9.9
Pogge	37.0	35.2	34.0	4.0	9.6	4.3	49.8	34.6	59.9
Lesser weever	55.5	61.6	95.2	0.1	0.3	0.4	4.4	5.6	11.1
Dragonet	63.1	81.5	94.0	39.2	45.1	61.6	401.4	660.1	498.9
Dogfish	3.1	4.2	10.8	1.7	11.0	22.0	8.7	11.6	4.5
Rays	3.2	5.6	4.3	6.1	8.2	9.6	3.4	5.1	4.0
Cod	0.5	2.3	0.5	0.0	0.0	0.0	0.0	0.5	0.5
Poor cod	34.4	12.5	14.5	170.2	134.1	156.1	235.3	82.0	44.2
Bib	36.2	24.3	16.8	30.7	27.0	11.1	106.5	146.4	117.3
Whiting	11.6	42.9	31.5	0.1	0.0	0.7	0.7	2.3	0.2
Monk	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
John dory	0.1	0.0	0.1	0.9	0.5	0.4	0.2	0.7	0.5
Red mullet	1.3	1.5	0.4	0.0	0.4	0.1	0.0	0.2	0.7
Thickback sole	1.1	1.8	1.9	0.7	0.8	0.3	1.3	4.3	7.2
Edible crab	1.5	11.6	7.5	4.3	4.8	2.9	1.2	3.1	2.0

Table 5.1 continued

	7			8			9		
	1991	1992	1993	1991	1992	1993	1991	1992	1993
Sole 1	0.6	0.1	0.3	33.6	30.7	7.4	13.2	14.9	3.6
Sole 2	8.6	4.0	2.7	81.3	18.9	13.0	104.5	26.2	13.3
Sole 3+	5.5	11.6	13.6	33.9	20.5	14.9	33.8	86.6	25.9
Plaice 1	0.3	2.9	0.7	92.7	28.4	3.9	64.4	50.7	168.5
Plaice 2	0.5	0.6	2.4	4.1	18.5	13.1	67.3	96.2	155.4
Plaice 3+	4.2	5.5	7.6	16.8	3.3	5.0	18.2	47.3	57.9
Dab 1	0.0	0.2							
Dab 2	0.3	0.2							
Dab 3+	1.7	0.3							
Dab	7.5	14.3	21.6	35.6	72.0	179.7	369.8	226.7	398.2
Turbot	0.0	0.0	0.1	2.6	1.8	0.6	0.4	0.2	0.1
Brill	0.5	0.5	0.3	1.1	1.5	1.3	2.0	1.5	1.7
Scaldfish	1.5	14.8	55.9	0.8	0.6	70.4	24.6	25.1	18.8
Lemon sole	0.9	0.3	0.4	0.8	1.5	9.4	1.3	3.0	15.1
Long rough dab	0.0	0.0	0.0	0.0	0.0	13.6	0.2	0.1	1.9
Flounder	0.0	0.0	0.0	0.9	0.5	0.4	1.2	0.9	0.6
Solenette	0.0	126.2	354.3	120.8	73.3	96.7	146.0	103.0	134.4
Tub gurnard	0.6	1.8	0.7	4.2	5.9	1.3	5.3	13.2	4.7
Grey gurnard	3.5	2.8	3.8	30.3	45.4	69.8	46.0	69.3	80.9
Red gurnard	10.4	28.9	25.8	2.4	0.5	7.5	5.2	2.2	4.6
Pogge	0.2	2.7	10.9	0.8	1.5	13.5	36.6	37.1	88.7
Lesser weever	0.0	2.7	0.5	2.1	0.5	2.1	15.8	31.3	24.0
Dragonet	224.8	84.7	157.1	19.4	36.6	64.5	135.2	272.4	187.7
Dogfish	6.4	13.4	20.8	47.7	68.1	22.7	20.1	34.6	34.7
Rays	3.4	2.3	2.3	15.0	19.8	5.3	16.5	17.5	16.7
Cod	0.0	0.0	0.0	0.5	1.1	0.6	10.9	9.6	35.8
Poor cod	156.0	123.1	150.3	243.0	225.2	214.1	37.2	69.2	331.5
Bib	34.3	8.3	6.6	75.5	47.1	11.6	30.5	33.2	6.0
Whiting	6.7	4.4	27.2	61.5	71.2	76.3	49.1	74.8	129.5
Monk	0.0	0.4	0.8	1.3	6.2	12.0	1.9	1.1	5.5
John dory	1.0	1.5	2.2	0.8	0.2	1.3	0.3	0.4	0.4
Red mullet	0.4	0.6	2.2	0.0	0.0	0.0	0.0	0.0	0.1
Thickback sole	2.8	55.1	98.6	11.6	15.6	39.8	2.9	10.0	42.3
Edible crab	1.0	2.1	1.1	3.7	4.5	3.0	9.9	10.9	8.5

Table 6.1 Catch rate of sole from Belgium, Netherlands and UK surveys in the North Sea and VIId,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
1992		76.0	23.0	14.3	1.7	1.5		1.7	0.1	0.8	0.6
1993		32.0	27.5	4.0	3.0	1.0	1.0	1.0		1.5	3.0

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

Age	0	1	2	3	4	5	6	7	8	9	10+
Year											
1985		2.34	6.43	3.58	1.68	0.74	0.21	0.00			0.02
1986		6.61	4.92	1.47	0.83	0.53	0.17	0.13		0.02	0.05
1987	0.05	6.15	11.11	1.60	0.54	0.52	0.17	0.21	0.05		0.02
1988		75.23	12.10	2.58	0.95	0.12	0.16	0.10	0.10	0.02	0.11
1989		8.00	60.40	3.90	3.60	0.63	0.13	0.20	0.00	0.04	0.03
1990	0.09	18.99	20.91	18.34	0.57	0.59	0.48	0.09	0.05	0.01	0.01
1991	0.95	3.23	21.15	5.14	5.22	0.11	0.12	0.07	0.02	0.01	0.03
1992	0.18	61.01	22.19	8.73	1.89	2.47	0.05	0.12	0.07	0.01	0.06
1993	0.03	5.10	25.14	0.83	3.59	2.29	4.01	0.03	0.05	0.06	0.05

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	0.00	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
1992	0.0	1.4	12.0	10.0	0.7	1.1	0.3	0.5	0.10	0.20	0.60
1993	0.0	0.5	17.5	8.4	7.0	0.8	1.0	0.3	0.23	0.04	0.38

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

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
1992	0.0	0.2	5.8	11.6	1.5	1.3	0.5	0.3	0.2	0.4	0.5
1993	0.0	0.3	2.7	5.4	5.4	1.0	0.5	0.3	0.2	0.1	0.7

Table 6.1 (continued)

United Kingdom (No/hr/8m trawl) Bristol Channel (VIIf&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
1992	0.3	30.7	18.9	12.1	3.0	2.1	1.5	0.1	0.5	0.2	1.0
1993	0.0	7.4	13.0	4.5	6.4	2.6	0.7	0.1	0.1	0.2	0.2

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
1992	0.1	14.9	26.2	53.9	14.3	6.2	1.2	0.5	7.9	1.7	0.8
1993	0.0	3.6	13.3	7.0	11.3	2.7	1.0	0.4	0.7	1.9	0.9

Table 6.2 Catch rate of plaice from Belgium, Netherlands and UK surveys in the North Sea and Vld,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	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	0.5	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
1992		8.0	5.0	5.0	3.0	0.0	1.0	0.0	0.0	0.0	0.0
1993		10.8	67.4	1.8	0.2	0.2	0.0	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		113.5	184.9	44.8	17.48	24.30	1.27	0.44	0.22	0.19	0.56
1986		596.0	121.4	52.8	14.35	6.87	0.74	0.47	0.23	0.16	0.28
1987		203.8	710.8	30.0	6.40	3.08	1.14	0.46	0.15	0.13	0.24
1988		541.7	134.4	188.0	13.38	3.58	1.67	1.05	0.47	0.20	0.42
1989		398.0	340.2	51.3	55.00	6.63	0.80	0.39	0.61	0.14	0.30
1990		123.5	112.8	68.7	32.00	8.58	0.84	0.21	0.48	0.22	0.16
1991		174.7	133.6	32.2	12.35	4.19	5.83	0.22	0.20	0.13	0.16
1992		166.3	108.7	21.6	5.23	2.97	2.79	1.44	0.22	0.07	0.09
1993		125.7	165.8	36.2	6.98	1.25	1.35	0.49	0.51	0.17	0.09

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

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
1992	0.0	16.5	12.5	4.2	4.2	5.6	4.9	3.4	0.66	0.49	0.72
1993	0.1	3.2	13.4	5.0	1.7	1.9	1.6	2.0	2.78	0.39	0.57

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

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
1992	0.0	4.3	1.0	1.4	0.5	1.3	0.7	0.5	0.1	0.2	0.2
1993	0.0	0.7	2.4	3.3	1.1	0.5	1.2	0.7	0.6	0.0	0.1

Table 6.2 (continued)

United Kingdom (No/hr/8m trawl) Bristol Channel

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
1992	0.2	28.4	18.5	0.8	0.4	1.2	0.3	0.3	0.0	0.0	0.1
1993	0.1	3.9	13.1	2.9	0.7	0.3	0.8	0.2	0.0	0.0	0.0

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

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
1992	4.8	50.7	96.1	38.0	2.0	2.1	1.5	1.6	0.1	0.0	2.0
1993	9.3	168.5	155.4	38.7	13.0	2.0	1.9	1.0	0.4	0.4	0.6

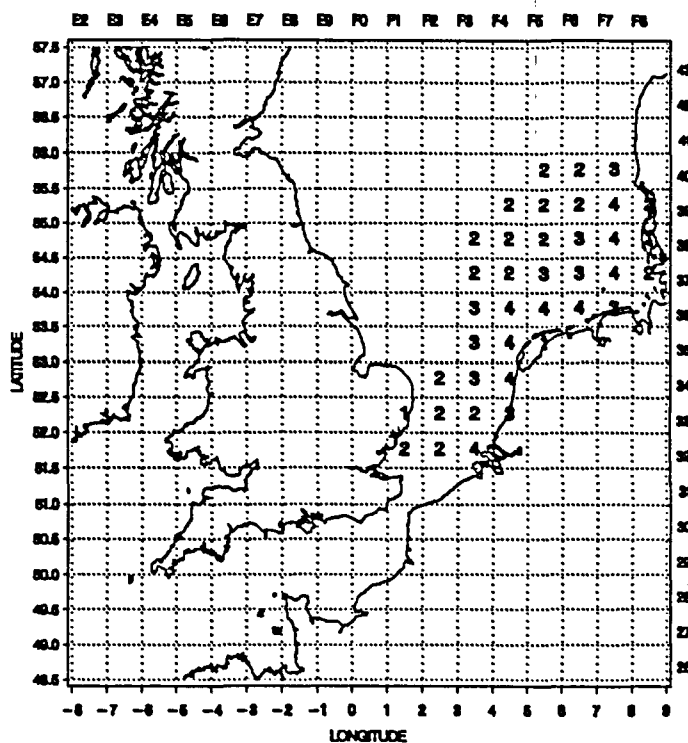
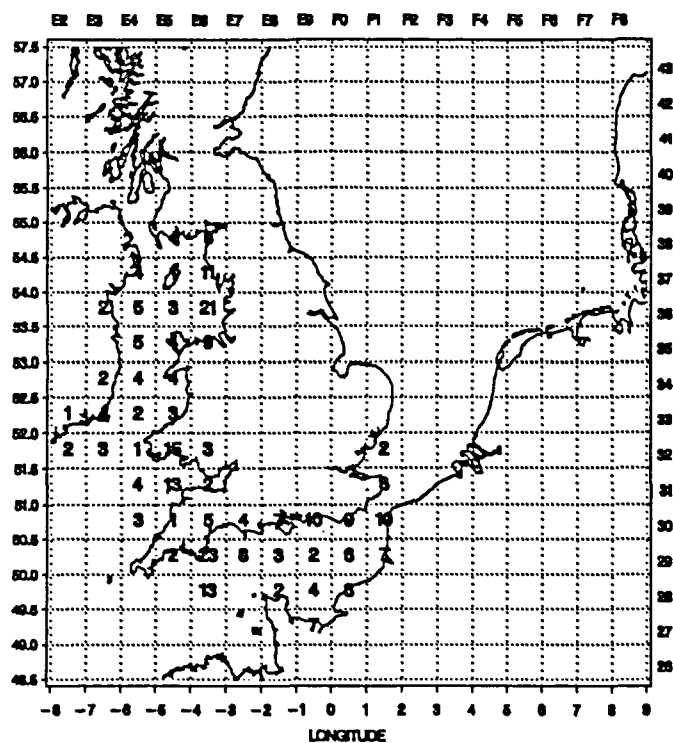
ENGLAND

Number of hauls

NETHERLANDS

Number of hauls

Figure 2.1 Number of hauls in each rectangle in different survey areas

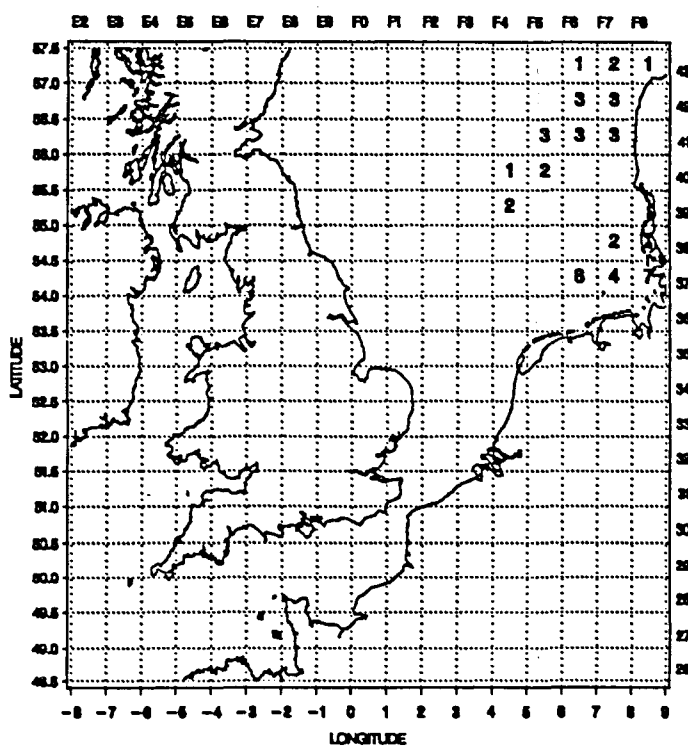
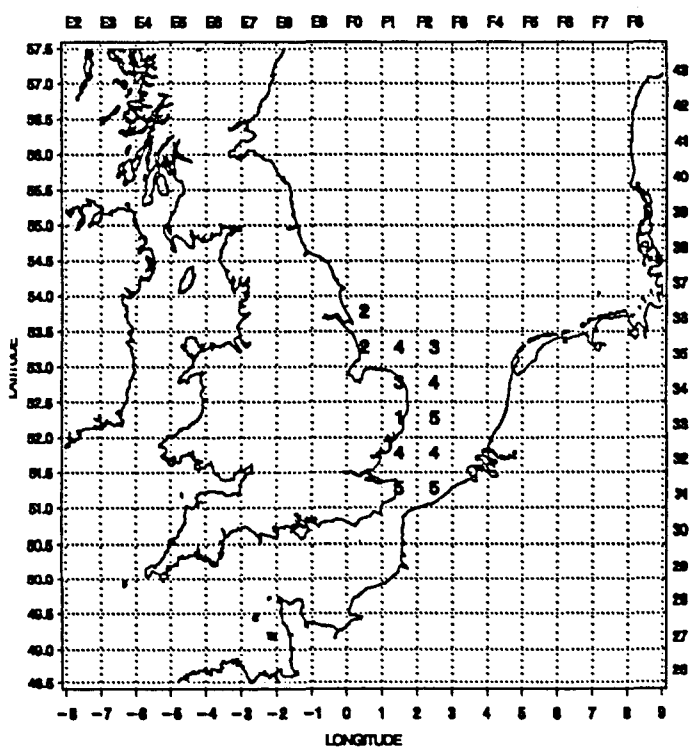


BELGIUM

Number of hauls

GERMANY

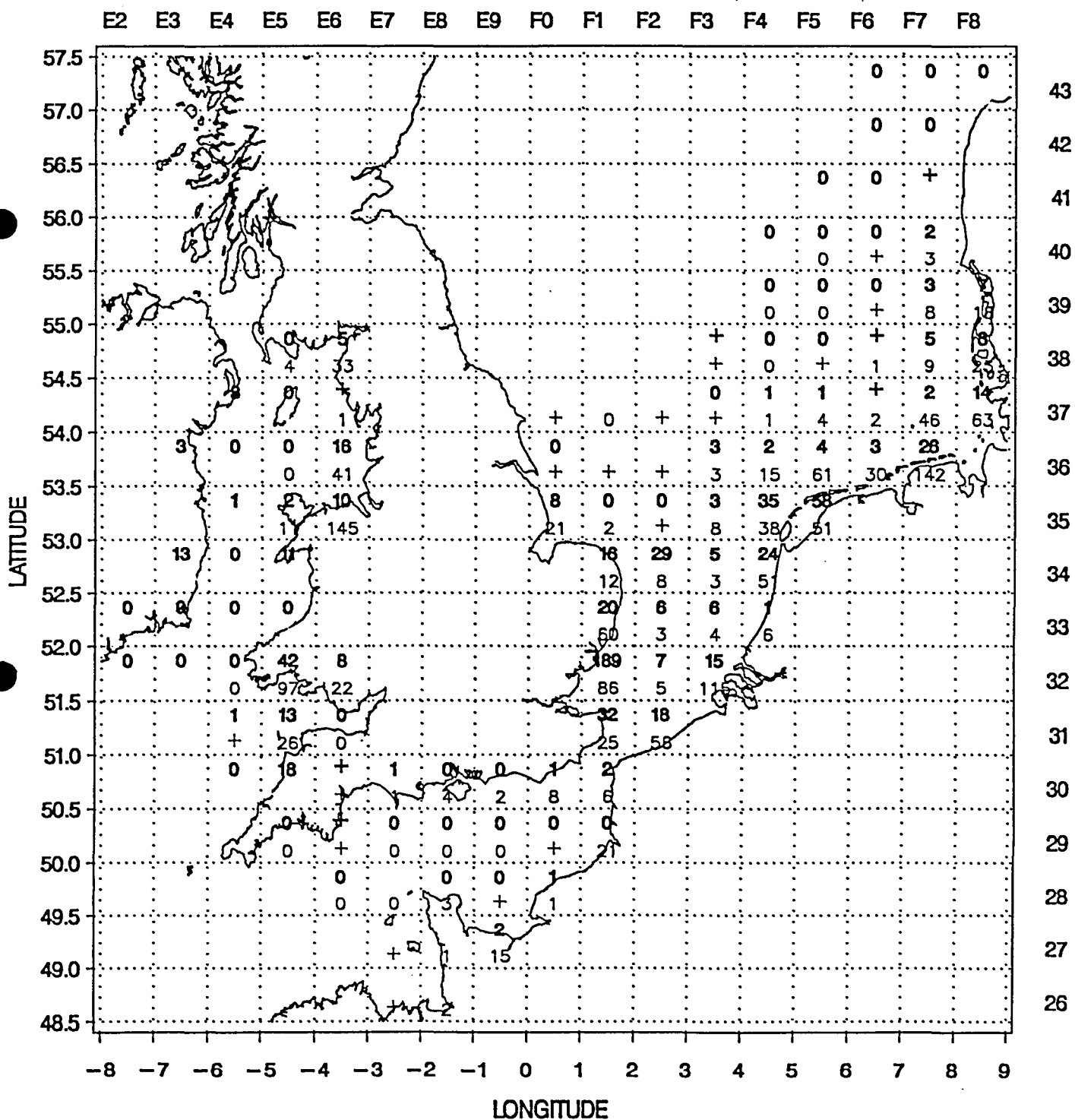
Number of hauls



BEAM TRAWL SURVEY 1993

SOLE 1 gp

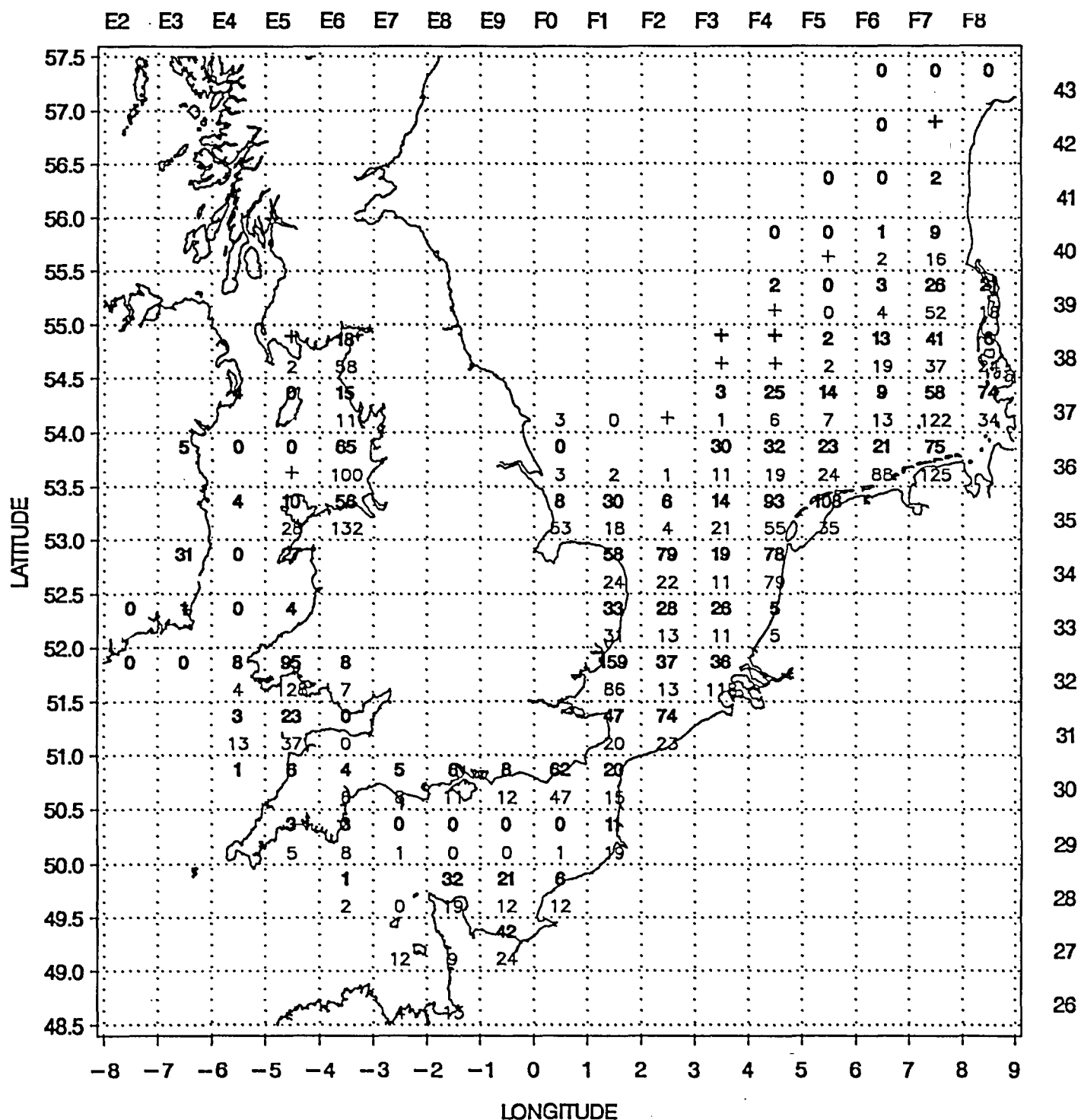
Figure 4.1 Distribution of 1-gp sole, *Solea solea*, (No/h/8m) in each rectangle.
 += <0.5/h. Upper figure 1993 survey mean; lower figure historic survey mean.



BEAM TRAWL SURVEY 1993

SOLE 2 gp

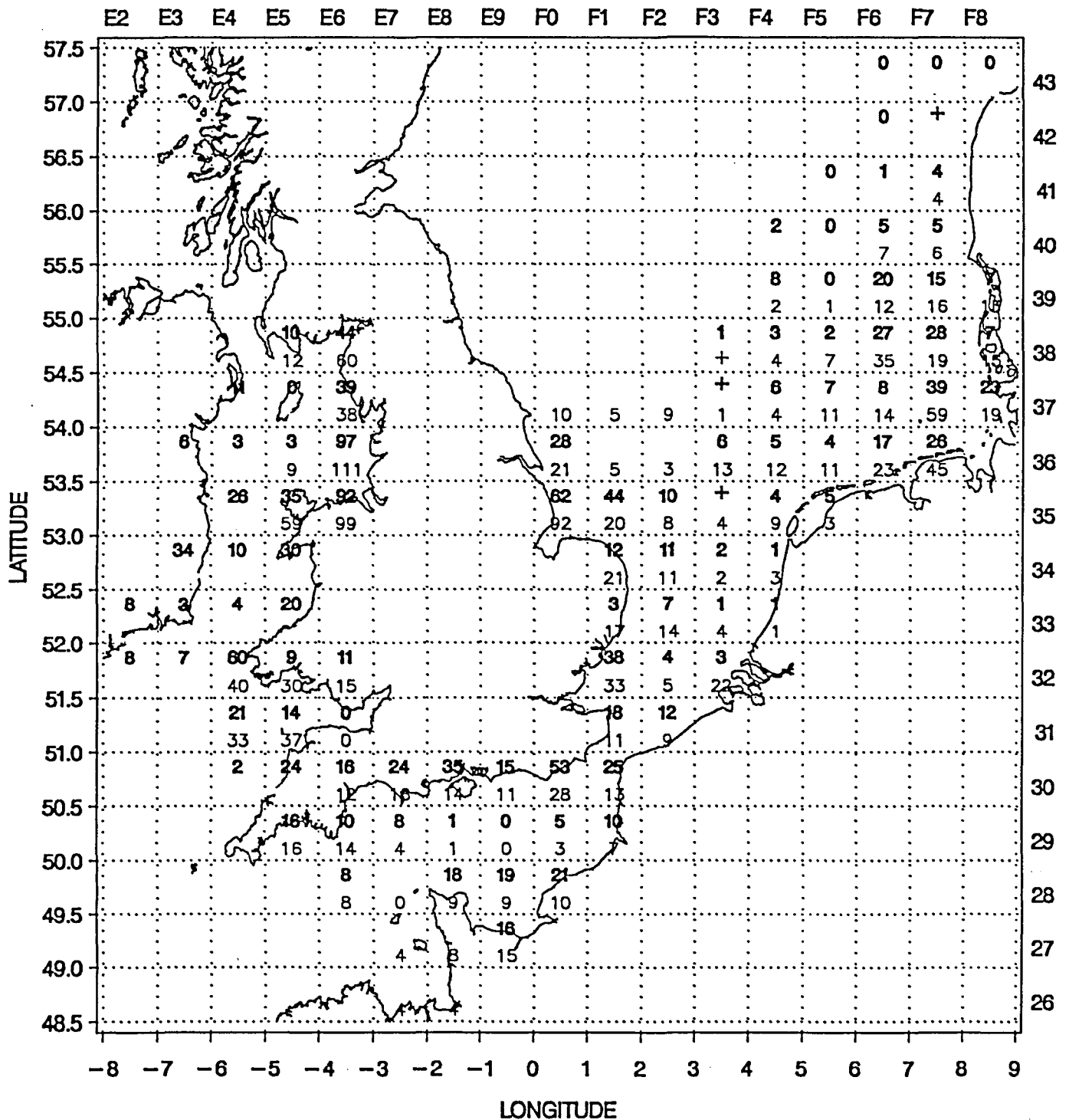
Figure 4.2 Distribution of 2-gp sole, *Solea solea*, (No/h/8m) in each rectangle.
 += <0.5/h. Upper figure 1993 survey mean; lower figure historic survey mean.



BEAM TRAWL SURVEY 1993

SOLE 3+ gp

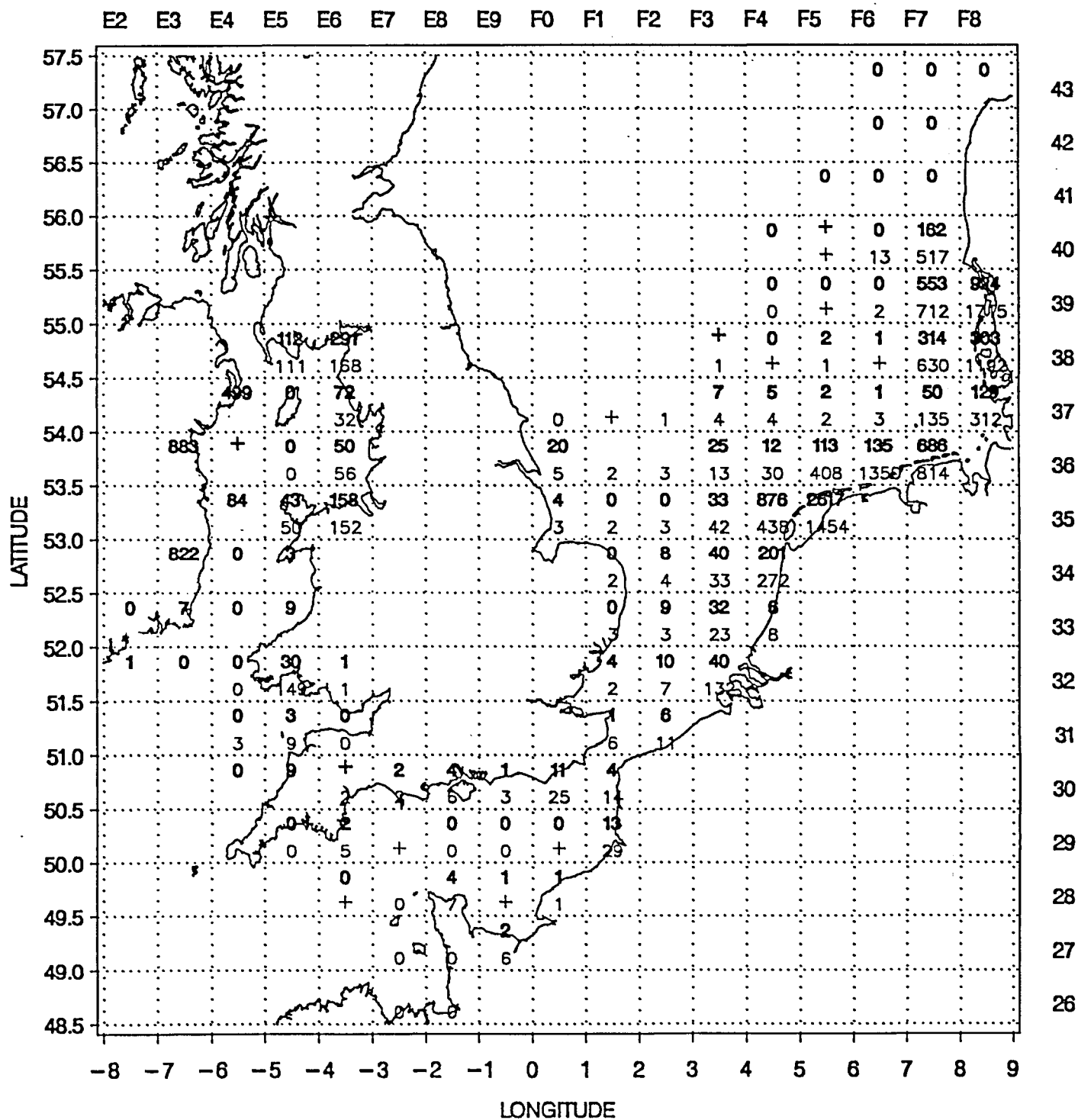
Figure 4.3 Distribution of 3+gp sole *Solea solea*, (No/h/8m) in each rectangle.
 += <0.5/h. Upper figure 1993 survey mean; lower figure historic survey mean.



BEAM TRAWL SURVEY 1993

PLAICE 1 gp

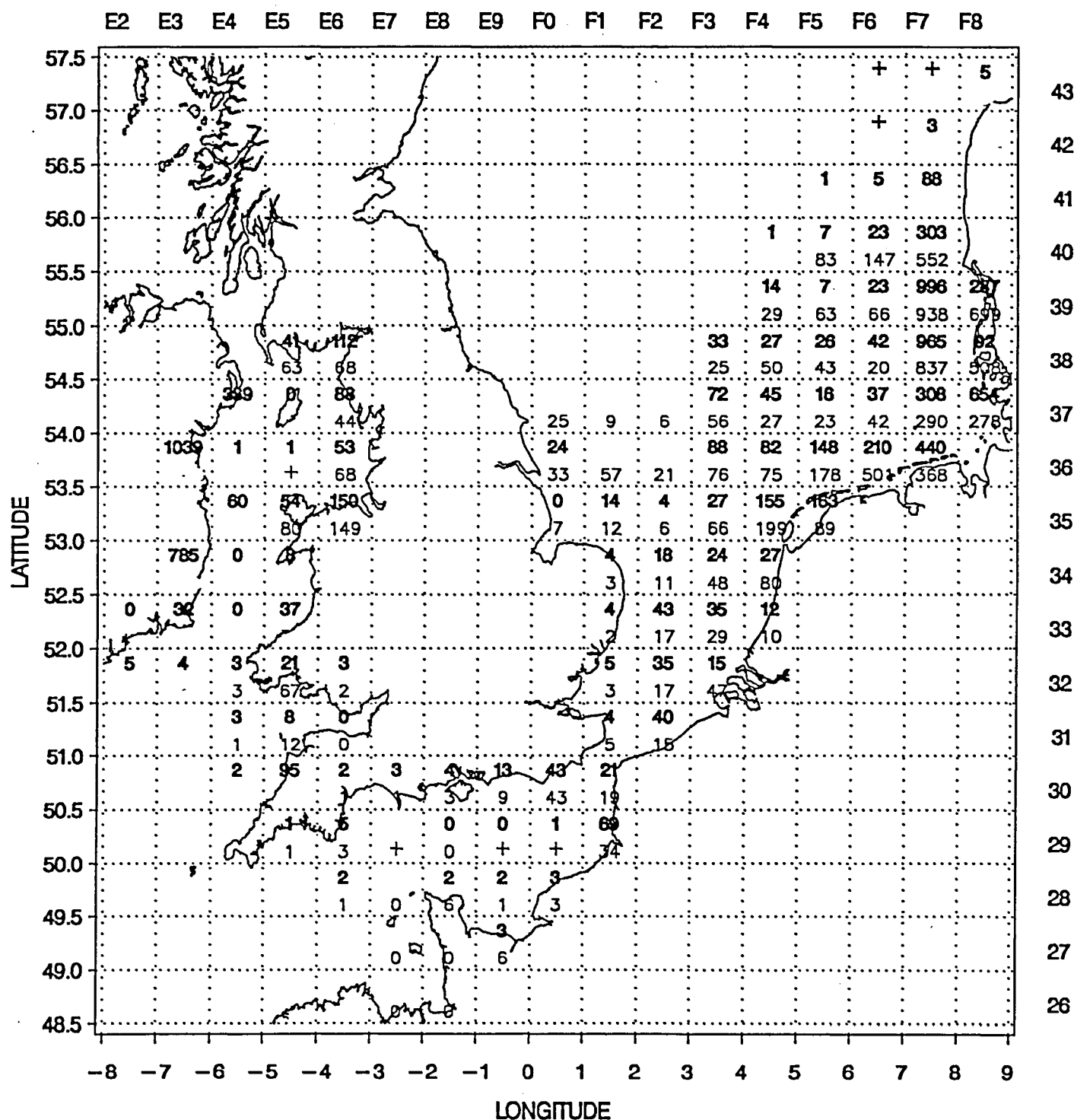
Figure 4.4 Distribution of 1-gp plaice, *Pleuronectes platessa*, (No/h/8m) in each rectangle. + = <0.5/h. Upper figure 1993 survey mean; lower figure historic survey mean.



BEAM TRAWL SURVEY 1993

PLAICE 2 gp

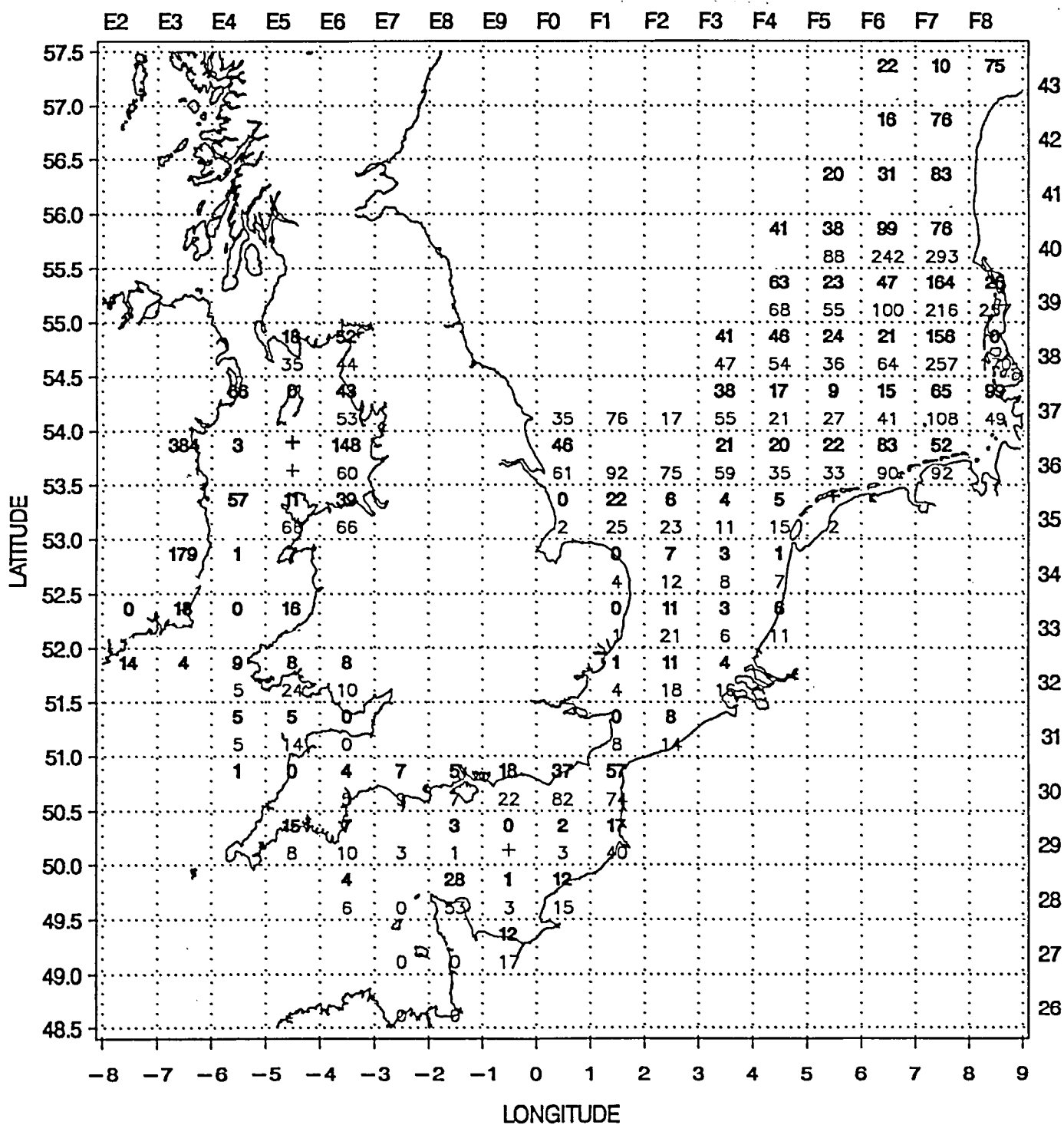
Figure 4.5 Distribution of 2-gp plaice, *Pleuronectes platessa*, (No/h/8m) in each rectangle. + = <0.5/h. Upper figure 1993 survey mean; lower figure historic survey mean.



BEAM TRAWL SURVEY 1993

PLAICE 3+ gp

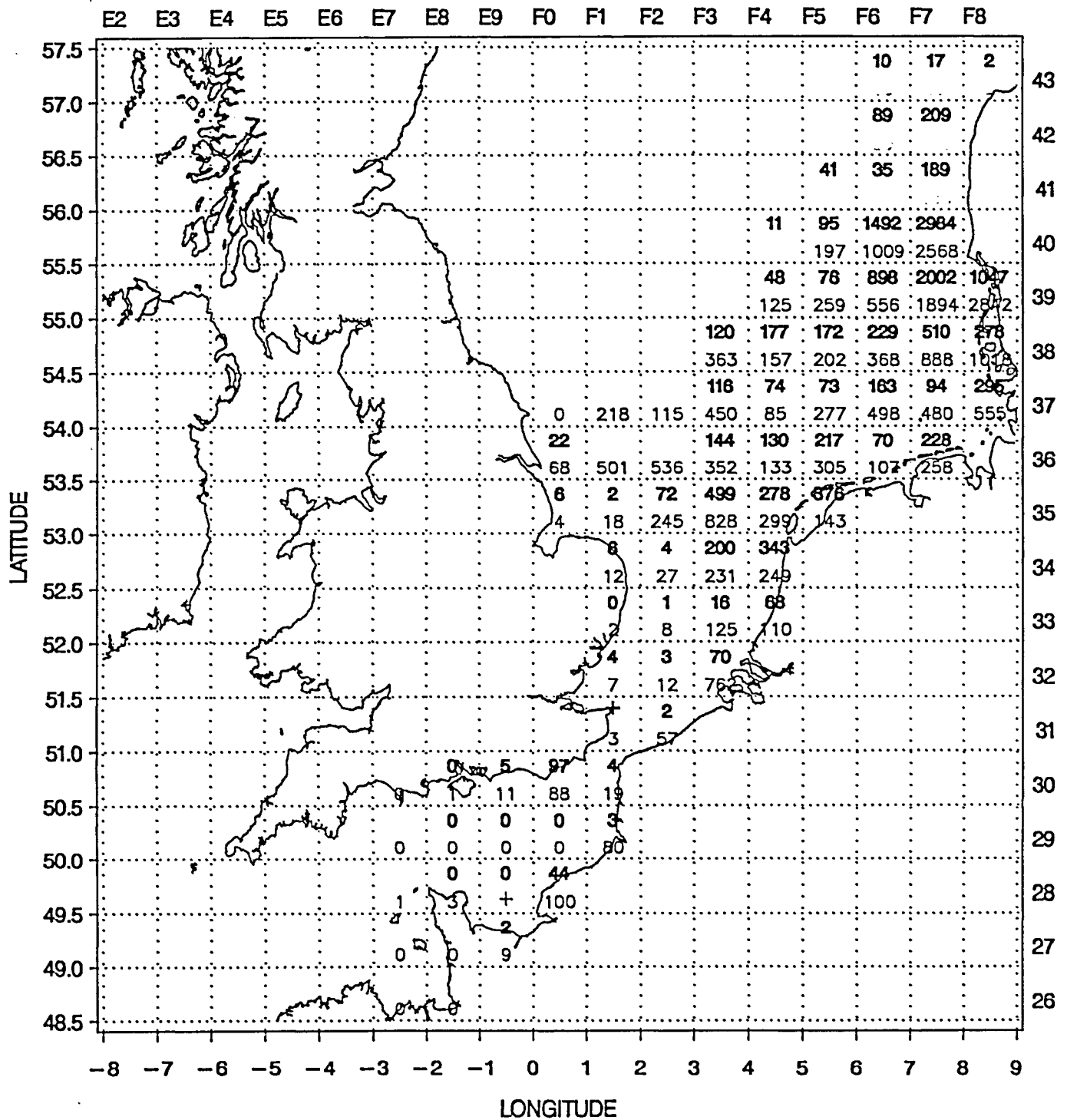
Figure 4.6 Distribution of 3+-gp plaice, *Pleuronectes platessa*, (No/h/8m) in each rectangle.
 += <0.5/h. Upper figure 1993 survey mean; lower figure historic survey mean.



BEAM TRAWL SURVEY 1993

DAB 1 gp

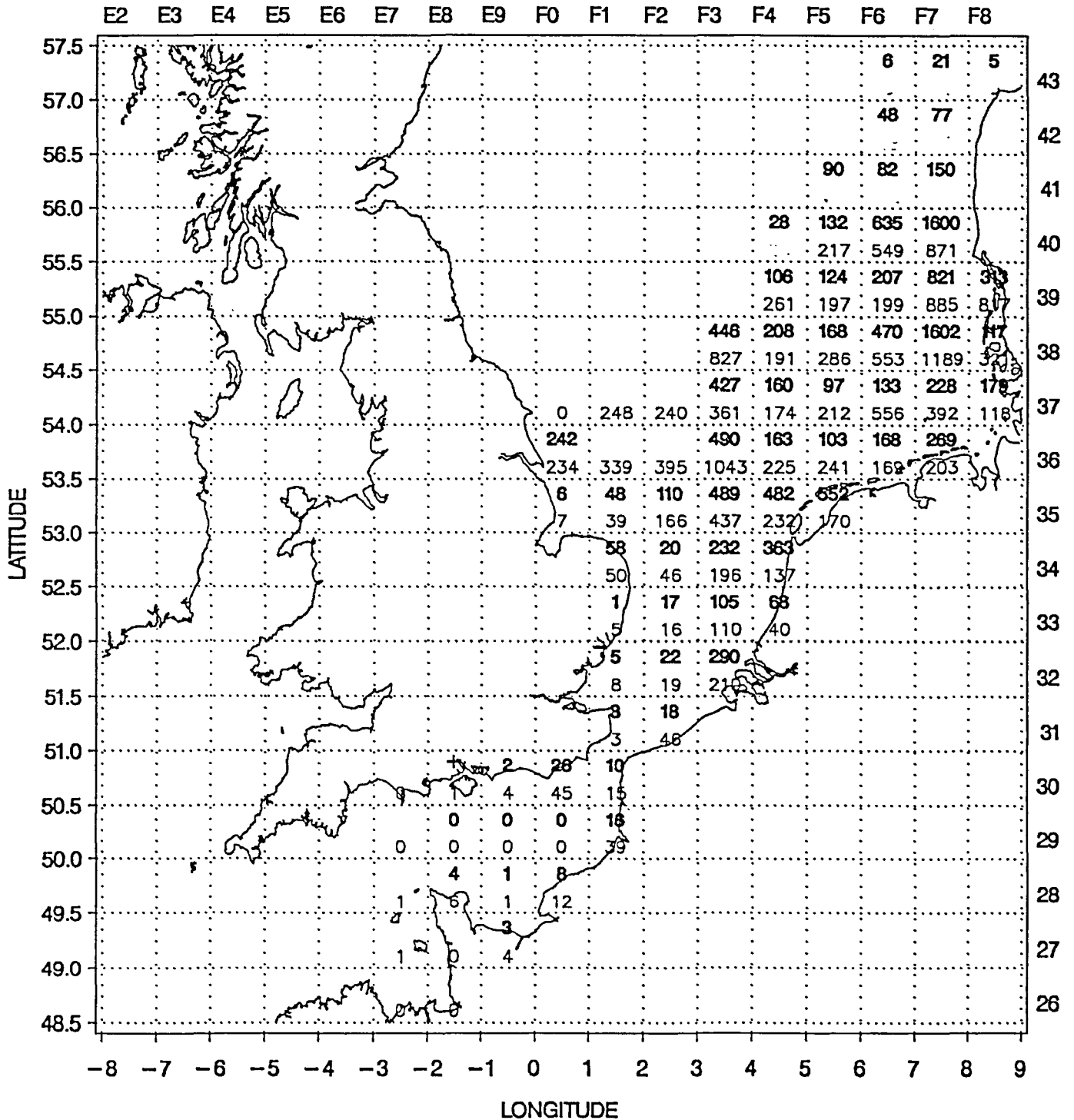
Figure 4.7 Distribution of 1-gp dab, *Limanda limanda*, (No/h/8m) in each rectangle.
+ = <0.5/h. Upper figure 1993 survey mean; lower figure historic survey mean.



BEAM TRAWL SURVEY 1993

DAB 2 gp

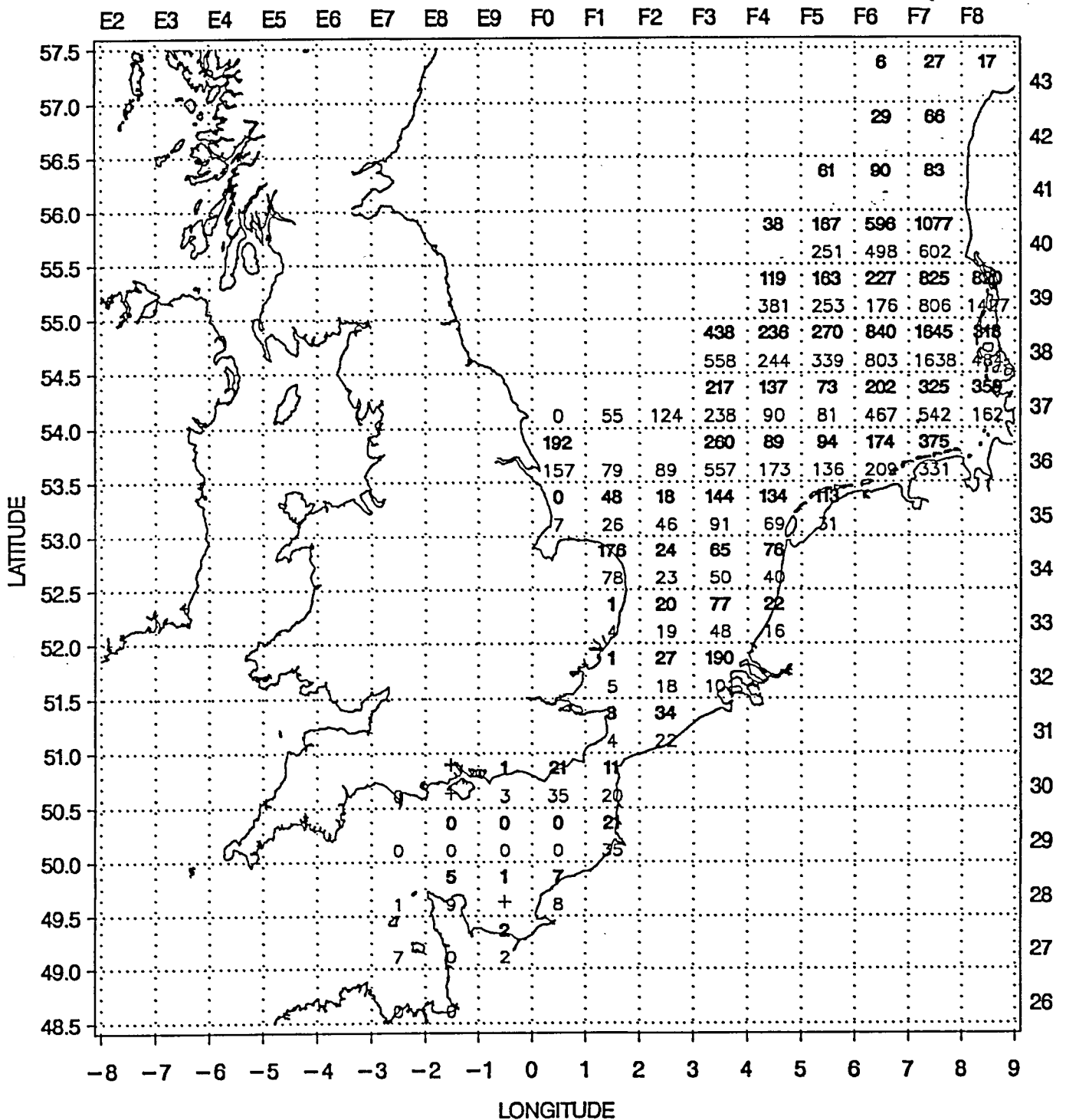
Figure 4.8 Distribution of 2-gp dab, *Limanda limanda*, (No/h/8m) in each rectangle.
+ = <0.5/h. Upper figure 1993 survey mean; lower figure historic survey mean.



BEAM TRAWL SURVEY 1993

DAB 3+ gp

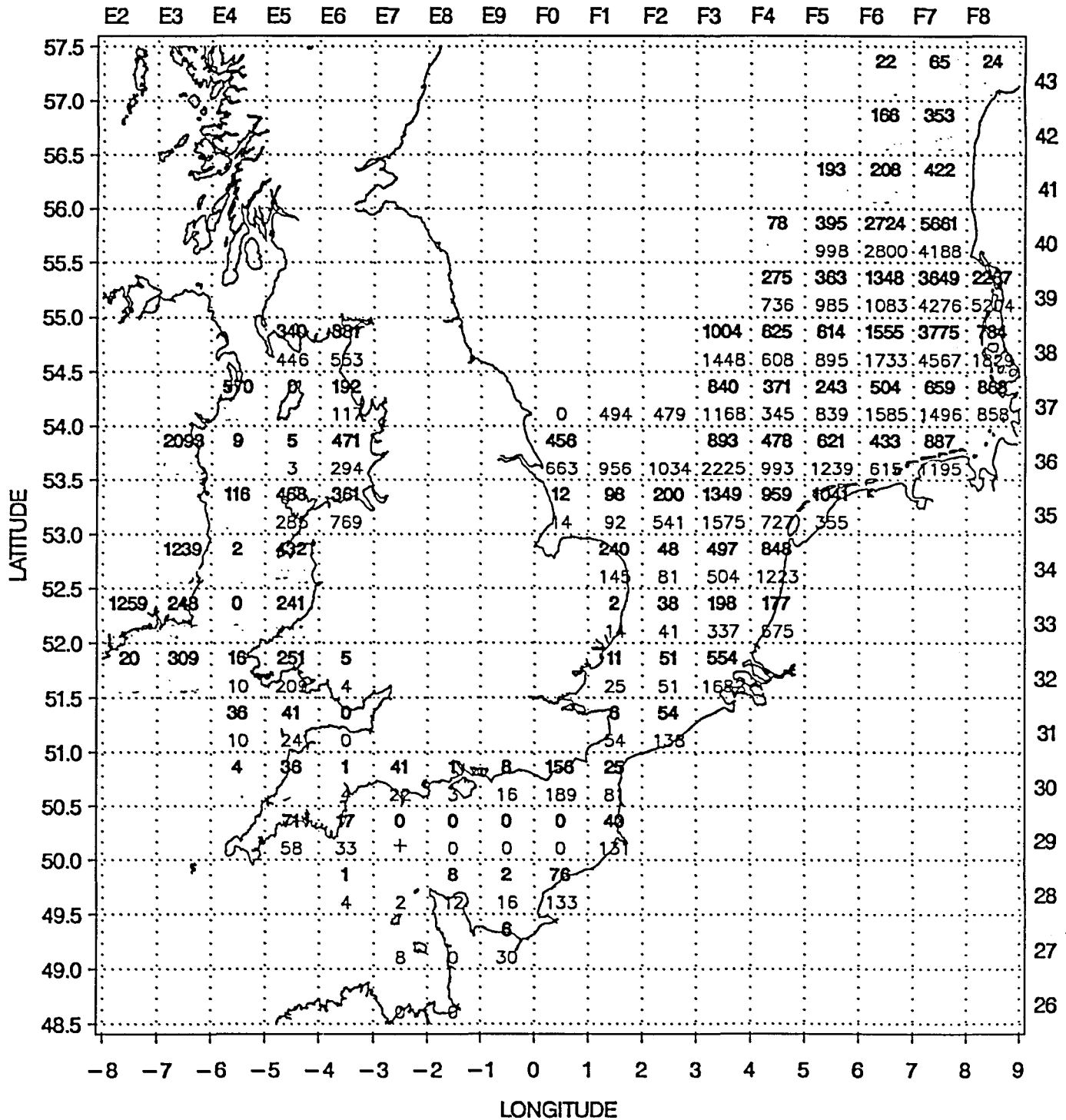
Figure 4.9 Distribution of 3+-gp dab, *Limanda limanda*, (No/h/8m) in each rectangle.
+ = <0.5/h. Upper figure 1993 survey mean; lower figure historic survey mean.



BEAM TRAWL SURVEY 1993

DAB UNAGED

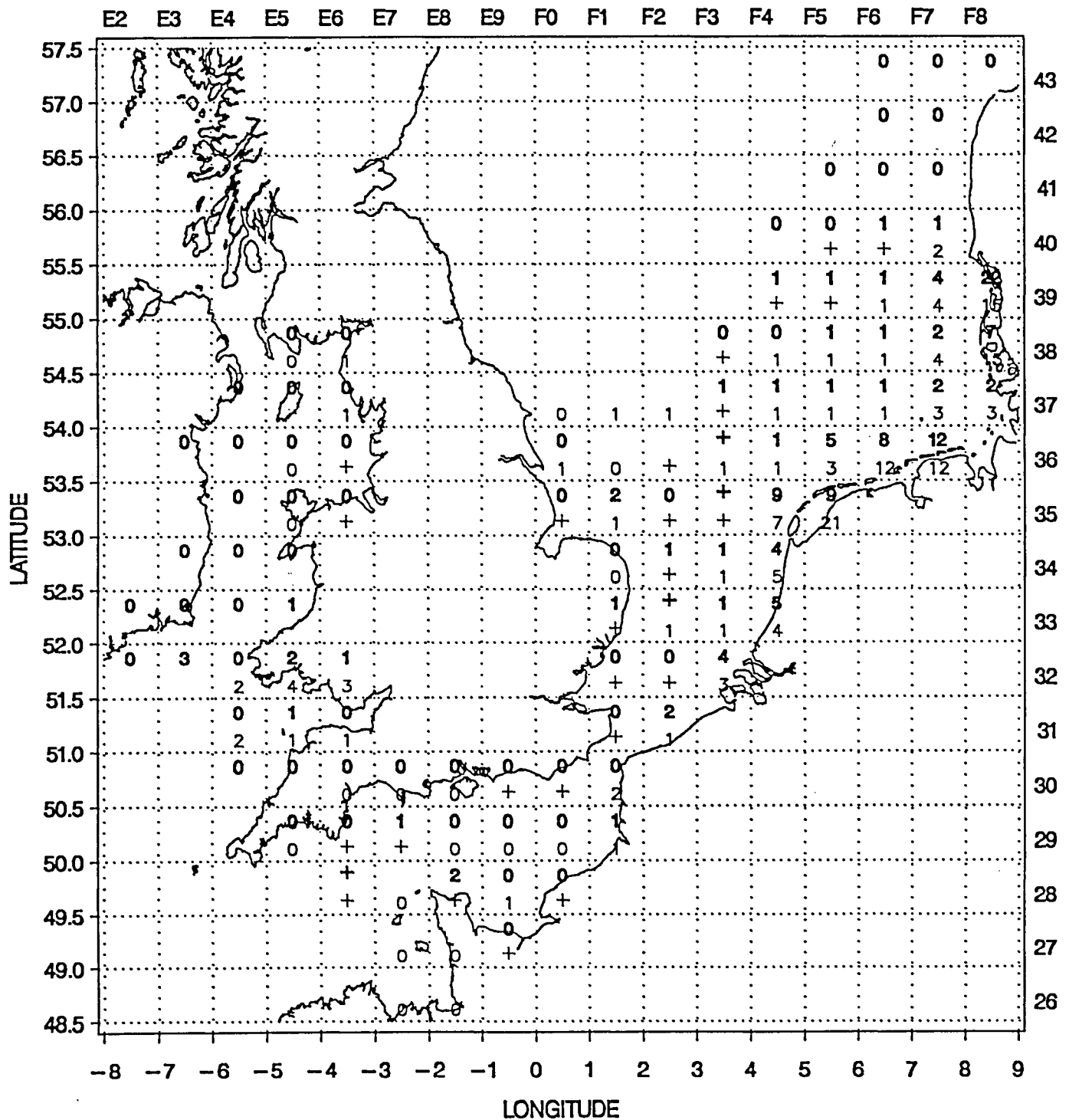
Figure 4.10 Distribution of unaged dab, *Limanda limanda*, (No/h/8m) in each rectangle.
 += <0.5/h. Upper figure 1993 survey mean; lower figure historic survey mean.



BEAM TRAWL SURVEY 1993

TURBOT

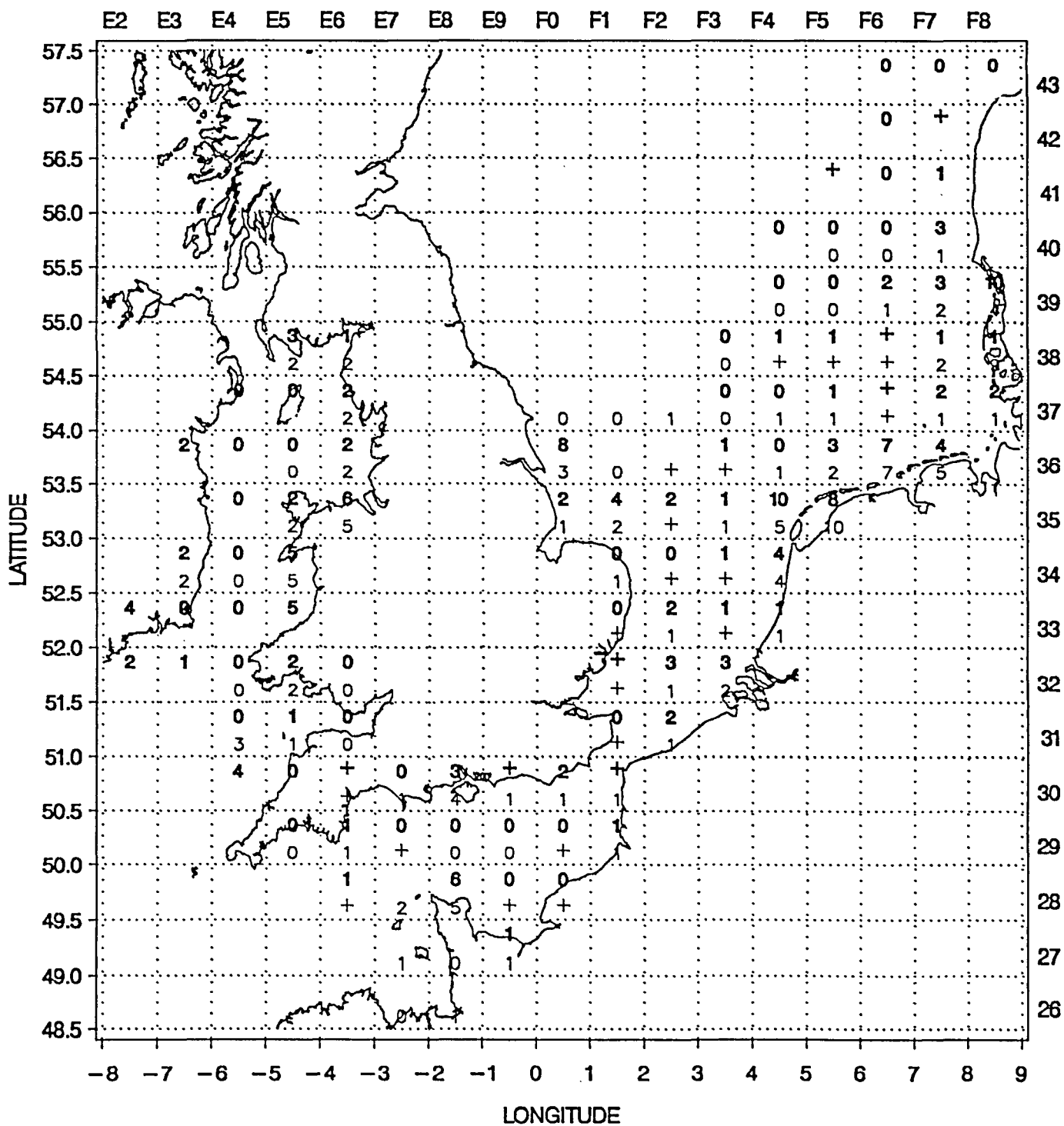
Figure 4.11 Distribution of turbot, *Scophthalmus maximus*, (No/h/8m) in each rectangle.
 += <0.5/h. Upper figure 1993 survey mean; lower figure historic survey mean.



BEAM TRAWL SURVEY 1993

BRILL

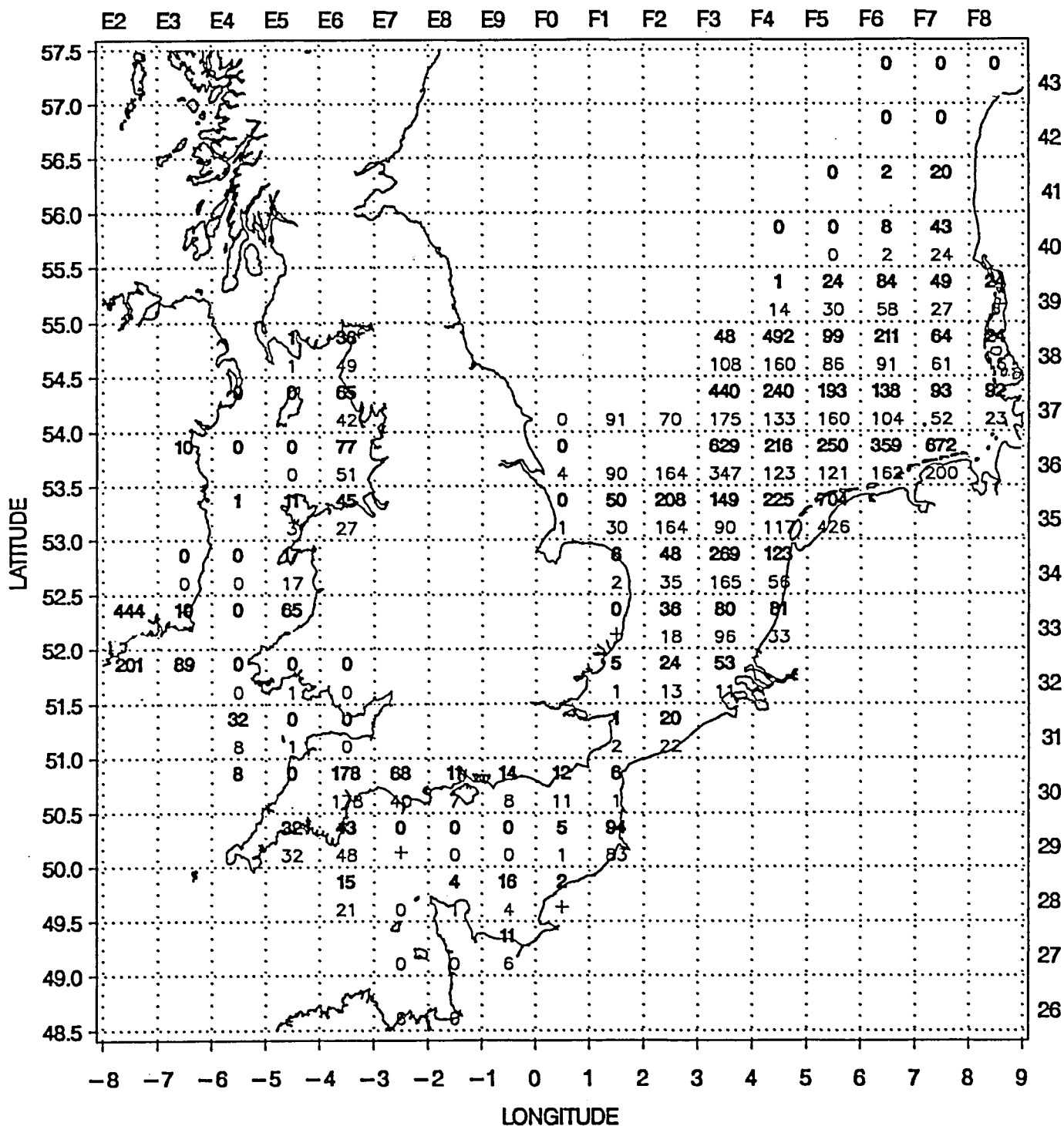
Figure 4.12 Distribution of brill, *Scophthalmus rhombus*, (No/h/8m) in each rectangle.
 += <0.5/h. Upper figure 1993 survey mean; lower figure historic survey mean.



BEAM TRAWL SURVEY 1993

SCALDFISH

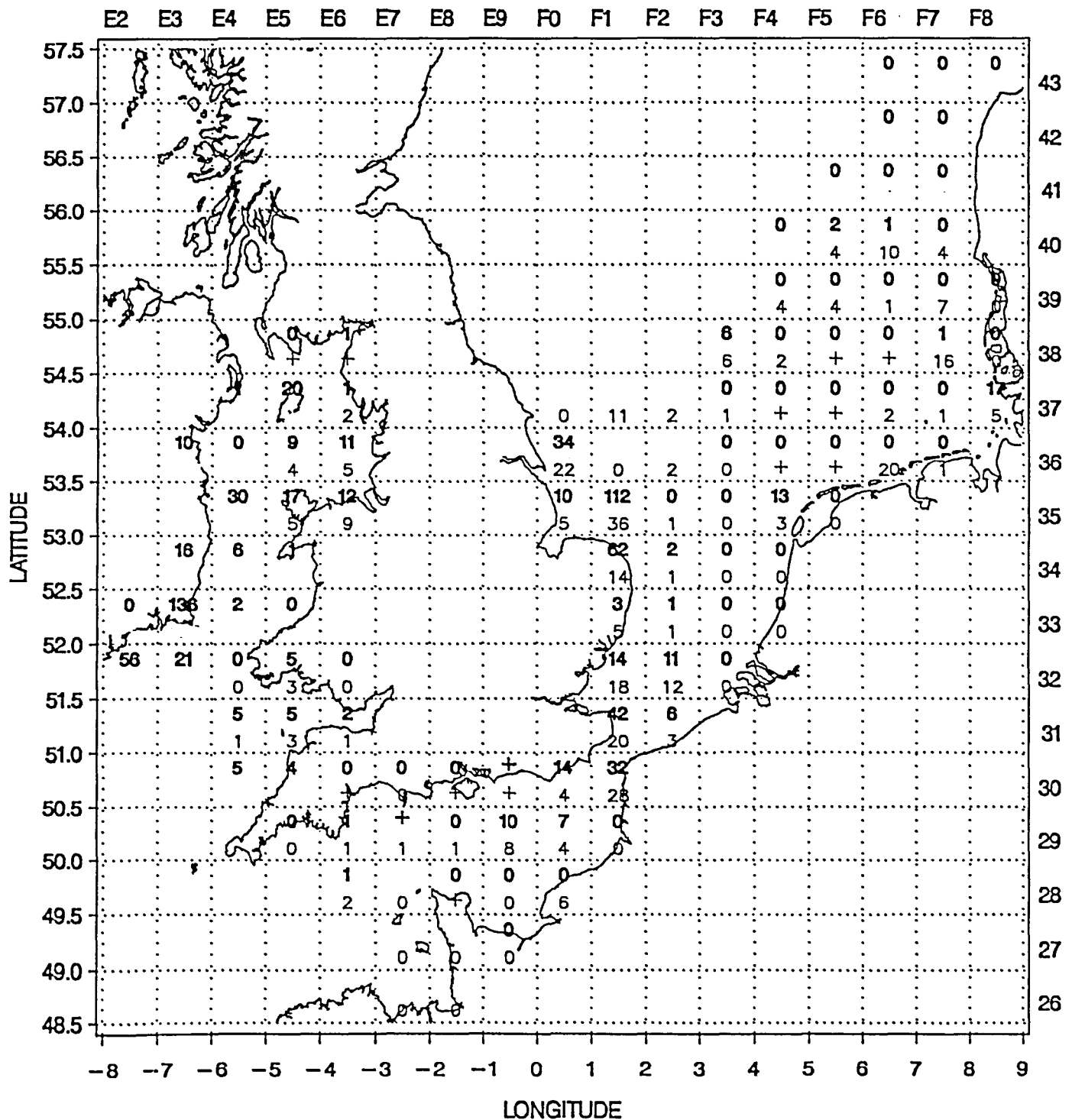
Figure 4.13 Distribution of scaldfish, *Arnoglossus laterna*, (No/h/8m) in each rectangle.
 += <0.5/h. Upper figure 1993 survey mean; lower figure historic survey mean.



BEAM TRAWL SURVEY 1993

LEMON SOLE

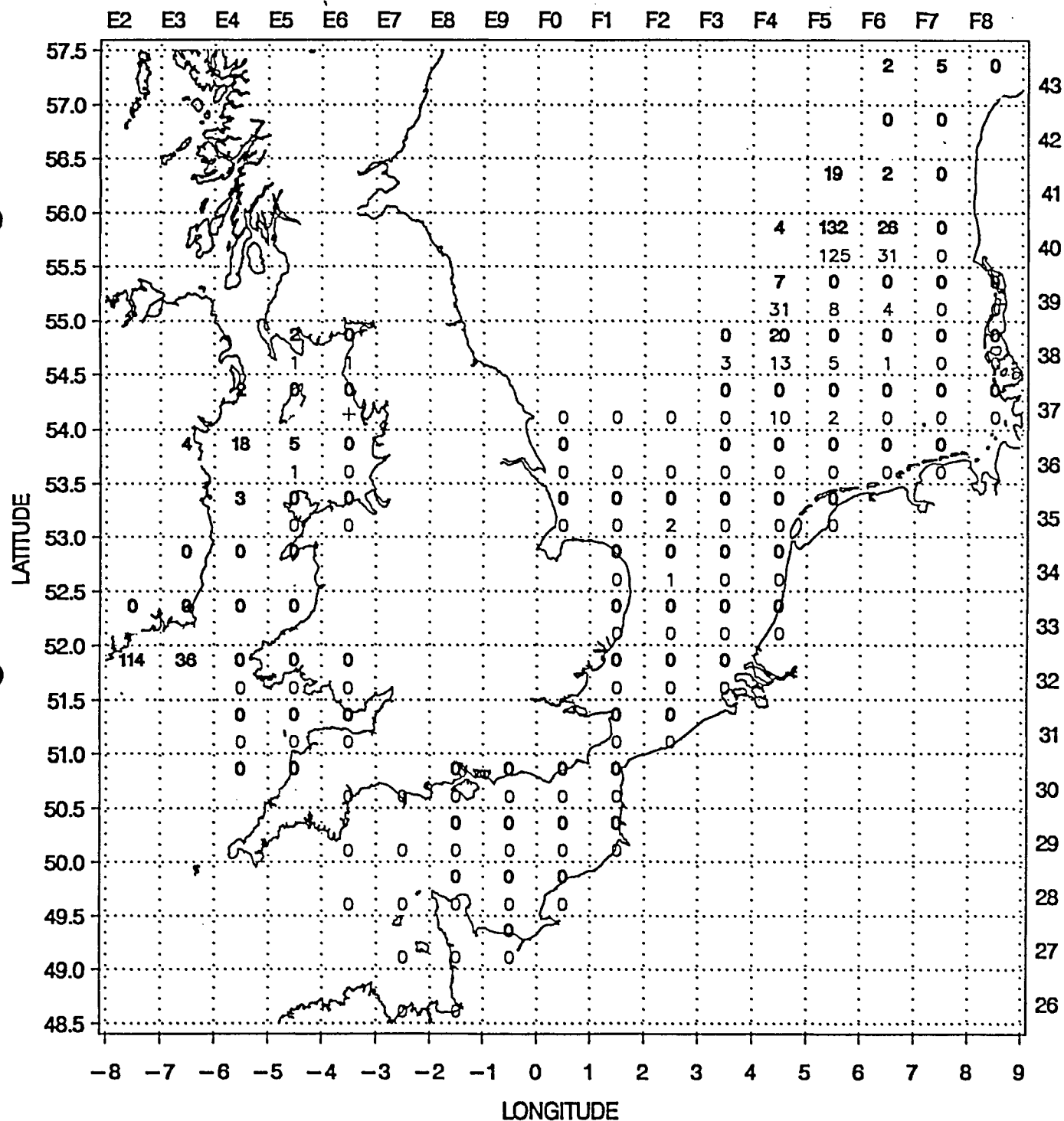
Figure 4.14 Distribution of lemon sole, *Microstomus kitt*, (No/l/8m) in each rectangle.
 += <0.5/h. Upper figure 1993 survey mean; lower figure historic survey mean.



BEAM TRAWL SURVEY 1993

LONG ROUGH DAB

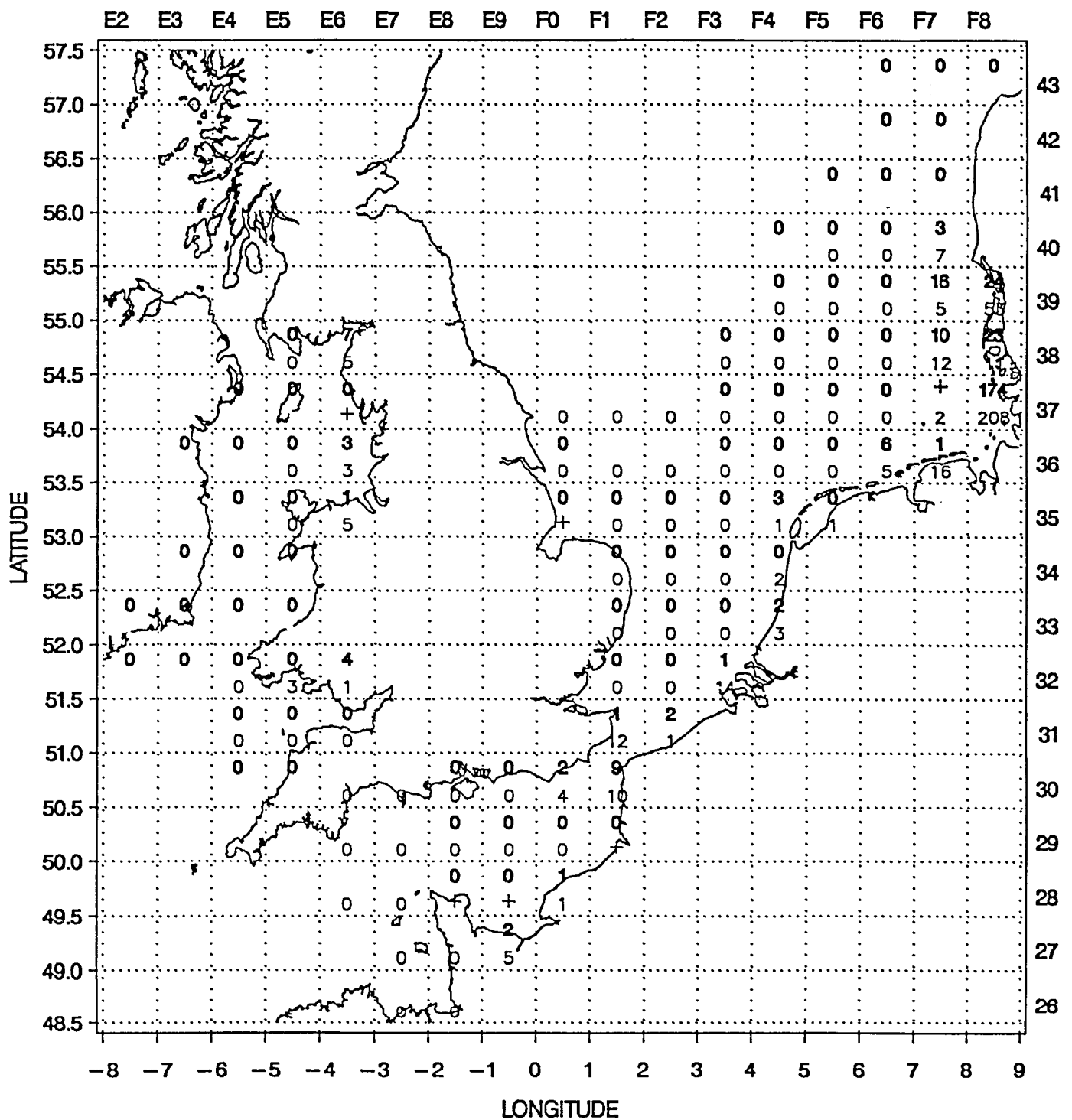
Figure 4.15 Distribution of long rough dab, *Hipploglossoides platessoides*, (No/h/8m) in each rectangle. + = <0.5/h. Upper figure 1993 survey mean; lower figure historic survey mean.



BEAM TRAWL SURVEY 1993

FLOUNDER

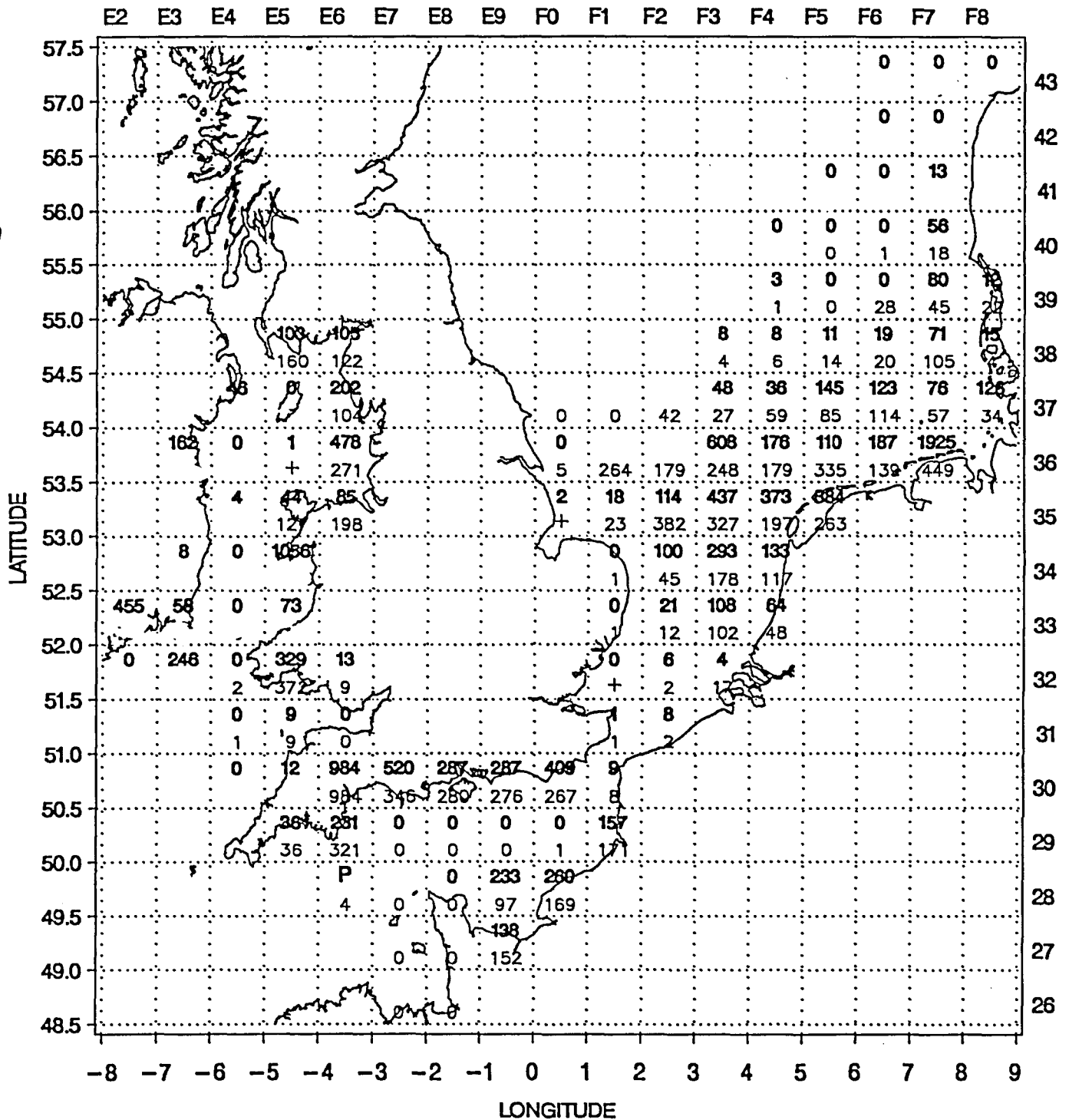
Figure 4.16 Distribution of flounder, *Platichthys flesus*, (No/h/8m) in each rectangle.
 += <0.5/h. Upper figure 1993 survey mean; lower figure historic survey mean.



BEAM TRAWL SURVEY 1993

SOLENETTE

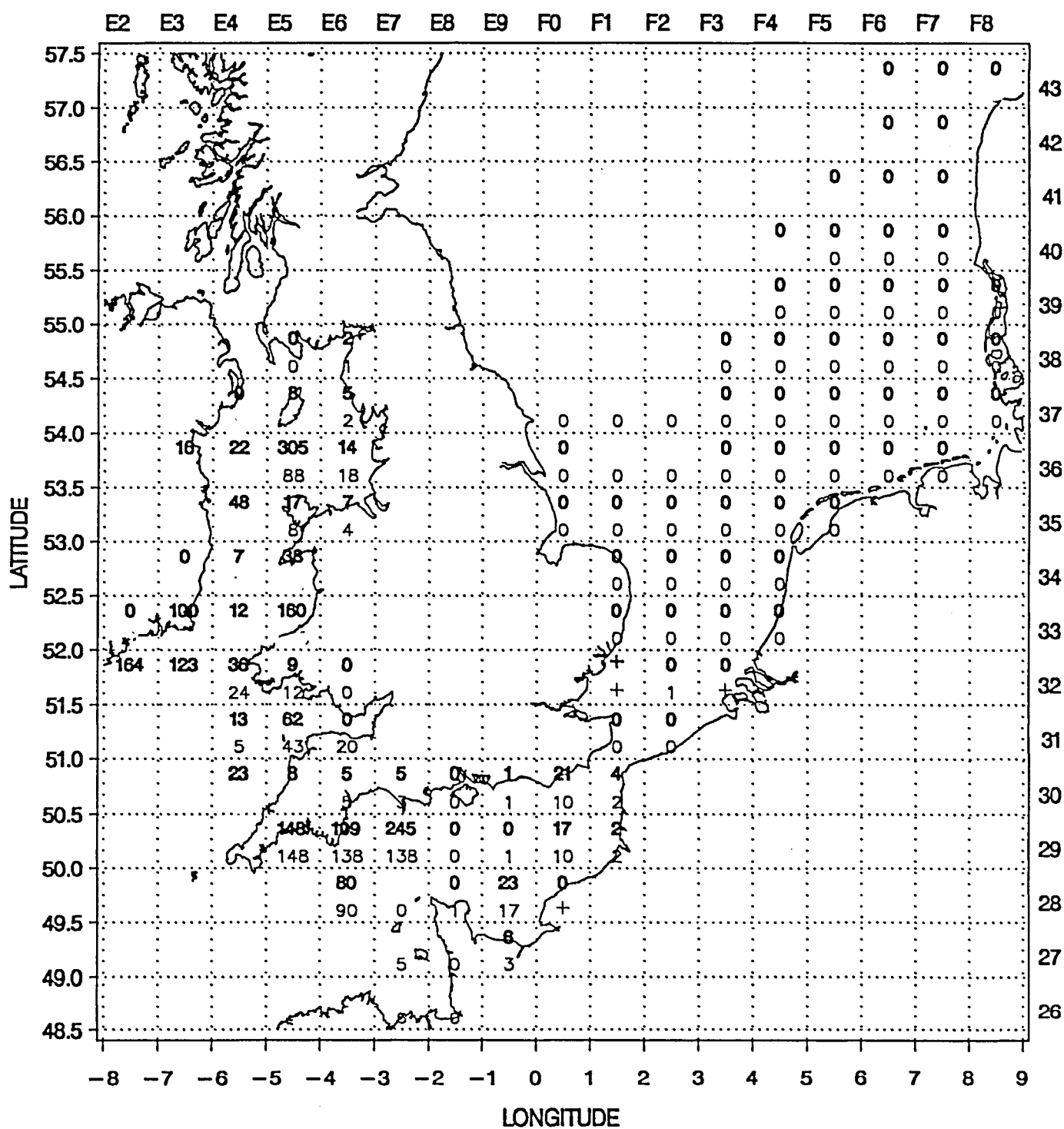
Figure 4.17 Distribution of solenette, *Buglossidium luteum*, (No/h/8m) in each rectangle.
 += <0.5/h. Upper figure 1993 survey mean; lower figure historic survey mean.



BEAM TRAWL SURVEY 1993

THICKBACK SOLE

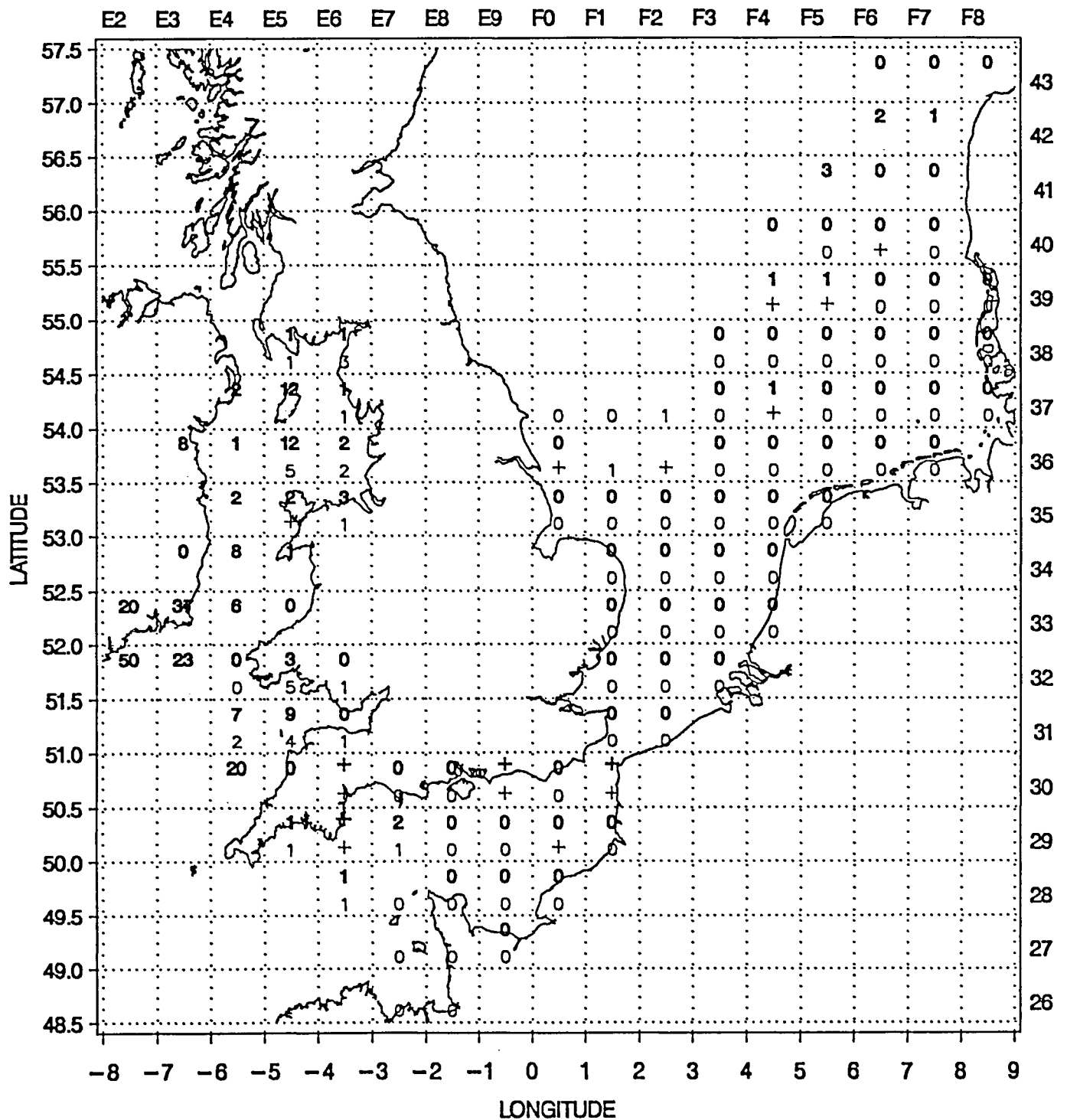
Figure 4.18 Distribution of thickback sole, *Microchirus variegatus*, (No/h/8m) in each rectangle. + = <0.5/h. Upper figure 1993 survey mean; lower figure historic survey mean.



BEAM TRAWL SURVEY 1993

MONK

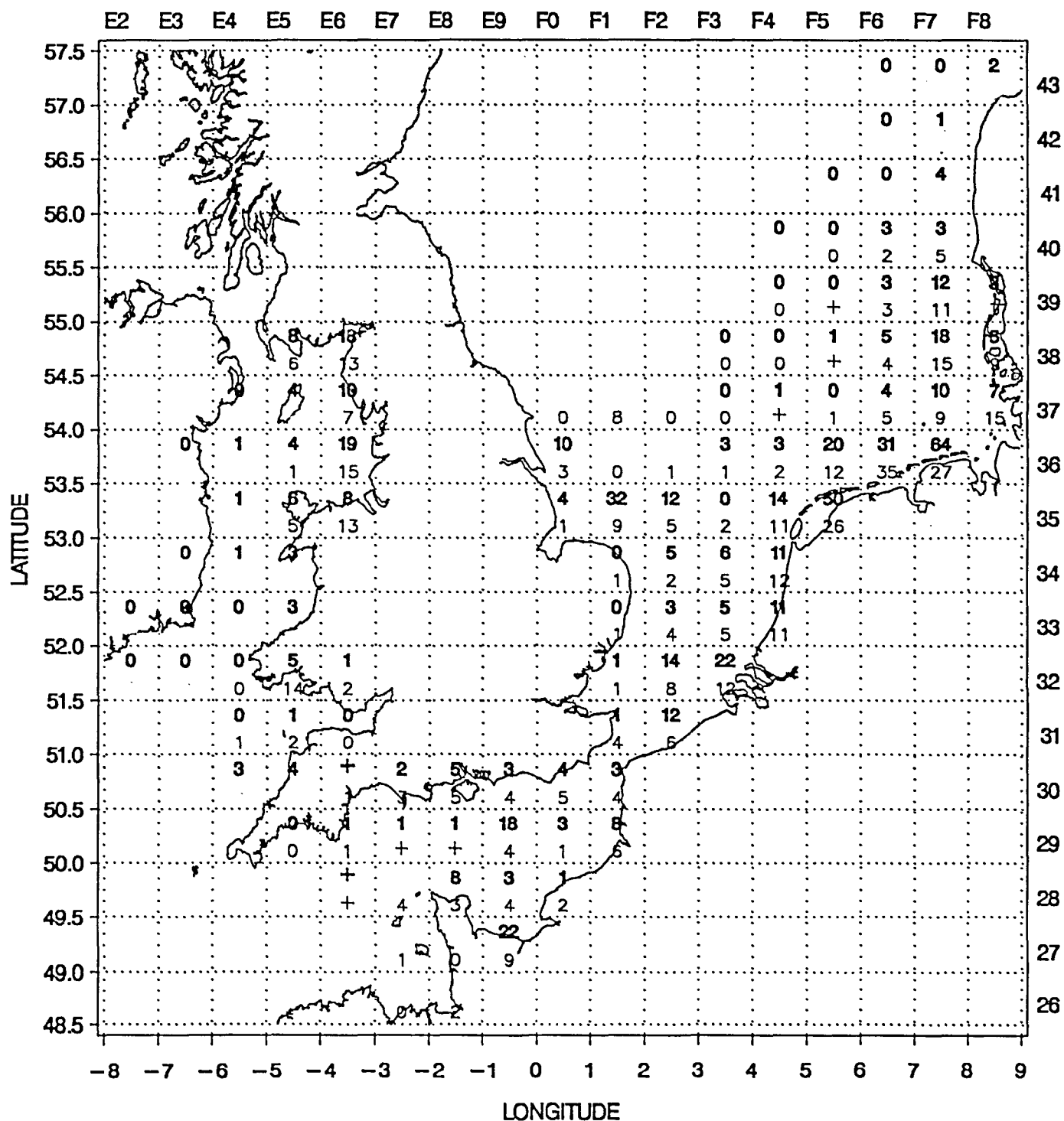
Figure 4.19 Distribution of monk, *Lophius* spp., (No/h/8m) in each rectangle.
 += <0.5/h. Upper figure 1993 survey mean; lower figure historic survey mean.



BEAM TRAWL SURVEY 1993

TUB GURNARD

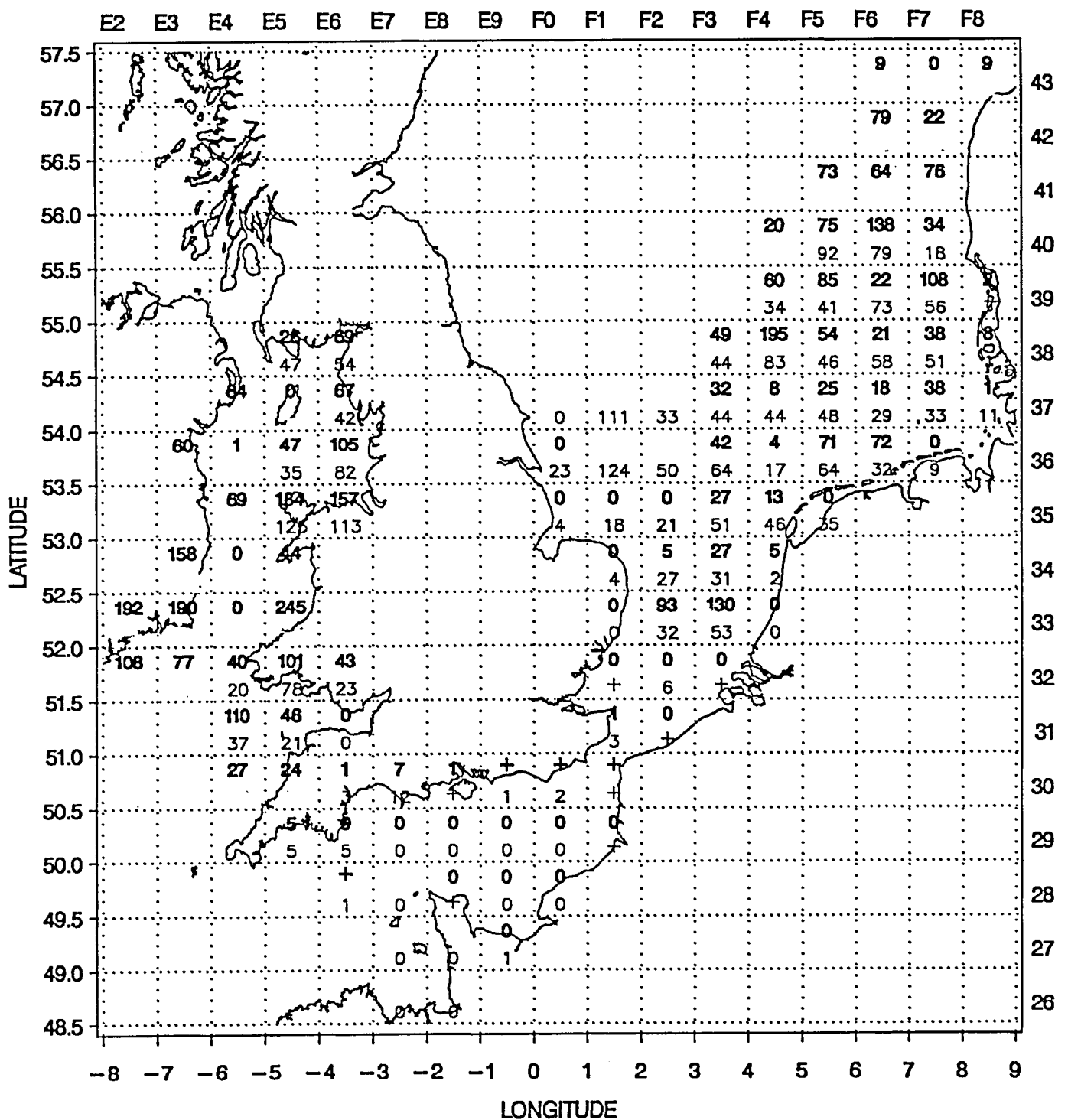
Figure 4.20 Distribution of tub gurnard, *Trigla lucerna*, (No/h/8m) in each rectangle.
 += <0.5/h. Upper figure 1993 survey mean; lower figure historic survey mean.



BEAM TRAWL SURVEY 1993

GREY GURNARD

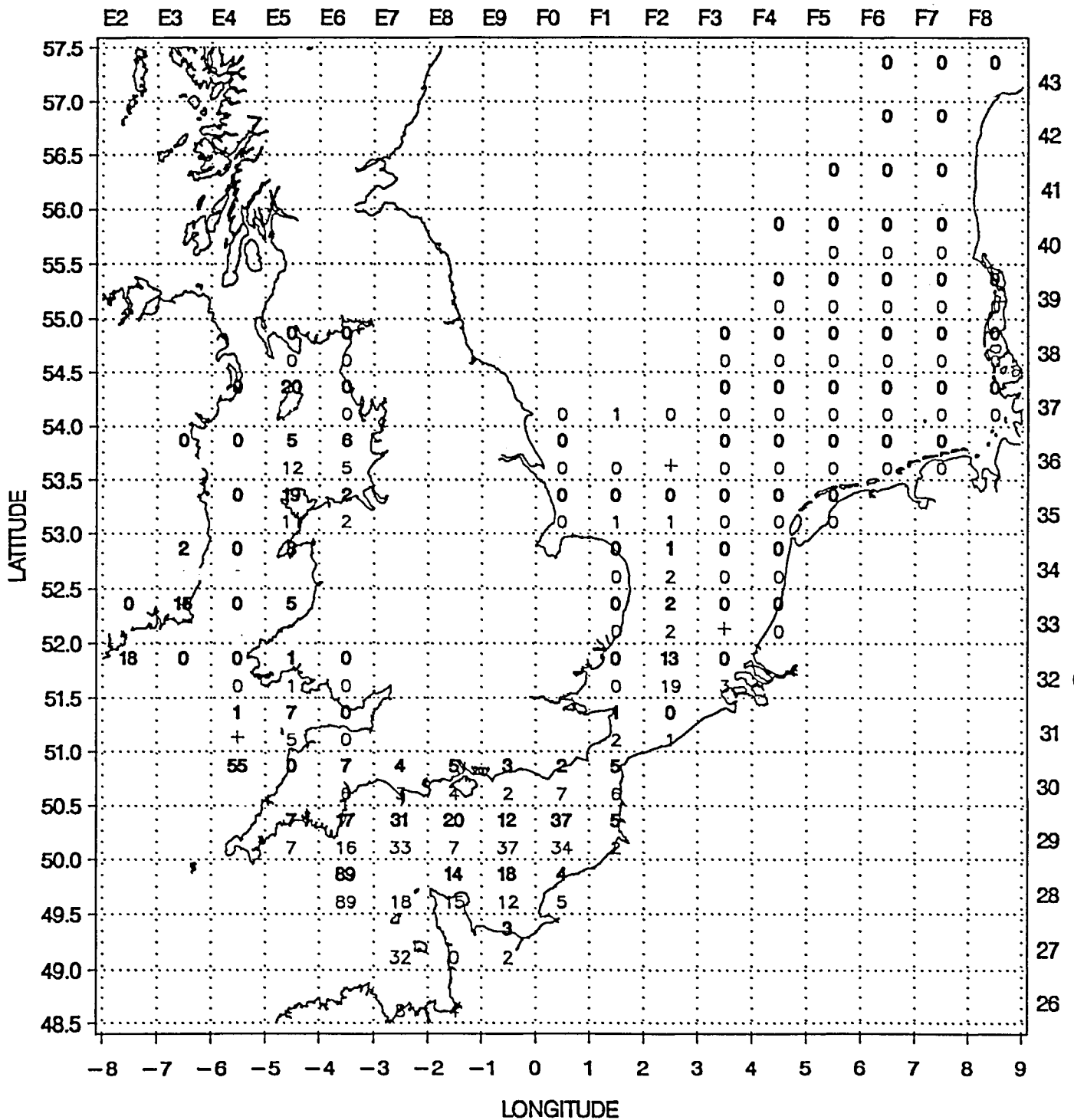
Figure 4.21 Distribution of grey gurnard, *Eutrigla gurnardus*, (No/h/8m) in each rectangle.
 += <0.5/h. Upper figure 1993 survey mean; lower figure historic survey mean.



BEAM TRAWL SURVEY 1993

RED GURNARD

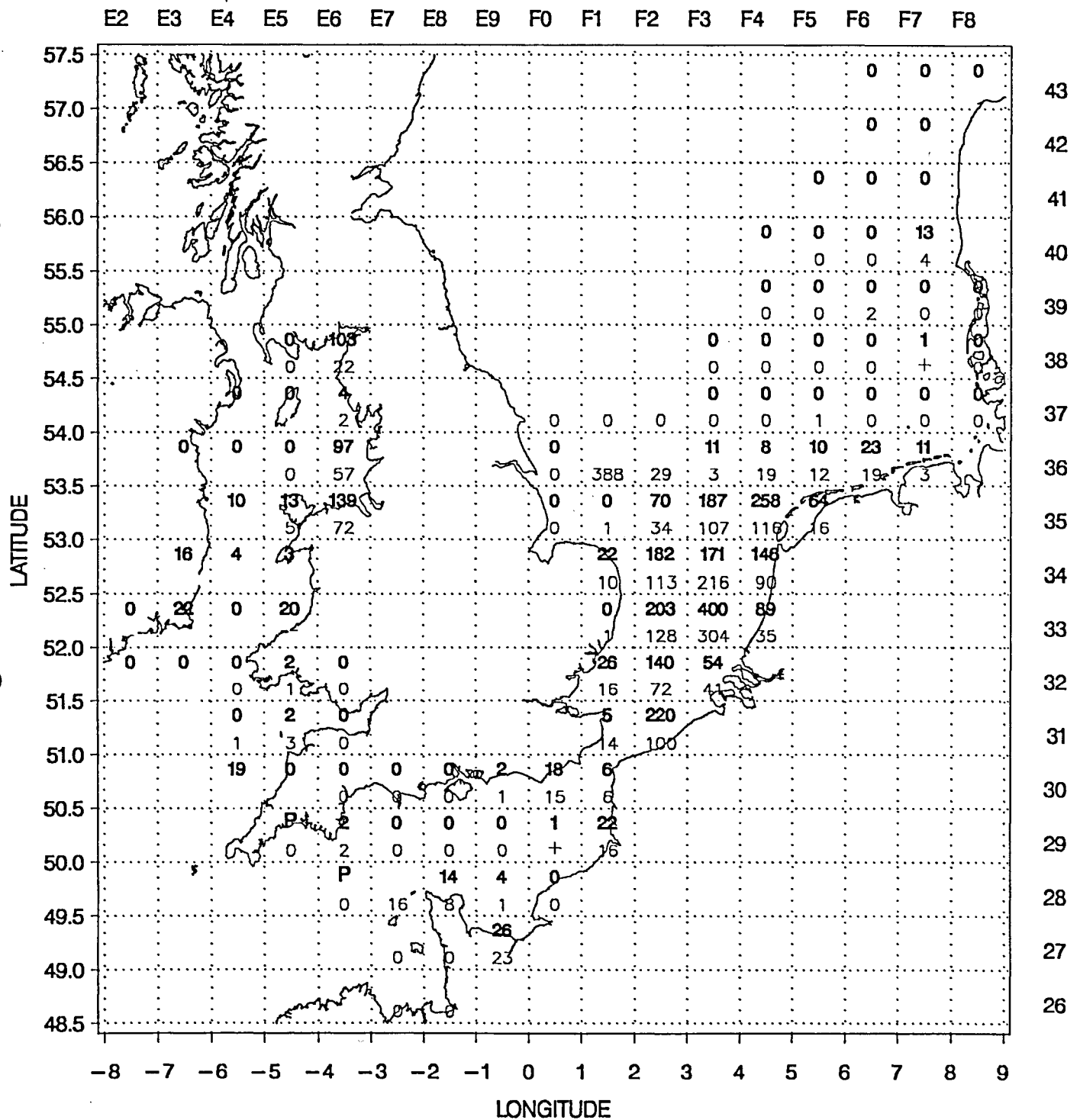
Figure 4.22 Distribution of red gurnard, *Aspitrigla cuculus*, (No/h/8m) in each rectangle.
 += <0.5/h. Upper figure 1993 survey mean; lower figure historic survey mean.



BEAM TRAWL SURVEY 1993

LESSER WEAVER

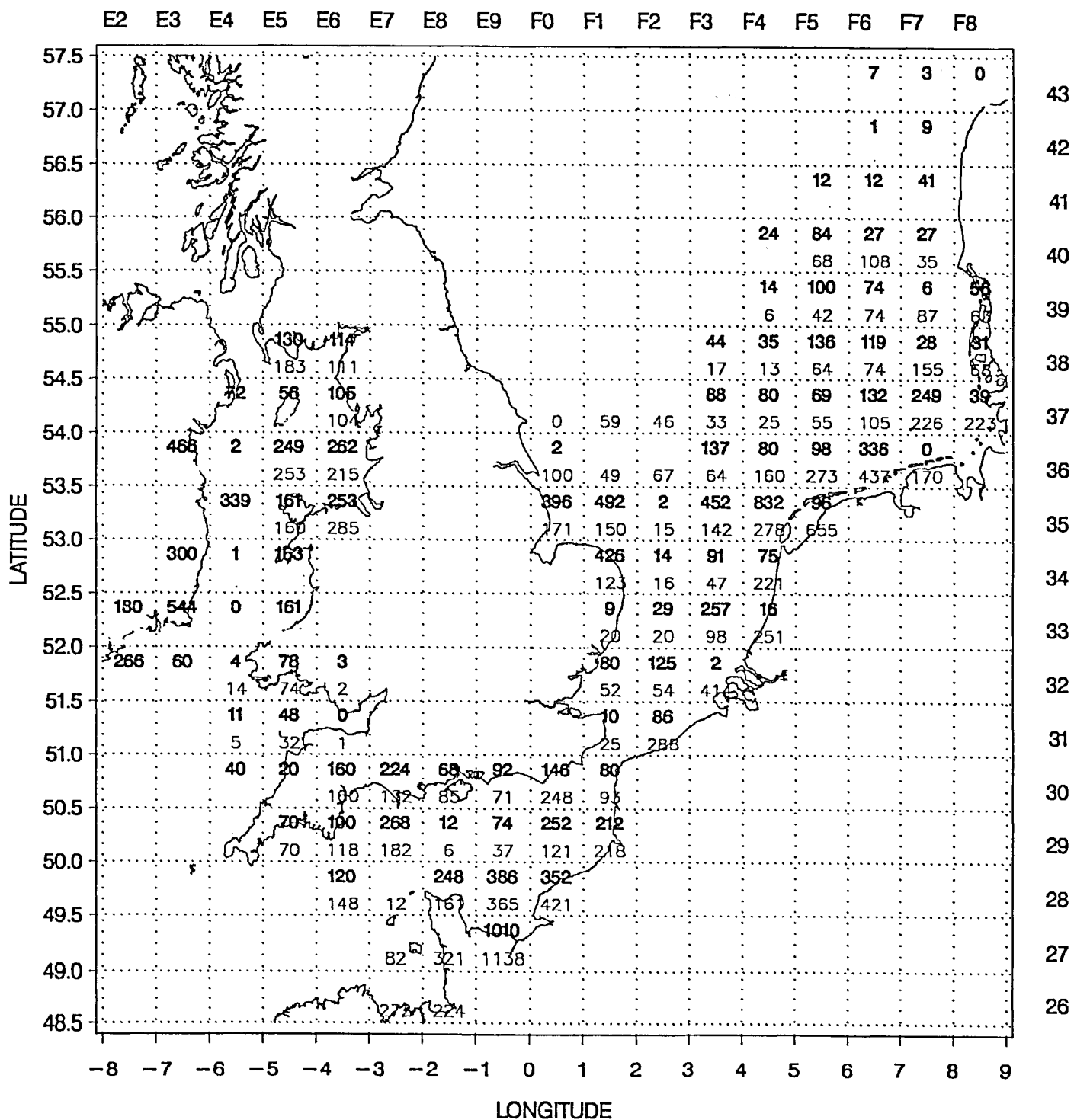
Figure 4.23 Distribution of pogge, *Agonus cataphractus*, (No/h/8m) in each rectangle.
 += <0.5/h. Upper figure 1993 survey mean; lower figure historic survey mean.



BEAM TRAWL SURVEY 1993

DRAGONET

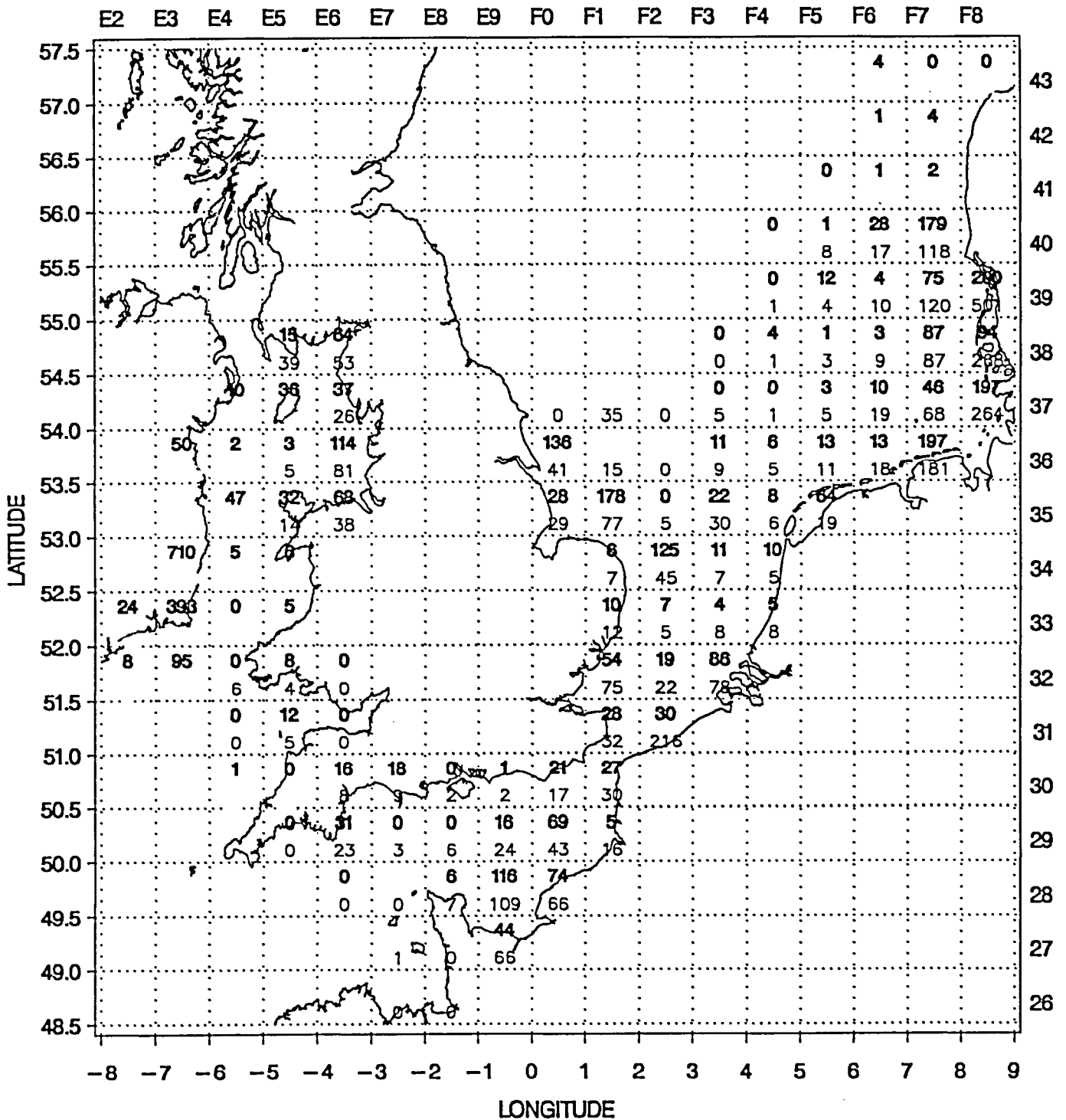
Figure 4.24 Distribution of lesser weever, *Echiichthys vipera*, (No/h/8m) in each rectangle.
 += <0.5/h. Upper figure 1993 survey mean; lower figure historic survey mean.



BEAM TRAWL SURVEY 1993

POGGE

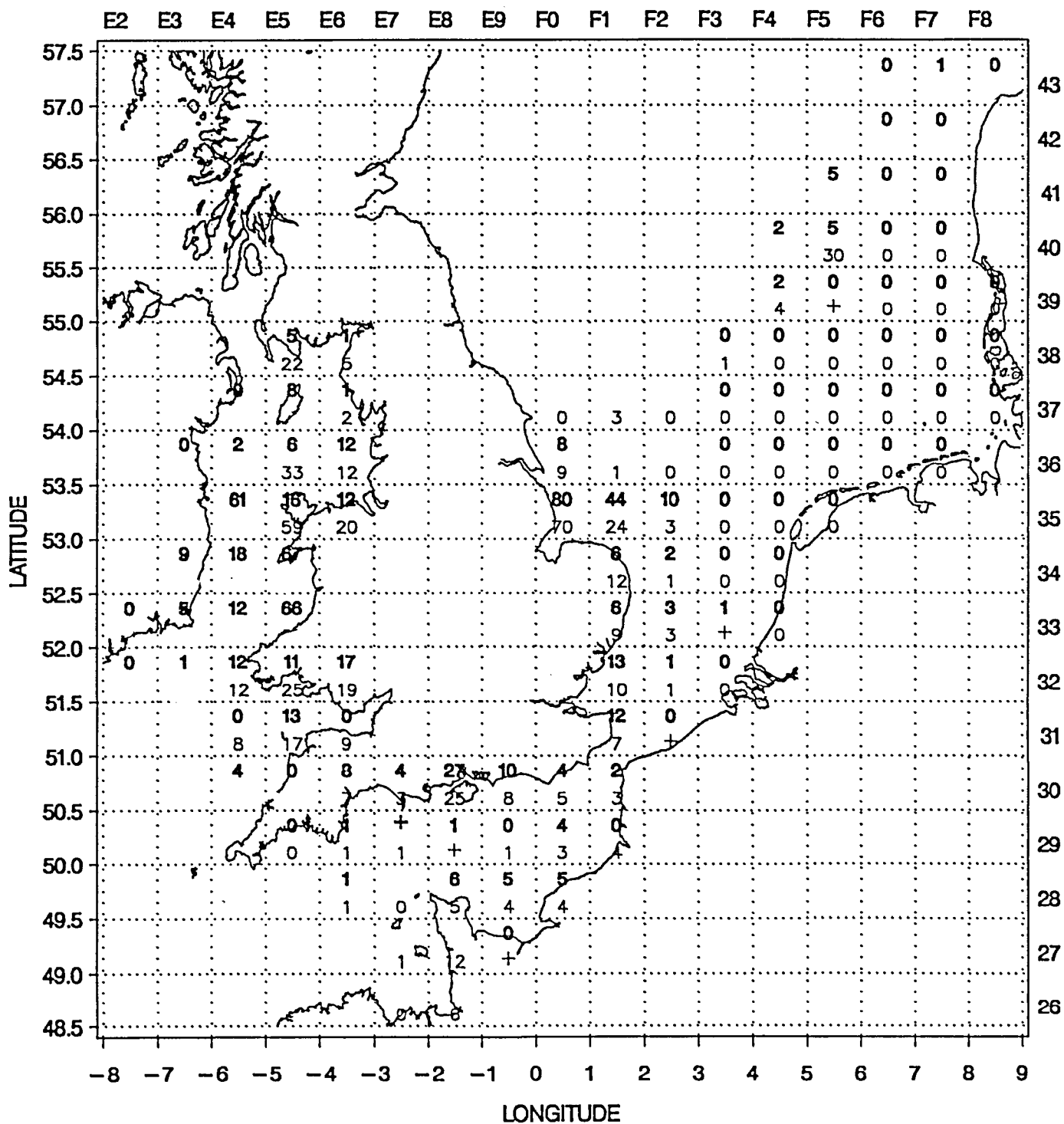
Figure 4.25 Distribution of dragonet, *Callionymus lyra*, (No/h/8m) in each rectangle.
+ = <0.5/h. Upper figure 1993 survey mean; lower figure historic survey mean.



BEAM TRAWL SURVEY 1993

RAYS

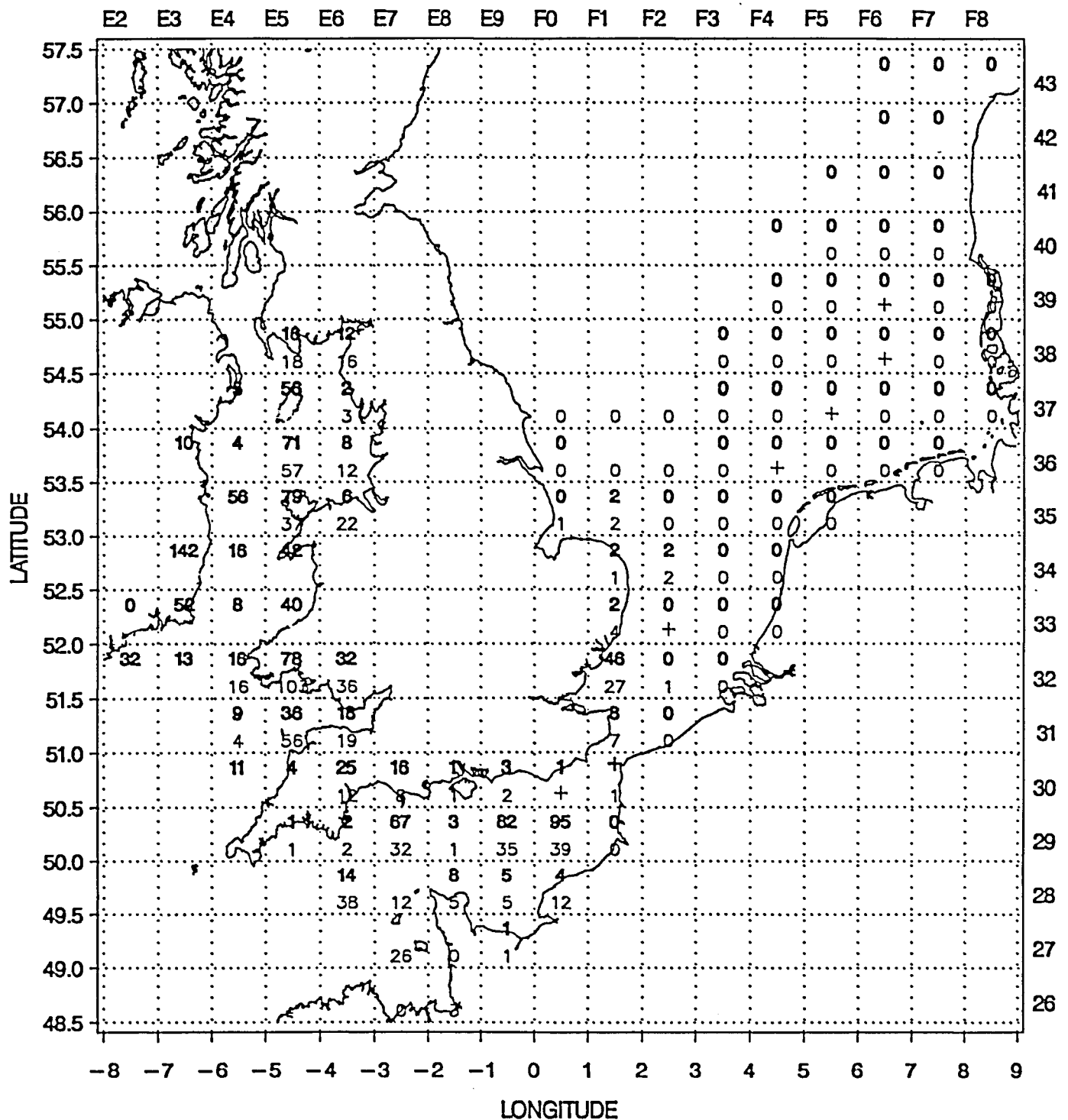
Figure 4.26 Distribution of lesser spotted dogfish, *Scyliorhinus canicula*, (No/h/8m) in each rectangle. + = <0.5/h. Upper figure 1993 survey mean; lower figure historic survey mean.



BEAM TRAWL SURVEY 1993

DOGFISH

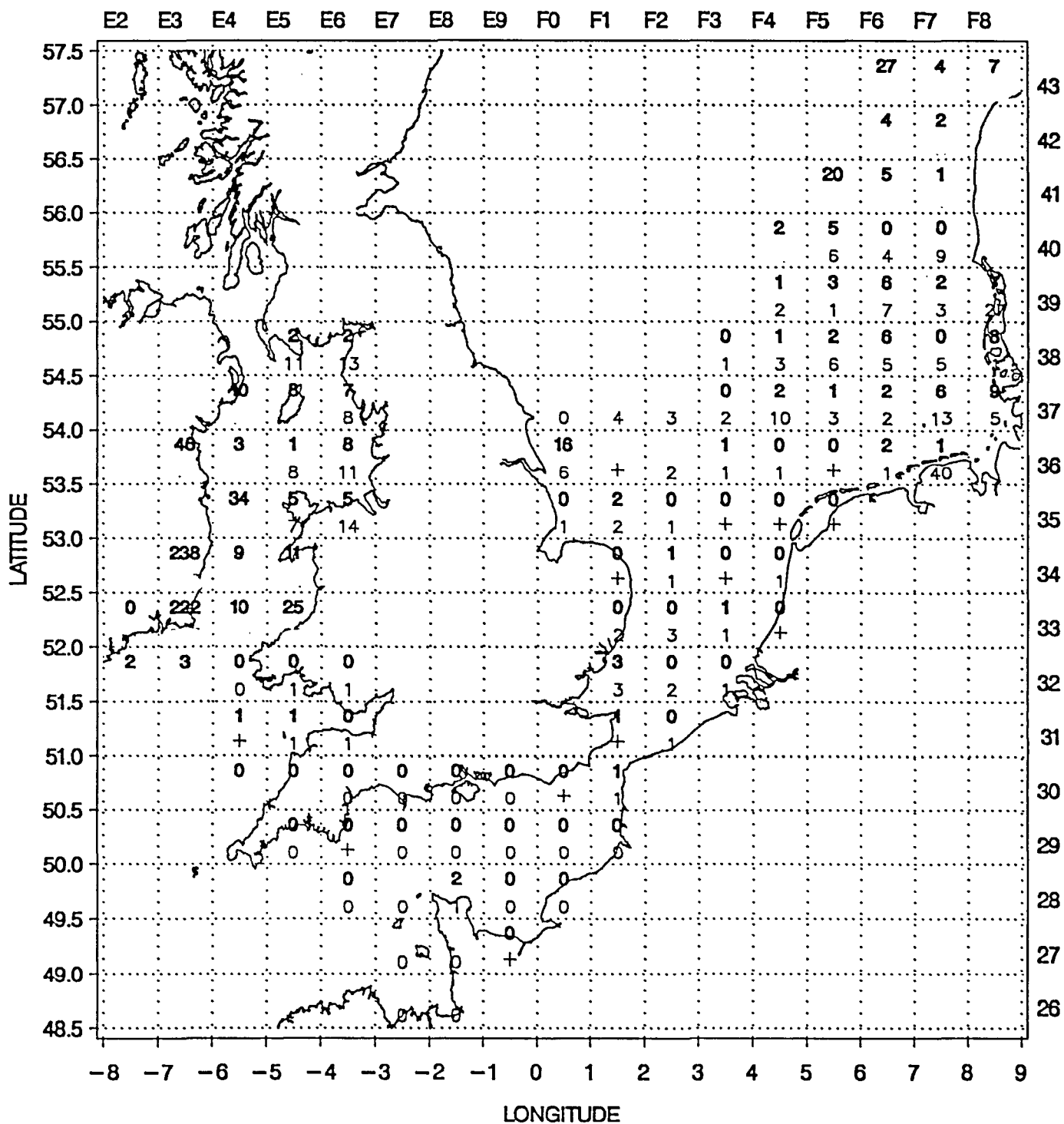
Figure 4.27 Distribution of rays, *Rajidae*, (No./8m) in each rectangle.
 += <0.5/h. Upper figure 1993 survey mean; lower figure historic survey mean.



BEAM TRAWL SURVEY 1993

COD

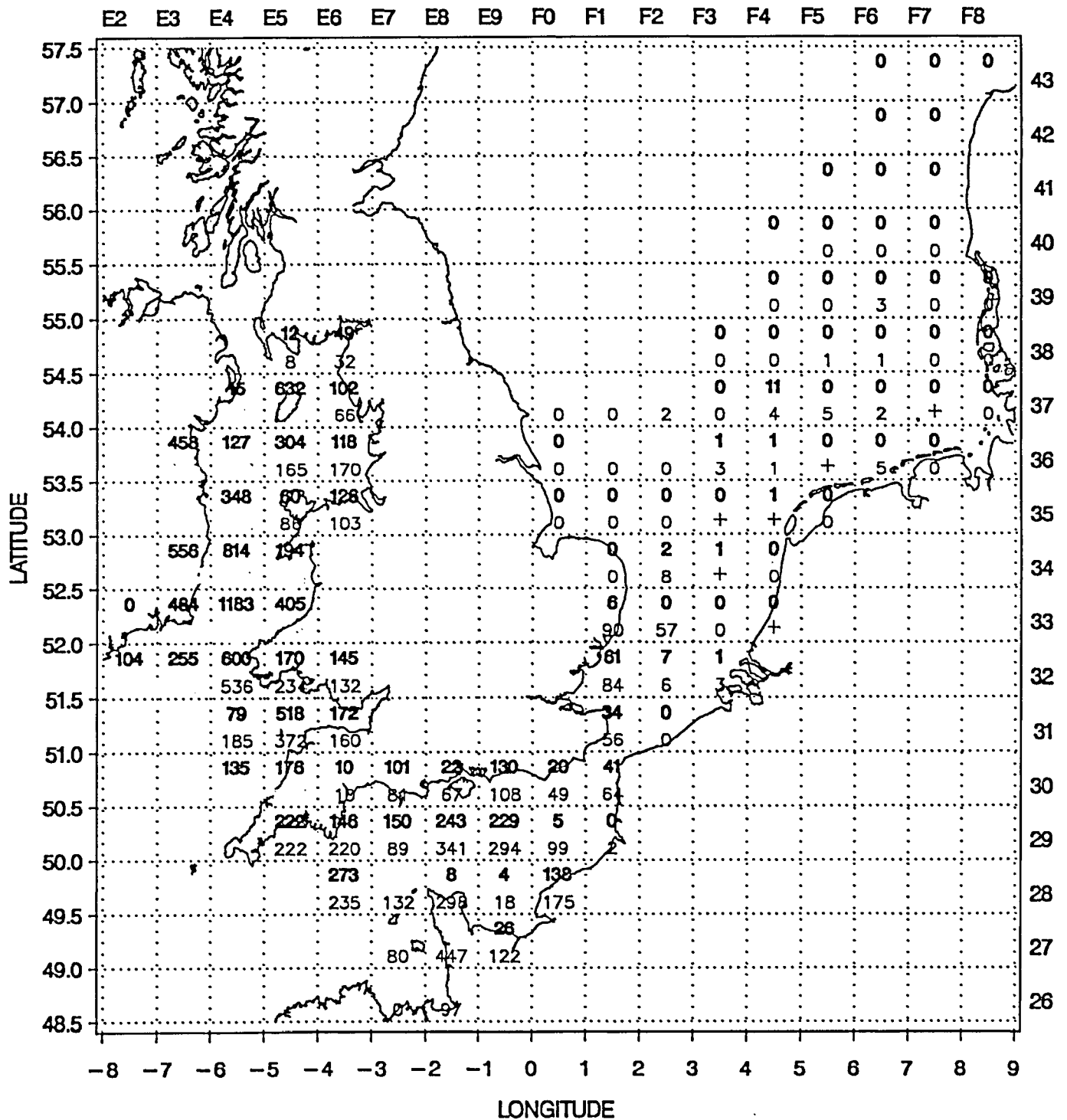
Figure 4.28 Distribution of cod, *Gadus morhua*, (No/h/8m) in each rectangle.
 += <0.5/h. Upper figure 1993 survey mean; lower figure historic survey mean.



BEAM TRAWL SURVEY 1993

POOR COD

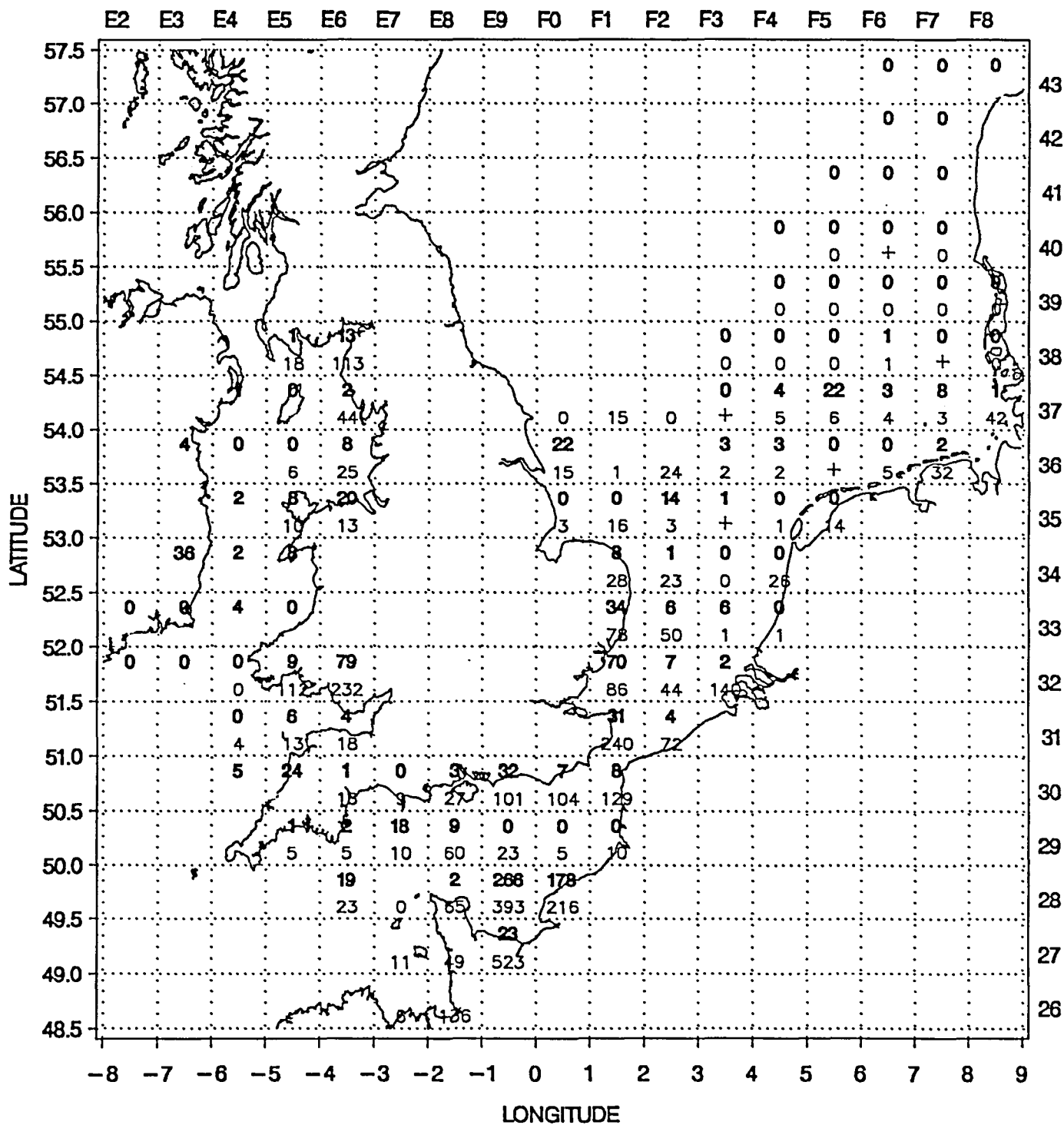
Figure 4.29 Distribution of bib, *Trisopterus luscus*, (No/h/8m) in each rectangle.
 += <0.5/h. Upper figure 1993 survey mean; lower figure historic survey mean.



BEAM TRAWL SURVEY 1993

BIB

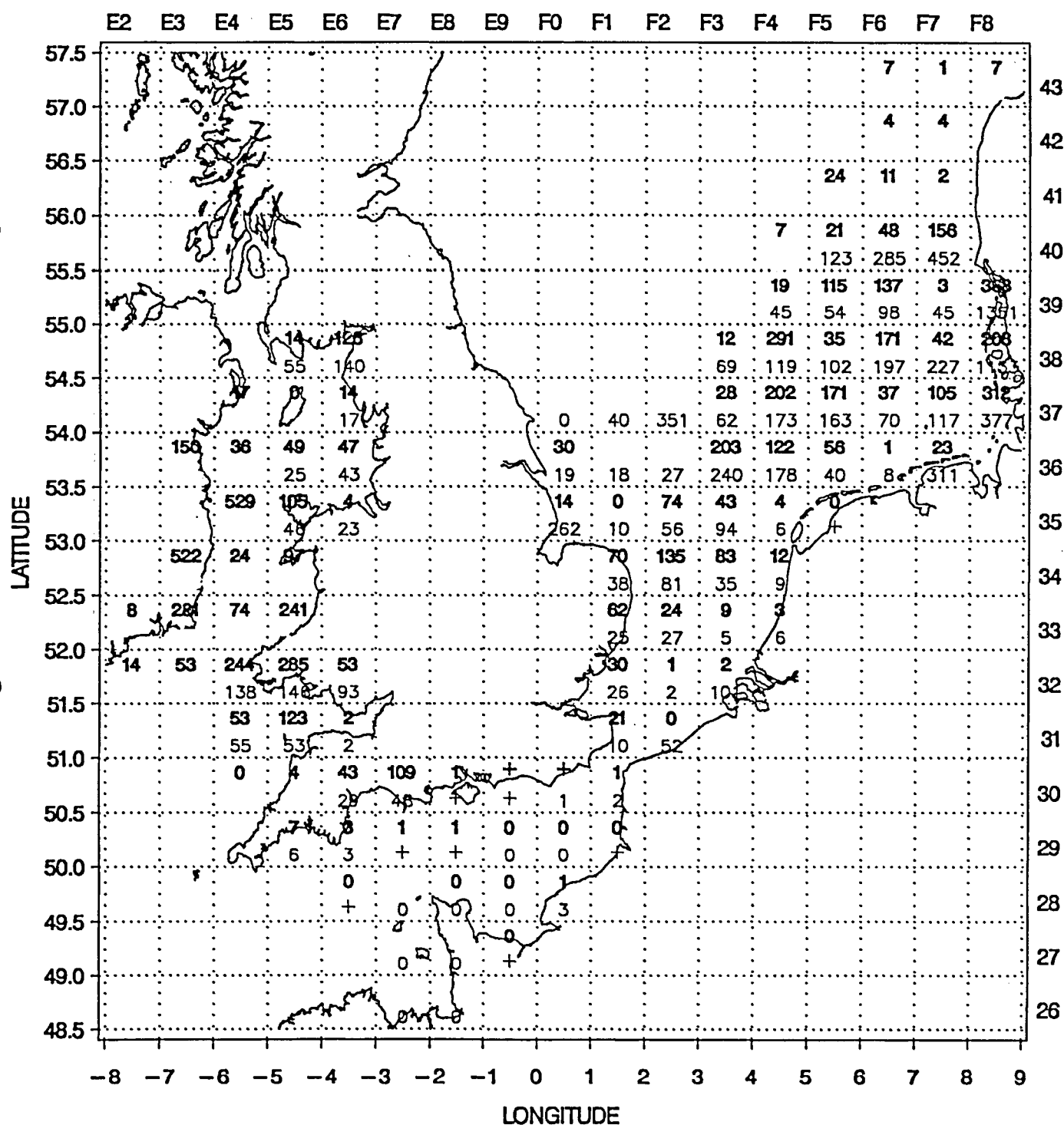
Figure 4.30 Distribution of poor cod, *Trisopterus minutus*, (No/h/8m) in each rectangle.
+ = <0.5/h. Upper figure 1993 survey mean; lower figure historic survey mean.



BEAM TRAWL SURVEY 1993

WHITING

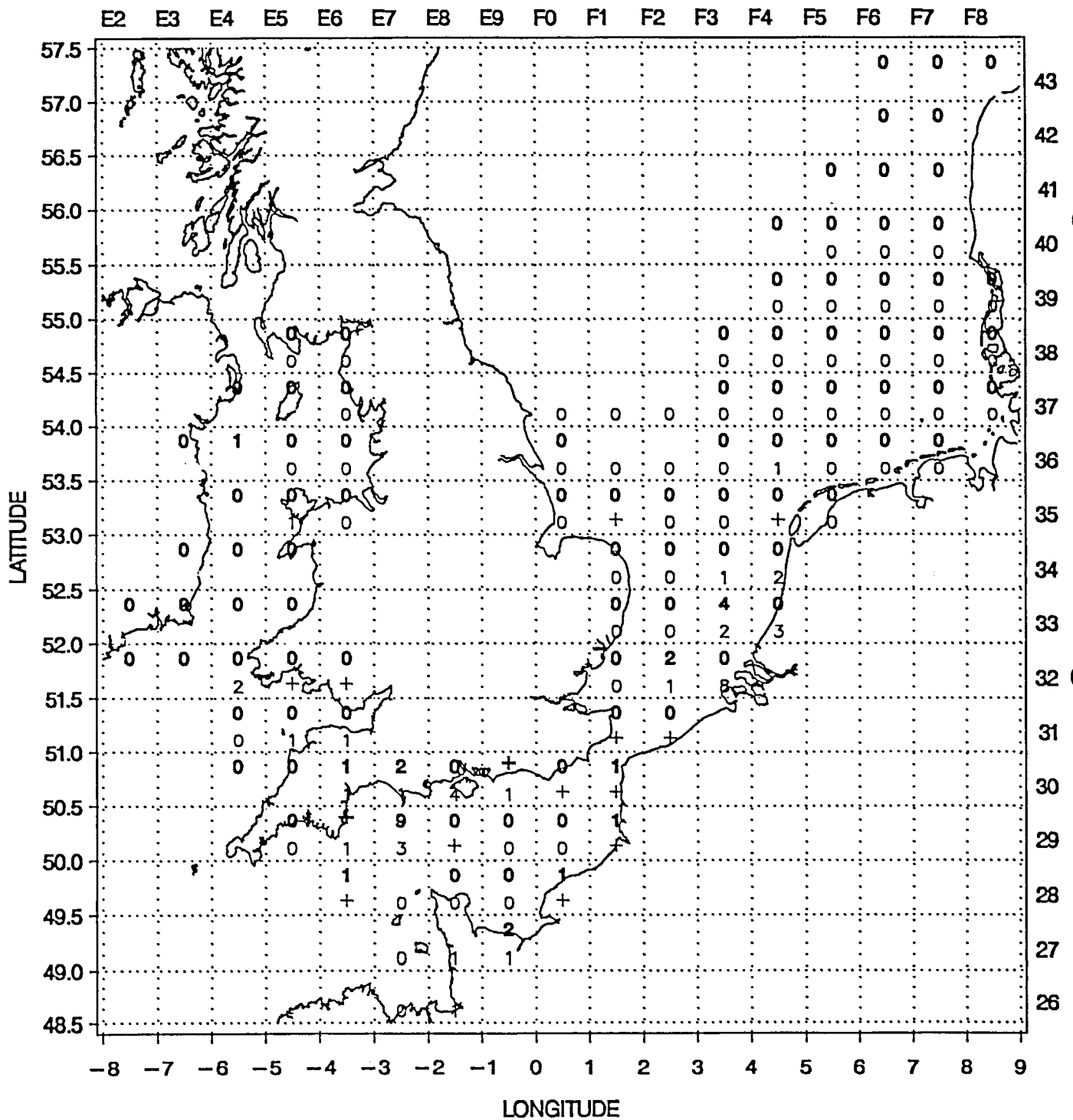
Figure 4 31 Distribution of whiting, *Merlangius merlangus*, (No/h/8m) in each rectangle.
+ = <0.5/h. Upper figure 1993 survey mean; lower figure historic survey mean.



BEAM TRAWL SURVEY 1993

RED MULLET

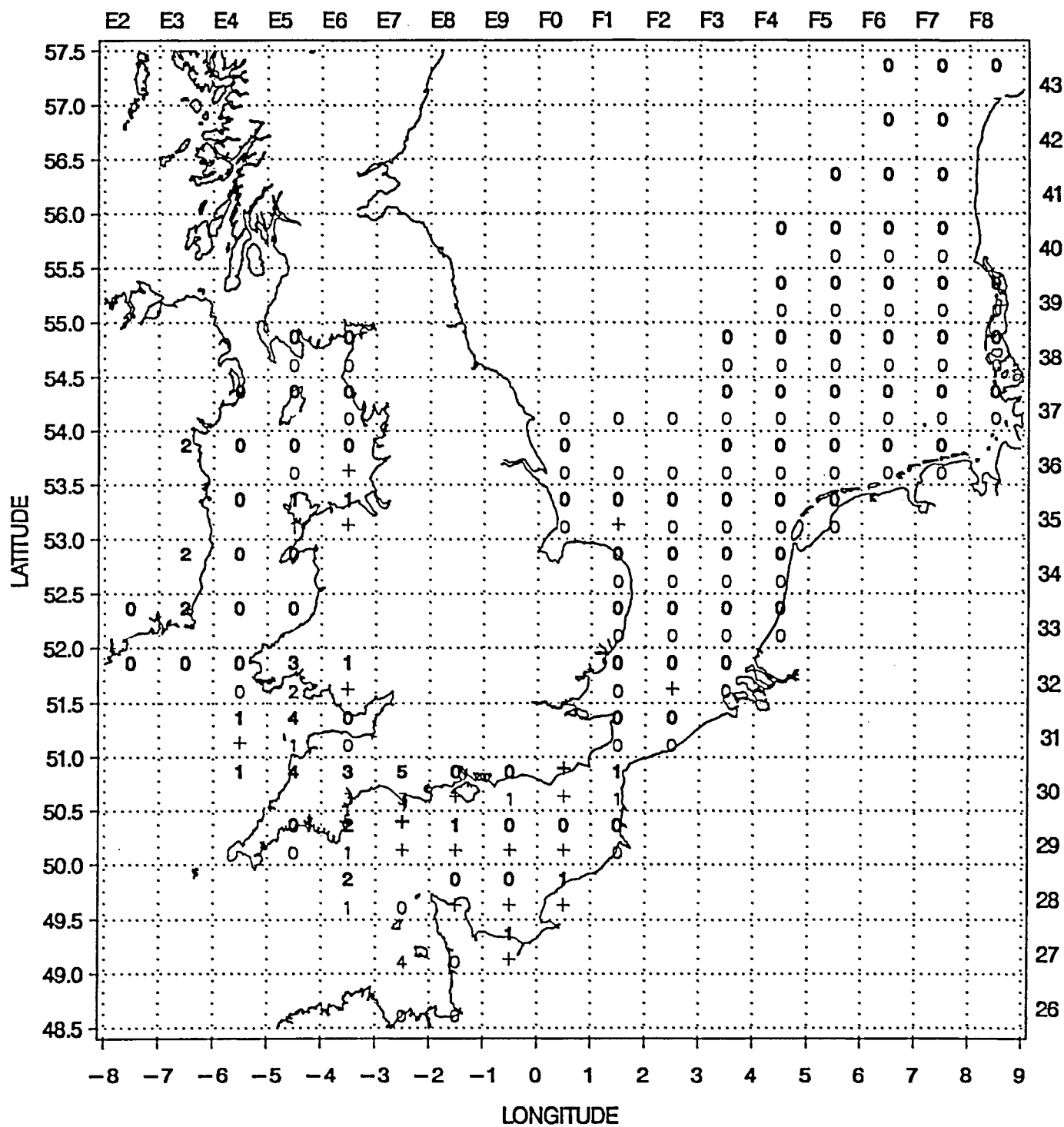
Figure 4.32 Distribution of red mullet, *Mullus surmuletus*, (No/h/8m) in each rectangle.
 += <0.5/h. Upper figure 1993 survey mean; lower figure historic survey mean.



BEAM TRAWL SURVEY 1993

JOHN DORY

Figure 4.33 Distribution of John dory, *Zeus faber*, (No/h/8m) in each rectangle.
 + = <0.5/h. Upper figure 1993 survey mean; lower figure historic survey mean.



BEAM TRAWL SURVEY 1993

EDIBLE CRAB

Figure 4.34 Distribution of edible crab, *Cancer pagurus*, (No/h/8m) in each rectangle.
 += <0.5/h. Upper figure 1993 survey mean; lower figure historic survey mean.

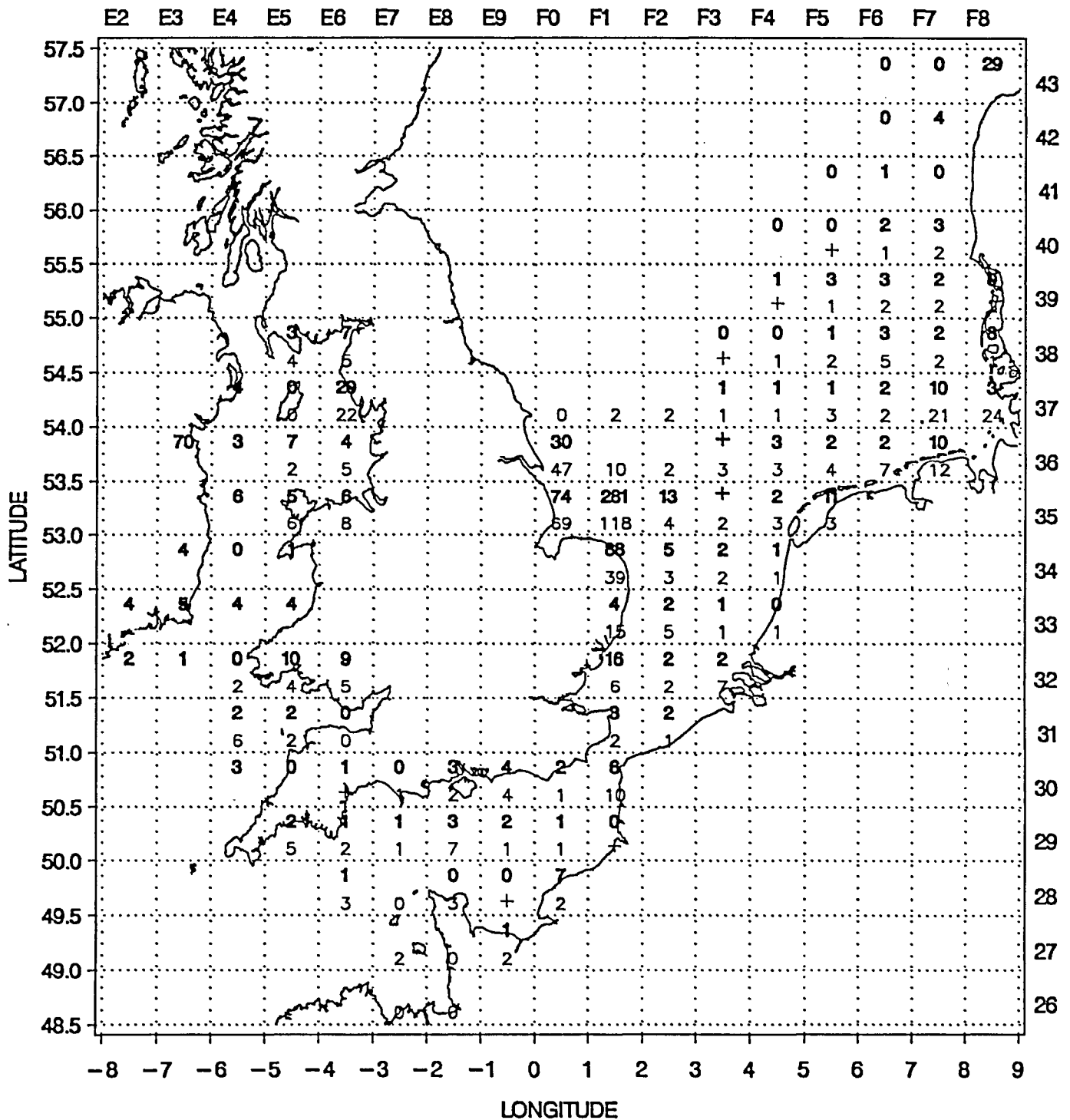


Figure 5.1 Division of the survey areas into sub-areas.

