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REPORT OF THE
STUDY GROUP ON BEAM TRAWL SURVEYS

By Correspondence

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<https://doi.org/10.17895/ices.pub.9686>

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1 INTRODUCTION

Fisheries independent beam trawl surveys using research vessels were established in the 1980s by countries bordering the North Sea to monitor stocks of plaice and sole. Collation and analysis of some of the data derived from these surveys was undertaken by the Beam Trawl Study Group, initially focused on the North Sea and Eastern Channel. At the ICES Statutory meeting in 1990, it was resolved to broaden the remit of the study group to evaluate all surveys in sub-areas IV and VII (ICES 1991). The Study Group now comprises participants from Belgium, Germany, Netherlands and the UK, and an annual report summarising survey data has been produced since 1990.

1.1 Terms of Reference

At the 1997 Annual Science Conference it was resolved that the Study Group on Beam Trawl Surveys (Chairman: Dr S I Rogers, UK) should work by correspondence in 1998 to:

- a) prepare a progress report summarising the results of the 1997 Beam Trawl Surveys;
- b) continue the work of developing an international database of beam trawl surveys;
- c) calculate population abundance indices by age-group for plaice and sole in the North Sea, Division VIIa and Divisions VIIId-g;
- d) present summary results from other International Demersal Young Fish Surveys, including the pre-recruit indices for commercially important species;
- e) collate information describing epibenthic invertebrate by-catch during beam trawl surveys.

The Study Group will report to the Living Resources and Marine Habitats Committees at the 1998 Annual Science Conference and to ACFM before its October 1998 meeting.

1.2 Participants by correspondence

Ulrich Damm	Germany
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Adriaan Rijnsdorp	Netherlands
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2 PROGRESS DURING 1997 AND SUMMARY RESULTS

2.1 Survey details

Beam trawl surveys described in this report cover an area comprising the southern North Sea (IVb, IVc), the English Channel (VIIId, VIIe), the Celtic Sea (VIIIf, VIIg) and the Irish Sea (VIIa). The gears deployed by research vessels in these areas are different because of differences in substrate type and the ability of vessels to deploy the trawls. Despite these differences, the survey and data analysis procedures are standardised, and are described in detail elsewhere (ICES 1993; ICES 1994; Rogers *et al.* 1997). Summary details of the beam trawl surveys for which data have been provided are given in Table 2.1. The total number of hauls by these surveys is shown by rectangle in Figure 2.1.

Sampling stations are stratified according to ICES rectangles and depth zone. In the UK surveys of the Channel and western UK waters, the station grid comprises fixed station positions, but in the Netherlands survey the stations are distributed pseudo-randomly over the rectangle, taking untrawlable areas into account.

Data for 1996 and 1997 from an additional beam trawl survey by The Netherlands (RV Tridens) was provided, and used in the description of fish distribution and abundance.

Length stratified otolith samples of sole, plaice and dab are taken by sub-area. In the UK surveys the position of all otolithed fish is recorded but in North Sea surveys pooled samples are taken from hauls within otolith sampling areas. These sampling areas are shown in Figure 2.2.

2.2 Sampling procedures

A detailed description of sampling procedures has been produced in earlier reports of the Study Group (ICES 1990; ICES 1991; ICES 1993; ICES 1995), and also in (Rogers *et al.* 1997; Rogers *et al.* 1998). All surveys sample fish and selected species of invertebrate bycatch. All fish are sorted from the catch, identified and the number by one cm size class is recorded. Large catches are subsampled. A list of all demersal species caught since 1990, with common name, Latin name and 3 letter NODC code used in the database, is shown in Table 2.2.1.

2.3 Fish distribution and abundance in 1997

The catch rates of fish from the 1997 beam trawl surveys were converted to the standard 8 m beam trawl by multiplying the observed catch rates by the ratio of the beam trawl widths, and raising to a one hour tow duration. Catch rates were averaged by rectangle, and these averages were averaged for the sub-areas shown in Figure 2.3. The results are presented in Tables 2.3.1 to 2.3.9 for selected species by management area since 1990, and by ICES rectangle in Figures 2.3.1 to 2.3.26. The inclusion of the Tridens survey has allowed increased coverage of the Division IVb and has enabled the southern limits of distribution of certain species in the North Sea to be identified.

2.4 Survey indices of sole and plaice

Year class strength indices of sole and plaice (0-group to 10+-group) are given for the Netherlands and UK surveys by management area (Tables 2.4.1 and 2.4.2). The geographic coverage of each management area is shown in Figure 2.4. Each survey index is calculated as the arithmetic mean abundance over a standard grid of rectangles, and data are presented here for:

North Sea	(IVa)
Eastern Channel	(VIIId)
Western Channel	(VIIe)
Bristol Channel	(VIIIf&g)
Irish Sea	(VIIa)

3 INTERNATIONAL BEAM TRAWL SURVEY DATABASE (BTSDB)

It is important that the data from these annual surveys are combined in a simple way so that they can be used by the wider scientific community. It was agreed during 1997 that annual, national survey datasets should be collated and combined centrally by the Chairman of the Study Group, as a first step to preparing a formal database, possibly held centrally at ICES. These data were to be submitted as plain data or text files, and held in a SAS format, following the basic principles of the International Bottom Trawl Survey database. A basic format of using a separate trawl data file and fish length frequency file was to be adopted, and the specification of these files has already been described (ICES 1996). Additional information on fish age and maturity at length is also available for some species from the surveys but has not yet been included in the database. This will be considered as a possible subject of future investigation by the Study Group.

3.1 Current database format

To improve the dataset already available to Study Group members, the species length frequency data is now presented by 1 cm length categories, rather than the 5 cm categories used originally. All data from beam trawl surveys listed in Table 2.1, and used in the preparation of all species distribution by rectangle data (section 2.3) are now held in this format. These data are available to all contributing countries on request as ASCII files, and to other scientists depending on their region of interest.

The responsibility for checking accuracy of entries and completeness of datasets remains entirely with the chief scientist of the relevant cruise. The role of the Study Group Chairman is therefore only to combine annual datasets and make the resulting compilation available.

4 OTHER BEAM TRAWL SURVEYS

There are other beam trawl surveys which regularly report abundance indices of sole and plaice to ICES, but which are not part of the Study Group database. The Demersal Young Fish Survey (DYFS) is a group of national surveys carried out by the Netherlands, Belgium and Germany in the continental nursery areas of the North Sea to record abundance of 0- and 1-group plaice and sole. A comparable survey is carried out by the UK on the flatfish nursery grounds of the North Sea (UKYFS). The Sole Net Survey (SNS) is a survey undertaken by the Netherlands to obtain pre-recruit indices for 1- and 2-group plaice and sole in coastal waters between the Scheldt estuary and Denmark. These surveys are described in further detail elsewhere (Beek 1997; Riley *et al.* 1981). Abundance indices for sole and plaice produced by these surveys are shown in Tables 4.1a) to c).

During the past 20 years, several other surveys have been started in coastal waters of Northwest Europe and have then ended after a few years, including in the western Channel and Bay of Biscay. Summary information on all known beam trawl surveys not already considered by the Study Group is shown in Table 4.2. Now that a simple system of data exchange is in place, it is appropriate to consider if these other beam trawl surveys could also be included in the work of this Study Group. It would be an important, though major exercise, to extend the database to include all beam trawl data.

5 ANALYSIS OF BENTHIC SPECIES DISTRIBUTION

Sampling of benthic species on groundfish surveys varies depending on the gear and type of vessel used, but the larger, epibenthic invertebrates are generally all identified and their abundances recorded. These species do not form part of the database, as more work needs to be done within the Group to set quality standards for identification, and to circulate lists of species to be recorded. The species sampled in this way are given in the 1994 Study Group Report on Beam Trawl Surveys in the North Sea and Eastern Channel (ICES 1994). During 1997, UK surveys by RV Corystes in southern and western waters of the UK, and The Netherlands RV Tridens survey, sampled the benthic by-catch in detail, in addition to the routine groundfish sampling. The full list of species identified is given in Table 5.1.

The distributions of nine selected epibenthic invertebrates, which include species with predominantly either northern and southern distributions, are shown in Figures 5.1 to 5.9. The shaded region in these figures represents rectangles sampled by the two vessels. It is clear that several species are widespread throughout the shelf seas of Northwest Europe, and that sampling the beam trawl bycatch for these species appears to be an effective way of collecting data on their relative abundance. Future studies will need to investigate the catchability and gear efficiency of beam trawls for the invertebrate bycatch before conclusions can be drawn from the regional differences in species distributions. These preliminary results suggest, however, that the groundfish surveys can provide valuable information for some macro-invertebrates.

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Table 2.1 Details of the beam trawl surveys currently undertaken by each country.

	Belgium	Germany	Netherlands	Netherlands	UK	UK	UK
Survey area:	IVb&c west	IVb east	IVb&c east	Central N Sea	VIId	VIIe	VIIa, f&g
Year survey started:	1992	1991	1985	1985	1988	1988	1988
Dates:	August	early September	end August	end August	early August	late September	late August
Ship:	RV Belgica	RV Solea	RV Isis	RV Tridens	RV Corystes	MFV Carhelmar	RV Corystes
Ship length:	50 m	35 m	28 m	73.5	53 m	22 m	53 m
Beam trawl length:	4 m	7 m	8 m	8 m	4 m	4 m	4 m
Number of beams fished:	1	2	2	2	1	2	1
Trawl duration (min):	30	30	30	30	30	30	30
Tow speed (knots):	4	4	4	4	4	4	4
Cod end liner stretched mesh (mm):	40	44	40	40	40	40	40
Number of ticklers:	0	5	8	8	0	0	0
Attachment:	*	(none)	(none)	(none)	*	*	*
Station positions:	fixed	pseudo-random	pseudo-random	pseudo-random	fixed	fixed	fixed
Benthos sampling since:	1992	1992	1985	1985	1991	1992	1992

* chain mat & flip-up rope

Table 2.2.1 Demersal fish species caught on the beam trawl surveys since 1990, with NODC 3 letter code..

SCYLIORHINIDAE	lesser spotted dogfish nurse hound	<i>Scyliorhinus canicula</i> <i>Scyliorhinus stellaris</i>	LSD DGN
CARCHARINIDAE	tope shark	<i>Galeorhinus galeus</i>	GAG
TRIAKIDAE	smooth hound starry smooth hound	<i>Mustelus mustelus</i> <i>Mustelus asterias</i>	SMH SDS
SQUALIDAE	spurdog	<i>Squalus acanthias</i>	DGS
TORPEDINIDAE	marbled electric ray electric ray	<i>Torpedo marmorata</i> <i>Torpedo nobiliana</i>	MER ECR
RAJIDAE	blonde ray thornback ray small-eyed ray spotted ray starry ray cuckoo ray undulate ray	<i>Raja brachyura</i> <i>Raja clavata</i> <i>Raja microocellata</i> <i>Raja montagui</i> <i>Raja radiata</i> <i>Raja naevus</i> <i>Raja undulata</i>	BLR THR PTR SDR SYR CUR UNR
ANGUILLIDAE	eel	<i>Anguilla anguilla</i>	ELE
CONGRIDAE	Conger eel	<i>Conger conger</i>	COE
GOBIESOCIDAE	two-spotted clingfish clingfish family	<i>Diplecogaster bimaculata</i> <i>Gobiesocidae</i>	TSC CFX
LOPHIIDAE	angler	<i>Lophius piscatorius</i>	MON
GADIDAE	cod haddock whiting poor cod bib pollack five-bearded rockling four-bearded rockling shore rockling three-bearded rockling common ling lesser forkbeard rockling species	<i>Gadus morhua</i> <i>Melanogrammus aeglefinus</i> <i>Merlangius merlangus</i> <i>Trisopterus minutus</i> <i>Trisopterus luscus</i> <i>Pollachius pollachius</i> <i>Ciliata mustela</i> <i>Enchelyopus cimbrius</i> <i>Gaidropsarus mediterraneus</i> <i>Gaidropsarus vulgaris</i> <i>Molva molva</i> <i>Raniceps raninus</i> <i>Gaidropsarus spp.</i>	COD HAD WHG POD BIB POL FVR FRR SRR TBR LIN LFB ROL
MERLUCCIIDAE	hake	<i>Merluccius merluccius</i>	HKE
ZOARCIDAE	eelpout	<i>Zoarces viviparus</i>	ELP
MACROURIDAE	roundhead rat-tail	<i>Coryphaenoides rupestris</i>	RNG
ZEIDAE	John dory	<i>Zeus faber</i>	JOD
CAPROIDAE	boar-fish	<i>Capros aper</i>	BOF
GASTEROSTEIDAE	stickleback	<i>Gasterosteus aculeatus</i>	TSS
SYNGNATHIDAE	greater pipefish Nilsson's pipefish snake pipefish sea horse short snouted seahorse	<i>Syngnathus acus</i> <i>Syngnathus rostellatus</i> <i>Entelurus aequoreus</i> <i>Hippocampus ramulosus</i> <i>Hippocampus hippocampus</i>	GPF NPF SKP SHE SNH
TRIGLIDAE	tub gurnard red gurnard grey gurnard streaked gurnard	<i>Trigla lucerna</i> <i>Aspitrigla cuculus</i> <i>Eutrigla gurnardus</i> <i>Trigloporus lastoviza</i>	TUB GUR GUG GUS
COTTIDAE			

	bull-rout	<i>Myoxocephalus scorpius</i>	BRT
	sea scorpion	<i>Taurulus bubalis</i>	SSN
AGONIDAE	hook-nose	<i>Agonus cataphractus</i>	POG
CYCLOPTERIDAE	lump sucker	<i>Cyclopterus lumpus</i>	LUM
	sea snail	<i>Liparis liparis</i>	SSL
	sea snail genus	<i>Liparis spp</i>	LPS
PERCICHTHYIDAE	sea bass	<i>Dicentrarchus labrax</i>	ESB
	bass family	<i>Dicentrarchus spp</i>	BSE
SPARIDAE	black sea-bream	<i>Spondyliosoma cantharus</i>	BKS
MULLIDAE	red mullet	<i>Mullus surmuletus</i>	MUR
CEPOLIDAE	red bandfish	<i>Cepola rubescens</i>	RPF
MUGILIDAE	thick lipped mullet	<i>Chelon labrosus</i>	MTL
	grey mullet family	<i>mugilidae</i>	MUL
LABRIDAE	cuckoo wrasse	<i>Labrus mixtus</i>	CUW
	ballan wrasse	<i>Labrus bergylta</i>	BNW
	rock cook	<i>Centrolabrus exoletus</i>	SMW
	goldsinny	<i>Ctenolabrus rupestris</i>	GDY
	corkwing wrasse	<i>Crenilabrus melops</i>	CWG
TRACHINIDAE	greater weever	<i>Trachinus draco</i>	WEG
	lesser weever	<i>Echiichthys vipera</i>	WEL
BLENNIIDAE	butterfly blenny	<i>Blennius ocellaris</i>	BBY
	tompot blenny	<i>Blennius gattorugine</i>	TBY
STICHAEIDAE	Yarrels blenny	<i>Chirolophis ascanii</i>	YBY
	snake blenny	<i>Lumpenus lampretaeformis</i>	SBY
PHOLIDAE	butterfish	<i>Pholis gunellus</i>	BTF
CALLIONYMIIDAE	dragonet family	<i>Callionymidae</i>	DTX
GOBIIDAE	rock goby	<i>Gobius paganellus</i>	RKG
	black goby	<i>Gobius niger</i>	BLG
	Stevens goby	<i>Gobius gasteveni</i>	GSV
	Fries's goby	<i>Lesuerigobius friesii</i>	FSG
	goby family	<i>Gobiidae</i>	GPA
SCOPHTHALMIDAE	brill	<i>Scophthalmus rhombus</i>	BLL
	turbot	<i>Scophthalmus maximus</i>	TUR
	megrim	<i>Lepidorhombus whiffianonis</i>	MEG
	Ekstroms topknot	<i>Phrynorhombus regius</i>	EKT
	Norwegian topknot	<i>Phrynorhombus norvegicus</i>	NKT
	topknot	<i>Zeugopterus punctatus</i>	TKT
BOTHIDAE	scaldfish	<i>Arnoglossus laterna</i>	SDF
	Imperial scaldfish	<i>Arnoglossus imperialis</i>	ISF
PLEURONECTIDAE	plaice	<i>Pleuronectes platessa</i>	PLE
	flounder	<i>Platichthys flesus</i>	FLE
	dab	<i>Limanda limanda</i>	DAB
	lemon sole	<i>Microstomus kitt</i>	LEM
	witch	<i>Glyptocephalus cynoglossus</i>	WIT
	long rough dab	<i>Hippoglossoides platessoides</i>	PLA
	halibut	<i>Hippoglossus hippoglossus</i>	HAL
SOLEIDAE	sole	<i>Solea solea</i>	SOL
	solenette	<i>Buglossidium luteum</i>	SOT
	sand sole	<i>Pegusa lascaris</i>	SOS
	thick back sole	<i>Microchirus variegatus</i>	TBS
MOLIDAE	sunfish	<i>Mola mola</i>	SUN

Table 2.3.1

Abundance of fish species in subarea RFA4

	1990	1991	1992	1993	1994	1995	1996	1997
AMERICAN PLAICE	53.3	66.2
ANGLERFISH (MONK)	1.4	0.6
BRILL	.	.	.	4	1	2	0.5	1.5
COD	.	.	.	10	2	6	5.6	660.9
COMMON DRAGONET	.	.	.	2	.	4	21.1	11.6
DAB	.	.	.	222	15	90	467.1	1799.2
EUROPEAN PLAICE	.	.	.	10	8	21	29.4	145.9
GREY GURNARD	2	8	0.1	.
HADDOCK	3	35.4	47.9
LEMON SOLE	.	.	.	14	10	9	29.9	380.6
LESSER SPOTTED DOGFISH	3	2	.	.
LESSER WEEVER FISH	10	100.5	2.7
POGGE (ARMED BULLHEAD)	.	.	.	136	16	33	17.8	6.6
RED GURNARD	5	.	.
SCALD FISH	14	87.9	11.1
SOLE (DOVER SOLE)	.	.	.	28	21	44	10.1	137.6
SOLENETTE	7	69.3	59.1
TUB GURNARD	.	.	.	2	.	.	.	.
TURBOT	1	.	0.4
WHITING	.	.	.	6	13	7	42.4	79.6
WHITING POUT (BIB)	.	.	.	2	3	7	1.6	57.1

Table 2.3.2

Abundance of fish species in subarea RFA5

	1990	1991	1992	1993	1994	1995	1996	1997
ANGLERFISH (MONK)	.	.	0.1	.	.	.	.	.
BRILL	1	1.7	0.2	0.8	0.8	1	1.1	0.7
COD	1.7	5.1	2.8	0.6	1	1.8	3.1	86.6
COMMON DRAGONET	23.7	36	10.2	112.1	73.5	124.4	84.2	5
DAB	77.1	93.1	318.3	22.7	16	27.9	246.9	1604.8
EUROPEAN PLAICE	20.6	28.6	29.8	12.1	19.8	26.2	62	254.7
FLOUNDER (EUROPEAN)	.	.	2.3	0.2	0.1	10.3	9.6	15.1
GREY GURNARD	18.9	40	27.1	9.5	6.9	6.3	23.3	86.9
LEMON SOLE	8.3	35.4	3.2	11.8	18.1	29.1	34.4	104.1
LESSER SPOTTED DOGFISH	10.3	3.1	3.6	8.6	4.7	4.2	6.8	8.3
LESSER WEEVER FISH	89.7	119.4	69.3	64.2	57.5	116.1	181.3	33.6
POGGE (ARMED BULLHEAD)	0.9	9.1	9.4	55.2	147.7	112.3	124.9	30.7
POOR COD	161.1	106.9	18.8	14.1	27.2	23.5	19.9	5.6
RED GURNARD	0.3	3.4	1	0.5	0.3	6.3	0.9	0.8
RED MULLET	.	.	0.2	.	0.1	0.2	0.3	0.1
SCALD FISH	28.9	14.3	77.4	20.1	11.8	23.8	19.1	65.3
SOLE (DOVER SOLE)	78.1	38.4	26	66.4	58.5	65.1	124.9	862.8
SOLENETTE	16	9.1	124.6	18.9	8.1	51.1	76.9	147.5
TUB GURNARD	1.4	0.3	1.4	2.8	1.1	0.7	0.7	0.1
TURBOT	.	.	0.6	0.2	0.1	0.1	0.2	0
WHITING	14	20.3	22	29.6	10.9	32.6	61.8	172.3
WHITING POUT (BIB)	20.6	46.3	8.1	14.5	65.7	82.4	15.5	135

Table 2.3.3

Abundance of fish species in subarea RFA6

	1990	1991	1992	1993	1994	1995	1996	1997
AMERICAN PLAICE (LR DAB)	2.7	2.1	1	0.7	1.5	2.5	3.4	8
ANGLERFISH (MONK)	.	.	0	0.1	0.1	0	0	.
BRILL	1.8	1.1	3	2.3	1.3	1.3	0.6	2.7
COD	4.4	10.5	2.4	1.2	12.6	11.6	10.8	18.6
COMMON DRAGONET	153.2	59.1	138	128.8	126.1	130.2	17.7	64.6
DAB	1925.8	1150.3	1161.5	1127	878.6	3016.8	1801.6	1694
EUROPEAN PLAICE	509.7	656.6	571.3	623.2	551	533.5	927.1	1381.5
FLOUNDER (EUROPEAN)	10.1	14.8	4.8	8.6	4.7	12.7	11.1	10.7
GREY GURNARD	23.9	24.9	30.4	34.1	55.8	46.8	44.2	22.8
HADDOCK	.	.	.	0	.	0.5	0	.
JOHN DORY	.	.	.	.	0	.	0	.
LEMON SOLE	2	1.8	0.5	2	9.8	8.7	8.7	28
LESSER SPOTTED DOGFISH	0	0.1	0.1	.	0.1	0	.	0
LESSER WEEVER FISH	29.3	28	34.1	62.3	56.8	60.2	29.4	65
POGGE (ARMED BULLHEAD)	44.6	60.2	59	42.7	147.4	164.4	70.5	116.1
POOR COD	2.7	0.7	0.7	0.7	1	4.4	2.7	0.9
RED GURNARD	.	0.5	0.5	0.6	0.2	0.3	0.1	0.6
RED MULLET	0.1	1.1	1.2	0.2	4.2	1.6	0.1	1.4
SCALD FISH	93.5	72.3	73.3	185.7	82.3	68.2	19.2	53.4
SOLE (DOVER SOLE)	86.8	51.1	128	69.6	42.7	48.6	21.4	376.5
SOLENETTE	82	78.7	143.1	183.7	154.3	123.3	37.1	111
THICKBACK SOLE	0	.	.	.	.	0.1	.	.
TUB GURNARD	7.7	5.7	12.5	11.8	9.3	6.4	5.5	4.3
TURBOT	4.9	3.5	3.2	3.3	2.7	2.8	2.8	4.7
WHITING	362.7	71.4	81.1	77.4	98.6	137.6	50.2	66.7
WHITING POUT (BIB)	26.2	1.5	3	2.6	2.4	19.7	1	184.9

Table 2.3.4

Abundance of fish species in subarea RFA7

	1990	1991	1992	1993	1994	1995	1996	1997
AMERICAN PLAICE (LR DAB)	26.7	27.7	.	72.7	34.6	30.7	183.7	228.7
ANGLERFISH (MONK)	.	0.1	.	.	1	0.4	2.8	1.3
BRILL	.	.	.	1.3	0.3	0.4	0.3	0.2
COD	1.1	4.9	.	2	16.2	10	100.6	30.1
COMMON DRAGONET	62	52.7	.	70.3	.	2.1	5.7	0.9
DAB	2798.6	1530.6	.	3381.7	286.8	433.4	1645.5	442.6
EUROPEAN PLAICE	870.6	692	.	286.3	115.6	235.7	200.2	170.8
FLOUNDER (EUROPEAN)	7.1	3.4	.	1.4	0.1	.	5.7	1.2
GREY GURNARD	110	86.3	.	90.7	63.7	119.5	83.8	30.9
HADDOCK	.	.	.	.	3.9	34.9	3	14.4
LEMON SOLE	8	3.4	.	1.4	.	2.6	9.8	5.5
LESSER WEEVER FISH	.	.	.	5.4	0.6	0.1	.	.
POGGE (ARMED BULLHEAD)	35.4	52	.	84.4	7.6	15.6	27.2	6.3
POOR COD	.	.	.	.	0.2	.	.	0.2
RED GURNARD	.	.	.	.	0.1	.	.	.
SCALD FISH	4.9	17.9	.	20.6	5.1	7.8	.	.
SOLE (DOVER SOLE)	16	11.4	.	9	4.7	4.4	4	.
SOLENETTE	4.6	3.1	.	24	6.6	14.9	2.2	0.1
TUB GURNARD	3.4	.	.	2.3	0.8	0.2	5	3
TURBOT	1.9	0.9	.	0.7	0.8	0.7	0.8	0.4
WHITING	659.1	152.3	.	89	27.8	31	10.8	9.7
WHITING POUT (BIB)	0.4	.	.	.	.	.	.	.

Table 2.3.5

Abundance of fish species in subarea VIIa

	1990	1991	1992	1993	1994	1995	1996	1997
AMERICAN PLAICE (LR DAB)	14.6	0.2	1.3	1.5	4.1	8.6	3.9	14.5
ANGLERFISH (MONK)	0.8	1.8	2.7	4.3	3.1	2.8	2.7	1.8
BRILL	2.3	2.4	2	2	0.9	1	1.8	1.1
COD	35.6	10.8	5.3	23	15.1	8.5	7.9	6.4
COMMON DRAGONET	189.4	153	209.1	196.8	174.8	136.3	133	141.4
DAB	573.8	357.8	214.2	380.8	548.7	487.1	429.5	586.2
EUROPEAN PLAICE	317	145.5	187.7	297.9	273.3	275.8	257.2	357.9
FLOUNDER (EUROPEAN)	3.6	1	1.8	1.2	0.8	0.5	0.5	2.1
GREY GURNARD	66.3	48.6	114.6	89.9	80.7	43.8	47	55.5
HADDOCK	1.8	.	0.8	0.6	11.5	1.7	8.1	4.3
JOHN DORY	0.2	0.4	0.4	0.4	0.1	0.2	0.1	1
LEMON SOLE	4.6	2	3.6	13.1	10.9	12.7	9.1	12.1
LESSER SPOTTED DOGFISH	21	19.8	31.7	22.8	19.4	18.7	20.7	39.9
LESSER WEEVER FISH	13.6	25.1	44.2	44.9	55.5	52.8	19.9	33.3
POGGE (ARMED BULLHEAD)	81.4	37.6	47	65.3	57	52.3	48.4	38.9
POOR COD	245.7	84.6	119.6	218.9	124.2	153.4	108.9	139.3
RED GURNARD	1.4	6.1	3.6	4	5.6	2.9	5.6	8.9
RED MULLET	.	0.2	0.1	0	.	0.6	.	0.3
SCALD FISH	24.4	38.3	34.8	39.9	47.1	33.6	47.8	40.4
SOLE (DOVER SOLE)	185.5	179	159	76	65.5	59.8	80.8	128.4
SOLENETTE	138.2	255.5	128.4	209.5	196.1	252.1	174.1	240.2
THICKBACK SOLE	11.7	20.9	49.6	30.2	24.3	22	26.8	24.1
TUB GURNARD	7.6	6.9	15.2	8.2	7.3	7.5	9.4	9.5
TURBOT	0.2	0.5	0.5	0.2	0.3	0.3	0.4	0.2
WHITING	73	45.9	85.2	97.6	83.2	173.1	85.2	123.6
WHITING POUT (BIB)	39.4	27.5	27.7	7.4	1.7	11.1	3.6	16.4

Table 2.3.6

	Abundance of fish species in subarea VIId					1990	1991	1992	1993	1994	1995	1996	1997
ANGLERFISH (MONK)		0.1	.	.	0.1	0.1	.	.	0.1	0.1	.	0.2	0.1
BRILL		2.3	0.9	0.8	0.9	1.3	1.7	1.7	1.5	1.3	1.7	1.5	1.3
COD		.	.	0.4	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.7
COMMON DRAGONET		117.3	212.7	300.3	245.3	304.9	126.5	226.6	260	260	260	260	260
DAB		49.2	81.7	96.6	34.7	132.2	69.7	52.6	69.7	69.7	69.7	69.7	69.7
EUROPEAN PLAICE		51.3	59.9	60.5	41.9	36.2	32	62.6	85.8	85.8	85.8	85.8	85.8
FLOUNDER (EUROPEAN)		0.8	5.3	2.1	1.7	2.2	2.4	16.9	2.9	2.9	2.9	2.9	2.9
GREY GURNARD		0.9	1	0.4	0.2	0.4	0.1	0.1	0.1	0.1	0.1	0.1	0.6
JOHN DORY		.	0.6	0.5	0.4	0.6	0.1	0.1	0.1	0.1	0.1	0.1	0.2
LEMON SOLE		7.8	3.5	2.9	7	11.1	13.2	8.9	7.6	7.6	7.6	7.6	7.6
LESSER SPOTTED DOGFISH		3.4	5.2	8.6	11.6	6.6	6.7	6	10.6	10.6	10.6	10.6	10.6
LESSER WEEVER FISH		8.8	5.3	6.4	8.5	11	5.3	11.4	5.1	5.1	5.1	5.1	5.1
POGGE (ARMED BULLHEAD)		13.8	24.9	24.9	29.9	43.9	36	28.6	55.6	55.6	55.6	55.6	55.6
POOR COD		171.9	83.2	70.3	59	98.9	100	77.5	61.4	61.4	61.4	61.4	61.4
RED GURNARD		8.3	8.1	8.1	8.4	12.3	9.7	13.5	7.2	7.2	7.2	7.2	7.2
RED MULLET		0.7	.	0.2	0.6	.	0.1	0.3	0.1	0.1	0.1	0.1	0.1
SCALD FISH		7	18.6	15.5	16.9	10.4	6.1	9.2	9.9	9.9	9.9	9.9	9.9
SOLE (DOVER SOLE)		28.3	46.9	31.5	42.1	33.6	28.1	29.9	39.7	39.7	39.7	39.7	39.7
SOLENETTE		104.8	163	138.1	180.8	180.2	79.2	161.8	139.9	139.9	139.9	139.9	139.9
THICKBACK SOLE		2.3	4.1	5	6.8	7.2	6.4	9.3	9.6	9.6	9.6	9.6	9.6
TUB GURNARD		3.9	2.3	5	5.9	4	3.4	2.2	3.5	3.5	3.5	3.5	3.5
TURBOT		0.8	0.5	0.6	0.2	0.5	0.8	0.4	0.3	0.3	0.3	0.3	0.3
WHITING		0.5	0.8	1.9	0.5	1.8	4.3	0.3	0.1	0.1	0.1	0.1	0.1
WHITING POUT (BIB)		221.8	39.2	59.5	38.6	62.4	47.2	71.2	91.8	91.8	91.8	91.8	91.8

Table 2.3.7

Abundance of fish species in subarea VIIe

	1990	1991	1992	1993	1994	1995	1996	1997
ANGLERFISH (MONK)	1.1	0.9	0.7	2.6	0.9	2	1.3	0.3
BRILL	0.3	0.6	0.6	0.4	0.4	0.3	0.5	0.5
COD	.	.	0.1	.	0	.	.	0.2
COMMON DRAGONET	39.2	8.2	74.3	37	87.6	60.4	122.9	40.4
DAB	17.5	12.9	13.4	13.1	32.3	21.5	19.8	19
EUROPEAN PLAICE	18.6	12	14.6	9.6	9.5	9.2	15.7	34.9
FLOUNDER (EUROPEAN)	.	.	.	0	.	0.1	0.3	.
GREY GURNARD	5.5	3.5	3.6	4.8	9.9	3.1	6.8	2.7
HADDOCK	.	.	.	.	.	0	.	.
JOHN DORY	0.1	0.9	1.2	2.2	1	0.1	0	0.6
LEMON SOLE	2	2.3	0.7	0.7	0.9	1.3	1.2	0.9
LESSER SPOTTED DOGFISH	9.9	9	13.9	18.3	11	14.9	13.7	28.9
LESSER WEEVER FISH	0.1	.	0.6	0.1	5.5	1.8	5	2.2
POGGE (ARMED BULLHEAD)	13.2	0.7	4.5	3.3	7.2	4.2	6.5	5.4
POOR COD	71.2	12.7	116.5	46.2	102.2	45.9	105.7	39
RED GURNARD	35.5	10.5	30.2	34.7	51.4	31.3	26.3	22.2
RED MULLET	1.1	0.6	0.8	1.6	1	1.7	1.9	1.7
SCALD FISH	6	2.5	12.7	9.4	23.9	15.5	25.6	10.1
SOLE (DOVER SOLE)	9.5	17.7	22.2	13.4	10.6	9.2	12.1	18.7
SOLENETTE	12.3	0.9	46	45.3	114.7	74.4	91.9	39.9
THICKBACK SOLE	31.5	6.2	58.5	23.7	44.9	25.6	59.8	31.1
TUB GURNARD	0.6	0.4	1.5	0.8	0.3	0.6	0.8	0.4
TURBOT	0.1	0.1	0	0.1	0.1	0.1	0.1	0.1
WHITING	0.7	12.9	5.2	13	2.1	3.5	4.3	6.2
WHITING POUT (BIB)	13.3	9	11.3	7.6	4.5	1.9	5.5	14.4

Table 2.3.8

Abundance of fish species in subarea VIIf

	1990	1991	1992	1993	1994	1995	1996	1997
ANGLERFISH (MONK)	0.6	2.8	10.8	6.2	4.8	3.2	2.3	1
BRILL	2.1	2.5	1.6	1.5	1.9	2.6	1.6	2.4
COD	0.6	0.8	1.5	0.3	0.8	1	0.5	0.8
COMMON DRAGONET	19.8	40.4	75.9	52.4	119.2	50.9	86.4	50.3
DAB	66.7	77.9	152.8	117.8	167.4	84.8	104.9	87.8
EUROPEAN PLAICE	100	121.9	101.3	33.8	36.7	42.5	71.9	51.8
FLOUNDER (EUROPEAN)	1.3	1.1	1	0.4	1.6	1.6	1.1	0.1
GREY GURNARD	15.4	52.2	85.2	63.1	45.1	25.6	23	26.3
HADDOCK	.	.	.	.	0.1	.	0.1	0.2
JOHN DORY	0.8	2.1	0.5	3	1.1	0.7	0.4	1.7
LEMON SOLE	1.7	1.8	3.3	4.7	9.1	6.3	12	5.9
LESSER SPOTTED DOGFISH	72.4	86.5	100.7	48.9	40.1	32.8	34.1	50.6
LESSER WEEVER FISH	0.2	2.8	1.1	3	3.2	3.4	3.4	1.6
POGGE (ARMED BULLHEAD)	0.4	1.9	3.2	7.9	3.3	3.9	4.7	2.7
POOR COD	321.8	293.7	334.9	298.3	112.8	116.4	121.5	181.5
RED GURNARD	1.5	5.1	1.1	7.4	10.4	6.9	9.5	6.7
RED MULLET	2.1	0.1	.	0.1	0.2	0.1	1.1	1.5
SCALD FISH	0.4	1.8	1.3	1	3	3.5	4	3.7
SOLE (DOVER SOLE)	118.5	136.8	130.2	81.1	110.1	54.8	59	96.4
SOLENETTE	113	280.5	153	138	246.9	119.6	111.1	74.5
THICKBACK SOLE	7.6	26.9	31.2	27.4	23.6	23.1	22.5	17
TUB GURNARD	9.7	7.4	12.6	2.8	8.6	6.8	6.2	6.2
TURBOT	1.3	2.3	1.2	1.3	1.9	2.4	1.4	0.5
WHITING	85.1	87.3	122.8	163.6	53.1	56.1	91.5	153.4
WHITING POUT (BIB)	255	100.3	29.2	13.5	5.4	7.6	15.5	171.3

Table 2.3.9

Abundance of fish species in subarea VIIg

	1990	1991	1992	1993	1994	1995	1996	1997
AMERICAN PLAICE (LR DAB)	.	.	.	33.6	87.1	60.3	42.3	21.7
ANGLERFISH (MONK)	.	.	.	19.6	26	20.3	9.4	4.6
BRILL	8	.	4	0.8	0.3	.	.	.
COD	.	.	.	1.6	0.9	0.9	0.6	0.6
COMMON DRAGONET	.	4	4	76	97.1	64.9	41.7	40
DAB	.	4	.	112.8	65.4	54.5	43.4	98.3
EUROPEAN PLAICE	.	12	4	10.4	7.4	8.9	11.4	17.7
GREY GURNARD	.	32	4	92.8	99.1	52.3	38.3	25.1
HADDOCK	.	.	.	27.2	44	16.9	20.3	16.6
JOHN DORY	.	.	.	0.4	0.3	.	0.3	.
LEMON SOLE	.	.	.	19.6	18.9	16.9	12.6	6.3
LESSER SPOTTED DOGFISH	.	.	8	15.6	13.7	18.8	14.6	45.7
LESSER WEEVER FISH	.	4	.	.	0.3	.	0.9	.
POGGE (ARMED BULLHEAD)	.	.	.	29.2	9.7	12.6	5.1	16
POOR COD	12	468	180	188.8	68	55.7	52.3	162.3
RED GURNARD	.	.	.	4	1.7	0.3	0.3	1.7
SCALD FISH	.	.	.	79.8	44	44.3	44	21.1
SOLE (DOVER SOLE)	12	60	16	20	12.6	12	8	22.9
SOLENETTE	.	.	4	73.7	44.4	41.2	9.1	20.6
THICKBACK SOLE	.	8	.	78.4	68.3	69.5	47.4	36
TUB GURNARD	.	4	.	.	.	.	0.3	0.6
TURBOT	4	.	4	0.8	.	0.3	.	.
WHITING	20	108	40	64.4	18.9	36	28.6	124
WHITING POUT (BIB)	.	12	4	.	0.9	.	.	7.4

**Table 2.4.1: Catch rate of sole from Netherlands and UK surveys
in the North Sea and VII d,a,e,f&g**

Netherlands (N.hr^-1/8m trawl) North Sea											
Age	0	1	2	3	4	5	6	7	8	9	10+
1985	0.0	2.4	6.0	4.0	1.6	0.6	0.2	0.0	0.0	0.0	0.0
1986	0.0	5.9	4.9	1.6	1.0	0.5	0.2	0.1	0.0	0.0	0.1
1987	0.1	6.1	9.8	2.5	0.8	0.6	0.2	0.1	0.1	0.0	0.0
1988	0.0	70.6	11.1	3.1	0.8	0.2	0.2	0.1	0.1	0.0	0.0
1989	0.9	8.0	60.5	3.2	4.1	0.5	0.2	0.1	0.0	0.0	0.0
1990	0.1	19.0	19.4	19.5	1.0	0.7	0.2	0.1	0.1	0.0	0.0
1991	0.9	3.3	17.4	4.6	9.1	0.3	0.5	0.1	0.0	0.0	0.0
1992	0.2	67.8	24.4	9.1	2.5	3.4	0.1	0.2	0.0	0.0	0.1
1993	0.0	5.0	24.5	2.7	3.9	1.7	3.3	0.0	0.1	0.0	0.0
1994	0.8	6.5	5.1	14.9	0.5	1.9	0.1	0.7	0.0	0.0	0.0
1995	0.7	25.8	6.3	8.3	7.4	0.4	0.9	0.2	0.9	0.0	0.1
1996	0.2	3.0	5.1	1.2	1.4	2.2	0.3	0.4	0.1	0.2	0.0
1997	1.3	173.2	5.4	3.2	0.8	0.8	0.4	0.1	0.0	0.0	0.1

United Kingdom (N.hr^-1/8m trawl) Eastern Channel (VIId)											
Age	0	1	2	3	4	5	6	7	8	9	10+
1988	0.0	8.2	14.2	9.9	0.8	1.3	0.6	0.1	0.1	0.2	0.2
1989	0.0	2.6	15.4	3.4	1.7	0.6	0.2	0.2	0.0	0.0	0.7
1990	0.0	12.1	3.7	3.7	0.7	0.8	0.2	0.1	0.2	0.0	0.1
1991	0.0	8.9	22.8	2.2	2.3	0.3	0.5	0.1	0.2	0.1	0.1
1992	0.0	1.4	12.0	10.0	0.7	1.1	0.3	0.5	0.1	0.2	0.6
1993	0.0	0.5	17.5	8.4	7.0	0.8	1.0	0.3	0.2	0.0	0.4
1994	0.0	4.8	3.2	8.3	3.3	3.3	0.2	0.6	0.1	0.3	0.3
1995	0.0	5.2	16.9	2.1	3.8	2.2	2.4	0.2	0.3	0.2	0.2
1996	0	3.5	7.3	3.8	0.7	1.3	0.9	1.1	0.1	0.5	0.4
1997	0	19	7.3	3.2	1.3	0.2	0.5	0.4	0.9	0	0.7

United Kingdom (N.hr^-1/8m trawl) Western Channel (VIIe)											
Age	0	1	2	3	4	5	6	7	8	9	10+
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
1994	0.0	0.1	1.7	3.3	2.4	1.4	0.2	0.3	0.0	0.1	0.3
1995	0.1	1.1	1.5	1.9	1.7	1.0	1.3	0.2	0.2	0.2	0.5
1996	0.0	1.9	4.7	2.4	1.0	1.3	0.7	0.6	0.1	0.0	0.4
1997	0.2	3.0	5.5	5.1	1.7	0.5	0.6	0.5	0.4	0.2	0.6

United Kingdom (N.hr^-1/8m trawl) Bristol Channel (VIIf&g)											
Age	0	1	2	3	4	5	6	7	8	9	10+
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
1994	0.1	9.7	4.7	5.9	3.8	2.5	1.0	0.1	0.1	0.7	0.1
1995	2.0	3.4	11.7	5.0	1.8	0.6	2.3	0.5	0.0	0.4	0.3
1996	0.3	7.9	11.0	3.4	2.4	0.8	0.4	0.2	0.3	0.2	0.6
1997	1.6	22.1	13.5	1.7	0.9	1.4	0.5	0.1	1.1	0.0	0.6

United Kingdom (N.hr^-1/8m trawl) Irish Sea (VIIa)											
Age	0	1	2	3	4	5	6	7	8	9	10+
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
1994	0.0	1.7	17.9	10.0	4.3	6.5	2.4	0.7	0.5	0.2	1.6
1995	1.8	13.2	8.8	11.2	4.8	2.2	2.9	0.6	0.3	0.1	1.2
1996	0.2	46.2	8.3	2.5	5.8	3.3	1.7	2.1	0.6	0.2	0.7
1997	0.5	65.7	39.8	4.9	1.8	3.9	1.9	1.1	2.3	0.6	0.8

Table 2.4.2: Catch rate of plaice from Netherlands and UK surveys
in the North Sea and VII d.a.e.f&g

Netherlands (N.hr^-1/8m trawl) North Sea

Age	0	1	2	3	4	5	6	7	8	9	10+
1985	44.8	105.7	185.9	39.5	13.3	1.5	1.0	0.5	0.2	0.2	0.5
1986	14.6	634.3	125.8	50.4	10.2	4.7	0.9	0.5	0.3	0.1	0.2
1987	39.0	207.7	707.4	32.1	9.5	2.7	1.5	0.3	0.2	0.1	0.3
1988	86.7	541.2	151.1	208.0	6.8	3.1	0.7	0.6	0.1	0.1	0.3
1989	73.2	398.0	337.9	56.1	51.1	7.9	1.1	0.4	0.2	0.1	0.3
1990	15.4	123.2	122.1	67.4	22.3	10.2	1.1	0.3	0.2	0.1	0.1
1991	6.1	187.2	125.5	30.1	21.6	5.4	4.6	0.6	0.2	0.1	0.2
1992	15.3	179.6	117.2	20.6	6.1	5.0	2.9	1.4	0.4	0.0	0.1
1993	49.7	124.9	164.1	36.9	7.3	1.8	1.5	0.5	0.5	0.2	0.1
1994	154.8	152.7	65.2	32.2	10.3	2.1	0.6	0.7	1.3	0.3	0.1
1995	97.4	238.2	48.2	14.3	6.2	2.3	0.9	0.4	1.1	0.3	0.2
1996	194.0	213.5	193.1	23.9	5.7	3.3	0.8	0.1	0.2	0.2	0.3
1997	40.7	431.6	742.0	20.3	2.8	0.2	0.4	0.2	0.1	0.0	0.0

United Kingdom (N.hr^-1/8m trawl) Eastern Channel (VIId)

Age	0	1	2	3	4	5	6	7	8	9	10+
1988	0.0	26.5	31.3	43.8	7.0	4.6	1.5	0.8	0.7	0.6	1.2
1989	0.0	2.3	12.1	16.6	19.9	3.3	1.5	1.3	0.5	0.3	1.7
1990	0.6	5.2	4.9	5.8	6.7	7.5	1.8	0.7	1.0	0.8	0.4
1991	0.0	11.7	9.1	7.0	5.3	5.4	3.2	1.2	1.0	0.1	1.2
1992	0.0	16.5	12.5	4.2	4.2	5.6	4.9	3.4	0.7	0.5	0.7
1993	0.1	3.2	13.4	5.0	1.7	1.9	1.6	2.0	2.8	0.4	0.6
1994	1.2	8.3	7.5	9.2	5.6	2.0	0.8	0.9	1.8	1.2	0.8
1995	0.0	11.3	4.1	3.0	3.7	1.5	0.6	0.6	1.3	0.8	0.8
1996	0	13.2	11.9	1.3	0.7	1.3	0.9	0.4	0.3	0.4	2.8
1997	0	33.2	13.5	4.2	0.7	0.3	0.3	0.2	0.2	0.2	1.9

United Kingdom (N.hr^-1/8m trawl) Western Channel (VIIe)

Age	0	1	2	3	4	5	6	7	8	9	10+
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
1994	0.0	0.8	0.8	3.6	1.2	0.4	0.2	0.5	0.6	0.3	0.0
1995	0.3	2.1	1.7	1.9	2.1	0.5	0.2	0.3	0.2	0.1	0.2
1996	5.4	2.3	3.9	1.3	0.8	0.9	0.2	0.0	0.1	0.3	0.4
1997	10.4	8.1	4.8	8.1	0.9	0.3	0.6	0.3	0.1	0.0	0.4

United Kingdom (N.hr^-1/8m trawl) Bristol Channel (VIIIf&g)

Age	0	1	2	3	4	5	6	7	8	9	10+
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
1994	3.3	5.1	4.3	3.4	1.0	0.0	0.0	0.2	0.1	0.0	0.4
1995	0.1	7.5	7.0	3.0	0.4	0.5	0.3	0.0	0.0	0.1	0.2
1996	0.4	12.0	21.8	5.3	1.6	0.8	0.0	0.1	0.0	0.0	0.1
1997	0.3	11.6	12.3	9.6	6.7	0.2	2.0	0.0	0.1	0.0	0.6

United Kingdom (N.hr^-1/8m trawl) Irish Sea (VIIa)

Age	0	1	2	3	4	5	6	7	8	9	10+
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
1994	14.6	207.0	124.6	81.4	17.5	5.6	1.4	1.4	0.6	0.2	0.6
1995	17.8	249.7	101.0	38.8	32.2	2.9	1.5	0.6	0.4	0.4	0.3
1996	6.3	144.0	69.3	20.4	9.1	7.1	2.3	1.0	0.1	0.4	0.5
1997	33.3	169.2	98.1	41.4	13.5	7.4	6.1	2.7	0.9	0.5	0.9

Table 4.1 Indices of juvenile sole and plaice abundance from other coastal beam trawl surveys. Abundance indices for sole and plaice are given as numbers per 1000 m² sampled during the DYFS (a), as millions of fish sampled during the UKYFS (b) and as numbers per 100 fishing hours of the SNS (c), (see section 4 for details).

a)				b)				c)									
Year class	Sole		Plaice		Year class	Sole		Plaice		Year class	Sole		Plaice		Year class	Plaice	
	0-group	1-group	0-group	1-group		0-group	1-group	0-group	1-group		0-group	1-group	2-group	3-group		0-group	1-group
69	0.66		2.87		69					67				204		2813	
70	12.18	0.04	6.7	0.93	70					68			745	99		9450	1008
71	7.93	0.07	4.59	2.63	71					69	4938	1961	161	8033	23848	4484	
72	0.29	0.21	2.46	6.79	72					70	669	613	341	73	3678	18101	9584
73	4.54	0.33	2.58	1.96	73	27.48		43.48		71	6327	1410	905	69	6705	6437	4191
74	0.83	0.03	2.29	3.03	74		2.69	56.91	14.36	72	24	4686	397	174	9242	57238	17985
75	8.08	0.19	2.17	4.03	75	42.79	7.08	21.06	4.76	73	847	1924	887	187	5451	15648	9171
76	3.38	0.22	7.03	6.59	76	65.3	8.5	59.87	9.08	74	140	597	79	77	2193	9781	2274
77	1.07	0.03	3.7	3	77	24.81	0.92	59.02	11.82	75	565	1413	762	267	1151	9037	2900
78	4.36	0.11	8.18	7.91	78	33.58	0.79	31.14	9.75	76	475	3724	1379	325	11544	19119	12714
79	20.65	2.05	17.07	10.53	79	46.97	8.61	17.67	6.6	77	1620	1552	388	99	4378	13924	9540
80	19.83	0.51	5.02	6.92	80	117.89	8.12	21.35	5.89	78	10529	104	80	51	3252	21681	12084
81	15.15	0.67	28.87	13.83	81	50.57	6.92	53.19	12.64	79	3908	4483	1411	231	27835	58049	16106
82	17.61	1.11	24.01	7.82	82	62.73	4.78	16.74	7.08	80	5518	3739	1124	107	4039	19611	8503
83	4.93	0.41	18	5.74	83	64	10.82	62.39	9.76	81	3194	5098	1137	307	31541	70108	14708
84	9.17	0.1	10.72	4.65	84	86.91	4.23	70.63	19.14	82	2528	2640	1081	159	23987	34884	10413
85	15.8	0.58	36.98	13.41	85	46.58	3.12	52.61	16.68	83	769	2359	709	67	36722	44667	13789
86	3.5	0.24	17.69	9.98	86	27.03	2.29	39.96	7.22	84	3473	2151	456	59	7958	27832	7558
87	28.55	0.76	23.38	4.97	87	38.22	9.4	33.9	7.98	85	4268	3791	955	284	47385	93573	33021
88	2.07	0.28	15.5	6.31	88	60.72	4.05	48.67	13.88	86	901	1890	594	248	8658	33426	14430
89	2.62	0.22	22.35	6.25	89	116.4	13.51	31.71	7.9	87	13690	11227	5369	907	21270	36672	14952
90	2.6	0.03	22.02	6.88	90	49.7	30.46	34.37	12.04	88	523	3052	1078	527	15598	37238	7287
91	19.37	0.54	24.47	5.88	91	53.55	5.93	17.8	7.47	89	2171	2900	2515	319	24198	24903	11149
92	0.82	0.03	18.09	3.41	92	58.08	28	35.55	7.3	90	53	1265	114	46	9559	57349	13742
93	0.76	0.03	12.31	0.87	93	50.8	8.97	49.5	9.19	91	3640	11081	3489	943	17120	48223	9484
94	3.62	0.11	22.92	0.96	94	34.19	10.59	40.65	11.95	92	303	1351	475	126	5398	22184	4866
95	0.47	0.07	6.94	6.17	95	31.37	5.77	49.84	4.98	93	1365	691			13029	24663	
96	2.32	0.47	24.68	8.11	96	58.46	17.24	62.84	10.62	94	2197	10132			91713	64524	
97	2.69		8.17		97	23.10		16.57		95	972				15363		

Table 4.2 Summary of coastal beam trawl surveys elsewhere in northwest Europe that do not form part of the Study Group database.

Country	Survey code	Survey area	Year range of survey	Dates:	Trawls per year	Beam trawl length
UK	UKYFS	VIIId	1980-present	Sep	170	1.5 & 2
UK	UKYFS	IVc	1980-present	Sep	290	1.5 & 2
UK	UKYFS	Filey Bay	1980-present	Sep	20	1.5 & 2
UK	UKYFS	VIIa, f & g	1972, 75, 80	Sep	430	1.5 & 2
France	-	VIIId	1977-83	Sep	75	2.7-4.5 ?
France	-	Seine estuary	1995-96	Feb & Sep	50	2.7-4.5 ?
France	-	Seine estuary	1981	Jun to Sep	160	2.7-4.5 ?
France	-	Somme estuary	1979-present	Sep	80	2.7-4.5 ?
France	-	Bay of Seine	1978-81	Jun to Sep	100	2.7-4.5 ?
France	-	VIIe	1978-81	?	?	2.7-4.5 ?
France	-	Bay of Villaine	1981-90	Jul & Oct	100	2.7-4.5 ?
France	-	Loire estuary	1980-86	Jul & Oct	50	2.7-4.5 ?
France	-	Bay of Bourneuf	1980-84	Jul & Oct	40	2.7-4.5 ?
Netherlands, Belgium, Germany	DYFS	IVb,c coastal waters	1969-present	Sep & Oct	c.200	3 & 6
Netherlands, Belgium, Germany	DYFS	IVb,c coastal waters	1969-86	Apr	c.200	3 & 6
Netherlands	SNS	IVb,c coastal waters	1970-present	Sep & Oct	c.60	6

Table 5.1 Taxonomic list of invertebrate fauna recorded in the North Sea (RV Tridens), Irish Sea and Eastern English Channel (RV Corystes) during 1997 groundfish surveys

Porifera: Demospongiae	<i>Pandalus</i> sp.	Mollusca: Scaphopoda
<i>Suberites domuncula</i>	<i>Crangon allmanni</i>	Dentaliidae indet.
<i>Suberites</i> sp.	<i>Crangon crangon</i>	Mollusca: Prosobranchia
<i>Halichondria panicea</i>	<i>Pontophilus spinosus</i>	<i>Diodora graeca</i>
<i>Haliclona oculata</i>	Crustacea: Astacidea	<i>Calliostoma ziziphinum</i>
<i>Stelligera stuposa</i>	<i>Nephrops norvegicus</i>	<i>Crepidula fornicate</i>
Porifera (indet.)	<i>Homarus gammarus</i>	<i>Natica alderi</i>
Cnidaria: Scyphozoa	Crustacea: Anomura	<i>Natica catenusa</i>
<i>Cyanea</i> sp.	<i>Upogebia deltaura</i>	<i>Trophonopsis</i> spp.
Cnidaria: Hydrozoa	<i>Anapagurus in Epizoanthus</i>	<i>Buccinum undatum</i>
<i>Tubularia</i> sp.	<i>Pagurus bernhardus</i>	<i>Colus gracilis</i>
<i>Diphasia</i> sp.	<i>Pagurus prideauxi</i>	<i>Colus islandicus</i>
<i>Thuiaria</i> sp.	<i>Pagurid in Suberites</i>	<i>Neptunea antiqua</i>
<i>Nemertesia</i> spp.	<i>Paguridae</i> (indet.)	<i>Nassarius reticulatus</i>
Hydroida (indet.)	<i>Lithodes maja</i>	Mollusca:
Cnidaria: Anthozoa	<i>Galathea</i> spp.	Opisthobranchia
<i>Alcyonium digitatum</i>	<i>Munida rugosa</i>	<i>Scaphander lignarius</i>
<i>Pennatula phosphorea</i>	<i>Pisidia longicornis</i>	<i>Philine aperta</i>
<i>Virgularia mirabilis</i>	<i>Porcellana</i> spp.	<i>Tritonia hombergi</i>
<i>Caryophyllia smithi</i>	Crustacea: Brachyura	<i>Dendronotus frondosus</i>
<i>Epizoanthus incrustans</i>	<i>Dromia personata</i>	<i>Acanthodoris pilosa</i>
<i>Bolocera tuedia</i>	<i>Ebalia cranchi</i>	<i>Onchidoris bilamellata</i>
<i>Urticina eques</i>	<i>Ebalia</i> spp.	<i>Archidoris pseudoargus</i>
<i>Urticina felina</i>	<i>Hyas araneus</i>	<i>Coryphella</i> spp.
<i>Metridium senile</i>	<i>Hyas coarctatus</i>	Opisthobranchia indet.
<i>Hormathia</i> sp.	<i>Inachus dorestensis</i>	Mollusca: Bivalvia
<i>Adamsia carcinopodus</i>	<i>Macropodia rostrata</i>	<i>Nucula</i> spp.
Anthozoa (indet.)	<i>Eury nome aspera</i>	<i>Glycymeris glycymeris</i>
Polychaeta	<i>Pisa armata</i>	<i>Mytilus edulis</i>
<i>Aphrodisia aculeata</i>	<i>Maia squinado</i>	<i>Mytilus</i> sp.
<i>Hyalinoecia tubicola</i>	<i>Majidae</i> (indet.)	<i>Modiolus barbatus</i>
Sabellaria (indet.)	<i>Corystes cassivelaunus</i>	<i>Modiolus modiolus</i>
<i>Filograna implexa</i>	<i>Atelecyclus rotundatus</i>	Ostreidae
<i>Protula tubularia</i>	<i>Cancer pagurus</i>	<i>Pecten maximus</i>
<i>Armina loveni</i>	<i>Carcinus maenas</i>	<i>Aequipecten opercularis</i>
<i>Sternapsis scutata</i>	<i>Liocarcinus depurator</i>	<i>Chlamys varia</i>
<i>Tubellaria tubes</i>	<i>Liocarcinus holsatus</i>	<i>Chlamys</i> sp.
Polychaeta (indet.)	<i>Liocarcinus marmoreus</i>	<i>Arctica islandica</i>
Crustacea: Cirripedia	<i>Liocarcinus pusillus</i>	<i>Acanthocardia echinata</i>
<i>Balanus balanus</i>	<i>Necora puber</i>	<i>Acanthocardia</i> sp.
Crustacea: Stomatopoda	<i>Portunus latipes</i>	<i>Laevicardium crassum</i>
<i>Squilla mantis</i>	<i>Pilumnus hirtellus</i>	<i>Venus (Mercenaria)</i>
Crustacea: Amphipoda	<i>Monodaeus couchi</i>	<i>verrucosa</i>
<i>Parathermisto (Thermisto)</i> spp.	<i>Goneplax rhomboides</i>	<i>Venus fasciata</i>
	<i>Pinnotheres pisum</i>	

<i>Caprella linearis</i> Crustacea: Natantia <i>Palaemon serratus</i> <i>Alpheus glaber</i> <i>Spirontocaris</i> sp. <i>Pandalus monatgui</i>	Pycnogonidae <i>Pycnogonum littorale</i> Mollusca: Polyplacophora <i>Acanthochitona</i>	<i>Venus (Chamelea) striatula</i> <i>Mactra</i> spp. <i>Spisula solidula</i> <i>Ensis</i> spp. <i>Mya</i> spp. <i>Hiatella</i> spp.
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Mollusca: Cephalopoda <i>Sepia</i> spp. <i>Sepiola</i> spp. <i>Alloteuthis subulata</i> <i>Loligo forbesi</i> <i>Loligo</i> sp. <i>Todaropsis</i> sp. Teuthoidea (indet.) <i>Eledone cirrhosa</i> Octopoda (indet.) Bryozoa <i>Flustra foliacea</i> <i>Cellaria</i> spp. <i>Pentapora</i> <i>Alcyonium diaphanum</i> <i>Alcyonium</i> sp. Bryozoa (indet.) Echinodermata: Crinoidea <i>Antedon bifida</i> Echinodermata: Asteroidea <i>Astropecten irregularis</i> <i>Psilaster andromeda</i> <i>Luidia ciliaris</i>	<i>Luidia sarsi</i> <i>Luidia</i> spp. <i>Hippasteria phrygiana</i> <i>Ceramaster placenta</i> <i>Porania pulvillus</i> <i>Crossaster papposus</i> <i>Solaster endeca</i> <i>Henricia oculata</i> <i>Henricia sanguinolenta</i> <i>Asterias rubens</i> <i>Marthasterias glacialis</i> Echinodermata: Ophiuroidea <i>Ophiura ophiura</i> <i>Ophiura albida</i> <i>Ophiocomina nigra</i> <i>Ophiothrix fragilis</i> <i>Ophioderma longicauda</i> Echinodermata: Echinoidea <i>Psammechinus miliaris</i> <i>Echinus esculentus</i> <i>Echinus elegans</i> <i>Spatangus purpureus</i> <i>Echinocardium cordatum</i> Echinoida (indet.)	Echinodermata: Holothuroidea <i>Thyone fusus</i> <i>Thyone raphanus</i> Cucumariidae (indet.) <i>Psolus phantapus</i> Holothuroidea (indet.) Asciidiacea: Enterogona <i>Aplidium punctum</i> <i>Polyclinum aurantium</i> <i>Synoicum pulmonaria</i> <i>Ascidia conchilega</i> <i>Ascidia mentula</i> <i>Ascidia prunum</i> <i>Ascidia aspersa</i> <i>Ascidia scabra</i> <i>Phallusia mammillata</i> Asciidiacea: Stolidobranchia <i>Styela clava</i> <i>Distomus variolosus</i> <i>Distomus</i> spp. <i>Botryllus schlosseri</i> <i>Molgula</i> sp. Molgulidae (indet.) Ascidian (indet.)
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Figure 2.1 Total number of beam trawl hauls per rectangle.
 Total hauls in 1997 (above) and total for 1990–97 (below).

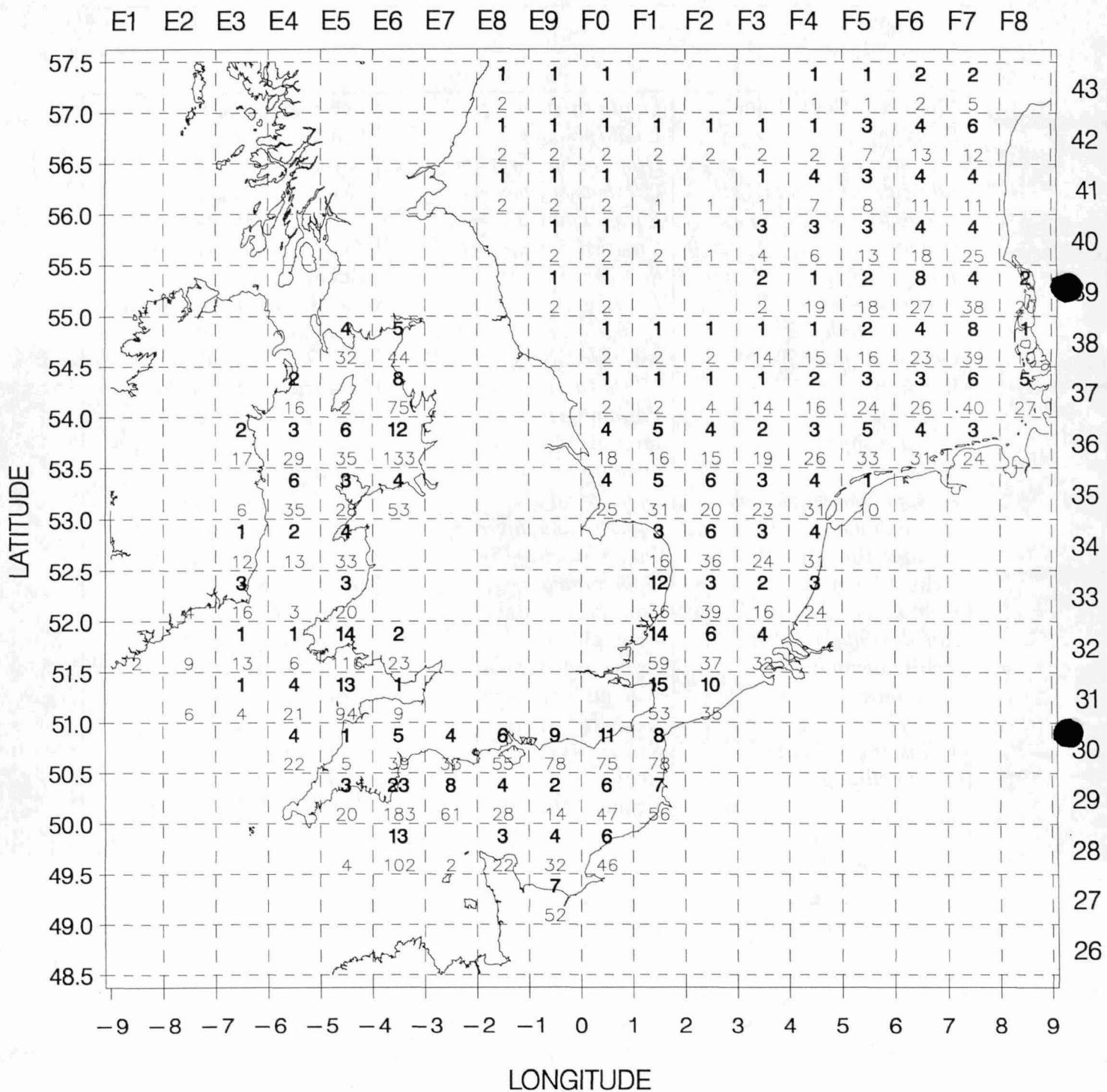
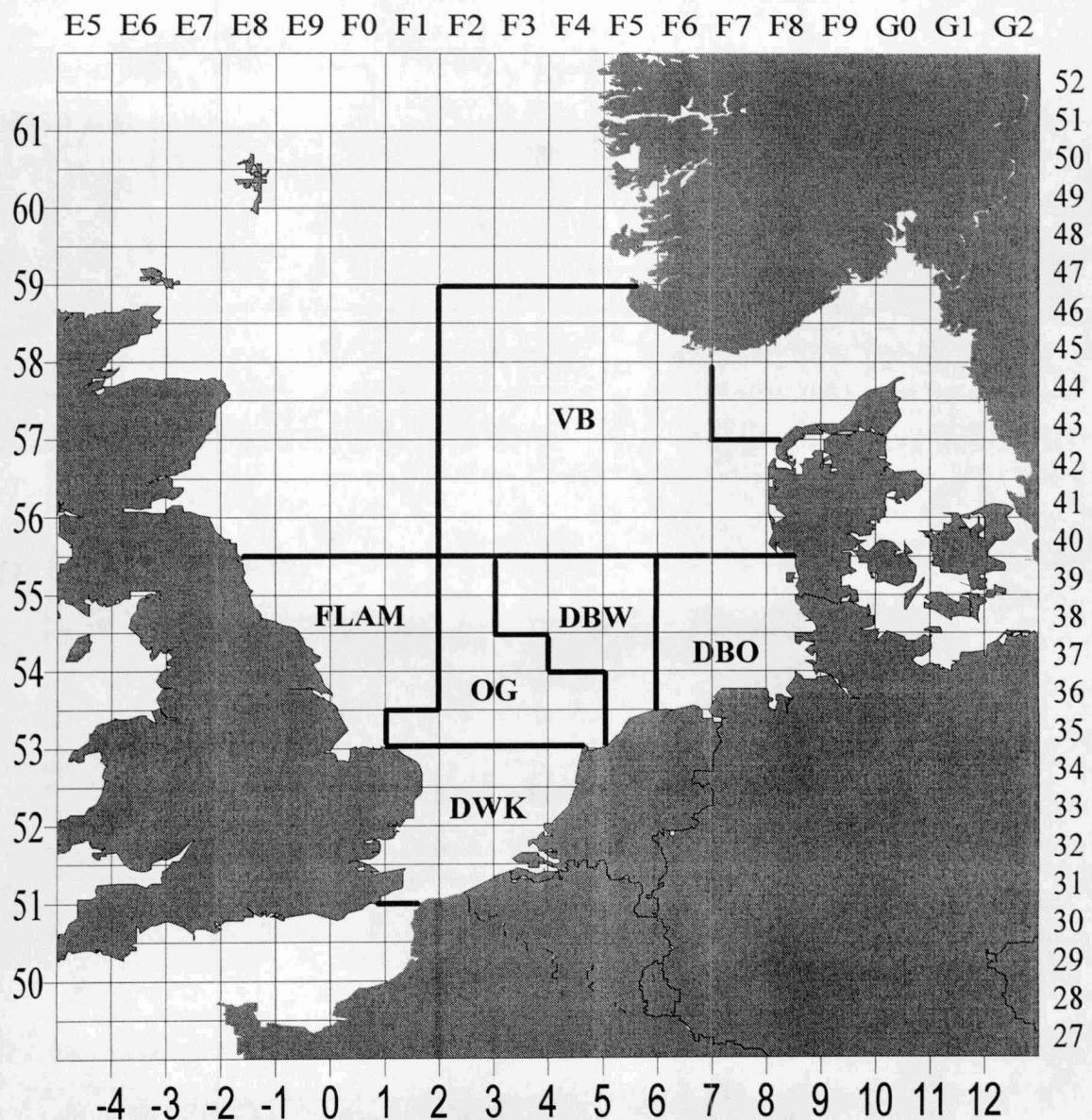


Fig. 2.2: Otolith sampling areas



Sub-area codes

Beam trawl survey sub-areas: 1995

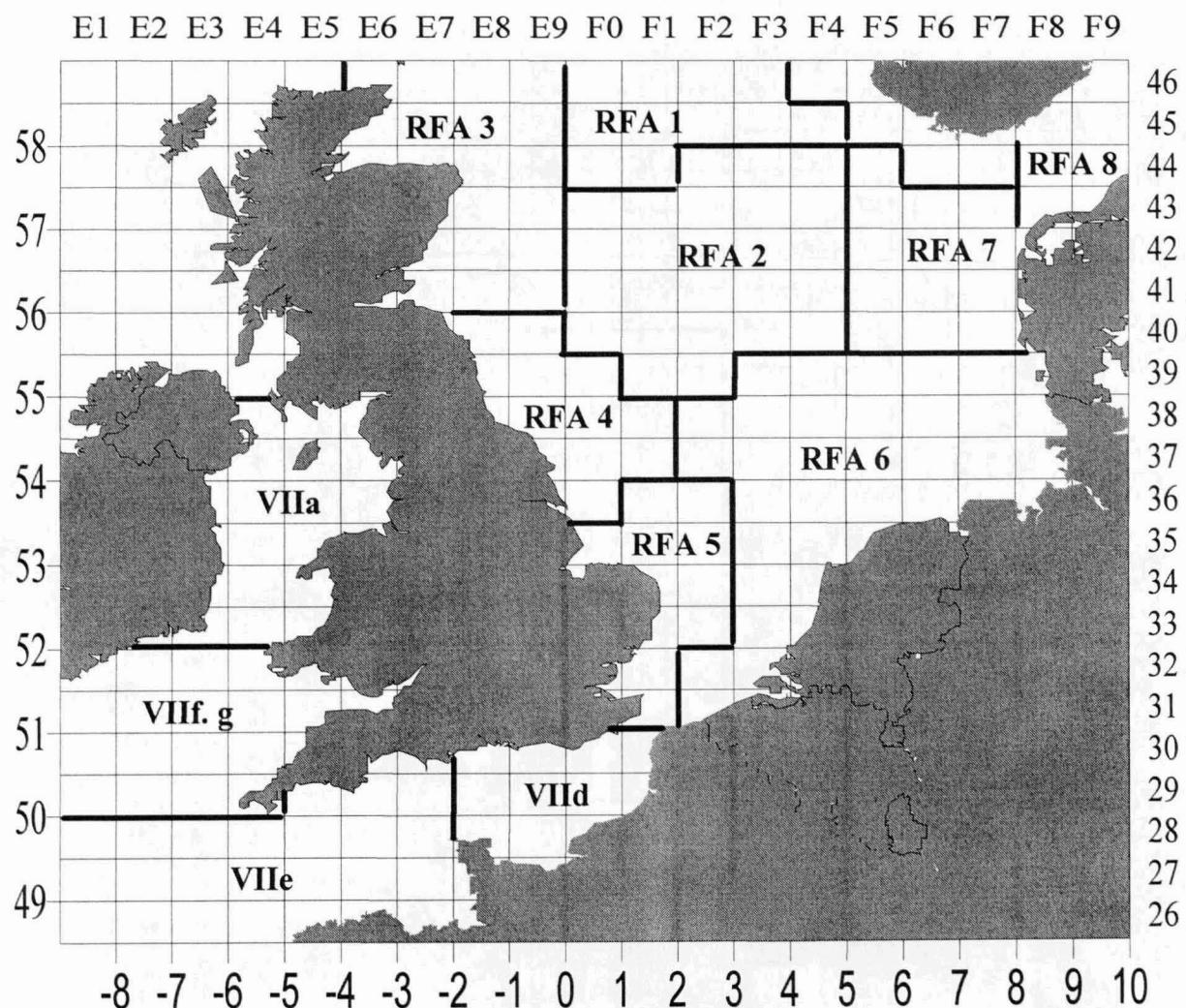


Fig. 2.3: Sub-areas for beam trawl surveys. Area classification is according to Roundfish areas for North Sea and Management areas (ICES Divisions) for other areas.

Figure 2.3.1 International Beam Trawl Surveys 1990–97
Catches in number / 8m beam / hour / rectangle
1997 data in bold, above the survey mean ('+' = < 0.5)

DAB

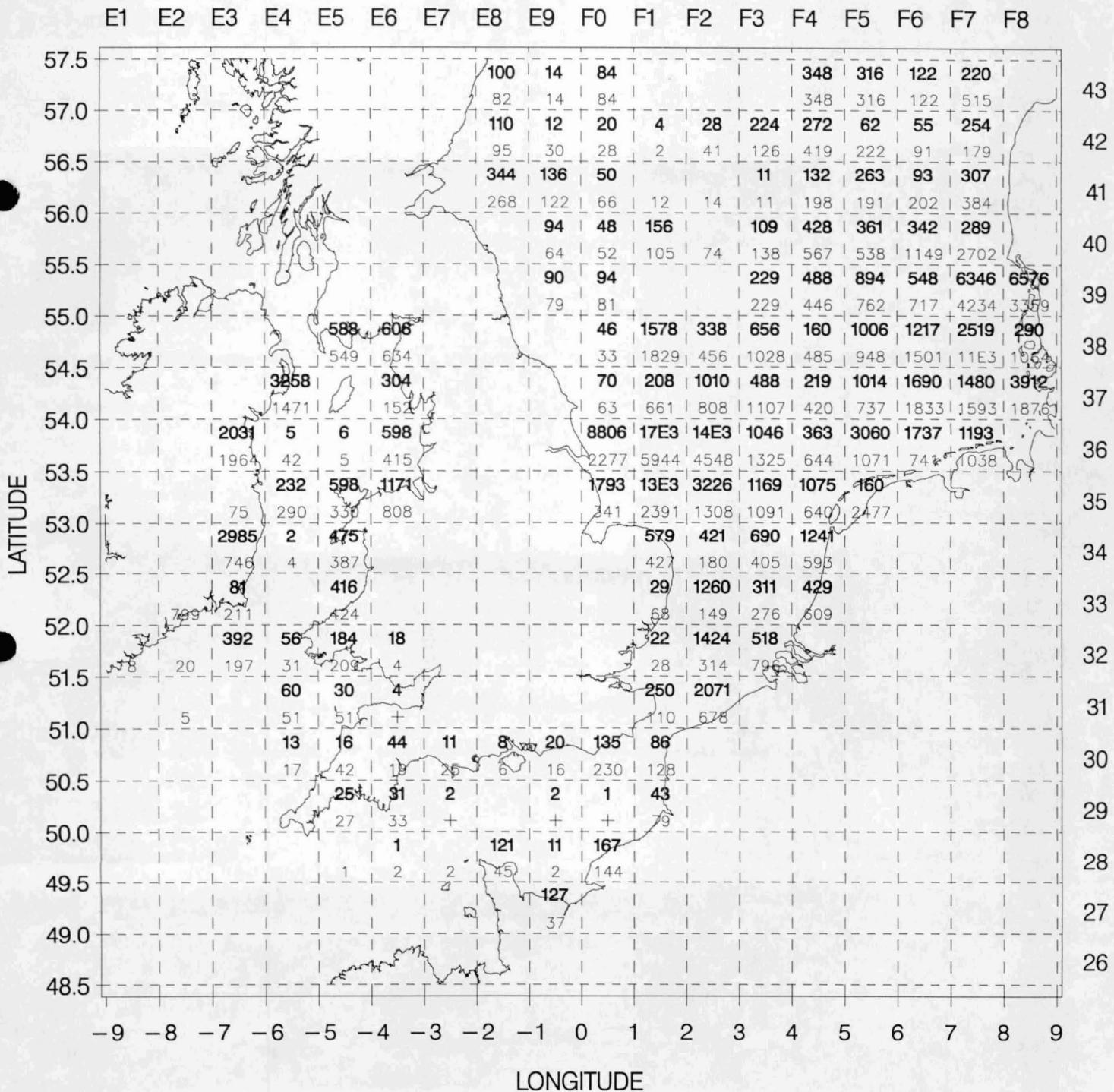


Figure 2.3.2 International Beam Trawl Surveys 1990–97

Catches in number / 8m beam / hour / rectangle

1997 data in bold, above the survey mean ('+' = < 0.5)

SOLE

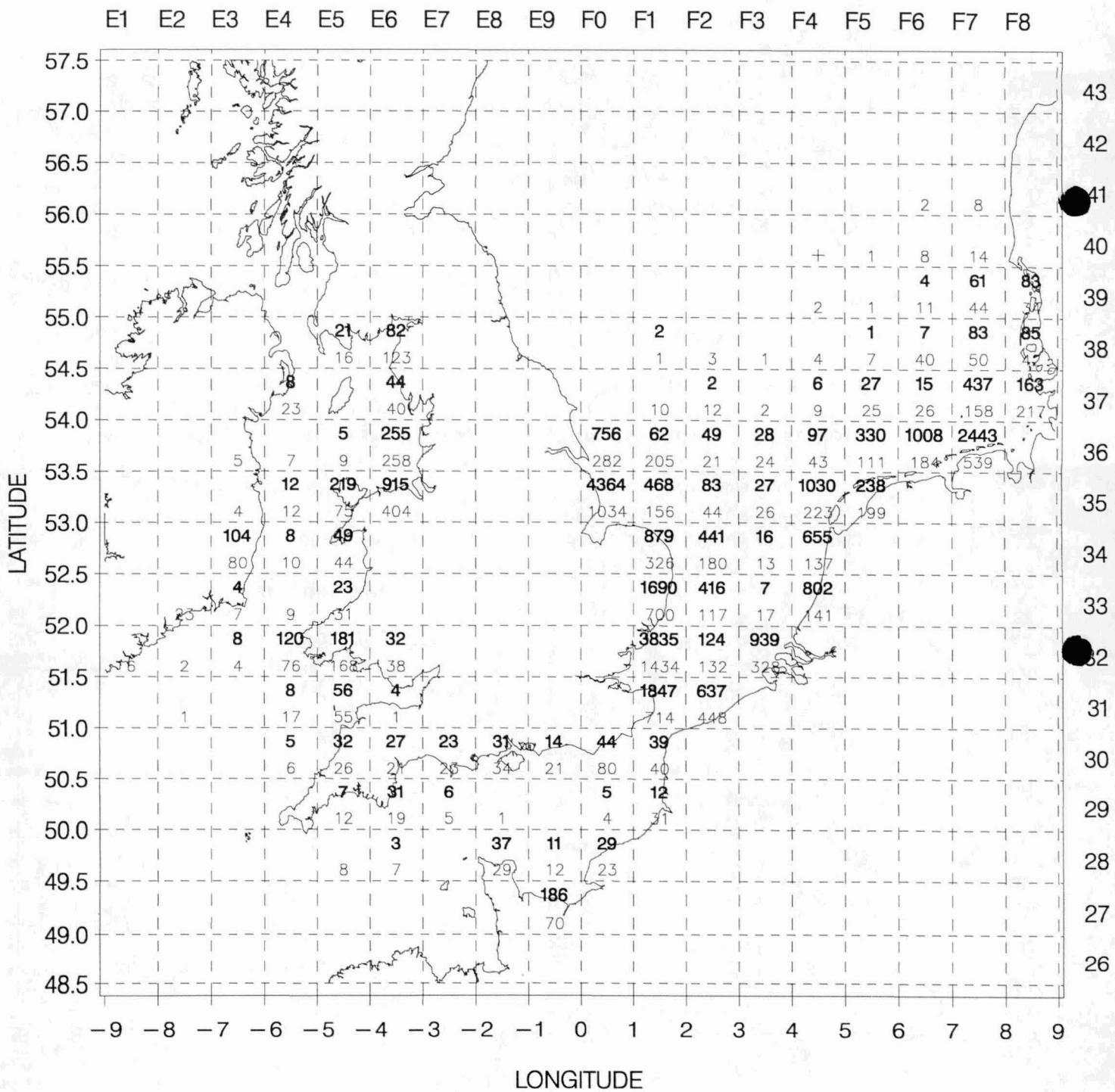


Figure 2.3.3 International Beam Trawl Surveys 1990–97

Catches in number / 8m beam / hour / rectangle

1997 data in bold, above the survey mean ($' + '$ = < 0.5)

PLAICE

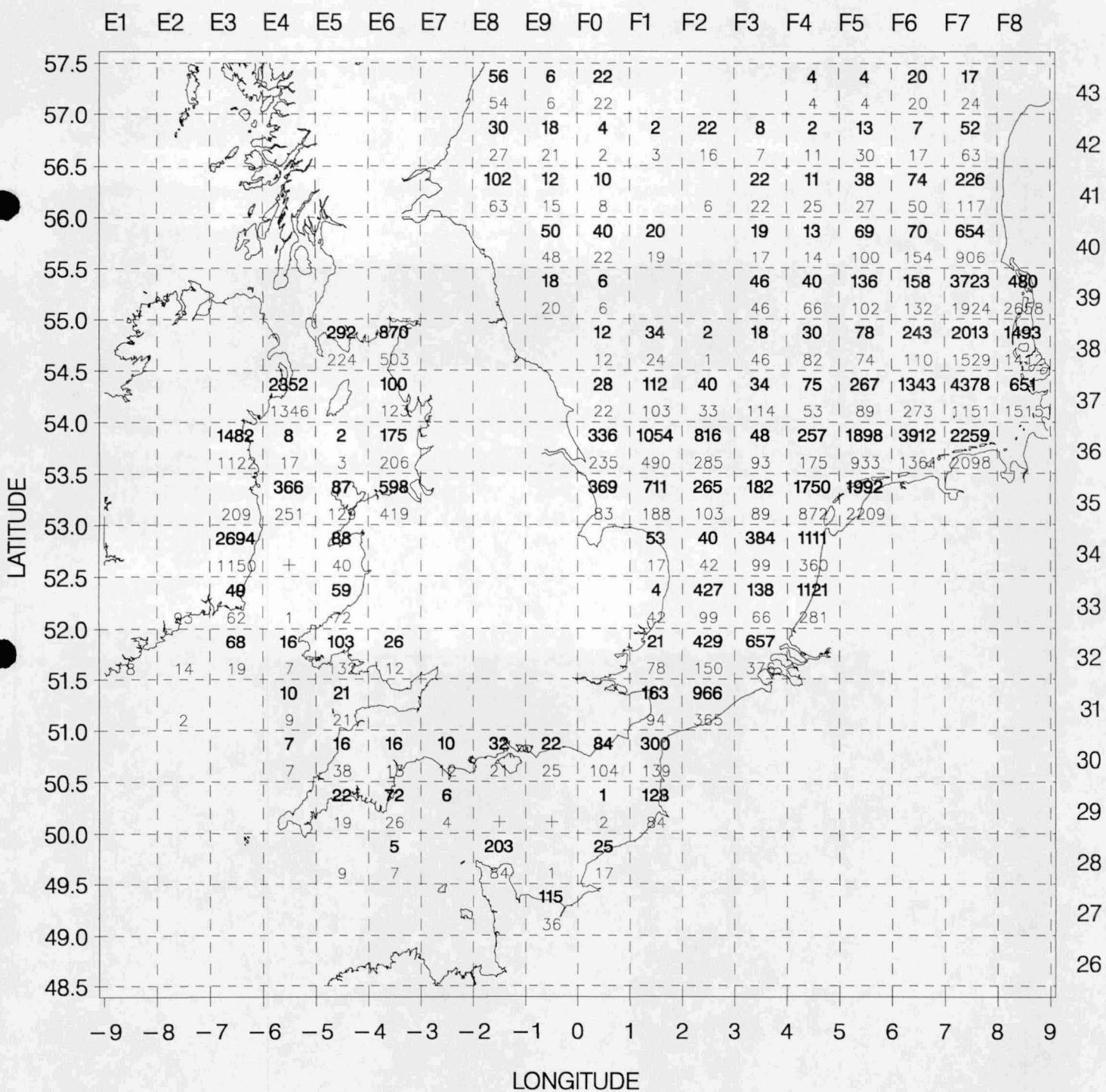


Figure 2.3.4 International Beam Trawl Surveys 1990–97

Catches in number / 8m beam / hour / rectangle

1997 data in bold, above the survey mean ('+' = < 0.5)

TURBOT

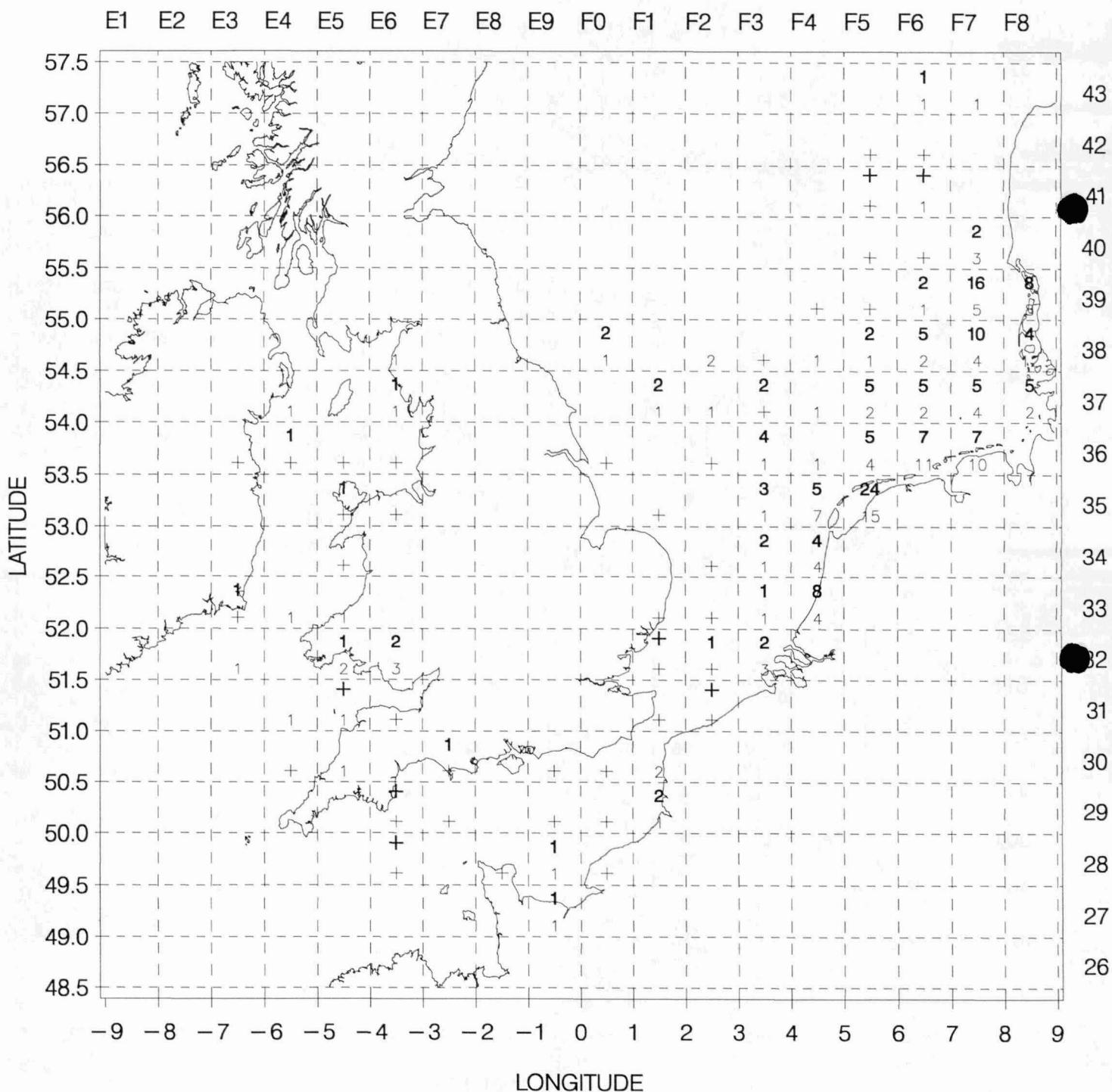


Figure 2.3.5 International Beam Trawl Surveys 1990–97
 Catches in number / 8m beam / hour / rectangle
 1997 data in bold, above the survey mean ('+' = < 0.5)
BRILL

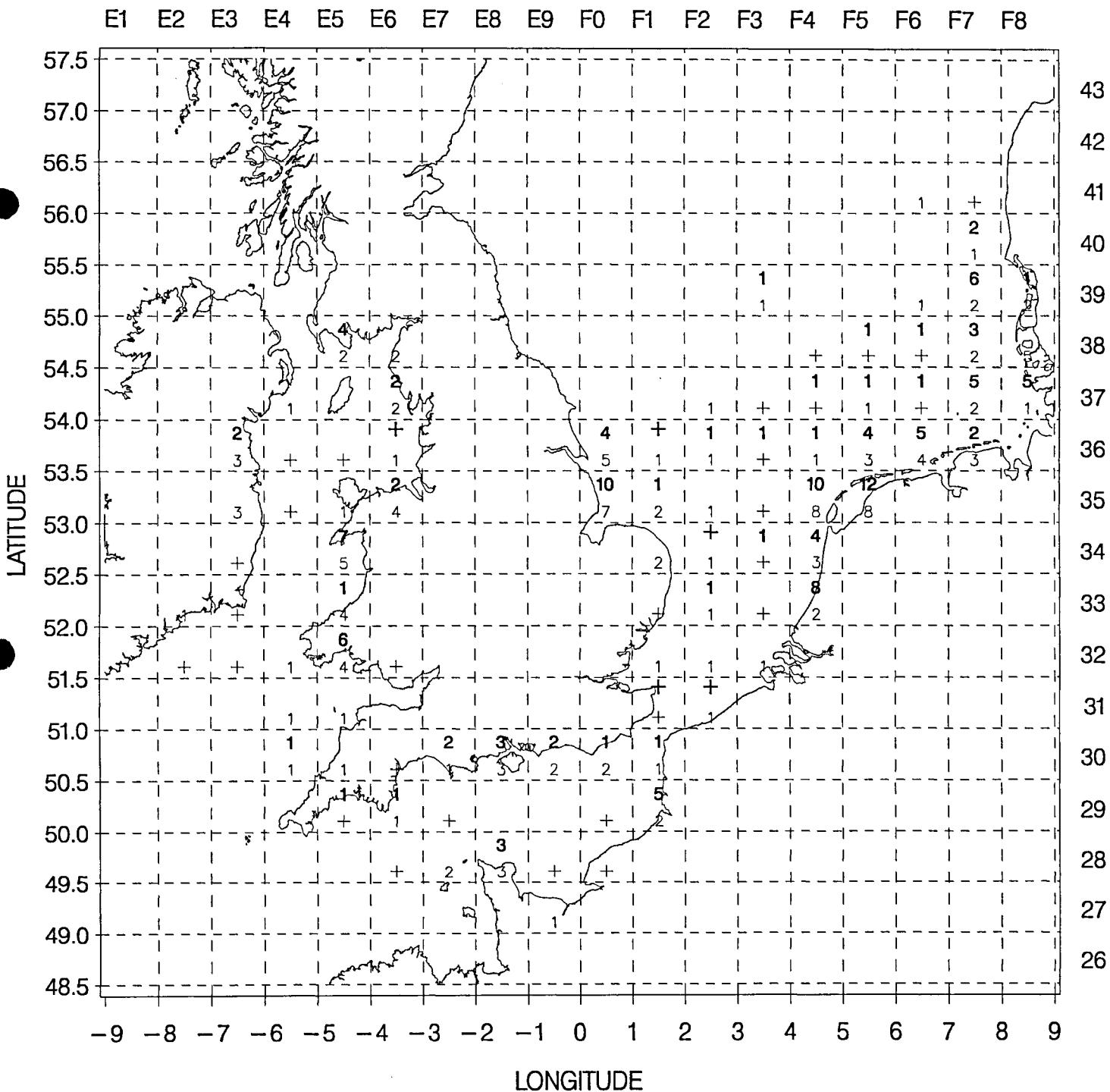


Figure 2.3.6 International Beam Trawl Surveys 1990–97

Catches in number / 8m beam / hour / rectangle

1997 data in bold, above the survey mean ('+' = < 0.5)

SCALDFISH

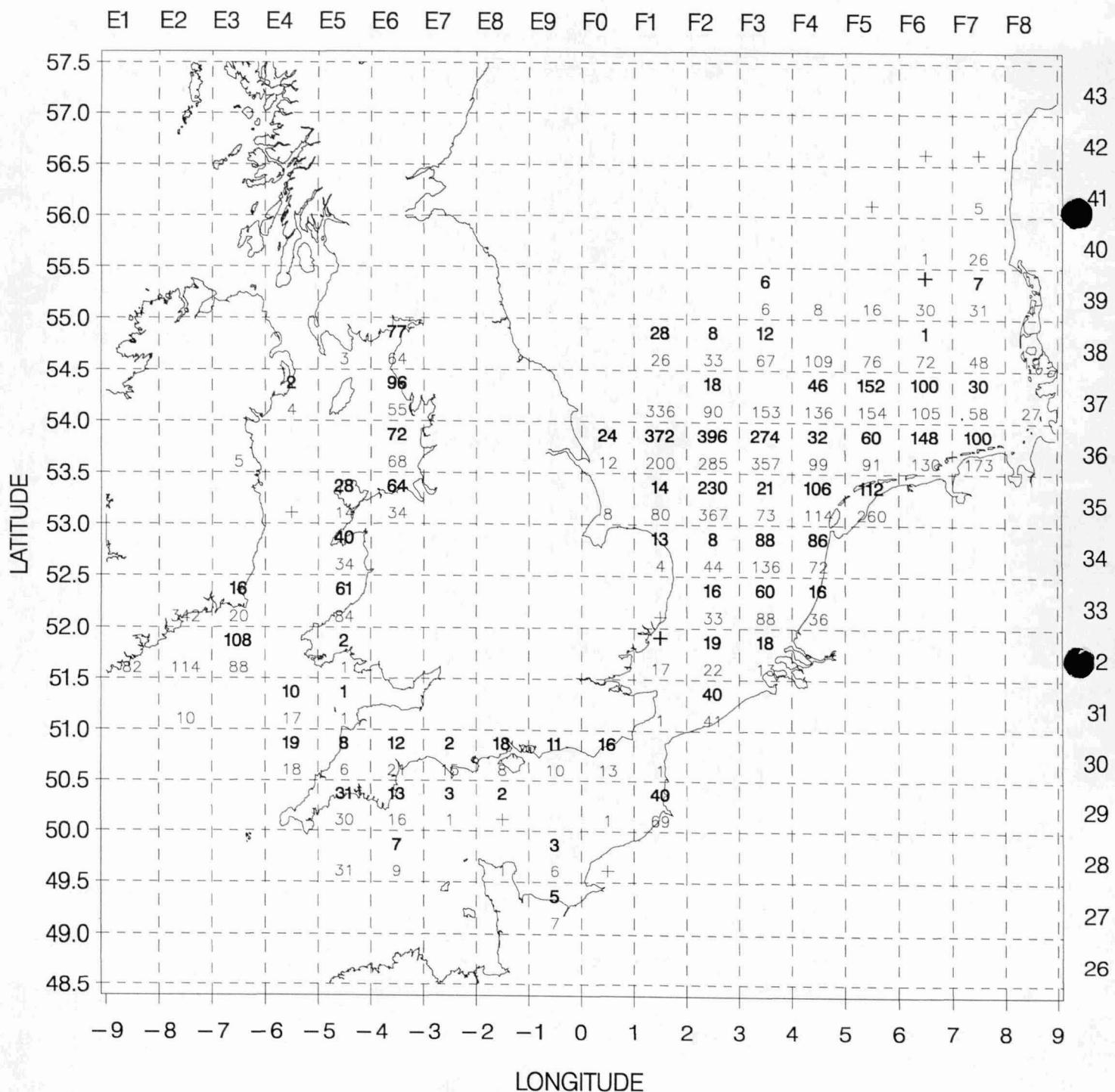


Figure 2.3.7 International Beam Trawl Surveys 1990–97

Catches in number / 8m beam / hour / rectangle

1997 data in bold, above the survey mean ('+' = < 0.5)

LEMON SOLE

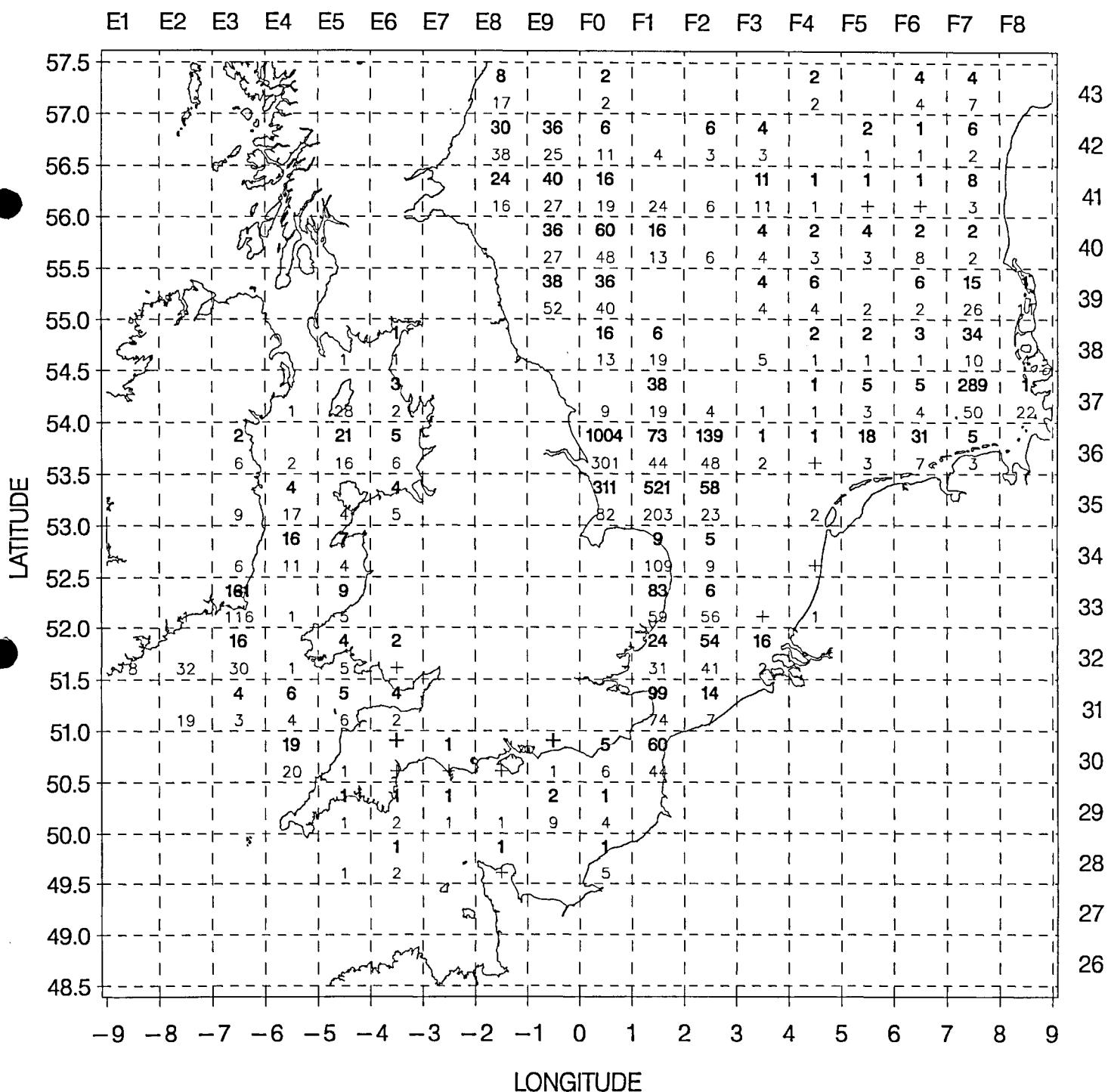


Figure 2.3.8 International Beam Trawl Surveys 1990–97
 Catches in number / 8m beam / hour / rectangle
 1997 data in bold, above the survey mean ('+' = < 0.5)
 AMERICAN PLAICE (LONG ROUGH DAB)

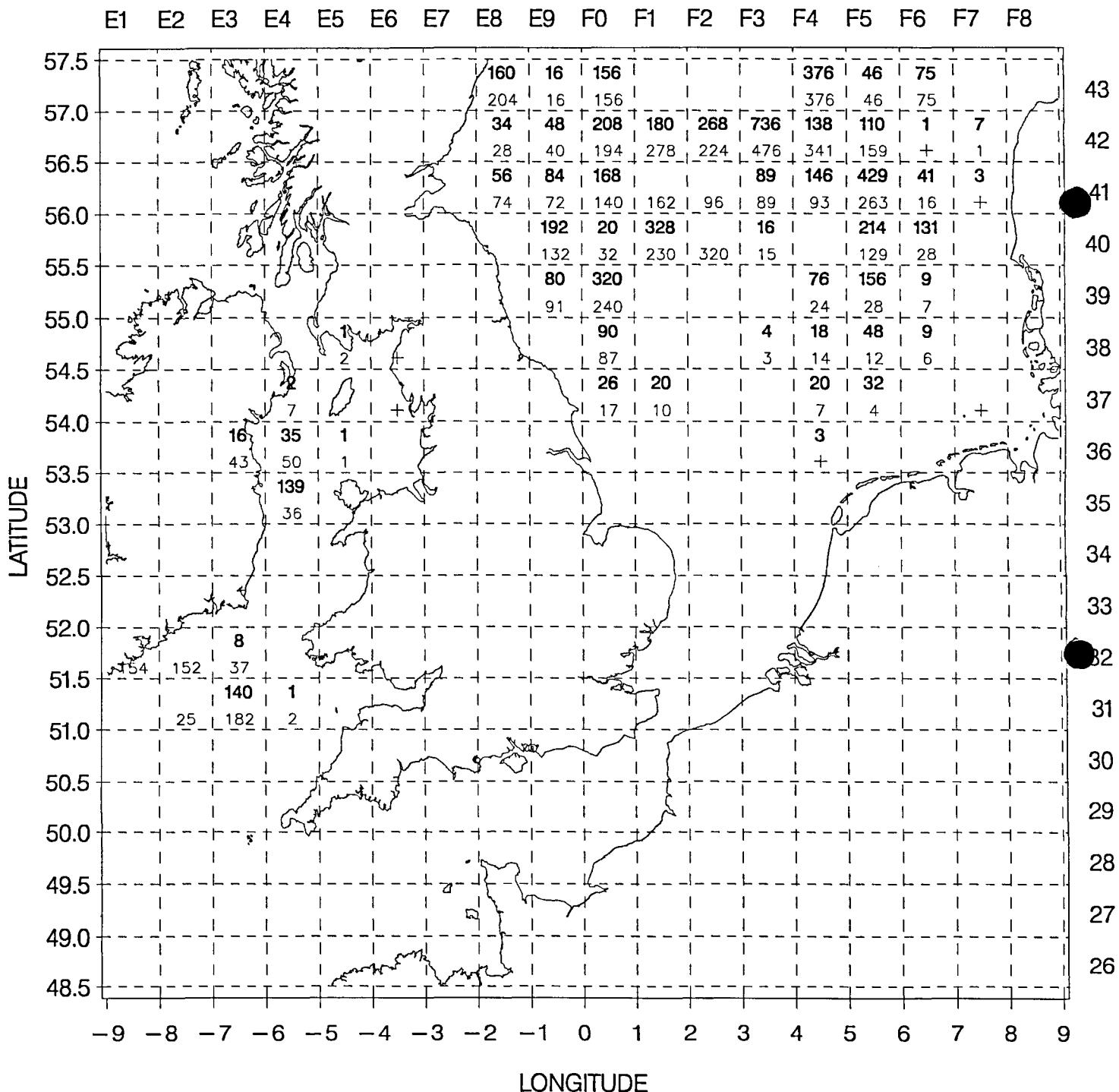


Figure 2.3.9 International Beam Trawl Surveys 1990–97
Catches in number / 8m beam / hour / rectangle
1997 data in bold, above the survey mean ('+' = < 0.5)
FLOUNDER

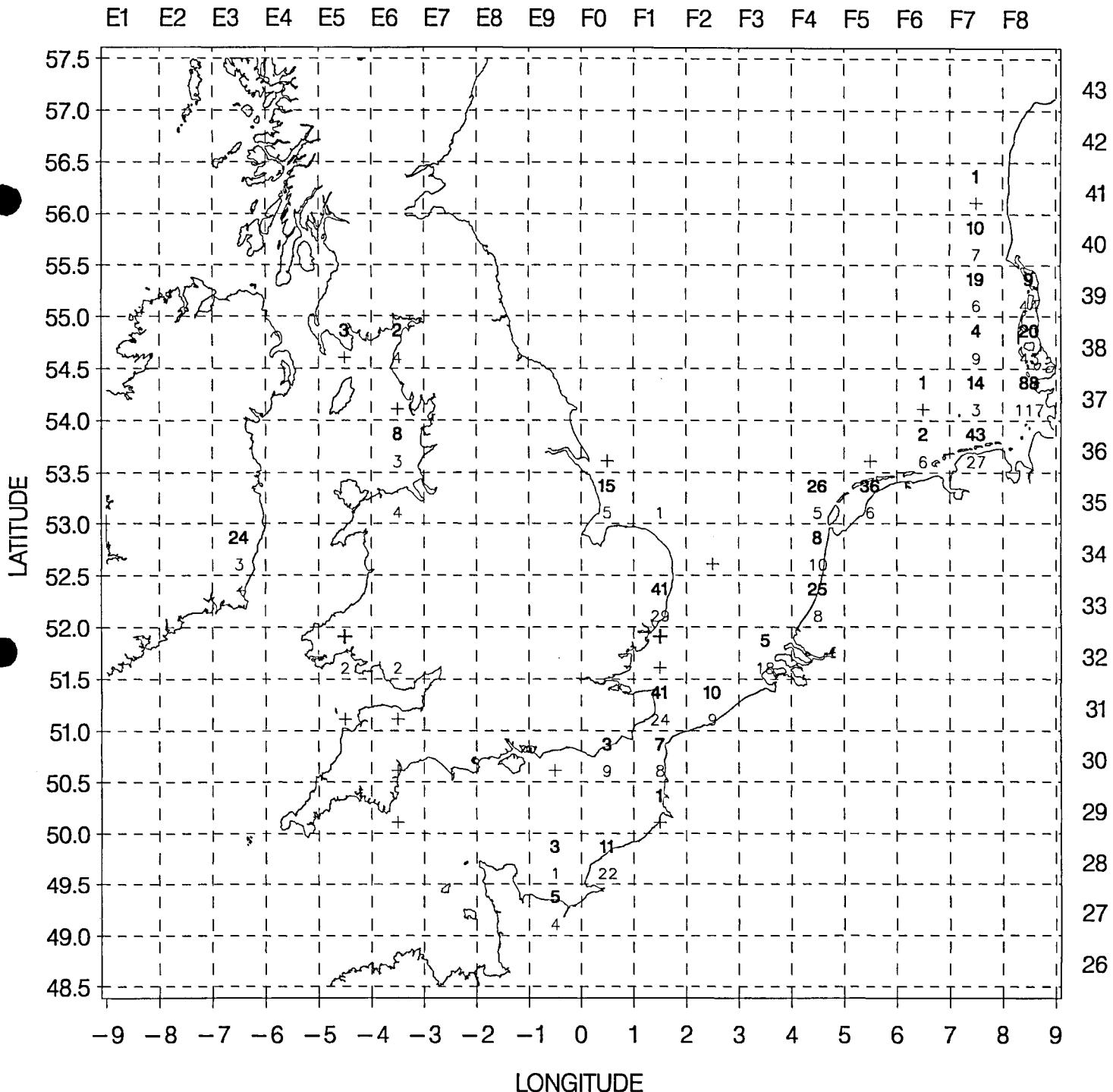


Figure 2.3.10 International Beam Trawl Surveys 1990–97
 Catches in number / 8m beam / hour / rectangle
 1997 data in bold, above the survey mean ('+' = < 0.5)
 SOLENETTE

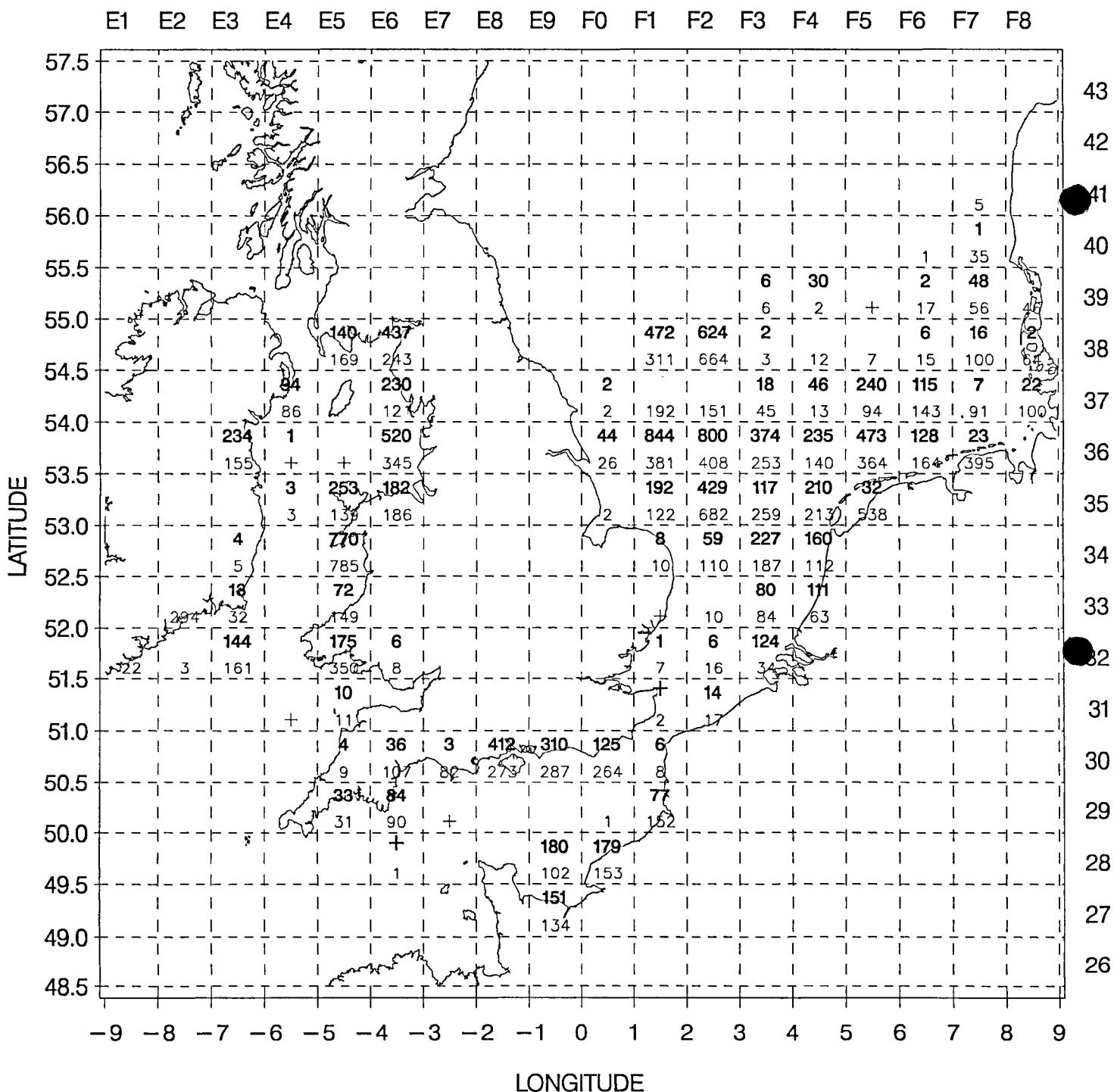


Figure 2.3.11 - International Beam Trawl Surveys 1990–97

Catches in number / 8m beam / hour / rectangle

1997 data in bold, above the survey mean ('+' = < 0.5)

THICKBACK SOLE

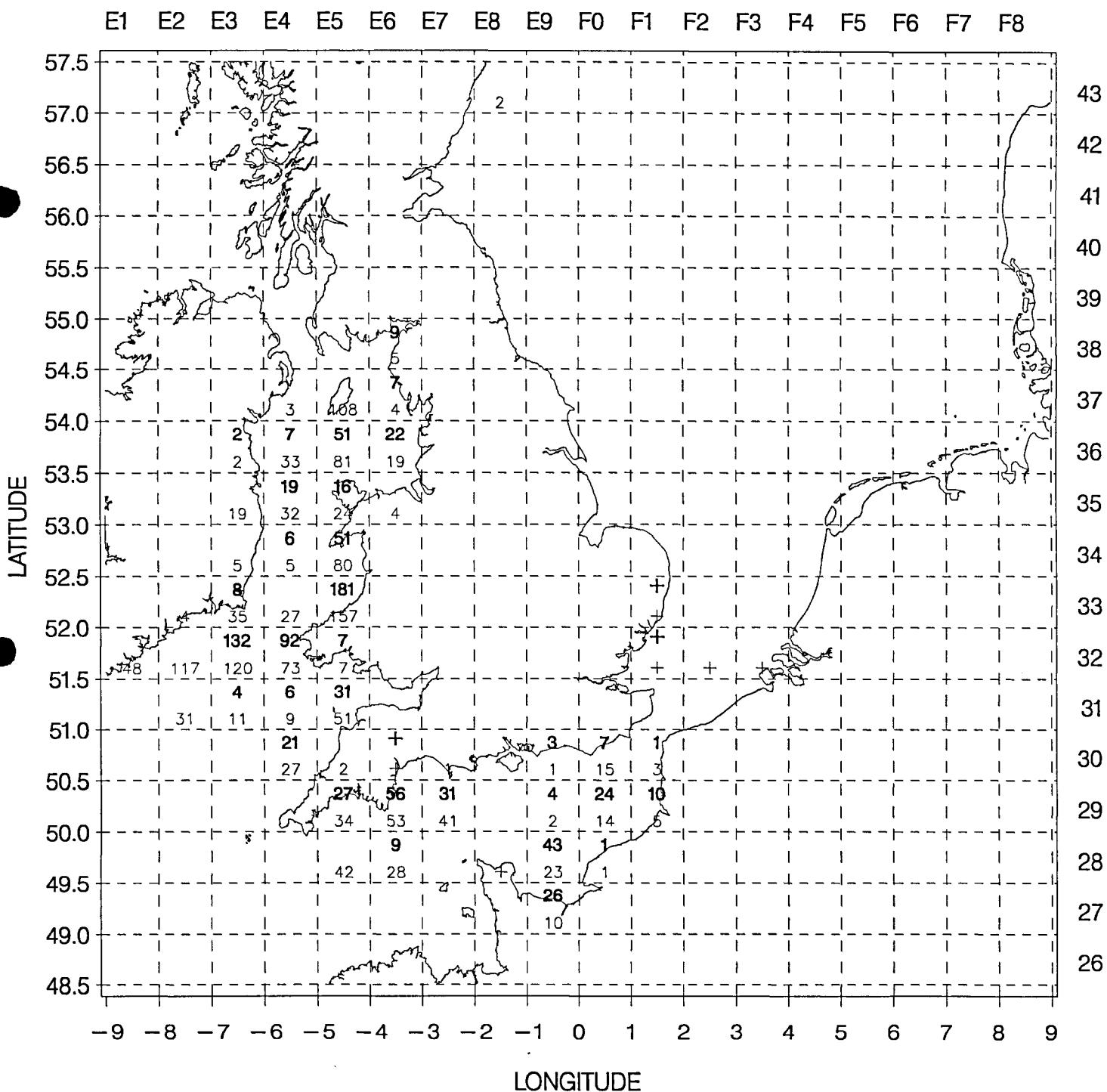


Figure 2.3.12 International Beam Trawl Surveys 1990–97

Catches in number / 8m beam / hour / rectangle

1997 data in bold, above the survey mean ('+' = < 0.5)

TUB GURNARD

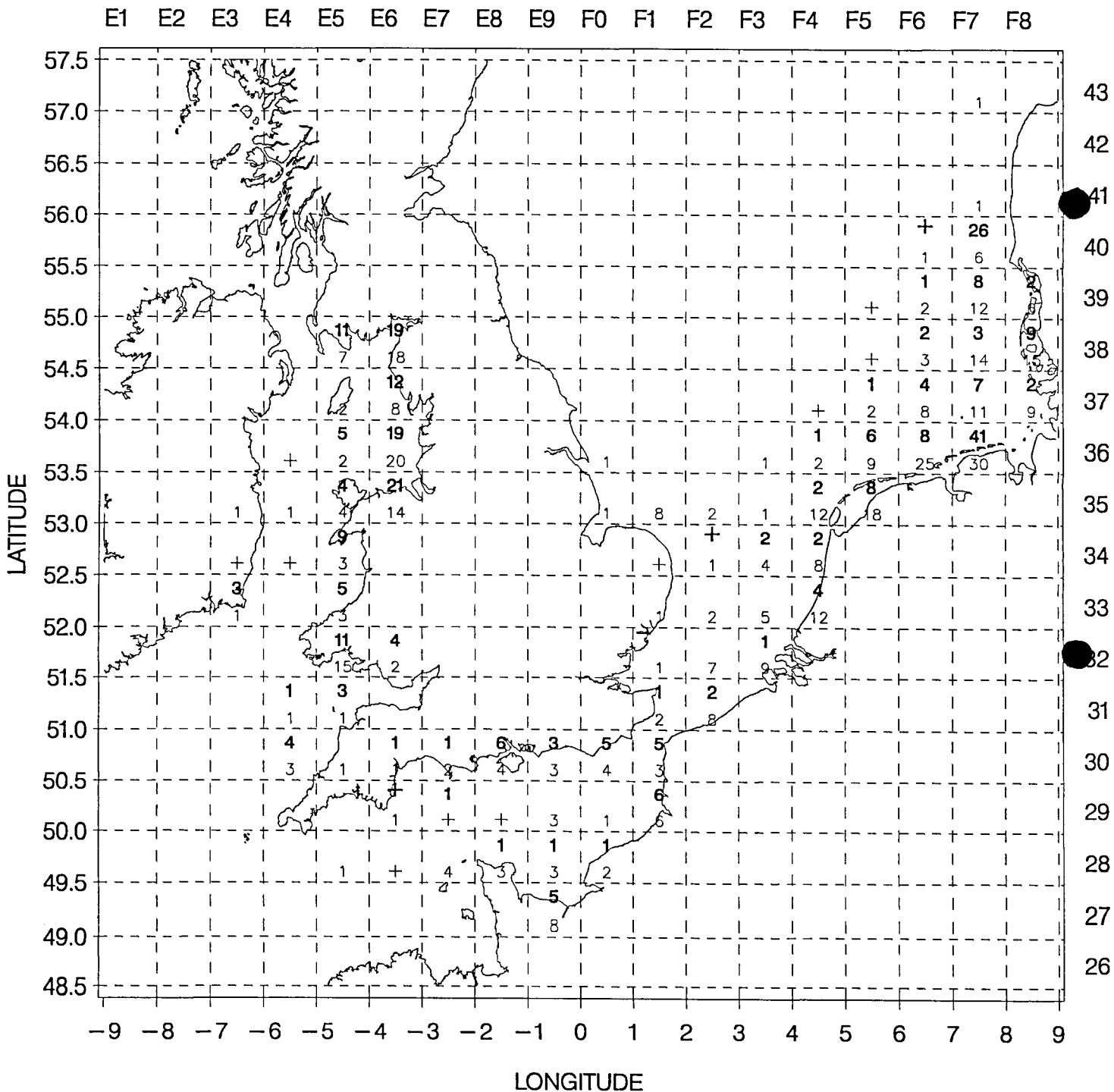


Figure 2.3.13 International Beam Trawl Surveys 1990–97

Catches in number / 8m beam / hour / rectangle

1997 data in bold, above the survey mean ('+' = < 0.5)

GREY GURNARD

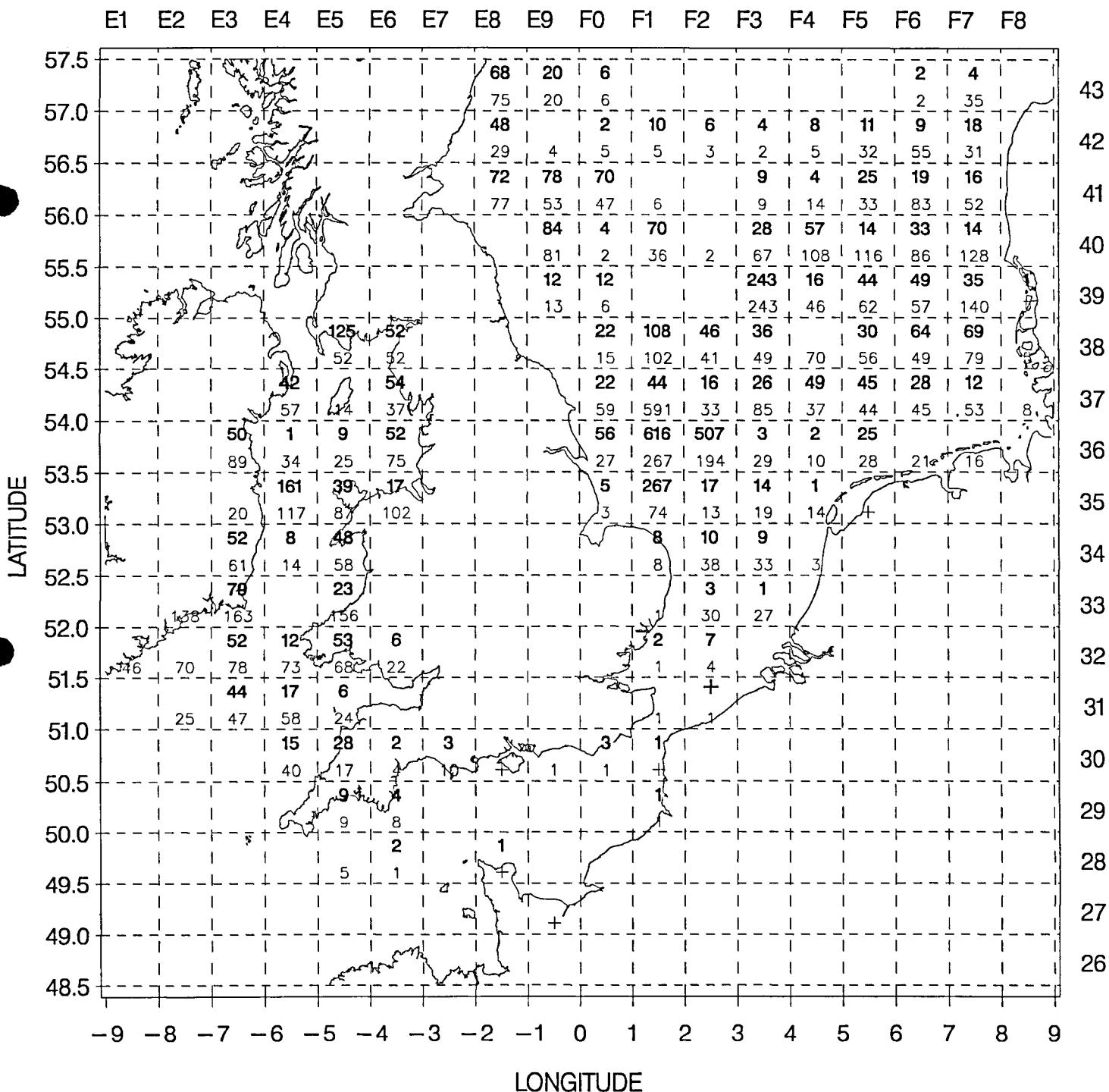


Figure 2.3.14 International Beam Trawl Surveys 1990–97

Catches in number / 8m beam / hour / rectangle

1997 data in bold, above the survey mean ('+' = < 0.5)

POGGE (ARMED BULLHEAD)

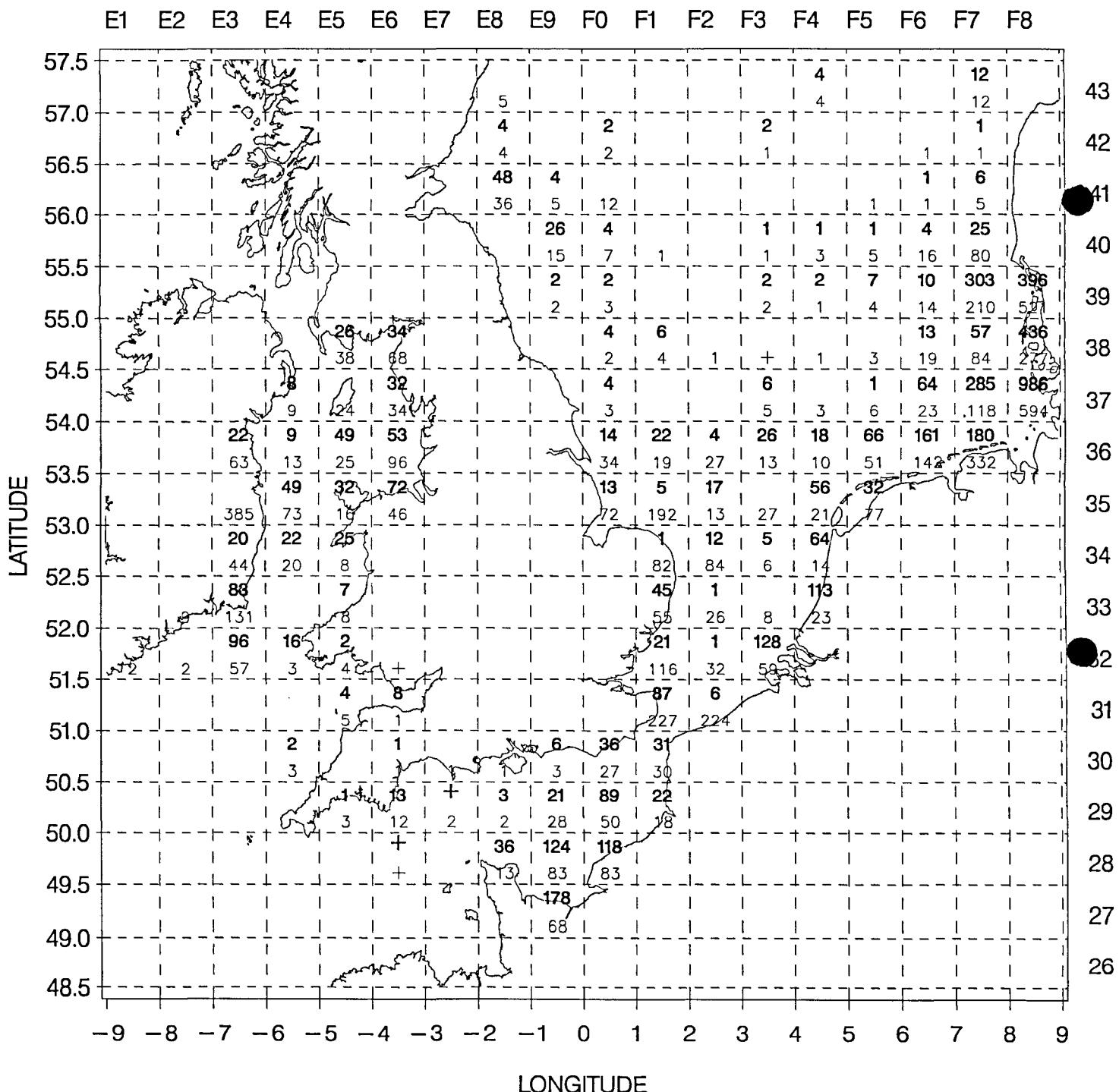


Figure 2.3.15 International Beam Trawl Surveys 1990–97
 Catches in number / 8m beam / hour / rectangle
 1997 data in bold, above the survey mean ('+' = < 0.5)
LESSER WEEVER

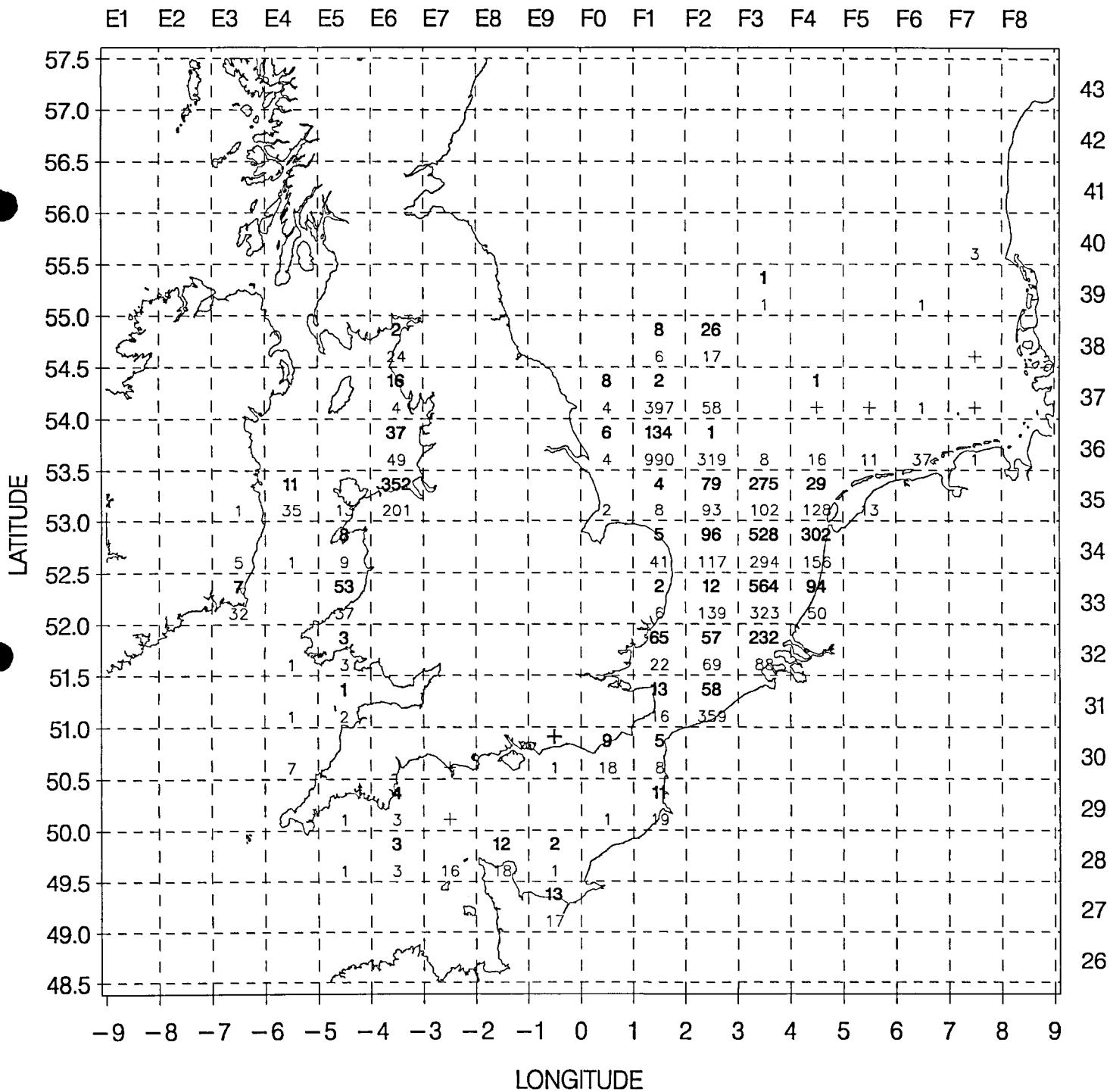


Figure 2.3.16 International Beam Trawl Surveys 1990–97

Catches in number / 8m beam / hour / rectangle

1997 data in bold, above the survey mean ('+' = < 0.5)

COMMON DRAGONET

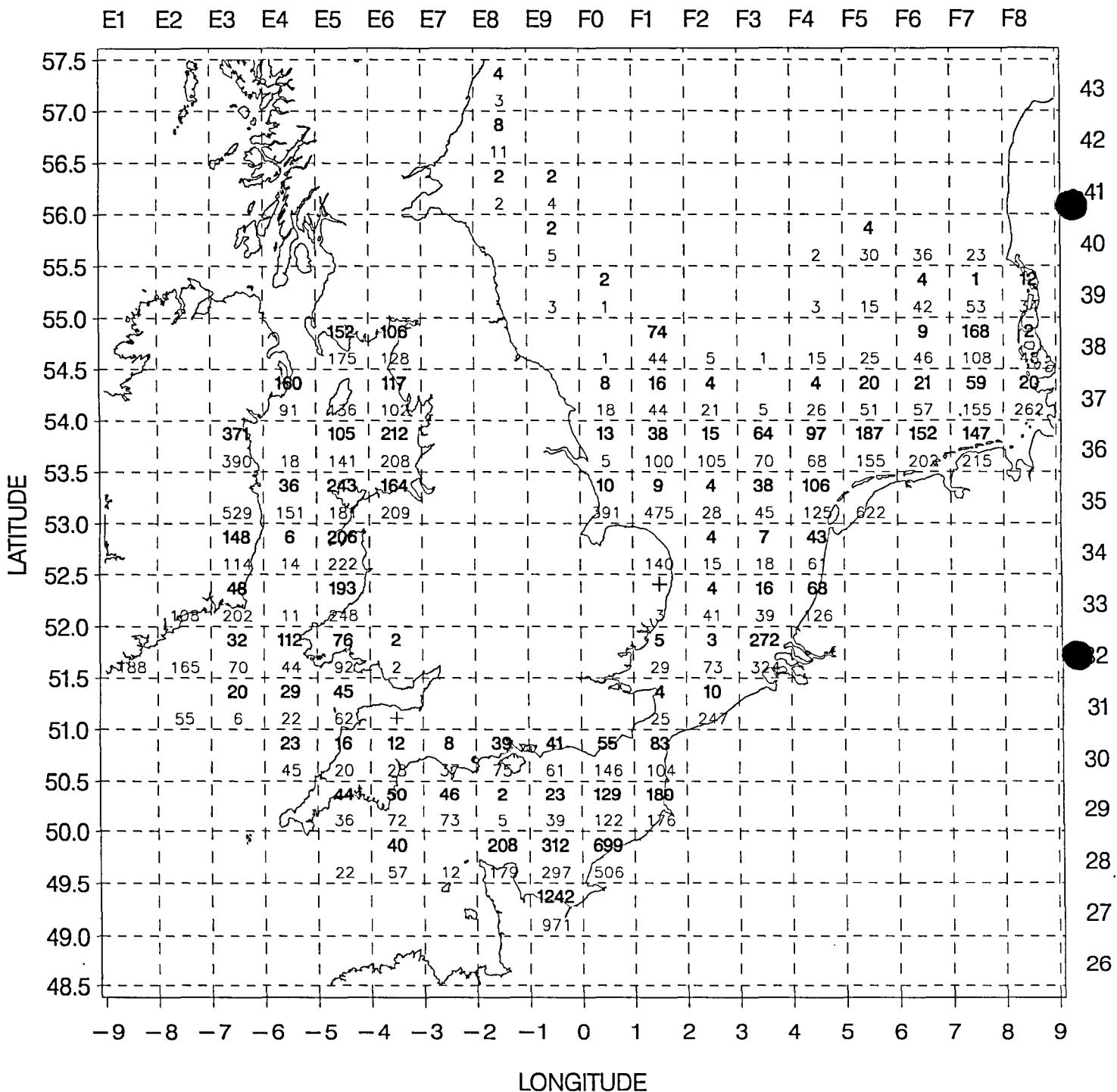


Figure 2.3.17 International Beam Trawl Surveys 1990–97
 Catches in number / 8m beam / hour / rectangle
 1997 data in bold, above the survey mean ('+' = < 0.5)
LESSER SPOTTED DOGFISH

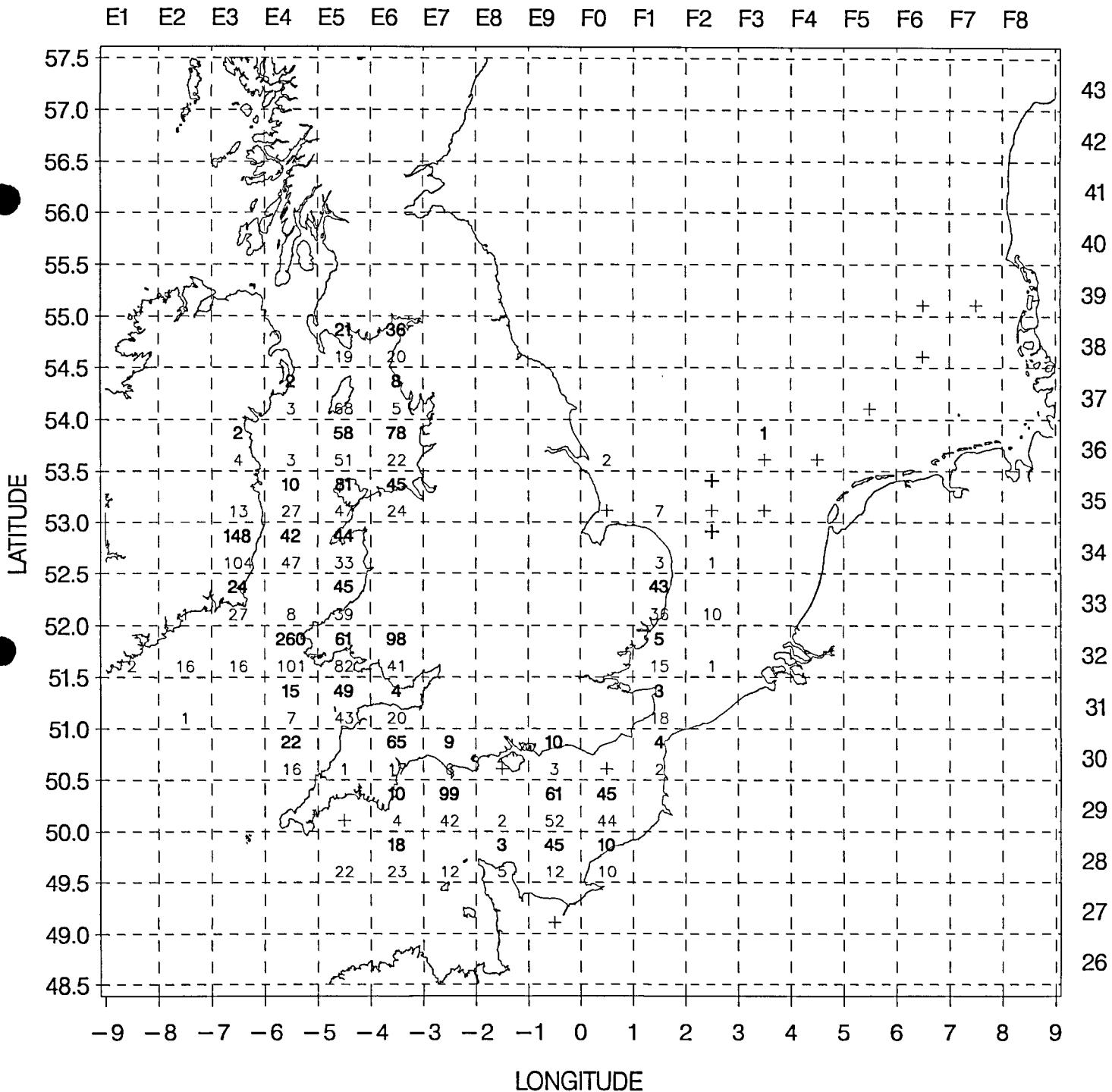


Figure 2.3.18 International Beam Trawl Surveys 1990–97
 Catches in number / 8m beam / hour / rectangle
 1997 data in bold, above the survey mean ('+' = < 0.5)
RAYS

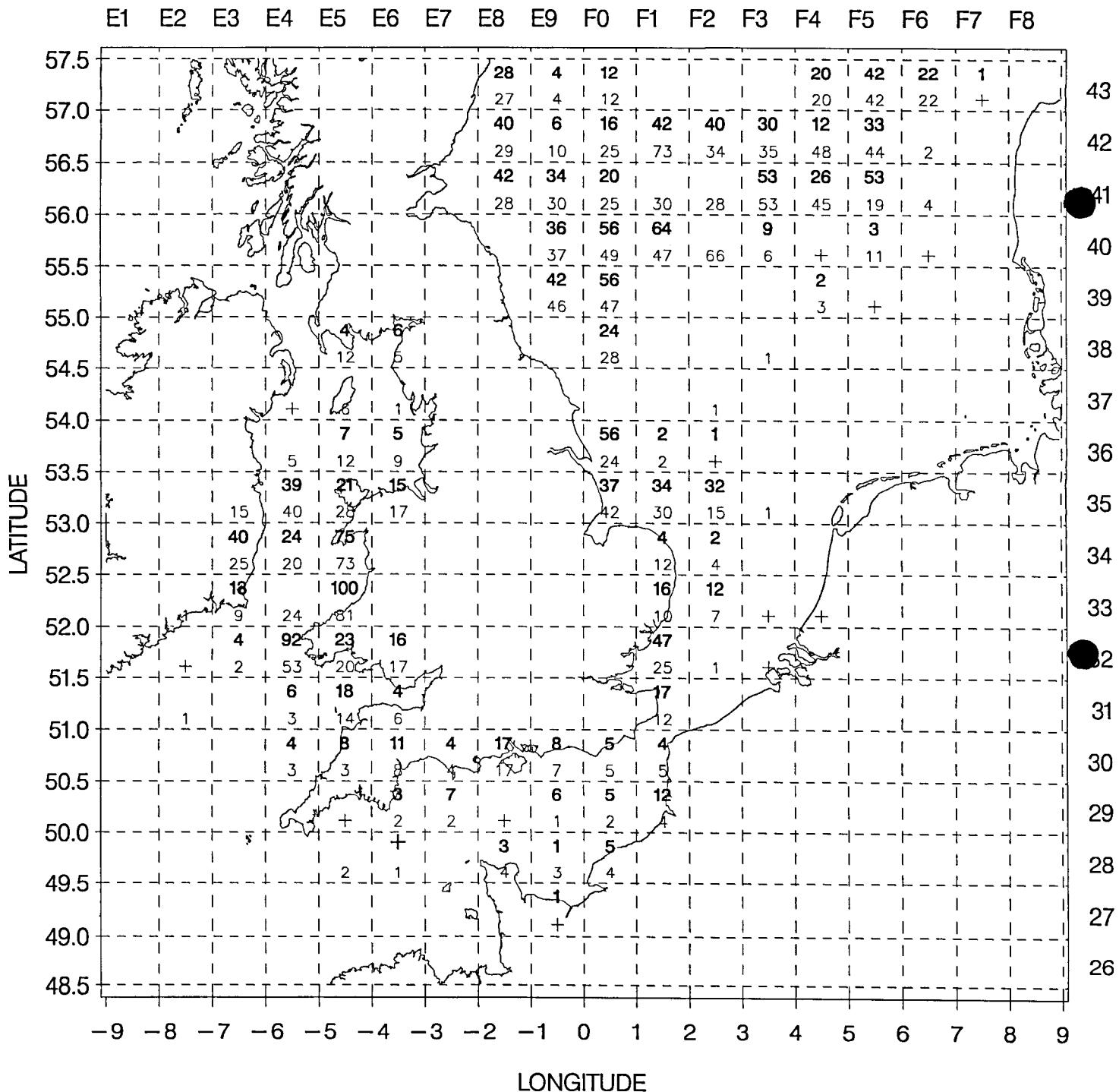


Figure 2.3.19 International Beam Trawl Surveys 1990–97

Catches in number / 8m beam / hour / rectangle

1997 data in bold, above the survey mean ('+' = < 0.5)

COD

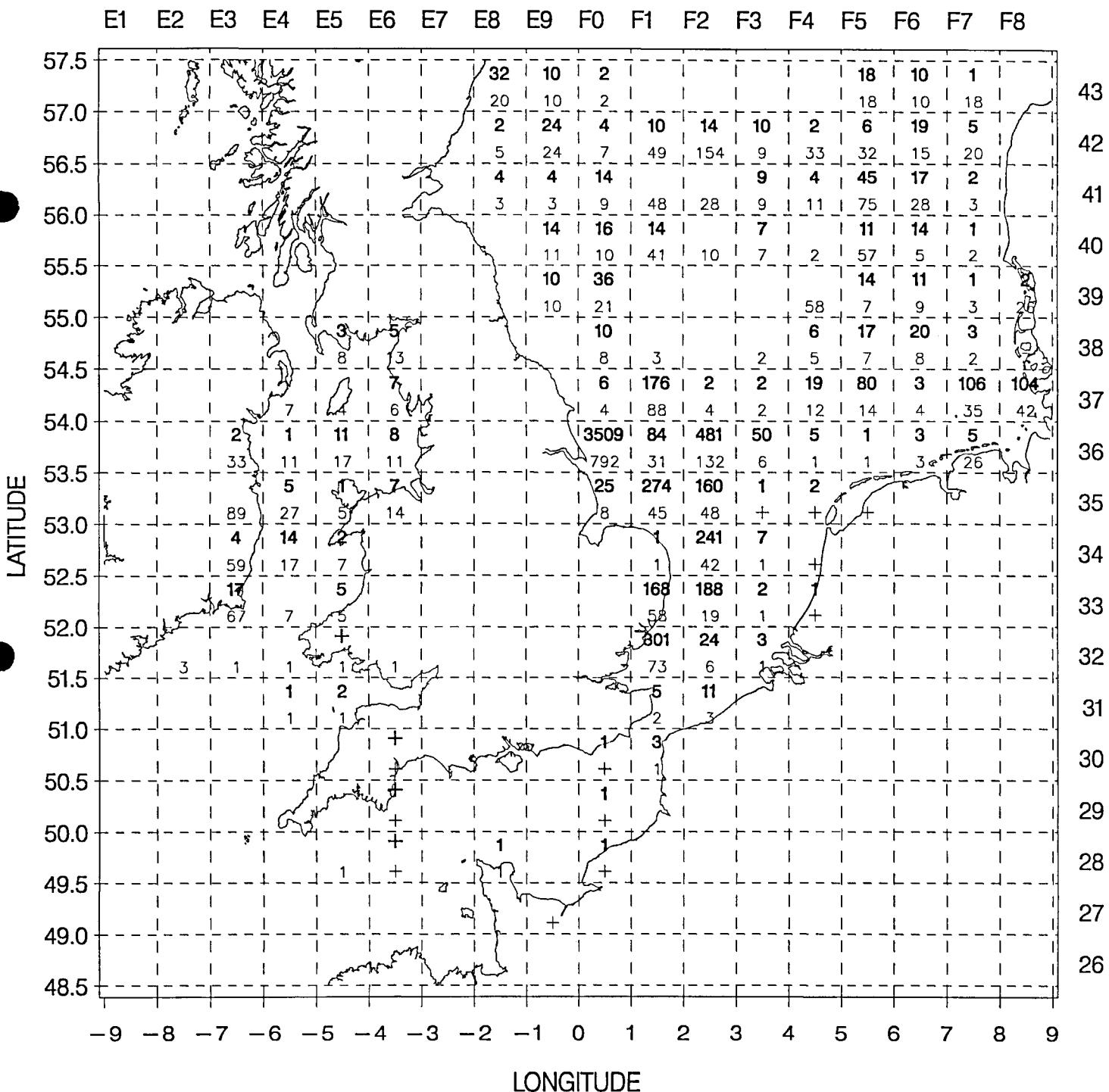


Figure 2.3.20 International Beam Trawl Surveys 1990–97
 Catches in number / 8m beam / hour / rectangle
 1997 data in bold, above the survey mean ('+' = < 0.5)
 POOR COD

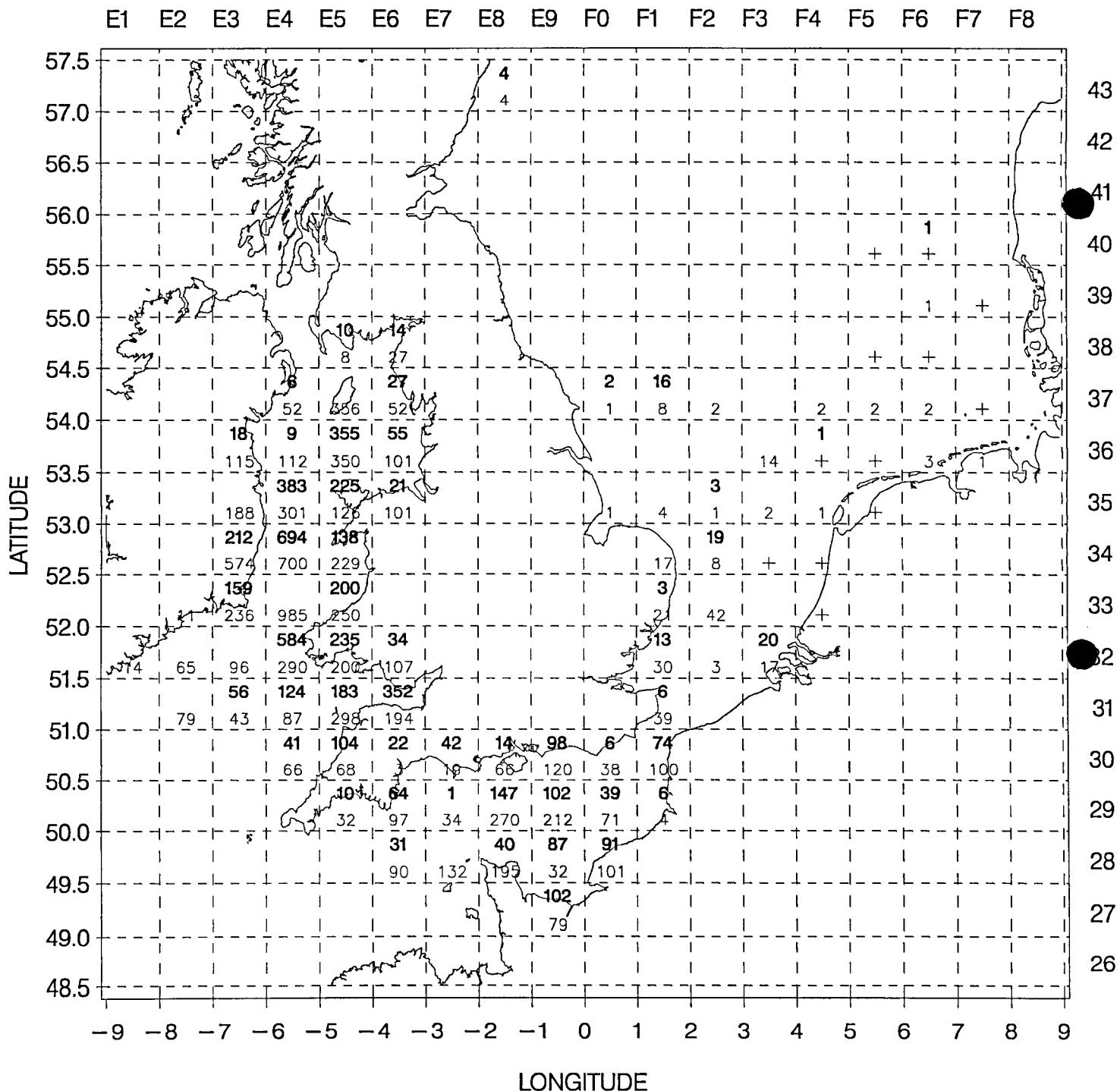


Figure 2.3.21 International Beam Trawl Surveys 1990–97

Catches in number / 8m beam / hour / rectangle

1997 data in bold, above the survey mean ('+' = < 0.5)

HADDOCK

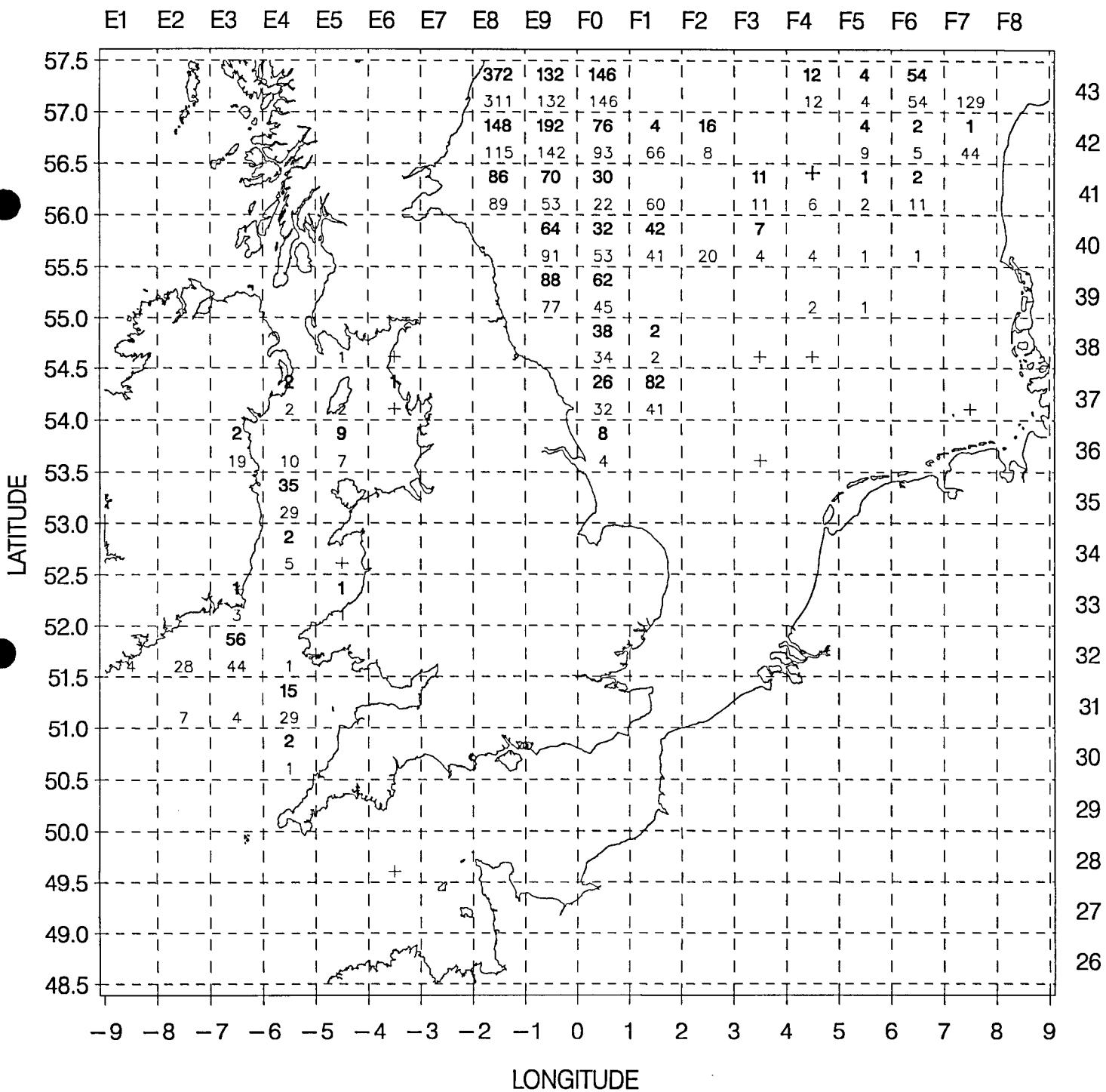


Figure 2.3.22 International Beam Trawl Surveys 1990–97
 Catches in number / 8m beam / hour / rectangle
 1997 data in bold, above the survey mean ('+' = < 0.5)
 POUT WHITING (BIB)

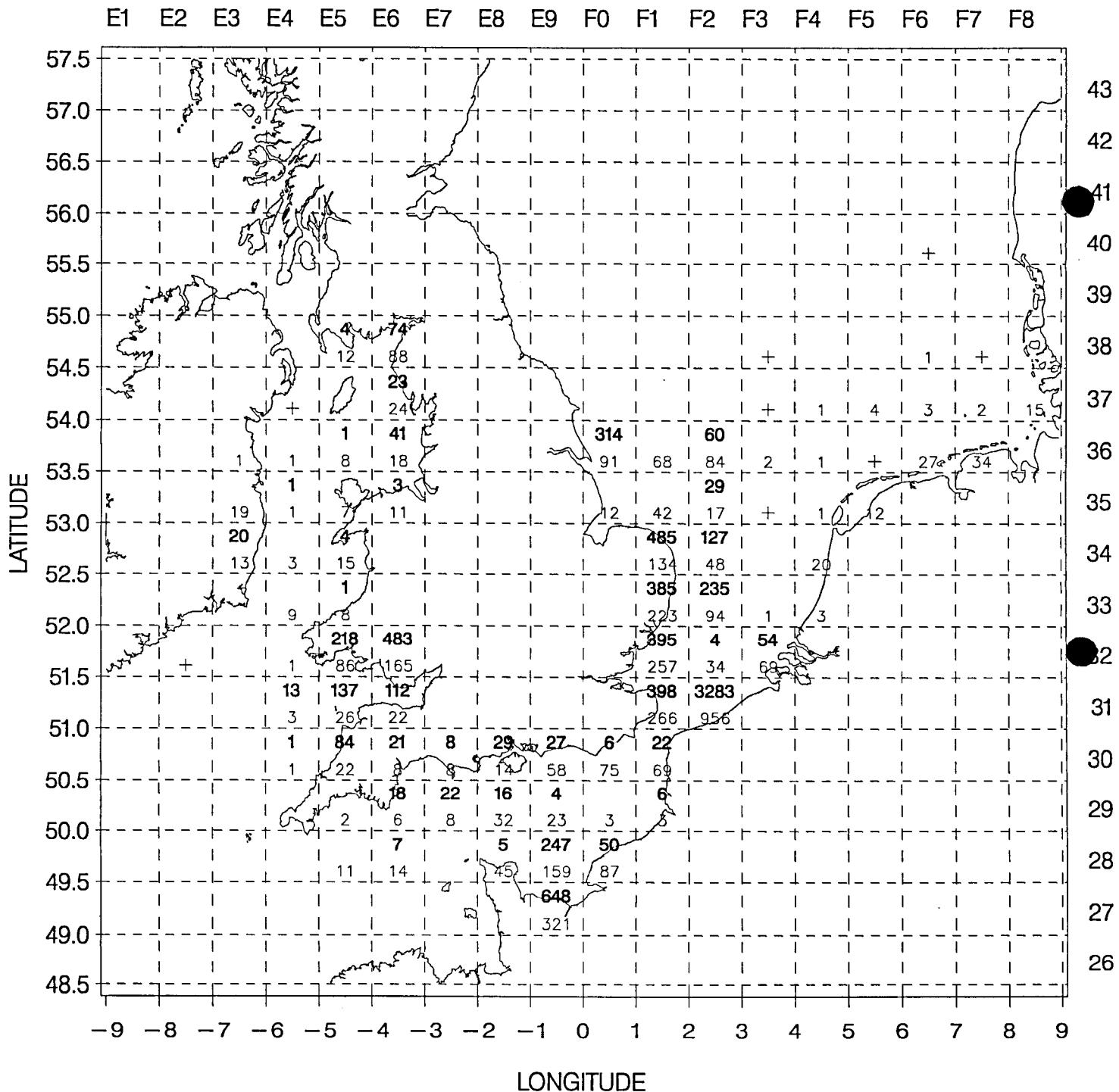


Figure 2.3.23 International Beam Trawl Surveys 1990–97
 Catches in number / 8m beam / hour / rectangle
 1997 data in bold, above the survey mean ('+' = < 0.5)
WHITING

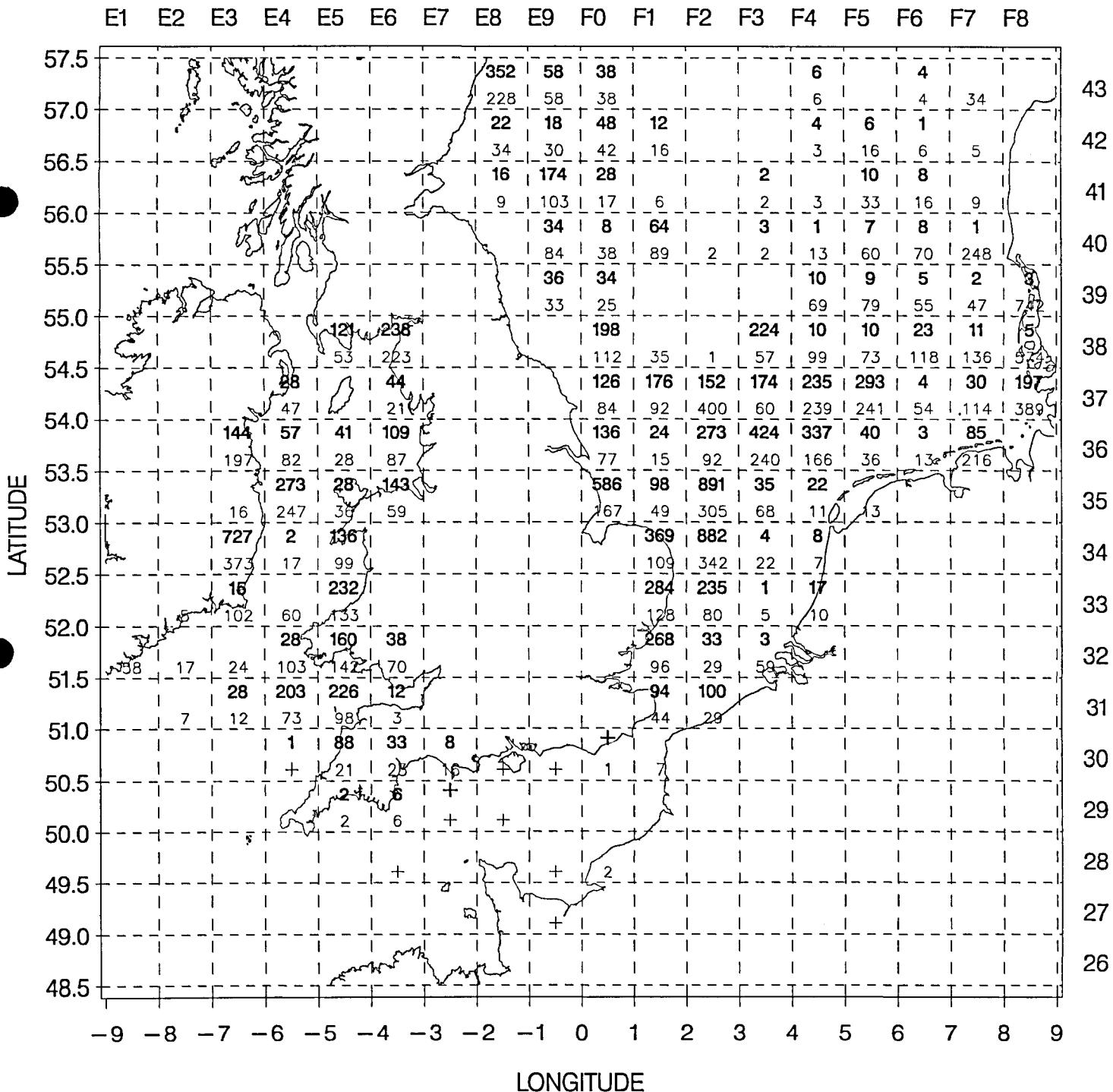


Figure 2.3.24 International Beam Trawl Surveys 1990–97
 Catches in number / 8m beam / hour / rectangle
 1997 data in bold, above the survey mean ('+' = < 0.5)
ANGLER FISH (MONK FISH)

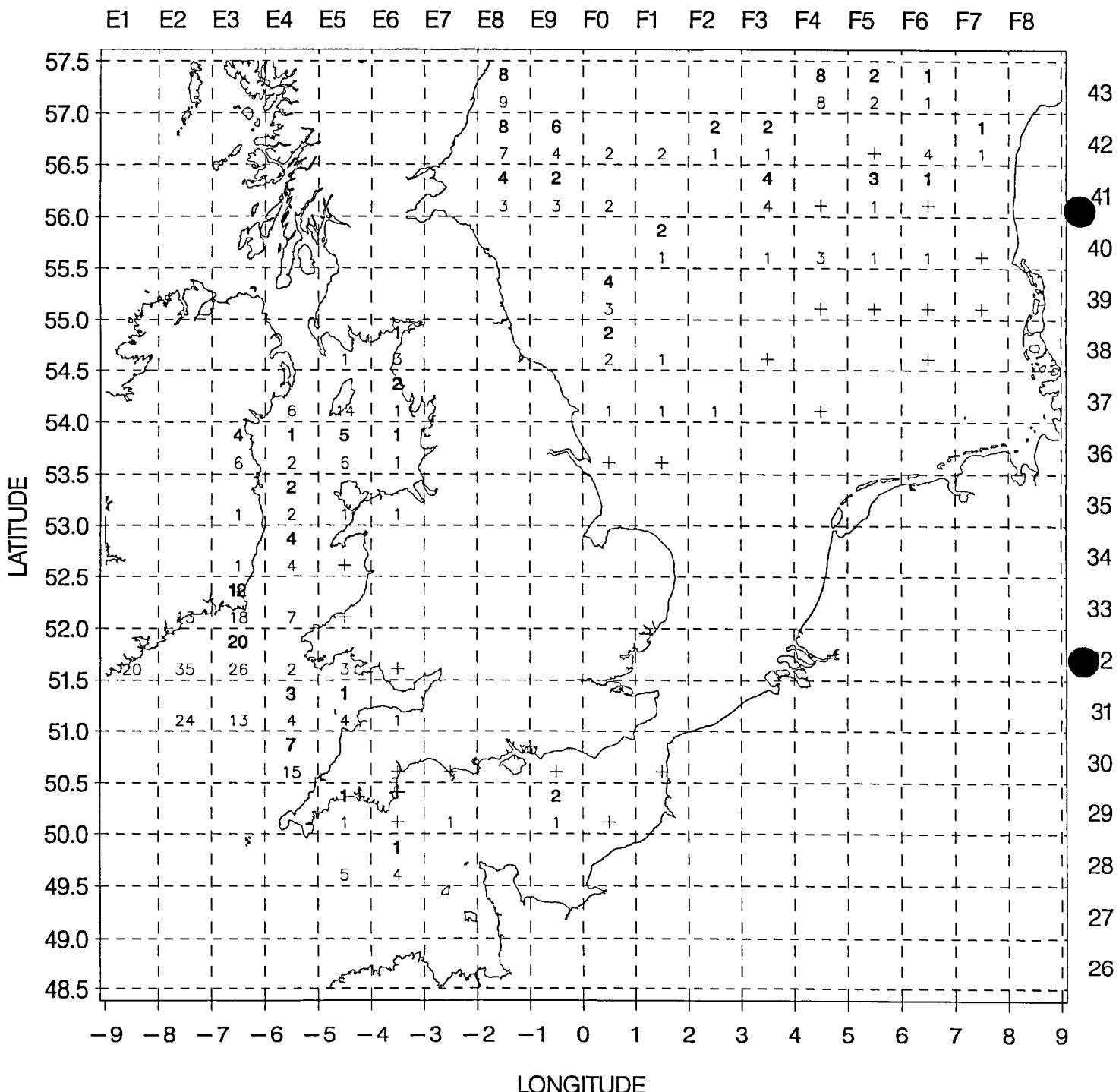


Figure 2.3.25 International Beam Trawl Surveys 1990–97
 Catches in number / 8m beam / hour / rectangle
 1997 data in bold, above the survey mean ('+' = < 0.5)
JOHN DORY

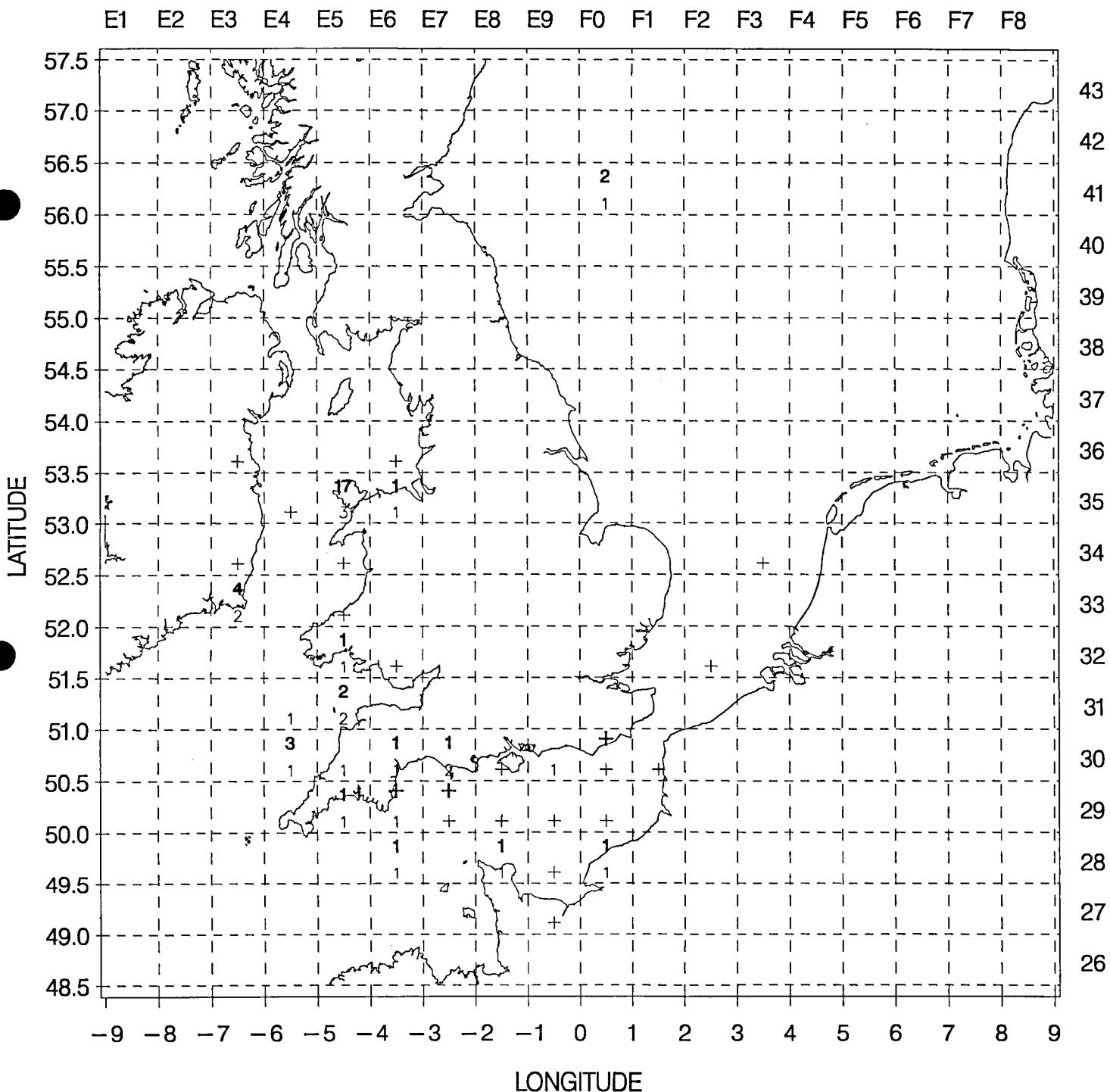
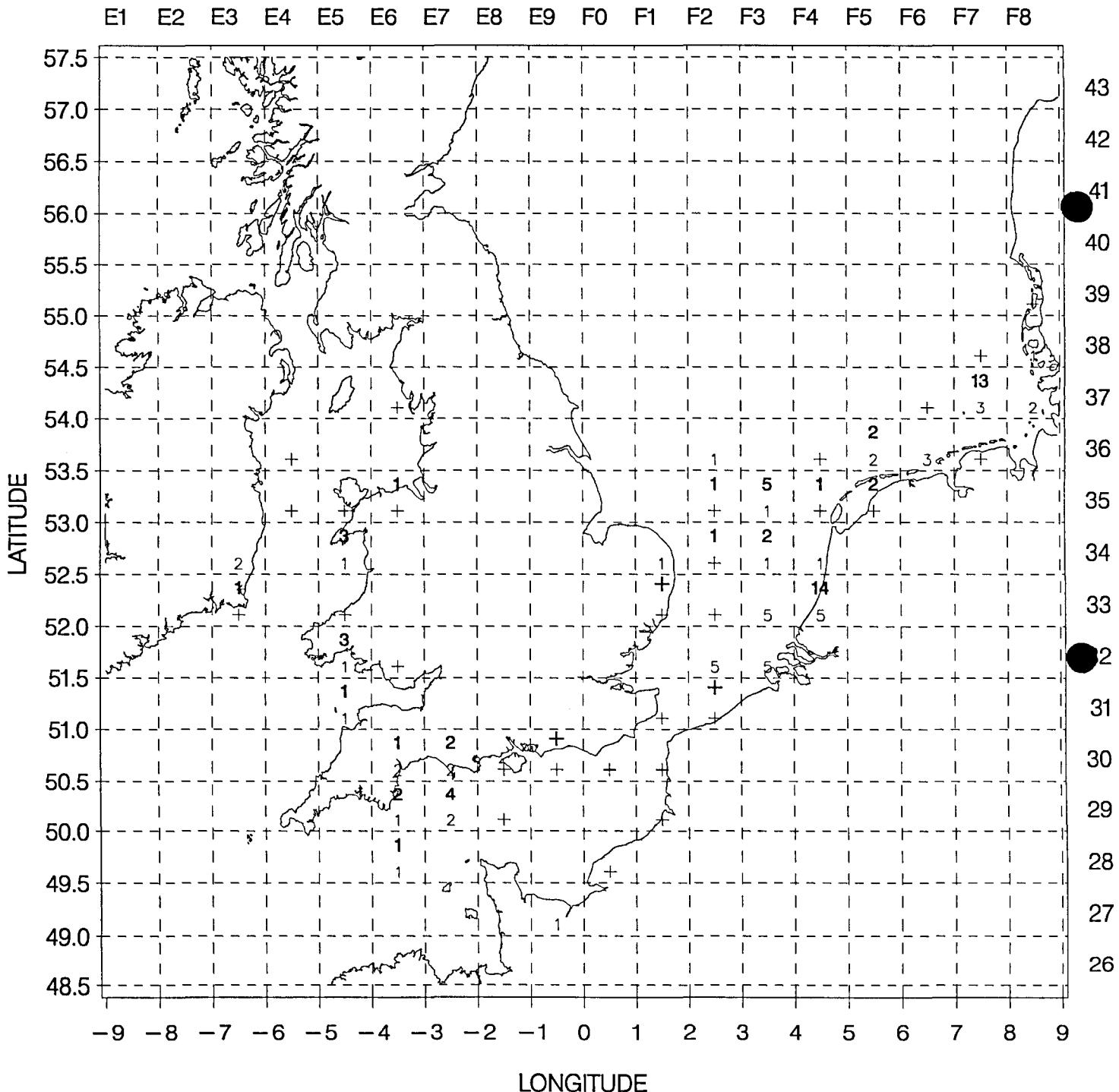


Figure 2.3.26 International Beam Trawl Surveys 1990–97
 Catches in number / 8m beam / hour / rectangle
 1997 data in bold, above the survey mean ('+' = < 0.5)
RED MULLET



Index area codes

Survey indices plaice and sole

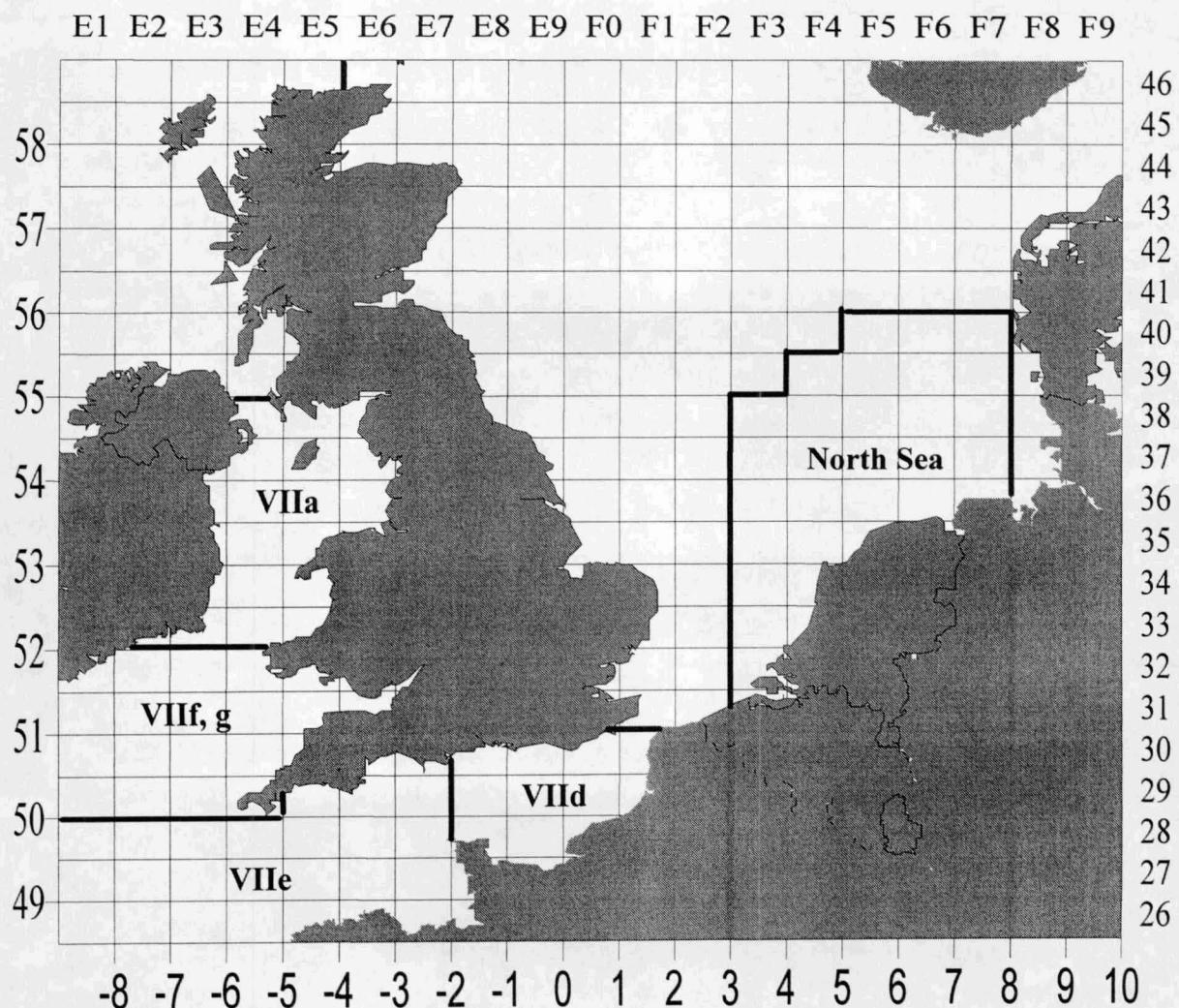


Fig. 2.4: Index areas for which the survey indices were calculated.

Figure 5.1 Catches of selected benthic invertebrates
 (mean no./8m beam/30 min) from beam trawl surveys in 1997
 Starfish - Asterias rubens

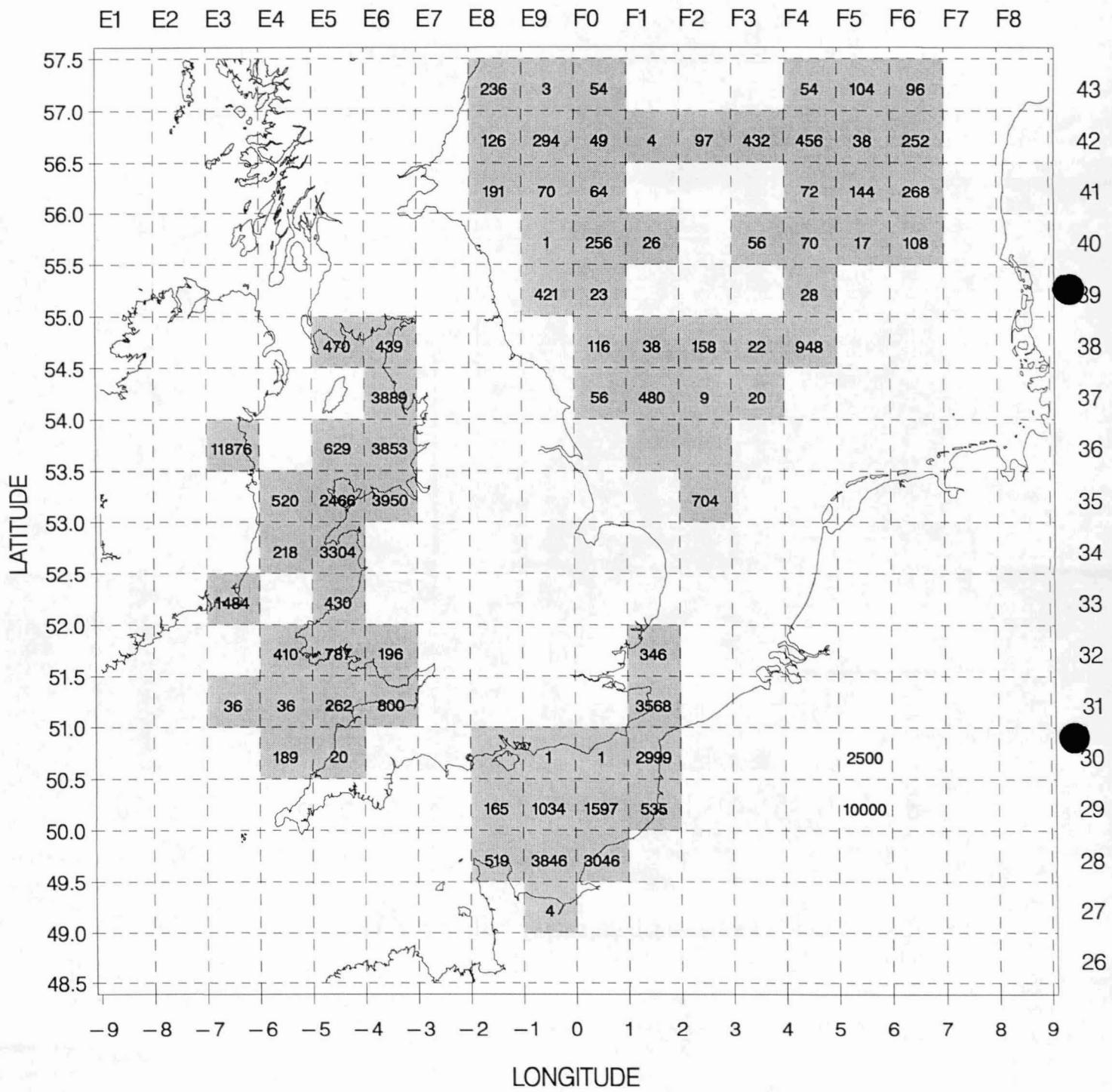


Figure 5.2 Catches of selected benthic invertebrates
 (mean no./8m beam/30 min) from beam trawl surveys in 1997

brown crab — Cancer pagurus

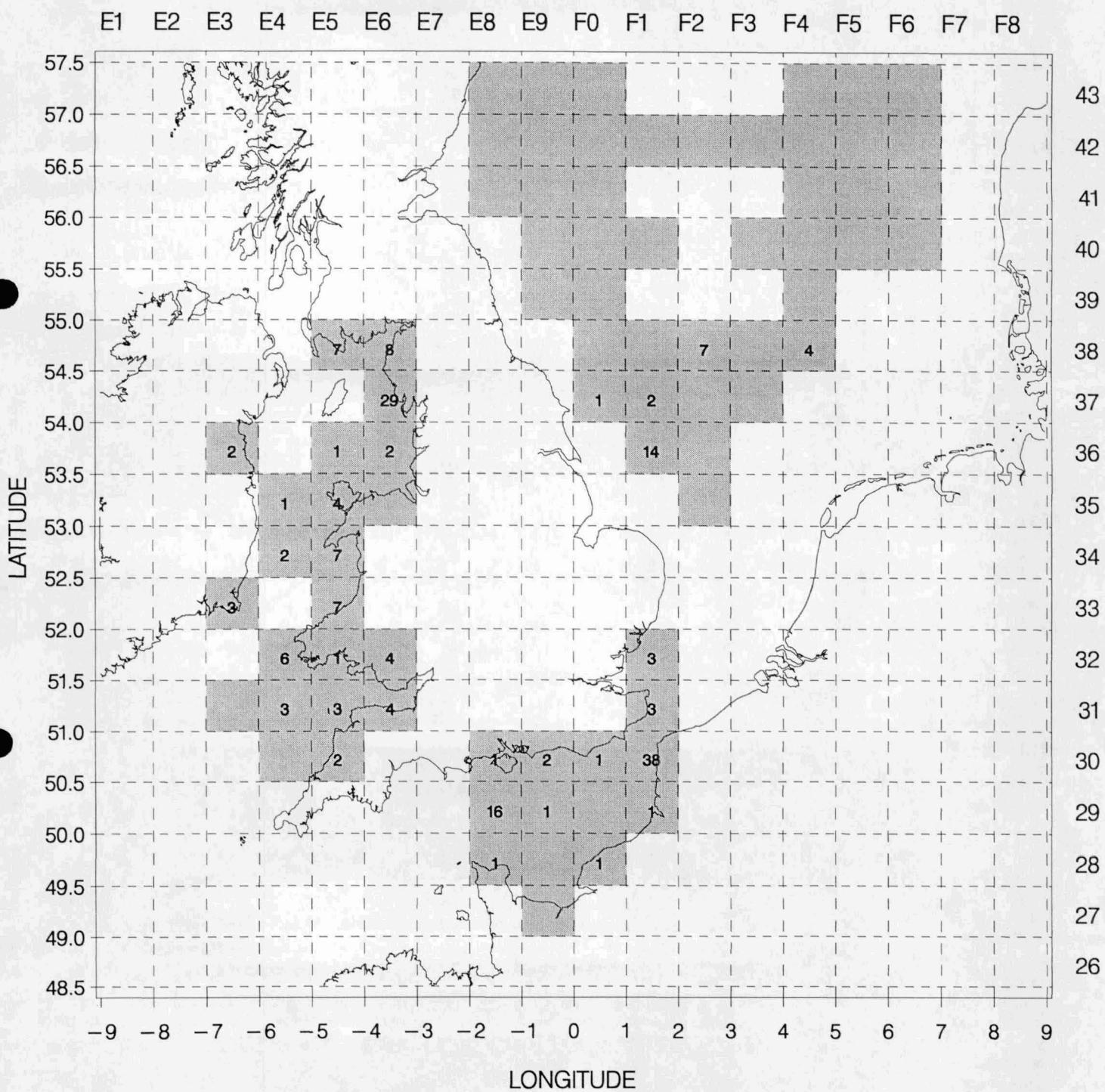


Figure 5.3 Catches of selected benthic invertebrates
 (mean no./8m beam/30 min) from beam trawl surveys in 1997
 whelk — Buccinum undatum

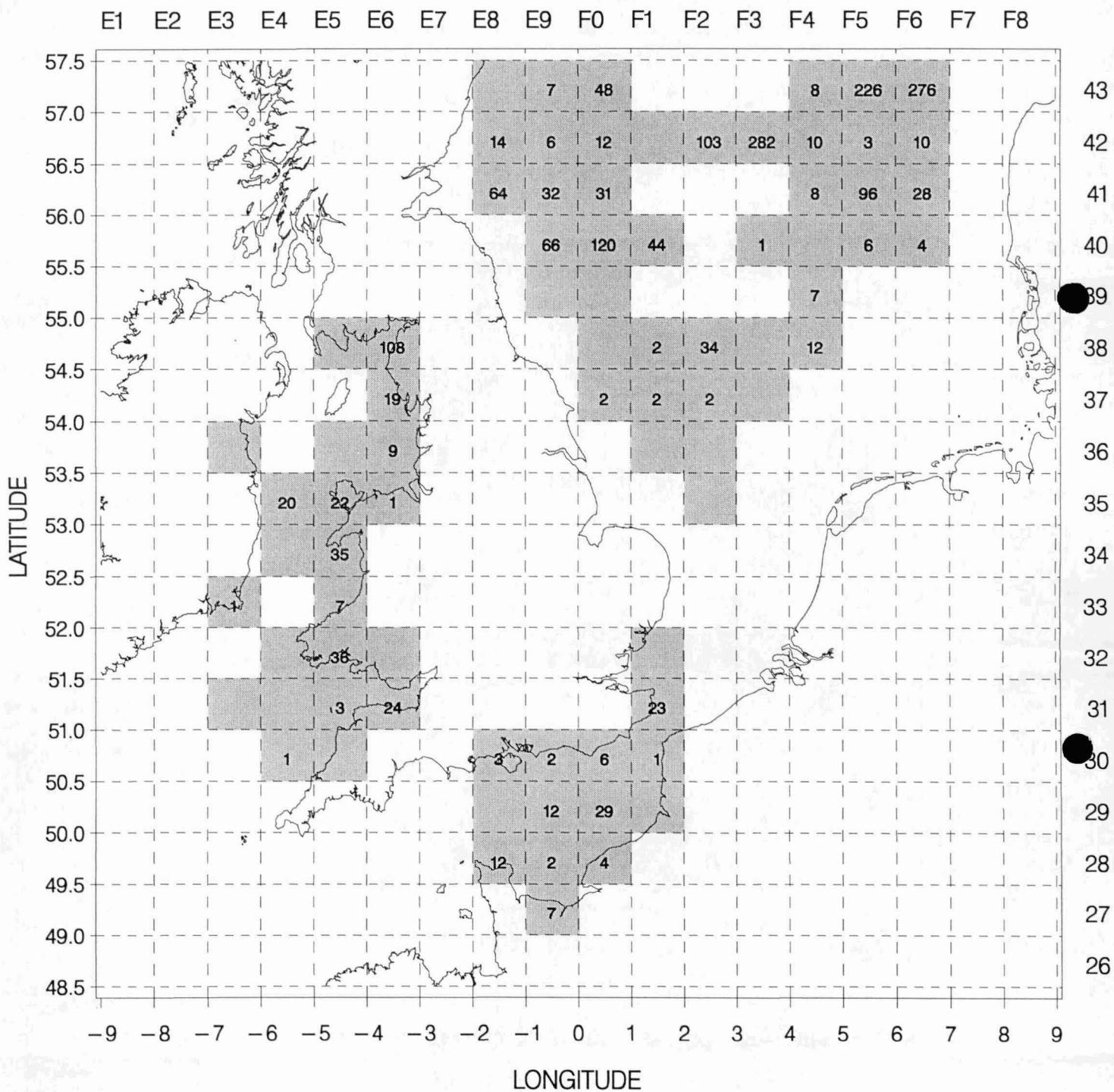


Figure 5.4 Catches of selected benthic invertebrates
 (mean no./8m beam/30 min) from beam trawl surveys in 1997
 queen scallop — *Aequipecten opercularis*

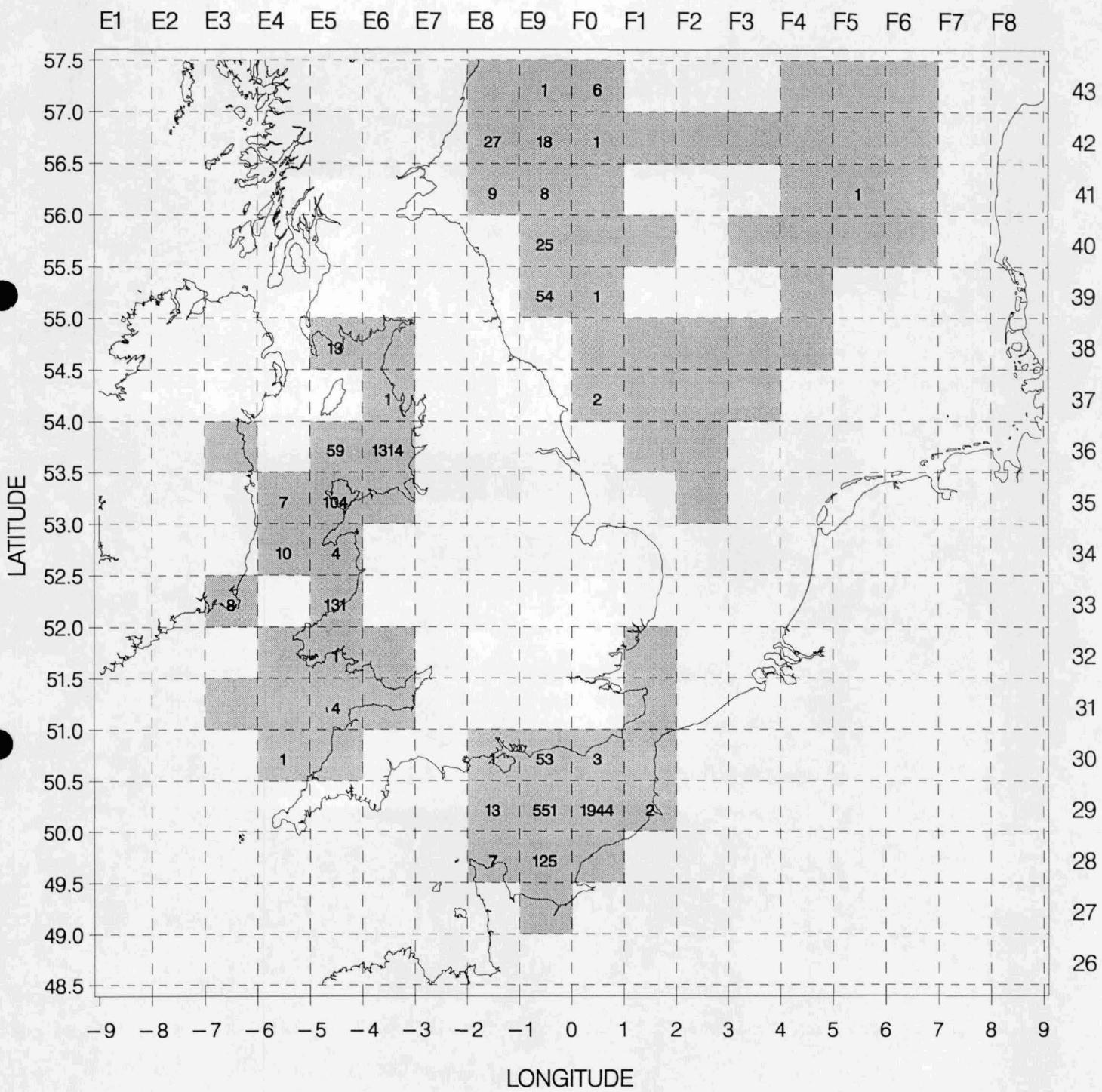


Figure 5.5 Catches of selected benthic invertebrates
 (mean no./8m beam/30 min) from beam trawl surveys in 1997
 swimming crab — Liocarcinus holsatus

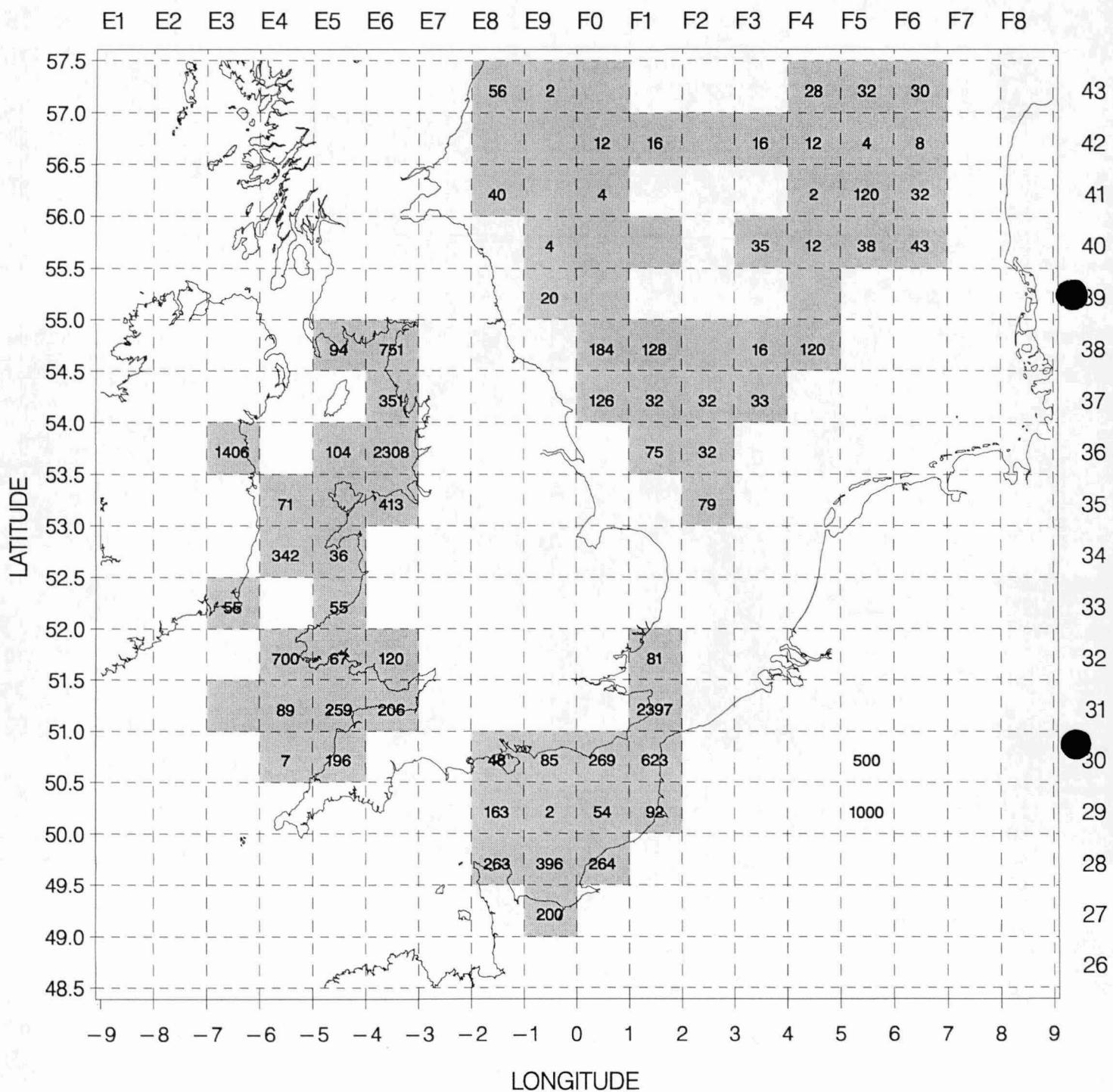


Figure 5.6 Catches of selected benthic invertebrates
 (mean no./8m beam/30 min) from beam trawl surveys in 1997
 sea mouse — *Aphrodite aculeata*

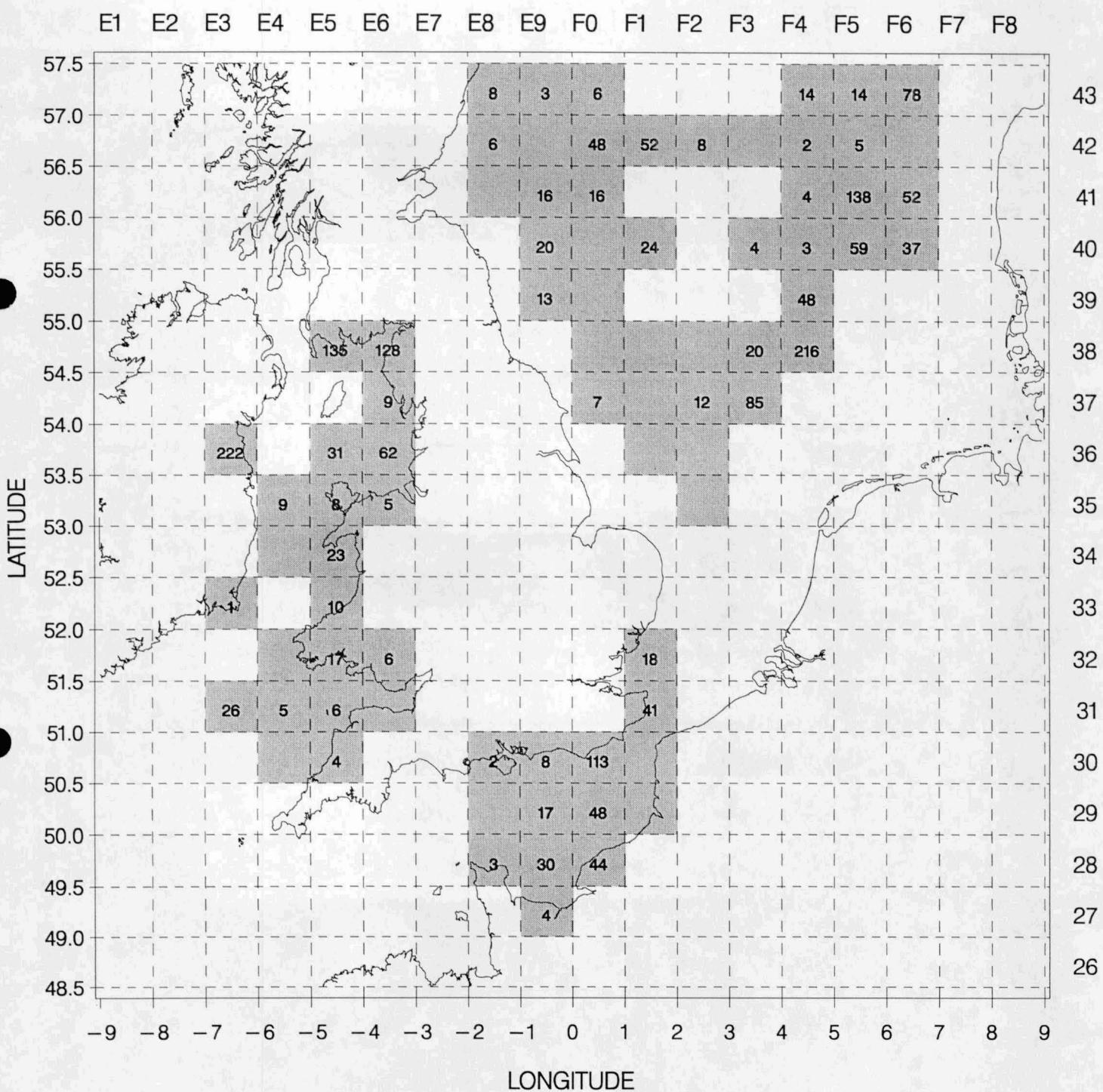


Figure 5.7 Catches of selected benthic invertebrates
 (mean no./8m beam/30 min) from beam trawl surveys in 1997
 masked crab — *Coryistes cassivelaunus*

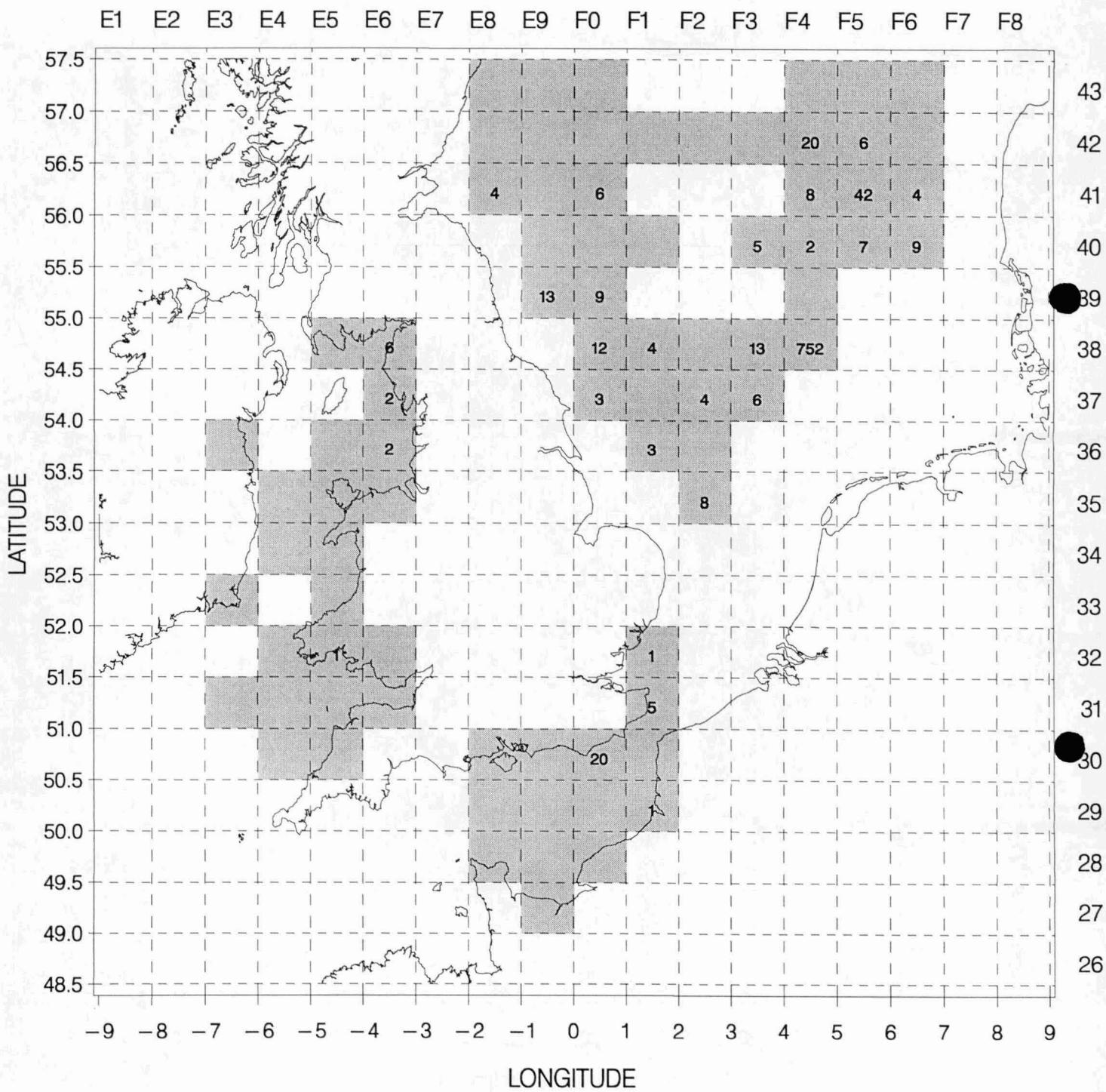


Figure 5.8 Catches of selected benthic invertebrates
 (mean no./8m beam/30 min) from beam trawl surveys in 1997
 brittle star — *Ophiothrix fragilis*

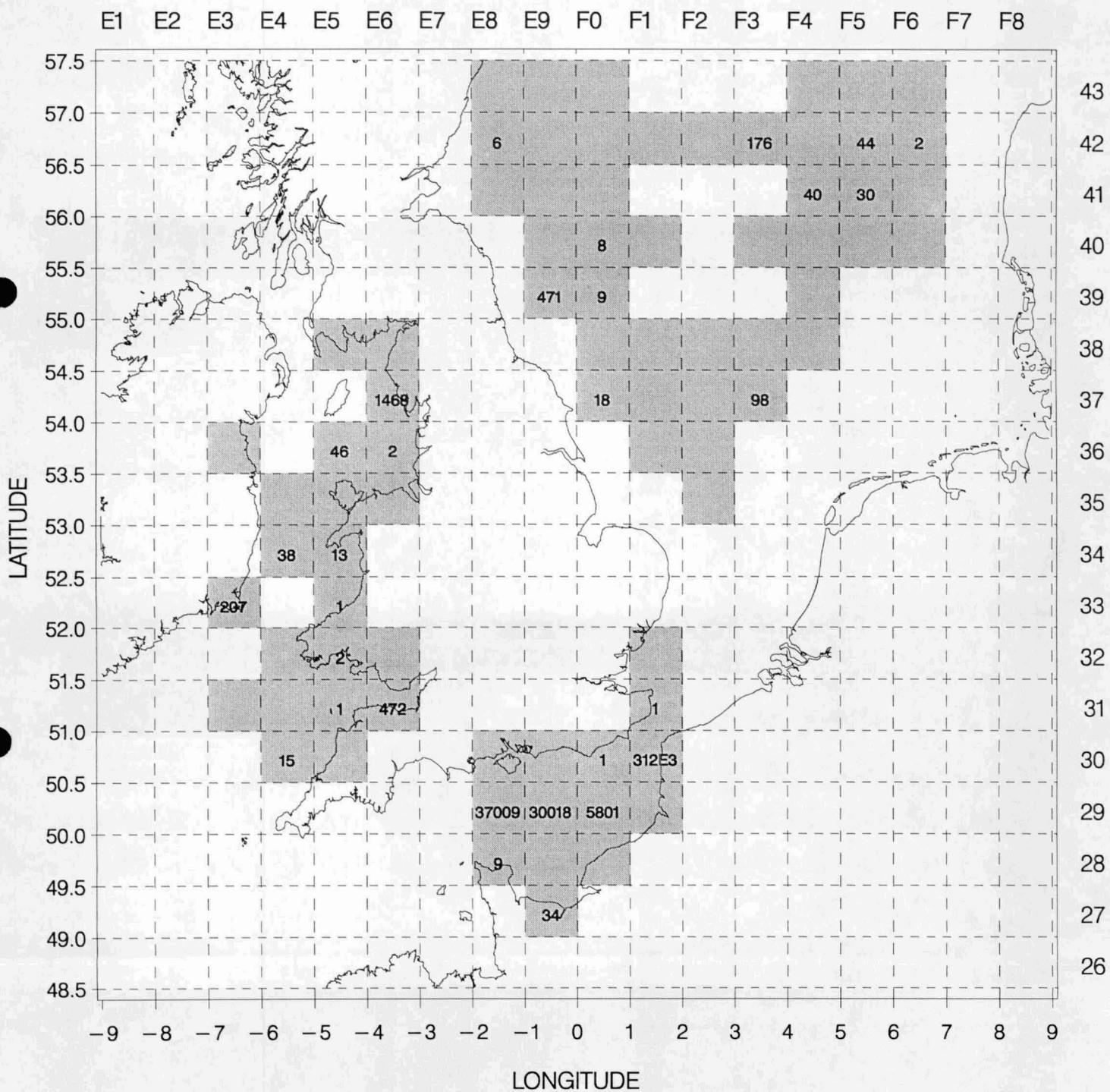


Figure 5.9 Catches of selected benthic invertebrates
 (mean no./8m beam/30 min) from beam trawl surveys in 1997

dahlia anemone — *Urticina felina*

