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BEAM TRAWL SURVEYS IN THE IRISH SEA, BRISTOL CHANNEL AND WESTERN ENGLISH CHANNEL

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ABSTRACT

This document reports on beam trawl surveys carried out by the UK in the Irish Sea, Bristol Channel and western English Channel in 1989 and 1990. It gives details of the sampling gear, survey designs and methods and a preliminary analysis and summary of the distributions and relative abundance of the more common commercial and non-commercial fish species in these areas. The document complements the reports of the Study Group on Beam Trawl Surveys already submitted to ICES (CM 1990/G:59 and CM 1991/G:81).

INTRODUCTION

A study group on beam trawl surveys in the North Sea and eastern Channel met in Ostende during June 1990. One of the recommendations in its report (Anon., 1990) was to invite the inclusion of results from beam trawl surveys being carried out in the Irish Sea and Bristol Channel in subsequent annual reports, thereby extending the areas surveyed from the southern North Sea to the Irish Sea.

It was impossible to comply with this request in 1991 (Anon., 1991) but it is intended that, from 1992, such data will be available to the Group. Meanwhile, the purpose of this paper is to bring together the results from surveys carried out by the United Kingdom since 1988 in the Irish Sea, Bristol Channel and western Channel in a format similar to that used by the Study Group.

SURVEY DESIGN AND METHODS

The surveys in the Irish Sea and Bristol Channel were started in 1988 using R.V. CORYSTES and were designed to sample pre-recruit sole and plaice. The western Channel survey commenced in 1984 using a chartered commercial beam trawler from Brixham and was targetted mainly on sole of all ages.

The positions of fishing stations in the Irish Sea and Bristol Channel were determined during a preliminary survey in September 1987 on R.V. CLIONE when trawling was carried out, as far as possible, to give a reasonable geographical coverage in each area. Both areas were stratified by depth zones of 0-20 m, 21-40 m and greater than 40 m. Fifty-four stations in the Irish Sea and 34 in the Bristol Channel were selected with their frequency within each zone approximately proportional to the catch rates made in each zone during the 1987 survey. These stations have formed the basis for the subsequent routine surveys, although not all stations in the Bristol Channel were worked in 1989 and 1990 (Figure 1).

In the first year of the western Channel survey (1984), sampling covered the major UK sole trawling grounds around Start Point. A grid of 48 stations was selected, with most sampling in areas giving best catch rates of sole and, with a few minor alterations, has remained the same since 1985 (Figure 1).

The sampling gear used from R.V. CORYSTES was a single commercially produced 4 m beam trawl fitted with a chain mat and flip-up ropes (Anon., 1990). A liner of 40 mm mesh was fitted in the codend to retain small fish. Hauls of 15 minutes duration were made, in daylight only, at a towing speed of 4 knots over the ground. In the Bristol Channel on the 1990 survey (and subsequently) the duration of the tows was increased to 30 minutes because of the lower catch rates of flatfish in this area.

The same 4 m beam trawls (twin) have been deployed on the chartered trawler in the western Channel since 1989; this also coincided with a change of vessel. Prior to this, sampling was carried out using the vessel's own 6 m beam trawls also fitted with chain mats and flip-up ropes. Haul duration was 30 minutes, towing speed nominally 4 knots and trawling took place in both daylight and dark.

All fish (or subsamples) on CORYSTES and selected species on the chartered vessel were measured to the nearest centimetre below and length-stratified samples of otoliths from sole, plaice, lemon sole and anglerfish were taken. The incidence of some commercial shellfish was noted.

SURVEY RESULTS

Distribution

For comparability with the reports of the Study Group, arithmetic mean catch rates per hour fished were calculated for each ICES rectangle. The data from the Irish Sea and Bristol Channel, based on catches from a single 4 m beam trawl, were raised by a factor of 2 to standardise with the 8 m beam trawl catches taken by the Netherlands and Belgium. The results of the two 4 m beam trawls used simultaneously in the western Channel have been combined. No correction has been made to take account of gear efficiency.

The relative abundances of each species by rectangle for 1989 and 1990 are given in Figures 2-9. These are presented as catch per hour per 8 m beam for separate age groups of sole and plaice but for all age-group totals of other species.

Sole (Figure 2)

In the Irish Sea, soles of all ages were relatively abundant in Liverpool Bay and, to a lesser extent, in the Solway Firth. There was a tendency for a dispersion away from these areas with increasing age (Symonds and Rogers, In prep.). In the Bristol Channel, Carmarthen Bay was an important area for 1, 2 and 3 year old soles but older fish were only caught in small numbers. Catches of sole of all ages were low in the western Channel with 1 and 2 year olds particularly scarce.

Plaice (Figure 3)

A somewhat similar distribution was found for plaice. Liverpool Bay, the Scottish coast and Carmarthen Bay all supported populations of plaice, particularly of the younger fish. Catches of plaice in the western Channel were small.

Other species (Figure 4-9)

The distribution of other benthic species are shown for comparison. Of the flatfish, brill, turbot, lemon sole and long rough dab occurred in low numbers. Dabs and solenettes were taken in all areas but with the highest catches in the Irish Sea and Carmarthen Bay. Similarly, scaldfish were found in the Irish Sea, mainly east of latitude 4°West and flounders were restricted to the inshore areas of the Solway Firth, Liverpool Bay and Carmarthen Bay.

The three gurnard species were found in all areas although the Tub and the grey were caught in greater numbers to the north and the red to the south; a similar distribution of the species by latitude was found in the North Sea and eastern Channel (Anon., 1990). *Callionymus lyra* was one of the three species of dragonet found in the Irish Sea; the other

species, *C. reticulatus* and *C. maculatus*, were taken in small numbers but were absent from the Bristol Channel and western Channel catches. Rays and dogfish were caught in all areas.

Of the gadoids, poor cod was the most abundant and was taken in all areas; the numbers of bib were highest in the Bristol Channel. The majority of the cod caught were 0-groups and these showed up most strongly in the Irish Sea in 1990. The catch rates of whiting were highest in the Irish Sea and in and around Carmarthen Bay.

Indices of abundance

Indices of abundance were calculated for each of the areas fished as the arithmetic mean catch rate per hour and the results from selected species are given in Table 1.

Major nursery areas for sole are found in the north eastern Irish Sea and the Bristol Channel where catch rates on these surveys compared favourably with those in the German Bight and the Waddensea, considered to be the most important flatfish nursery in the North Sea (Anon., 1991). The Irish Sea also provided the highest catch rates for all flatfish species, except the thickback sole (Bristol Channel), and also for cod (0-groups) and rays. The catches of most commercial species in the western Channel were low.

Trends in abundance

Only three years data for the Irish Sea and Bristol Channel (1988-90) and two years for the western Channel (1989-90) are available in a comparative format for plaice and sole (Table 2). As in the North Sea and eastern Channel (Anon., 1990), there was generally an increase, in both species, in catch rates of each year class from 1 year olds to 2 year olds indicating that 1 year olds were not fully sampled on these surveys; in the western Channel, the increase in catch rates occurred one year later. Although again not fully sampled, 0-group sole showed up well in catches from the Bristol Channel compared to other areas.

The 1984 year class of sole in the Irish Sea showed up strongly as 4, 5 and 6 year olds in 1988, 1989 and 1990 respectively. Athough the data series is short, there is a strong suggestion that the 1989 year class of both plaice and sole in the Irish Sea may be good.

CONCLUSIONS

Some caution must be exercised in interpreting and comparing the results from different surveys. The distributions of many benthic fish appear to be associated to depth of water. In particular, the juveniles of several commercial flatfishes, such as sole, plaice and turbot are generally found in shallow coastal water and movement into deeper water occurs as age increases (e.g. Riley *et al.*, 1981; Symonds and Rogers, In prep.). The distributions of stations on the surveys reported here (Table 3) show that, in the Irish Sea, the majority of stations are in water depths less than 20 m, in contrast to the western Channel survey, where

more than three-quarters of the stations are deeper than 40 m; the Bristol Channel is situated in between these extremes. As the position of fishing in relation to depth is likely to have a profound influence on the catch composition, it is recommended that future analyses and interpretation of these survey data be based on depth bands rather than on statistical square.

REFERENCES

Anon., 1990. Report of the study group on beam trawl surveys in the North Sea and eastern Channel, Ostende 5-8 June 1990. ICES CM 1990/G:59.

Anon., 1991. Report of the study group on beam trawl surveys in 1990. ICES CM 1991/G:81.

Riley, J. D., Symonds, D. J. and Woolner, L., 1981. On the factors influencing the distribution of 0-group demersal fish in coastal waters. Rapp P.-v. Réun. Cons. int. Explor. Mer, 178, p.223-228.

Table 1 Mean abundance of species (no/hr/8 m trawl) by area, 1989 and 1990

Species		Age	1989			1990		
			Irish Sea	Bristol Channel	Western Channel	Irish Sea	Bristol Channel	Western Channel
Sole	*Solea solea*	1	15.8	19.7	.2	122.7	30.8	.6
		2	25.9	27.0	2.5	53.8	18.3	1.7
		3	22.1	18.6	4.9	12.1	6.2	3.0
		3+	41.8	6.5	8.8	33.5	7.3	3.7
Plaice	*Pleuronectes platessa*	1	41.3	15.1	.6	146.9	11.4	.8
		2	67.6	26.5	1.8	36.7	17.0	1.2
		3	64.8	7.4	8.7	19.9	6.4	7.0
		3+	16.5	3.1	7.9	21.5	3.4	6.3
Dab	*Limanda limanda*		318.3	52.8	53.1	532.0	23.0	15.7
Turbot	*Scophthalmus maximus*		.3	3.6	.1	.3	2.0	.1
Brill	*S. rhombus*		2.3	.4	.5	2.6	2.5	.3
Scaldfish	*Arnoglossus laterna*		13.7	.8	+	26.3	.0	+
Lemon sole	*Microstomus kitt*		5.0	.4	.8	2.6	1.0	1.2
Long rough dab	*Hippoglossoides platessoides*		.0	.0	.0	.9	.0	.0
Flounder	*Platichthys flesus*		9.4	1.6	.0	4.9	.5	.0
Solenette	*Buglossidium luteum*		140.0	93.6	+	170.3	41.0	+
Tub gurnard	*Trigla lucerna*		4.6	3.6	.4	9.4	4.5	1.0
Grey gurnard	*Eutrigla gurnardus*		71.1	8.4	4.3	71.4	9.5	5.0
Red gurnard	*Aspitrigla cuculus*		6.3	.8	11.1	4.9	1.0	26.2
Hooknose	*Agonus cataphractus*		24.3	4.0	+	43.1	.0	+
Lesser weever	*Echiichthys vipera*		5.7	1.2	+	10.3	.0	+
Dragonet	*Callionymus lyra*		173.1	26.4	+	162.9	8.5	+
Dogfish	*Scyliorhinus caniculus*		16.0	24.0	3.8	24.0	52.0	6.9
Rays	*Rajidae*		47.4	23.6	3.1	14.6	13.5	2.8
Cod	*Gadus morhua*		2.9	1.2	.0	29.4	.0	.0
Haddock	*Melanogrammus aeglifinus*		.0	.0	.0	.0	.0	.0
Poor cod	*Trisopterus minutus*		84.3	249.6	+	236.0	217.0	+
Bib	*T. luscus*		33.4	95.6	5.6	64.0	170.0	+
Whiting	*Merlangius merlangus*		29.7	25.2	.2	43.7	102.5	1.3
Thick back sole	*Microchirus variegatus*		7.4	23.2	+	5.7	12.5	+
John dory	*Zeus faber*		.0	.0	1.2	.0	.5	.1
Red mullet	*Mullus surmuletus*		.6	1.2	5.5	.0	2.3	1.2
Anglerfish	*Lophius piscatorius*		1.7	.0	.4	.3	.0	.7
Edible crab	*Cancer pagurus*		2.9	1.6	.5	7.7	3.5	.6

+ = present but not counted

Table 2 Catch rate of sole and plaice: Irish Sea, Bristol Channel and Western Channel (no/hr/8m trawl), 1988-1990

SOLE

	Age										
	0	1	2	3	4	5	6	7	8	9	10+
Irish Sea											
1988	.2	8.8	24.3	23.3	43.8	8.6	4.6	.1	.0	.0	.0
1989	2.0	15.8	25.9	22.1	9.9	25.0	4.9	1.8	.0	.0	.2
1990	.9	122.7	53.8	12.1	4.0	9.5	15.2	2.6	1.4	.6	.1
Bristol Channel											
1988	2.2	6.7	26.6	3.7	1.8	.9	.0	.0	.0	.0	.4
1989	18.6	19.7	27.0	18.7	2.2	2.4	1.2	.4	.1	.1	.0
1990	6.9	30.8	18.2	6.2	1.9	1.0	3.4	.5	.0	.0	.5
Western Channel											
1989	.0	.2	2.3	4.9	4.3	1.4	1.6	.7	.2	.3	.5
1990	.0	1.0	2.1	3.2	1.3	1.0	.3	.6	.1	.2	.5

PLAICE

	Age										
	0	1	2	3	4	5	6	7	8	9	10+
Irish Sea											
1988	2.9	72.6	145.3	30.8	1.2	6.8	1.2	.5	.0	.1	.8
1989	5.9	41.3	67.6	64.8	11.3	1.4	3.4	.3	.0	.0	.1
1990	63.4	146.9	36.7	19.9	9.1	4.8	4.1	.2	.1	.9	.3
Bristol Channel											
1988	.4	10.9	26.2	7.5	.0	.7	.7	.0	.0	.2	.0
1989	.5	15.1	26.5	7.4	2.1	.8	.0	.1	.0	.0	.0
1990	.9	11.4	15.8	6.4	2.5	.4	.0.	.0	.3	.0	.3
Western Channel											
1989	.0	1.2	2.5	11.6	8.1	1.4	.3	.3	.2	.1	.3
1990	.0	1.0	1.7	9.6	3.9	2.8	.0	.2	.0	.1	.2

Table 3 Distribution of stations by depth band, 1989 and 1990

	Irish Sea	Bristol Channel		Western Channel
Year	Both	1989	1990	Both
Depth zone				
0-20 m	30	8	7	2
21-40 m	21	9	11	9
41+ m	3	7	2	37
Total	54	24	20	48

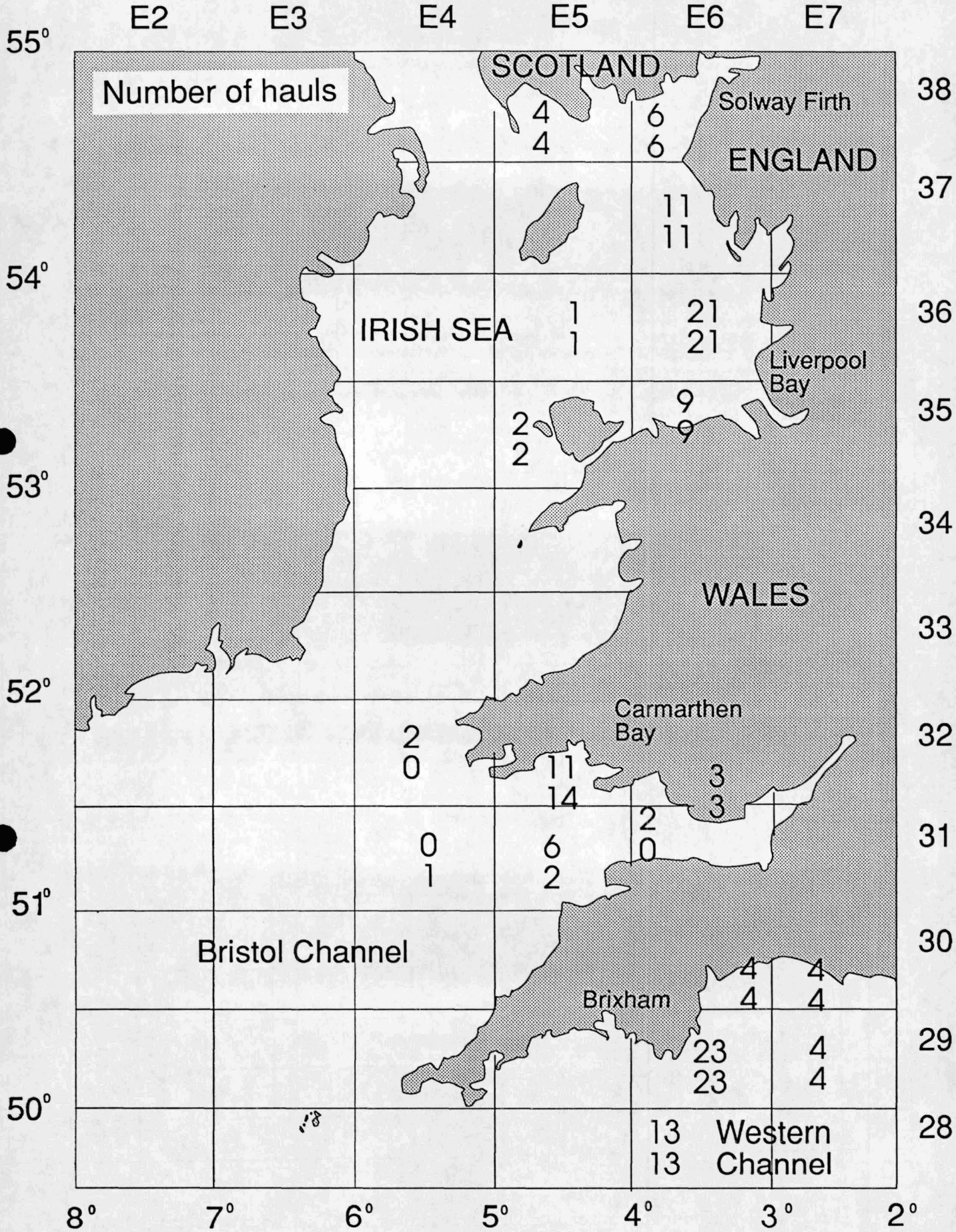

Figure 1. Survey area and number of hauls in each rectangle. Top number, 1989; bottom number, 1990. Names of places mentioned in the text are given.

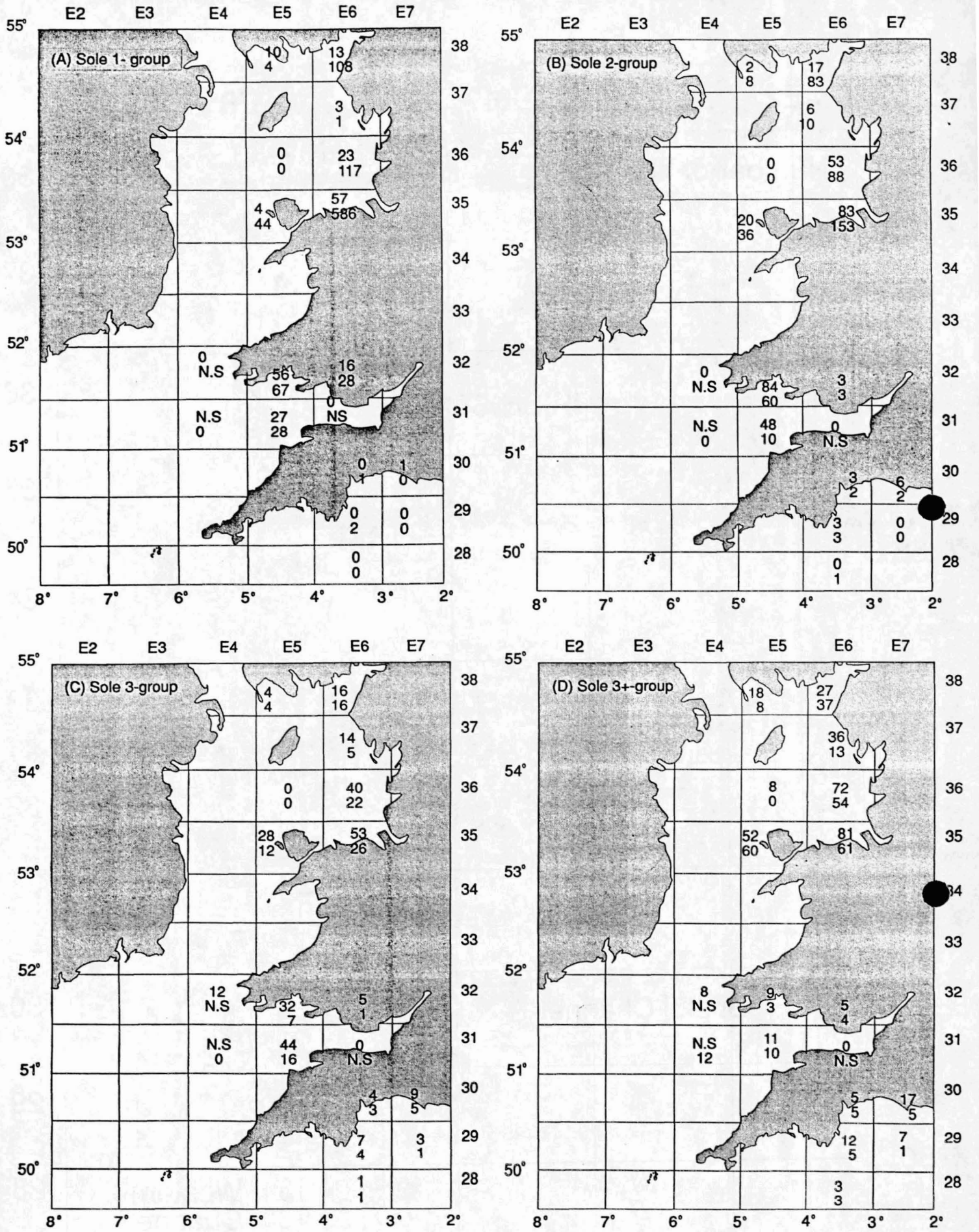

Figure 2. Distribution from beam trawl surveys (mean catch per hour by rectangle). Top number, 1989; bottom number, 1990. NS = not sampled.

A: Sole, 1 group. B: Sole, 2 group. C: Sole, 3 group. D: Sole, 3+ group.

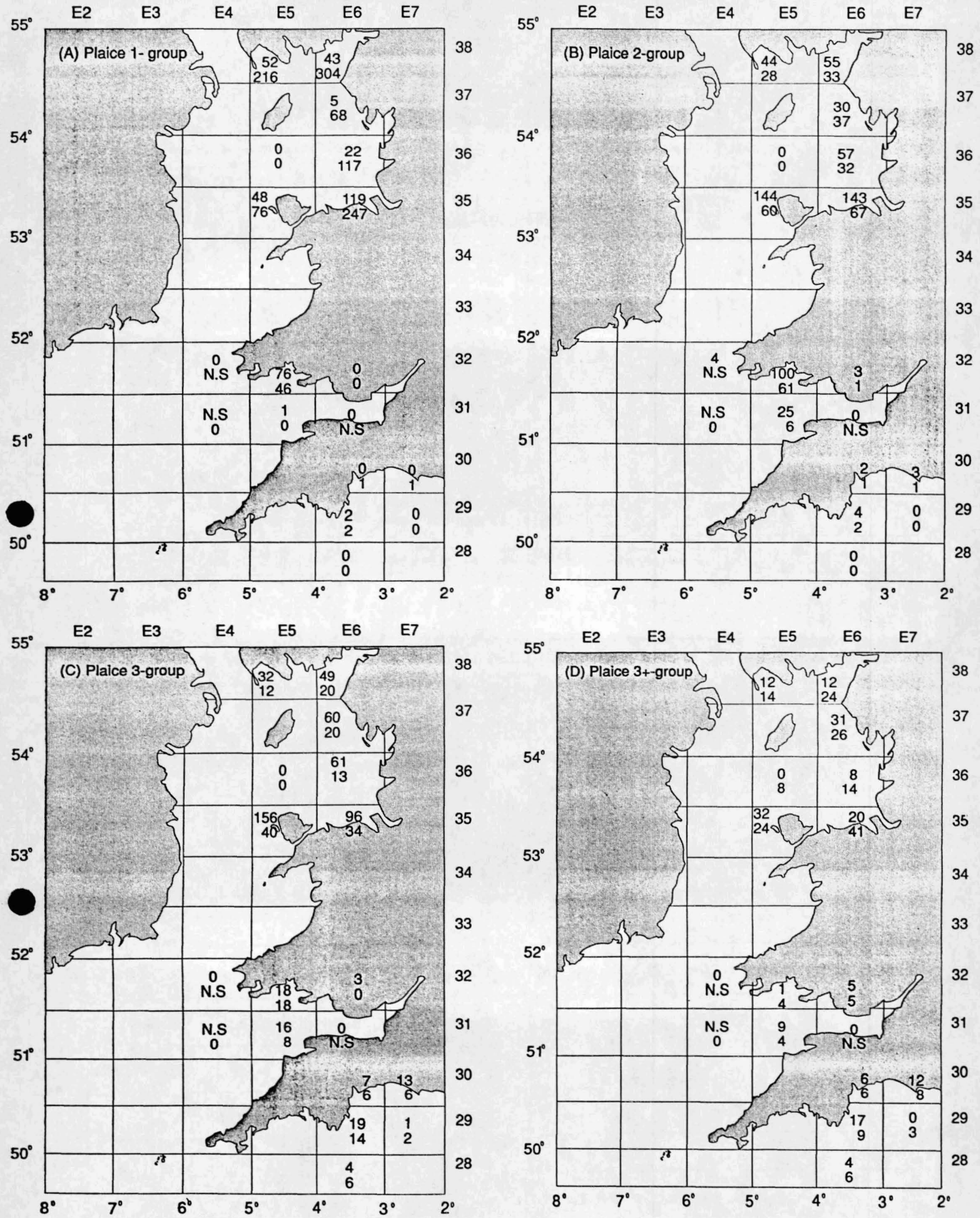

Figure 3. Distribution from beam trawl surveys (mean catch per hour by rectangle). Top number, 1989; bottom number, 1990. NS = not sampled.

A: Plaice, 1 group. B: Plaice, 2 group. C: Plaice, 3 group. D: Plaice, 3+ group.

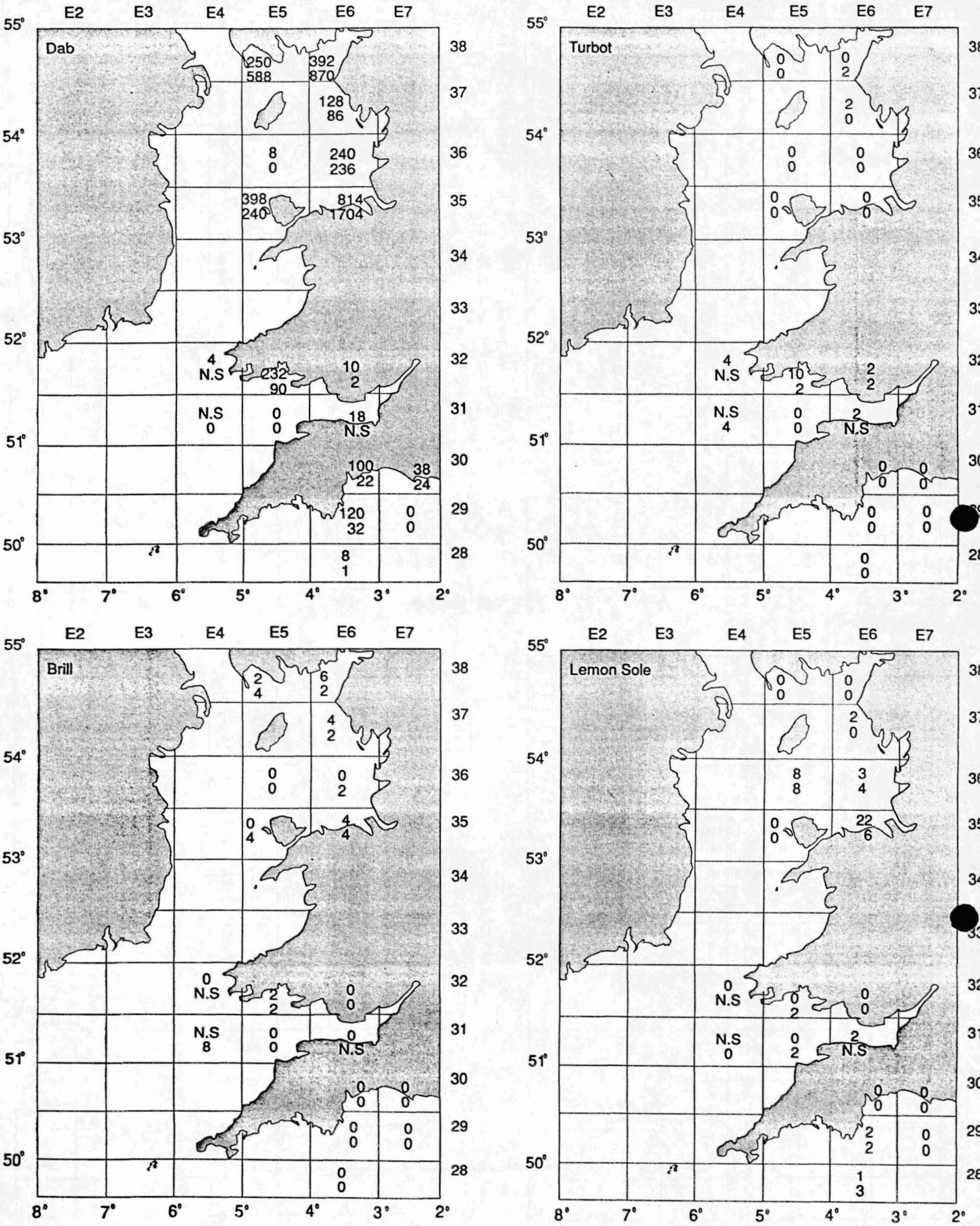

Figure 4. Distribution from beam trawl surveys (mean catch per hour by rectangle). Top number, 1989; bottom number, 1990. NS = not sampled.

A: Dab. B: Turbot. C: Brill. D: Lemon sole.

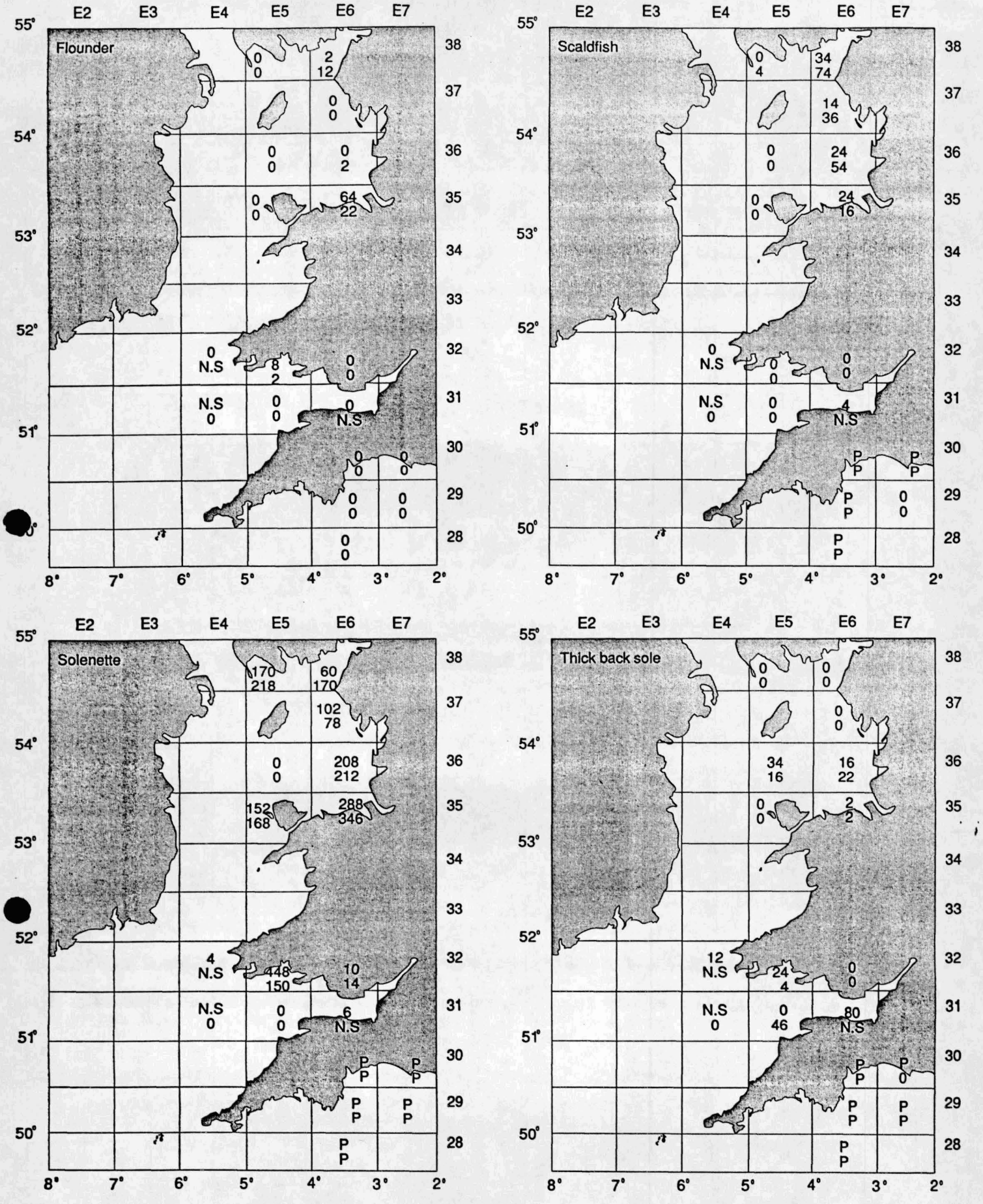

Figure 5. Distribution from beam trawl surveys (mean catch per hour by rectangle). Top number, 1989; bottom number, 1990. NS = not sampled. A: Flounder. B: Scaldfish. C: Solenette. D: Thick back sole.

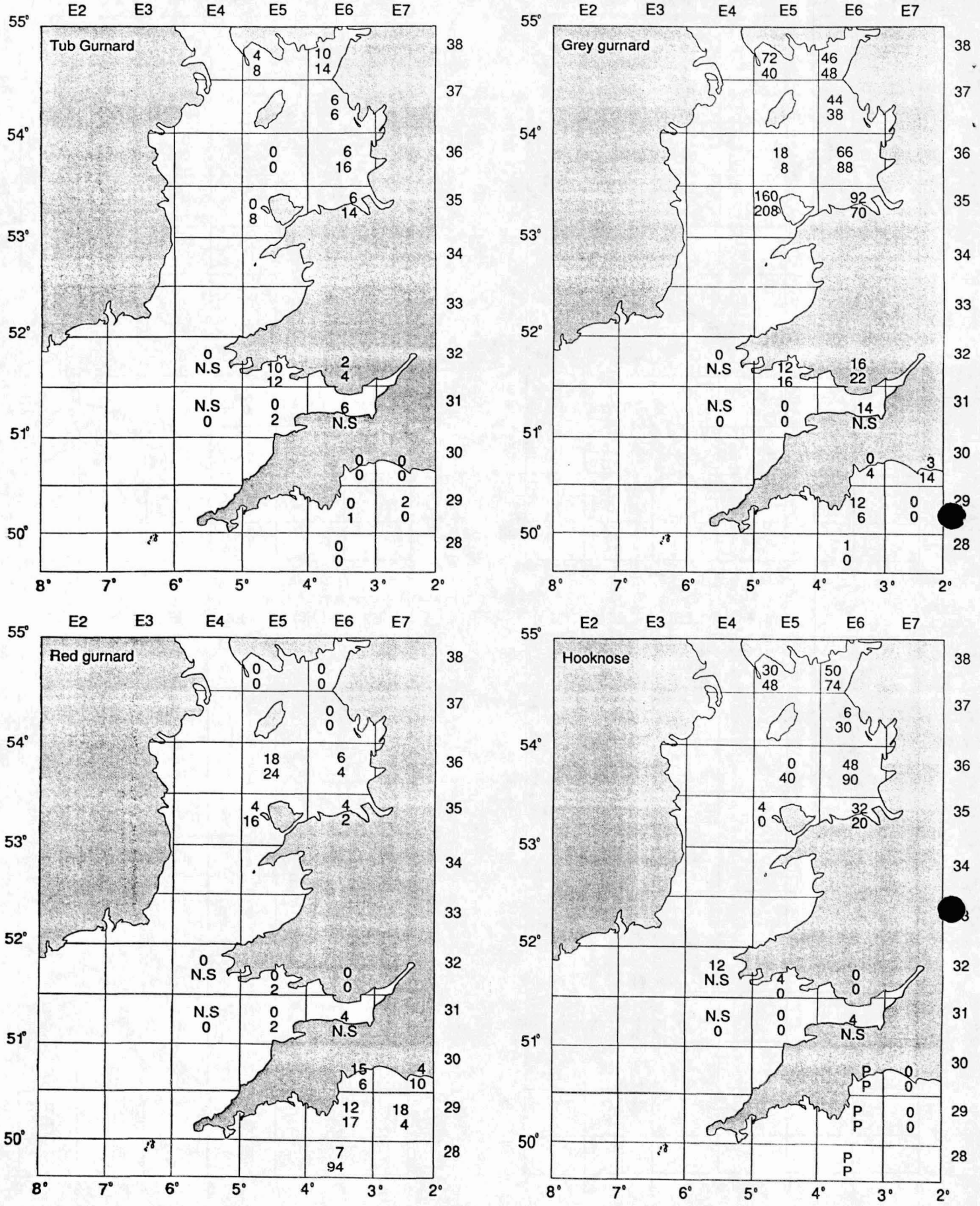

Figure 6. Distribution from beam trawl surveys (mean catch per hour by rectangle). Top number, 1989; bottom number, 1990. NS = not sampled.

A: Tub gurnard. B: Grey gurnard. C: Red gurnard. D: Hooknose.

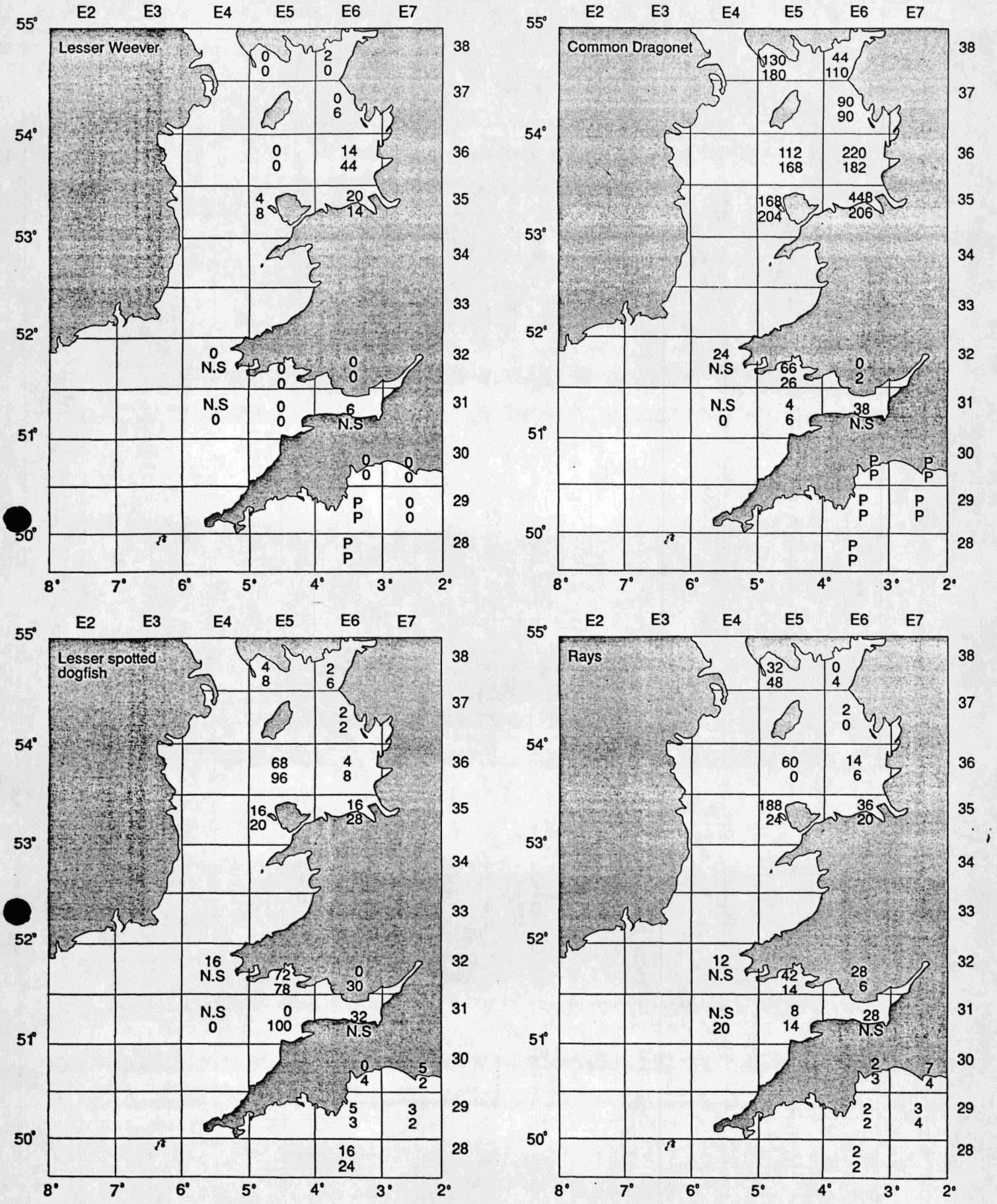

Figure 7. Distribution from beam trawl surveys (mean catch per hour by rectangle). Top number, 1989; bottom number, 1990. NS = not sampled.
A: Lesser weever. B: Dragonet. C: Lesser spotted dogfish. D: Rays.

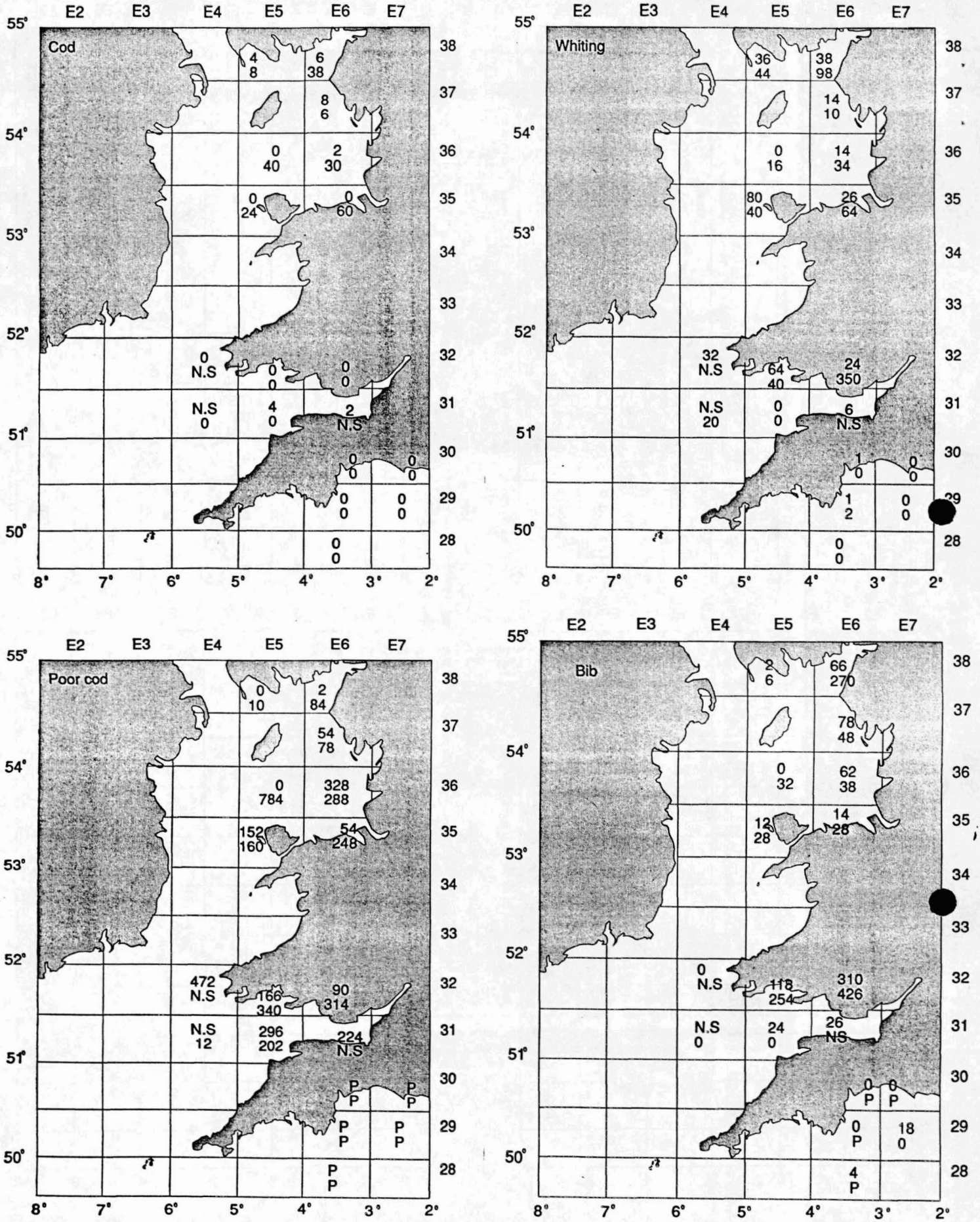

Figure 8. Distribution from beam trawl surveys (mean catch per hour by rectangle). Top number, 1989; bottom number, 1990. NS = not sampled.

A: Cod. B: Whiting. C: Poor cod. D: Bib.

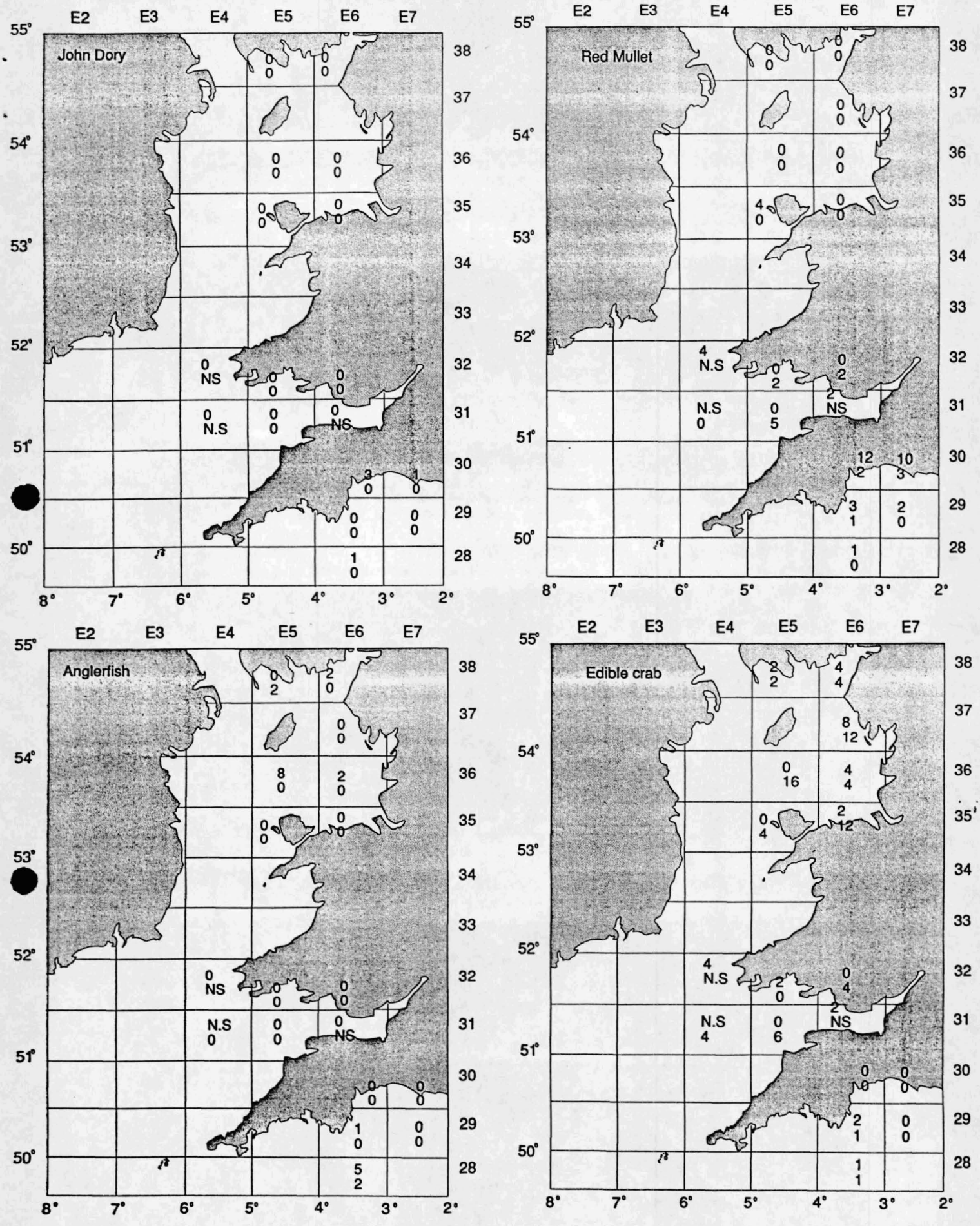

Figure 9. Distribution from beam trawl surveys (mean catch per hour by rectangle). Top number, 1989; bottom number, 1990. NS = not sampled.

A: John Dory. B: Red mullet. C: Anglerfish. D: Edible crab.