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Distribution and relative abundance of demersal fishes from beam trawl surveys in the Bristol Channel (ICES division VIIf) 1993-2001

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1. BRISTOL CHANNEL FISHERIES

ICES division VIIf (Figure 1) supports important fisheries for demersal finfish and shellfish. The main fisheries involve beam and otter trawls, with gillnets, longlines and pots also used.

Otter trawlers target cod *Gadus morhua*, haddock *Melanogrammus aeglefinus*, whiting *Merlangius merlangus* and plaice *Pleuronectes platessa*, although important by-catch species include anglerfish *Lophius piscatorius*, sole *Solea solea,* skates and rays (Rajidae) and in the deeper waters of the outer Bristol Channel, hake *Merluccius merluccius*. Targeted fisheries for sole and plaice using beam trawls became prevalent during the mid 1970s, and ever since there has been a gradual replacement of otter trawls by beam trawls in the Belgian and UK fleets. The beam trawl fishery in the Bristol Channel involves vessels from Belgium, UK, France and Ireland, and its effort is concentrated off Trevose Head (north Cornwall), and around Land's End. The fishery also lands rays and high value demersal species such as brill *Scophthalmus rhombus*, turbot *S. maximus* and anglerfish. Cuttlefish *Sepia officinalis* is becoming an increasingly important component of beam trawl landings.

The inshore fisheries of ICES division VIIf are very diverse (Pawson *et al*., 2002). Longlines are used to target demersal species (e.g. cod) on rough ground, and surface longlines are occasionally used to target porbeagle shark *Lamna nasus* (Ellis and Shackley, 1995). Handlines are used for mackerel *Scomber scombrus* and bass *Dicentrarchus labrax*, and various gillnets and tangle nets are used to target cod, bass, rays, turbot and brill.

There are also important fisheries for shellfish in the area, notably potting for edible crab *Cancer pagurus* and lobster *Homarus gammarus* on rough ground, potting for whelk *Buccinum undatum* in Carmarthen Bay and the cockle *Cerastoderma edule* fishery in the Burry Inlet.

Table 1 shows the landings (all gears combined) of demersal finfish and shellfish by UK vessels landing into England and Wales. The data covers the period 1993 to 2001, and covers the most commercially important species for ICES division VIIf. Boon (1992) reviewed commercial landings from this area for earlier years.

2. HISTORY OF THE SURVEY

Fisheries science is dependent upon accurate fisheries and biological data to assess the status of fish stocks. In addition to landings information and biological data collected from commercial landings, it is also necessary to collect fishery-independent data describing the distribution and relative abundance of fishes, including juveniles, and further biological sampling of commercial species. This is achieved by conducting standardised scientific surveys of the relevant fish stocks and areas. CEFAS conducts surveys around the coast of England and Wales using a variety of fishing gears, to collect fisheries-independent indices of stock abundance. These data are integrated into the stock assessments carried out under the auspices of ICES (International Council for Exploration of the Seas) Assessment Working Groups. See www.ices.dk for more information.

The CEFAS near-west groundfish survey has taken place every autumn since 1988, and covers the Irish Sea (ICES division VIIa), Bristol Channel (VIIf) and parts of the Celtic Sea (VIIg). Data for the Irish Sea were summarised in Parker-Humphreys (2004). Equivalent spring surveys were also conducted between 1993 and 1998. The survey was initially designed to provide abundance indices for pre-recruit (1 and 2 year old) plaice and sole, while also providing abundance and length data for all species caught, and age and other biological data for commercially important species. *RV CORYSTES* has been used for all the near-west groundfish surveys used in this report. Due to minor inconsistencies in the sampling grid before 1993, this report uses data from 1993 onwards, during which time the position of sampling stations and tow length have been consistent.

3. CURRENT SURVEY OBJECTIVES

The primary objectives of the Bristol Channel beam trawl survey are to (a) carry out a 4 m beam-trawl survey of groundfish to i) obtain fisheries independent data on the distribution and abundance of commercial flatfish species, and ii) derive age compositions of sole and plaice for use in the assessment of stock size; and (b) to collect biological data, including maturity and weight at age, for sole, plaice, lemon sole and other commercially important species. The epibenthic by-catch from these catches has been quantified since 1997 (Ellis *et al*., 2000), and these surveys are also used to collect biological samples in support of other CEFAS projects and training courses.

Table 1. Demersal and shellfish landings from all gears, by UK vessels landing into England and Wales from 1993-2001

Year	1993			1994			1995		
Species	Weight (tonnes)	Value (£1000s)	Price per kg (£/kg)	Weight (tonnes)	Value (£1000s)	Price per kg (£/kg)	Weight (tonnes)	Value (£1000s)	Price per kg (£/kg)
Anglerfish	468	820	1.75	314	523	1.67	238	421	1.77
Brill	36	144	4.06	51	225	4.44	56	254	4.51
Bass	22	148	6.78	73	393	5.36	91	494	5.41
Cod	353	363	1.03	263	281	1.07	298	299	1.00
Conger eel	145	119	0.82	254	206	0.81	167	173	1.03
Dab	20	9	0.46	9	5	0.60	7	3	0.48
Spurdog	215	149	0.69	278	194	0.70	259	195	0.75
Flounder	4	2	0.41	6	2	0.29	6	1	0.22
Haddock	37	42	1.13	44	43	0.97	51	44	0.87
Hake	291	1192	4.09	221	759	3.44	155	624	4.04
John dory	16	59	3.62	32	117	3.67	31	121	3.89
Lemon sole	105	262	2.50	93	300	3.22	133	364	2.74
Ling	216	156	0.72	344	245	0.71	456	372	0.82
Megrim	162	434	2.68	168	427	2.53	161	409	2.54
Red mullet	6	27	4.71	6	33	5.34	9	56	6.21
Plaice	219	273	1.25	183	251	1.37	209	270	1.29
Saithe	59	37	0.62	58	31	0.52	85	50	0.58
Pollock	298	302	1.01	491	427	0.87	347	363	1.04
Sole	221	1177	5.33	190	1054	5.55	222	1180	5.32
Sand sole	3	6	1.72	9	18	2.09	6	11	1.77
Turbot	52	306	5.89	92	557	6.03	70	469	6.67
Whiting	172	96	0.56	185	117	0.63	216	109	0.50
Witch	20	26	1.32	12	16	1.33	28	42	1.51
Mixed demersal	17	34	2.02	18	14	0.78	29	14	0.49
Mixed gurnards	54	20	0.37	53	22	0.41	39	22	0.57
Mixed mullets	6	8	1.22	8	8	0.94	10	10	1.01
Dogfish, hounds and sharks	76	47	0.62	64	41	0.64	85	41	0.49
Skates and rays	638	557	0.87	606	590	0.97	588	618	1.05
Total demersal landings	**3929**	**6814**		**4126**	**6898**		**4051**	**7028**	
Cockles	4615	821	0.18	4615	821	0.18	3156	597	0.19
Edible crab	641	626	0.98	641	626	0.98	399	433	1.09
Loster	60	581	9.75	60	581	9.75	58	546	9.48
Mussels	75	8	0.11	75	8	0.11	152	10	0.07
Nephrops	1	1	2.53	1	1	2.53	4	13	3.66
Queen scallops	0	0	0.31	0	0	0.31	0	0	4.53
Scallops	119	142	1.20	119	142	1.20	58	71	1.22
Whelk	0	0		0	0		358	153	0.43
Total shellfish landings	**5511**	**2180**		**5511**	**2180**		**4185**	**1824**	

Table 1. continued: Demersal and shellfish landings from all gears, by UK vessels landing into England and Wales from 1993-2001

Year	1996			1997			1998		
Species	Weight (tonnes)	Value (£1000s)	Price per kg (£/kg)	Weight (tonnes)	Value (£1000s)	Price per kg (£/kg)	Weight (tonnes)	Value (£1000s)	Price per kg (£/kg)
Anglerfish	332	624	1.88	338	647	1.92	341	757	2.22
Brill	58	288	4.96	57	298	5.22	51	248	4.87
Bass	57	339	5.94	44	276	6.27	21	140	6.66
Cod	310	344	1.11	283	321	1.14	256	328	1.28
Conger eel	129	146	1.13	112	111	0.99	77	71	0.92
Dab	10	6	0.60	12	6	0.46	9	5	0.51
Spurdog	342	277	0.81	228	202	0.89	124	117	0.94
Flounder	2	1	0.22	13	3	0.20	1	0	0.22
Haddock	85	76	0.89	146	140	0.96	101	125	1.24
Hake	150	664	4.41	163	564	3.45	127	371	2.92
John dory	22	123	5.48	24	131	5.55	16	79	4.79
Lemon sole	122	352	2.88	157	409	2.60	151	495	3.28
Ling	238	192	0.81	313	233	0.74	326	257	0.79
Megrim	167	449	2.69	219	501	2.29	184	421	2.29
Red mullet	7	42	5.78	6	33	5.78	5	29	5.37
Plaice	202	287	1.42	198	270	1.37	149	208	1.39
Saithe	62	34	0.55	65	38	0.58	36	19	0.54
Pollock	327	325	0.99	325	282	0.87	371	317	0.85
Sole	230	1394	6.07	214	1448	6.75	174	1299	7.47
Sand sole	6	14	2.52	6	14	2.46	4	11	2.56
Turbot	84	641	7.60	80	555	6.98	74	551	7.42
Whiting	237	120	0.51	273	124	0.45	253	139	0.55
Witch	16	19	1.21	22	23	1.04	26	28	1.10
Mixed demersal	13	9	0.74	30	19	0.63	19	13	0.68
Mixed gurnards	25	17	0.67	30	34	1.15	27	19	0.71
Mixed mullets	7	6	0.82	6	4	0.64	2	2	0.86
Dogfish, hounds and sharks	59	25	0.43	51	29	0.56	61	38	0.63
Skates and rays	676	756	1.12	665	709	1.07	624	739	1.18
Total demersal landings	**3976**	**7570**		**4080**	**7425**		**3612**	**6827**	
Cockles	3730	859	0.23	5537	1296	0.23	4529	1748	0.39
Edible crab	337	364	1.08	375	446	1.19	583	700	1.20
Loster	63	619	9.86	61	617	10.07	67	661	9.81
Mussels	124	18	0.14	1034	200	0.19	18	3	0.14
Nephrops	1	1	2.12	15	29	1.98	0	0	2.54
Queen scallops	0	0		0	0		0	0	
Scallops	99	124	1.25	474	648	1.37	61	93	1.53
Whelk	905	507	0.56	862	287	0.33	16	5	0.31
Total shellfish landings	**5258**	**2492**		**8357**	**3524**		**5274**	**3209**	

Table 1. continued: Demersal and shellfish landings from all gears, by UK vessels landing into England and Wales from 1993-2001

Year	1999			2000			2001		
Species	Weight (tonnes)	Value (£1000s)	Price per kg (£/kg)	Weight (tonnes)	Value (£1000s)	Price per kg (£/kg)	Weight (tonnes)	Value (£1000s)	Price per kg (£/kg)
Anglerfish	356	846	2.38	399	865	2.17	451	1009	2.24
Brill	34	187	5.51	37	195	5.25	48	256	5.28
Bass	21	136	6.41	32	191	5.91	50	294	5.86
Cod	188	330	1.75	192	317	1.65	288	472	1.64
Conger eel	54	52	0.96	60	57	0.94	44	29	0.65
Dab	7	4	0.54	21	8	0.36	10	5	0.46
Spurdog	96	95	0.98	66	67	1.02	148	133	0.90
Flounder	1	0	0.25	5	2	0.40	2	1	0.35
Haddock	60	94	1.57	71	119	1.66	115	175	1.53
Hake	142	319	2.25	147	278	1.89	124	323	2.60
John dory	27	148	5.56	22	89	4.04	23	112	4.96
Lemon sole	121	462	3.82	131	503	3.84	125	496	3.99
Ling	182	164	0.90	111	110	0.99	92	87	0.95
Megrim	227	566	2.49	196	522	2.66	194	408	2.10
Red mullet	2	12	6.66	8	45	5.60	10	52	5.29
Plaice	141	241	1.71	104	161	1.55	110	199	1.81
Saithe	17	13	0.76	10	7	0.71	5	3	0.66
Pollock	195	261	1.34	288	446	1.55	365	466	1.28
Sole	192	1461	7.60	203	1403	6.91	239	1679	7.03
Sand sole	3	10	3.09	8	23	3.06	8	27	3.41
Turbot	44	351	7.93	45	327	7.35	45	317	7.09
Whiting	119	82	0.70	98	77	0.78	96	63	0.65
Witch	20	24	1.18	12	17	1.48	11	14	1.27
Mixed demersal	36	32	0.88	6	8	1.27	4	4	0.97
Mixed gurnards	31	41	1.34	35	44	1.25	55	89	1.61
Mixed mullets	3	3	0.80	3	5	1.40	4	3	0.76
Dogfish, hounds and sharks	40	33	0.83	49	29	0.59	137	67	0.49
Skates and rays	560	743	1.33	613	824	1.35	692	946	1.37
Total demersal landings	**2918**	**6711**		**2973**	**6736**		**3496**	**7730**	
Cockles	4318	1060	0.25	7094	1051	0.15	957	151	0.16
Edible crab	658	703	1.07	545	553	1.02	805	1087	1.35
Loster	81	768	9.42	72	804	11.13	88	842	9.56
Mussels	699	213	0.30	300	0	0.00	554	7	0.01
Nephrops	0	1	2.66	0	1	2.46	0	0	1.63
Queen scallops	0	0		0	0	0.55	0	0	
Scallops	32	45	1.39	90	149	1.66	47	67	1.42
Whelk	0	0	0.83	0	0	1.20	50	19	0.38
Total shellfish landings	**5789**	**2789**		**8101**	**2558**		**2501**	**2173**	

4. SURVEY METHODS

The standard gear used is a 4 m beam trawl with chain mat, flip up rope, and a 40 mm codend liner to retain small fish. The gear is towed at 4 knots (over the ground) for 30 minutes, averaging 2 nautical miles per tow. Fishing is only carried out in daylight, shooting after sunrise and hauling no later than sunset, as the vertical distribution of some species is known to vary diurnally. The gear was described and illustrated by Kaiser and Spencer (1994).

Once on board the catch is sorted to species level, with the exception of small gobies and sandeels, which are identified to genus. Species were identified according to Wheeler (1969) and Whitehead *et al. (*1986). Plaice, sole, dab, and elasmobranchs are sorted by sex, all fish categories weighed, and total lengths are measured to the nearest full centimetre below. Area-stratified samples of selected species are sampled for weight, length, sex, maturity, and otoliths or scales removed for ageing. The extent of sampling carried out by species is detailed in Table 2.

In all, 32 stations were consistently fished in ICES Division VIIf in the period 1993–2001 (Figure 1), although the presence of static fishing gear, etc., may have prevented the sampling of certain stations in some years. Additional stations were sampled prior to 1993, but as these stations are not currently fished, they are excluded from this report.

Table 2. Sampling protocols for commercial and non-commercial fish and shellfish

Higher taxa	Scientific name	Common name	Total catch				Biological sample				
			Number	Biomass	Length	Sex	Length	Weight	Sex	Maturity	Age
Gadiformes	*Gadus morhua*	Cod	✓	✓	✓	-	✓	✓	✓	✓	✓
	Melanogrammus aeglefinus	Haddock	✓	✓	✓	-	✓	✓	✓	✓	✓
	Merlangius merlangus	Whiting	✓	✓	✓	-	✓	✓	✓	✓	✓
	Merluccius merluccious	Hake	✓	✓	✓	-	✓	✓	✓	✓	✓
Lophiiformes	*Lophius piscatorius*	Monkfish	✓	✓	✓	-	✓	✓	✓	✓	✓
	Lophius budegassa	Black bellied angler	✓	✓	✓	-	✓	✓	✓	✓	✓
Perciformes	*Dicentrarchus labrax*	European sea bass	✓	✓	✓	-	✓	✓	✓	✓	✓
Pleuronectiformes	*Lepidorhombus whiffiagonis*	Megrim	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Psetta maxima	Turbot	✓	✓	✓	-	✓	✓	✓	✓	✓
	Scophthalmus rhombus	Brill	✓	✓	✓	-	✓	✓	✓	✓	✓
	Limanda limanda[#]	Dab	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Microstomus kitt	Lemon sole	✓	✓	✓	-	✓	✓	✓	✓	✓
	Pleuronectes platessa	Plaice	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Solea solea	Sole	✓	✓	✓	✓	✓	✓	✓	✓	✓
Others	Sharks and dogfishes		✓	✓	✓	✓	-	-	-	-	-
	Skates and rays[+]		✓	✓	✓	✓	✓	✓	✓	✓	-
	Other fin fish		✓	✓	✓	-	-	-	-	-	-
Shellfish	*Homarus gammarus*	European Lobster	✓	✓	✓	✓	✓	-	-	-	-
	Nephrops norvegicus	Nephrops	✓	✓	✓	✓	✓	-	-	-	-
	Maia squinado	Spiny spider crab	✓	✓	-	✓	-	-	-	-	-
	Cancer pagurus	Edible crab	✓	✓	✓	✓	✓	-	-	-	-
	Pecten maximus	Scallop	✓	✓	-	-	-	-	-	-	-
	Sepiola spp. and *Rossia* spp.*	Cuttlefish	✓	✓	-	-	-	-	-	-	-
	Sepia spp.*	Cuttlefish	✓	✓	-	-	-	-	-	-	-
	Octopodidae*	Octopus	✓	✓	-	-	-	-	-	-	-
	Loliginidae*	Squid	✓	✓	-	-	-	-	-	-	-

[#] *Biological samples taken from 2000 onwards.*
[+] *Biological samples taken from 2001 onwards.*
***** *Identified to species level since 2002.*

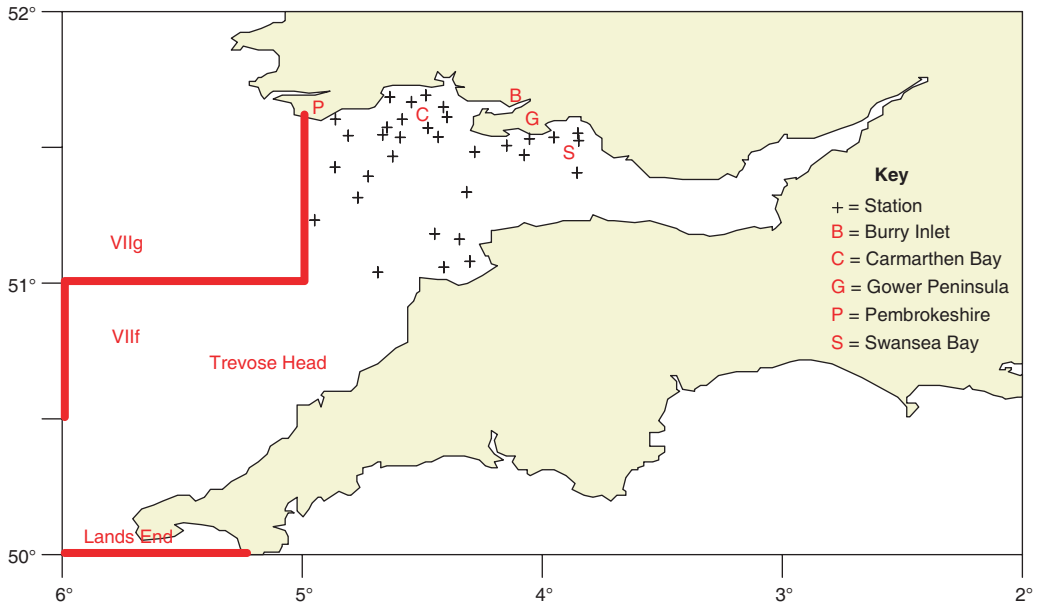

Figure 1. The Bristol Channel with fixed sampling stations indicated and locations mentioned in the text

5. PHYSICAL CHARACTERISTICS OF THE AREA

5.1 Depth

ICES Division VIIf is a shallow area with the majority less than 40 m deep. The depth generally increases from east to west, as the area gets closer to the Celtic Sea, and the primary bathymetric feature is the deeper waters in mid-Channel (Figure 2).

5.2 Circulation

The main water flow into the Bristol Channel is from the south, and the main flow out is to the north (Figure 3). This leads to a general anticlockwise circulation. The Bristol Channel has one of the highest tidal ranges in the world and its currents are strong with spring rates of up-to 8 knots, although this varies with tidal state, weather and seasonal circulation features.

5.3 Temperature

The main feature of the water temperature of the Bristol Channel is the general north-south alignment of the isotherms, with the warmest waters in the east in summer and in the west in winter (Figure 4).

The shallow depth in the eastern Bristol Channel influences surface water temperature, which ranges from approx 17°C in the summer to approx 6°C in the winter. Western Bristol Channel waters are kept relatively warm by the water masses entering from the south-west, which derive from the continuation of the Gulf Stream, driven by the North Atlantic Drift. This flow is stronger in winter, and there is thus less variation in surface temperature, from approx 17°C in the summer to approx 10°C in the winter. Warm weather in summer warms the surface layers and creates a temperature gradient to the cooler bottom waters, while in winter there is little difference in temperature between the surface and bottom over most of the Bristol Channel.

5.4 Salinity

The salinity patterns of ICES division VIIf are influenced by the huge amount of fresh water flowing out of the Severn estuary and into the Bristol Channel. As this water progresses into the Channel the salinity increases as it becomes mixed with the saline water pushing in from the north Atlantic (Figure 5). Surface waters within the Channel are slightly more saline in summer, owing to faster evaporation rates. Bottom waters are fairly homogeneous throughout the year, with slightly higher salinities towards the Celtic Sea.

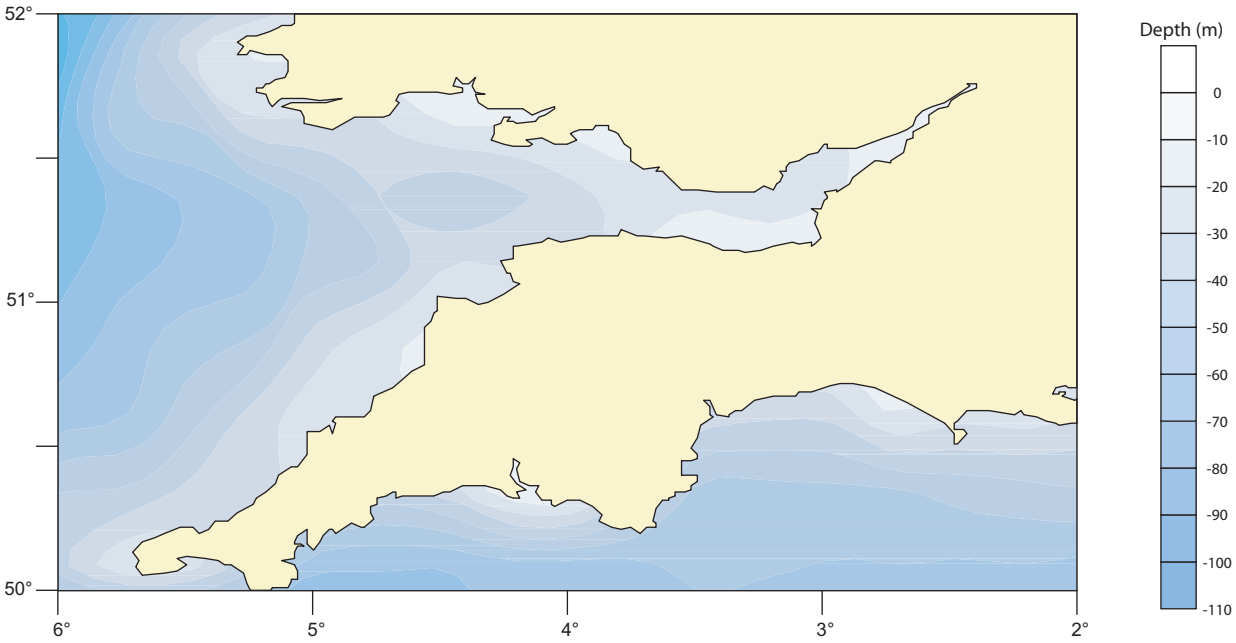

Figure 2. Bathymetry of the Bristol Channel

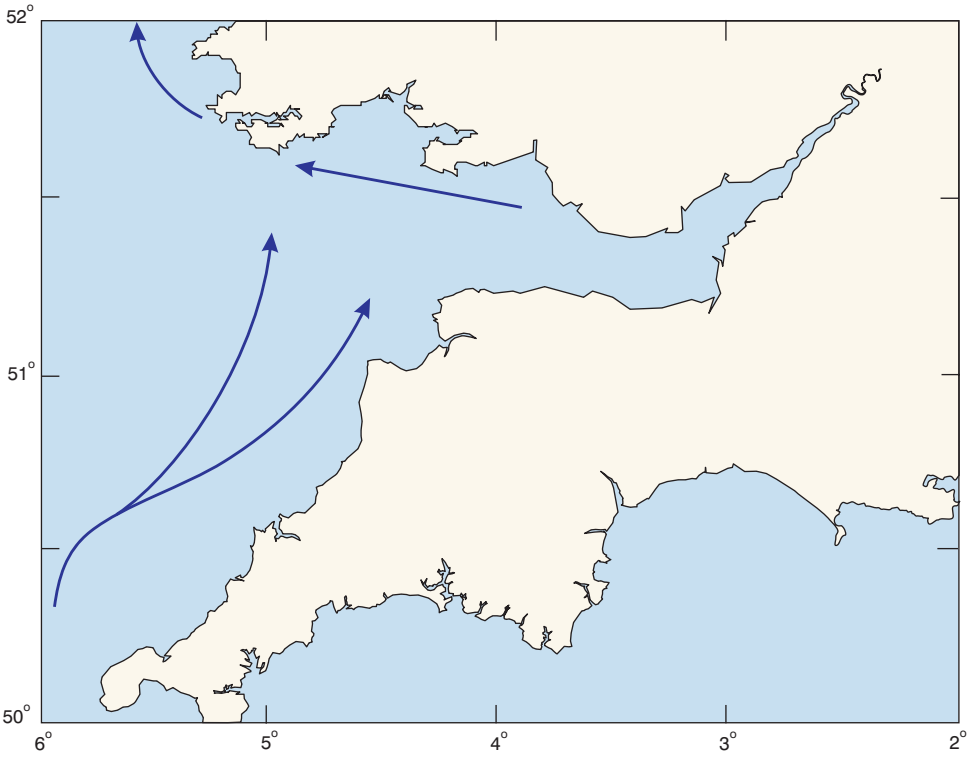

Figure 3. Near surface water circulation. Adapted from Lee and Ramster (1981)

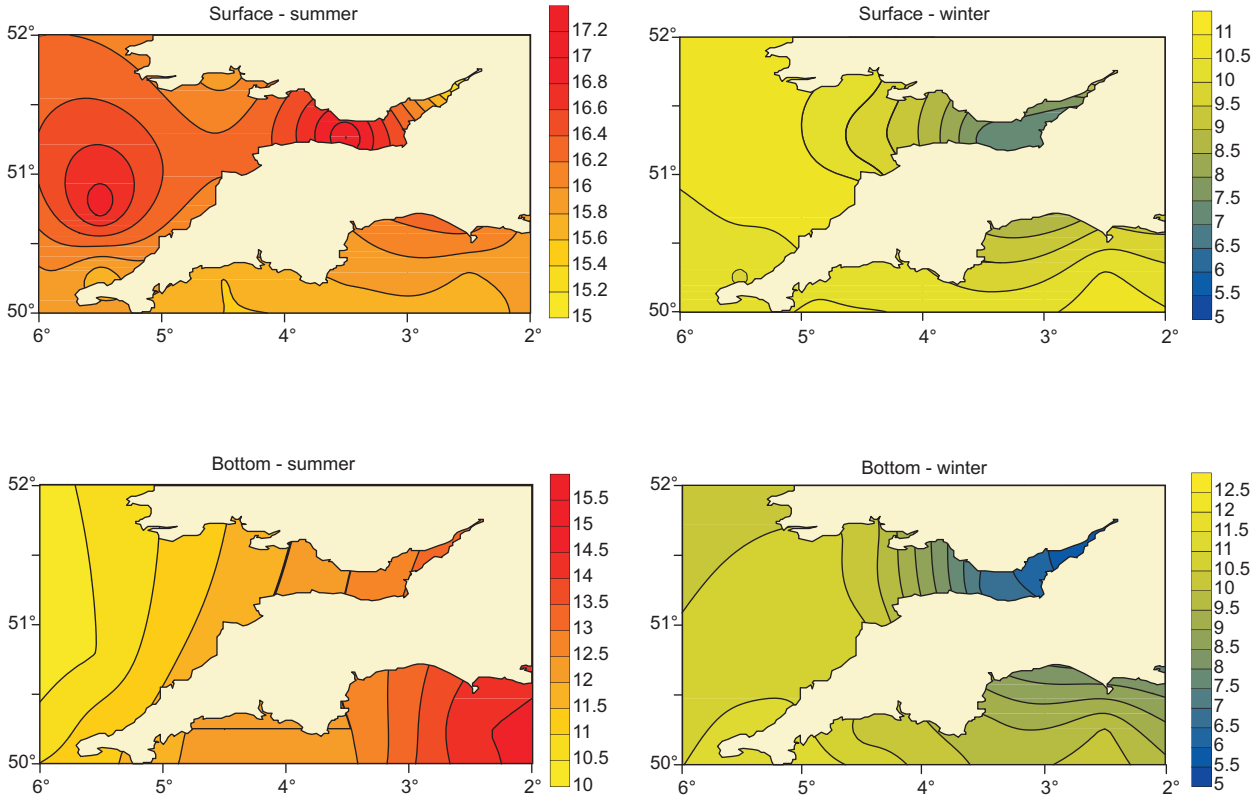

Figure 4. Average near bottom and near surface temperature (1993–2001) for summer (August) and winter (January). Data supplied by ICES

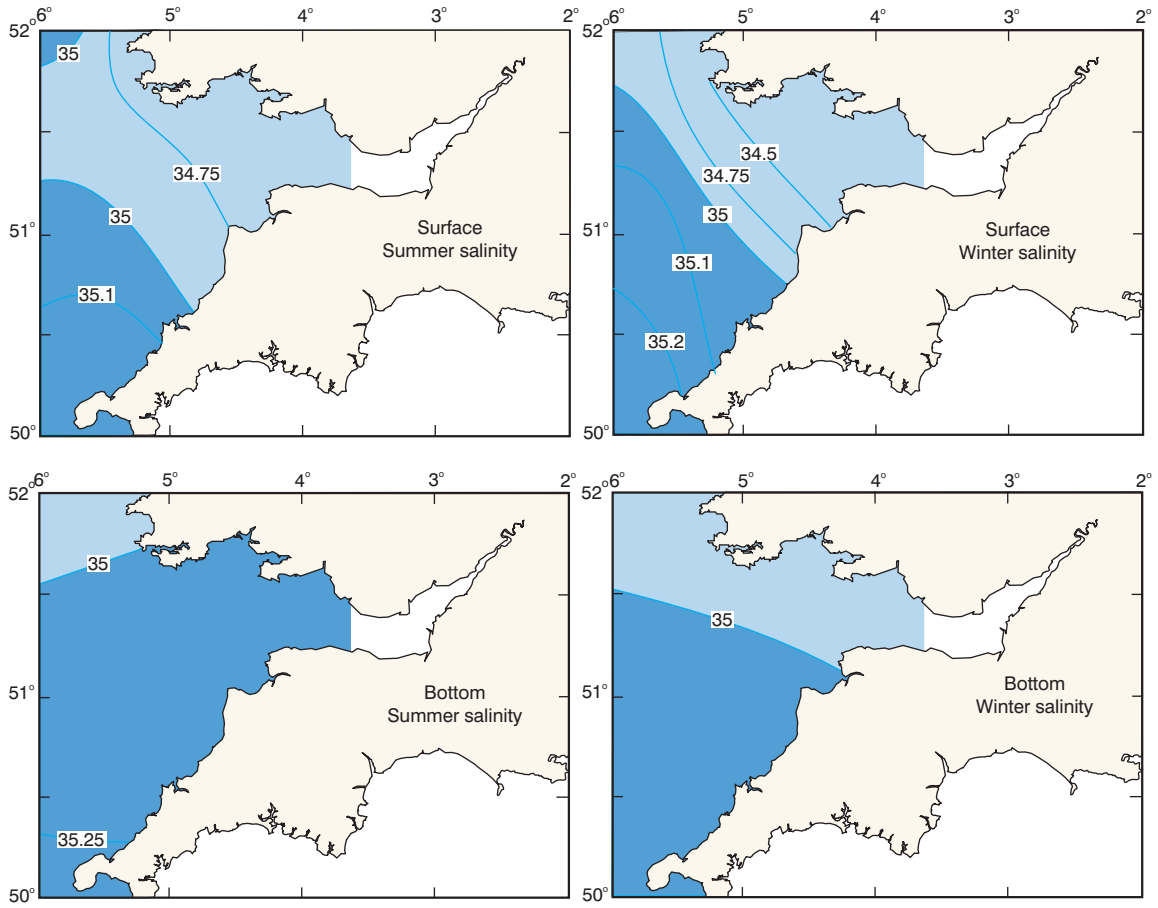

Figure 5. Average near bottom and near surface salinity for summer and winter. Adapted from Lee and Ramster (1981)

5.5 Sediment type

The distribution of many marine fishes is closely linked to both bathymetry, sediment type and benthic community. There are a variety of sediment types found within ICES division VIIf, with the majority of the area being covered by a mixture of sand, gravel and rock (Figure 6). In general, the southern half of the Bristol Channel is relatively coarse, with sandy habitats predominant in the northern Bristol Channel, especially in Carmarthen Bay. There are also extensive rocky coastlines on both the coasts of England and Wales (Gower Peninsula and Pembrokeshire). Certain inshore areas (e.g. parts of Swansea Bay) are primarily muddy, and there are also important muddy habitats in the Celtic Deep (VIIg). The benthic communities of the area were described by Warwick and Davies (1977), Warwick *et al.* (1978), Warwick and Uncles (1980) and Warwick (1984).

6. SPECIES RECORDED BY THE SURVEY

More than 80 species of marine fish were recorded during CEFAS beam trawl surveys of the Bristol Channel from 1993 to 2001. In total approximately 150 species of marine fish have been recorded from this area (Ellis, pers comm.). The numbers and weights of the species caught are described in Table 3.

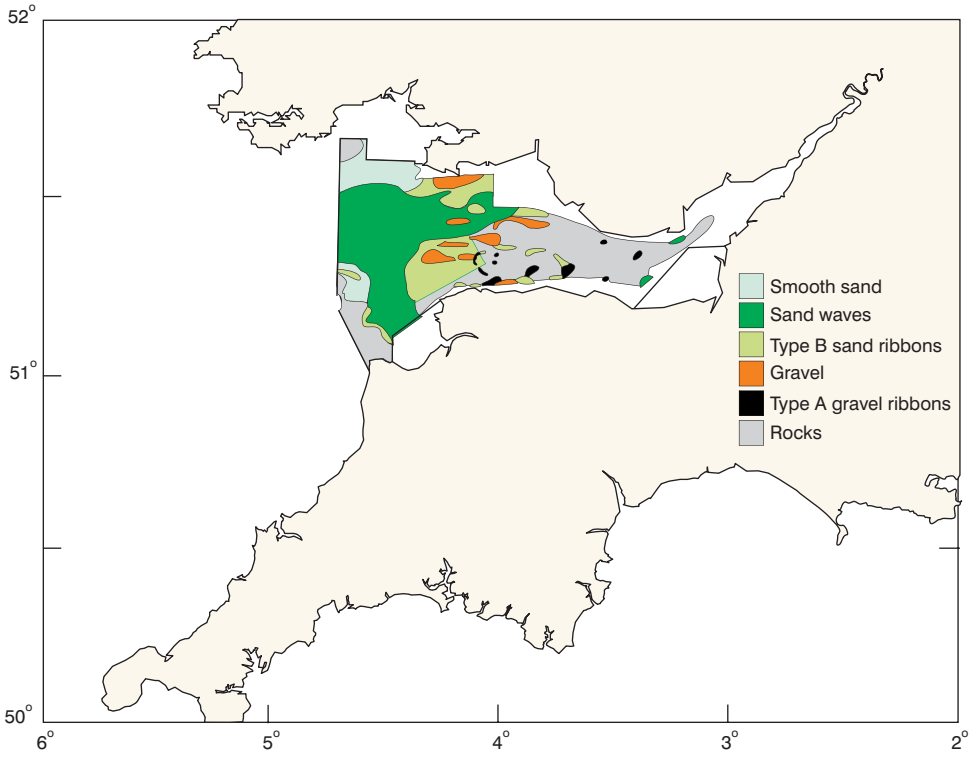

Figure 6. Distribution of major sediment types in the Bristol Channel. Adapted from Warwick (1984) and Lee and Ramster (1981)

Table 3. Species recorded by the surveys

Latin name	Common name	Number	% abundance	Weight in kg	% of total weight
Trisopterus minutus	Poor cod	14387	18.05	230.873	3.31
Solea solea	Sole	12003	15.06	1180.941	16.94
Buglossidium luteum	Solenette	11003	13.81	146.112	2.10
Limanda limanda	Dab	8985	11.28	429.034	6.15
Merlangius merlangus	Whiting	7504	9.42	315.009	4.52
Callionymus lyra	Common dragonet	4624	5.80	220.899	3.17
Pleuronectes platessa	European plaice	4096	5.14	663.105	9.51
Scyliorhinus canicula	Lesser spotted dogfish	3480	4.37	1840.293	26.40
Trisopterus luscus	Bib	3090	3.88	112.847	1.62
Eutrigla gurnardus	Grey gurnard	2977	3.74	82.359	1.18
Microchirus variegatus	Thickback sole	1415	1.78	47.494	0.68
Trigla lucerna	Tub gurnard	597	0.75	124.786	1.79
Raja clavata	Thornback ray	578	0.73	419.544	6.02
Microstomus kitt	Lemon sole	515	0.65	75.315	1.08
Aspitrigla cuculus	Red gurnard	479	0.60	47.555	0.68
Agonus cataphractus	Pogge	436	0.55	4.243	0.06
Gobiidae	Gobies	430	0.54	0.936	0.01
Raja microocellata	Smalleyed ray	375	0.47	278.377	3.99
Lophius piscatorius	Anglerfish	242	0.30	85.206	1.22
Raja montagui	Spotted ray	237	0.30	106.167	1.52
Echiichthys vipera	Lesser weever fish	232	0.29	6.561	0.09
Pegusa lascaris	Sand sole	196	0.25	28.670	0.41
Merluccius merluccius	European hake	188	0.24	39.290	0.56
Arnoglossus laterna	Scaldfish	187	0.23	2.651	0.04
Zeus faber	John dory	155	0.19	25.185	0.36
Psetta maxima	Turbot	132	0.17	78.590	1.13
Scophthalmus rhombus	Brill	127	0.16	52.755	0.76
Platichthys flesus	Flounder	120	0.15	29.480	0.42
Mustelus asterias	Starry smooth hound	117	0.15	61.776	0.89
Gadus morhua	Cod	95	0.12	22.464	0.32
Mullus surmuletus	Red mullet	79	0.10	3.215	0.05
Raja brachyura	Blonde ray	65	0.08	27.480	0.39
Dicentrarchus labrax	European seabass	65	0.08	35.629	0.51
Trachurus trachurus	Horse mackerel	59	0.07	5.671	0.08
Trisopterus esmarki	Norway pout	51	0.06	0.428	+
Phrynorhombus norvegicus	Norwegian topknot	50	0.06	0.445	+
Lepidorhombus whiffiagonis	Megrim	35	0.04	14.690	0.21
Conger conger	European conger eel	32	0.04	54.129	0.78
Arnoglossus imperialis	Imperial scaldfish	31	0.04	0.910	0.01
Sprattus sprattus	Sprat	30	0.04	0.139	+

Table 3. continued: Species recorded by the surveys

Latin name	Common name	Number	% abundance	Weight in kg	% of total weight
Gaidropsarus vulgaris	Three bearded rockling	25	0.03	4.127	0.06
Ciliata septentrionalis	Northern rockling	16	0.02	0.065	+
Gobius niger	Black goby	14	0.02	0.164	+
Mustelus mustelus	Smooth hound	14	0.02	8.615	0.12
Scyliorhinus stellaris	Greater spotted dogfish	13	0.02	38.398	0.55
Ammodytidae	Sandeels	13	0.02	0.222	+
Ctenolabrus rupestris	Goldsinny	10	0.01	0.410	+
Leucoraja naevus	Cuckoo ray	9	0.01	5.550	0.08
Ciliata mustela	Five bearded rockling	8	0.01	0.101	+
Melanogrammus aeglefinus	Haddock	8	0.01	2.515	0.04
Spondyliosoma cantharus	Black seabream	6	+	1.331	0.02
Molva molva	Common ling	6	+	2.880	0.04
Cyclopterus lumpus	Lumpsucker	6	+	0.126	+
Belone belone	Garfish	4	+	0.297	+
Hyperoplus lanceolatus	Great sandeel	4	+	0.035	+
Zeugopterus punctatus	Topknot	4	+	0.030	+
Syngnathus acus	Great pipefish	3	+	0.003	+
Clupea harengus	Herring	3	+	0.003	+
Callionymus reticulatus	Reticulate dragonet	3	+	0.004	+
Argentinidae	Argentines	2	+	0.014	+
Crenimugil labrosus	Thick lipped mullet	2	+	2.750	0.04
Trachinus draco	Greater weever fish	2	+	0.240	+
Blennius ocellaris	Butterfly blenny	1	+	0.000	+
Myoxocephalus scorpius	Bullrout	1	+	0.090	+
Squalus acanthias	Spurdog	1	+	0.170	+
Enchelyopus cimbrius	Four bearded rockling	1	+	0.020	+
Galeorhinus galeus	Tope	1	+	0.440	+
Trigloporus lastoviza	Streaked gurnard	1	+	0.145	+
Argentina sphyraena	Lsr silver smelt	1	+	0.015	+
Liza ramada	Thin lipped mullet	1	+	0.605	+
Syngnathus rostellatus	Nilssons pipefish	1	+	0.001	+
Callionymus maculatus	Spotted dragonet	1	+	0.005	+
Balistes capriscus	Trigger fish	1	+	0.690	+
Diplecogaster bimaculata	Two spotted clingfish	1	+	0.001	+
Ammodytes tobianus	Sandeel	1	+	0.002	+
Glyptocephalus cynoglossus	Witch	1	+	0.140	+

7. SPECIES DISTRIBUTIONS

This report presents the data describing catches of the major fish and selected commercial shellfish species from ICES Division VIIf. Data cover the period 1993 to 2001, during which time the position of sampling stations and tow length have been consistent.

More detailed analyses are presented for sole and plaice, owing to their commercial importance in the Bristol Channel.

Analyses for plaice and sole provide:
(a) The mean numbers of fish (by age) caught per 30 min tow at core stations.
(b) The mean number of fish (all ages) caught per 30 min tow at core stations.
(c) The mean number of fish caught (by age) per year, from a 30 min tow.
(d) The mean catch weight of fish from a 30 min tow.
(e) Length-frequency (by age).
(f) Mean length at age.
(g) Mean weight at length.
(h) Proportion of male and female fish mature at length.

Information for other species is restricted to:
(a) The mean number of fish caught per 30 min tow at core stations.
(b) The mean catch weight of fish from a 30 min tow at core stations.
(c) Length frequency distributions from all stations.

8. SUMMARY

CEFAS have conducted beam trawl surveys in ICES division VIIf since 1988, providing indices of abundance for commercially important demersal stocks. During the course of these surveys, in excess of 80 fish species have been recorded, and data on the length distributions and relative abundance has been collected. This report complements the data presented in Parker-Humphreys (2004), and the data for other sea areas sampled with a 4 m beam trawl will be described in subsequent reports.

9. ACKNOWLEDGEMENTS

I thank Jim Ellis for ideas and comments on the report, and Brian Harley for supplying data.
I also acknowledge the help of the scientists and crew who participated on the relevant surveys.

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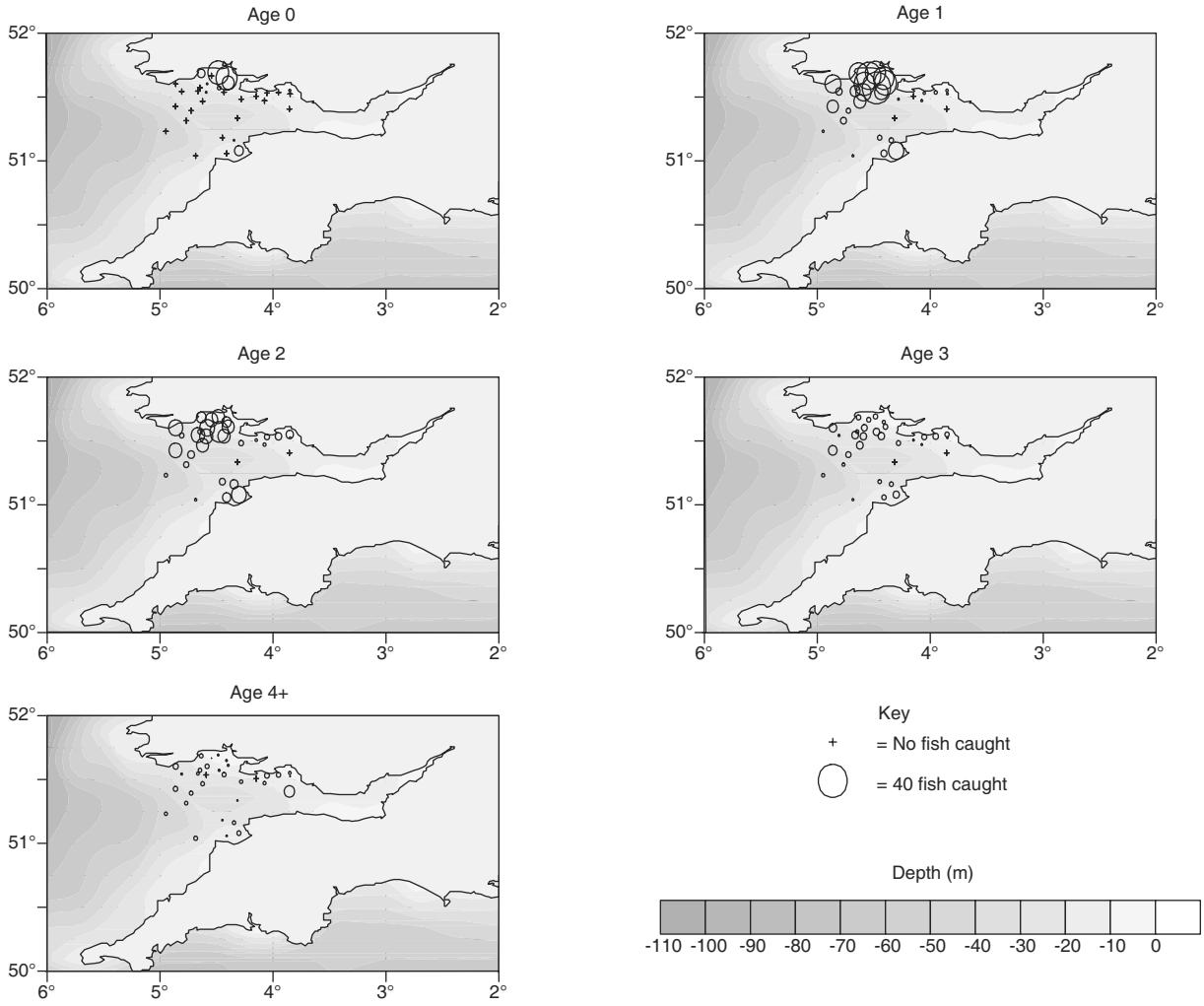
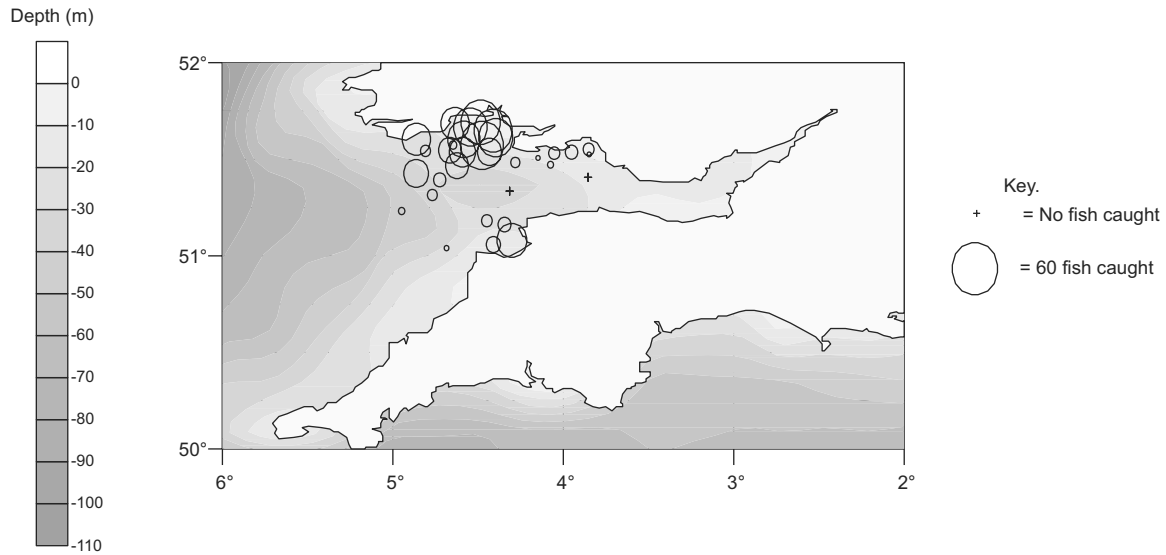
Flatfish

Plaice - *Pleuronectes platessa*

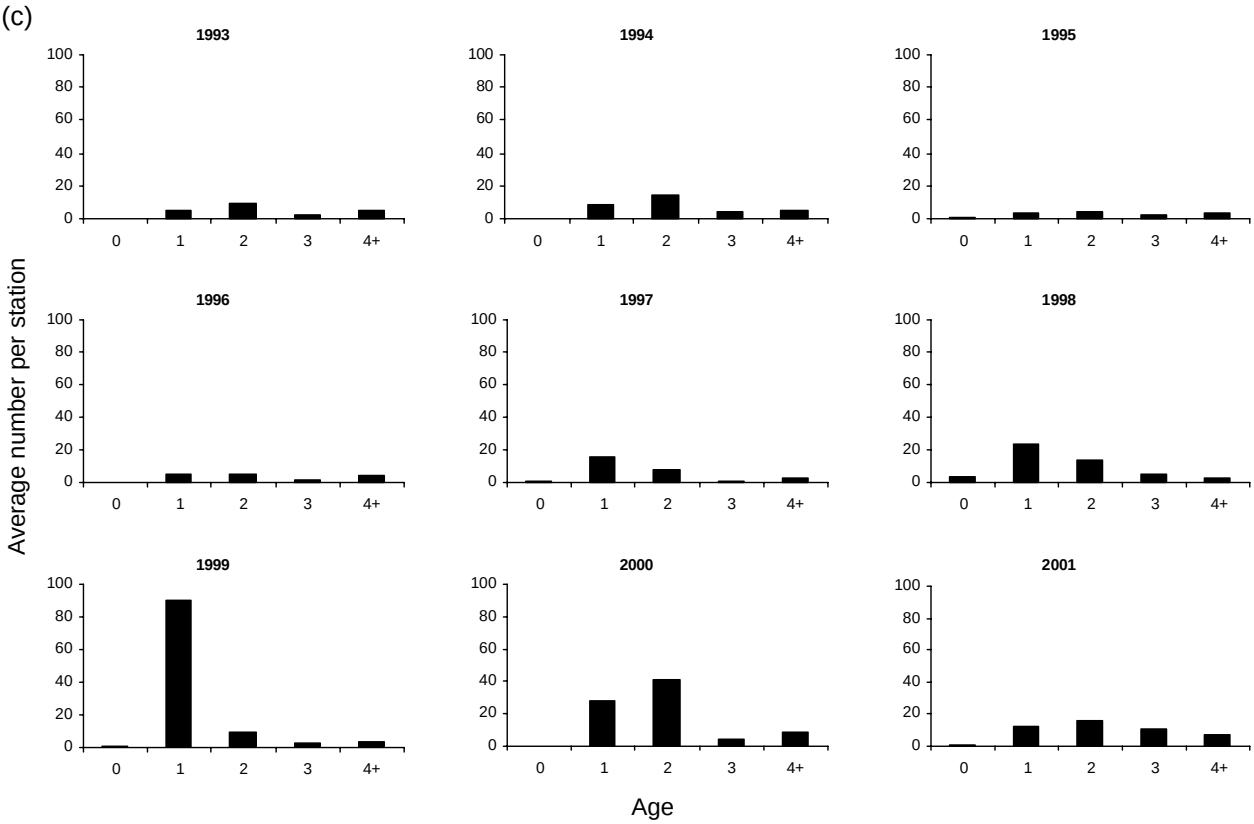
(a)



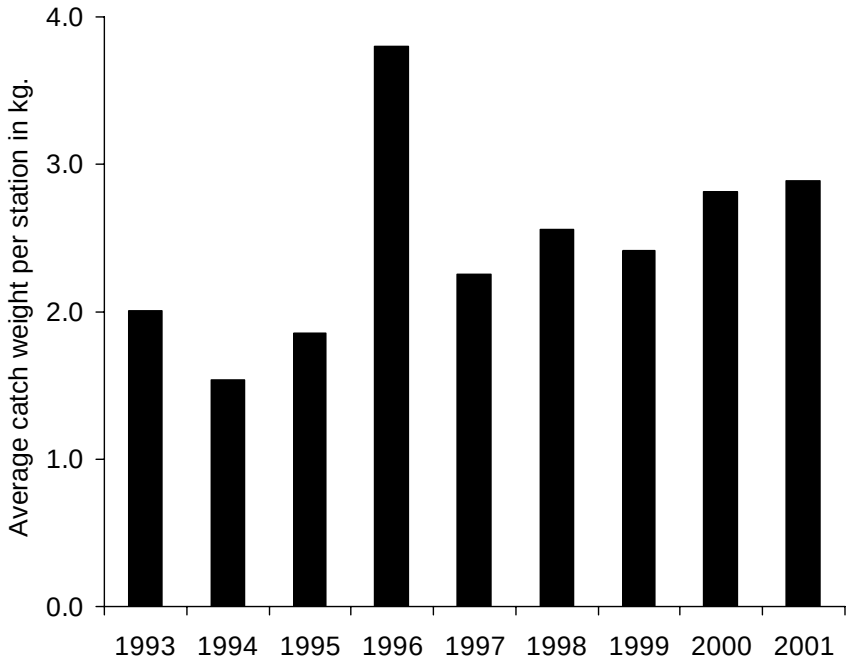
(b)


Depth (m)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
52°
51°
50°
6°
5°
4°
3°
2°
Key.
= No fish caught
= 60 fish caught

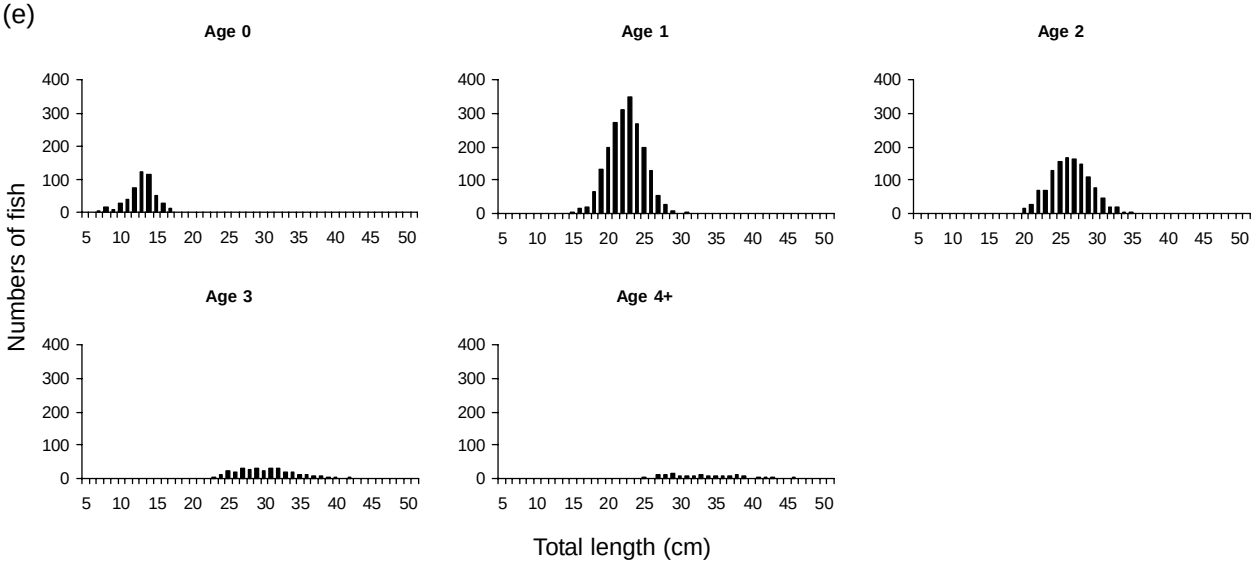
(c)


1993
1994
1995
1996
1997
1998
1999
2000
2001
Average number per station
Age
0
1
2
3
4+
0
20
40
60
80
100

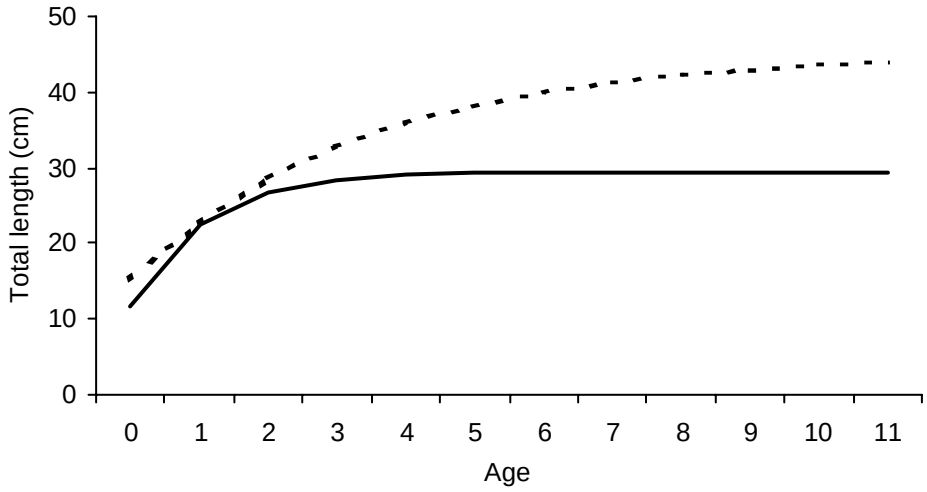
(d)


Average catch weight per station in kg.
4.0
3.0
2.0
1.0
0.0
1993
1994
1995
1996
1997
1998
1999
2000
2001

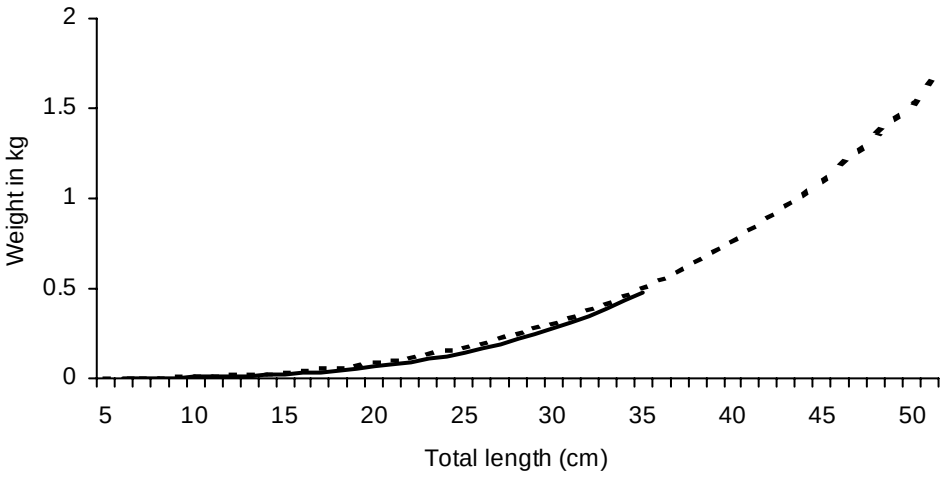
(e)


Age 0
Age 1
Age 2
Age 3
Age 4+
Numbers of fish
Total length (cm)

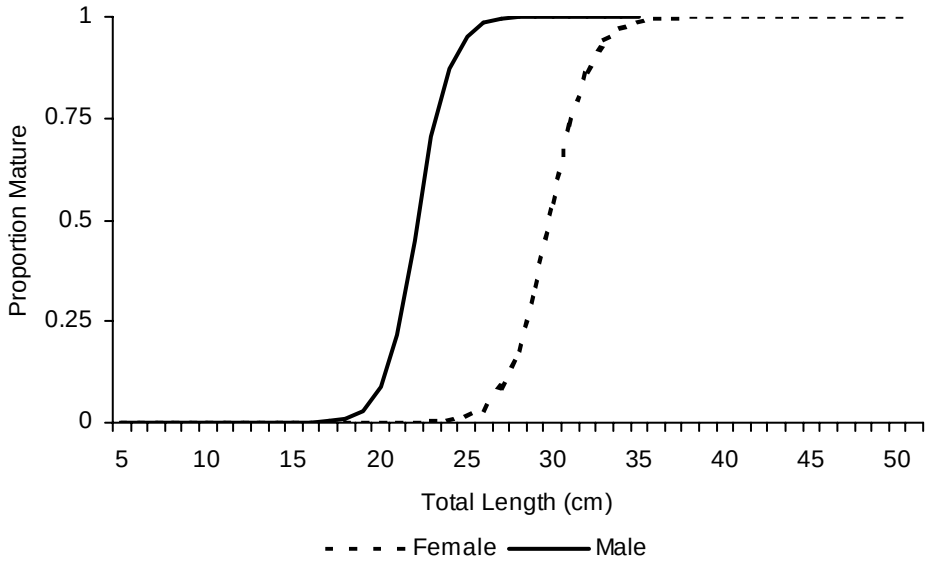
(f)


Total length (cm)
0
10
20
30
40
50
0 1 2 3 4 5 6 7 8 9 10 11
Age

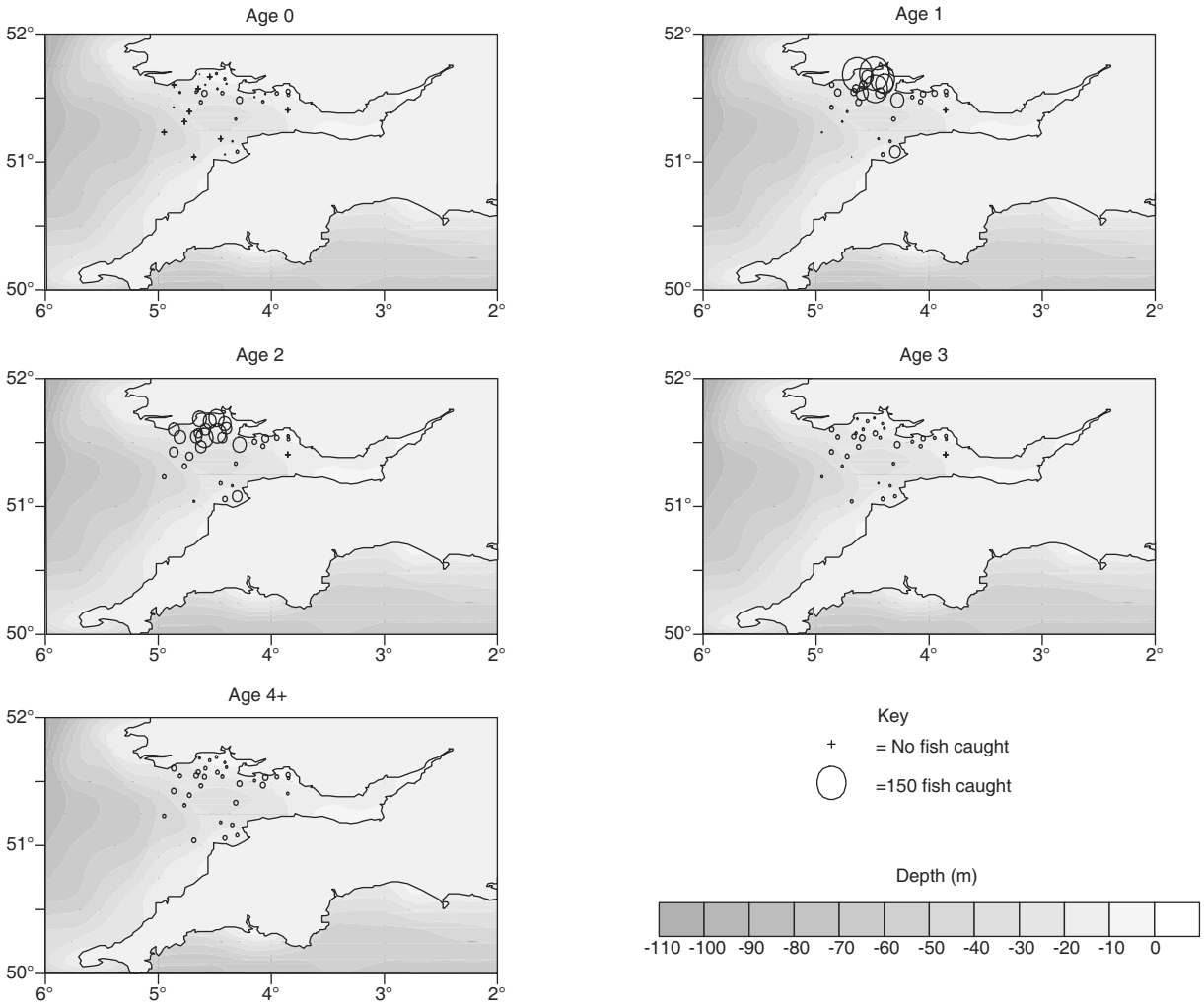
(g)


Weight in kg
0
0.5
1
1.5
2
5 10 15 20 25 30 35 40 45 50
Total length (cm)

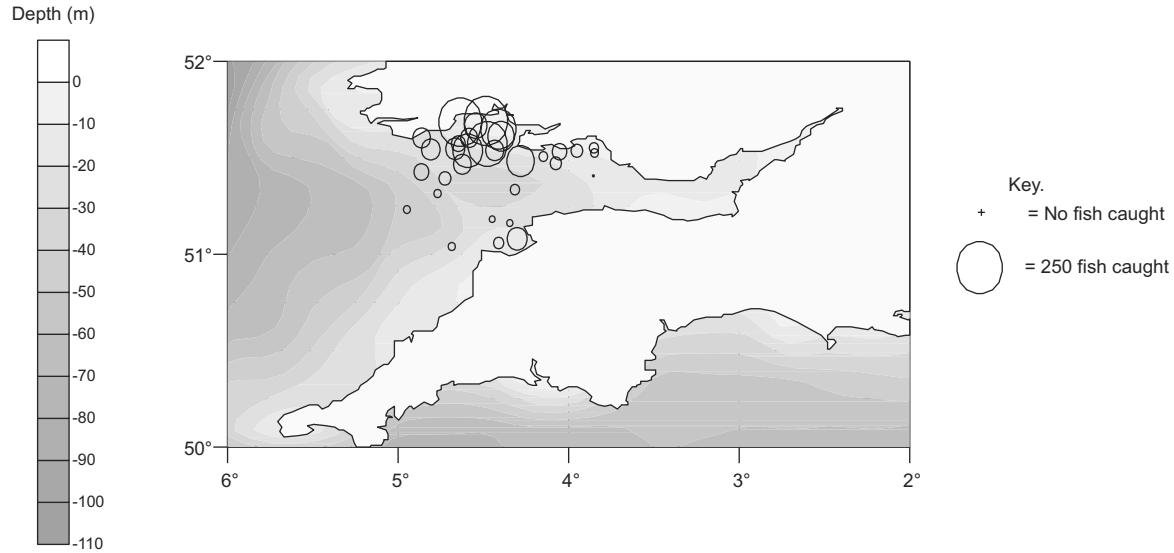
(h)


Proportion Mature
0
0.25
0.5
0.75
1
5 10 15 20 25 30 35 40 45 50
Total Length (cm)
Female
Male

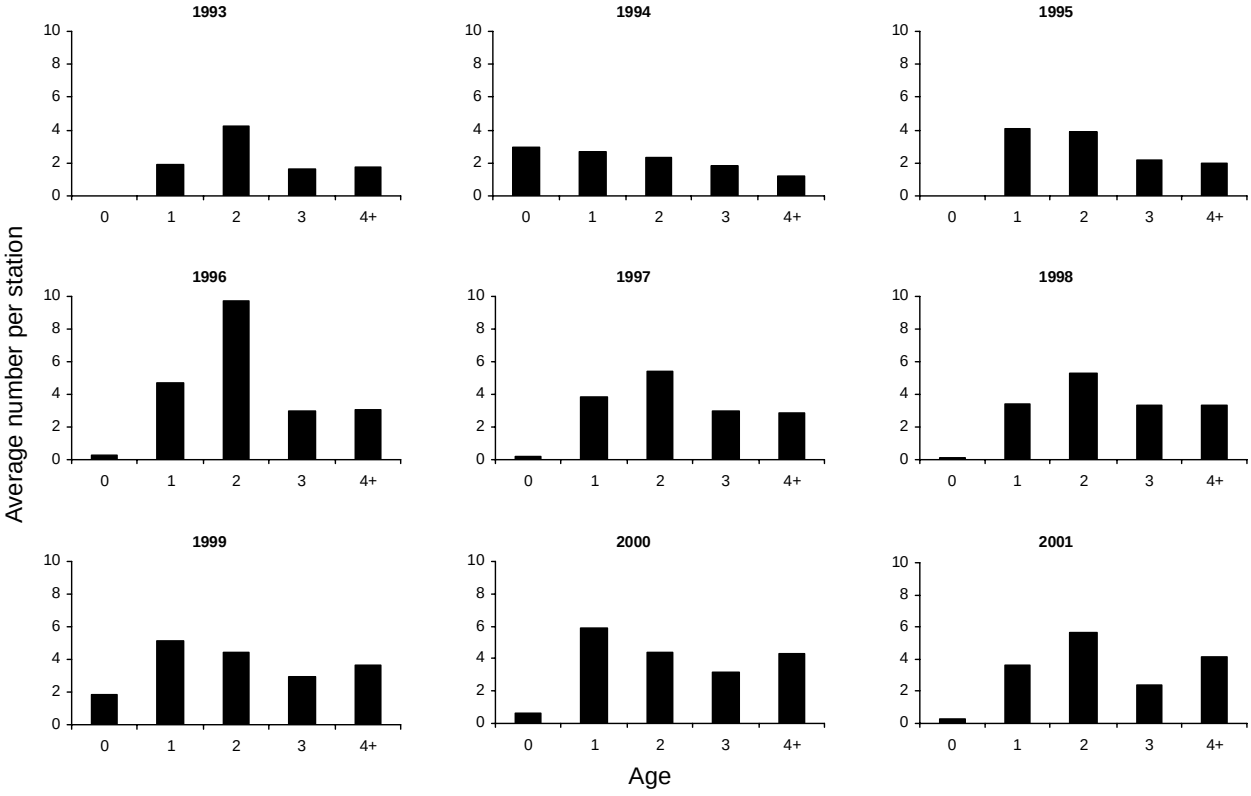
(a)


Age 0
Age 1
Age 2
Age 3
Age 4+
52°
51°
50°
6°
5°
4°
3°
2°
Key
+ = No fish caught
=150 fish caught
Depth (m)
-110 -100 -90 -80 -70 -60 -50 -40 -30 -20 -10 0

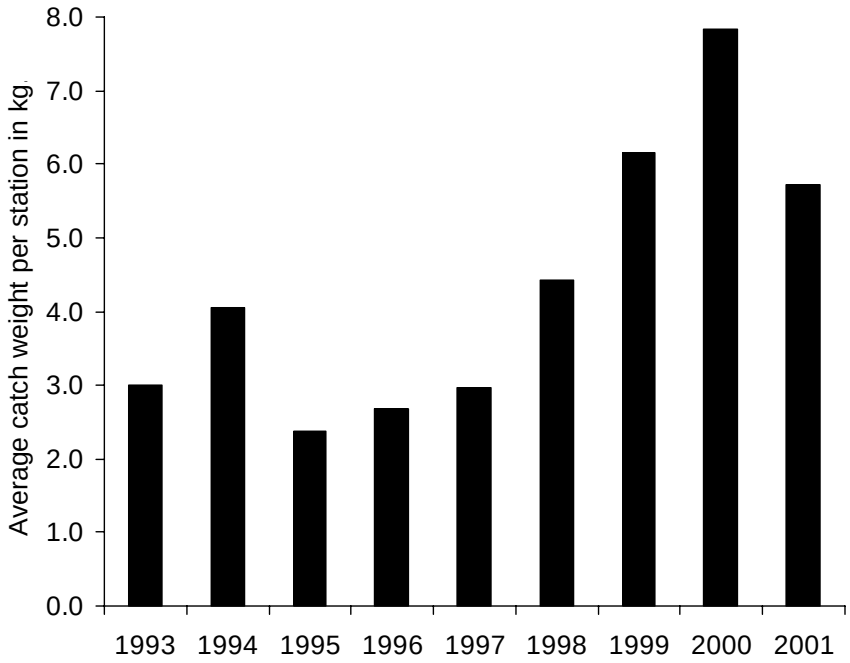
(b)


Depth (m)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
52°
51°
50°
6°
5°
4°
3°
2°
Key.
+ = No fish caught
= 250 fish caught

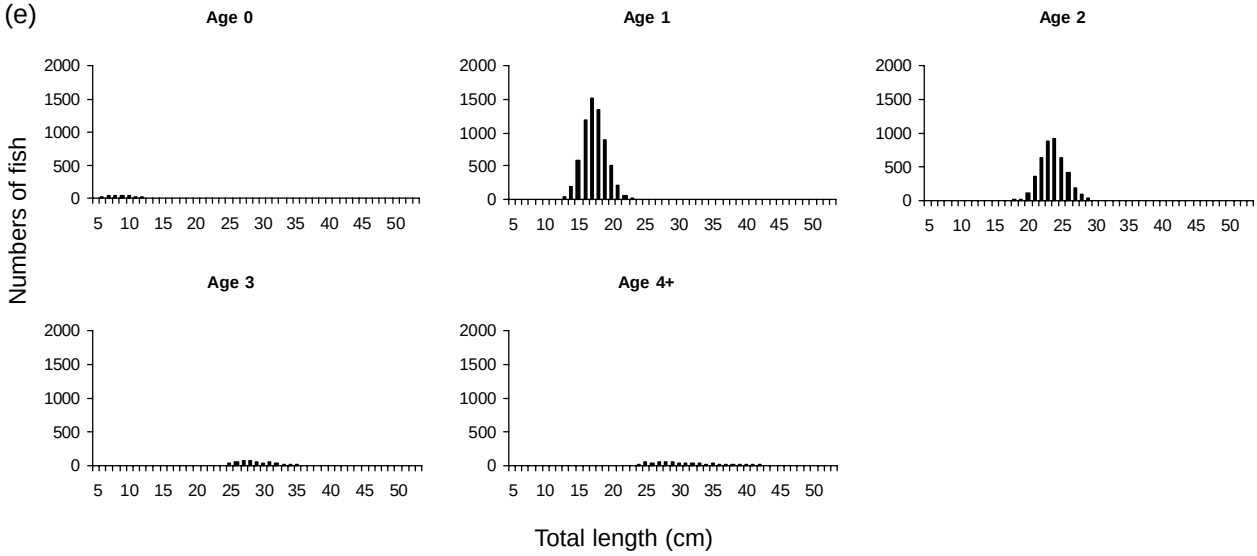
(c)


1993
1994
1995
1996
1997
1998
1999
2000
2001
Average number per station
Age
0
1
2
3
4+
0
2
4
6
8
10

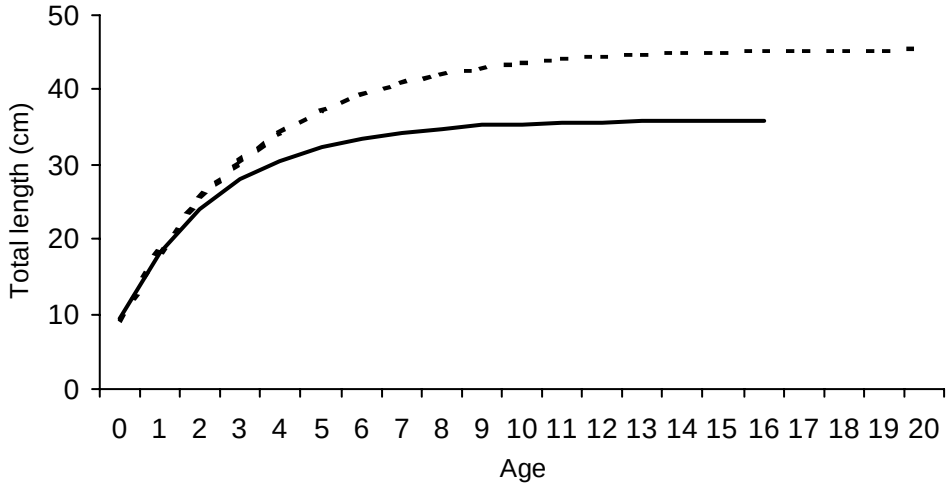
(d)


Average catch weight per station in kg
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
1993
1994
1995
1996
1997
1998
1999
2000
2001

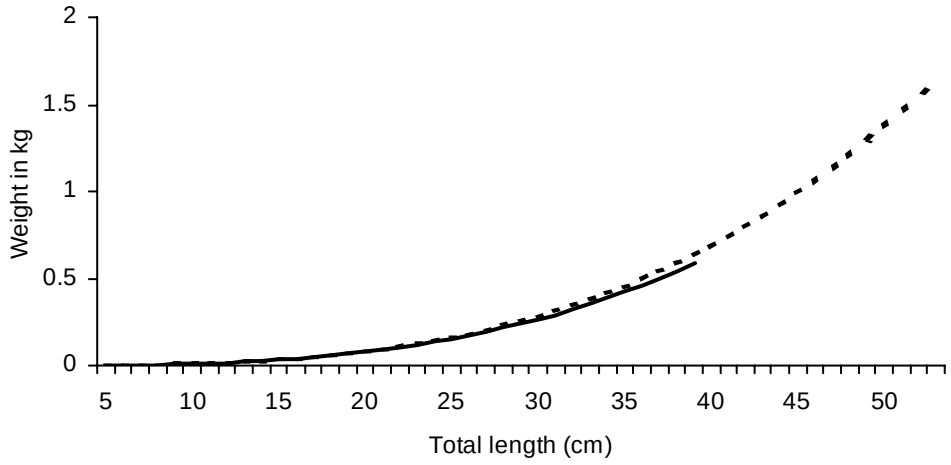
(e)


Age 0
Age 1
Age 2
Age 3
Age 4+
Numbers of fish
2000
1500
1000
500
0
5 10 15 20 25 30 35 40 45 50
Total length (cm)

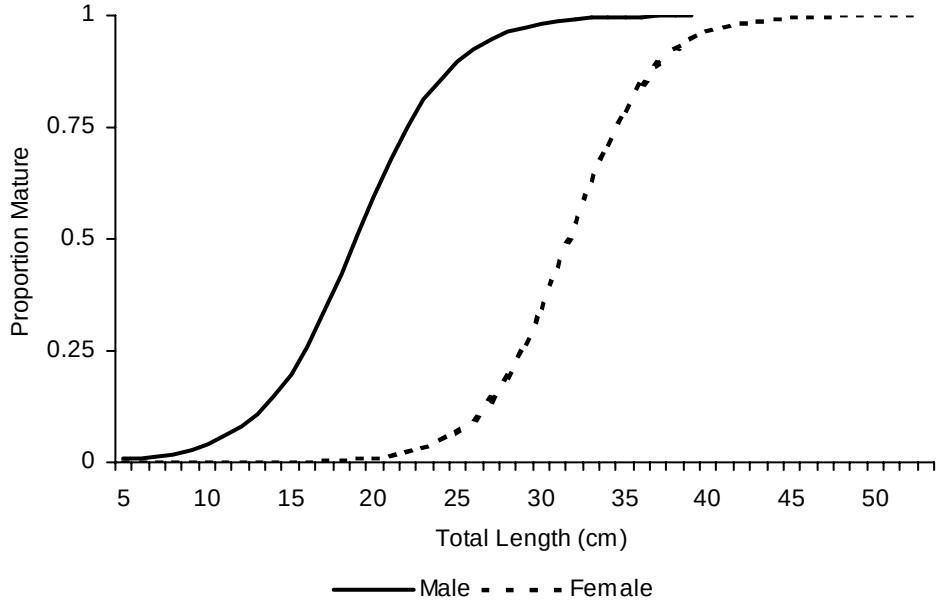
(f)


Total length (cm)
0
10
20
30
40
50
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Age

(g)

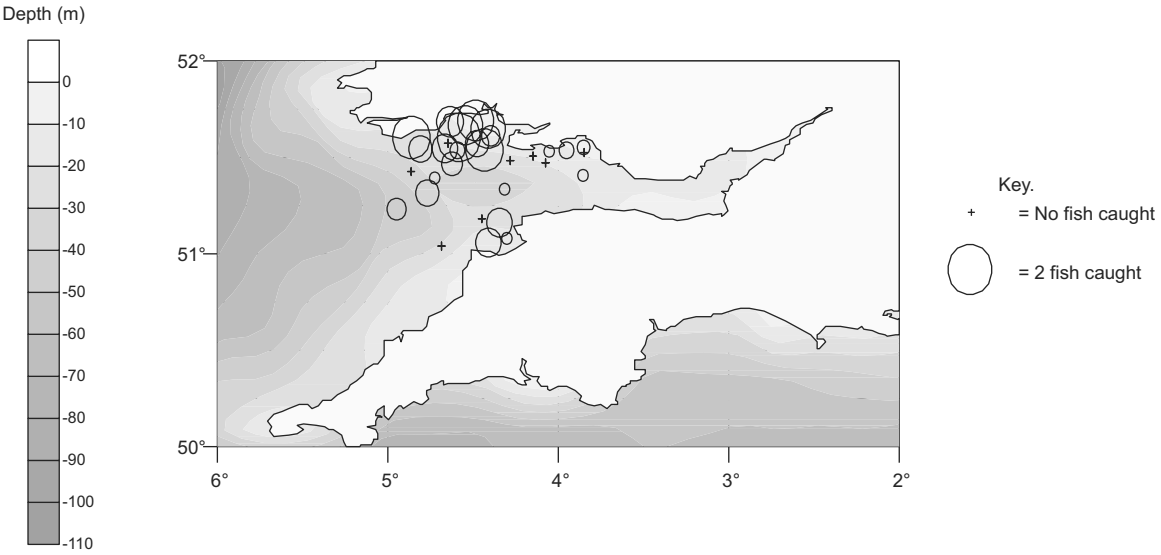

Weight in kg
0
0.5
1
1.5
2
5 10 15 20 25 30 35 40 45 50
Total length (cm)

(h)

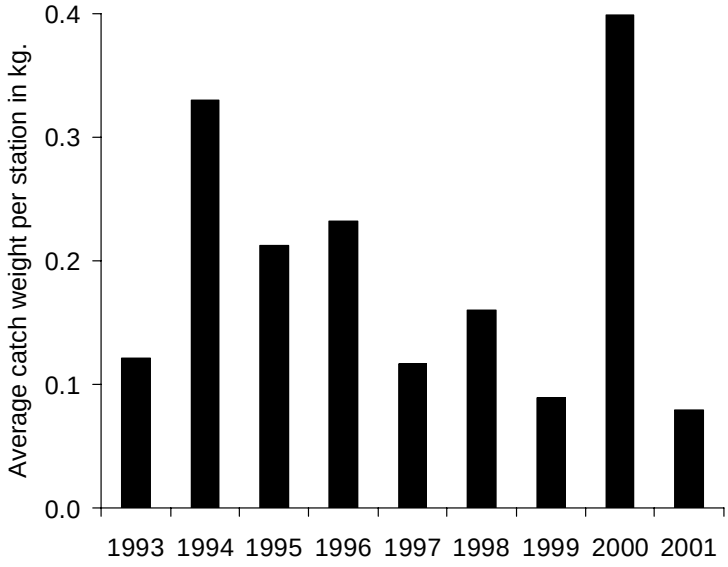

Proportion Mature
0
0.25
0.5
0.75
1
5 10 15 20 25 30 35 40 45 50
Total Length (cm)
Male
Female

Brill - *Scophthalmus rhombus*

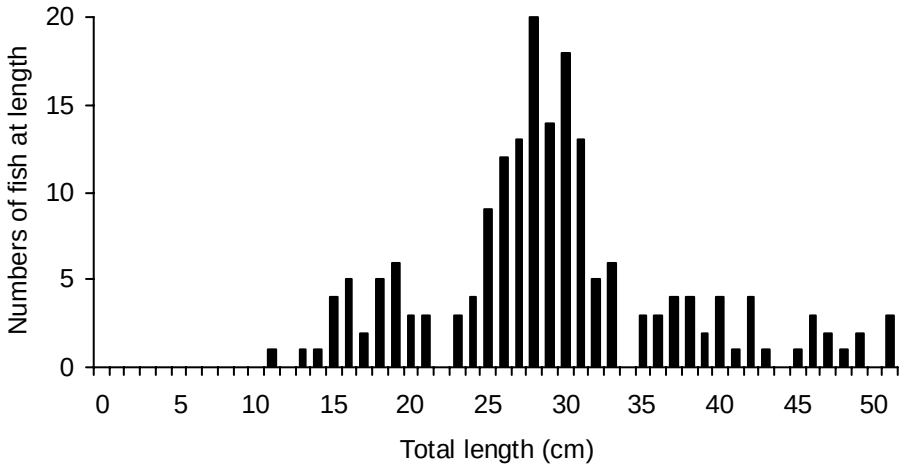
(a)



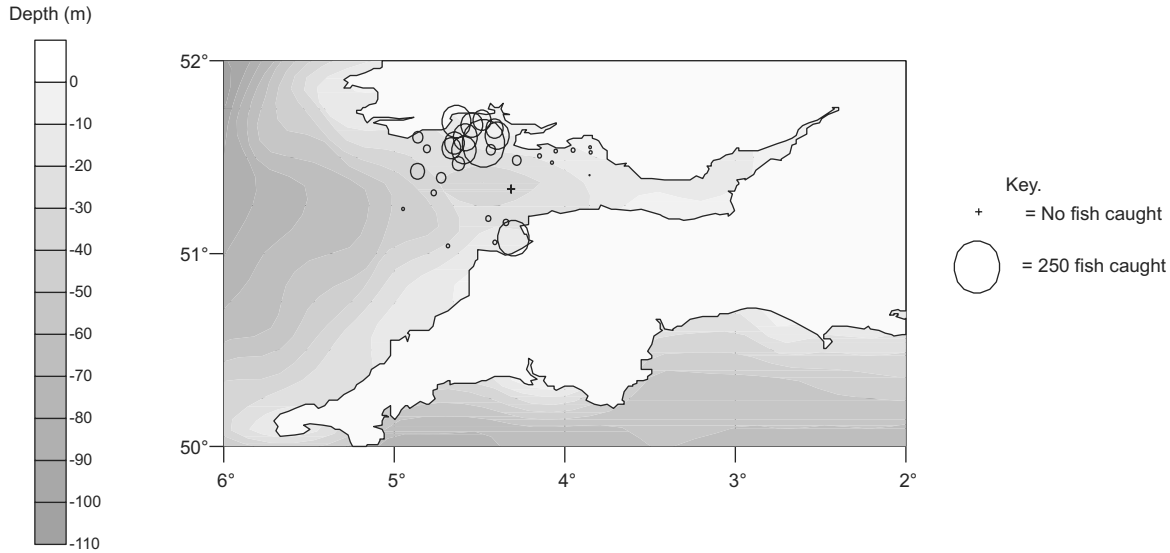
(b)



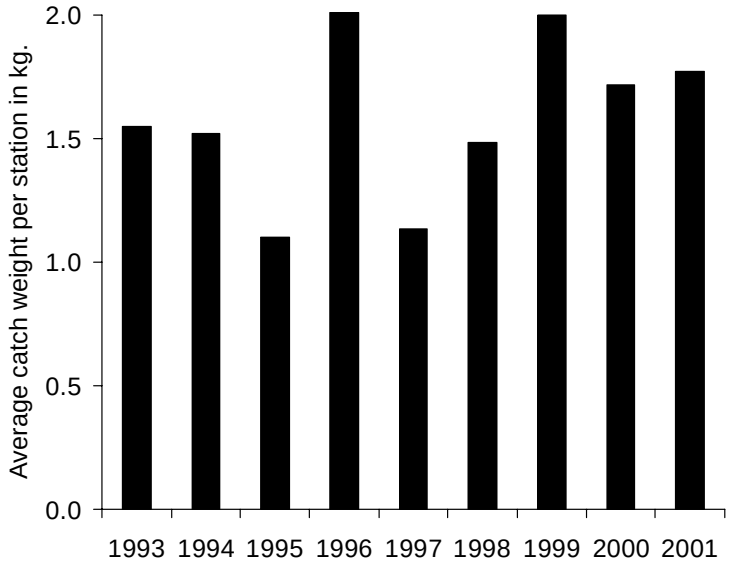
(c)



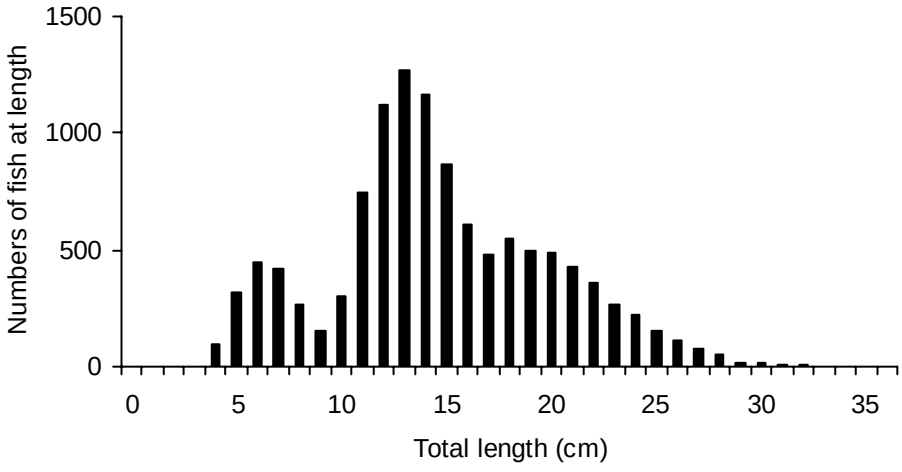
(a)


Depth (m)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
52°
51°
50°
6°
5°
4°
3°
2°
Key.
+ = No fish caught
= 250 fish caught

(b)

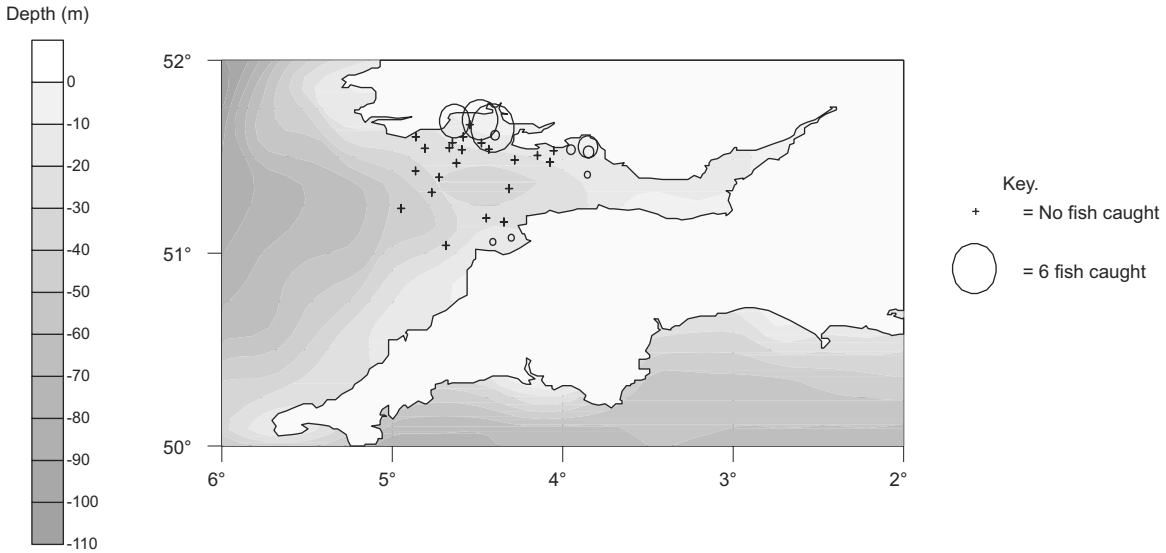

Average catch weight per station in kg.
2.0
1.5
1.0
0.5
0.0
1993 1994 1995 1996 1997 1998 1999 2000 2001

(c)

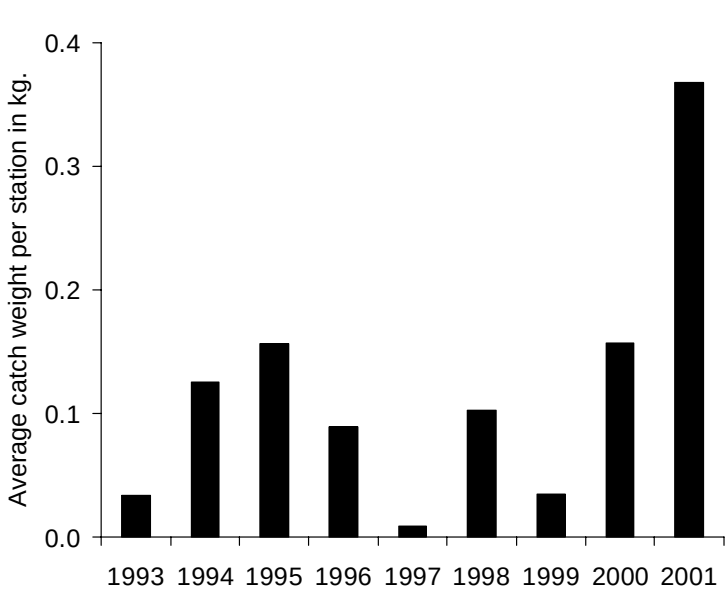

Numbers of fish at length
1500
1000
500
0
0 5 10 15 20 25 30 35
Total length (cm)

Flounder - *Platichthys flesus*

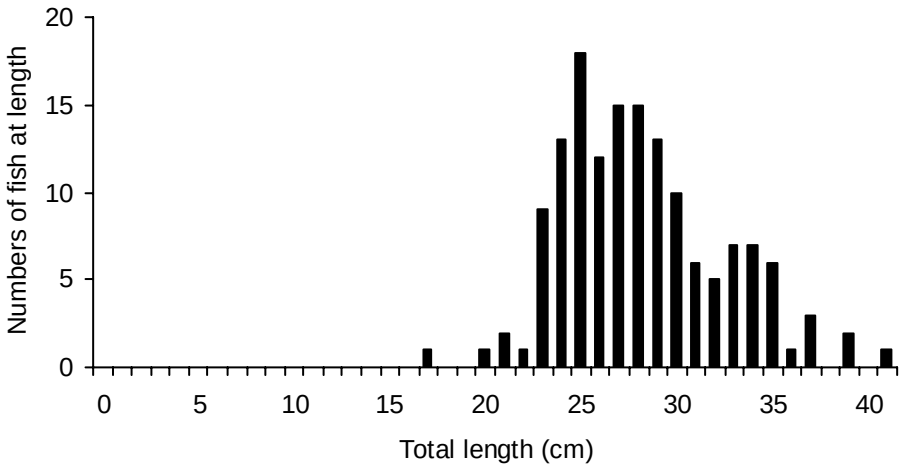
(a)



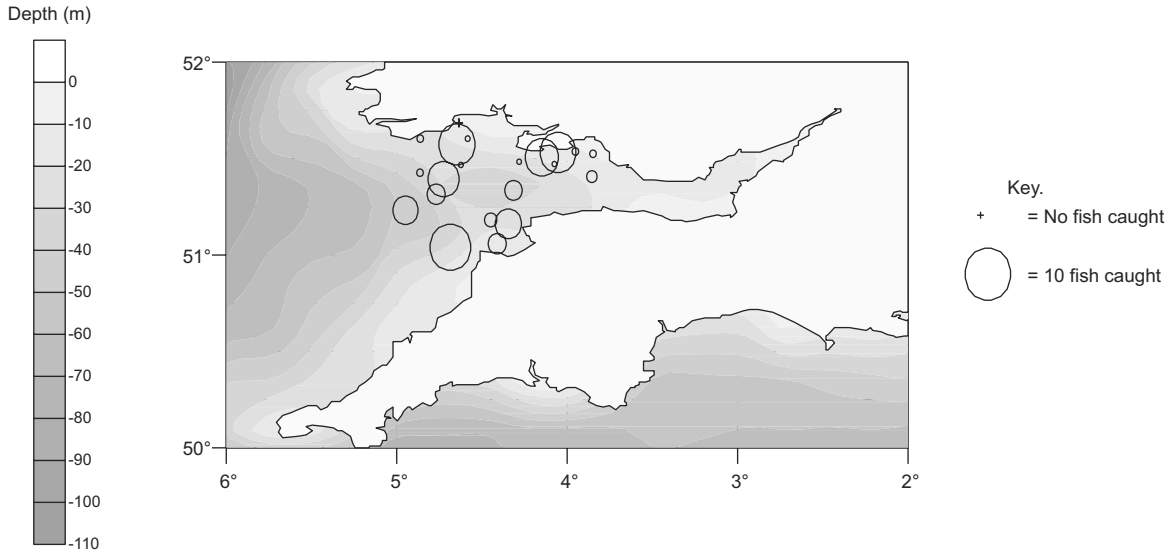
(b)



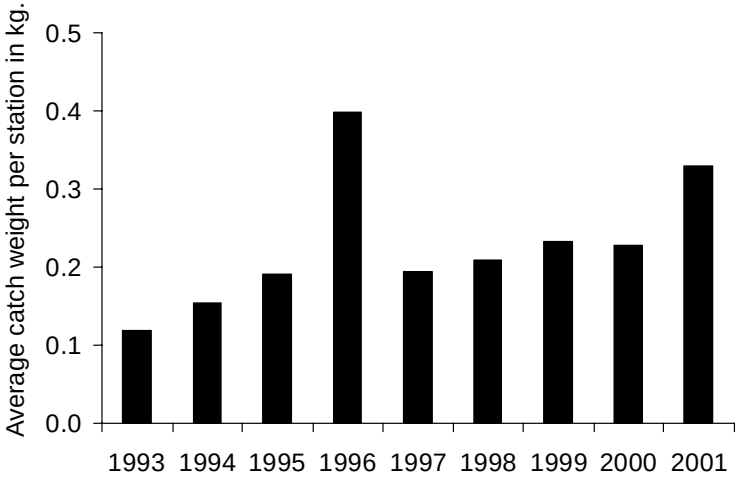
(c)



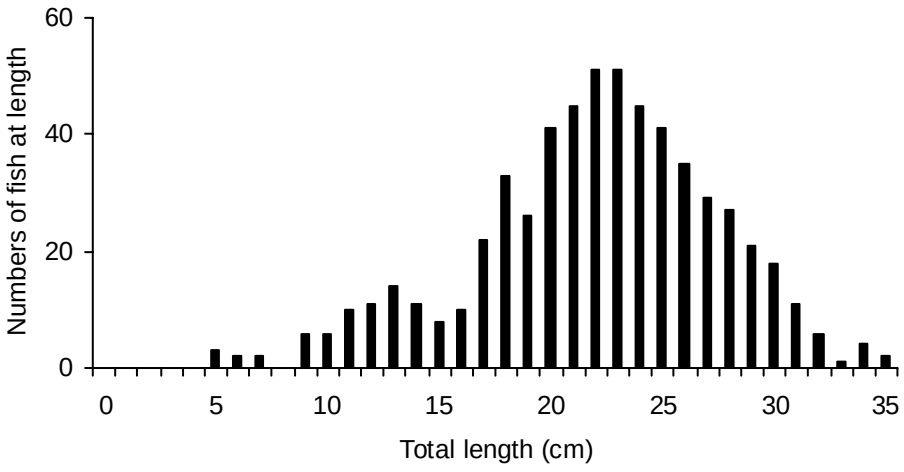
(a)


Depth (m)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
52°
51°
50°
6°
5°
4°
3°
2°
Key.
+ = No fish caught
= 10 fish caught

(b)

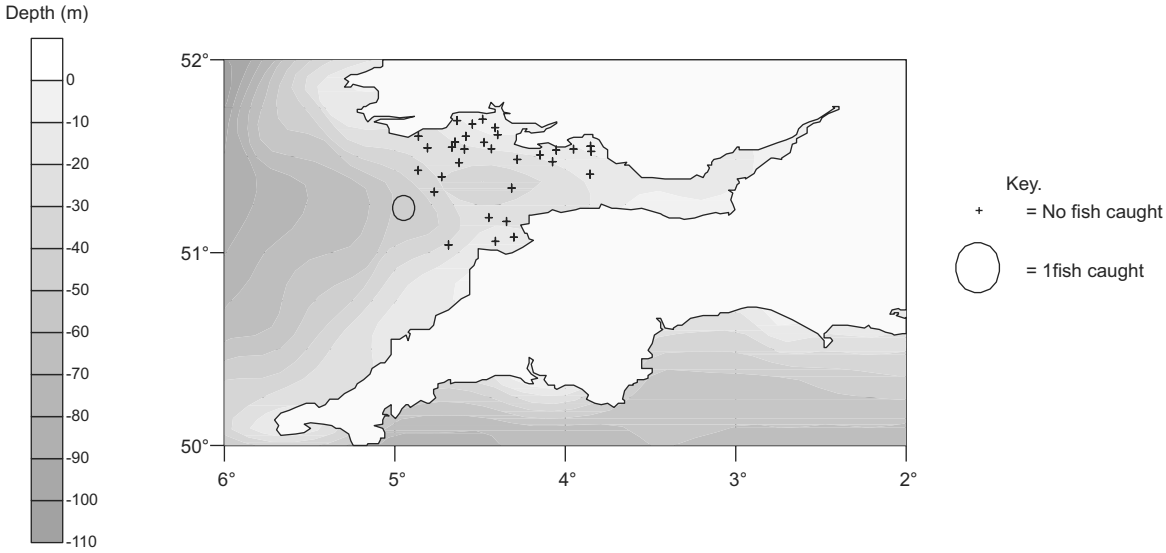

Average catch weight per station in kg.
0.5
0.4
0.3
0.2
0.1
0.0
1993 1994 1995 1996 1997 1998 1999 2000 2001

(c)

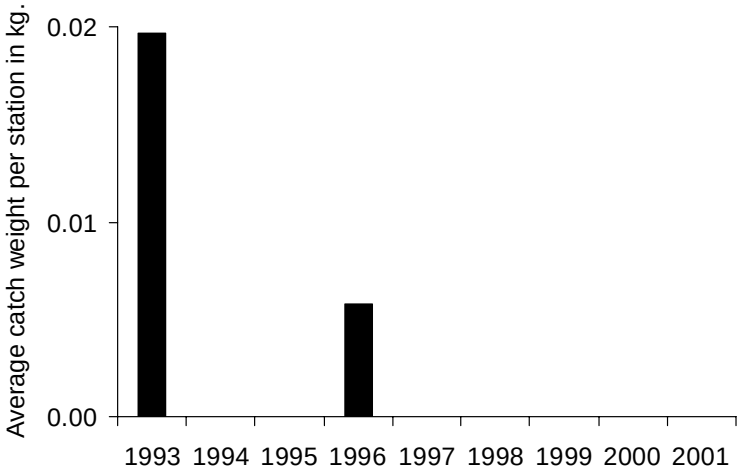

Numbers of fish at length
60
40
20
0
0 5 10 15 20 25 30 35
Total length (cm)

Megrim - *Lepidorhombus whiffiagonis*

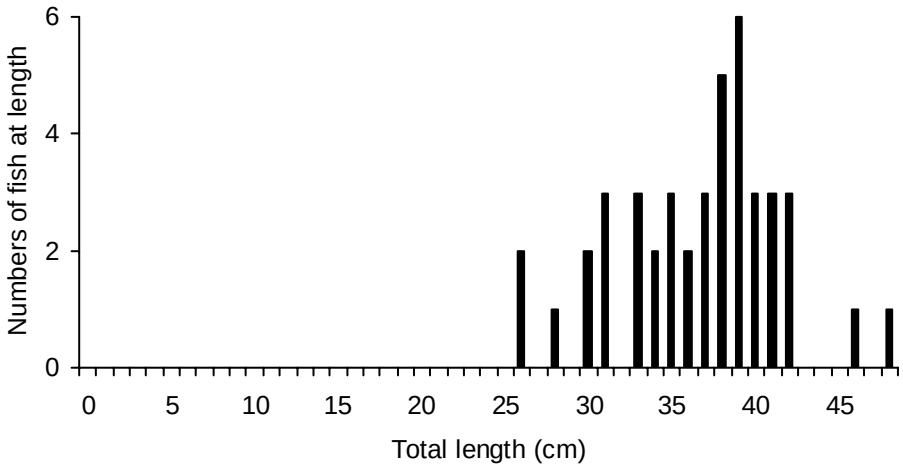
(a)



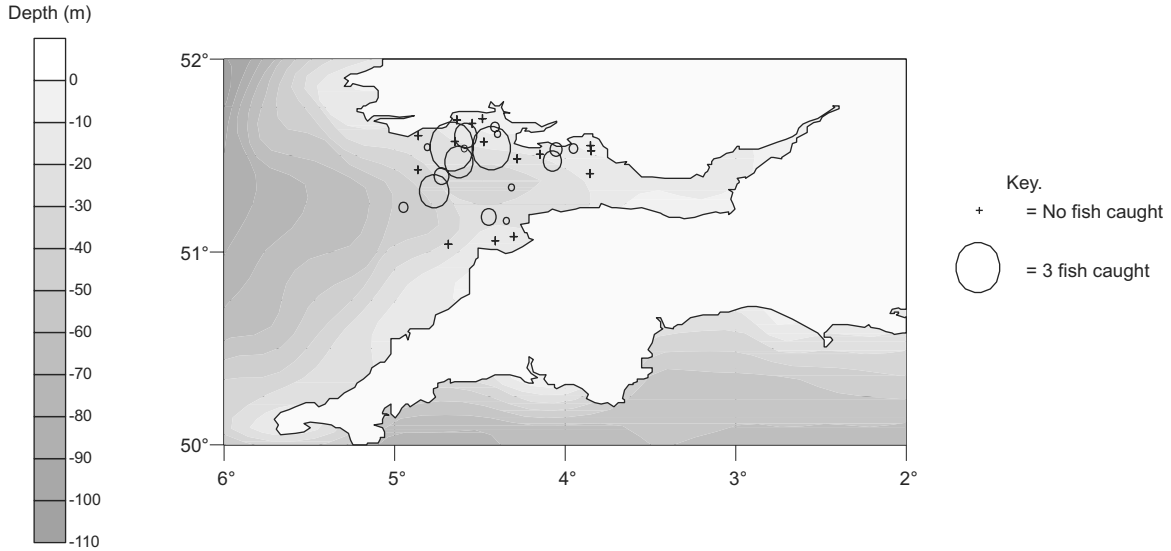
(b)



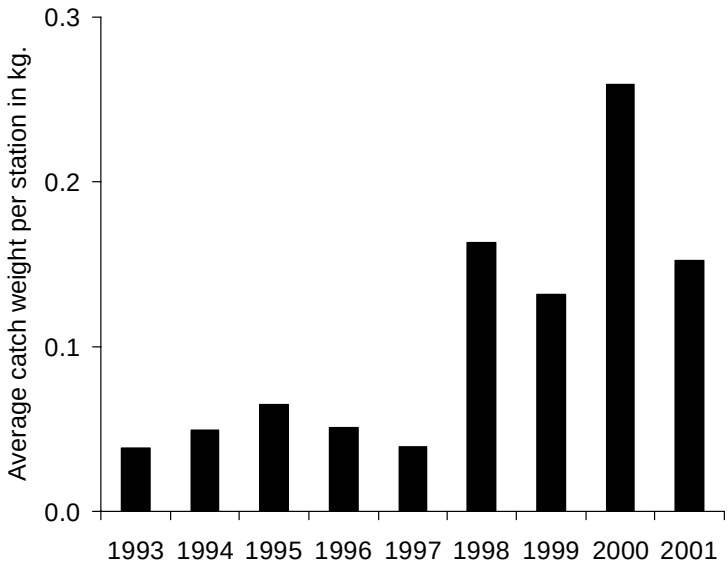
(c)



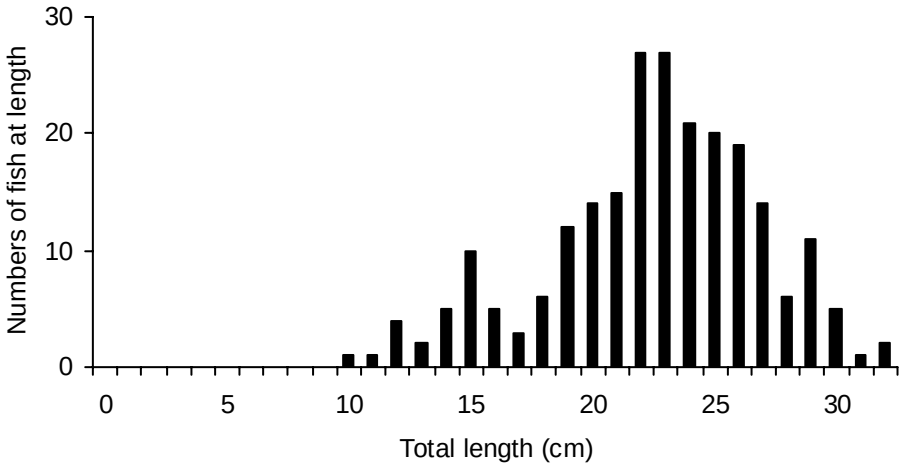
(a)


Depth (m)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
52°
51°
50°
6°
5°
4°
3°
2°
Key.
= No fish caught
= 3 fish caught

(b)

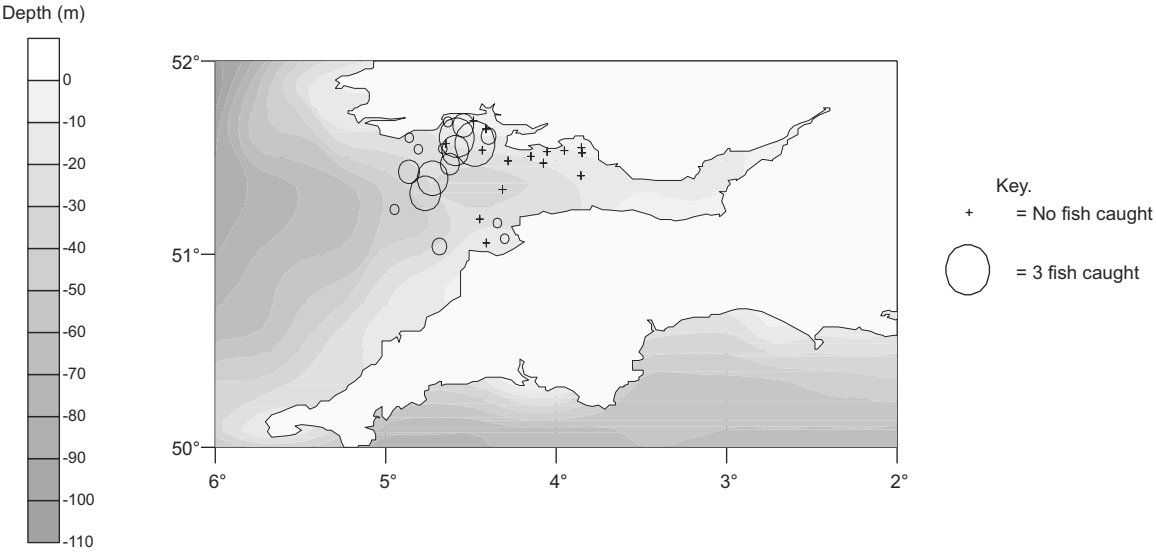

Average catch weight per station in kg.
0.3
0.2
0.1
0.0
1993 1994 1995 1996 1997 1998 1999 2000 2001

(c)

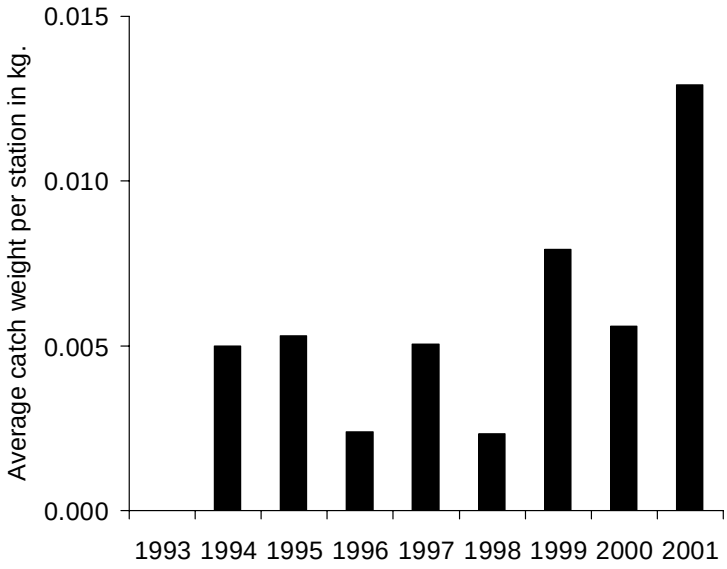

Numbers of fish at length
30
20
10
0
0 5 10 15 20 25 30
Total length (cm)

Scaldfish - *Arnoglossus laterna*

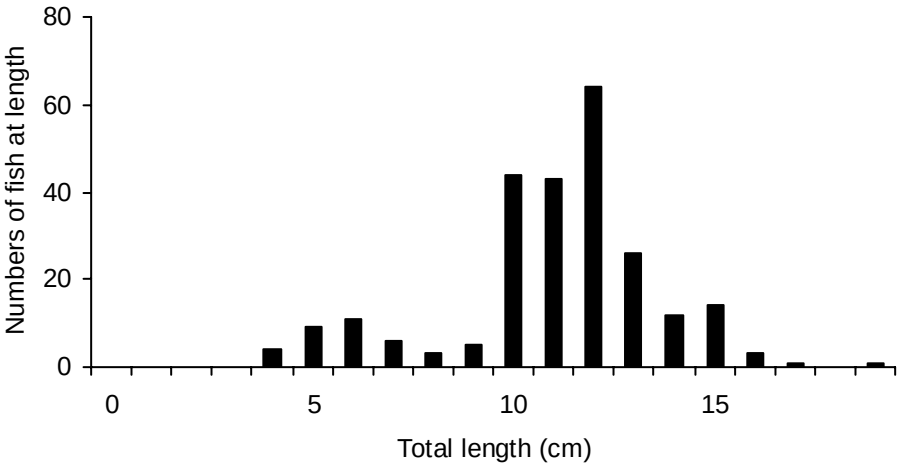
(a)



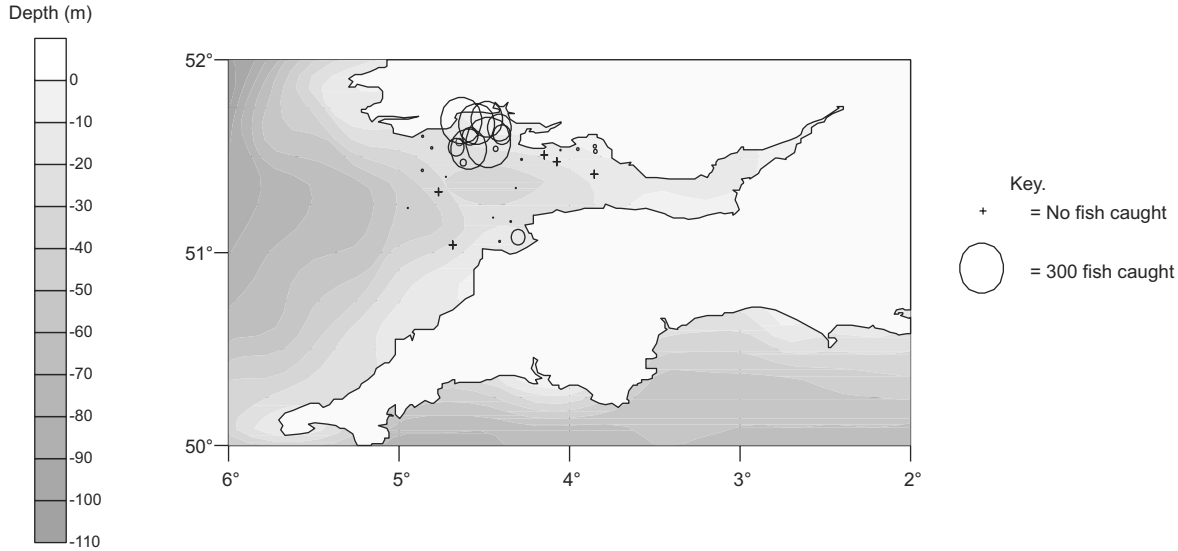
(b)



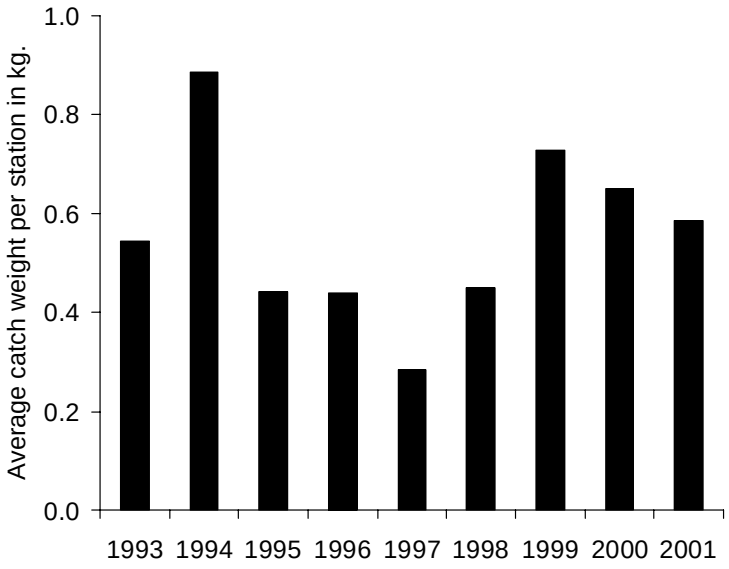
(c)



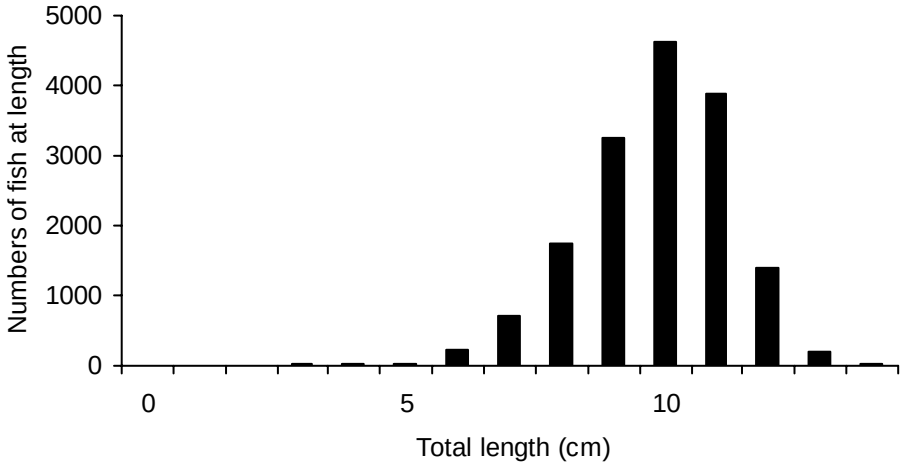
(a)


Depth (m)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
52°
51°
50°
6°
5°
4°
3°
2°
Key.
= No fish caught
= 300 fish caught

(b)

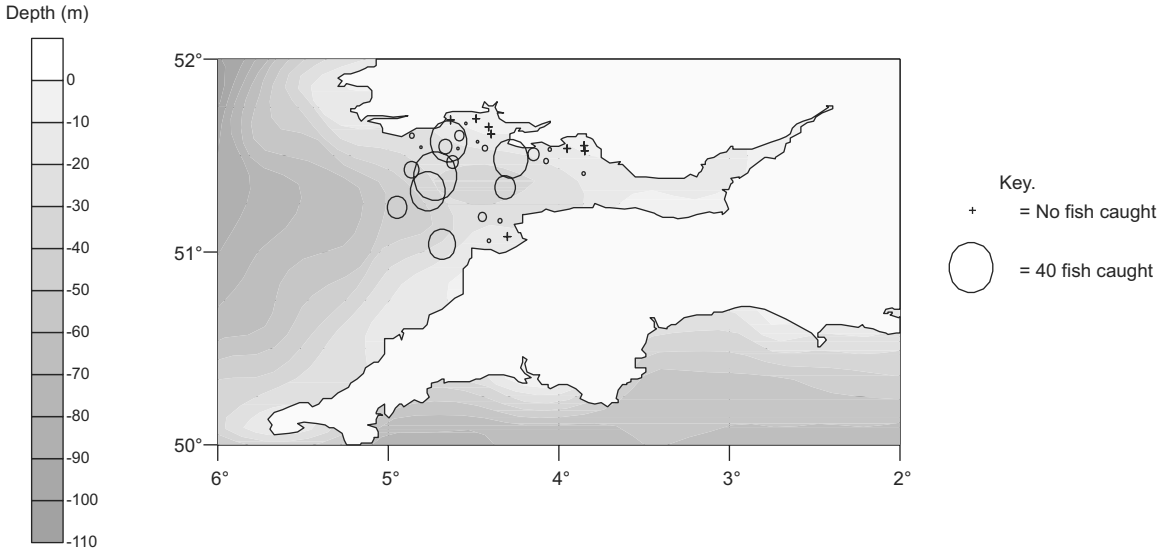

Average catch weight per station in kg.
1.0
0.8
0.6
0.4
0.2
0.0
1993 1994 1995 1996 1997 1998 1999 2000 2001

(c)

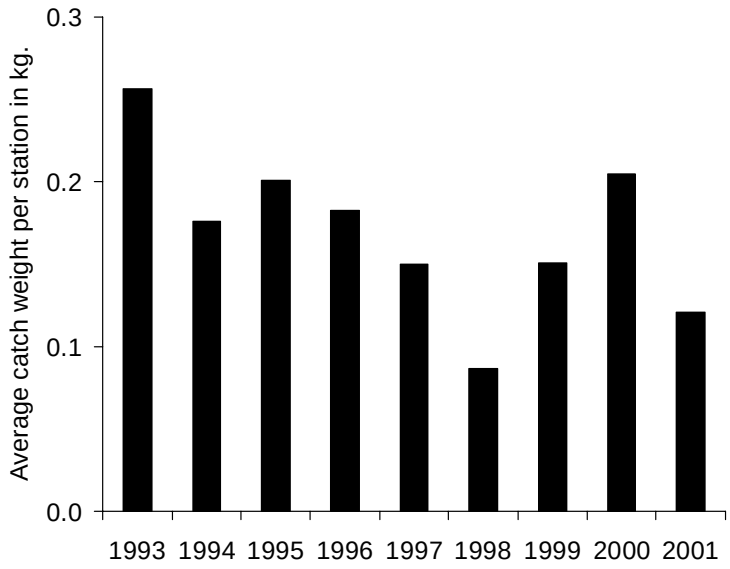

Numbers of fish at length
5000
4000
3000
2000
1000
0
0
5
10
Total length (cm)

Thickback sole - *Microchirus variegatus*

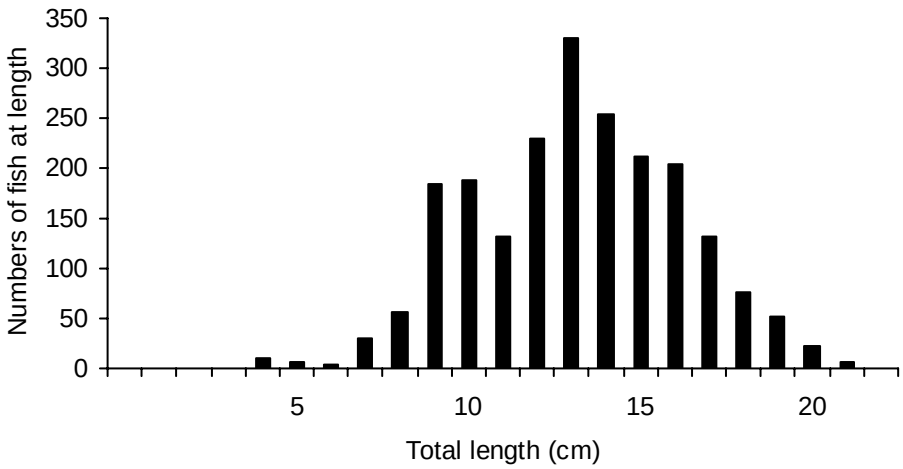
(a)



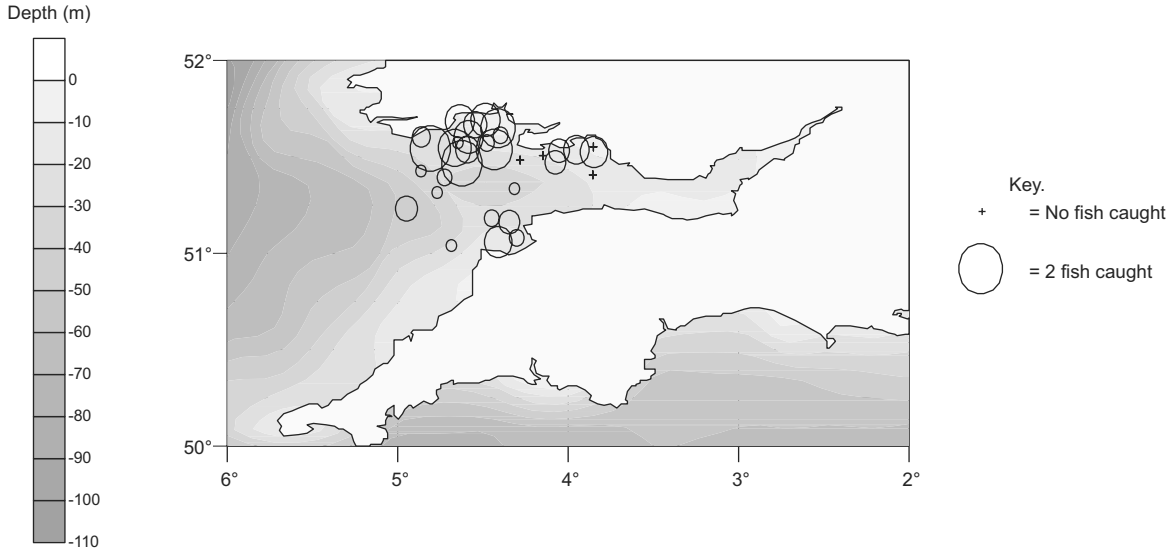
(b)



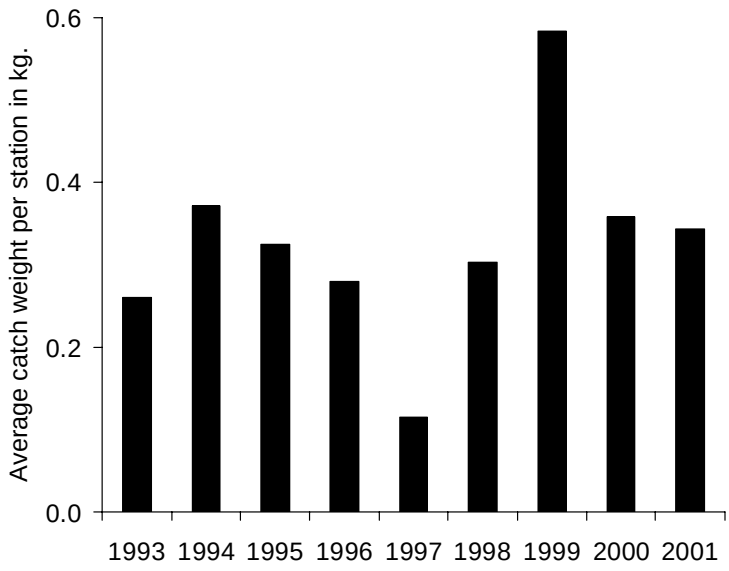
(c)



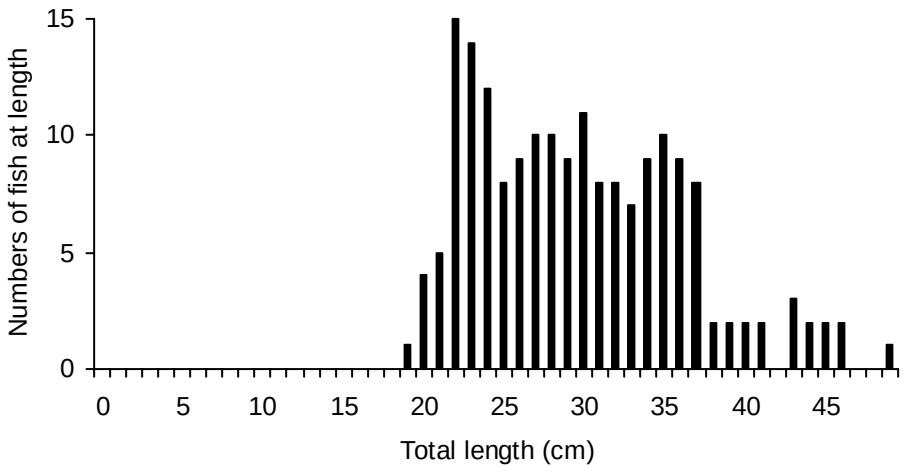
(a)


Depth (m)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
52°
51°
50°
6°
5°
4°
3°
2°
Key.
= No fish caught
= 2 fish caught

(b)

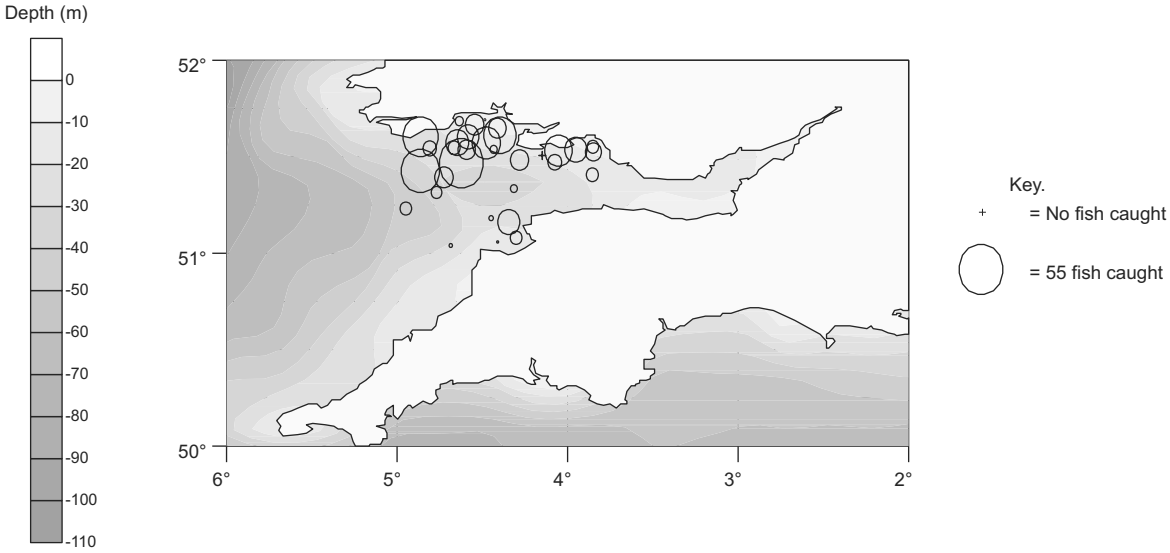

Average catch weight per station in kg.
0.6
0.4
0.2
0.0
1993 1994 1995 1996 1997 1998 1999 2000 2001

(c)

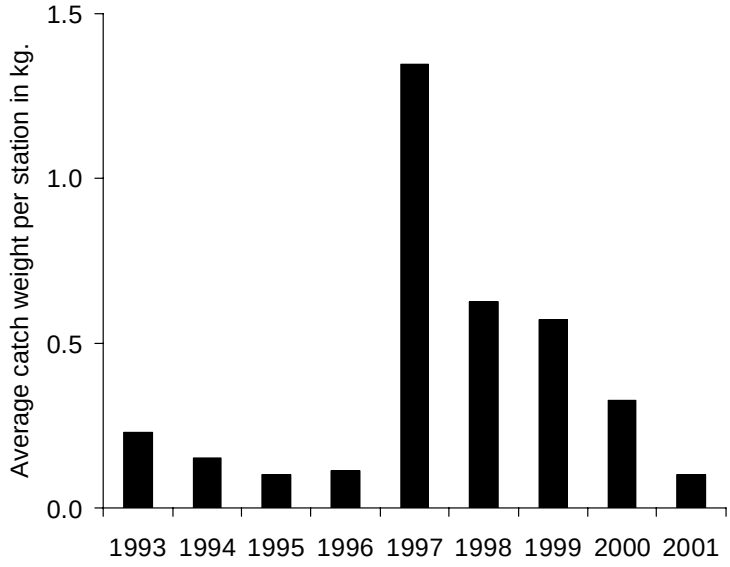

Numbers of fish at length
15
10
5
0
0 5 10 15 20 25 30 35 40 45
Total length (cm)

Gadoids

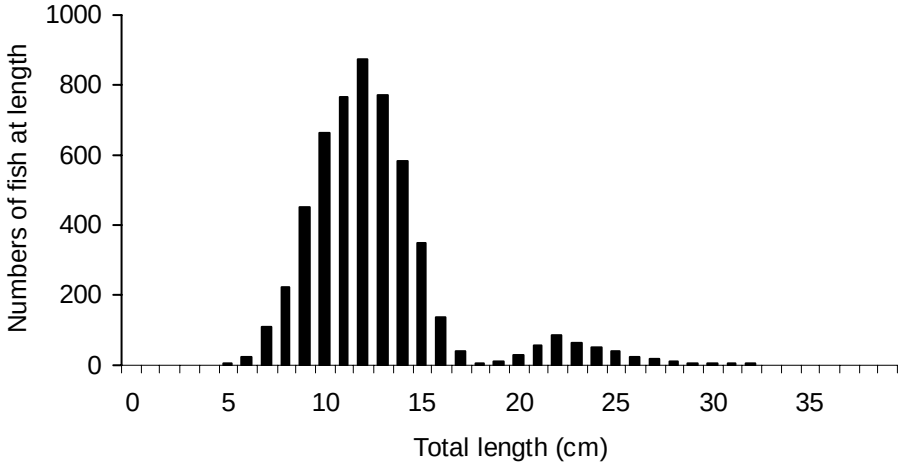
(a)


Depth (m)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
52°
51°
50°
6°
5°
4°
3°
2°
Key.
= No fish caught
= 55 fish caught

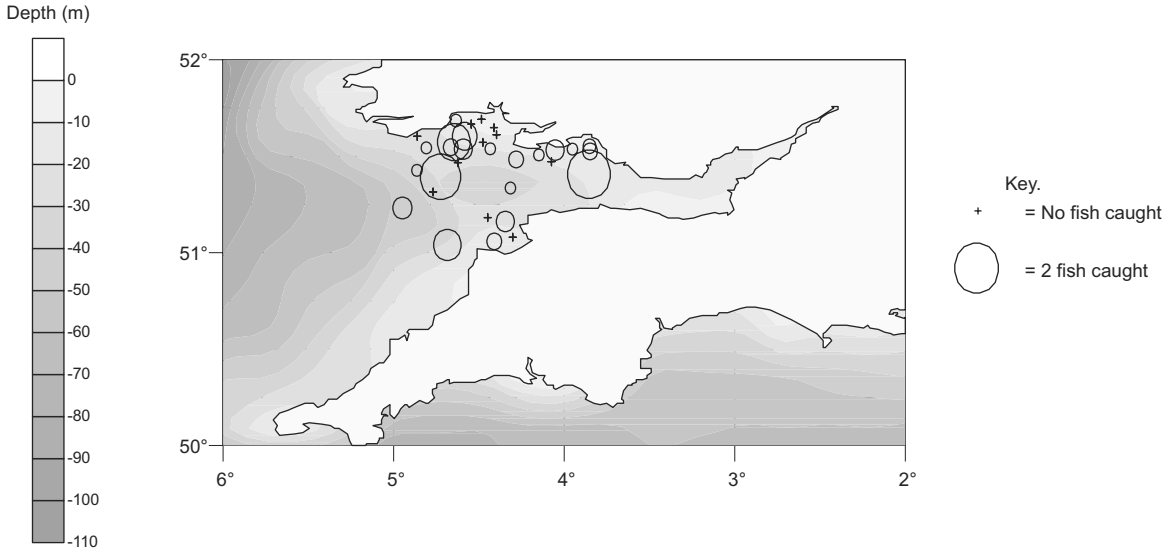
(b)


Average catch weight per station in kg.
1.5
1.0
0.5
0.0
1993
1994
1995
1996
1997
1998
1999
2000
2001

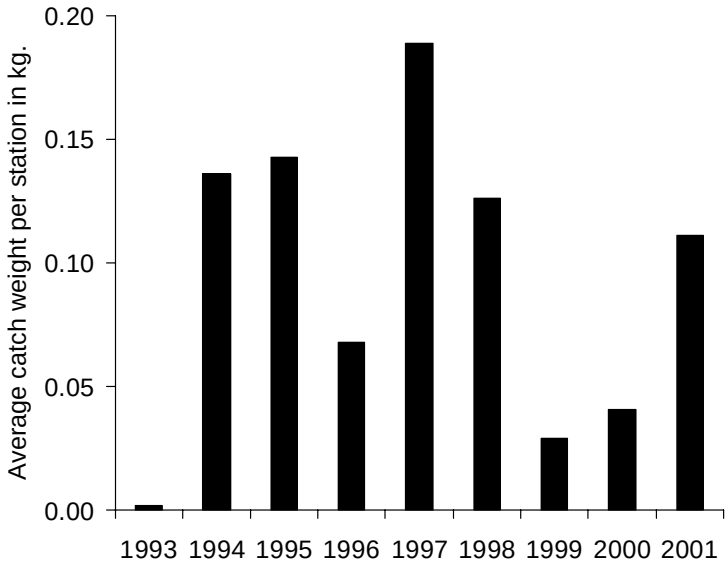
(c)


Numbers of fish at length
1000
800
600
400
200
0
0
5
10
15
20
25
30
35
Total length (cm)

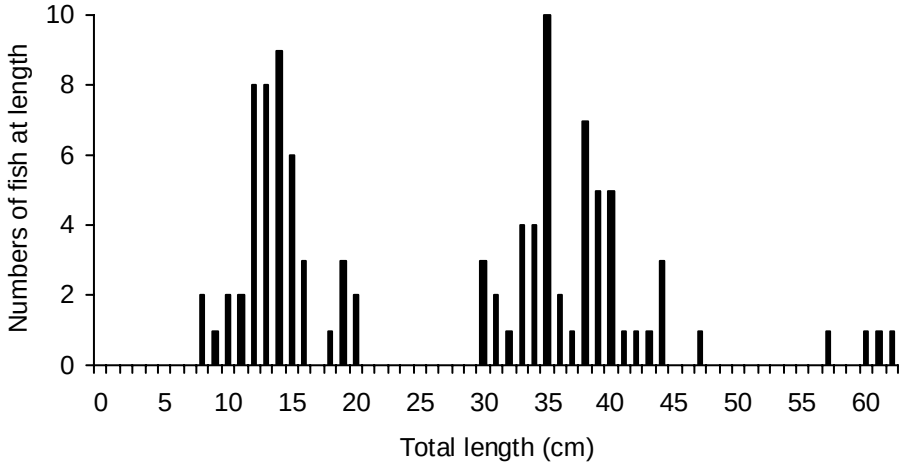
(a)


Depth (m)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
52°
51°
50°
6°
5°
4°
3°
2°
Key.
= No fish caught
= 2 fish caught

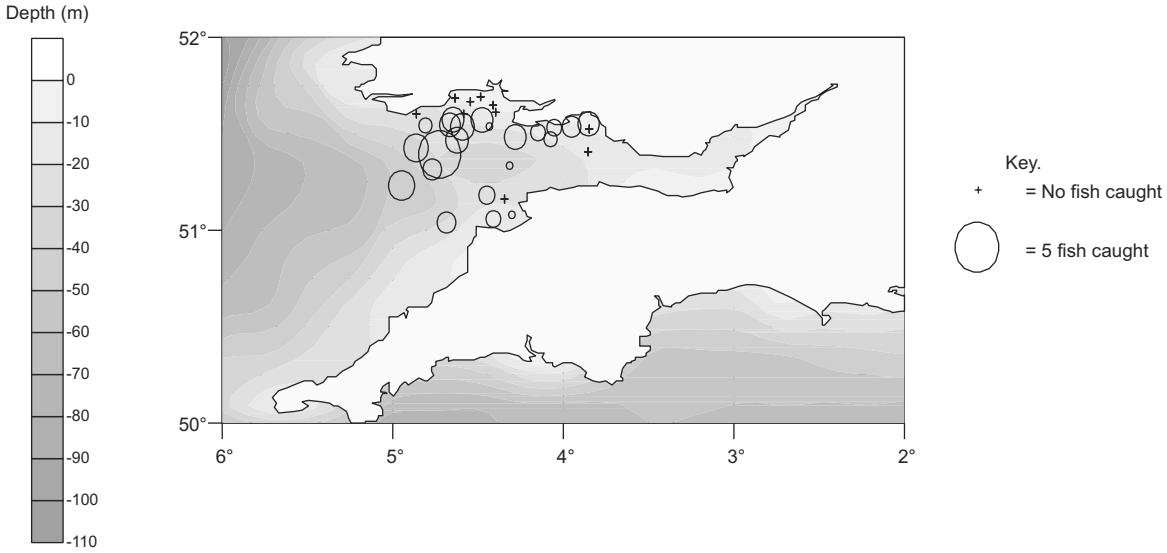
(b)


Average catch weight per station in kg.
0.20
0.15
0.10
0.05
0.00
1993 1994 1995 1996 1997 1998 1999 2000 2001

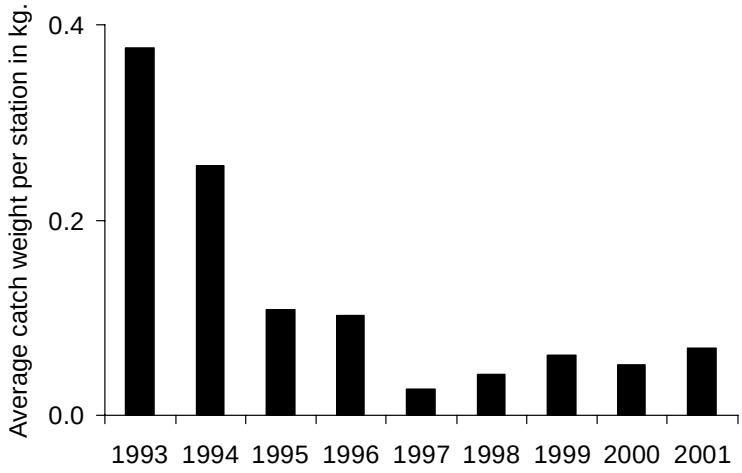
(c)


Numbers of fish at length
10
8
6
4
2
0
0 5 10 15 20 25 30 35 40 45 50 55 60
Total length (cm)

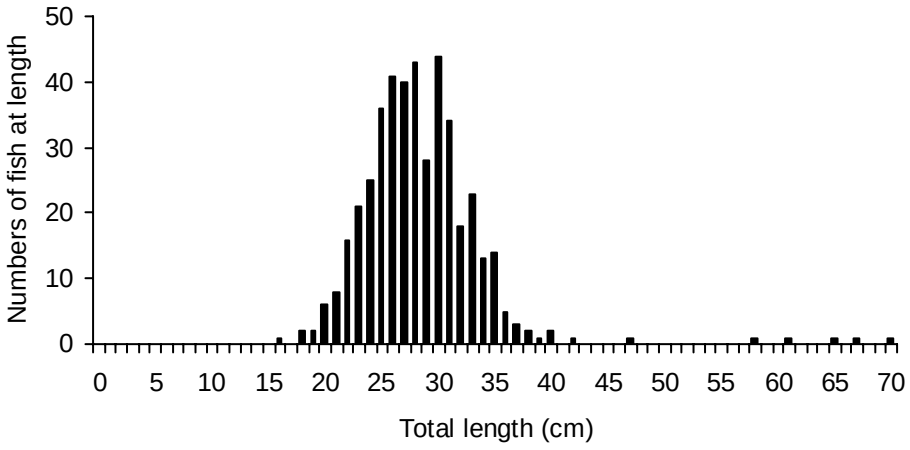
(a)


Depth (m)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
52°
51°
50°
6°
5°
4°
3°
2°
Key.
= No fish caught
= 5 fish caught

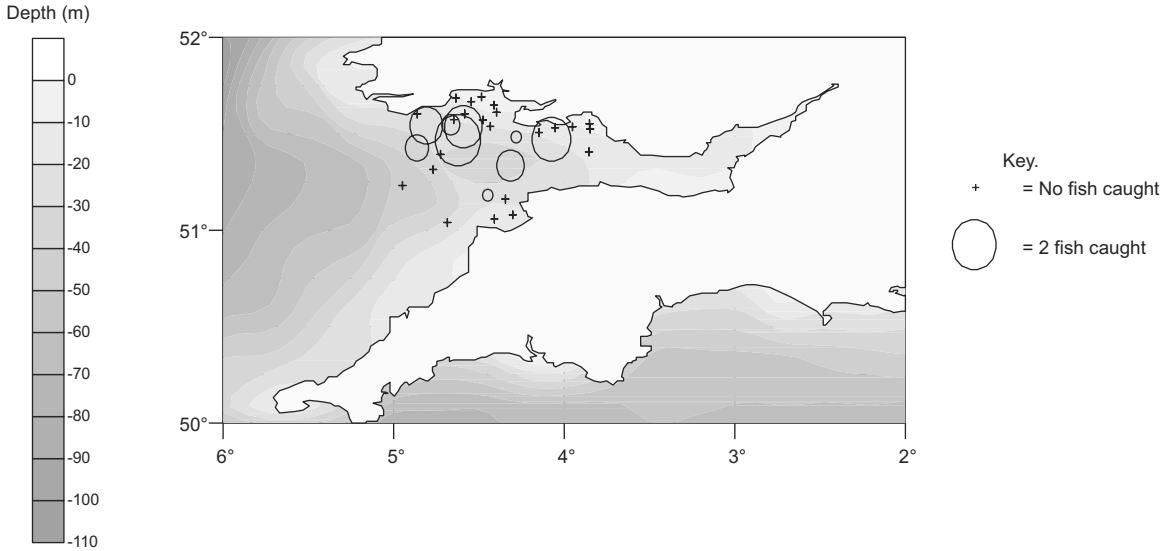
(b)


Average catch weight per station in kg.
0.4
0.2
0.0
1993
1994
1995
1996
1997
1998
1999
2000
2001

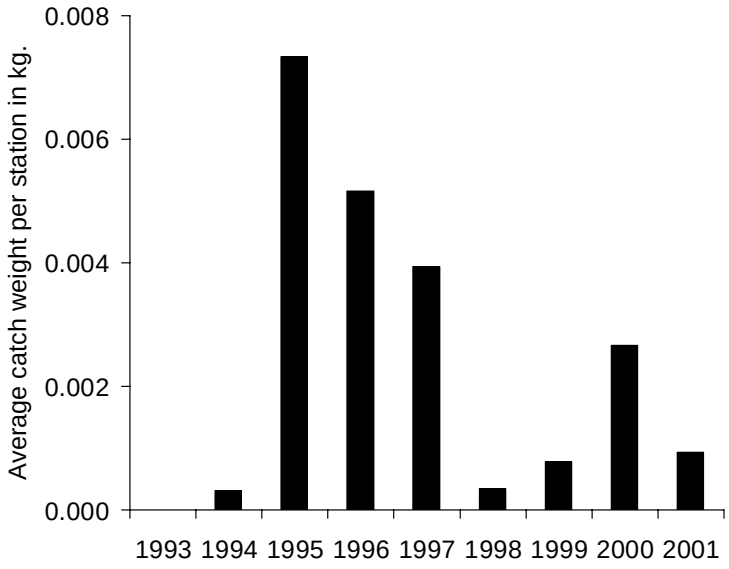
(c)


Numbers of fish at length
50
40
30
20
10
0
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
Total length (cm)

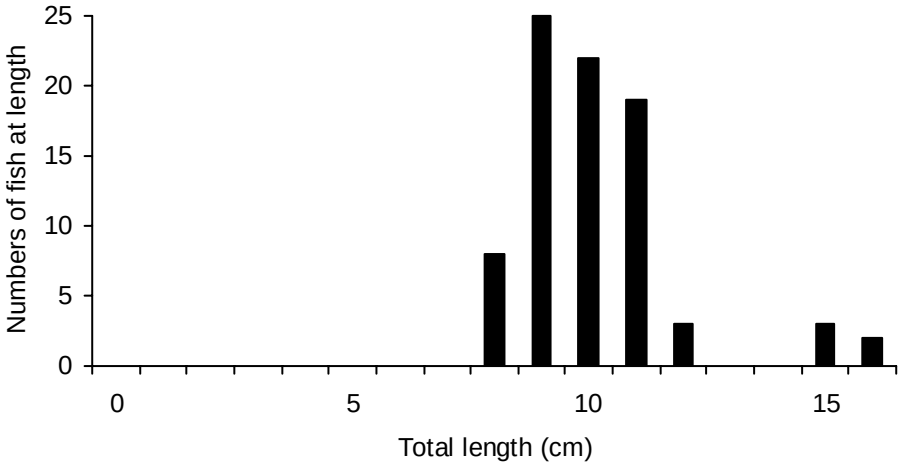
(a)


Depth (m)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
52°
51°
50°
6°
5°
4°
3°
2°
Key.
= No fish caught
= 2 fish caught

(b)

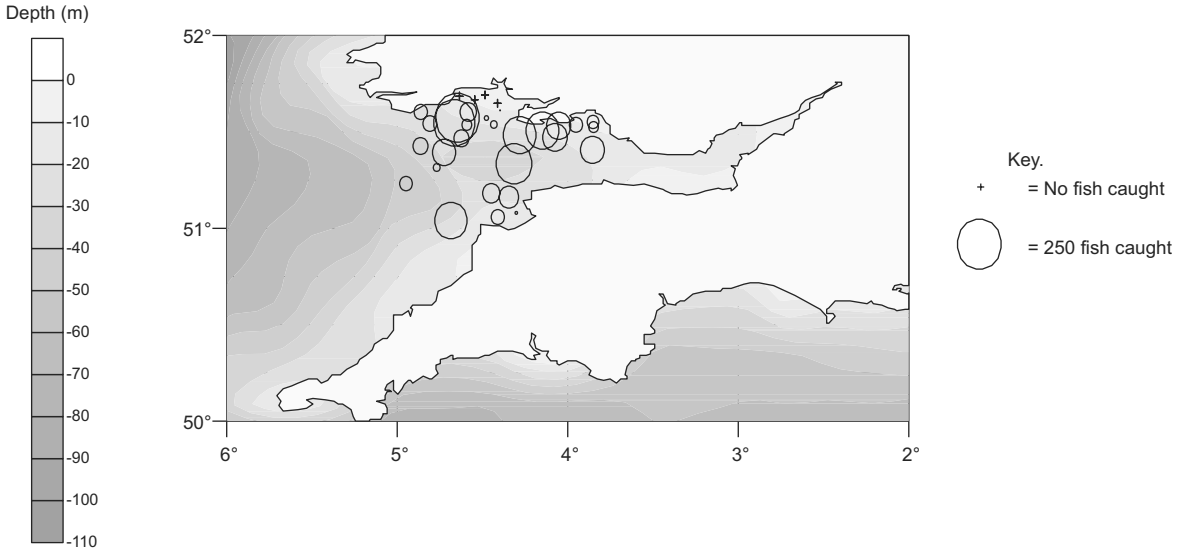

Average catch weight per station in kg.
0.008
0.006
0.004
0.002
0.000
1993 1994 1995 1996 1997 1998 1999 2000 2001

(c)

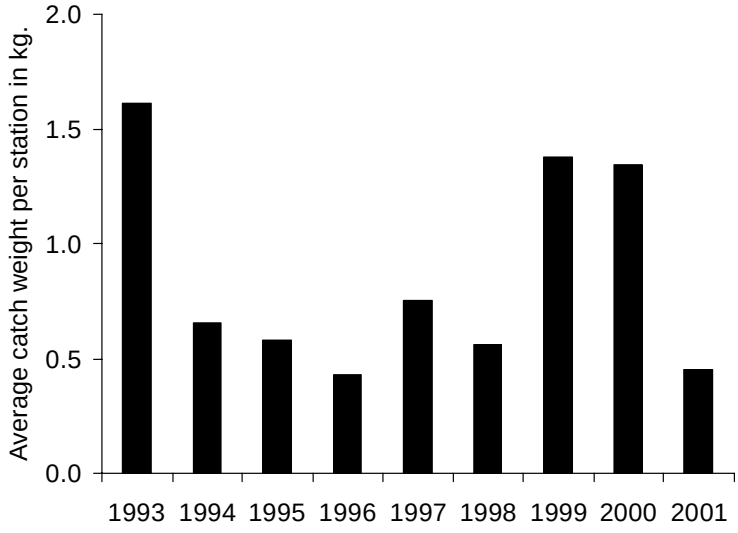

Numbers of fish at length
25
20
15
10
5
0
0
5
10
15
Total length (cm)

Poor cod - *Trisopterus minutus*

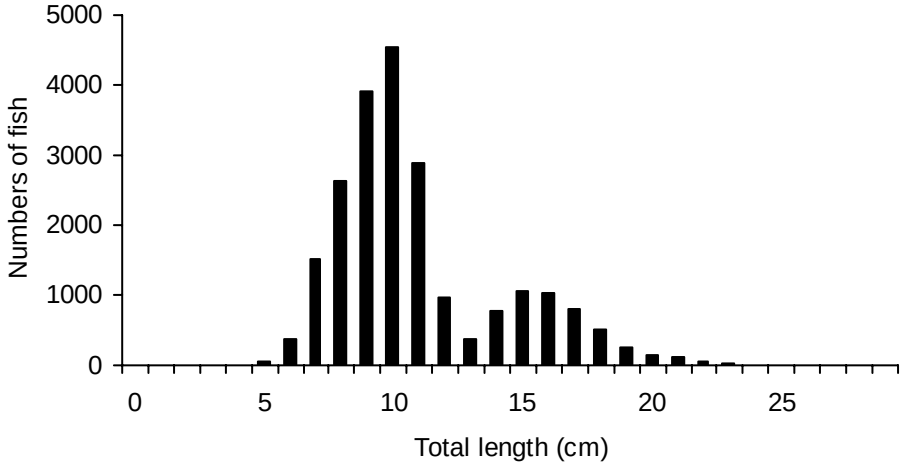
(a)



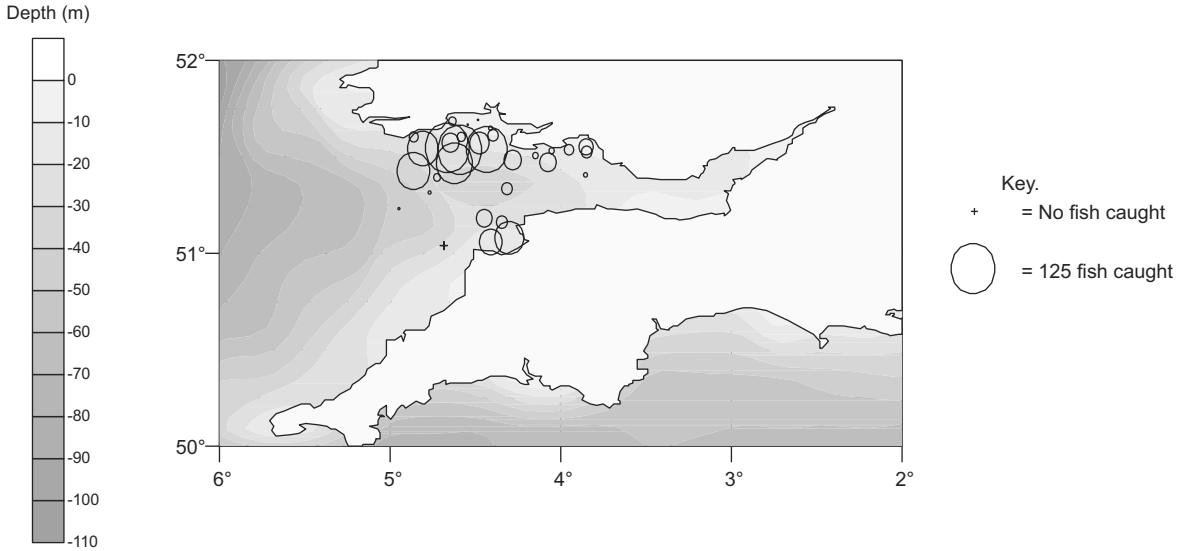
(b)



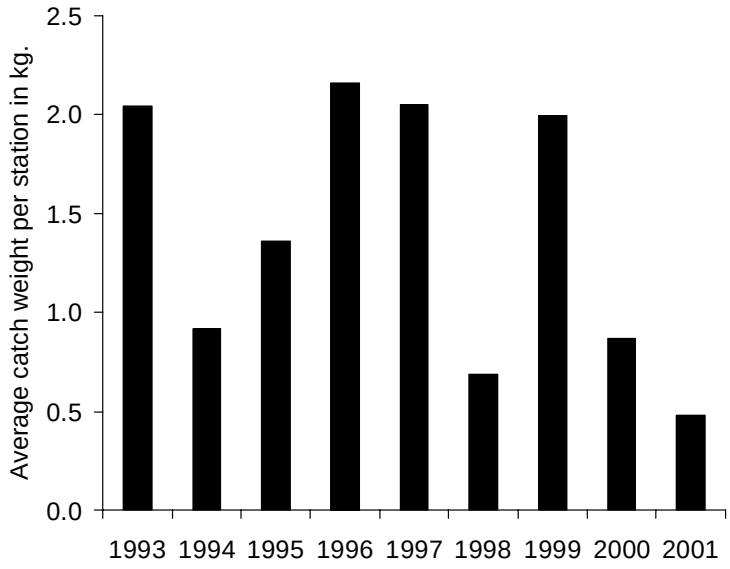
(c)



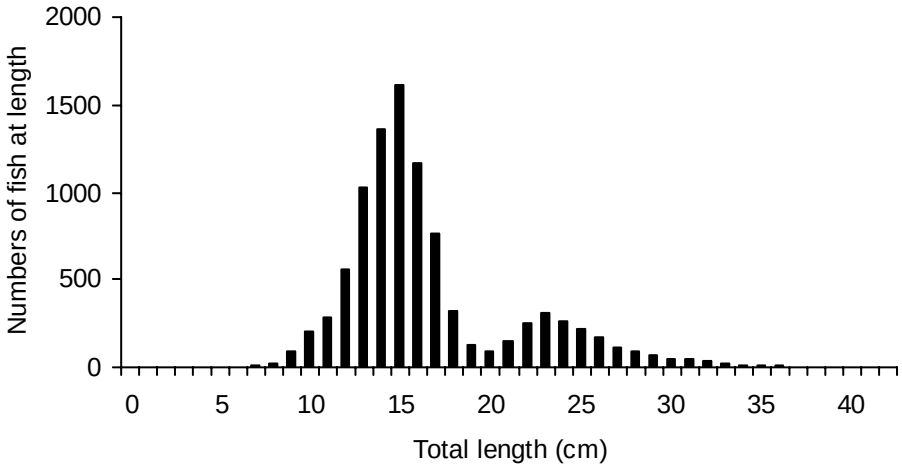
(a)


Depth (m)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
52°
51°
50°
6°
5°
4°
3°
2°
Key.
= No fish caught
= 125 fish caught

(b)


Average catch weight per station in kg.
2.5
2.0
1.5
1.0
0.5
0.0
1993 1994 1995 1996 1997 1998 1999 2000 2001

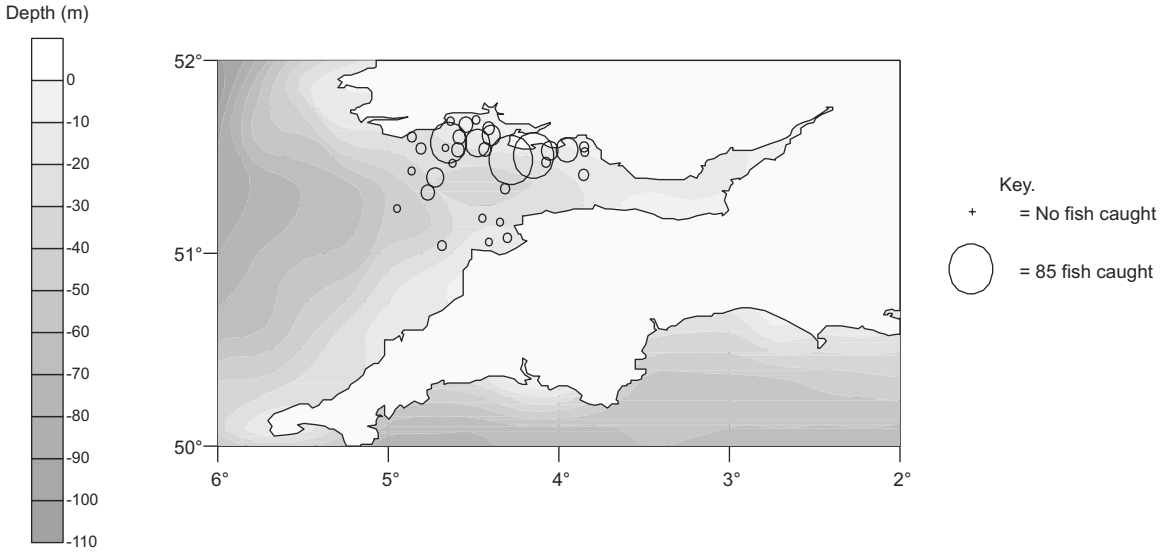
(c)


Numbers of fish at length
2000
1500
1000
500
0
0 5 10 15 20 25 30 35 40
Total length (cm)

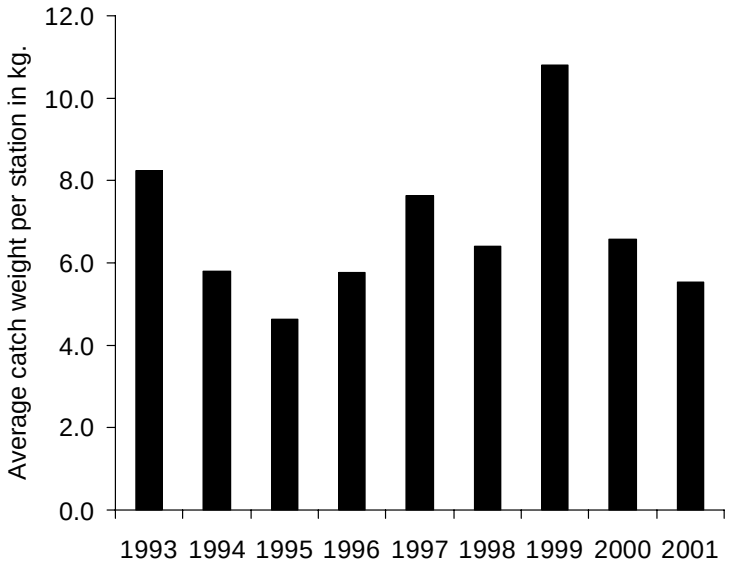
Elasmobranchs

Lesser spotted dogfish - *Scyliorhinus canicula*

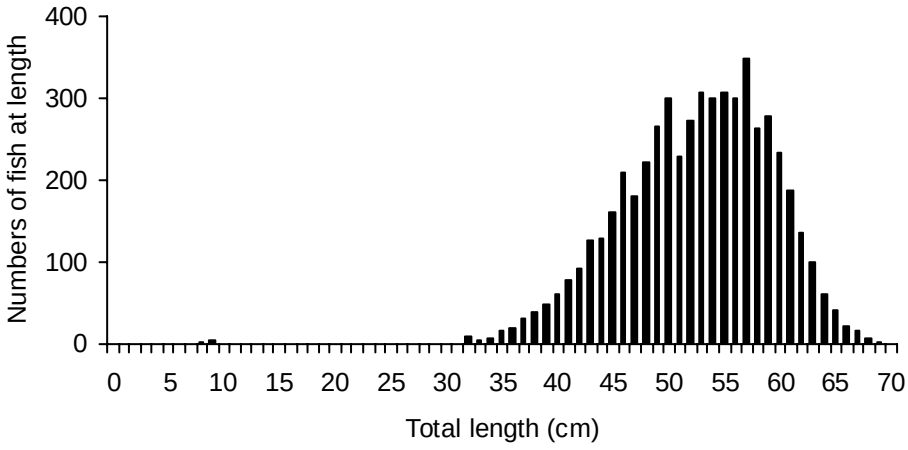
(a)



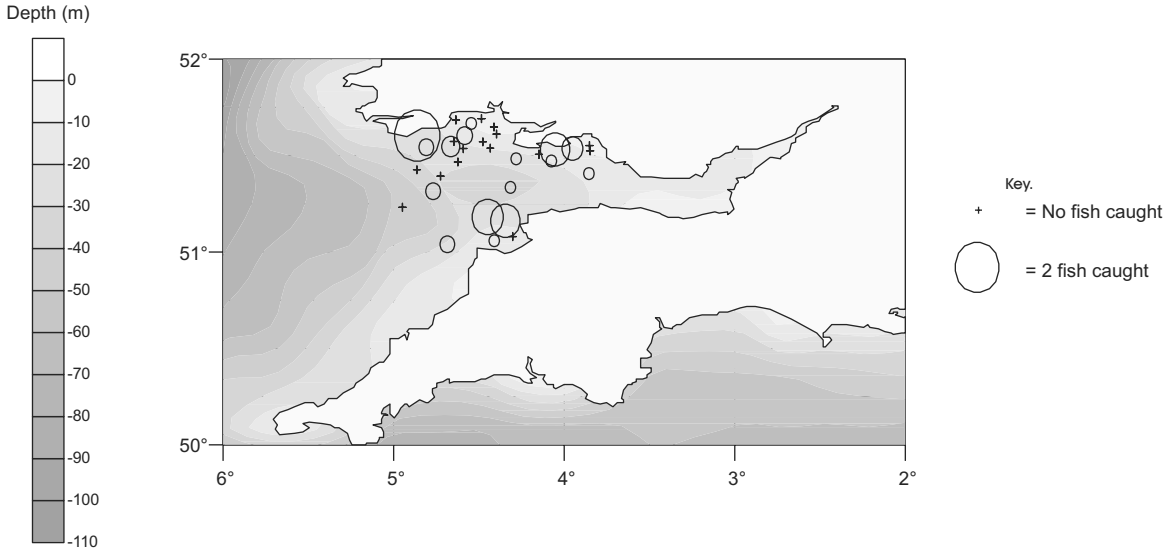
(b)



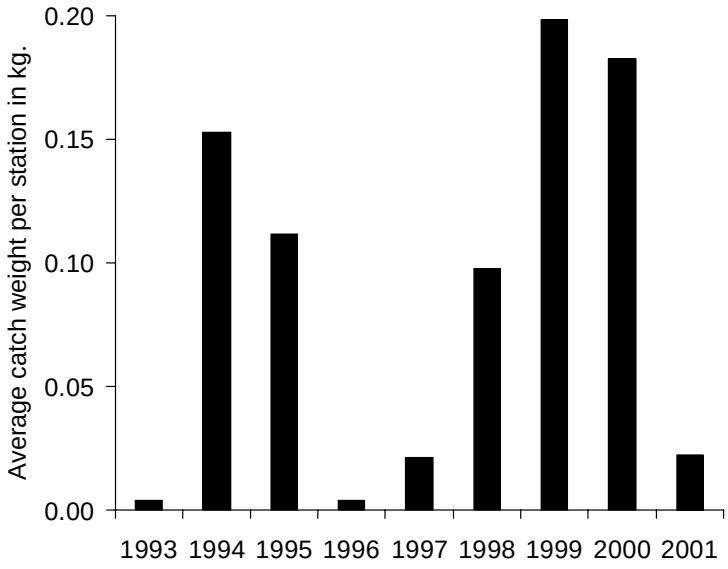
(c)



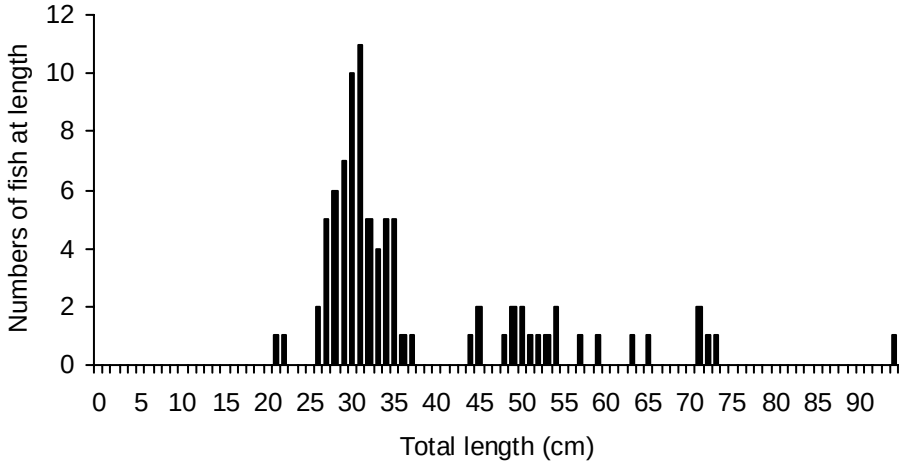
(a)


Depth (m)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
52°
51°
50°
6°
5°
4°
3°
2°
Key.
= No fish caught
= 2 fish caught

(b)

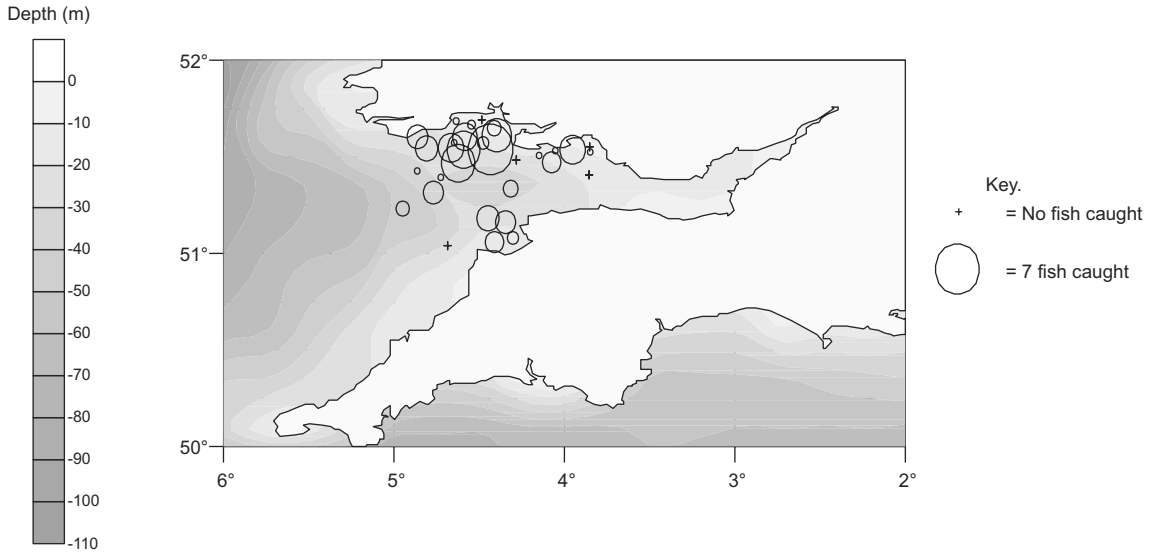

Average catch weight per station in kg.
0.20
0.15
0.10
0.05
0.00
1993 1994 1995 1996 1997 1998 1999 2000 2001

(c)

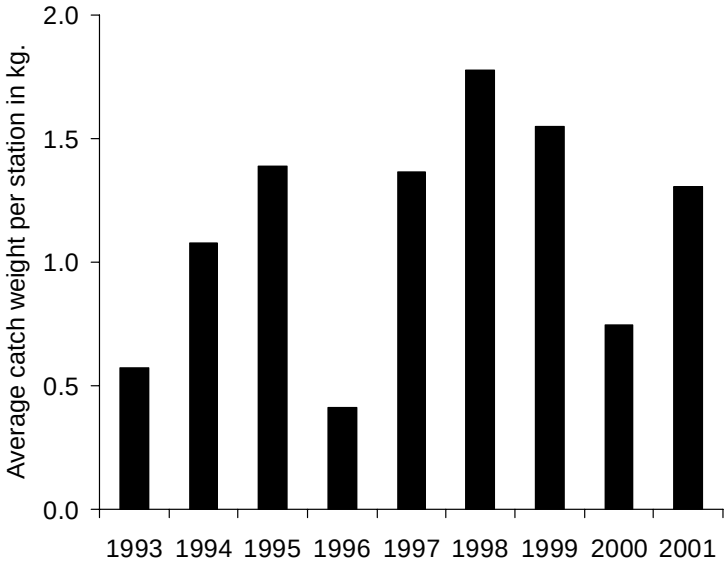

Numbers of fish at length
12
10
8
6
4
2
0
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90
Total length (cm)

Ray, painted - *Raja microocellata*

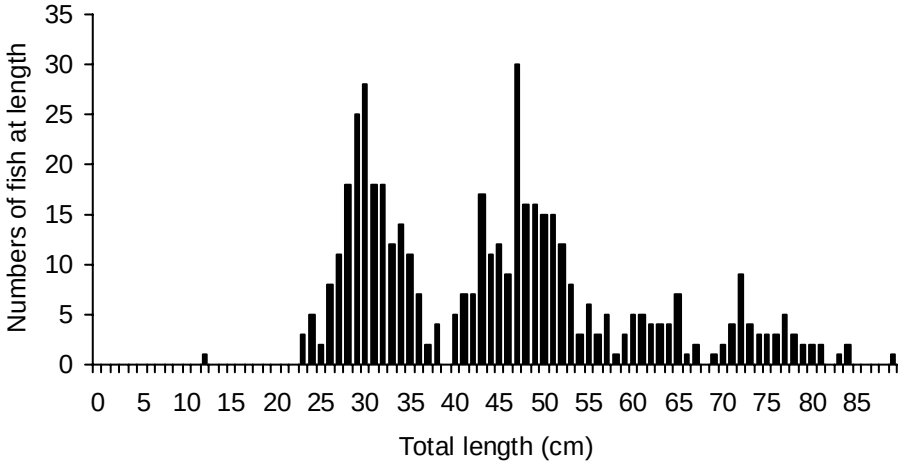
(a)



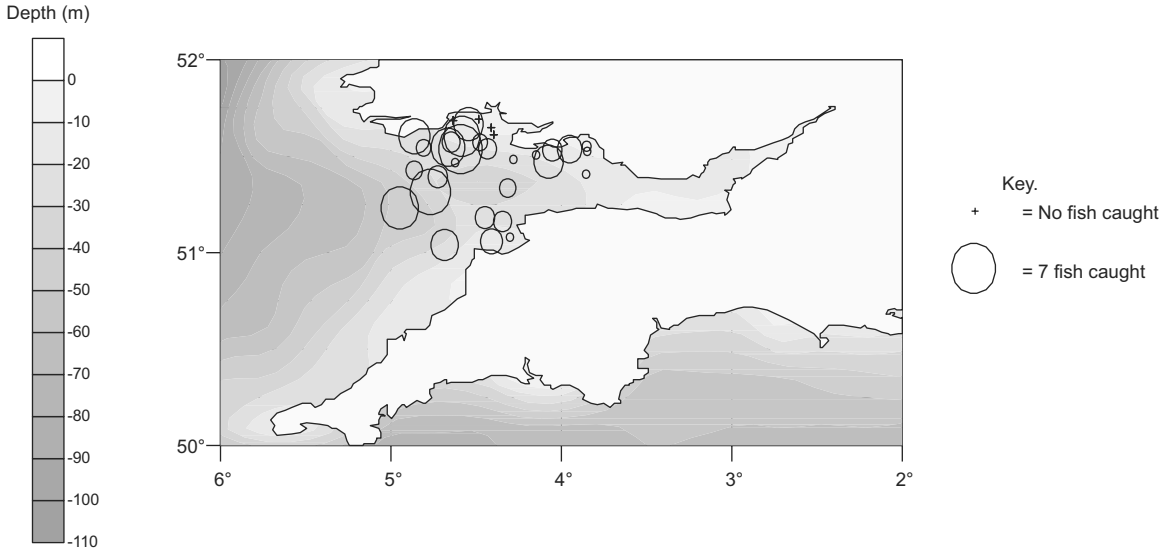
(b)



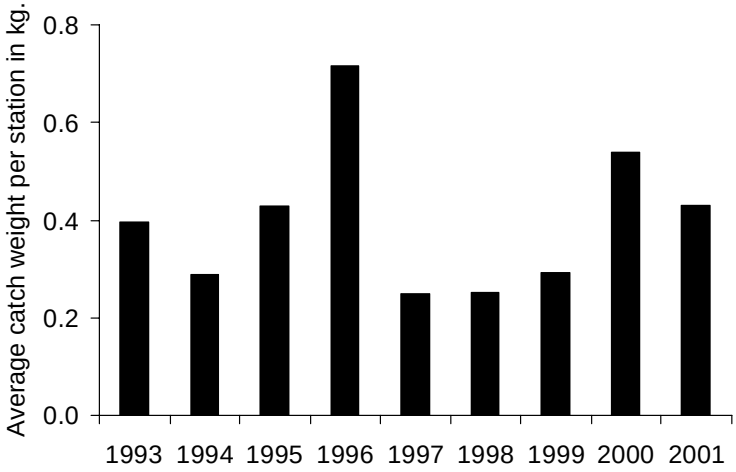
(c)



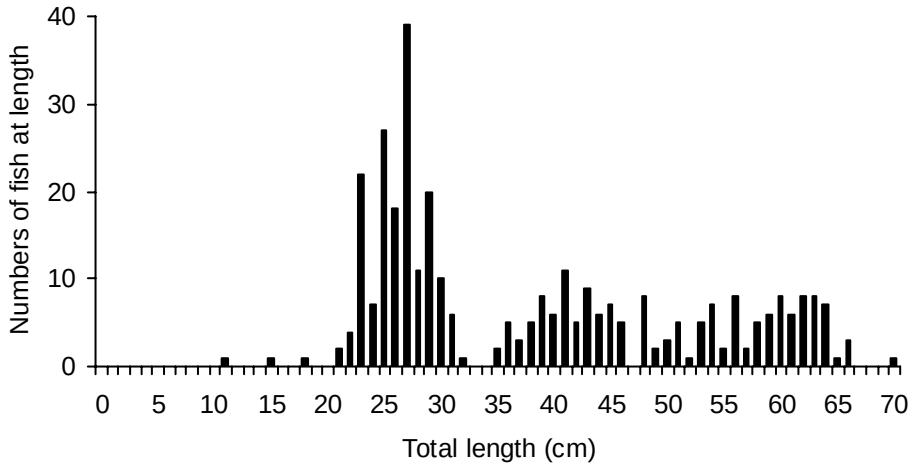
(a)


Depth (m)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
52°
51°
50°
6°
5°
4°
3°
2°
Key.
+ = No fish caught
= 7 fish caught

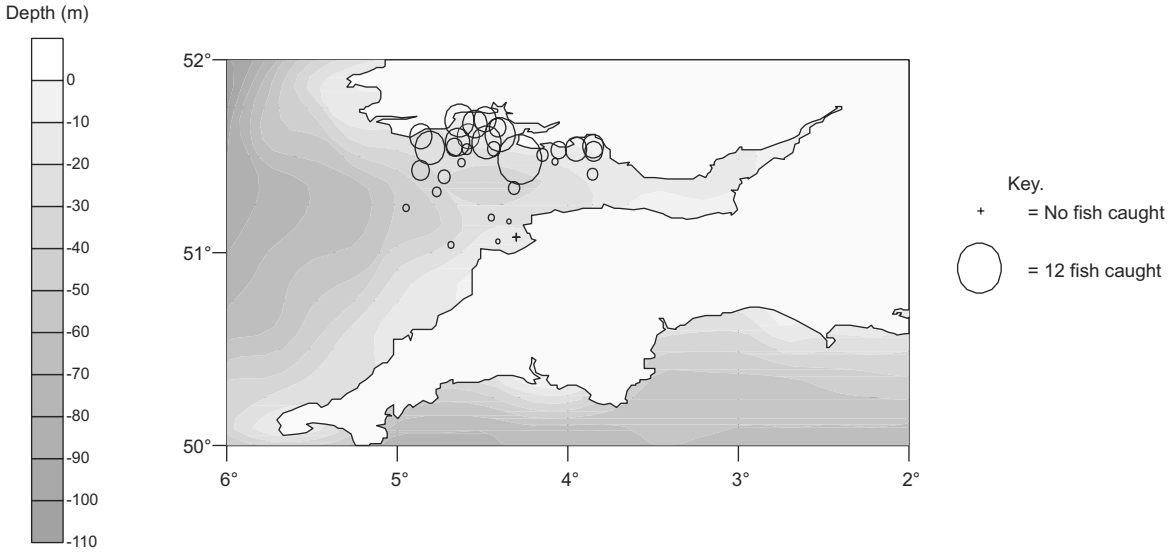
(b)


Average catch weight per station in kg.
0.0
0.2
0.4
0.6
0.8
1993 1994 1995 1996 1997 1998 1999 2000 2001

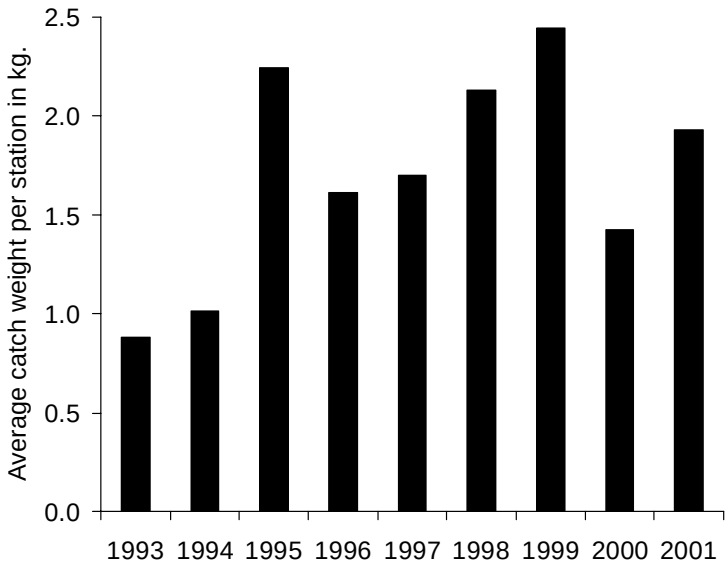
(c)


Numbers of fish at length
0
10
20
30
40
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70
Total length (cm)

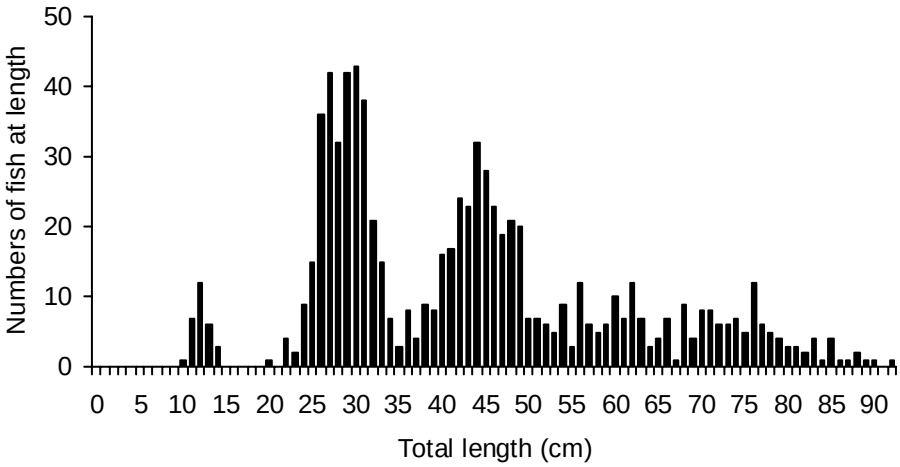
(a)


Depth (m)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
52°
51°
50°
6°
5°
4°
3°
2°
Key.
= No fish caught
= 12 fish caught

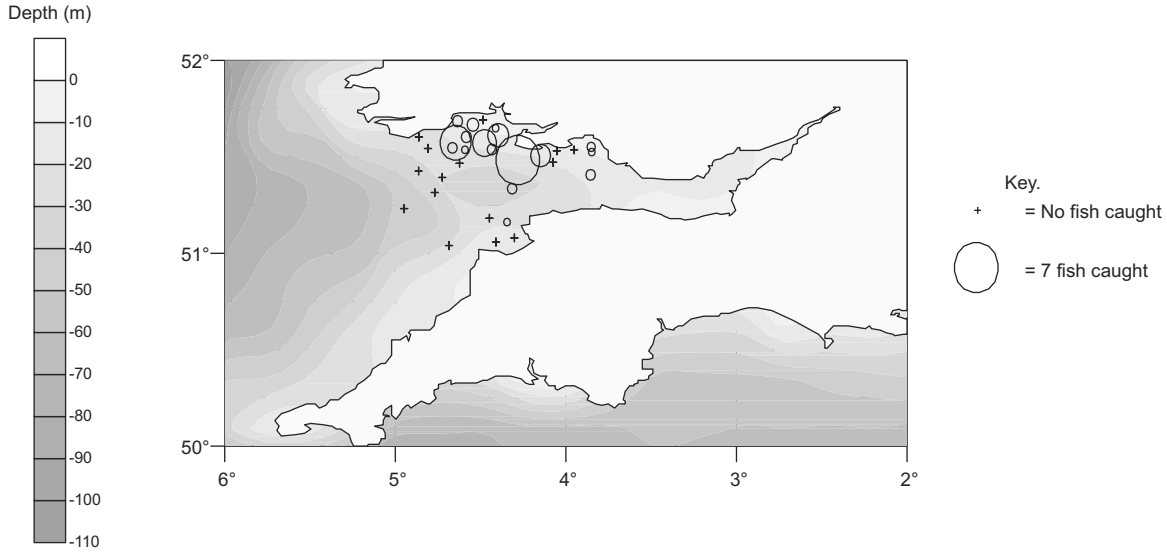
(b)


Average catch weight per station in kg.
2.5
2.0
1.5
1.0
0.5
0.0
1993 1994 1995 1996 1997 1998 1999 2000 2001

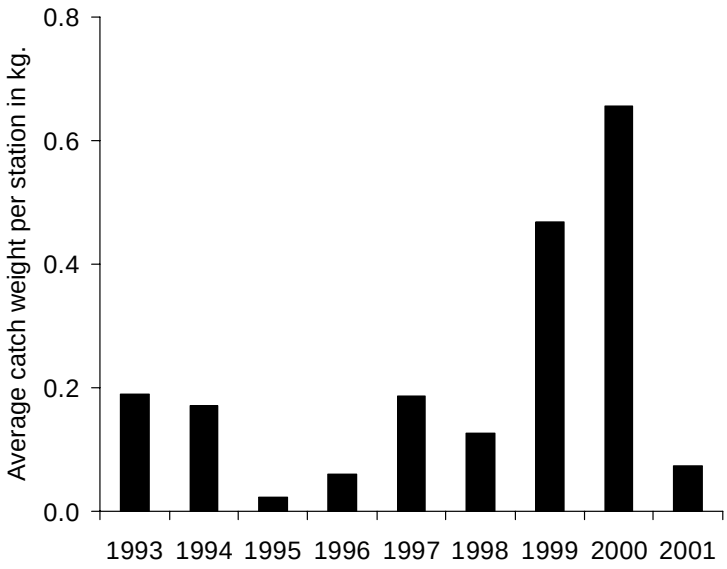
(c)


Numbers of fish at length
50
40
30
20
10
0
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90
Total length (cm)

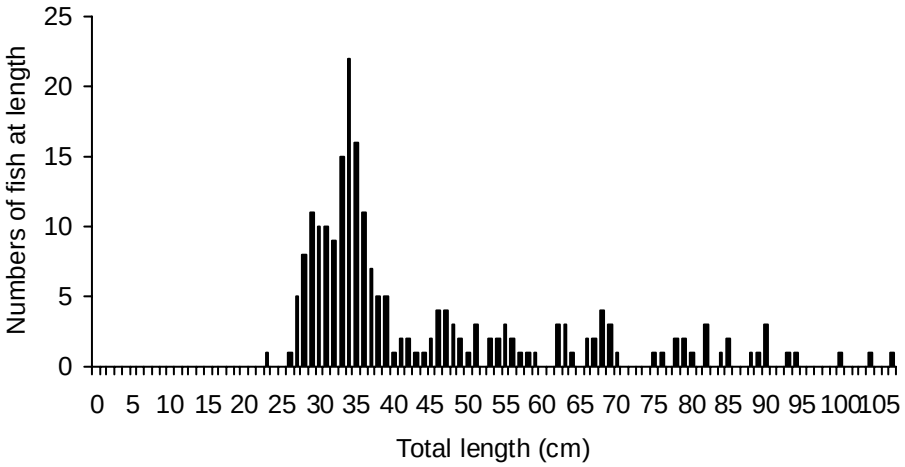
(a)


Depth (m)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
52°
51°
50°
6°
5°
4°
3°
2°
Key.
= No fish caught
= 7 fish caught

(b)

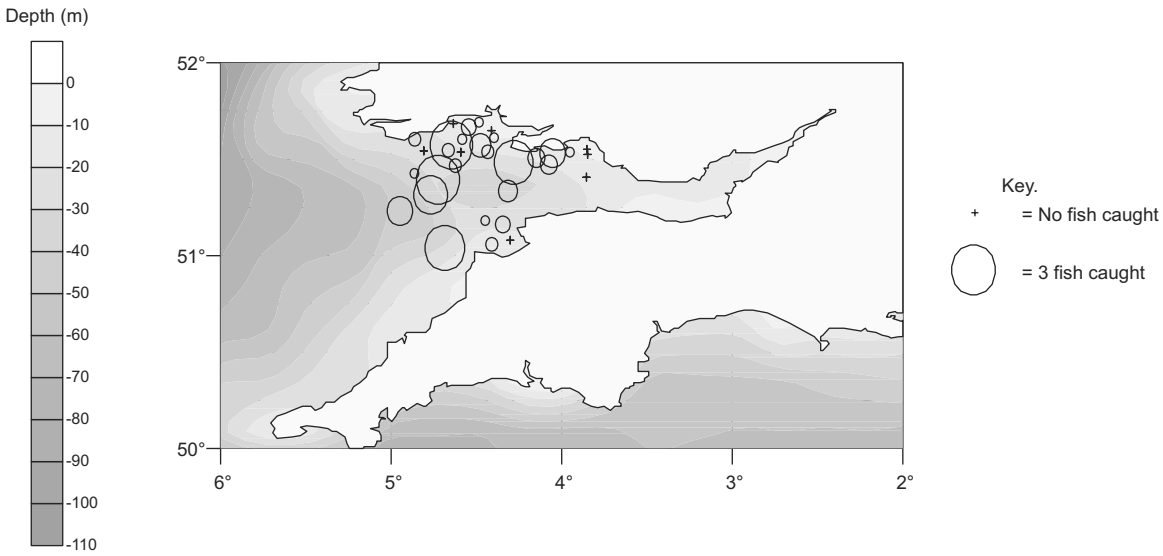

Average catch weight per station in kg.
0.0
0.2
0.4
0.6
0.8
1993 1994 1995 1996 1997 1998 1999 2000 2001

(c)

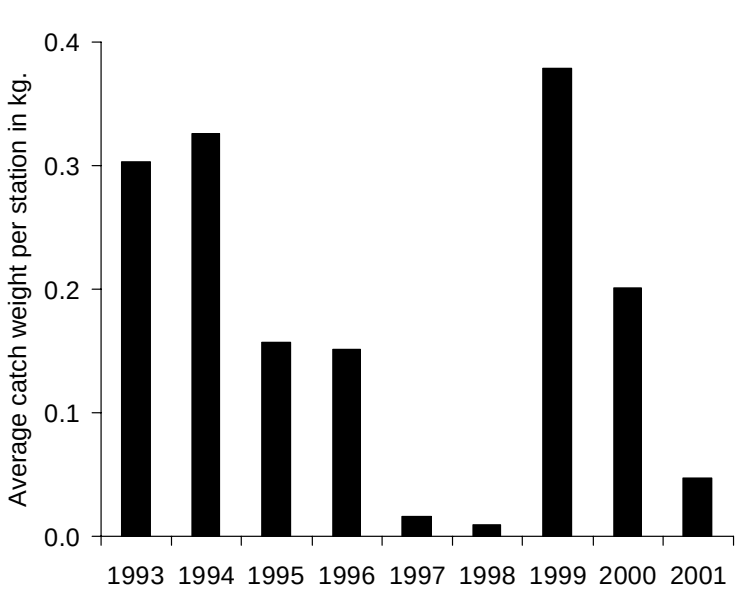

Numbers of fish at length
0
5
10
15
20
25
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105
Total length (cm)

Other fish species

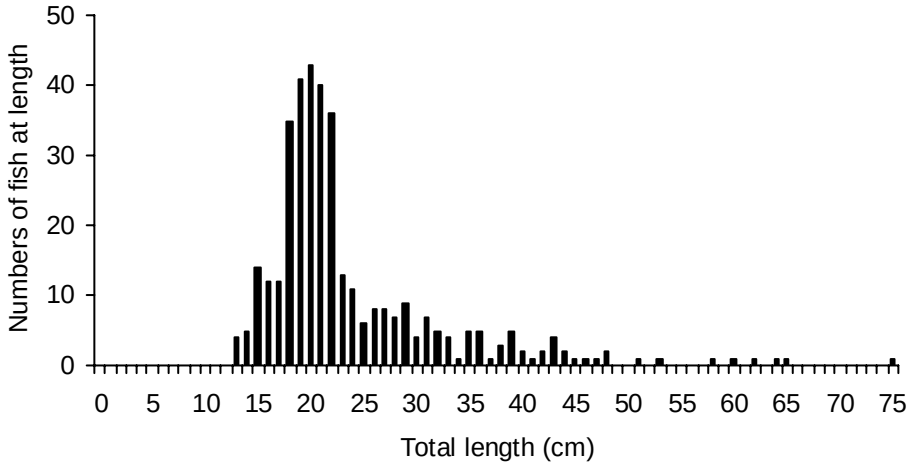
(a)


Depth (m)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
52°
51°
50°
6°
5°
4°
3°
2°
Key.
= No fish caught
= 3 fish caught

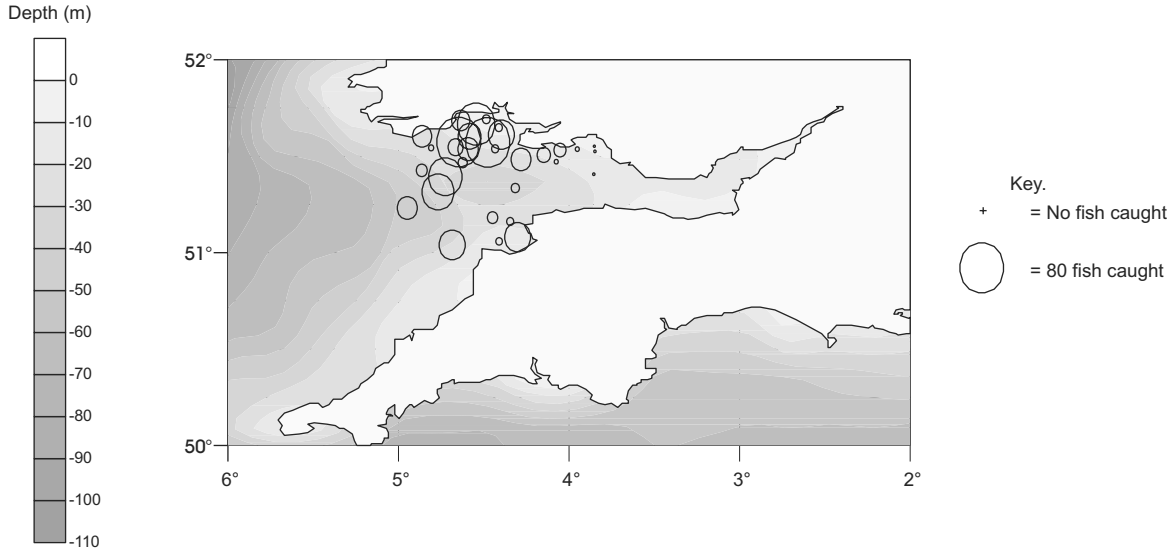
(b)


Average catch weight per station in kg.
0.4
0.3
0.2
0.1
0.0
1993 1994 1995 1996 1997 1998 1999 2000 2001

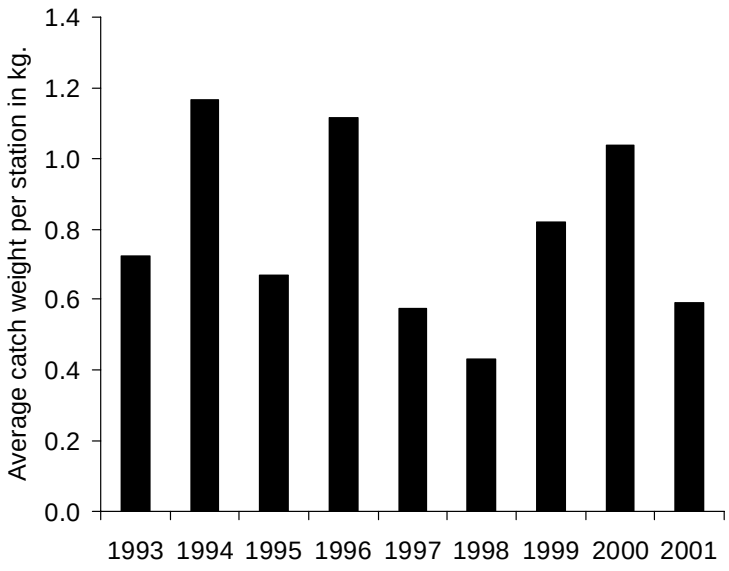
(c)


Numbers of fish at length
50
40
30
20
10
0
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75
Total length (cm)

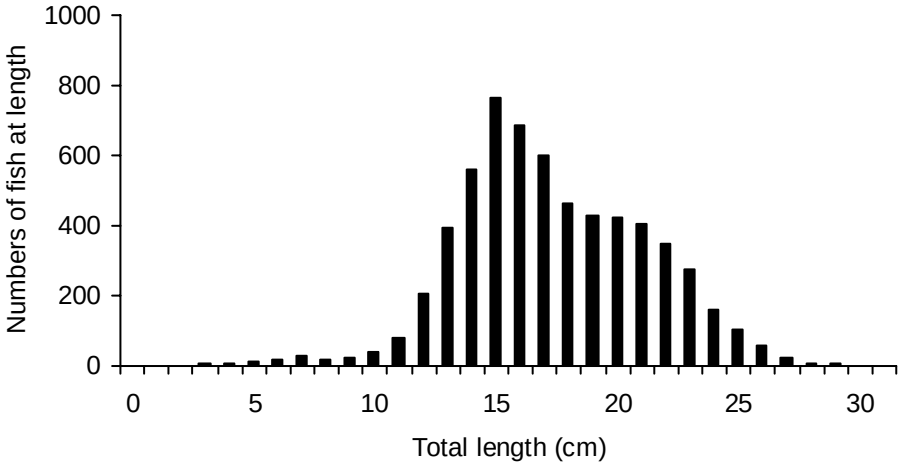
(a)


Depth (m)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
52°
51°
50°
6°
5°
4°
3°
2°
Key.
+ = No fish caught
= 80 fish caught

(b)

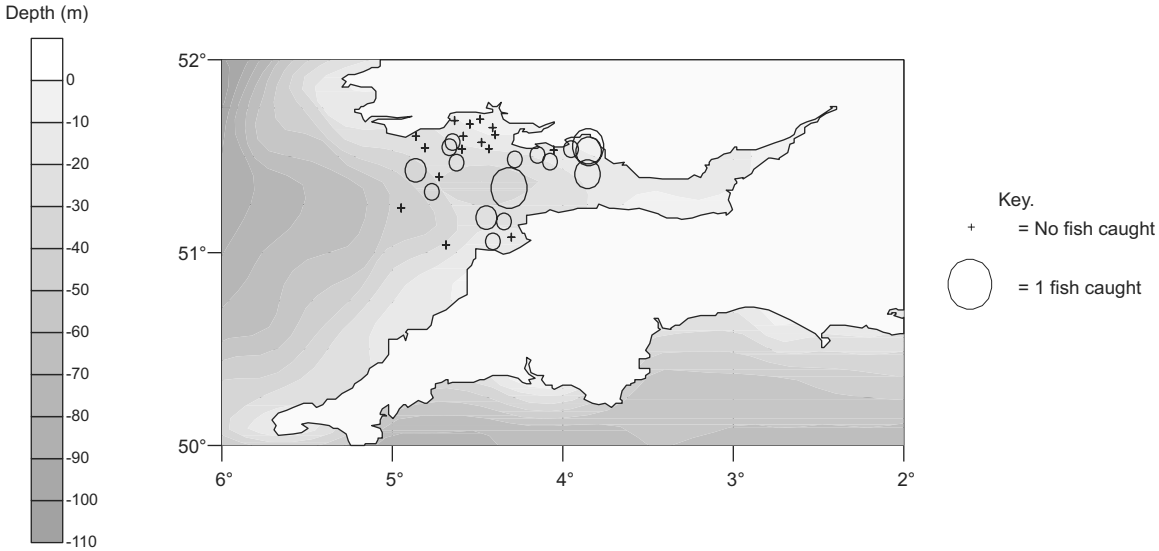

Average catch weight per station in kg.
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
1993 1994 1995 1996 1997 1998 1999 2000 2001

(c)

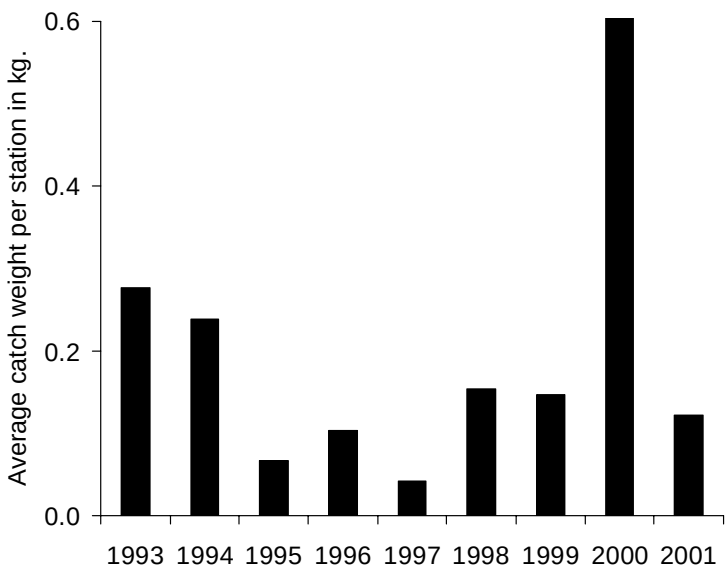

Numbers of fish at length
1000
800
600
400
200
0
0 5 10 15 20 25 30
Total length (cm)

Eel, conger - *Conger conger*

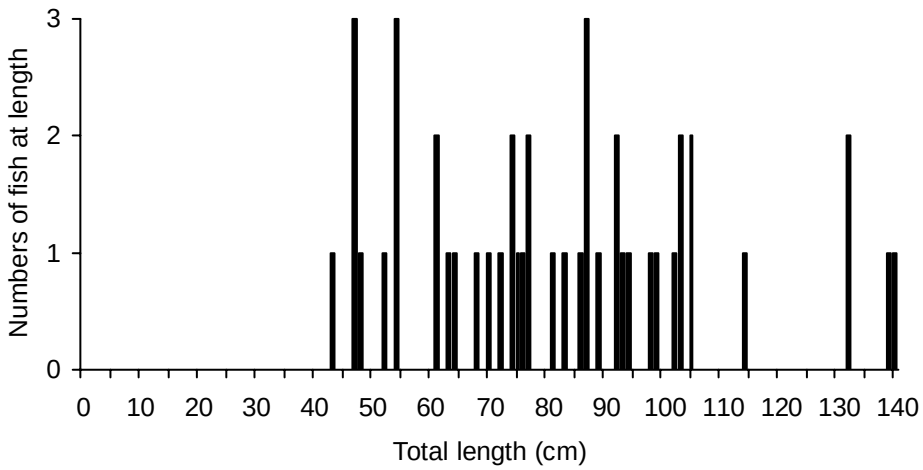
(a)



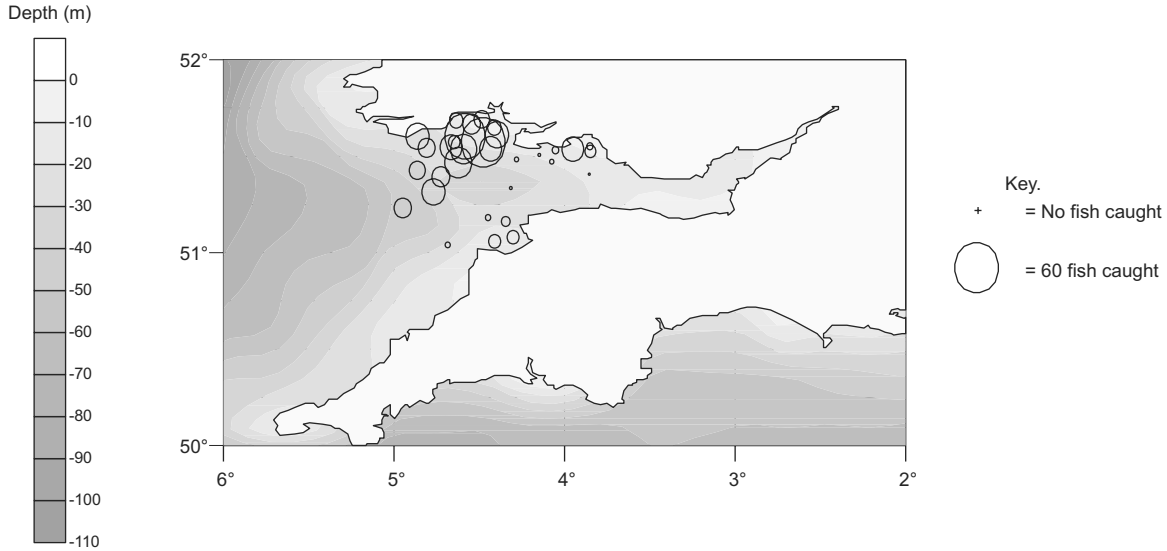
(b)



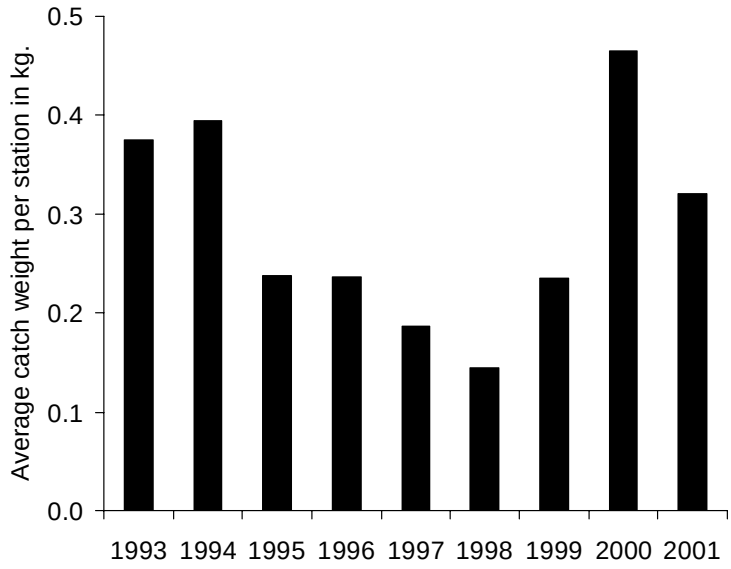
(c)



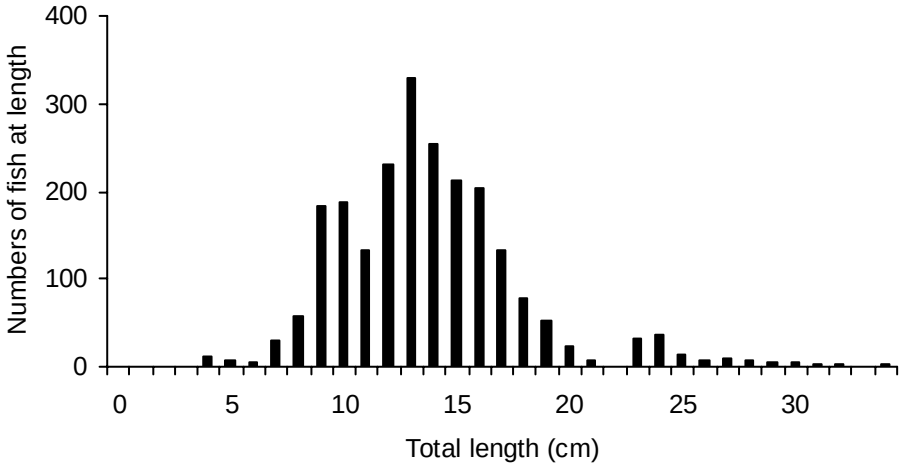
(a)


Depth (m)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
52°
51°
50°
6°
5°
4°
3°
2°
Key.
+ = No fish caught
= 60 fish caught

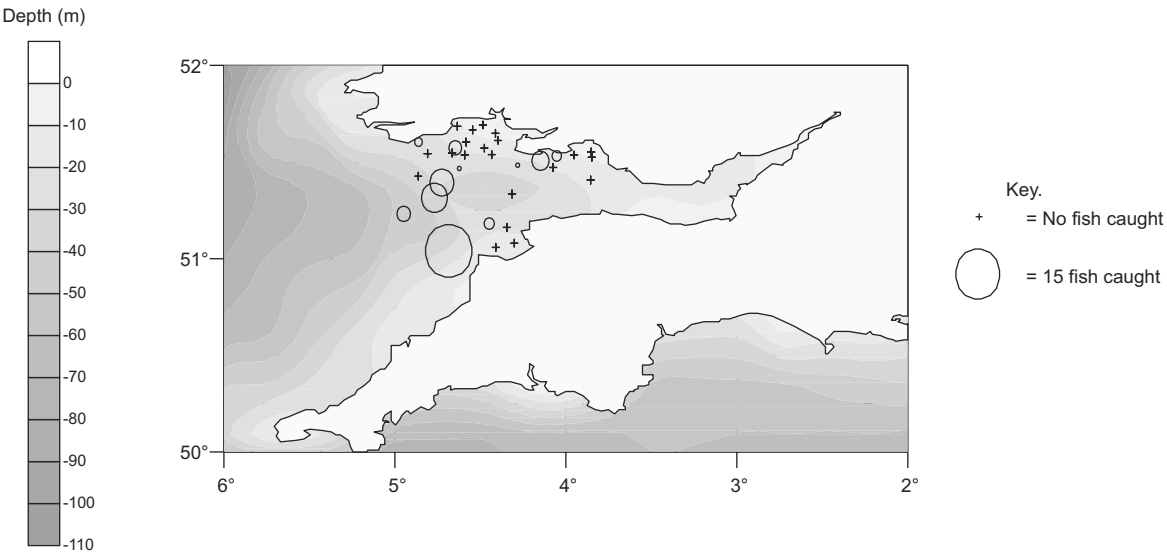
(b)


Average catch weight per station in kg.
0.5
0.4
0.3
0.2
0.1
0.0
1993 1994 1995 1996 1997 1998 1999 2000 2001

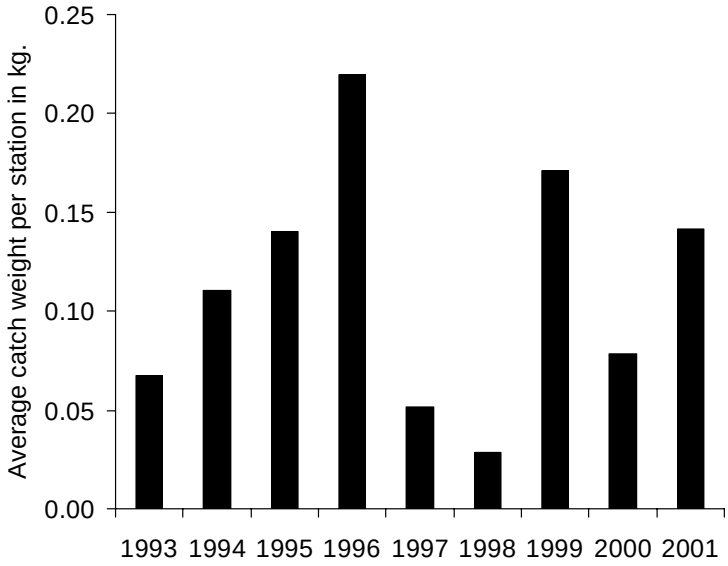
(c)


Numbers of fish at length
400
300
200
100
0
0 5 10 15 20 25 30
Total length (cm)

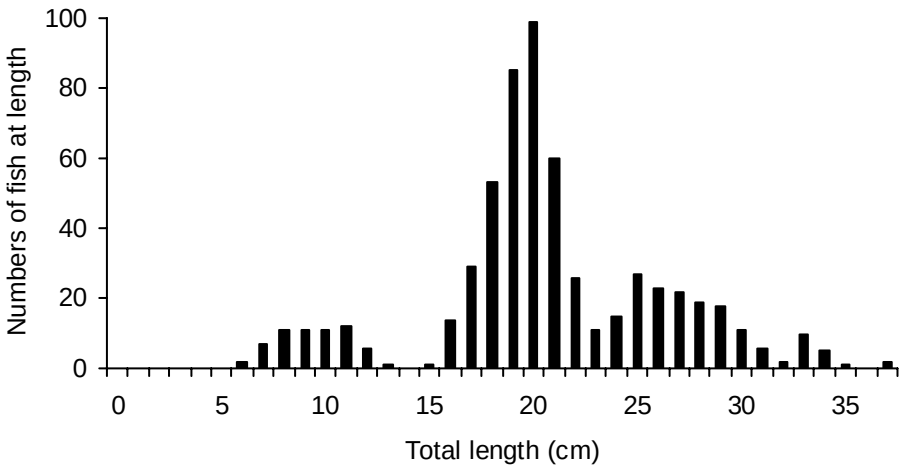
(a)


Depth (m)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
52°
51°
50°
6°
5°
4°
3°
2°
Key.
+ = No fish caught
= 15 fish caught

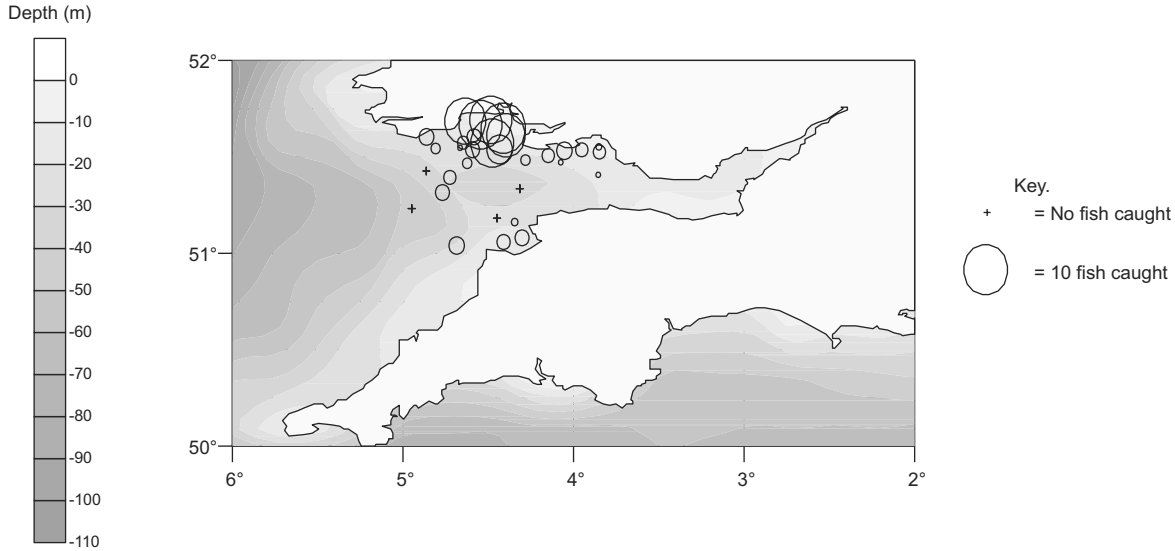
(b)


Average catch weight per station in kg.
0.25
0.20
0.15
0.10
0.05
0.00
1993 1994 1995 1996 1997 1998 1999 2000 2001

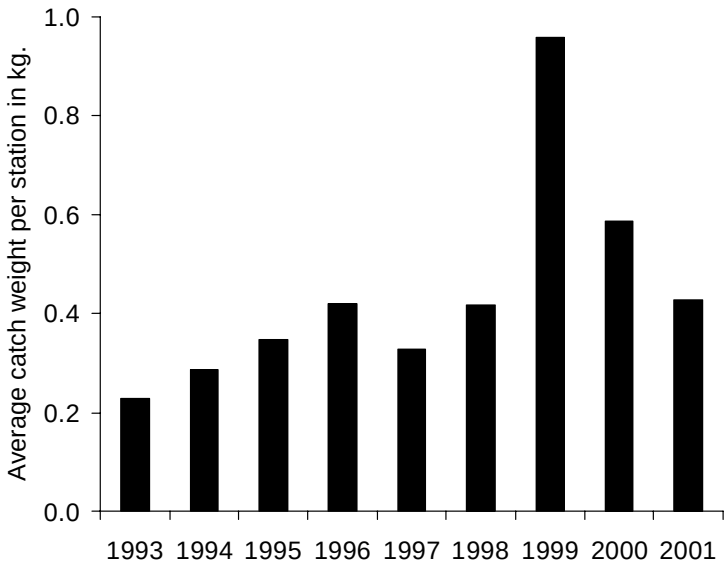
(c)


Numbers of fish at length
100
80
60
40
20
0
0 5 10 15 20 25 30 35
Total length (cm)

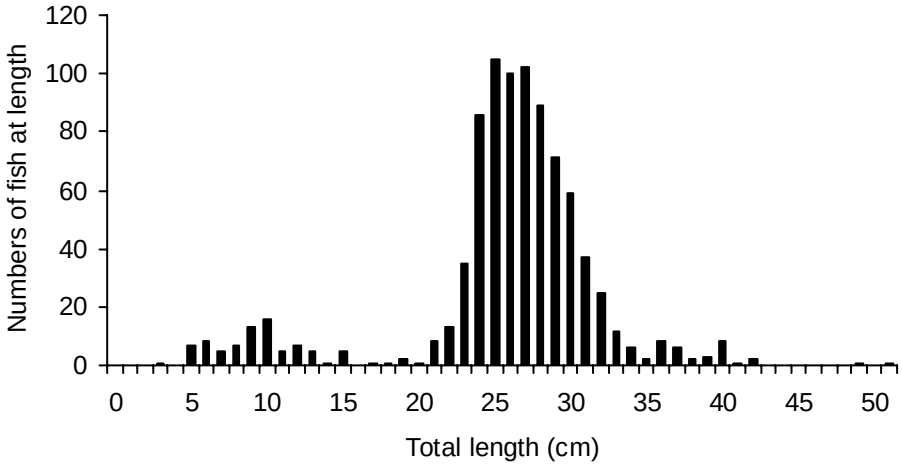
(a)


Depth (m)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
52°
51°
50°
6°
5°
4°
3°
2°
Key.
= No fish caught
= 10 fish caught

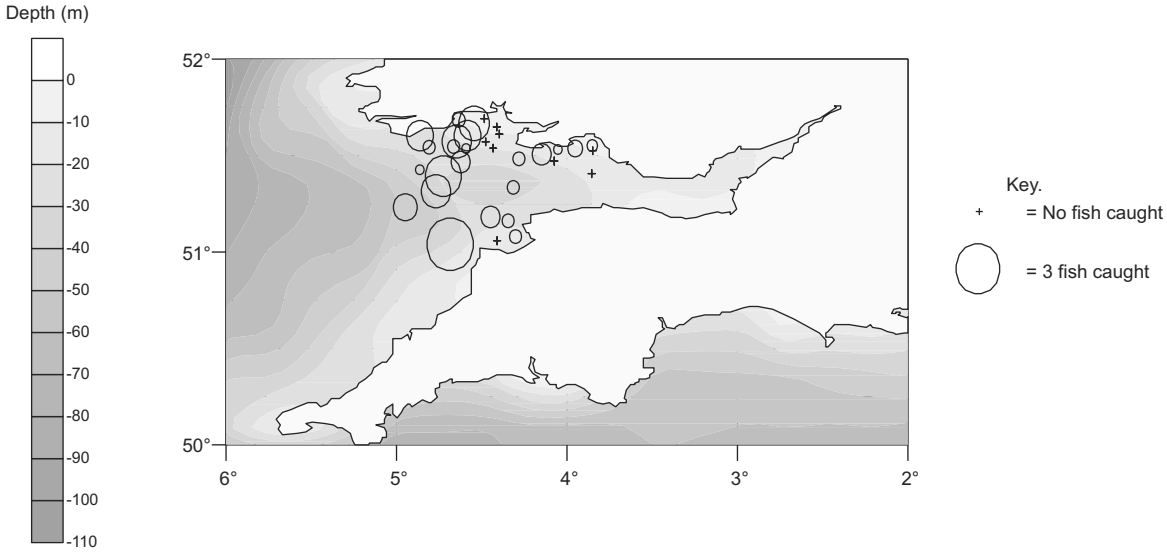
(b)


Average catch weight per station in kg.
1.0
0.8
0.6
0.4
0.2
0.0
1993 1994 1995 1996 1997 1998 1999 2000 2001

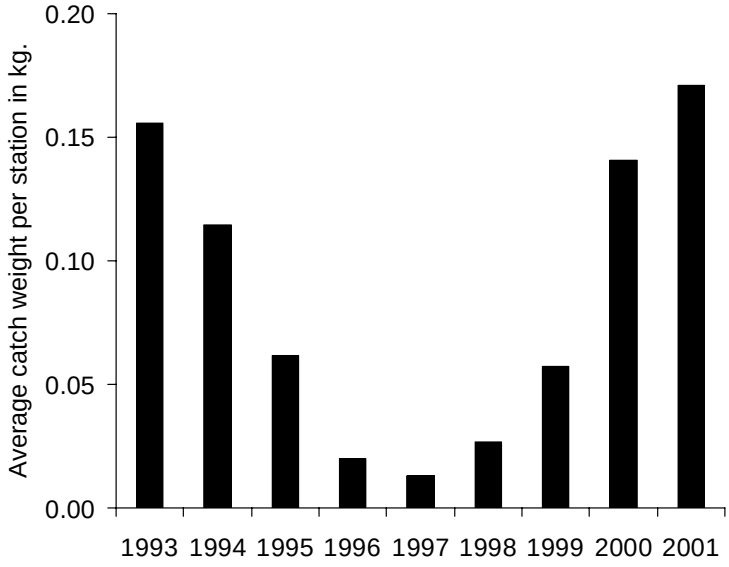
(c)


Numbers of fish at length
120
100
80
60
40
20
0
0 5 10 15 20 25 30 35 40 45 50
Total length (cm)

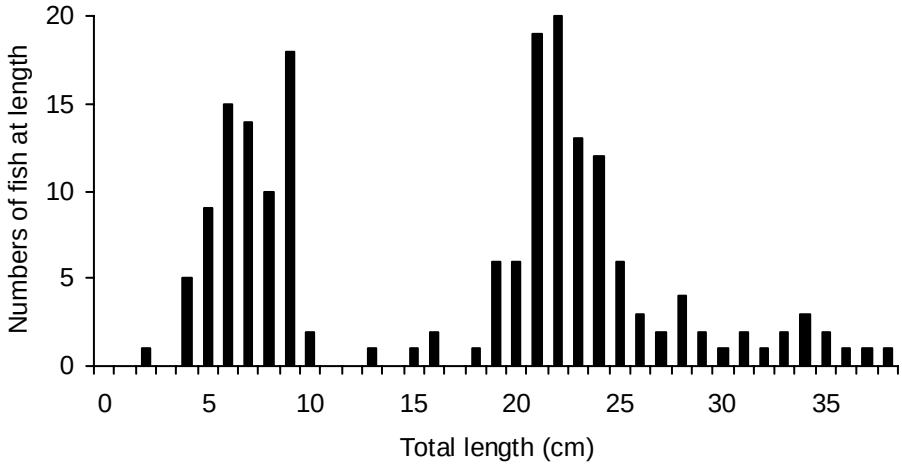
(a)


Depth (m)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
52°
51°
50°
6°
5°
4°
3°
2°
Key.
= No fish caught
= 3 fish caught

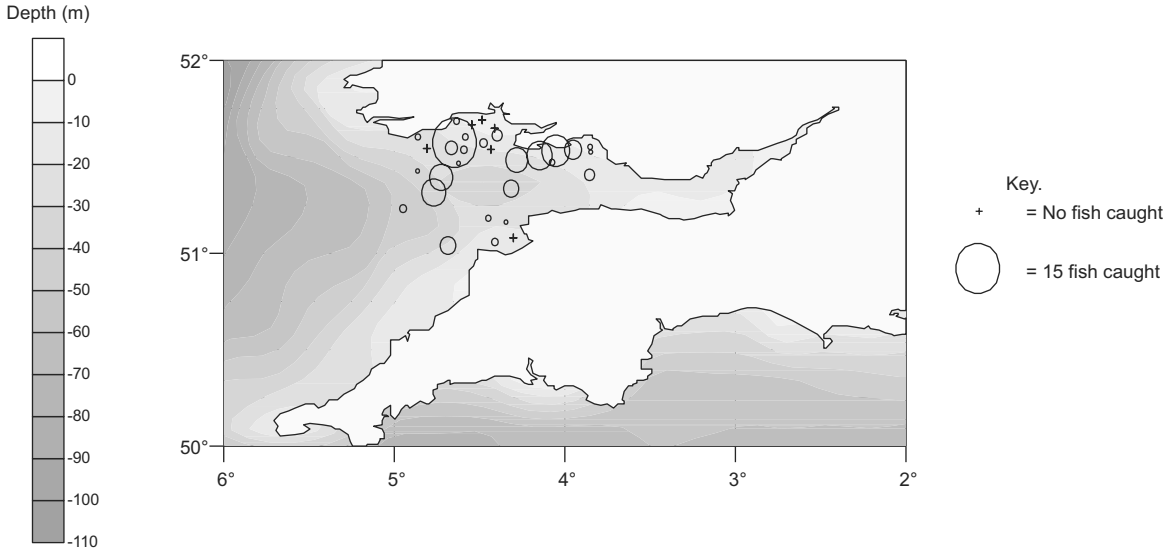
(b)


Average catch weight per station in kg.
0.20
0.15
0.10
0.05
0.00
1993 1994 1995 1996 1997 1998 1999 2000 2001

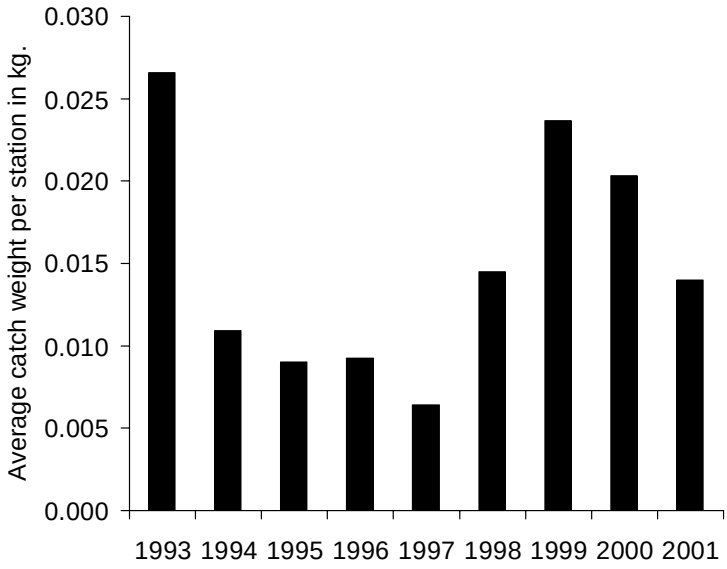
(c)


Numbers of fish at length
20
15
10
5
0
0 5 10 15 20 25 30 35
Total length (cm)

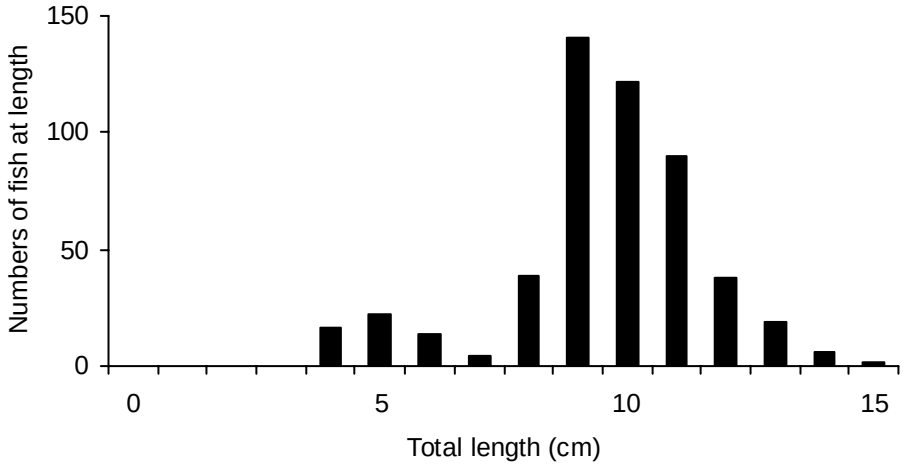
(a)


Depth (m)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
52°
51°
50°
6°
5°
4°
3°
2°
Key.
= No fish caught
= 15 fish caught

(b)

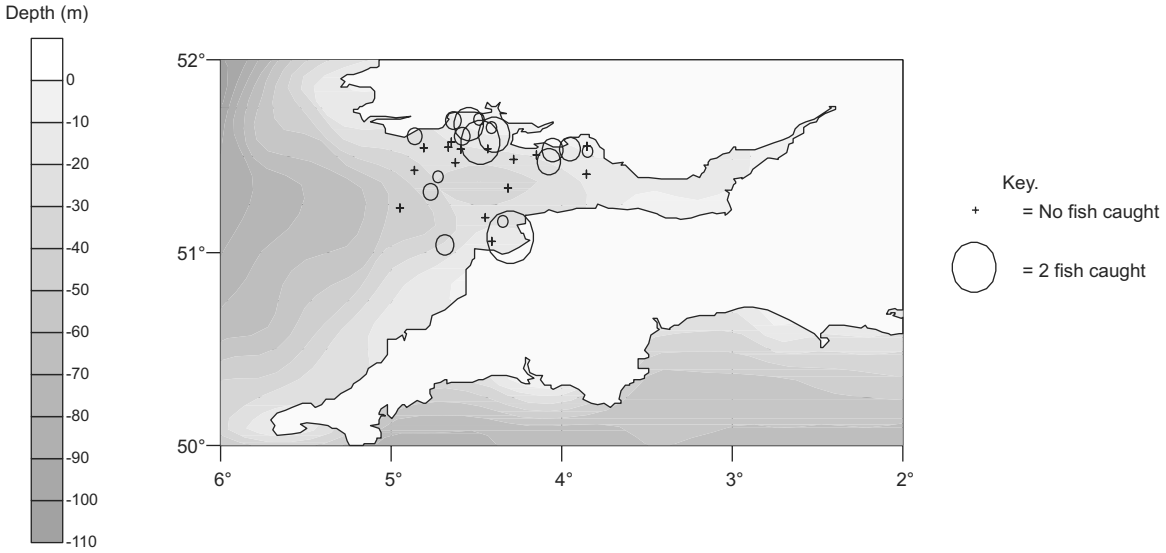

Average catch weight per station in kg.
0.030
0.025
0.020
0.015
0.010
0.005
0.000
1993 1994 1995 1996 1997 1998 1999 2000 2001

(c)

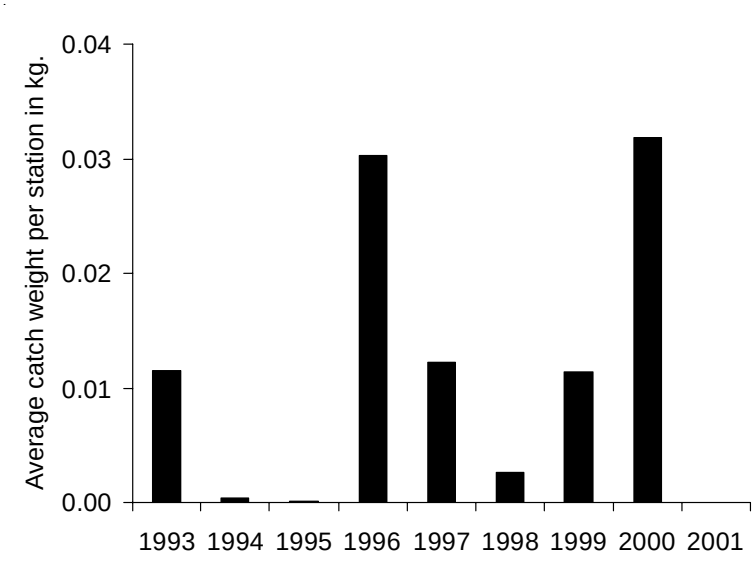

Numbers of fish at length
150
100
50
0
0
5
10
15
Total length (cm)

Red mullet - *Mullus surmuletus*

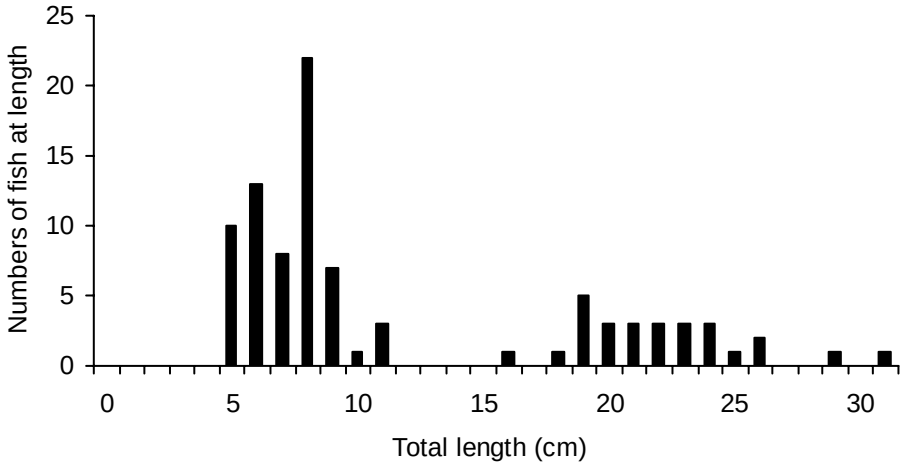
(a)



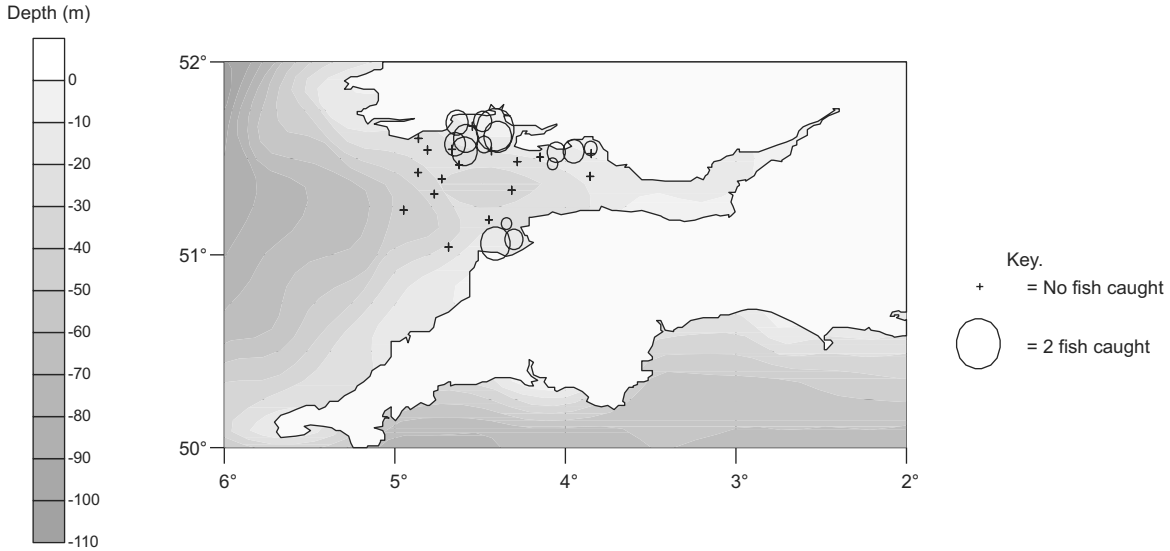
(b)



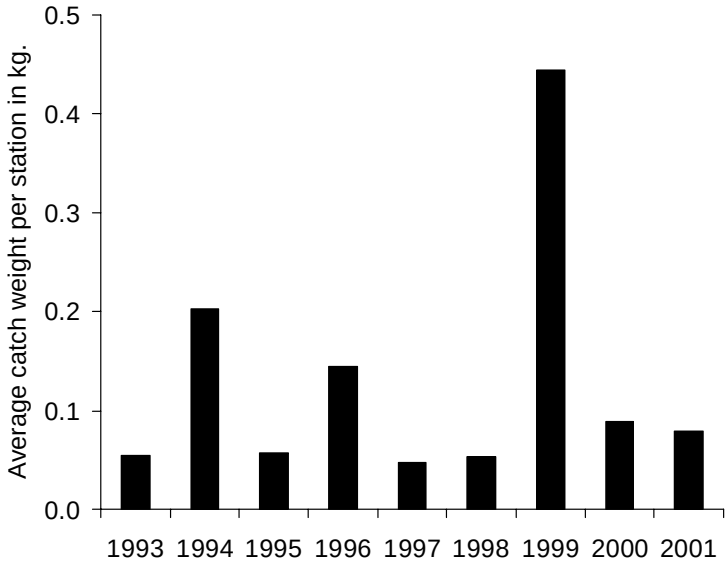
(c)



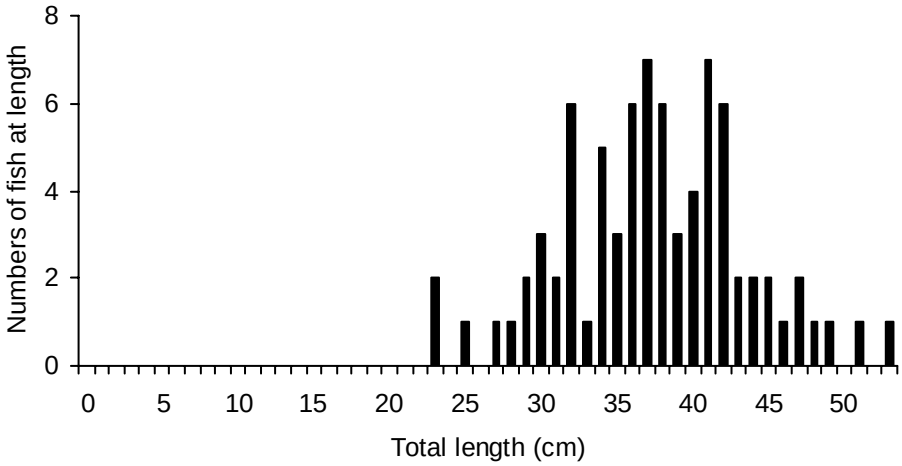
(a)


Depth (m)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
52°
51°
50°
6°
5°
4°
3°
2°
Key.
+ = No fish caught
= 2 fish caught

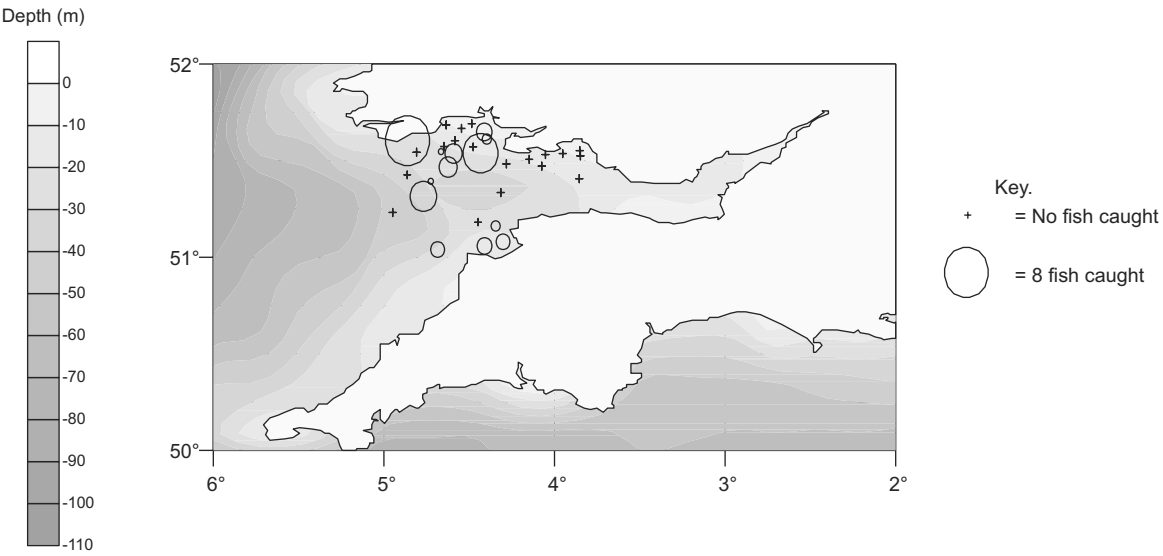
(b)


Average catch weight per station in kg.
0.5
0.4
0.3
0.2
0.1
0.0
1993 1994 1995 1996 1997 1998 1999 2000 2001

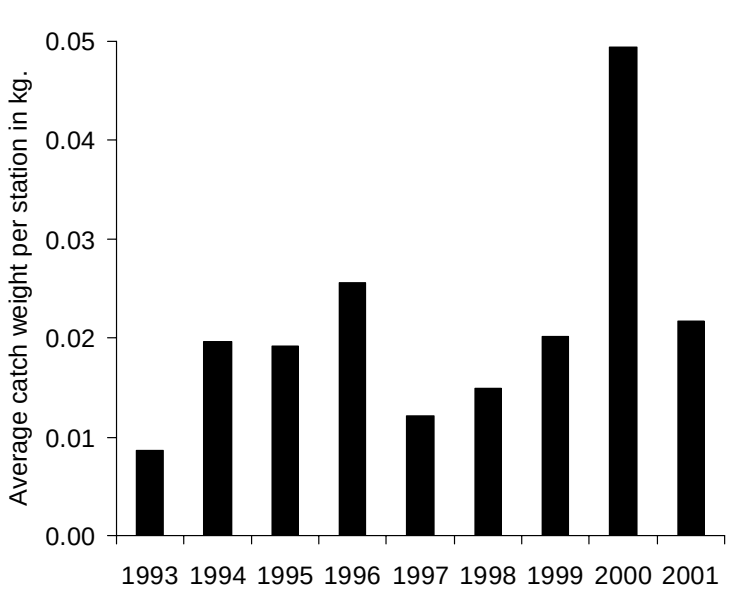
(c)


Numbers of fish at length
8
6
4
2
0
0 5 10 15 20 25 30 35 40 45 50
Total length (cm)

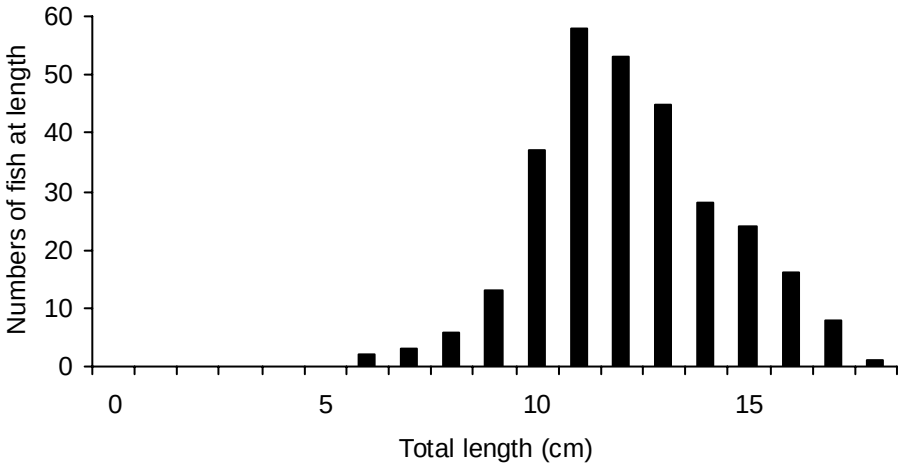
(a)


Depth (m)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
52°
51°
50°
6°
5°
4°
3°
2°
Key.
= No fish caught
= 8 fish caught

(b)


Average catch weight per station in kg.
0.05
0.04
0.03
0.02
0.01
0.00
1993 1994 1995 1996 1997 1998 1999 2000 2001

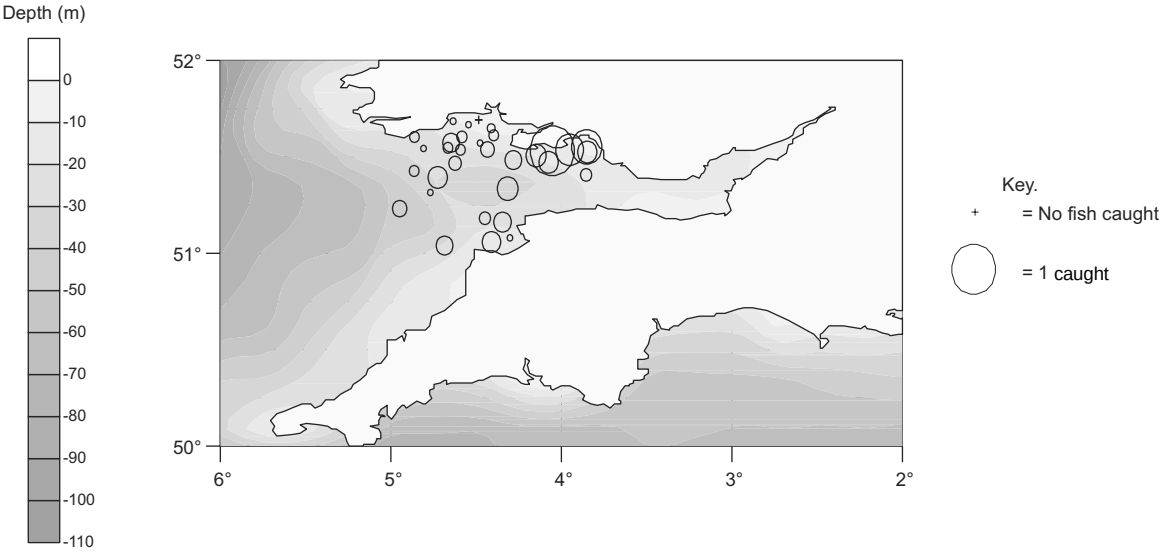
(c)


Numbers of fish at length
60
50
40
30
20
10
0
0
5
10
15
Total length (cm)

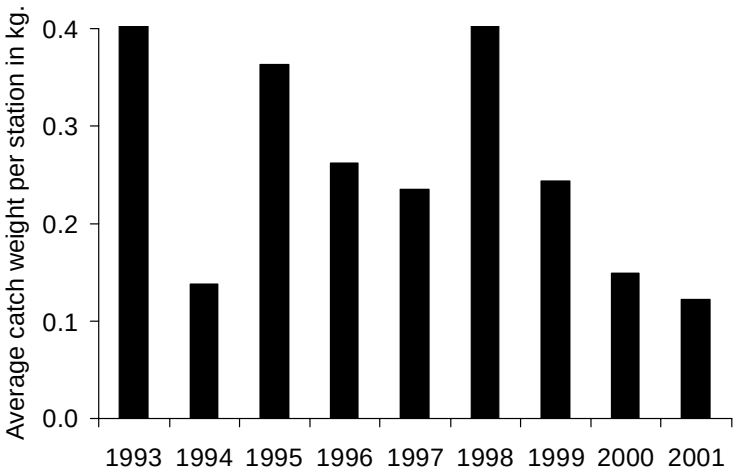
Invertebrate species

Edible crab - *Cancer pagurus*

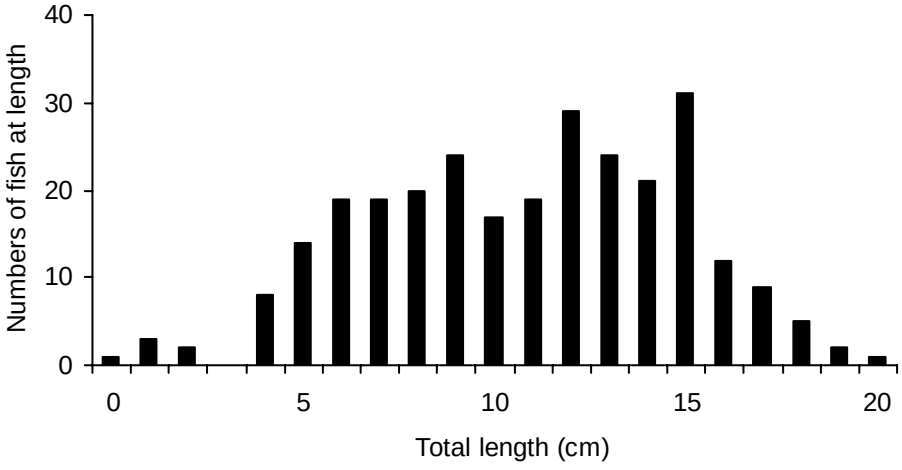
(a)



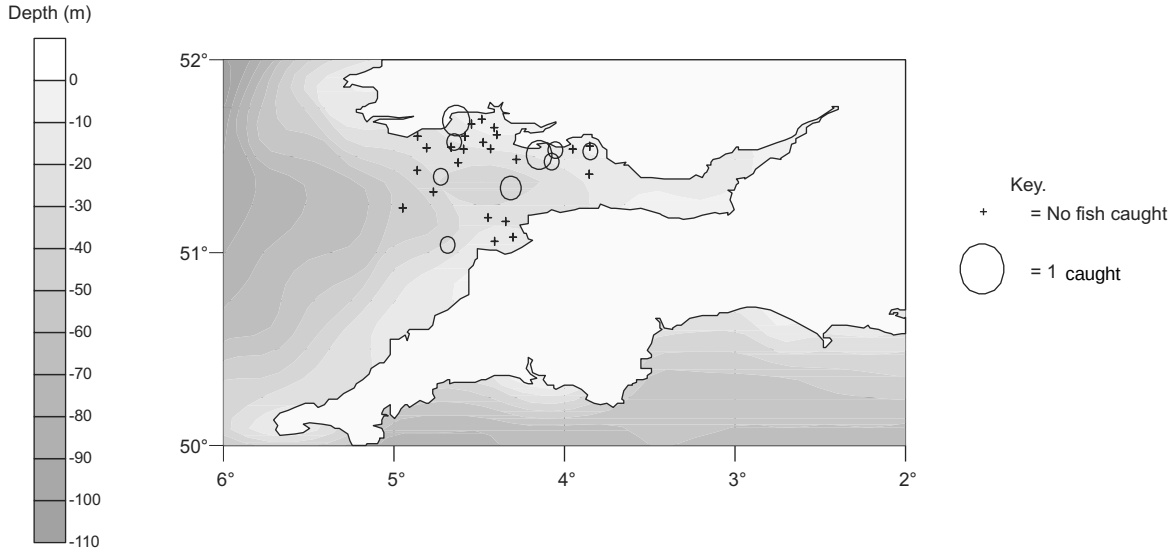
(b)



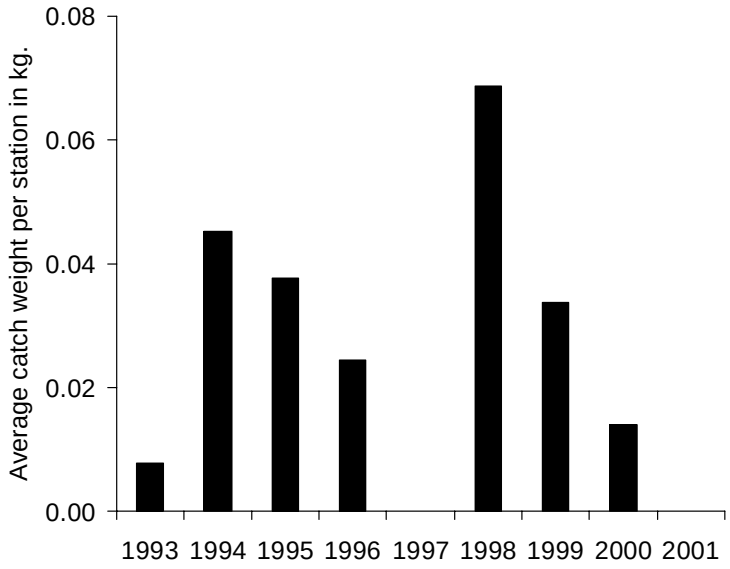
(c)



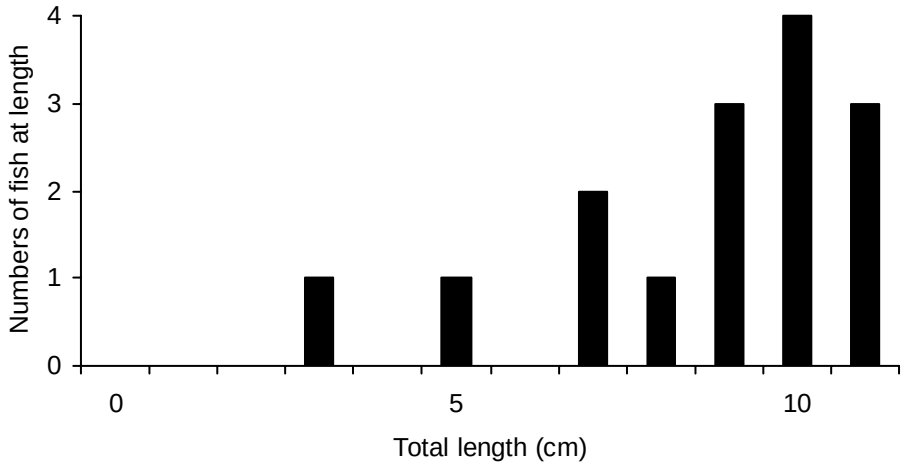
(a)


Depth (m)
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
52°
51°
50°
6°
5°
4°
3°
2°
Key.
= No fish caught
= 1 caught

(b)


Average catch weight per station in kg.
0.08
0.06
0.04
0.02
0.00
1993 1994 1995 1996 1997 1998 1999 2000 2001

(c)


Numbers of fish at length
4
3
2
1
0
0
5
10
Total length (cm)

CEFAS
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Distribution and relative abundance of demersal fishes from beam trawl surveys in the Bristol Channel (ICES division VIIf) 1993-2001

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