Northwest Atlantic Fisheries Organization

Serial No. N3017 NAFO SCR Doc. 98/30

SCIENTIFIC COUNCIL MEETING - JUNE 1998

Results from Bottom Trawl Survey of Flemish Cap in July 1997

by

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INTRODUCTION

The survey of Flemish Cap was carried out in 1997 on board R/V Cornide de Saavedra. A synoptic sheet of the survey with ship and gear characteristics is shown in Table 1. This was the tenth survey of the series initiated by the EU in 1988. Dates of the previous survey were:

year	vessel	valid tows	dates
1988	Cornide de Saavedra	115	8/7 -22/7
1989	Cryos	116	12/7 - 1/8
1990	Ignat Pavlyuchenkov	113	18/7 - 6/8
1991	Cornide de Saavedra	117	24/6 -11/7
1992	Cornide de Saavedra	117	29/6 -18/7
1993	Cornide de Saavedra	101	23/6 - 8/7
1994	Cornide de Saavedra	116	6/7 -23/7
1995	Cornide de Saavedra	121	2/7 -19/7
1996	Cornide de Saavedra	117	28/0 -14/7
1997	Cornide de Saavedra	117	16/7 - 1/8

All survey had a stratified random design following NAFO specifications (Doubleday, 1981).

A total of 117 valid bottom trawl were made up to a depth of 720 metres (400 fathoms) (Figure 1). The survey covered adequately all strata of the bank.

Total biomass of all species was calculated by the swept area method. The results are presented in Table 2, as well as in the table bellow. Those amounts are assumed to underestimate real values but in different degrees, as a consequence of each species having a peculiar catchability and accessibility to bottom gears. In this framework, the total biomass estimated for 1995 has the minimum value of all the series. Redfish shows the highest annual variability due to probably its pelagic habitat, making accessibility to bottom gears to change more often than demersal or benthic species. American plaice, skates, the genus Urophicis and witch flounder reached a biomass minimum in 1997. Greenland halibut was the single species that reached a maximum in 1997.

RESULTS

Total biomass of main species on the bank, estimates by the swept area method were:

species	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
cod	37127	103644	55360	36597	24295	55642	24062	8815	8196	9063
American plaice	11886	10533	9101	7565	6492	5949	6173	5087	3073	2268
redfish	158417	136658	104194	63845	104477	62589	126010	73640	100543	139241
Greenland halibut	6818	4391	5649	8038	8588	7210	7904	10705	11409	15846
roughhead grenadier	2390	1024	996	1587	1817	3757	2350	1855	1619	1425
shrimp	2164	1923	2139	8211	16531	9163	3337	5413	6502	5096

tons

Cod

Mean catch by strata and whole bank data and their standard error are presented in Table 3. Biomass estimated by the swept area method by strata and its comparison

with results of previous surveys are presented in Table 4. Global data compared with Russian survey results are:

year	EU(1)	Russia:(2)	(3)
1983		23,070	
1984		31,210	
1985		28,070	
1986		26,060	
1987		10,150	21,600
1988	37,127	7,720	34,200
1989	103,644	36,520	78,300
1990	55,360	3,920	15,200
1991	36,597	6,740	8,200
1992	24,295	2,490	2,400
1993	55,642	8,990	9,700
1994	24,062	-	-
1995	8,815	8,260	-
1996	8,196	730	-
1997	9,063	-	-

tons

1) Biomass estimated from bottom trawl survey.
2) Biomass estimated from bottom trawl survey (Kiseleva and Vaskov 1994; Kiseleva 1996, 1997).
3) Biomass estimated of bottom trawlable plus pelagic biomass (Borovkov et al. 1993; Kiseleva and Vaskov 1994).

The calculated abundance (x 10000) by age-groups is shown in the following table.

age	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	
1 -	458	2418	237	13780	7118	438	315	155	4	4	
2 -	7196	6062	1179	2560	3706	13274	385	1137	297	14	
3 -	4037	6964	467	1538	475	2852	2459	123	613	315	
4 -	1085	2819	1588	193	203	102	456	361	82	436	
5 -	128	227	1453	628	33	127	12	90	225	36	
6 -	22	33	394	168	127	17	6	1	19	90	
7 -	28	12	32	31	21	50		2	1	2	
8 -	11	7	13	7	1	10	12		1		
9 -		1	8	4				1			
10 -			3	1			1	1			
11 -				2	1						
12 -										1	
total	12965	18543	5374	18906	11685	16870	3646	1873	1240	898	
Biomass	37127	103644	55360	36597	24295	55642	24062	8815	8196	9063	tons
SOP *)	33474	100217	51388	37231	22734	54945	22867	8841	8138	8873	tons

*) SOP = Sum of products: back calculation of biomass as sum of products of frequencies and mean weight at age.

The 1990 year-class was the more abundant one observed at age 1, but its importance did not maintained in the following years, after recruitment; it seems indicate that its abundance was overestimated in 1991 survey. The 1991 year-class, the more abundant one at age 2, was the more important of last years, but its abundance decreased quickly as a consequence of an intense fishery on ages 2 and 3 during year 1993 and 1994. Among most recent year-classes, those of 1993 and 1994 (ages 4 and 3 in 1997) were among weaker ones observed in the previous period. The 1995 year-class (age 2 in 1997) failed almost completely and, according to the results of the present survey, the same failure seems to be happened to the 1996 year-class (age 1 in 1997).

Tables 5, 6 and 7 show length frequency, age-length key and estimated age composition of the stock in 1997 respectively. Catch per tow distribution is presented in Figure 2.

American plaice

Mean catch by strata and whole bank data and its standard error are presented in Table 8. Biomass estimated by swept area method by strata and its comparison with results of previous surveys are presented in Table 9. Total biomass in comparison with Russian survey results is:

year	EU	Russia (1)
1983		8,900
1984		7,500
1985		7,800
1986		20,200
1987		9,300
1988	11,887	6,500
1989	10,533	5,000
1990	9,101	1,200
1991	7,565	14,400
1992	6,492	1,200
1993	5,949	2,700
1994	6,173	-
1995	5,087	-
1996	3,073	-
1997	2,268	-

tons

1) Rikhter et al. 1991; Borovkov et al. 1992, 1993, 1994

The abundance (x 1000) by age-groups is presented in the following table.

age	year: 1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
1	-	-	-	-	-	-	-	-	-	7
2	2284	454	359	309	736	9	34	19	28	14
3	625	6847	775	911	679	1365	40	99	103	96
4	3034	1500	7083	1877	910	969	1789	627	222	22
5	1975	3238	897	4461	1471	643	782	1620	465	99
6	3020	3006	2475	1836	3423	320	651	990	1236	311
7	4154	2868	1717	2009	913	3110	703	988	656	901
8	4258	1691	1657	1566	1090	339	2487	665	411	200
9	1492	587	1030	675	624	592	243	1132	308	312
10	207	261	485	232	289	296	480	128	470	223
11	109	34	90	8	138	198	166	143	113	372
12	61	14	15	48	74	229	164	119	63	103
13	-	-	31	-	16	280	195	119	67	19
14	-	-	17	-	-	865	398	241	90	77
15	-	-	-	-	-	28	397	183	62	38
16	-	-	-	-	-	35	9	27	20	92
total	21219	20500	16631	13932	10363	9268	8538	7100	4321	2886
Biomass tons	11887	10533	9101	7565	6492	5949	6173	5087	3073	2268
SOP tons		9726	8827	7682	6111	5856	5966	5041	3031	2229
N 6+	13301	8461	7517	6374	6567	6282	5893	4735	3496	2648

The 1984, 1986 and 1990 year-classes, ages 13, 11 and 7 in 1997, were the most abundant cohort since 1989. Their growth can be easily followed in the above table, what is a test in favour of the appropriateness of the ageing criterion. It is to note that good year-classes can be recognised as such when aged 2 and 3 years, long time before the recruitment is completed at ages 4 to 7 years.

Fish having 6 or more years roughly corresponds with fisheable biomass. Its abundance (N 6+) decreased along the period except in 1992, when a increase was produced by the income of the abundant 1986 year-class.

The stock has a steady decline since 1988. Global indices in the above table, such as total abundance, biomass, SOP and N6+, had a decreasing tendency over the period: their levels in 1997 are around 5 times lower than in 1988. The above table seems to indicate two periods for recruitment, and a change from an upper abundance level to a lower one. The 1991 year-class should be the first weak cohort. These results neither show some signal that could indicate a change in the tendency for the next years: the five youngest year-classes, those less than 7 years old in 1997, were the weaker observed in this survey. The 1990 year-class (age 6 in 1996), the most abundant cohort of recent years, is less abundant that 1986 year-class at the same age.

Tables 10, 11 and 12 show length frequency, age-length key and estimated age composition of the stock respectively. Catch per tow distribution is presented in Figure 3.

Redfish

All redfish catches were classified by species. The group name *juvenile* contains those individuals of small size which classification was not possible. The 15 cm maximum length is a good reference for the group, but it was never used as a criterion. The skill to identify the species increased over the time, so the group

juvenile is not an uniform defined group, but it is maintained for practical reasons.

Mean catch by strata and whole bank data are presented in Tables 13, 17, 21 and 25 for *Sebastes marinus*, *S. mentella*, *S. fasciatus* and the *juvenile* group respectively. Total biomass estimates by the swept area method are summarised in the next table:

	Sebastes:	*spp.*					
		mente-	*fascia-*	juve-	UE	Russia	
year	*marinus*	*lla*	*tus*	nile	total	bottom(1)	total(2)
1983						154,900	
1984						132,300	
1985						51,900	
1986						309,500	
1987						110,700	
1988	15,397		143,022		158,419	61,400	379,000
1989	22,962		113,696		136,658	90,100	365,900
1990	14,699		72,893	16,601	104,193	20,700	246,400
1991	4,093	50,071	5,680	4,001	63,846	45,500	107,700
1992	4,130	71,810	5,308	23,229	104,477	18,500	99,500
1993	4,173	25,056	4,425	28,935	62,589	72,600	147,100
1994	33,240	35,710	7,829	49,233	126,011	-	-
1995	9,042	59,332	5,032	235	73,641	21,600	-
1996	11,293	77,897	11,025	329	100,544	15,900	-
1997	64,847	56,093	17,471	830	139,241	-	-

1) Trawlable biomass.
2) Trawlable plus pelagic biomass (Vaskov 1994, Vaskov and Karsakov 1996, Vaskov 1997)

Tables 14, 18, 22 and 26 show length frequency for the four groups. Age-length keys were made for three species (Tables 15, 19 and 23). Age composition for each of the three species are presented in tables 16, 20 and 24. Catch per tow distribution of the three species are presented in Figures 4, 5 and 6; their age composition are given together in the following table.

	S. marinus			*S. mentella*			*S. fasciatus*		
age	freq.	mw	ml	freq.	mw	ml	freq.	mw	ml
2 :	-	-	-	59	31	13	89	46	14
3 :	-	-	-	480	56	16	1483	68	16
4 :	612	100	18	3190	87	18	2340	93	18
5 :	1523	161	21	17631	132	21	1867	149	21
6 :	4227	245	25	10163	169	23	1714	211	23
7 :	3480	317	27	794	226	25	784	298	26
8 :	2062	382	29	331	314	28	300	347	28
9 :	452	430	30	217	374	30	202	394	29
10 :	897	473	31	251	431	31	79	513	32
11 :	856	540	32	133	471	32	211	439	30
12 :	915	577	33	134	529	33	-	-	-
13 :	611	668	35	72	552	34	-	-	-
14 :	420	787	37	121	585	34	-	-	-
15 :	315	742	36	34	636	35	-	-	-
16 :	70	884	38	48	683	36	-	-	-
17 :	56	978	40	44	718	37	-	-	-
18 :	18	1107	41	11	675	36	-	-	-
19 :	26	995	40	14	742	37	-	-	-
20 :	121	1086	41	16	808	38	-	-	-
21 :	13	923	39	6	732	37	-	-	-
22 :	3	1702	48	2	667	36	-	-	-
23 :	-	-	-	-	-	-	-	-	-
24 :	-	-	-	-	-	-	-	-	-
25+:	-	-	-	-	-	-	-	-	-

frequency x 10000
mw - mean weight in grams
ml - mean length in cm

Frequencies (x 10000) at age of redfish stocks are presented in the following table. The ageing criterion used was the one described by Saborido-Rey (1995).

age	*S. marinus* 1991	1992	1993	1994	1995	1996	1997	*S. mentella* 1992	1993	1994	1995	1996	1997	*S. fasciatus* 1992	1993	1994	1995	1996	1997
1 :										10	6					2			
2 :				20	122	51				49	259	280	59			12	81	235	89
3 :	12	11	65	231	765	139		132		1074	3040	1620	480	5	82	264	400	486	1483
4 :	225	74	125	770	1342	791	612	2673	173	5249	19700	11726	3190	469	265	1284	875	1407	2340
5 :	357	234	228	808	1529	2120	1523	9884	550	2273	11900	30498	17631	1131	634	1777	1108	2620	1867
6 :	179	197	254	885	406	1168	4227	3829	1420	1285	490	4765	10163	417	485	885	422	1064	1714
7 :	175	149	157	1087	281	438	3480	3048	1013	1915	870	850	794	140	204	353	238	533	784
8 :	73	100	119	755	146	170	2062	2181	637	1178	980	826	331	83	99	118	105	200	300
9 :	53	65	50	578	76	121	452	1361	228	778	570	641	217	54	47	40	31	127	202
10 :	72	56	59	431	61	87	897	862	317	605	550	374	251	16	26	23	11	23	79
11 :	46	56	39	448	57	63	856	631	335	519	610	281	133	19	12	15	17	27	211
12 :	44	35	37	324	32	72	915	465	410	330	280	284	134	13	2		8	34	
13 :	39	32	11	420	48	34	611	446	259	253	220	168	72	3	5	4	7	4	
14 :	9	14	14	145	26	25	420	321	260	161	250	188	121	9	3		2	13	
15 :	18	14	6	222	23	28	315	174	297	172	260	147	34		1	5	1	7	
16 :	9	2	4	22	14	14	70	172	69	85	160	106	48		3				
17 :	18	1	4	83	17	10	56	107	95	59	102	69	44					3	
18 :		3	1	24	6	3	18	69	44	84	87	67	11	2					
19 :	6	3	5	50	3		26	72	34	38	46	32	14	2				2	
20 :	7	1			7	3	121	19	26	22	38	41	16						
21 :	3	2		23			13	13	31	13	25	18	6						
22 :		1		10	1	1	3			13	11	5	2					1	
23 :	1			9	1			5	10	7	5	13							
24 :												5							
25+:	5	1		51	9	4		16	3	2	31	17			2				

The 1990 and 1991 year-classes of the whole species were abundant, causing the juvenile biomass to peak in 1994, when those year-classes aged 4 and 3 years respectively. The decline of juvenile biomass since 1995 reflects the weakness of youngest year-classes.

Greenland halibut

Mean catch by strata and whole bank estimates are presented in table 27. Total biomass estimates by the swept area method by strata and its comparison with results of previous surveys are presented in Table 28 and resumed as follow:

1988	-	6,818
1989	-	4,391
1990	-	5,649
1991	-	8,038
1992	-	8,588
1993	-	7,210
1994	-	7,904
1995	-	10,705
1996	-	11,409
1997	-	15,846 tons

Length frequency, age-length keys and age composition of the population were calculated (Tables 29, 30 and 31). Catch per tow distribution is presented in Figure 7. Age composition of the stock was calculated as follows:

age		1991	1992	1993	1994	1995	1996	1997	
1	-	349	922	937	832	6165	2874	1597	
2	-		800	933	706	1394	4613	2113	
3	-	235	286	599	1082	1369	1527	4396	
4	-	993	861	566	1224	1249	2066	5157	
5	-	1956	1600	960	1365	1709	3070	5216	
6	-	1253	1996	1574	2233	3793	4394	6045	
7	-	2283	1793	1732	2096	3026	2020	3885	
8	-	545	991	1388	1213	1729	1378	1709	
9	-	464	473	905	689	1134	392	593	
10	-	388	266	257	264	254	75	200	
11	-	122	139	141	95	68	31	33	
12	-		67	51	54	26	35	22	
13	-		18	19	19			23	
14	-		13	10		7			
15	-						8	8	
16	-							14	
									(x 1000)
total		8588	10225	10072	11860	21925	22483	31091	
Biomasa		8038	8588	7210	7904	10705	11409	15846	tons
SOP		8329	8084	7136	7406	9782	11005	15367	tons
N 10+		510	503	478	432	355	149	300	

The apparent increase of cohort abundance in the first ages of each cohort is a consequence of the recruitment of young fish to the area. Abundance of cohorts aged 2 to 6 years in 1996, as shown in previous table, are the highest recorded in

the previous time series. Those year-classes in 1997, with 3 to 7 years old reached the highest abundance observed at each age.

Shrimp

Detailed results were presented by Del Rio (1997).

Roughhead grenadier (*Macrourus berglax*)

Total biomass estimated by swept area method in this survey was:

1989	-	1,024
1990	-	996
1991	-	1,587
1992	-	1,817
1993	-	3,757
1994	-	2,350
1995	-	1,855
1996	-	1,619
1997	-	1,425 tons

Ageing of fish started in 1994 survey. Detailed results were presented by Sarasua et al. (1998).

Oceanographic records

A CTD sounder was used after each fishing haul. The characteristic anticyclonic gyre of the water mass on the bank was observed in the southern half. The northern area exhibit a cyclonic gyre. Detailed results were presented by Sanchez and Gil (1998).

ACKNOWLEDGEMENTS. This study was supported by the European Commission (DG XIV, Study 96-030), CSIC IEO, IPIMAR and the Basque Government.

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Table 1 - Technical data of the 1997 survey.

Procedure	specification
Vessel	R/V CORNIDE DE SAAVEDRA
GT	1,200 t
power	1,500 + 750 HP
Mean trawling speed	3.53 knots
Trawling time	30 minutes effective time
Trawl gear	type Lofoten
footrope / handrope	31.20 / 17.70 m
footgear	27 steel bobbins of 35 cm
vertical opening	2.5 - 2.8 m
warps	100 meters, 45 mm, 200 Kg/100 m
trawl doors	polyvalent, 850 Kg
wire length	2.75 times the depth
mesh size in codend	35 mm
Type of survey	stratified sampling
Station selection procedure	random
Criterion to change position of a selected tow	- unsuitable bottom for trawling according to ecosonder register. - information on from previous surveys.
Criterion to reject data from tow	- tears in codend - severe tears in the gear - less than 20 minutes tow - bad behaviour of the gear
Daily period for fishing	6.00 to 22.00 hours
Species for sampling	all fishes, squid and shrimp
Species for age determination	cod, American plaice, redfish (*Sebastes marinus*, *S. mentella* and *S. fasciatus*), Greenland halibut and roughhead grenadier (*Macrourus berglax*).

Table 2 - Total biomass swept area method estimates for several species or groups of species in 1988-1997 surveys (tons).

especies	survey 1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Rajidae	4495	1908	2824	4064	3765	6279	3462	2267	2052	1839
Synaphobranchus sp.	219	88	42	77	70	70	8	16	3	11
Urophycis sp.	654	167	169	261	69	161	214	83	81	32
Antimora sp.	392	302	284	560	720	594	799	195	186	235
Macrouridae	3088	1438	1223	2249	2592	6183	3230	2604	2342	2289
Notacanthus sp.	501	408	65	478	449	705	455	346	180	287
Illex sp.	5	8	1647	1159	66	1	210	1	87	64
Anarhichadidae	7973	7478	8120	10097	9095	14304	15516	19217	20559	14036
witch flounder	909	335	420	769	823	1048	776	705	509	319
Greenland halibut	6818	4391	5649	8038	8588	7210	7904	10705	11409	15846
Zoarcidae	559	923	1202	1978	1356	3277	1869	2182	1702	1730
cod	37127	103644	55360	36597	24295	55642	24062	8815	8196	9063
American plaice	11886	10533	9101	7565	6492	5949	6173	5087	3073	2268
redfish	158417	136658	104194	63845	104477	62589	126010	73640	100543	139241
shrimp	2164	1923	2139	8211	16531	9163	3337	5413	6502	5096
others	624	206	1138	664	439	779	503	395	692	584
Total	235833	270410	193575	146611	179828	173954	194528	131671	158114	192943

Table 3 - Cod catches (Kg) by strata in the 1997 survey.

stratum	area squa. miles	tow number	catch per tow mean	catch per tow s.deviat.	catch per mile towed mean	catch per mile towed s.deviat.
1 -	342	4	8.24	4.36	4.84	2.66
2 -	838	10	28.61	17.48	16.67	10.56
3 -	628	7	21.06	13.09	12.29	7.55
4 -	348	4	28.77	23.42	16.79	13.86
5 -	703	8	19.82	18.16	11.15	10.38
6 -	496	6	25.92	15.02	14.78	8.13
7 -	822	9	15.79	22.66	8.85	12.58
8 -	646	7	29.98	71.56	16.99	40.63
9 -	314	3	6.81	4.05	3.79	2.10
10 -	951	11	3.85	5.43	2.16	3.13
11 -	806	9	4.88	6.03	2.63	3.26
12 -	670	7	-	-	-	-
13 -	249	3	-	-	-	-
14 -	602	7	-	-	-	-
15 -	666	7	-	-	-	-
16 -	634	7	-	-	-	-
17 -	216	2	-	-	-	-
18 -	210	2	-	-	-	-
19 -	414	4	-	-	-	-
total	10555	117				

	catch per tow	catch per mile towed
mean	11.26	6.44
standard error	1.96	1.11

(Kg)

Stock biomass estimated by swept area method = 9,063 tons

Table 4 - Cod biomass estimated by the swept area method (tons) 1988-1997.

Stratum	depth in fathoms	survey 1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
1 -	70- 80	1223	590	751	5078	69	469	1969	1421	915	221
2 -	81-100	9229	9386	1876	4988	4683	8223	7443	2764	3629	1863
3 -	101-140	4065	9344	1994	2236	7704	7670	5539	1042	958	1029
4 -	"	2846	4404	2355	2637	3131	12885	1714	678	971	779
5 -	"	1937	9731	7738	9685	4155	6205	840	1158	851	1045
6 -	"	2932	6173	3007	1392	866	3837	1284	1191	564	977
7 -	141-200	2022	14571	3582	2308	859	5595	779	111	50	970
8 -	"	8121	14943	15313	4644	2136	7241	3287	317	85	1464
9 -	"	167	4784	5895	171	130	907	217	8	94	158
10 -	"	1217	4454	4255	1417	297	851	460	53	42	274
11 -	"	2278	12020	3706	1625	204	1526	529	71	37	282
12 -	201-300	305	2245	1478	115	-	22		-	-	-
13 -	"	8	2304	689	85	-	-		-	-	-
14 -	"	97	686	584	119	61	211		-	-	-
15 -	"	680	7671	2137	98	-	-		-	-	-
16 -	301-400	-	60		-	-	-		-	-	-
17 -	"	-	5		-	-	-		-	-	-
18 -	"	2	-		-	-	-		-	-	-
19 -	"	-	91		-	-	-		-	-	-
total		37127	103644	55360	36597	24295	55642	24062	8815	8196	9063

Table 5 - Cod length frequency by strata (x 1000) in the 1997 survey.

length	stratum											
(cm)	1	2	3	4	5	6	7	8	9	10	11	total
18-20		13		7	7							26
21-23	7			7								13
24-26												
27-29								7				7
30-32	7	26	14	40	13			7				106
33-35		13	14	20	7			27				81
36-38	20	109	28	221	46	32	13	123	8	6		605
39-41	27	300	236	301	171	89	74	450	8	6	26	1688
42-44	27	287	118	174	178	133	115	423	31		39	1524
45-47	60	473	208	201	138	177	115	409	16	13	6	1815
48-50	33	383	159	80	132	139	155	136	39	19	45	1322
51-53	13	109	97	33	105	127	128	61	39	45	32	790
54-56		51	21	13	39	32	47	27		19	6	257
57-59	13	32	42		26	70	7	7	8	6	26	236
60-62	7	57	35		39	32	61	7		13		250
63-65		6	14		39	6	13	7		13		99
66-68	7	26	7		13	13	13				26	104
69-71							20	7				27
72-74		6			7							13
75-77												
.....												
96-98												
99-101										6		6

Table 6 - Cod age-length key in 1997.

length (cm)	age 1	2	3	4	5	6	7	8	9	10	11	12	13	no id	tot n.
15-17															
18-20	4														4
21-23	2														2
24-26															
27-29		1													1
30-32		12	1											3	16
33-35		2	10												12
36-38		2	80	3										6	91
39-41		1	223	25										4	253
42-44			123	101	2									2	228
45-47			21	245	6	1								1	274
48-50			2	186	11									1	200
51-53			1	83	20	14	1								119
54-56				9	12	18									39
57-59				2	3	31									36
60-62						36	1							1	38
63-65						14	1								15
66-68						15								1	16
69-71						4									4
72-74						2									2
75-77															
78-80															
81-83															
84-86															
87-89															
90-92															
93-95															
96-98															
99-101												1			1
total:	6	18	461	654	54	135	3					1		19	1351

Table 7 - Cod age composition by strata (x 1000) in the 1997 survey.

age	stratum 1	2	3	4	5	6	7	8	9	10	11	total	mean weight (g)	mean length (cm)
1 :	7	13		14	7							41	77	20
2 :	7	30	17	47	15	1	1	23				141	324	32
3 :	63	581	333	609	313	198	153	805	34	13	46	3148	636	40
4 :	110	1034	488	397	429	458	408	782	93	66	93	4358	1004	47
5 :	7	71	41	20	44	50	49	39	10	15	12	358	1309	51
6 :	27	159	112	11	148	140	148	48	12	44	55	904	2097	60
7 :		3	3		5	2	4	1		2		20	2001	59
8 :														
9 :														
10 :														
11 :														
12 :										6		6	9573	100
13 :														
14+:														

Table 8 - American plaice catch (Kg) by strata in the 1997 survey.

stratum	area squa. miles	tow number	catch per tow mean	catch per tow s.deviat.	catch per mile towed mean	catch per mile towed s.deviat.
1 -	342	4	10.59	11.86	6.28	7.06
2 -	838	10	8.47	11.87	4.97	6.98
3 -	628	7	7.92	11.55	4.43	6.31
4 -	348	4	5.68	5.50	3.28	3.18
5 -	703	8	8.82	19.42	4.95	10.92
6 -	496	6	0.27	0.39	0.15	0.22
7 -	822	9	1.01	1.30	0.57	0.72
8 -	646	7	1.88	4.10	1.07	2.33
9 -	314	3	1.19	2.07	0.64	1.10
10 -	951	11	3.08	4.52	1.69	2.47
11 -	806	9	0.42	0.60	0.22	0.32
12 -	670	7	0.09	0.24	0.06	0.16
13 -	249	3	-	-	-	-
14 -	602	7	-	-	-	-
15 -	666	7	0.09	0.24	0.05	0.14
16 -	634	7	-	-	-	-
17 -	216	2	-	-	-	-
18 -	210	2	-	-	-	-
19 -	414	4	-	-	-	-
total	10555	117				

	catch per tow	catch per mile towed
mean	2.82	1.61
standard error	0.66	0.38

(Kg)

Stock biomass estimated by swept area method = 2,268 tons
" " " " " by sex (m f) = 790 1,478 tons

Table 9 - American plaice biomass estimated by swept area method (tons) 1988-1997.

stratum	depth in fathoms	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
1 -	70- 80	979	750	448	808	532	809	496	1672	1096	286
2 -	81-100	1990	2701	1040	1997	1285	950	899	1001	707	555
3 -	101-140	1025	838	1207	935	473	333	244	189	126	371
4 -	"	1649	346	661	240	418	429	640	367	201	152
5 -	"	1949	2319	1406	1055	628	968	922	412	375	464
6 -	"	358	847	720	376	451	229	606	92	24	10
7 -	141-200	880	398	562	292	479	239	237	187	54	62
8 -	"	313	123	209	188	545	365	132	99	42	92
9 -	"	77	122	262	-	280	154	15	375	41	27
10 -	"	1742	1118	1555	981	1054	1094	1677	531	311	215
11 -	"	889	876	973	301	279	219	227	82	51	24
12 -	201-300	7	14	35	13	8	11	25	9	24	5
13 -	"	2	-	15	-	-	-	-	2	-	-
14 -	"	6	6	6	292	22	53	18	11	3	-
15 -	"	17	74	2	73	28	82	30	51	17	5
16 -	301-400	4	-	-	3	7	9	4	-	-	-
17 -	"	-	-	-	-	-	-	-	-	-	-
18 -	"	-	-	-	-	-	-	-	-	-	-
19 -	"	-	-	-	11	3	4	2	8	-	-
total		11887	10533	9101	7565	6492	5949	6173	5087	3073	2268

Table 10 - American plaice length frequency by strata (x 1000) in the 1997 survey.

length (cm)	stratum 1	2	3	4	5	6	7	8	9	10	11	12	15	total
12-13			7											7
14-15														
16-17			7											7
18-19			7	7										14
20-21														
22-23														
24-25						6	20							26
26-27			14		7	12				13	6			52
28-29		6			7		13			12				39
30-31	13				13									26
32-33	46	19	14		13		14	21		26	12			165
34-35	80	38	21		13					6				158
36-37	100	26	21	7	33	6	7	7		97				302
38-39	179	76	35		59	6	13		16	77	19			482
40-41	53	51	28	26	59		13	14	16	51	6	8		327
42-43	27	39	49	7	59		20	7		12	6		7	233
44-45	27	57	35	13	53		7	20		6				219
46-47		26	28	20	72					19				165
48-49	7	64	62	7	59			14		13				225
50-51		64	62	27	66		7	7	8	19				260
52-53		64	21	13	13			14		6				131
54-55		19	7											26
56-57		6	7	7										20
58-59				7										7

Table 11 - American plaice age-length key in the 1997 survey.

MALE

length (cm)	age 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16+	no id	tot n.
10-11																		
12-13																		
14-15																		
16-17																		
18-19			1															1
20-21																		
22-23																		
24-25			1	1														2
26-27			3														1	4
28-29						2												2
30-31						1	2	1										4
32-33				1	3	5	10	2	1									22
34-35					3	2	11	2	3								1	22
36-37					3	9	15	4	3		2						4	40
38-39						10	24	8	7	4	8	1					3	65
40-41						2	10	2	7	7	6	1					2	37
42-43							5	2	2		4						1	14
44-45							1	1	2	1	2			1				8
46-47																		
48-49												1						1
total:			5	2	9	31	78	22	25	12	22	3		1			12	222

FEMALE

length (cm)	age 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16+	no id	tot n.
10-11																		
12-13	1																	1
14-15																		
16-17		1																1
18-19		1																1
20-21																		
22-23																		
24-25			2															2
26-27			4															4
28-29			2	1													1	4
30-31																		
32-33					2	1												3
34-35					1		1											2
36-37					2	2	1										1	6
38-39						2	3		1	1	1							8
40-41						3	7	1									1	12
42-43						4	13	2	1	1								21
44-45						1	17	3	1	1	2							25
46-47						1	7	1	7	2	6	1						25
48-49							4		4	7	7	7	2	1		1		33
50-51									4	8	12	1	1	5	2	6		39
52-53									3	1	4	2		2	3	5		20
54-55												1		2			1	4
56-57											1					2		3
58-59															1			1
total:	1	2	8	1	5	14	53	7	21	21	33	12	3	10	6	14	4	215

Table 12 - American plaice age composition by strata (x 1000) in the 1997 survey.

edad	stratum 1	2	3	4	5	6	7	8	9	10	11	12	15	total	mean weight (g)	mean length (cm)
1 :			7											7	13	12
2 :			14											14	41	17
3 :			14	7	12	18	22			17	6			96	152	25
4 :	2	1	1		3		11	1		3				22	212	28
5 :	35	10	7	1	6	1	8	7		19	5			99	384	34
6 :	83	48	31	9	44	3	12	10	3	56	9	2	1	311	506	37
7 :	209	162	109	35	170	5	29	33	11	114	15	5	4	901	617	39
8 :	54	33	23	6	37	1	6	6	3	27	2	1	1	200	588	39
9 :	61	61	44	15	65	1	7	10	6	38	4			312	809	42
10 :	28	48	36	13	48	1	6	9	6	25	3			223	949	45
11 :	52	81	62	23	82	1	9	12	7	40	3			372	963	45
12 :	6	31	27	5	20		1	5	1	7				103	1155	48
13 :		6	5	1	5			1		1				19	1196	49
14 :	3	30	19	5	12		1	3	1	3				77	1362	51
15 :		13	6	10	5			2		2				38	1527	52
16+:		32	21	12	15		1	5	1	5				92	1435	51

Table 13 - Redfish (*Sebastes marinus*) catch (Kg) by strata in the 1997 survey.

stratum	area squa. miles	tow number	catch per tow mean	catch per tow s.deviat.	catch per mile towed mean	catch per mile towed s.deviat.
1 -	342	4	44.60	77.11	27.20	47.49
2 -	838	10	10.53	17.35	6.15	10.16
3 -	628	7	3.94	3.98	2.35	2.44
4 -	348	4	96.24	189.86	54.35	107.17
5 -	703	8	304.94	814.38	176.91	473.61
6 -	496	6	739.88	1755.26	392.46	929.93
7 -	822	9	33.40	60.43	18.91	34.64
8 -	646	7	9.58	15.33	5.36	8.71
9 -	314	3	16.61	21.15	9.29	11.92
10 -	951	11	52.77	87.84	28.60	47.53
11 -	806	9	184.66	211.06	100.95	118.51
12 -	670	7	0.08	0.22	0.05	0.13
13 -	249	3	0.60	0.19	0.37	0.14
14 -	602	7	4.16	9.34	2.54	5.73
15 -	666	7	0.89	0.96	0.49	0.54
16 -	634	7	-	-	-	-
17 -	216	2	-	-	-	-
18 -	210	2	-	-	-	-
19 -	414	4	-	-	-	-
total	10555	117	83.62			

	catch per tow	catch per mile towed
mean	83.62	46.08
standard error	39.38	21.40

(Kg)

Stock biomass estimated by swept area method = 64,847 tons
" " " " " by sex (i m f) = 3 30,421 34,423 tons

Table 14 - Redfish (*Sebastes marinus*) length frequency by strata (x 1000) in 1997.

length (cm)	stratum 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	total
10-							7									7
11-																
12-							13		8							21
13-	10	12	7				7		8							44
14-	54	19			7		7									86
15-	165	51			13	171				27						428
16-	209	77			46	355		7		6						699
17-	451	102	35	23	272	135	7			62	32					1120
18-	498	153	56	23	333	331	53	7	8	47	128			7	7	1650
19-	508	313	49	68	469	353	150	14	65	145	144					2277
20-	662	319	125	203	957	545	180	14	8	338	348			13		3713
21-	598	326	104	362	1432	879	284	27	73	392	483					4960
22-	676	275	138	701	2143	776	420	85	209	514	923			13	14	6888
23-	663	408	111	1325	2770	1187	580	179	80	801	726		7	54	28	8921
24-	441	339	63	1516	2532	1448	674	211	366	924	921			54	28	9517
25-	317	288	49	1884	3542	4867	873	234	217	1045	878		14	67	7	14283
26-	175	191	104	1063	4412	7400	792	317	152	1225	1444	8		40	21	17346
27-	283	134	14	815	3745	6682	634	246	145	1013	1507			33	21	15271
28-	145	89	28	504	3405	7810	550	103	210	733	1396	8		20	21	15021
29-	70	70	28	187	3204	5657	269	101	8	482	1374		7	40	7	11505
30-	91	12	14	226	2499	7110	280	41		378	1383			27	7	12070
31-	40	6	21	30	2000	4865	110	7	8	388	1256			20		8751
32-	40	19		52	936	3544	58	23		470	1307			20		6468
33-	20	6	7	23	1942	2435	83	9		281	1315			7	7	6137
34-	10	6		7	929	2262	97	16		269	1223			13		4833
35-				52	865	1133	114	7		226	1243			20		3662
36-	10				495	985	71			240	926					2727
37-				23	635	1617	26			177	750		7	27		3261
38-					390	661	52			100	778			13		1995
39-					231	167	14			108	590					1110
40-					692	322	20		8	109	471					1622
41-					83	161	20			35	130					429
42-						483	32			30	90			7		642
43-					84		13			6	228					330
44-					77		13				18					107
45-										29	27					56
46-					77					26	29					131
47-											18					18
48-											29					29
49-					7											7
50-							7				13					19
51-											29					29
52-				23						14				7		43
53-					7											7
54-											13					13
55-										6						6
56-							7									7

Table 15 - Redfish (*Sebastes marinus*) age-length key in the 1997 survey.

MALES length (cm)	age 4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	no id	tot n.
12-																				2	2
13-																				3	3
14-																				7	7
15-																				17	17
16-	1																			30	31
17-	1																			43	44
18-	2																			31	33
19-	2	2																		19	23
20-	1	5																		17	23
21-		2	1																	22	25
22-		5	4																	14	23
23-		6	6																	14	26
24-			4	1																19	24
25-			4	1																17	22
26-			1	1																20	22
27-			5	6	1															12	24
28-				3	2															18	23
29-				1	3		1													19	24
30-					3	2														23	28
31-								1	1											20	22
32-							1		1	1										18	21
33-								1	1											19	21
34-							1	1	3	2	1	1					1			14	24
35-								1	1	1	1									16	20
36-								1		3		1								14	19
37-									1		1	4	2							17	25
38-											1									12	13
39-										1			1	1					1	8	12
40-												1		1	1	1	1			7	12
41-																				1	1
42-																				1	1
43-																				4	4
44-																					
45-																				1	1
46-																				1	1
47-																					
48-																					
49-																				1	1
total:	7	20	25	13	9	2	3	5	8	8	4	7	3	2	1	1	2	1		501	622

FEMALES length (cm)	age 4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	no id	tot n.
12-																					
13-																				1	1
14-																				5	5
15-																				7	7
16-	1																			9	10
17-	2																			25	27
18-	1																			19	20
19-	4	1																		14	19
20-	3	2																		21	26
21-		6																		28	34
22-		10	2																	13	25
23-		1	10																	16	27
24-		1	10	1																12	24
25-			4	2																15	21
26-			4	3																19	26
27-			2	5	2															15	24
28-			1	5	3															18	27
29-				2	5	1														13	21
30-				1		1	3													16	21
31-				1	2			2												16	21
32-							3	1	1											15	20
33-							1	1				1								16	19
34-									1	1										17	19
35-									1	1										9	11
36-								1	1	2	1									7	12
37-											2									11	13
38-								1	1	2	1	3								14	22
39-						1				2	1	1	1							8	14
40-											1	2	1	2		1				16	23
41-																				11	11
42-																	1			6	7
43-															1		2			11	14
44-																				2	2
45-																				1	1
46-																	1			5	6
47-																					
48-																			1	1	2
49-																				1	1
50-																				1	1
51-																				3	3
52-																				2	2
53-																				1	1
54-																				1	1
55-																				1	1
56-																				1	1
total:	11	21	33	20	12	3	7	6	5	8	6	7	2	2	1	1	4		1	443	593

Table 16 - Redfish (*Sebastes marinus*) age composition (x 10000) in the 1997 survey.

age	stratum 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	total	mean weight (g)	mean length (cm)
3 :																		
4 :	170	61	16	15	127	123	21	3	5	33	36			1	1	612	100	18
5 :	181	96	32	139	439	220	91	15	25	121	159			3	2	1523	161	21
6 :	156	105	28	471	1119	1239	242	74	75	333	359	1	1	17	7	4227	245	25
7 :	49	36	10	199	852	1561	145	46	39	212	317	1		9	4	3480	317	27
8 :	18	10	4	50	501	1067	56	17	11	93	229			4	2	2062	382	29
9 :	4	1	1	8	98	250	10	2		17	60			1		452	430	30
10 :	5	2		11	197	491	17	2		39	130			3		897	473	31
11 :	4	1	1	3	211	405	13	1		45	171			1		856	540	32
12 :	3	1	1	5	187	424	15	2		56	219			2		915	577	33
13 :	1	1		4	112	252	13	1		42	183			2		611	668	35
14 :				1	96	172	6			19	123			3		420	787	37
15 :	1			2	92	100	6			21	92			1		315	742	36
16 :				1	19	15	1			6	28					70	884	38
17 :					22	12	1			4	17					56	978	40
18 :					3	3	1			1	10					18	1107	41
19 :					10	6				2	8					26	995	40
20 :					18	58	5			9	31					121	1086	41
21 :					2	4				1	6					13	923	39
22 :											3					3	1702	48
23 :																		
24 :																		
25+:																		

Table 17 - Redfish (*Sebastes mentella*) catch (Kg) by strata in the 1997 survey.

stratum	area squa. miles	tow number	catch per tow mean	catch per tow s.deviat.	catch per mile towed mean	catch per mile towed s.deviat.
1 -	342	4	-	-	-	-
2 -	838	10	0.01	0.03	0.01	0.02
3 -	628	7	0.28	0.36	0.17	0.22
4 -	348	4	8.88	16.47	5.03	9.29
5 -	703	8	164.76	464.18	98.89	278.70
6 -	496	6	0.74	0.83	0.46	0.51
7 -	822	9	26.39	35.74	14.02	17.12
8 -	646	7	117.59	80.13	64.99	44.29
9 -	314	3	476.76	143.91	269.37	89.04
10 -	951	11	199.53	289.42	110.22	154.36
11 -	806	9	27.44	36.89	15.07	20.66
12 -	670	7	56.61	28.64	34.24	17.78
13 -	249	3	48.67	27.51	28.97	14.18
14 -	602	7	109.51	83.52	64.54	51.00
15 -	666	7	60.56	51.43	34.15	30.18
16 -	634	7	3.08	3.34	1.77	1.86
17 -	216	2	3.38	3.50	1.92	1.94
18 -	210	2	1.91	0.36	1.08	0.31
19 -	414	4	2.30	1.68	1.27	0.94
total	10555	117				

	catch per tow	catch per mile towed
mean	70.02	39.86
standard error	14.07	8.15

(Kg)

Stock biomass estimated by swept area method = 56,093 tons
" " " " " by sex (i m f) = 1 28,525 27,567 tons

Table 18 - Redfish (*Sebastes mentella*) length frequency by strata (x 10,000) in 1997.

length (cm)	stratum 2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	total
9-		2				1													3
10-																			
11-						1													1
12-		3				1			3	1									7
13-		5	2	27		3	6		1	3									47
14-		5	1	28		7	4	6	11	5									67
15-		1	2	55	1	15	4	10	84	27				2					199
16-		1	2	3	4	22	24	63	191	40			2	1					351
17-	1	1	2	245	3	40	49	295	166	32	1		2	2					836
18-		1	8	296	2	54	106	417	257	50	2	1	5	3					1199
19-			8	376	2	82	182	419	610	79	3	1	7	16					1785
20-			14	750	2	164	290	982	1843	134	11	5	91	72					4356
21-		2	30	1176	3	253	663	1703	3091	279	47	16	227	133					7624
22-			30	1122	4	265	859	1945	2615	199	125	54	298	277					7791
23-		1	17	1232	3	184	709	1081	1109	110	212	72	208	254	2				5192
24-		1	15	241		55	475	426	125	55	191	60	122	137	1				1905
25-			5	27		17	90	127	28	18	126	37	85	56	1		1		615
26-			2			6	25	6	7	5	51	15	53	39	2			2	213
27-			2	54		2	11	6	14	4	29	10	46	22	2			1	203
28-			1	1	1	2	5		5	3	38	9	55	28	2			1	148
29-						2	2		3	4	52	15	70	32	4	1		2	187
30-							4		2	3	60	8	73	31	1	1		1	183
31-							1		5	1	39	21	70	37	4			2	181
32-						1	2		4	2	27	9	71	31	4	4	1	1	157
33-						1	4			7	26	9	53	37	5		1	2	145
34-						1				3	30	10	41	21	2		1	1	109
35-						1				4	21	6	26	15	1				74
36-						1				1	21	2	37	22					84
37-							1		4		9	4	24	9		1	1	1	53
38-											9	1	19	7	1			1	39
39-										1	5	1	9	3		1			21
40-											3		7	3				1	14
41-											2	1	7	2		2			13
42-											1	1	1				1		4
43-																			
44-													1		1				2

Table 19 - Redfish (*Sebastes mentella*) age-length key in the 1997 survey.

MALES

length (cm)	age 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	no id	tot n.
11-																								
12-																							2	2
13-		4																					4	8
14-		1	4	1																			12	18
15-			3																				20	23
16-				2																			27	29
17-			1	4																			22	27
18-				4	1																		21	26
19-				4	5	1																	28	38
20-				2	9																		13	24
21-					22	2																	11	35
22-					15	5																	8	28
23-					1	18																	5	24
24-						12	1																28	41
25-						8	3																18	29
26-						2	5																16	23
27-								1															22	23
28-							3	3															15	21
29-								7	4	1													15	27
30-								1	8	1	2												11	23
31-									1	8													14	23
32-										6	4	3	1	1									12	27
33-										2	7	5	1		1								5	21
34-											1	5	5	4			1	1					6	23
35-												4	4	4	1	1	1		1		1		12	29
36-													2	3	6	3	1	2	2	1	1	1	14	36
37-																1	2						15	18
38-													1			1	2			1			11	16
39-																	1	1		1			3	6
40-																							5	5
41-																								
42-																							1	1
43-																								
44-																					1			1
total:		5	8	17	53	48	12	12	13	18	14	17	14	12	8	6	8	4	3	3	3	1	396	675

FEMALES

length (cm)	age 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	25	no id	tot n.
11-																								
12-		2																					1	3
13-		1	1																				5	7
14-			4																				8	12
15-			1																				16	17
16-			2	2																			19	23
17-				9																			13	22
18-			1	5	1																		25	32
19-				2	6																		30	38
20-					6																		15	21
21-				1	15	3																	9	28
22-					10	6																	6	22
23-					3	17	1																	21
24-					1	21	2																7	31
25-						12	10																1	23
26-						2	5																15	22
27-						1	9	2	1														7	20
28-							6	9															6	21
29-								4	4	1													13	22
30-								1	6	2													14	23
31-									1	4	2	1											16	24
32-										2	4		2	1									14	23
33-												3	1	4									15	23
34-										1	1	6				1							12	21
35-														3									13	16
36-														1	1	1							16	19
37-														1		1	1						16	19
38-																							12	12
39-																			1	1			11	13
40-																							11	11
41-																							6	6
42-																							5	5
43-																							1	1
44-																							2	2
total:		3	9	19	42	62	33	16	12	10	7	10	3	10	1	3	1		1	1			360	603

Table 20 - Redfish (*Sebastes mentella*) age composition (x 100,000) in the 1997 survey.

						stratum											mean weight	mean length
age	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	total	(g)	(cm)
1 :																		
2 :		1		3			1		1							6	31	13
3 :		1		11		4	2	8	16	5						47	56	16
4 :			1	69	1	14	25	92	96	14	1		3	2		318	87	18
5 :			7	284	1	63	163	411	663	57	16	7	51	41		1764	132	21
6 :			5	184		34	146	225	232	26	50	16	48	50		1016	169	23
7 :			1	8		2	11	11	7	2	13	4	12	8		79	226	25
8 :				3			1	1	1	1	8	2	10	5		32	314	28
9 :											6	1	8	4		19	374	30
10 :											6	2	10	5	1	24	431	31
11 :											3	1	5	3		12	471	32
12 :											3	1	5	3		12	529	33
13 :											2		3	2		7	552	34
14 :											2	1	6	2		11	585	34
15 :											1		1	1		3	636	35
16 :											1		2	1		4	683	36
17 :											1		2	1		4	718	37
18 :																	675	36
19 :																	742	37
20 :													1			1	808	38
21 :																	732	37
22 :																	667	36
23 :																		
24 :																		
25+:																		

Table 21 - Redfish (*Sebastes fasciatus*) catch (Kg) by strata in the 1997 survey.

stratum	area squa. miles	tow number	catch per tow mean	catch per tow s.deviat.	catch per mile towed mean	catch per mile towed s.deviat.
1 -	342	4	1.14	1.99	0.70	1.23
2 -	838	10	0.67	0.86	0.39	0.50
3 -	628	7	1.25	1.15	0.75	0.71
4 -	348	4	23.33	43.48	13.19	24.53
5 -	703	8	38.51	57.76	22.54	34.18
6 -	496	6	187.22	434.38	99.52	230.02
7 -	822	9	10.32	7.02	5.72	3.85
8 -	646	7	20.42	19.42	11.33	10.97
9 -	314	3	107.44	98.16	60.78	55.20
10 -	951	11	23.91	16.85	13.21	9.00
11 -	806	9	28.45	39.14	15.86	22.03
12 -	670	7	1.08	0.85	0.65	0.51
13 -	249	3	2.77	1.15	1.76	0.88
14 -	602	7	4.59	3.53	2.75	2.18
15 -	666	7	3.14	1.85	1.74	0.94
16 -	634	7	-	-	-	-
17 -	216	2	-	-	-	-
18 -	210	2	-	-	-	-
19 -	414	4	0.29	0.13	0.15	0.06
total	10555	117				

	catch per tow	catch per mile towed
mean	22.48	12.41
standard error	8.72	4.65

(Kg)

Stock biomass estimated by swept area method = 17,471 tons
" " " " " by sex (i m f) = 3 6,761 10,707 tons

Table 22 - Redfish (*Sebastes fasciatus*) length frequency by strata (x 1000) in the 1997 survey.

lenght (cm)	stratum 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	19	total
9-			7		7		7										20
10-			21		7												28
11-	7	25			14												46
12-		26	42		52	19	7			6	12						165
13-		38	35	7	205	32	14	25		32							387
14-	20	39	14	44	576	108	88	18	88	154	66						1214
15-	40	51	63	137	1210	810	249	9	548	610	789			7			4523
16-	20	70	111	357	2325	1765	607	89	2122	1071	1441		7	40			10025
17-	20	19	124	757	2051	1058	695	264	2859	1345	996		7	40	7		10242
18-	7	52	42	846	1670	278	472	366	2428	1317	565	8	14	60	43	7	8174
19-		19	21	832	1366	178	519	539	2208	1585	463	15	7	141	142	30	8064
20-	7	32	97	553	1075	63	418	935	3158	1741	742	23	20	229	163	22	9278
21-	7	26	28	375	880	76	486	847	1615	1281	758	84	74	181	164	7	6889
22-	14	13	28	364	919	375	405	982	1794	998	922	46	61	188	156	7	7270
23-	13	19	21	182	602	661	344	816	1292	746	741	54	34	87	79		5689
24-	7	6		112	519	1126	161	456	650	463	762	38	48	87	64		4499
25-	7		14	56	274	2041	108	217	187	302	534	15	41	67	28		3891
26-	7			56	367	2644	34	108	96	311	590	16	7	68	42		4343
27-	20	6			247	1823	14	89	72	167	402			20	28		2890
28-					161	2700	34	40	72	122	191			34	7		3361
29-					120	1288	34	30		64	92		7	20			1654
30-				19	80	2090	20	41		64	66	8		13	7		2408
31-	7				80	672	27	7		51	70			7			921
32-					120	380	7		8	38	53				7		613
33-						448	7				55						509
34-					47	373				6	27						453
35-						224				6	6						237
36-						75				6							81
37-											11						11
38-																	
39-																	
40-										6							6

Table 23 - Redfish (*Sebastes fasciatus*) age-length key in the 1997 survey.

MALES

length (cm)	age 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	no id	tot n.
9-																				1	1
10-																				1	1
11-																				2	2
12-																				12	12
13-																				18	18
14-		1	1																	11	13
15-			1																	22	23
16-			2	2																37	41
17-			2	7																25	34
18-				8	2		1													27	38
19-				4																28	32
20-				2	3															34	39
21-					7															24	31
22-					9	2														20	31
23-					2	4														27	33
24-						8														20	28
25-						5	1													18	24
26-						1	1													28	30
27-																				24	24
28-							1													16	17
29-								1												10	11
30-																				9	9
31-																				2	2
32-																				3	3
33-																				1	1
34-																				1	1
total:		1	6	23	23	20	4	1												421	499

FEMALES

length (cm)	age 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	no id	tot n.
9-																					
10-																				2	2
11-																				2	2
12-																				7	7
13-																				17	17
14-		1																		22	23
15-			2																	22	24
16-			3	2																22	27
17-			6	3																22	31
18-				4																24	28
19-																				23	23
20-					1															29	30
21-					2	2														25	29
22-					1	2														23	26
23-						3														25	28
24-						2														24	26
25-						1	1													27	29
26-							1	1												28	30
27-							1													20	21
28-							1		1											21	23
29-								2												24	26
30-											1									20	21
31-									2	1										10	13
32-										2										7	9
33-																				5	5
34-																				2	2
35-																				2	2
36-																				1	1
37-																				1	1
38-																					
39-																					
40-																				1	1
total:		1	11	9	4	10	4	3	3	3	1									458	507

Table 24 - Redfish (*Sebastes fasciatus*) age composition (x 10000) in the 1997 survey.

	stratum																	mean	mean
age	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	19	total	weight (g)	length (cm)
1 :																			
2 :	2	3	1	2	44	8	6	1	5	13	4						89	46	14
3 :	6	11	18	71	349	228	91	17	297	184	205		1	5			1483	68	16
4 :	3	11	19	178	438	169	141	102	672	351	211	2	3	23	14	3	2340	93	18
5 :	2	5	12	101	217	51	105	207	521	319	215	13	12	47	37	3	1867	149	21
6 :	3	4	5	58	213	349	81	194	294	206	222	13	14	33	25		1714	211	23
7 :	2	1		9	59	498	11	24	38	48	77	1	2	9	5		784	298	26
8 :				3	21	226	4	6	4	12	18		1	4	1		300	347	28
9 :					13	165	3	1	4	5	9			2			202	394	29
10 :					15	52	2		1	4	4				1		79	513	32
11 :				2	4	187	1	4		5	5	1		1	1		211	439	30
12 :																			
13 :																			
14 :																			
15 :																			
16 :																			
17 :																			
18 :																			
19 :																			
20 :																			
21 :																			
22 :																			
23 :																			
24 :																			
25+:																			

Table 25 - Juvenile redfish (*Sebastes sp.*) catch (Kg) by strata in the 1997 survey.

stratum	area squa. miles	tow number	catch per tow mean	catch per tow s.deviat.	catch per mile towed mean	catch per mile towed s.deviat.
1 -	342	4	-	-	-	-
2 -	838	10	-	-	-	-
3 -	628	7	-	-	-	-
4 -	348	4	0.07	0.13	0.04	0.08
5 -	703	8	0.37	0.75	0.19	0.40
6 -	496	6	2.68	2.17	1.56	1.19
7 -	822	9	3.24	1.69	1.82	0.99
8 -	646	7	0.35	0.60	0.20	0.34
9 -	314	3	6.14	5.71	3.39	3.19
10 -	951	11	1.89	1.42	1.05	0.76
11 -	806	9	3.73	3.96	2.01	2.12
12 -	670	7	-	-	-	-
13 -	249	3	-	-	-	-
14 -	602	7	-	-	-	-
15 -	666	7	-	-	-	-
16 -	634	7	-	-	-	-
17 -	216	2	0.02	0.03	0.01	0.02
18 -	210	2	-	-	-	-
19 -	414	4	-	-	-	-
total	10555	117				

	catch per tow	catch per mile towed
mean	1.06	0.59
standard error	0.16	0.09

(Kg)

Stock biomass estimated by swept area method = 830 tons
" " " " " by sex (i m f) = 817 7 6 tons

Table 26 - Juvenile redfish (*Sebastes sp.*) length frequency by strata (x 1000) in the 1997 survey.

length (cm)	stratum 4	5	6	7	8	9	10	11	17	total
6-				1						1
7-										
8-			3	16	1		2	10		32
9-	2		9	41	3		3	20		79
10-	1	1	7	13	1		13	20		56
11-	1	11	13	75	5	3	48	52		208
12-	3	22	70	280	23	65	120	217		800
13-	1	21	100	252	23	197	140	303		1036
14-		7	53	54	6	101	52	63	1	337
15-		1	36	8	1	31	31	31		138
16-			8	3		12	6	13		43
17-			1	1			1	1		4
18-				1						1

Table 27 - Greenland halibut (*Reinhardtius hippoglossoides*) catch (Kg) by strata in the 1997 survey.

stratum	area squa. miles	tow number	catch per tow mean	catch per tow s.deviat.	catch per mile towed mean	catch per mile towed s.deviat.
1 -	342	4	-	-	-	-
2 -	838	10	0.04	0.12	0.02	0.07
3 -	628	7	1.81	1.42	1.07	0.88
4 -	348	4	0.85	1.05	0.49	0.61
5 -	703	8	1.78	2.03	1.02	1.21
6 -	496	6	5.79	4.97	3.39	2.74
7 -	822	9	23.08	17.66	12.79	9.80
8 -	646	7	22.09	15.43	12.17	8.45
9 -	314	3	11.16	18.05	5.98	9.62
10 -	951	11	11.83	7.23	6.69	4.41
11 -	806	9	10.70	5.02	5.75	2.69
12 -	670	7	41.24	21.90	24.77	13.38
13 -	249	3	23.05	7.29	14.33	5.00
14 -	602	7	32.34	38.95	19.49	24.07
15 -	666	7	53.07	12.54	29.81	7.13
16 -	634	7	35.12	9.03	20.61	5.25
17 -	216	2	30.68	1.51	17.96	1.81
18 -	210	2	35.55	12.80	19.56	5.21
19 -	414	4	50.63	17.45	27.89	11.27
total	10555	117				

	catch per tow	catch per mile towed
mean	19.68	11.26
standard error	1.33	0.79

(Kg)

Stock biomass estimated by swept area method = 15,846 tons
" " " " " by sex (i m f) = 16 5,775 10,055 tons

Table 28 - Greenland halibut (*Reinhardtius hippoglossoides*) biomass stimated by swept area method (tons) 1988-1997.

stratum	depth in fathoms	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
1 -	70- 80	-	-	-	-	-	-	-	-	-	
2 -	81-100	-	3	6	-	-	-	-	119	-	2
3 -	101-140	26	31	8	8	18	3	-	21	106	89
4 -	"	142	20	-	15	27	10	-	5	0	23
5 -	"	73	96	-	28	41	1	2	21	35	96
6 -	"	31	18	15	12	8	15	-	31	104	224
7 -	141-200	84	62	63	186	242	93	211	890	1130	1401
8 -	"	149	219	63	177	373	138	38	328	353	1048
9 -	"	177	162	53	75	318	30	42	175	157	250
10 -	"	106	81	48	169	356	31	231	518	705	848
11 -	"	44	60	20	104	225	230	232	484	660	617
12 -	201-300	399	637	290	749	609	918	1200	1129	2091	2213
13 -	"	63	122	214	43	24	141	150	125	293	476
14 -	"	362	289	315	775	834	469	610	404	888	1564
15 -	"	428	166	505	958	633	1356	1469	1740	1425	2647
16 -	301-400	1352	1342	2492	2487	1798	2141	1500	1832	2065	1742
17 -	"	262	118	130	408	39	105	730	730	254	517
18 -	"	104	49	449	348	57	208	380	943	188	548
19 -	"	3016	919	977	1498	2988	1321	1108	1211	956	1539
total		6818	4391	5649	8038	8588	7210	7904	10705	11409	15846

Table 29 - Greenland halibut (*Reinhardtius hippoglossoides*) length frequency by strata (x 1000) in the 1997 survey.

length (cm)	stratum 2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	total
12-13										6									6
14-15		21		7	13	195			52	122									410
16-17		42		7	13	465	34		244	154				7					966
18-19		14	7		19	108	21		64	70	15			21	7				347
20-21						61	7		13	32				21	7			7	149
22-23					6	60	21		25	12	8			14					148
24-25		14			19	337	116	8	90	71				21				7	684
26-27		7		7	108	742	130		129	167	16		13	93		8	8	29	1455
28-29		35	7	27	32	351	212	32	64	96	23		14	64	14		16	22	1006
30-31		49		26	63	331	177	55	135	96	84	14	69	114	21		8	45	1287
32-33		14		46	70	594	334	94	180	161	130	27	93	306	71	51	39	29	2238
34-35		56	20	40	120	728	423	141	264	251	222	61	208	525	156	92	94	157	3557
36-37	6	21		72	82	566	369	63	231	141	315	61	192	547	220	84	78	194	3243
38-39		28	33	26	76	304	150	102	193	199	368	47	255	554	234	118	54	328	3071
40-41		28		14	26	155	157	47	96	97	437	102	285	717	291	168	101	298	3017
42-43		7			13	121	171	47	90	83	399	149	229	511	326	59	172	275	2653
44-45				7		60	109	24	103	45	369	82	298	341	283	42	94	268	2124
46-47					19	41	68		77	45	238	48	151	185	220	84	32	134	1340
48-49		7			6	27	28	24	52	26	238	14	125	192	241	16	86	126	1207
50-51					6	14	20		45	6	123	27	83	128	149	33	16	97	747
52-53							21		32	13	130	20	42	85	71	34	8	52	508
54-55						7	20		13	6	77	7	35	57	71	16	16	52	377
56-57							14				23	7		43	49	8	8	37	189
58-59							7			6	15	14	7		14		8	15	86
60-61											23		7	21	21			15	87
62-63													7			8	8	14	37
64-65											15		7					7	30
66-67									6										6
68-69																			
70-71													7						7
72-73																			
74-75												7							7
76-77																			
78-79																			
80-81													11						11

Table 30 - Greenland halibut (*Reinhardtius hippoglossoides*) age-length key in the 1997 survey.

MALES

length (cm)	age 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16+	no id	tot n.
12-13	2																	2
14-15	12																	12
16-17	32																	32
18-19	4	6																10
20-21	2	10																12
22-23		7	1															8
24-25		18	6															24
26-27		26	14	1														41
28-29		9	13	6														28
30-31			18	14	2													34
32-33			6	11	9													26
34-35			8	13	8	3												32
36-37			3	11	22	10											5	51
38-39				8	15	11	1											35
40-41				1	9	16	7										1	34
42-43					5	16	8	3										32
44-45					1	21	10	5										37
46-47						7	13	5										25
48-49						4	13	9										26
50-51						1	6	11	4	2								24
52-53							5	9	5									19
54-55							2	8	2	1								13
56-57							1	2	5	1								9
58-59								1	1	1								3
60-61									4									4
62-63													1					1
total:	52	76	69	65	71	89	66	53	21	5			1				6	574

FEMALES

length (cm)	age 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16+	no id	tot n.
12-13																		
14-15	19																	19
16-17	31																1	32
18-19	12	5																17
20-21		10																10
22-23		13																13
24-25		23	6															29
26-27		20	15	4														39
28-29		9	19	3													1	32
30-31		1	19	6														26
32-33			20	12	3												1	36
34-35			9	18	4												2	33
36-37			8	13	14	6												41
38-39				9	15	9	1										1	35
40-41				3	12	22	5										1	43
42-43					6	24	17											47
44-45					6	16	18	3										43
46-47						14	18	8										40
48-49						4	18	10									1	33
50-51						2	8	16	6									32
52-53							6	12	9	2								29
54-55							6	9	10	2								27
56-57								2	9	5								16
58-59									4	4	1	1						10
60-61									2	3		2	1					8
62-63									1	2	1							4
64-65										1	1		1		1			4
66-67										1								1
68-69																		
70-71																1		1
72-73																		
74-75																1		1
76-77																		
78-79																		
80-81											1							1
total:	62	81	96	68	60	97	97	60	41	20	4	3	2		1	2	8	702

Table 31 - Greenland halibut (*Reinhardtius hippoglossoides*) age composition (x 1000) in the 1997 survey.

							stratum												mean weight	mean ength
age	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	total	(g)	(cm)
1 :		71	4	14	38	729	45		336	329	6			20	5				1597	30	16
2 :		33	5	13	103	958	269	16	222	246	34	1	14	134	13	5	9	38	2113	121	25
3 :		80	9	77	168	1275	593	145	363	347	229	51	178	511	114	62	66	128	4396	247	31
4 :	1	70	17	79	159	1056	595	180	397	339	386	81	305	763	245	126	106	252	5157	330	34
5 :	3	44	19	59	118	681	448	132	317	271	576	117	388	920	398	171	145	409	5216	432	37
6 :	1	32	12	30	70	394	368	105	272	218	881	205	573	1127	674	218	239	626	6045	578	41
7 :		11	1	6	26	134	188	49	178	110	668	140	414	682	556	132	174	416	3885	758	45
8 :		2			9	33	64	10	83	34	316	50	175	277	310	68	74	204	1709	979	49
9 :					1	5	28		22	9	109	23	45	107	117	26	19	82	593	1327	54
10 :						1	9		9	3	42	10	18	25	31	11	10	31	200	1568	57
11 :							1			1	5	1	15			2	3	5	33	2861	68
12 :							1			1	7	1	2	2	2		1	5	22	1796	59
13 :											7		3	1	1			11	23	2058	62
14 :																					
15 :											4		2					2	8	2264	64
16+:												7	7						14	3272	72

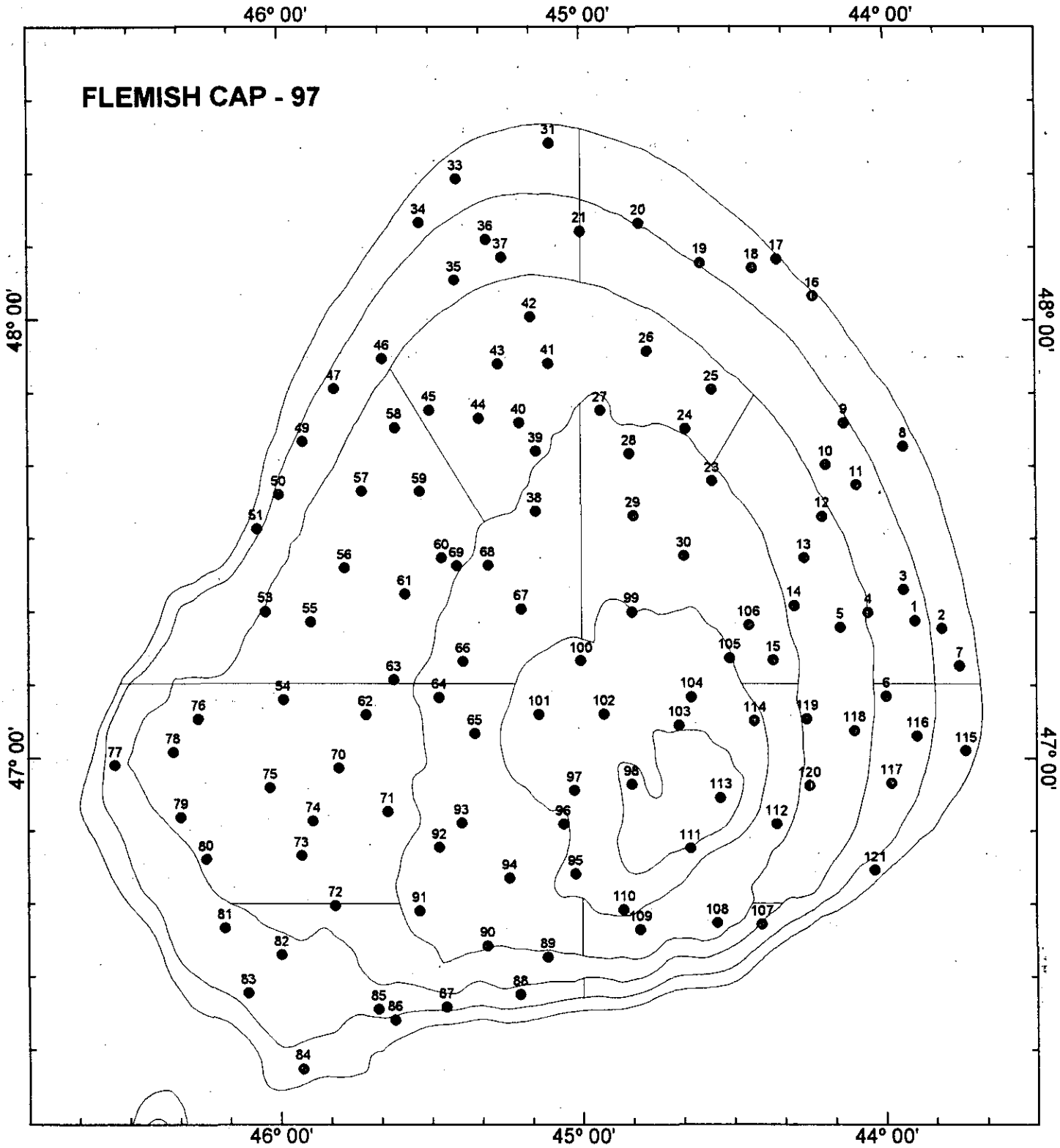

Figure 1 .- Hauls position of the Flemish Cap - 97 survey.

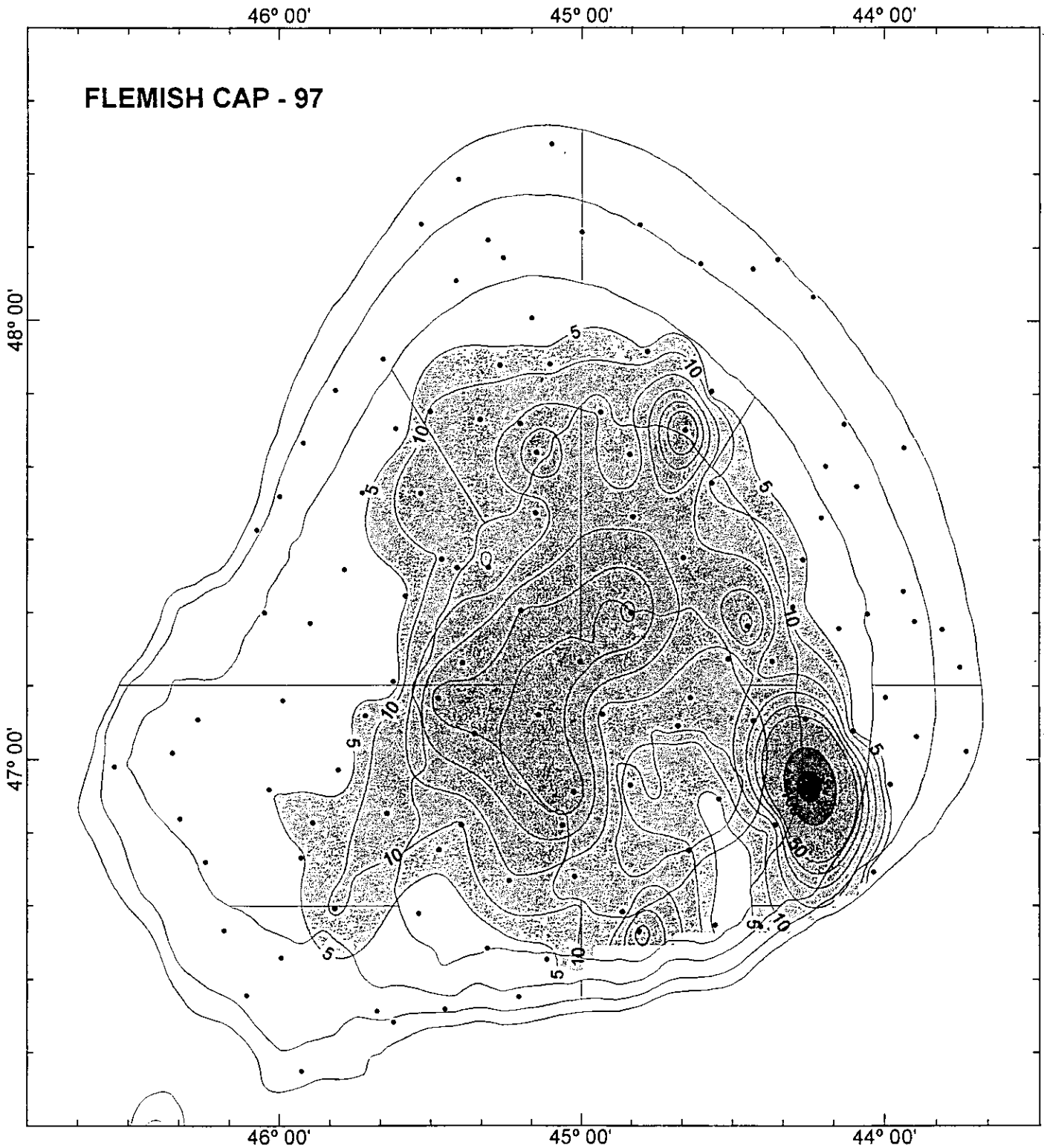

Figure 2 .- Cod (Gadus morhua) catch distribution in Kg/tow.

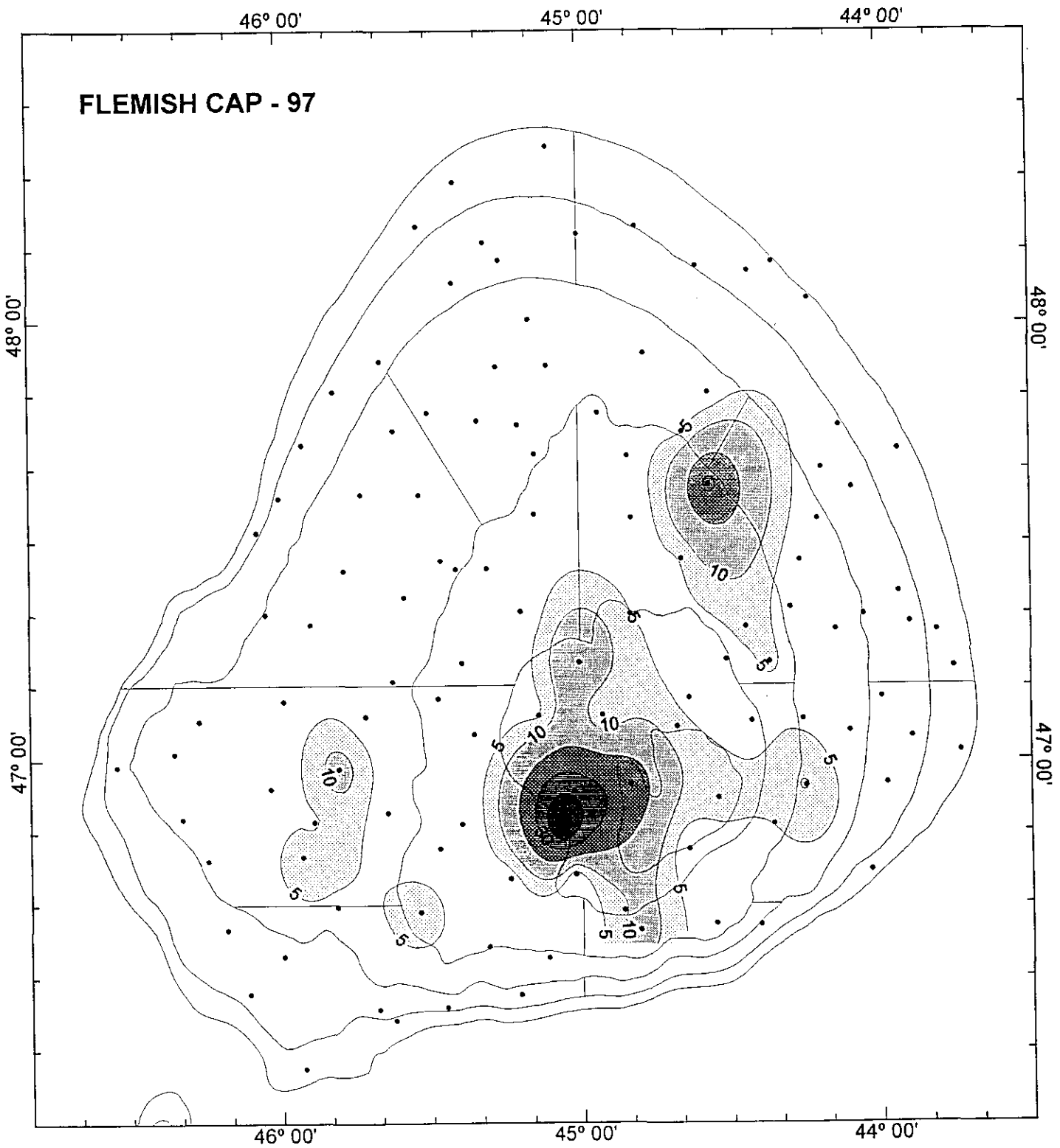

Figure 3 .- American plaice (Hippoglossoides platessoides) catch distribution in Kg/tow.

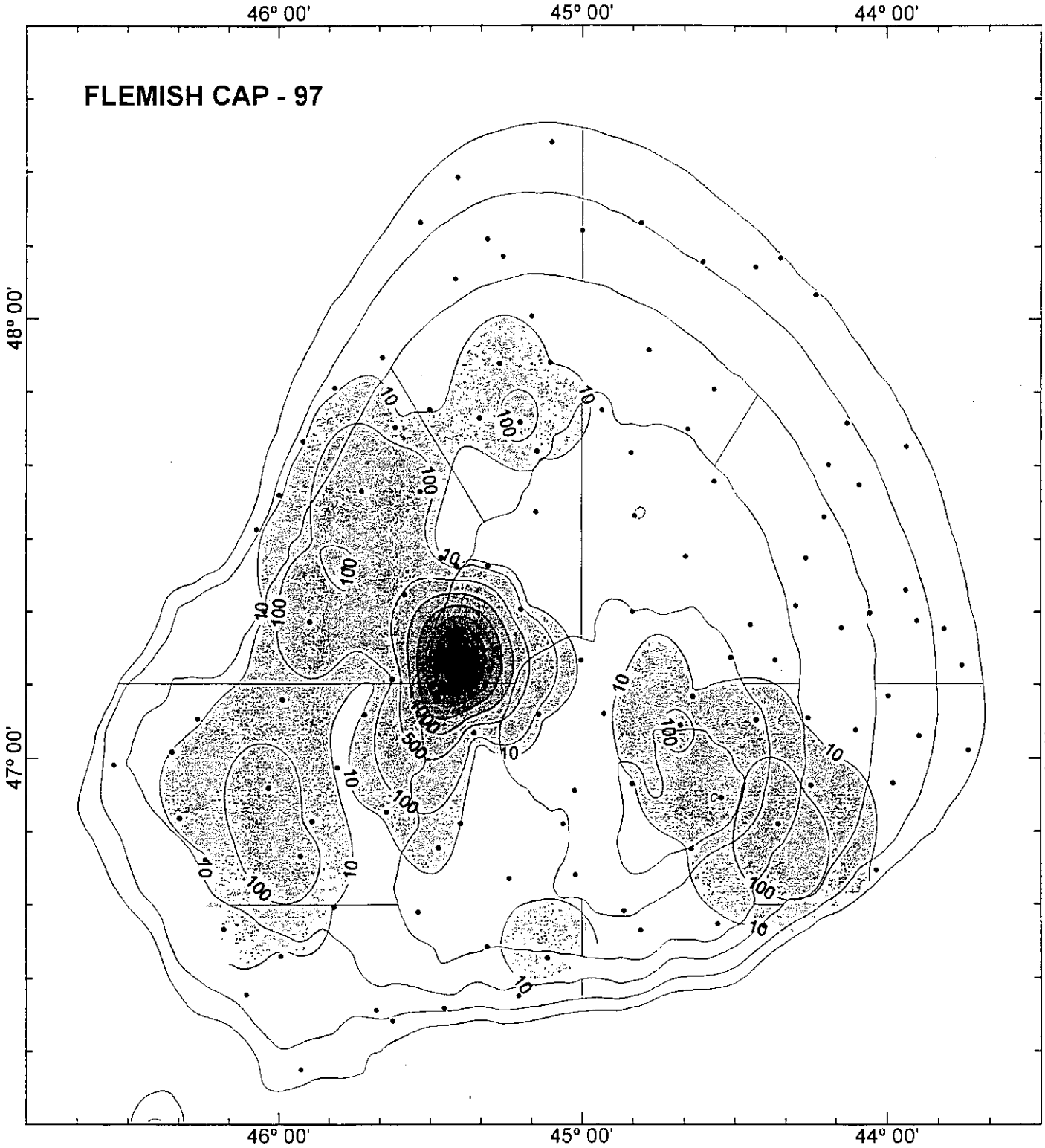

Figure 4.- Redfish (Sebastes marinus) catch distribution in Kg/tow).

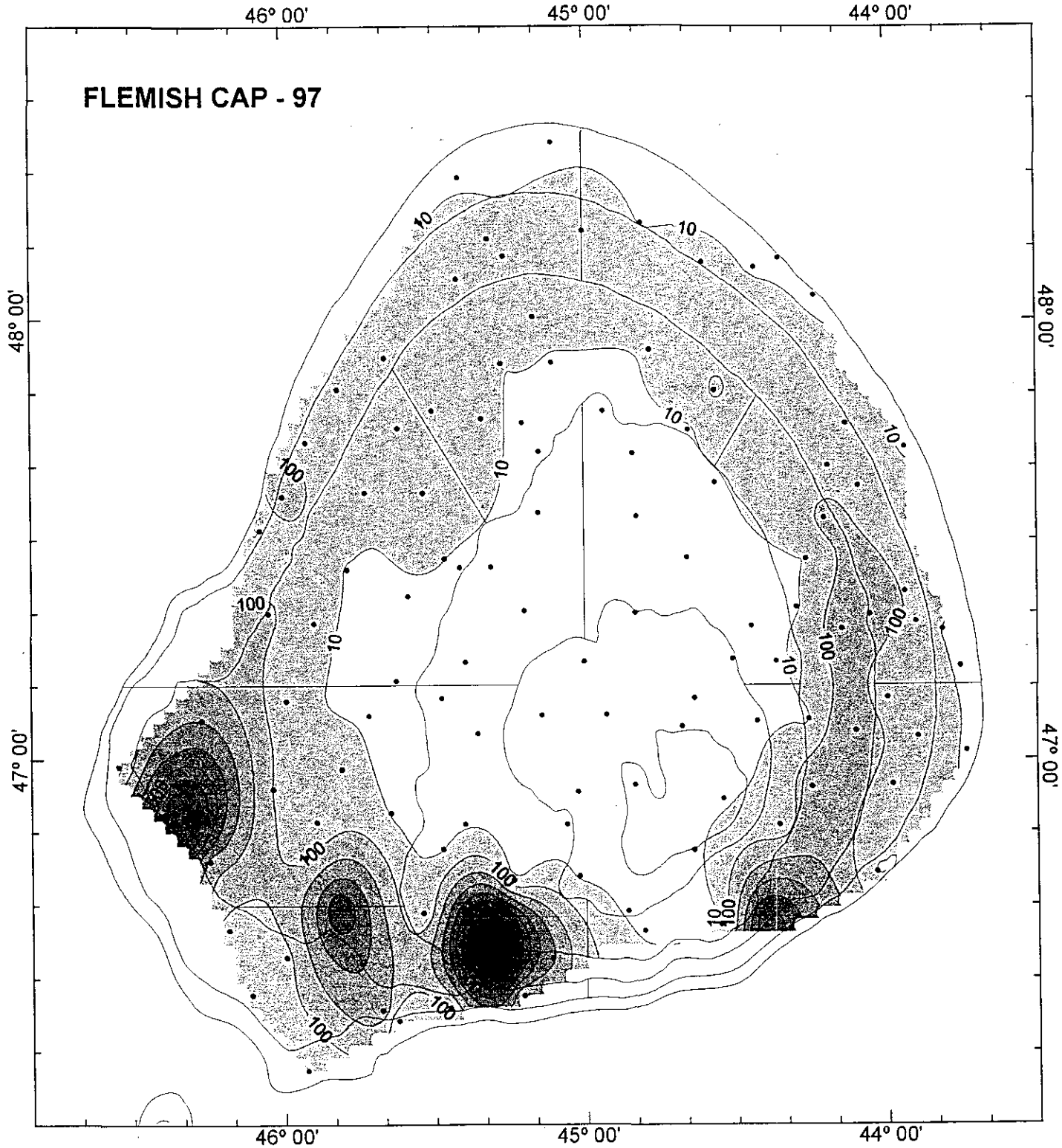

Figure 5 .- Redfish (Sebastes mentella) catch distribution in Kg/tow.

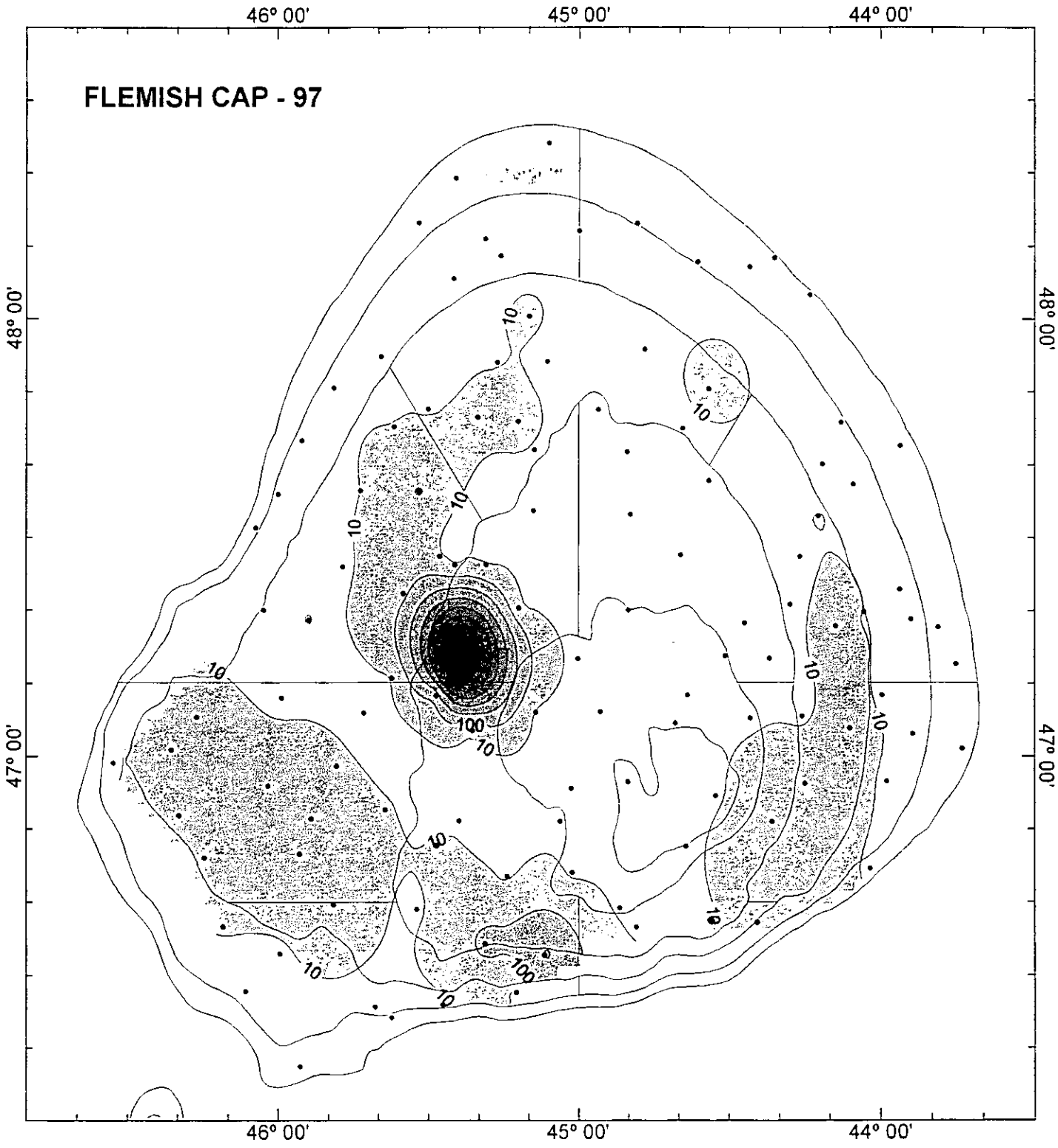

Figure 6 .- Redfish (Sebastes fasciatus) catch distribution in Kg/tow.

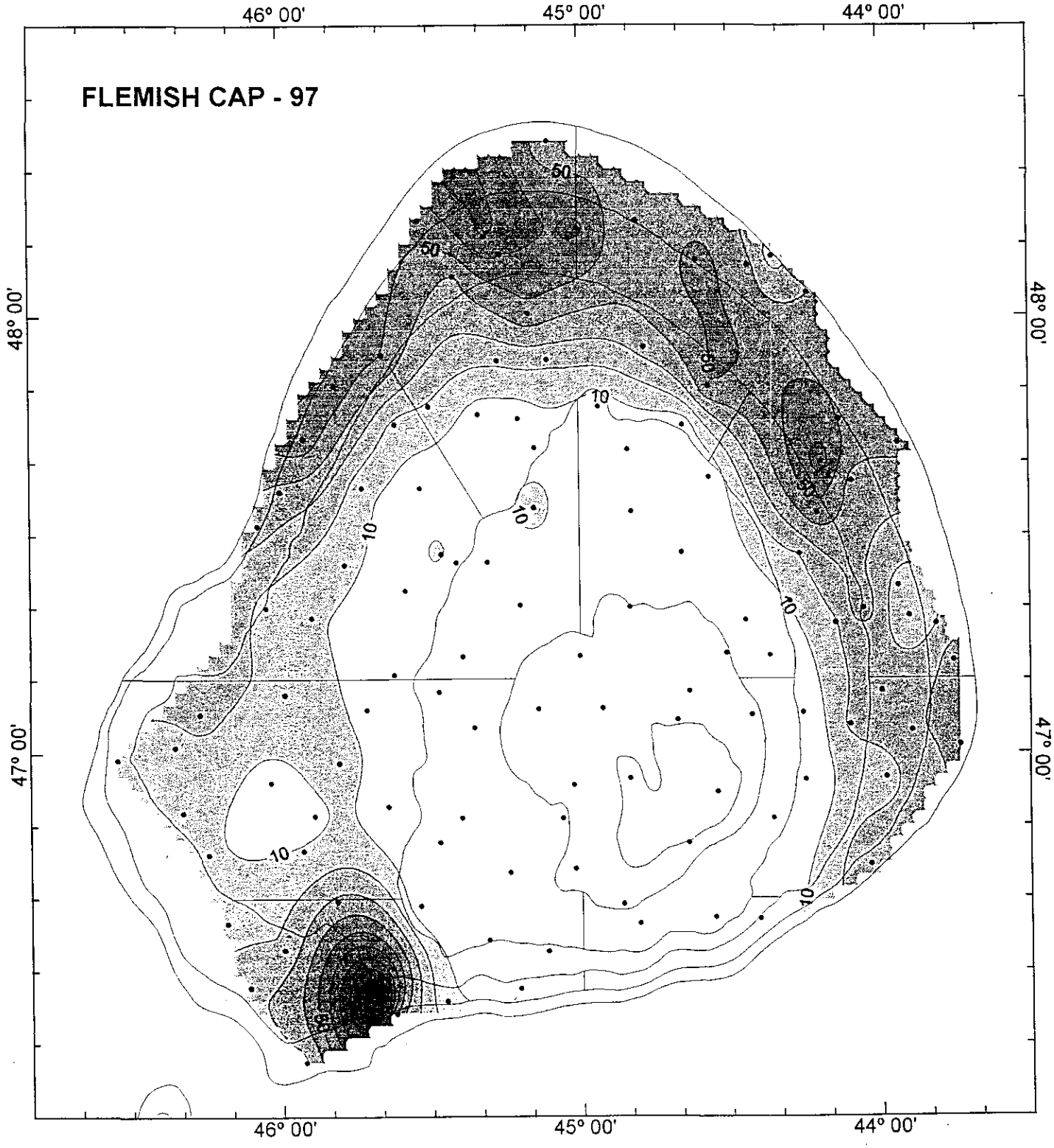

Figure 7 .- Greenland halibut (Reinhardtius hippoglossoides) catch distribution in Kg/tow.