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Results From the 98 Spanish Bottom Trawl Survey in the NAFO  
Regulatory Area for Divisions 3NO

by

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As the previous years a stratified-random bottom trawl survey was performed in NAFO Regulatory Area (Divisions 3NO) during 6<sup>th</sup> to 28<sup>th</sup> May. The survey, which covered offshore areas on the Grand Bank, was conducted following the same procedures and the same vessel and gear of the 1995-97 surveys (Paz, et al, 1995; 1996, 1997). The area and strata to be covered by the survey were based on the stratification charts and tables in Bishop (1994).

In 1998, the area covered was extended until 800 fathoms including the new strata: 755, 759, 763, 767. A total of 124 successful fishing sets were completed, 101 in Div 3N and 23 in Div 3O (Figure 1).

At touchdown of the net a standard 30 minutes tow started at a mean speed of 3 knots. Trawls with net damage were excluded from analysis. From each set, catch numbers and weights for main species along with length frequency from American plaice, Greenland halibut, witch flounder, yellowtail flounder and cod. Otoliths were collected from American plaice, Greenland halibut, cod and routhead grenadier.

The catch weight by tow distribution for American plaice, yellowtail flounder, Greenland halibut, witch flounder and cod appears in the figures 2 to 6. The catches of the five species considered: American plaice, yellowtail flounder, Greenland halibut, witch flounder and cod are increasing this year and their value indices estimates resulted greater. In the figure 7 appears the comparison between abundance and biomass indices for the four years considering only the strata covered in 1995 and in the figure 8 we compare three years considering the area covered in 1996, depth of the strata until 110 m.. Here the indices are referred to an area greater than in the figure 7. The abundance and biomass indices by strata for these species are presented in the tables 1 to 5 respectively, and their length distribution by sexes in tables 6 to 10 respectively. Cod length distribution (table 10) is given for both sexes combined.

## REFERENCES

- 2 -

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Table 1.- American plaice abundance and biomass indices by strata in the 1998 Spanish spring bottom trawl survey in Div. 3NO.

Estrata	Area	Number of hauls	Area trawled	Catch (number)	Catch (Kg)	Abundance (,000)	Biomass (t)
353	269	4	0.05	7817	3447.0	45219	19940.7
354	246	3	0.04	8820	3680.7	60908	25416.2
355	74	2	0.02	1871	866.2	6257	2897.1
356	47	2	0.02	215	91.5	457	194.4
357	164	2	0.02	33	15.0	226	102.5
358	225	3	0.02	150	64.9	1429	618.2
359	421	6	0.07	8963	3832.2	54100	23130.6
360	2783	25	0.26	19074	8645.4	207258	93939.1
374	214	3	0.04	90	38.6	547	234.3
375	271	3	0.03	120	57.2	941	449.3
376	1334	10	0.09	4624	2666.9	66322	38254.2
377	100	2	0.02	581	303.5	2541	1326.8
378	139	2	0.01	85	33.6	985	389.2
379	106	3	0.04	86	25.6	255	76.2
380	96	2	0.01	41	10.9	350	93.0
381	144	2	0.02	258	54.1	1624	340.6
382	343	3	0.02	161	42.0	2414	629.8
721	65	2	0.02	102	49.4	328	158.6
722	84	2	0.01	32	12.8	267	106.2
723	155	2	0.02	133	64.6	884	430.7
724	124	2	0.02	155	69.7	932	419.0
725	105	1	0.01	4	2.0	47	24.3
726	72	2	0.01	49	19.0	377	145.9
727	96	2	0.02	174	58.0	718	239.5
728	78	2	0.02	383	100.2	1448	378.9
752	131	2	0.02	1024	321.3	5861	1840.0
753	138	2	0.02	2597	945.4	16478	5998.4
754	180	2	0.02	41	17.2	351	147.4
755	385	2	0.02	8	2.5	148	46.7
756	101	2	0.02	2899	1284.9	13012	5767.8
757	102	2	0.02	1323	529.0	6544	2616.1
758	99	2	0.01	47	25.9	443	244.2
759	127	2	0.02	0	0.0	0	0.0
760	154	2	0.02	88	51.7	635	372.5
761	171	2	0.02	45	22.3	373	184.9
762	212	2	0.01	0	0.0	0	0.0
763	261	2	0.02	1	0.5	13	6.0
764	100	2	0.02	4	1.6	18	7.4
765	124	2	0.01	0	0.0	0	0.0
766	144	2	0.02	0	0.0	0	0.0
767	158	2	0.01	0	0.0	0	0.0
<b>TOTAL</b>	<b>10342</b>	<b>124</b>	<b>1.22</b>	<b>62098</b>	<b>27453</b>	<b>500711</b>	<b>227166.6</b>
Standard error:						3999	4293

Table 2.- Yellowtail flounder abundance and biomass indices by strata in the 1998 Spanish spring bottom trawl survey in Div. 3NO.

Estrata	Area	Number of hauls	Area trawled	Catch (number)	Catch (Kg)	Abundance (,000)	Biomass (t)
353	269	4	0.05	313	146.2	1813	845.9
354	246	3	0.04	29	10.9	201	75.3
355	74	2	0.02	1	0.8	3	2.5
356	47	2	0.02	0	0.0	0	0.0
357	164	2	0.02	0	0.0	0	0.0
358	225	3	0.02	0	0.0	0	0.0
359	421	6	0.07	9	3.1	54	18.7
360	2783	25	0.26	123789	27955.2	1345060	303755.3
374	214	3	0.04	3	0.4	16	2.4
375	271	3	0.03	306	111.0	2401	871.9
376	1334	10	0.09	41721	8352.1	598447	119803.2
377	100	2	0.02	0	0.0	0	0.0
378	139	2	0.01	0	0.0	0	0.0
379	106	3	0.04	0	0.0	0	0.0
380	96	2	0.01	0	0.0	0	0.0
381	144	2	0.02	0	0.0	0	0.0
382	343	3	0.02	0	0.0	0	0.0
721	65	2	0.02	0	0.0	0	0.0
722	84	2	0.01	0	0.0	0	0.0
723	155	2	0.02	0	0.0	0	0.0
724	124	2	0.02	0	0.0	0	0.0
725	105	1	0.01	0	0.0	0	0.0
726	72	2	0.01	0	0.0	0	0.0
727	96	2	0.02	0	0.0	0	0.0
728	78	2	0.02	0	0.0	0	0.0
752	131	2	0.02	0	0.0	0	0.0
753	138	2	0.02	0	0.0	0	0.0
754	180	2	0.02	0	0.0	0	0.0
755	385	2	0.02	0	0.0	0	0.0
756	101	2	0.02	0	0.0	0	0.0
757	102	2	0.02	0	0.0	0	0.0
758	99	2	0.01	0	0.0	0	0.0
759	127	2	0.02	0	0.0	0	0.0
760	154	2	0.02	0	0.0	0	0.0
761	171	2	0.02	0	0.0	0	0.0
762	212	2	0.01	0	0.0	0	0.0
763	261	2	0.02	0	0.0	0	0.0
764	100	2	0.02	0	0.0	0	0.0
765	124	2	0.01	0	0.0	0	0.0
766	144	2	0.02	0	0.0	0	0.0
767	158	2	0.01	0	0.0	0	0.0
TOTAL	10342	124	1.22	166170	36579.7	1947995	425375.3
Standard error:						29221	15485

Table 3.- Greenland halibut abundance and biomass indices by strata in the 1998 Spanish spring bottom trawl survey in Div. 3NO.

Estrata	Area	Number of hauls	Area trawled	Catch (number)	Catch (Kg)	Abundance (,000)	Biomass (t)
353	269	4	0.05	306	59	1771	341.3
354	246	3	0.04	367	76.4	2536	527.6
355	74	2	0.02	12	6.2	40	20.7
356	47	2	0.02	332	91.9	704	195.2
357	164	2	0.02	902	181	6163	1236.8
358	225	3	0.02	441	76	4198	723.8
359	421	6	0.07	83	14.5	501	87.5
360	2783	25	0.26	57	9.7	619	105.4
374	214	3	0.04	7	1.5	42	9.1
375	271	3	0.03	0	0	0	0.0
376	1334	10	0.09	0	0	0	0.0
377	100	2	0.02	3	0.6	13	2.6
378	139	2	0.01	74	14.3	858	165.6
379	106	3	0.04	393	60.8	1169	180.9
380	96	2	0.01	362	53.4	3091	455.7
381	144	2	0.02	67	15	422	94.4
382	343	3	0.02	6	1.2	90	18.0
721	65	2	0.02	1115	254.6	3580	817.2
722	84	2	0.01	1376	535.2	11420	4440.2
723	155	2	0.02	523	114.6	3490	764.0
724	124	2	0.02	567	180.9	3406	1087.6
725	105	1	0.01	122	22.3	1485	271.5
726	72	2	0.01	2334	602.4	17928	4626.4
727	96	2	0.02	874	168.1	3609	694.1
728	78	2	0.02	5402	1232.6	20428	4661.5
752	131	2	0.02	3523	1168.2	20173	6690.0
753	138	2	0.02	1081	717.8	6862	4554.3
754	180	2	0.02	341	373.1	2920	3198.0
755	385	2	0.02	446	410.9	8320	7670.1
756	101	2	0.02	11695	4742.9	52499	21290.4
757	102	2	0.02	3093	2052.3	15298	10149.6
758	99	2	0.01	1286	1132.3	12129	10676.0
759	127	2	0.02	1330	1038.2	7902	6168.5
760	154	2	0.02	1391	708.7	10022	5106.0
761	171	2	0.02	2111	991.3	17500	8218.8
762	212	2	0.01	1036	823.5	23425	18622.1
763	261	2	0.02	761	754.5	9131	9054.0
764	100	2	0.02	727	459.2	3340	2111.3
765	124	2	0.01	927	491.7	11789	6253.4
766	144	2	0.02	398	448.6	2994	3377.7
767	158	2	0.01	138	220	2005	3196.3
<b>TOTAL</b>	<b>10342</b>	<b>124</b>	<b>1.22</b>	<b>46009</b>	<b>20305.4</b>	<b>293873</b>	<b>147863.6</b>
Standard error:						2443	4064

Table 4.- Witch flounder abundance and biomass indices by strata in the 1998 Spanish spring bottom trawl survey in Div. 3NO.

Estrata	Area	Number of hauls	Area trawled	Catch (number)	Catch (Kg)	Abundance (,000)	Biomass (t)
353	269	4	0.05	48	34.6	278	200.2
354	246	3	0.04	761	326.6	5252	2255.3
355	74	2	0.02	1295	484.7	4332	1621.1
356	47	2	0.02	415	156.7	881	332.9
357	164	2	0.02	12	4.8	80	32.8
358	225	3	0.02	13	7.9	124	75.2
359	421	6	0.07	130	84.6	785	510.6
360	2783	25	0.26	31	24.4	336	265.3
374	214	3	0.04	0	0.0	0	0.0
375	271	3	0.03	0	0.0	0	0.0
376	1334	10	0.09	2	1.9	29	27.3
377	100	2	0.02	0	0.0	0	0.0
378	139	2	0.01	1	1.0	11	11.6
379	106	3	0.04	8	5.0	24	14.9
380	96	2	0.01	1	0.4	9	3.5
381	144	2	0.02	0	0.0	0	0.0
382	343	3	0.02	0	0.0	0	0.0
721	65	2	0.02	692	177.7	2222	570.4
722	84	2	0.01	682	137.3	5657	1139.1
723	155	2	0.02	68	30.0	453	200.0
724	124	2	0.02	123	40.7	739	244.7
725	105	1	0.01	11	2.2	132	26.8
726	72	2	0.01	110	24.8	846	190.5
727	96	2	0.02	5	2.3	20	9.5
728	78	2	0.02	72	12.8	271	48.4
752	131	2	0.02	54	18.5	309	105.9
753	138	2	0.02	106	49.0	675	310.9
754	180	2	0.02	3	2.2	26	18.9
755	385	2	0.02	0	0.0	0	0.0
756	101	2	0.02	214	70.5	960	316.5
757	102	2	0.02	601	199.5	2970	986.6
758	99	2	0.01	64	11.8	599	111.3
759	127	2	0.02	1	1.2	6	7.3
760	154	2	0.02	525	175.2	3785	1262.3
761	171	2	0.02	648	220.3	5374	1826.5
762	212	2	0.01	0	0.0	0	0.0
763	261	2	0.02	2	0.7	24	8.3
764	100	2	0.02	504	139.9	2319	643.2
765	124	2	0.01	282	67.1	3589	853.4
766	144	2	0.02	51	14.8	384	111.4
767	158	2	0.01	21	6.3	305	91.5
TOTAL	10342	124	1.22	7555	2537.46	43807	14434.1
Standard error:						588	675

Table 5.- Cod abundance and biomass indices by strata in the 1998 Spanish spring bottom trawl survey in Div. 3NO.

Estrata	Area	Number of hauls	Area trawled	Catch (number)	Catch (Kg)	Abundance (,000)	Biomass (t)
353	269	4	0.05	1	0.0	6	0.1
354	246	3	0.04	108	151.5	746	1046.1
355	74	2	0.02	125	154.6	418	517.1
356	47	2	0.02	23	35.6	49	75.6
357	164	2	0.02	36	42.6	246	291.1
358	225	3	0.02	30	38.2	285	363.8
359	421	6	0.07	3	6.7	18	40.4
360	2783	25	0.26	11	15.8	117	171.9
374	214	3	0.04	0	0.0	0	0.0
375	271	3	0.03	6	6.7	47	52.6
376	1334	10	0.09	8	5.6	112	80.9
377	100	2	0.02	10	10.8	44	47.2
378	139	2	0.01	23	19.8	265	229.4
379	106	3	0.04	67	71.2	199	211.9
380	96	2	0.01	40	13.3	341	113.5
381	144	2	0.02	3	1.2	19	7.6
382	343	3	0.02	2	2.7	29	40.6
721	65	2	0.02	3	3.5	10	11.2
722	84	2	0.01	0	0.0	0	0.0
723	155	2	0.02	24	25.1	160	167.3
724	124	2	0.02	5331	8509.5	32052	51160.1
725	105	1	0.01	92	88.2	1120	1073.7
726	72	2	0.01	30	27.1	230	208.1
727	96	2	0.02	43	15.2	178	62.8
728	78	2	0.02	9	8.8	34	33.3
752	131	2	0.02	0	0.0	0	0.0
753	138	2	0.02	0	0.0	0	0.0
754	180	2	0.02	0	0.0	0	0.0
755	385	2	0.02	0	0.0	0	0.0
756	101	2	0.02	2	1.8	9	8.1
757	102	2	0.02	0	0.0	0	0.0
758	99	2	0.01	0	0.0	0	0.0
759	127	2	0.02	0	0.0	0	0.0
760	154	2	0.02	0	0.0	0	0.0
761	171	2	0.02	0	0.0	0	0.0
762	212	2	0.01	0	0.0	0	0.0
763	261	2	0.02	0	0.0	0	0.0
764	100	2	0.02	0	0.0	0	0.0
765	124	2	0.01	0	0.0	0	0.0
766	144	2	0.02	0	0.0	0	0.0
767	158	2	0.01	0	0.0	0	0.0
TOTAL	10342	124	1.22	6030	9255.6	36735	56014.7
Standard error:						3150	5371

Table 6.- Length distribution of American plaice

Length groups (cm)	Frecuency % <sub>0</sub>		
	Males	Females	Combined
12	0.02	0.02	0.03
14	0.02	0.0	0.02
16	1.1	0.7	1.8
18	0.2	0.5	0.7
20	1.3	0.9	2.1
22	4.4	3.6	7.9
24	15.3	12.7	27.9
26	24.6	21.9	46.4
28	45.4	31.3	76.7
30	60.4	40.9	101.3
32	55.6	60.3	115.9
34	42.1	96.8	138.9
36	24.0	113.1	137.1
38	12.4	105.7	118.1
40	4.0	78.8	82.8
42	2.3	53.7	55.9
44	0.6	36.5	37.1
46	0.6	20.2	20.8
48	0.1	13.4	13.5
50	0.0	5.9	5.9
52	0.0	2.5	2.5
54	0.3	1.7	1.9
56	0.0	1.3	1.3
58	0.0	1.2	1.2
60	0.0	1.2	1.2
62	0.0	0.3	0.3
64	0.0	0.3	0.3
66	0.0	0.1	0.1
68	0.0	0.2	0.2
TOTAL	294.6	705.4	1000.0
N° Ind. Sampled	4640	7390	12030
N° Samples	108		
Total catch	27453		
Sampled catch	27383		
Total hauls	124		



Table 7.- Length distribution of yellowtail flounder

Length groups (cm)	Frecuency ‰			
	Males	Females	Indeterm.	Combined
10	0.0	0.0	0.01	0.01
12	0.0	0.0	0.3	0.3
14	0.1	0.1	0.0	0.2
16	1.1	1.2	0.0	2.3
18	8.2	5.2	0.0	13.4
20	9.8	11.1	0.0	20.9
22	32.3	26.0	0.0	58.3
24	64.6	53.7	0.0	118.4
26	114.7	95.6	0.0	210.3
28	96.9	104.5	0.0	201.4
30	57.7	99.3	0.0	157.0
32	28.7	58.9	0.0	87.6
34	11.0	42.2	0.0	53.2
36	5.1	23.5	0.0	28.5
38	4.8	16.0	0.0	20.8
40	2.0	14.5	0.0	16.6
42	0.1	6.0	0.0	6.1
44	0.02	3.2	0.0	3.2
46	0.0	1.1	0.0	1.1
48	0.01	0.4	0.0	0.5
TOTAL	437.1	562.5	0.3	1000.0
N° Ind. Sampled	2848	3693	3	<b>6544</b>
N° Samples	48			
Total catch	36580			
Sampled catch	36578			
Total hauls	124			

Table 8.- Length distribution of Greenland halibut

Length groups (cm)	Frequency ‰			
	Males	Females	Indeterm.	Combined
10	0.0	0.0	0.02	0.02
12	0.0	0.05	0.1	0.1
14	0.05	0.6	0.2	0.8
16	0.1	0.1	0.0	0.2
18	0.6	0.5	0.0	1.1
20	3.9	3.9	0.1	7.9
22	6.8	11.1	0.0	17.9
24	9.9	11.9	0.0	21.8
26	21.7	25.4	0.0	47.0
28	40.3	56.3	0.0	96.5
30	52.9	63.9	0.0	116.8
32	42.5	57.0	0.0	99.5
34	51.8	56.0	0.0	107.8
36	48.4	69.0	0.0	117.4
38	41.4	61.7	0.0	103.1
40	22.2	41.3	0.0	63.5
42	17.7	29.4	0.0	47.1
44	11.7	26.6	0.0	38.3
46	9.3	19.5	0.0	28.8
48	8.0	15.5	0.0	23.5
50	5.1	13.3	0.0	18.4
52	4.3	6.5	0.0	10.7
54	1.7	5.1	0.0	6.8
56	2.2	5.5	0.0	7.7
58	0.8	3.9	0.0	4.7
60	1.0	2.1	0.0	3.1
62	0.3	1.3	0.0	1.6
64	0.5	1.4	0.0	1.9
66	0.2	1.0	0.0	1.2
68	0.03	0.7	0.0	0.7
70	0.0	0.8	0.0	0.8
72	0.0	0.6	0.0	0.6
74	0.0	0.5	0.0	0.5
76	0.0	0.6	0.0	0.6
78	0.0	0.7	0.0	0.7
80	0.0	0.3	0.0	0.3
82	0.0	0.3	0.0	0.3
84	0.0	0.0	0.0	0.0
86	0.0	0.2	0.0	0.2
88	0.0	0.1	0.0	0.1
90	0.0	0.1	0.0	0.1
92	0.0	0.0	0.0	0.0
94	0.0	0.1	0.0	0.1
<b>TOTAL</b>	<b>405.2</b>	<b>594.4</b>	<b>0.4</b>	<b>1000.0</b>
N° Ind. Sampled	4470	7080	14	<b>11564</b>
N° Samples	84			
Total catch	20305			
Sampled catch	20305			
Total hauls	124			

Table 9.- Length distribution of witch flounder

Length groups (cm)	Frecuency ‰			
	Males	Females	Indeterm.	Combined
16	0.0	0.0	0.4	0.4
18	0.0	0.0	0.1	0.1
20	0.0	1.2	0.1	1.3
22	1.5	2.8	0.3	4.6
24	7.3	9.0	0.3	16.7
26	11.7	19.5	0.1	31.4
28	27.0	33.1	0.0	60.1
30	41.4	41.9	0.0	83.2
32	50.6	50.9	0.0	101.5
34	61.7	60.5	0.0	122.3
36	78.5	68.9	0.0	147.4
38	65.3	76.1	0.0	141.4
40	40.3	68.5	0.0	108.8
42	21.1	47.1	0.0	68.2
44	12.4	27.0	0.0	39.4
46	7.4	23.8	0.0	31.2
48	4.6	16.4	0.0	21.0
50	0.6	8.1	0.0	8.7
52	0.4	6.8	0.0	7.2
54	0.3	2.2	0.0	2.5
56	0.1	2.0	0.0	2.1
58	0.0	0.6	0.0	0.6
60	0.0	0.1	0.0	0.1
TOTAL	432.1	566.5	1.4	1000.0
N° Ind. Sampled	1451	1914	8	3373
N° Samples	74			
Total catch	2537			
Sampled catch	2536			
Total hauls	124			

Table 10.- Cod length distribution in the 1998 Spanish spring bottom trawl survey in Div. 3NO.

Length (cm)	Frecuency ‰
12 – 14	1.3
15 – 17	1.6
18 – 20	0.8
21 – 23	0.5
24 – 26	1.3
27 – 29	4.8
30 – 32	7.3
33 – 35	5.3
36 – 38	5.0
39 – 41	13.5
42 – 44	24.5
45 – 47	80.6
48 – 50	119.9
51 – 53	122.7
54 – 56	179.1
57 – 59	150.9
60 – 62	95.2
63 – 65	69.4
66 – 68	32.2
69 – 71	21.1
72 – 74	28.3
75 – 77	8.7
78 – 80	10.6
81 – 83	7.1
84 – 86	0.7
87 – 89	7.2
90 – 92	0.0
93 – 95	0.2
96 – 98	0.0
99 – 101	0.0
102 – 104	0.2
TOTAL	1000.0
N° Ind. Sampled	967
N° Samples	55
Total catch	9256
Sampled catch	9256
Total hauls	124

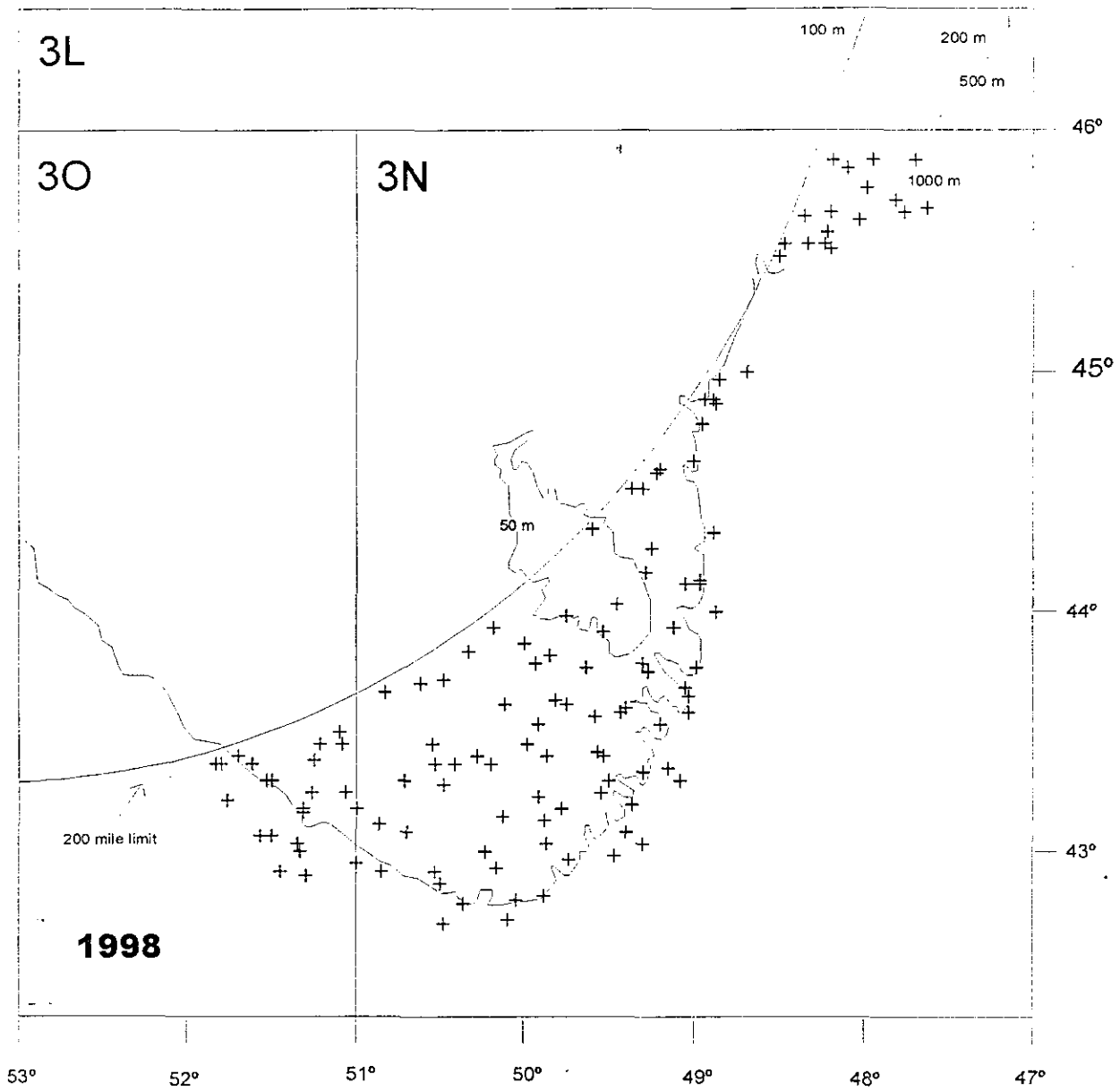


Fig 1.- Distribution of fishing stations during 1998 Spanish Bottom Trawl Survey in NAFO Divs. 3NO.

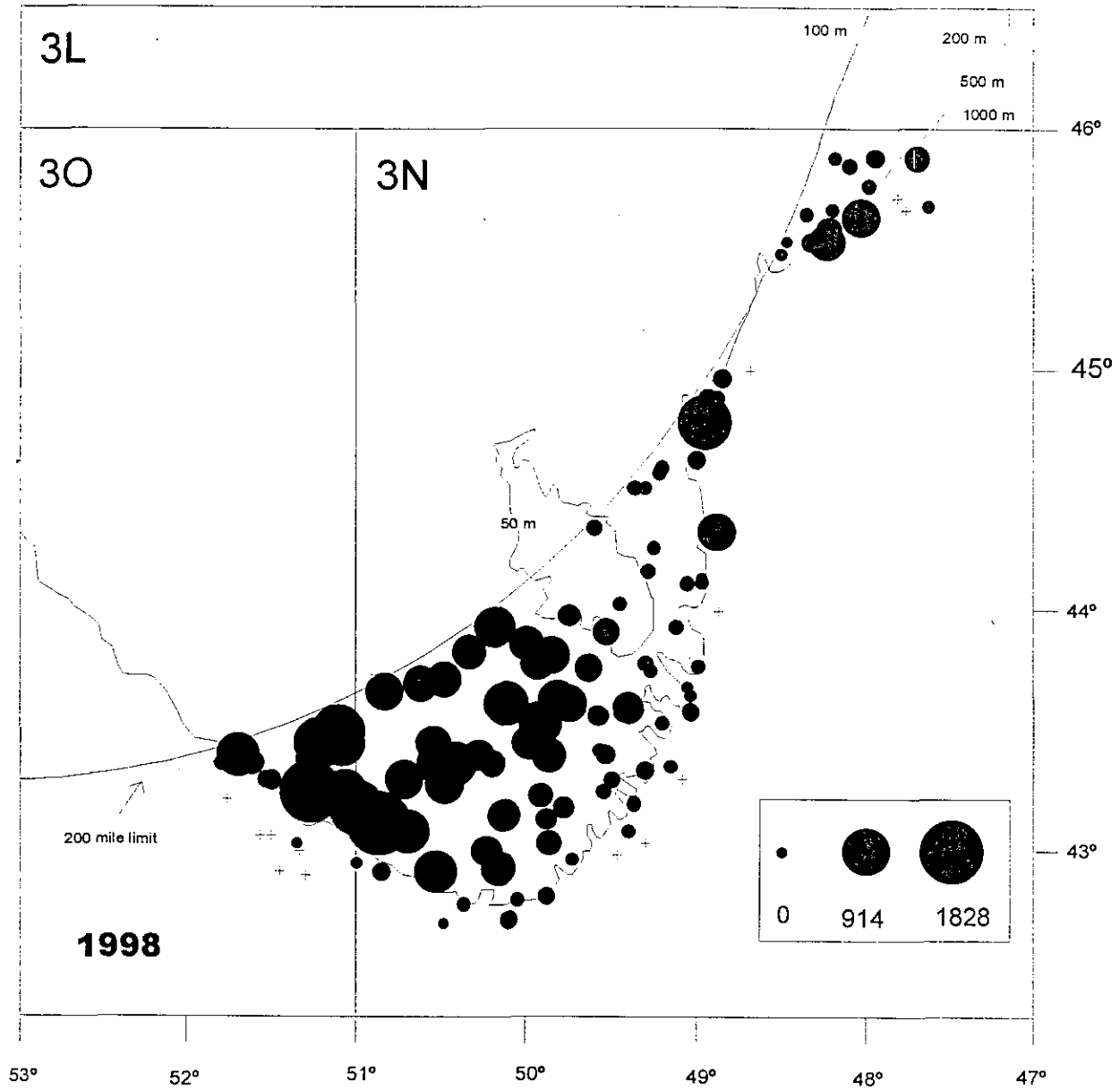


Fig. 2.- Distribution of American plaice catches from the 1998 Spanish Bottom Trawl Survey in NAFO Divs. 3NO. Symbols represent Catch in weight (Kg) per haul (square root scale).

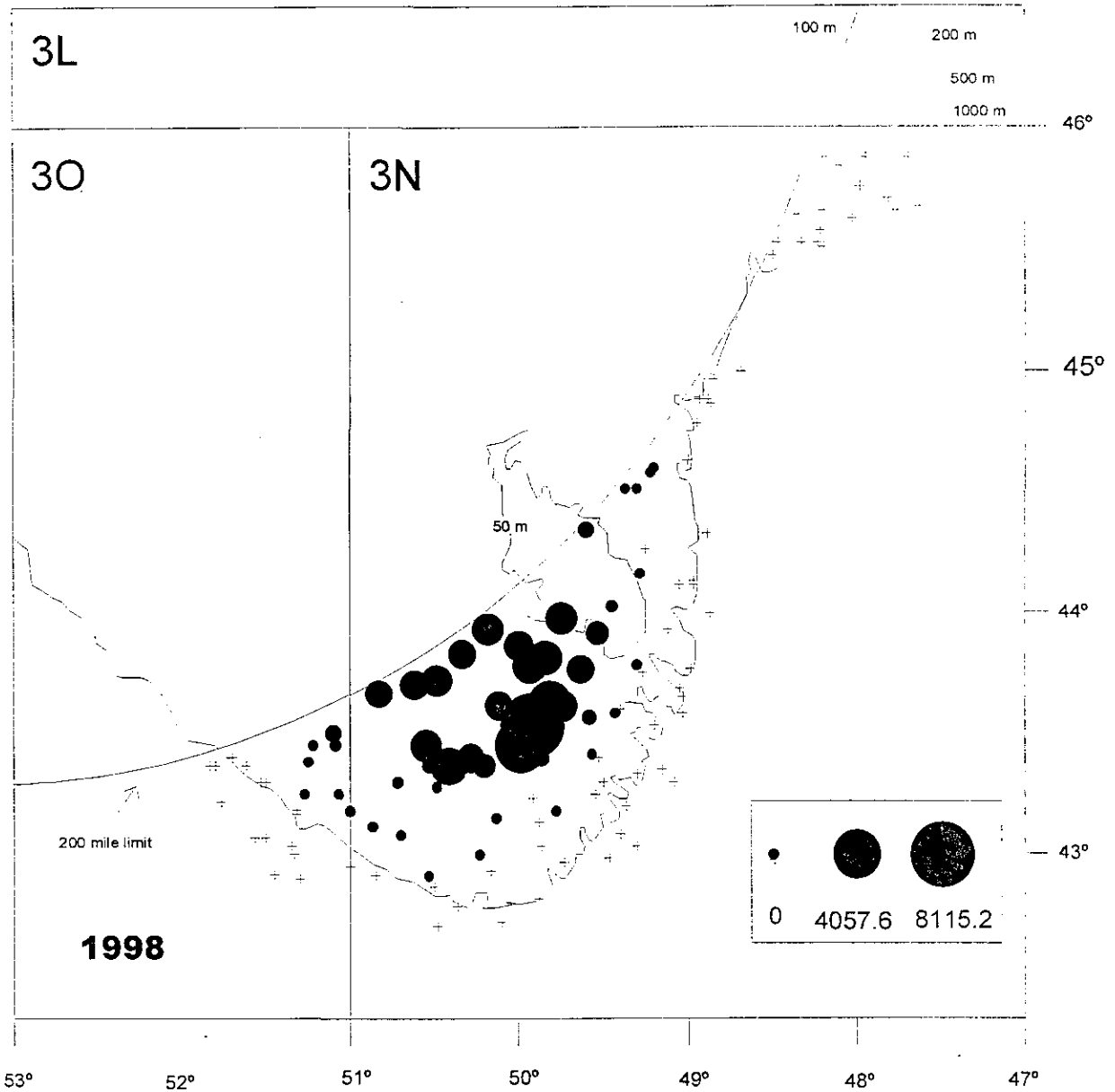


Fig. 3.- Distribution of yellowtail flounder catches from the 1998 Spanish Bottom Trawl Survey in NAFO Divs. 3NO. Symbols represent Catch in weight (Kg) per haul (square root scale).

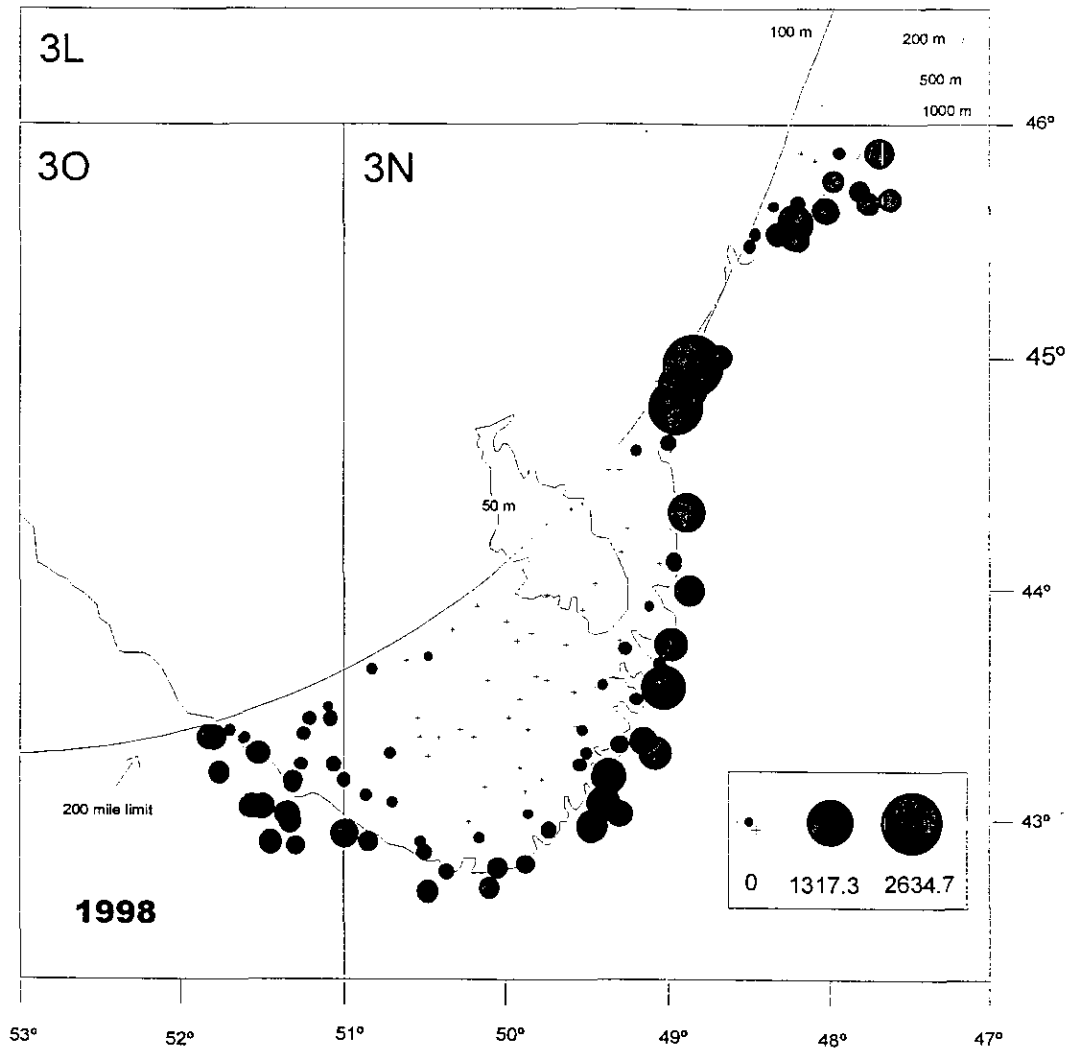


Fig. 4.- Distribution of Greenland halibut catches from the 1998 Spanish Bottom Trawl Survey in NAFO Divs. 3NO. Symbols represent Catch in weight (Kg) per haul (square root scale).



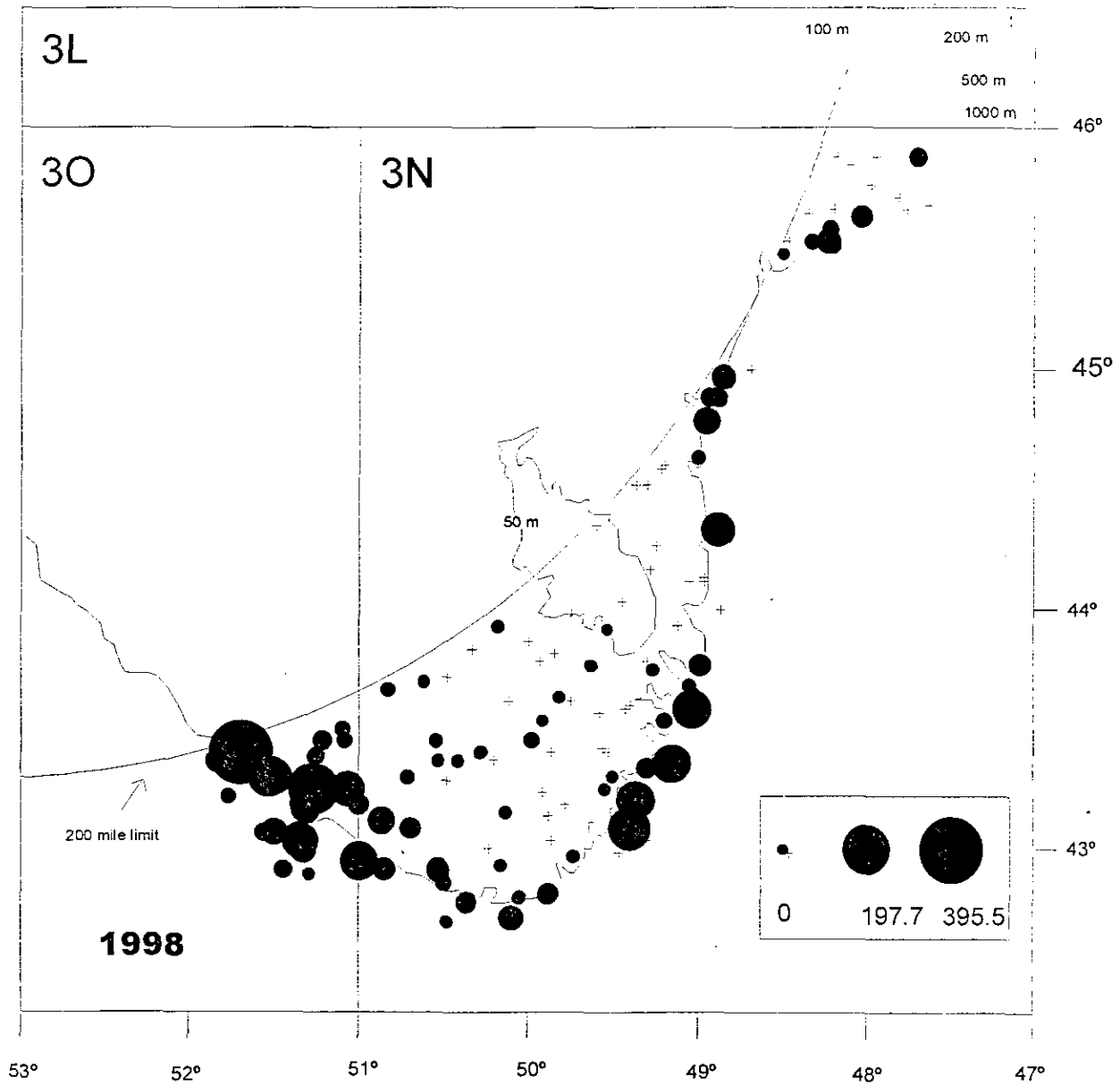


Fig. 5.- Distribution of witch flounder catches from the 1998 Spanish Bottom Trawl Survey in NAFO Divs. 3NO. Symbols represent Catch in weight (Kg) per haul (square root scale).

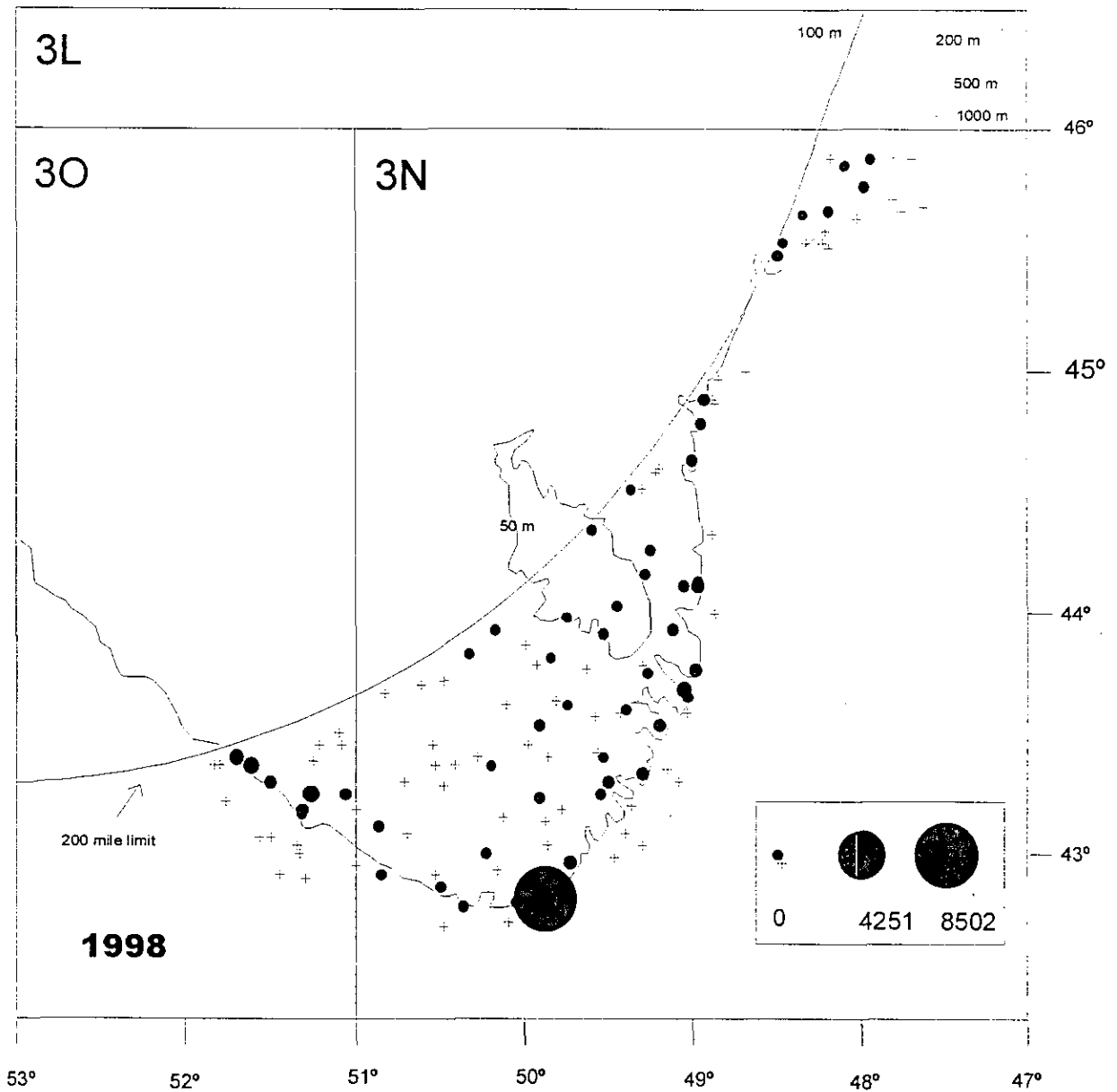


Fig. 6.- Distribution of cod catches from the 1998 Spanish Bottom Trawl Survey in NAFO Divs. 3NO. Symbols represent Catch in weight (Kg) per haul (square root scale).

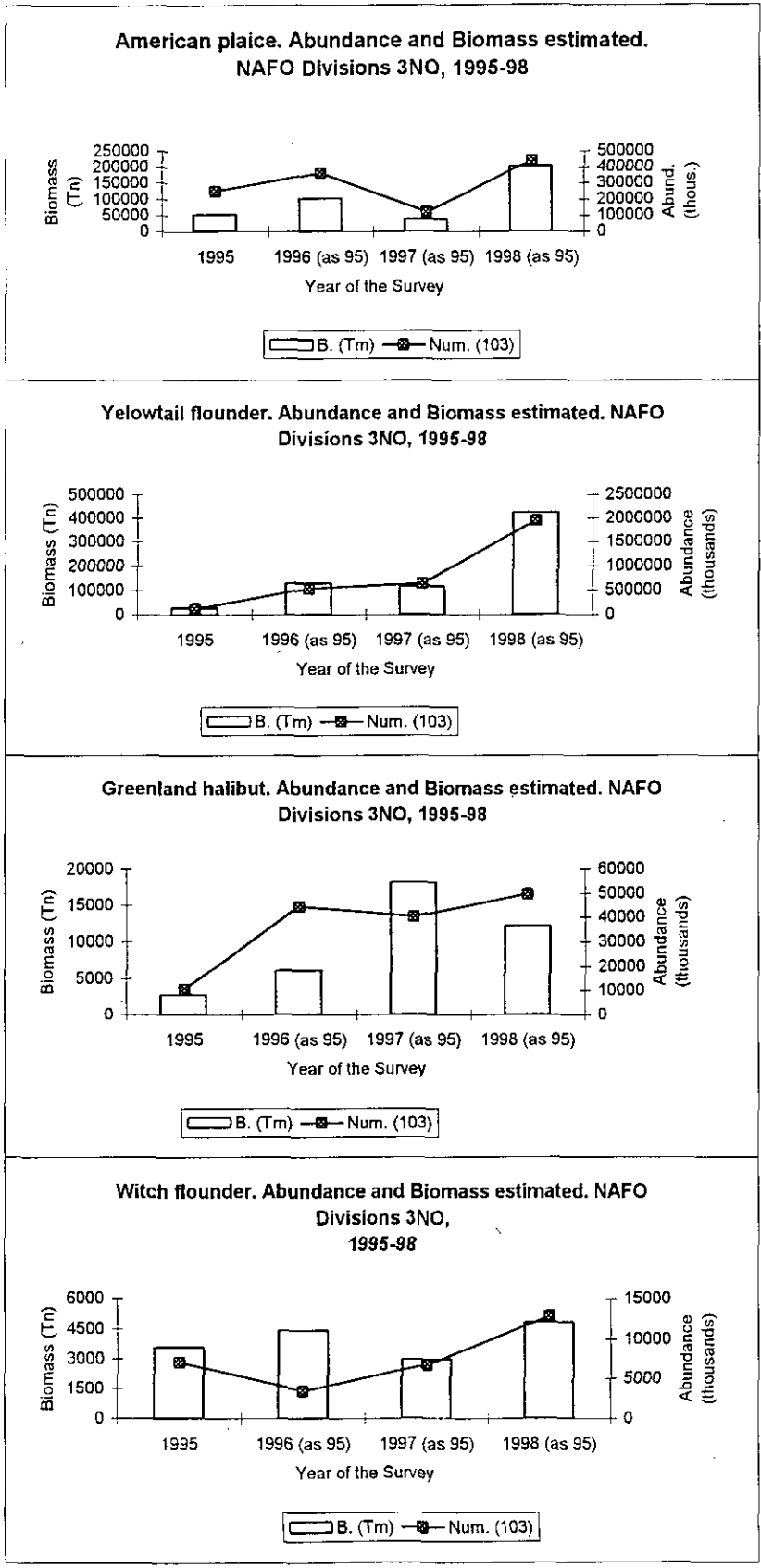


Fig 7.- Abundance and biomass indices from Spanish survey for the main commercial species, considering only the strata covered in 1995. NAFO Divisions 3NO, 1995-1998.

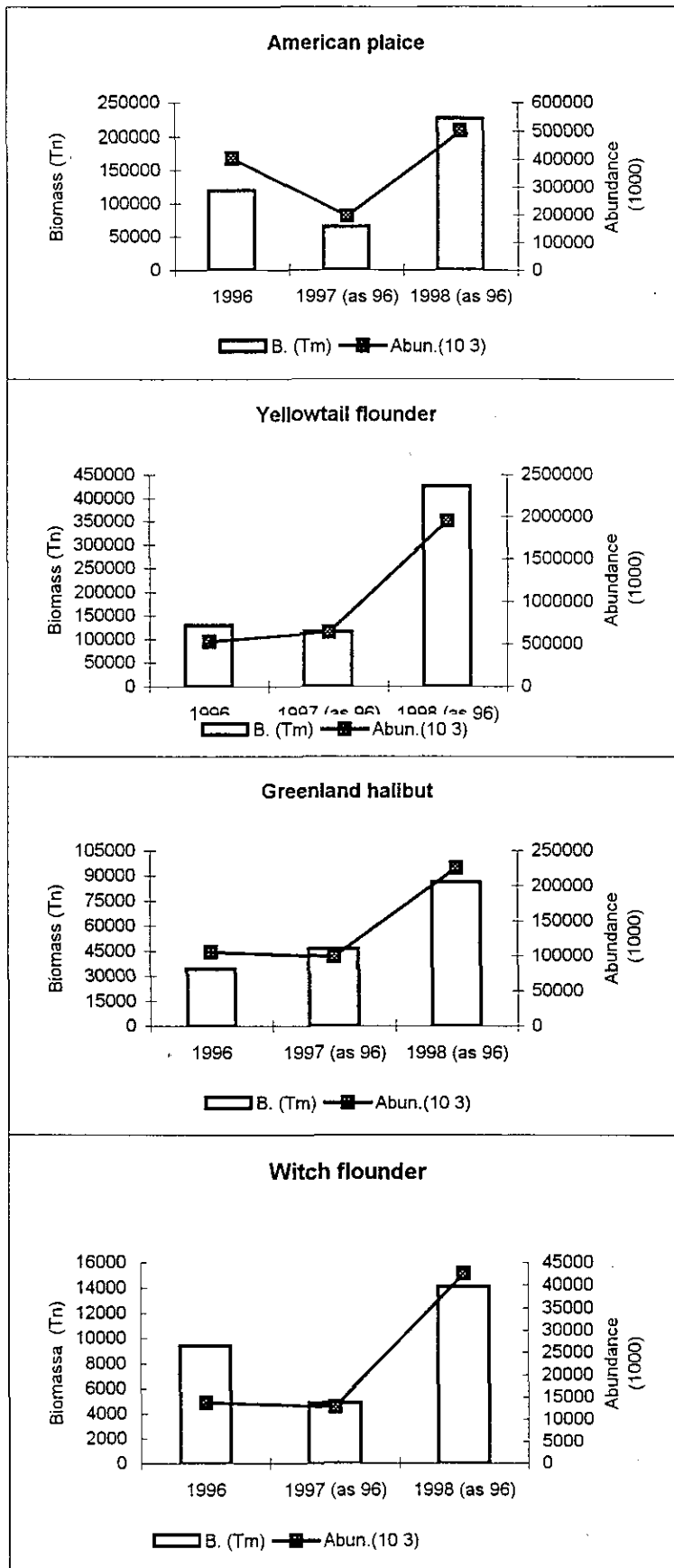


Fig 8.- Abundance and biomass indices from Spanish survey for the main species, considering only the strata covered in 1996. NAFO div. 3NO, 1996-98 (\*) Depth until 1100 m.