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Spanish Research Report for 1991

by

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Subarea 3

Status of the Fisheries

During 1991 three Spanish fleets fished in NAFO Convention area: pair-trawlers, fishing directly for cod, small freezers, fishing in a mixed fishery, mainly for flatfishes, and large freezers, fishing for Greenland halibut in deep water of Divisions 3LM.

Pair-trawl fishery for cod

During 1991 there were five observers on board pair-trawlers for periods of two months each. Sampling intensity of cod catch was:

Division:	3L	3M	3N
Samples	83	35	27
Fish measured	28569	11720	8705
Otoliths aged	1965	1117	1191

Cod length and age frequency in those months with sampling are presented in Tables 1 and 2. In these tables SAMPLED CATCH means the catches from which samples were taken; frequencies are referred to the sample size. SAMPLED WEIGHT means the weight of all samples taken from the catch to make length measurements. Samples were not weighed on board; their weights were calculated with a length-weight relationship. SAMPLES means the number of samples taken, and MEAN WEIGHT is the quotient between Sampled Catch and Total (frequency). When frequencies were reduced by a factor of 10 this fact is indicated below the TOTAL figure (Table 2, p.e.).

Mean weights at age in the catch were also calculated with the same length-weight relationship. Results are presented in Table 3. In Table 2 SOP means Sum Of Products and it is a later calculation of sampled catch using age frequencies and weight at age data (Table 3). Under the headline "%" the quotient between SOP and Sampling catch is presented and expressed in percent. This figure means the proportion of Sampling catch covered by the sampling process. When the value is less than 100 it means that the same portion of the length range was not covered by otolith sampling.

As was mentioned in last year's report (NAFO SCS Doc. 91/16), length and age frequencies presented in this report come from the bulk of the catch, including discards.

During 1991 some pair-trawlers moved occasionally to deep waters to fish Greenland halibut. The geographic area belongs mainly to statistical Division 3M, but the fishery was carried out on the Grand Bank side of the Flemish Pass. We use in tables the denomination 3LM for that zone of deep waters, belonging statistically to Division 3M but topographically to Division 3L. Length distributions of Greenland halibut catches are presented in table 4.

Groundfish fishery of freezers

Catch sampling was done on board by three observers during 1991. American plaice length, age frequencies and mean weight by months are presented in Tables 5, 6 and 7, respectively. As in the case of cod, both length and age frequencies are referred to the catch figure under SAMPLED CATCH in the table. Sampled catch was divided by sex using length frequencies and a length-weight relationship, and mean weight by sex was calculated after that. Under the headline "%" the quotient between SOP by sex and catch sampled is presented and expressed in percent. So, this is a partial value, and the global percent of transformation of length to age frequencies must be calculated by the sum of values corresponding to Males, Females and Indeterminate.

Other species caught by freezers and sampled on board were yellowtail flounder (Table 8), Greenland halibut (Table 9), witch flounder (Table 10), redfish (Table 11), skates (Table 12) and Cod (Table 13). Length frequencies for all species as well as age frequencies for American plaice correspond to the total catch, not only to the retained portion of the catch.

During 1991 some small freezers moved occasionally to deep waters to fish Greenland halibut in the same area described for pair-trawlers. According to observers on board, the fishery for flatfish was carried out in less than 350 meters water depth and that for Greenland halibut in 700-1400 meters depth. In the tables the deep water zone is designated as 3LM and the depth range is indicated to emphasize the differences.

Greenland halibut fishery

Around thirty bottom trawlers fished on Greenland halibut in the zone described of Divisions 3LM. Fishing was conducted in 700-1,500 meters depth, and Greenland halibut comprised 95% of the catch. Most of the vessels have an observer on board to sample the catch. Length distribution of the catch is presented in Table 14. A complete report of this fishery is presented in a separate paper (NAFO SCR Doc. 92/).

Special Research Studies

During 1991 we co-operated in two EEC projects: Tagging cod in Flemish Cap and Bottom trawl survey of Flemish Cap:

The Tagging cruise for Flemish Cap cod was carried out in April from 1st to 15th, and about 600 cod were tagged. Some recaptures were made outside the Cap. Results are presented in the report (SCR Doc. 92/).

The fishing survey of Flemish Cap was carried out in July. The survey had a bottom trawl stratified random design and 117 valid tows were made up to a depth of 720 meters (400 f.). Results of the survey are presented in the report (SCR Doc. 92/) and it includes age compositions for cod, American plaice and redfish (Sebastes spp and S. marinus) stocks.

Division Month	3L					3M					3M						
	FEB	MAR	APR	MAY	JUN	JUL	NOV	FEB	MAR	3M	MAY	JUN	JUL	OCT	NOV	DEC	
length																	
18-20:					156	11						19	81		33		
21-23:					809	36					186	743			45		
24-26:					2409	78	2				202	5840		80	4206	167	
27-29:	12				5116	278	7	14			394	402	8594	301	6139	189	
30-32:	168		438		72	16296	868	15	40	4	1603	1089	35040	461	5523	187	
33-35:	1089		194	1815	72	43700	1977	2	94	36	3012	2515	17150	576	2717	89	
36-38:	1908		238	5573	215	58190	2146	28	51	56	3181	2352	82860	879	1553	36	
39-41:	3370		584	9325	860	66670	2534	86	18	19	1420	1117	40120	1028	1486	110	
42-44:	4256		2128	15246	1792	65800	1720	59	7	23	1425	744	14808	1057	1211	84	
45-47:	7678		3436	16450	3011	64030	1245	103	11	12	1893	711	8251	1355	1031	60	
48-50:	9682		6225	15233	4373	40570	915	108	15	15	2915	724	6634	970	1110	32	
51-53:	10881		7448	15233	5162	31166	573	105	4	5	3758	891	8156	1171	835	45	
54-56:	8967		6682	10992	5520	18200	357	48	11	7	3048	817	6560	1362	902	29	
57-59:	6651		4564	6119	5520	12245	175	13		9	57-59:	3048	817	6560	1362	902	29
60-62:	3365		2713	3376	4230	12245	175	13		9	57-59:	3048	817	6560	1362	902	29
63-65:	1441		1567	1857	1577	4439	123	4	4	3	60-62:	2838	832	5540	1036	768	43
66-68:	1175		1113	1363	1219	3044	18	6		12	63-65:	2169	516	4595	871	643	28
69-71:	1064		776	1069	1219	828	50			4	66-68:	903	363	2898	623	238	11
72-74:	454		782	643	574	949	3	2	4	4	69-71:	703	275	1630	501	263	13
75-77:	226		581	480	860	456				3	72-74:	416	161	1252	540	212	32
78-80:	416		323	162	430	393				1	75-77:	184	81	590	359	128	13
81-83:	162		255	235	287	174					78-80:	112	27	231	424	170	9
84-86:	73		165	373	287	87					81-83:	117	29	179	450	306	10
87-89:	63		70	329	72	72					84-86:	32	19	691	358	17	17
90-92:	50		41	22	72	122					87-89:	24	20	30	882	363	11
93-95:	50		54		72	31					90-92:	27	13	851	571	3	3
96-98:			30								93-95:	3	74	624	536	24	24
99-01:			12								96-98:		33	717	476	26	26
102-04:			7								99-01:	9	34	572	621	31	31
105-07:					30						102-04:		19	813	463	8	8
108-10:											105-07:			763	422	22	22
111-13:											108-10:			689	375	63	63
114-16:											111-13:			704	186	19	19
117-19:											114-16:			637	362	77	77
120-22:											117-19:			573	171	33	33
123-25:											120-22:			333	232	20	20
126-28:											123-25:			173	132	1	1
129-31:											126-28:			61	44	5	5
132-34:											129-31:			25	25	3	3
135-37:											132-34:						
138-40:											135-37:						
											138-40:			4			
Total	64201	39991	108244	319034	35978	13057	592	261	215		30328	143063	12568	23869	36599	1607	
Sampled catch (t)	91	68	133	63	441	11	1	1	2		44	16	237	137	88	6	
Samples	10	11	13	1	44	3	1	1	1		7	5	21	13	8	6	
Fish meas.	3370	4002	4008	445	15785	959	322	72	162		2368	1383	7735	5003	3251	451	
Sampled weight Kg	4657	7092	4772	872	15752	822	408	57	226		3386	1773	8573	32616	12288	1746	
Mean weight	1.416	1.689	1.231	1.959	1.011	0.851	1.267	0.785	1.393		1.441	1.123	0.758	5.735	2.411	3.803	

Table 1 - Length composition of pair-trawler cod catches.

Table 6 - American plaice catch at age frequency.

Div. Month	JUL			AUG			3N OCT			NOV			DEC		
	I	M	F	I	M	F	I	M	F	I	M	F	I	M	F
AGE															
1															
2															
3															
4			27			63	40	107			36				
5	1232	249		144	369		110	518	692		627	654		1	1
6	8885	1754		1444	3435		429	5559	4946		8281	7781		66	33
7	13199	5906		22431	1857		299	4456	10288		8143	18193		125	176
8	5250	1633		1018	3303		61	2805	4962		5080	8155		147	209
9	6761	711		1477	1241		4	1131	2639		1635	4029		92	143
10	1405	331		355	608			547	775		430	1193		52	70
11	374	194		78	351			330	608		266	921		35	68
12	88	71		25	130			64	309		104	468		8	64
13	12	31		5	29				238			245			49
14		7			8				27			42			11
15			4		8				149			52			39
16+									2			5			2
									18			9			5
Total	37447	11003		6800	21421		987	15560		24603			526	871	
		x10						25660		41761					
Otoliths Sampled	150	200		150	200		382	154	228		154	228		154	228
catch(Kg)		54206		10356		15770		24096		1050					
SOP	11602	41499		2320	8010		161	4732	10843		7232	16842		268	780
n	21	77		22	77		1	30	69		30	70		25	74

Table 7 - American plaice mean weight (gr) at age.

Div. Month	JUL			AUG			3N OCT			NOV			DEC		
	I	M	F	I	M	F	I	M	F	I	M	F	I	M	F
AGE															
1															
2															
3			76			76	76	76			76				
4		102	127		114	133	95	110	128		113	150		136	175
5		170	182		172	187	143	183	193		197	209		256	249
6		264	325		266	325	221	266	280		274	283		341	347
7		389	476		405	471	308	394	507		372	496		461	560
8		477	671		496	652	393	540	674		525	662		624	745
9		595	770		628	780		779	936		693	946		807	1045
10		797	1050		819	1082		819	1059		678	1045		968	1146
11		804	1277		860	1258		808	1360		610	1325		834	1665
12		1086	1831		1086	1619			1429			1296			1832
13			1817			1817			1760			1763			1963
14									2775			2444			2648
15			1610			1610			2549			2549			2549
16+									1817			1817			1817

Table 8 - Yellowtail flounder length frequency in freezer catch.

Division Month	JUN			JUL			AUG			3N OCT			NOV			DEC			
	I	M	F	I	M	F	I	M	F	I	M	F	I	M	F	I	M	F	
length																			
16-17:		15	36																
18-19:		18			17			61	39			64	49						52
20-21:		148	104		17	79		158	289		10	209	378						138
22-23:		320	174		190	330		1436	1425		74	343	324		139	118			34
24-25:		1292	1243		1114	846		3866	3608		146	1321	1151		277	234			470
26-27:		3019	3858		1557	1907		8017	9600		230	2751	2603		1042	556			1394
28-29:		2571	4010		1986	5844		8634	18338		207	4222	6062		2105	1333			2322
30-31:		1236	4201		1489	10344		7486	29469		88	2803	6499		2319	1910			2614
32-33:		472	1918		498	9709		2432	23627			1760	6600		1127	2284			1569
34-35:		227	945		195	5010		489	10711			473	3744		574	1350			557
36-37:		21	393		65	1129		190	2889			352	1371		167	798			307
38-39:		149	217			257		90	763			222	477		195	389			275
40-41:		18	111		34	73		98	145			207	466		91	187			128
42-43:		35	207			79			19			62	350		62	227			58
44-45:			90		48	39		45				50	206		28	112			127
46-47:			61						23				114			36			39
48-49:			21			16							41			28			38
50-51:			18										22			5			
52-53:																17			
54-55:																5			
Total	9540	17607		7194	35678		33002	100945		755	14839	30456		8125	9588		9919	15076	
Sampled catch (t)		6			12			35				13			6				7
by sex(Kg)	0	1947	4511		0	1561	10399		0	7019	27706		132	3575	9157		0	2197	3315
Samples		6			7			14				19			8				9
Fish meas.		1228			1559			3055				1927			1478				1815
Sampled weight Kg		311			429			801				544			494				543
Mean weight	.204	.256		.217	.291		.213	.274	.174	.241	.301		.270	.346		.267	.301		

Table 10 - Witch flounder length frequency in freezers catch.

Division Month Depth	3L JUN < 350 m			3LM MAR > 700 m			3LM APR			3LM MAY > 700 m			3LM JUN			3M OCT < 500 m		
	I	M	F	I	M	F	I	M	F	I	M	F	I	M	F	I	M	F
length																		
24-25:								1										
26-27:																		
28-29:																		
30-31:								3			1							
32-33:						1						1						
34-35:					3					1								
36-37:					13	5		2										14
38-39:		1			11	8		2	8				1				58	72
40-41:		3			10	5		12	11		2		1	1	2		29	43
42-43:					9	3		15	30		2	1		1	3		43	130
44-45:		10	1		4	7		21	63		1	5		2	12			130
46-47:		6	2		1	12		20	70		1	5			16			87
48-49:		5	8		2	10		14	51		1	4		1	8		14	145
50-51:		5	12			6			36		1	3		1	10			58
52-53:		2	10			9		2	13		2				8			29
54-55:		1	13			6			42			1			6			14
56-57:		6	7			2			7			1			3			29
58-59:		1	12						1									29
60-61:		1	2						1			1						
62-63:			1						1									
Total		49	68		53	72		88	338		6	21		2	5	67	145	781
Sampled catch (t)			0.1			0.1			0.4			0.0			0.1			0.8
by sex(Kg)	0	48	96	0	27	63	0	65	319	0	4	21	1	3	67	0	81	681
Samples		1			1	29			15			1		1				1
Fish meas.			101			124			211			49			98			64
Sampled weight Kg			124			99			191			44			95			53
Mean weight		.979	1.408		.502	.874		.739	.944		.663	.977	.611	.670	1.007		.560	.872

Table 11 - Redfish length frequency in freezers catch.

Division Month Depth	3LM FEB > 700 m			3LM MAR			3LM APR			3LM MAY > 700 m			
	I	M	F	I	M	F	I	M	F	I	M	F	
length													
22:									1				
23:										1			
24:													
25:										2			
26:													
27:									1	1		1	
28:										3			
29:						1			2			1	
30:		1				1			2	3		5	
31:									5	2		7	
32:			2	3		6	2		3	1		9	
33:						4			7	3		9	
34:						2	6		4	5		10	
35:						5	4		6	4		12	
36:		1				2	5		5	7		10	
37:		2				1	3		5	9		9	
38:			1			1	2		2	5		6	
39:		1				2	1			3		5	
40:							1		2	5		5	
41:			1			1	1		1	1		1	
42:						1			1				
43:						2							
44:							1						
45:						1							
Total			8	6		27	28		47	55		76	92
Sampled catch(Kg)				8		35			62			100	
by sex(Kg)	0	5	3	0	17	18	0	28	34	0	45	55	
Samples			1			21			13			1	
Fish meas.				12		46			147			137	
Sampled weight Kg				7		31			90			82	
Mean weight			.594	.614		.652	.627		.592	.627		.591	.598

Table 12 - Skates length frequency in freezer catch.

Division Month	3L JUN		
length		72:	39
39:	20	73:	57
40:	39	74:	77
41:	20	75:	77
42:	19	76:	116
43:	39	77:	137
44:	40	78:	19
45:	59	79:	57
46:	59	80:	38
47:	19	81:	57
48:	19	82:	19
49:	20	83:	.
50:	60	84:	.
51:	98	85:	19
52:	78	86:	.
53:	20	87:	20
54:	.	88:	.
55:	57	89:	.
56:	20	90:	.
57:	38	91:	.
58:	38	92:	.
59:	38	93:	.
60:	59	94:	19
61:	59		
62:	19	Total	1907
63:	.		
64:	59	Sampled	
65:	.	catch (t)	6
66:	19	Samples	2
67:	19	Fish meas.	98
68:	.	Sampled	
69:	.	weight Kg	300
70:	57	Mean weight	3.046
71:	58		

Table 13 - Cod length frequency in freezer catch.

Division Month	3L JUN	3M FEB	OCT	3N NOV	DEC
length					
21-23:	65	79	105	11	.
24-26:	192	198	1956	279	19
27-29:	420	237	6761	2843	407
30-32:	1101	1741	9710	6786	1182
33-35:	2297	2256	6885	6226	1279
36-38:	3487	712	2079	2765	465
39-41:	3393	198	1199	1187	97
42-44:	2791	119	1074	745	58
45-47:	2564	.	165	593	58
48-50:	1902	.	153	253	.
51-53:	1184	.	108	295	.
54-56:	855	.	68	269	.
57-59:	412	.	135	76	.
60-62:	127	.	.	77	.
63-65:	149	.	34	33	.
66-68:	68	.	.	41	.
69-71:	27	.	.	19	.
72-74:	16	.	.	13	.
75-77:	.	.	.	21	.
78-80:	18	.	.	2	.
Total	21068	5541	30432	22532	3565
Sampled					
catch (t)	16	2	10	10	1.2
Samples	11	1	5	12	1
Fish meas.	1748	140	1092	2416	184
Sampled					
weight Kg	1323	49	351	1022	64
Mean weight	.769	.349	.335	.429	.348

Table 14 - Greenland halibut length composition for the second half of the year in deep-water trawler catch in Division 3LMN.

Division Sex	3LMN		
	I	M	F
<u>length</u>			
< 21:	16	.	.
22-23:	0	12	6
24-25:	8	18	48
26-27:	2	55	46
28-29:	8	105	74
30-31:	15	154	175
32-33:	18	290	251
34-35:	25	543	510
36-37:	39	911	972
38-39:	47	1710	1820
40-41:	60	3399	3592
42-43:	46	5052	5889
44-45:	49	7157	9212
46-47:	69	9945	13298
48-49:	38	11128	16363
50-51:	58	12376	18515
52-53:	49	11774	20124
54-55:	45	11023	21198
56-57:	29	10155	21746
58-59:	42	8769	21923
60-61:	24	7662	20892
62-63:	27	4977	18322
64-65:	19	3744	16117
66-67:	7	2427	12773
68-69:	6	1648	11048
70-71:	11	1249	9876
72-73:	5	916	8325
74-75:	3	803	7036
76-77:	5	492	5855
78-79:	3	474	4959
80-81:	.	410	3909
82-83:	2	229	3382
84-85:	.	188	2530
86-87:	.	106	1785
88-89:	.	64	1208
90-91:	3	64	830
92-93:	2	3	431
94-95:	.	.	603
96-97:	.	.	366
98-99:	.	.	229
>100:	.	.	199
Total:	780	120035	285437
Sampled catch (t)	0.8	155.5	528.6
Samples 1539			
Fish meas... 412002			
Mean weight (Kg)	1.02	1.29	1.85