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The Canadian Fishery for Greenland Halibut in SA 2 + Divisions 3KLMNO, with Emphasis on 2002

by

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Abstract

The Canadian catch of Greenland halibut in 2002 in NAFO Subarea 2 and Divisions 3KLMNO was reported to be almost 6 300 tons. This was down by 2 100 tons from the catch in 2001, and about 4 300 tons lower than the catch in 2000. Reduced catches in the gillnet sector, primarily in Div. 3KL, were responsible for the decline, although gillnet was still the predominant gear type. The otter trawl catch of just under 1 800 tons was similar to the 2001 level, which was the highest by this fleet sector in ten years. As in 2000 and 2001, much of the catch came from Div. 3KL, and over half of the catch was taken in June and July. The catch at age in 2002 was dominated by the 1995 year-class, which accounted for 42% of the catch numbers and 29% of the catch weight.

Review of the Canadian fishery prior to 2002

The Canadian fishery for Greenland halibut in Subareas 2 and 3 began in the early-1960s, using gillnets in the deepwater bays of eastern Newfoundland, particularly Trinity Bay. As catches declined here, the effort moved progressively northward in the other bays along the east and northeast coast of Newfoundland. In later years, vessels moved further offshore to the deep channels, such as the area in the central part of Div. 3K known as Funk Island Deep, and eventually to the continental slope. Canadian catches increased from fairly low levels in the early-1960s to almost 32 000 tons in 1980 then declined steadily to between 2900 and 6 300 tons in each year from 1993-99 (Table 1). This declining trend was mainly a result of low catch rates and reduced effort, as fishers pursued other species such as snow crab which were more profitable. However, in 2000, the Canadian catch in NAFO Subarea 2 and Div. 3KLMNO increased to about 10 600 tons, more than two and a half times the catches in 1998 and 1999. Reasons for this increased catch and effort include a switch of some effort by fishers in Div. 3KL from snow crab to G. halibut due to declining quotas for crab in certain areas, combined with improved catch rates for Greenland halibut in most of the traditional fishing areas (Brodie and Power, 2000). However, catches declined by more than 2 000 tons from 2000 to 2001.

Canadian catches have been taken mostly by gillnet (Table 1). This fishery has been conducted mainly by small vessels (<20 m) fishing in the deepwater channels near the Newfoundland and Labrador coast as well as in the deepwater bays, using an average mesh size of 150 mm. However, Canadian gillnet catches taken during recent years also include those from a substantial fishery along the deep edge of the continental slope. In an attempt to reduce the catch of young Greenland halibut in this deepwater fishery, gillnet mesh size for Greenland halibut in the Canadian zone in depths > 731 m (400 fm) is regulated to be no less than 190 mm. Gillnet catches during the 1990s ranged from 2 400 to 6 700 tons, averaging about 4 200 tons. Catches in 2000 from this sector then increased to 9 300 tons, before declining to 6 400 tons in 2001. Most of the Canadian gillnet catches are taken in Div. 3K.

Canadian otter trawl catches peaked at about 8 000 tons in 1982, but from 1993 to 1999, catches by this fleet were less than 1 050 tons annually. In 1998 and 1999, otter trawl catches declined to less than 100 tons per year, but

increased sharply in 2000 to almost 1 300 tons, then increased again in 2001 to just over 1 800 tons, which is the highest level since 1992 (Table 1). Much of the otter trawl catch occurs in the slope area around the boundary between Div. 3K and 3L.

Catches from Subarea 2 were very low prior to the mid-1970s, then increased to a peak around 9 000 tons in 1982. Since 1991, catches from Subarea 2 have been in the range of 1 000 to 2 500 tons per year, and were stable around 1 300 tons during 1999-2001. Most of the catch from Subarea 2 has come from Div. 2J, although catches in 1993-96 were higher in Div. 2GH combined compared to Div. 2J. In most years, Div. 3K has produced the largest Canadian catches, peaking around 18 000 tons in 1979-80. Peak catches of around 13 000 tons in Div 3L occurred in 1966-67 and 1980. Catches in Div. 3M and 3N have been negligible, and catches in Div. 3O increased from similar low levels to a few hundred tons per year from 1993-1999, peaking at 567 tons in 2000. The catch in Div. 2GH declined from values around 1 400 tons in 1994-95 to less than 325 tons per year from 1999 to 2001.

The Canadian fishery in 2002

The spatial and temporal patterns in the Canadian fishery for *G. halibut* in 2002 were generally similar to those observed in 2000-01, although there were some notable differences. The total reported catch was about 6 300 tons, having declined by approximately 2 000 tons in each of 2001 and 2002. Most of the decline occurred in the gillnet sector, mainly in the shallow-water fisheries (Tables 3a and 3b). Breakdowns of this catch by gear, Division, depth range and month are shown in Tables 3 and 4. As was the case in 2000-01, the dominant gear by far was gillnet. However, in 2002 the catches in the shallow and deep zones were almost equal, contrasting to 2001 when catches in the shallow zone being about 70% higher than the catch in the deeper zone. These catches are referred to in Tables 3 and 4 as GN<400 and GN>400. Longline catches, which have not exceeded 130 tons per year since the early-1970s, increased to 650 tons in 2002, mostly in Div. 2GH. The otter trawl catch in 2002 was similar to 2001, when 1 833 tons were the highest catch by this fleet sector since 1992. Catches in Subarea 2 in 2002 increased to almost 1 800 tons, which is above the 1 300 ton level of 1999-2001. Much of this increase was due to the higher longline catches in Div. 2GH. Most of the drop in catch in 2002 occurred in Div 3L (Table 2), followed closely by Div. 3K.

Figures 1-3 show the location of most of the Canadian catch of Greenland halibut in 2000-2. These data were aggregated by 10-minute squares, from logbook records, and in 2002, account for almost 6 000 tons of the total catch of 6 290 tons. The spatial distributions of the 2000 and 2001 fisheries were quite similar (Fig. 1 and 2). Most of the fishery in all years occurred between 48°N and 51°N latitude, although there was an increase in catches in Div. 2GH in 2002, which are north of 56°N latitude. Another difference in 2002 was the reduction in catch from the central Div. 3K (Funk Island Deep) area. Fig. 4 shows the location of the 2002 catch by the 4 major gear types (2 gillnet categories, otter trawl, and longline). Most of the otter trawl fishery in 2002 was located in a relatively small area around the slope edge at the border between Div. 3K and 3L, similar to the fishery in 2000 and 2001. The spatial distribution of the deepwater gillnet fishery in 2002 was similar to 2001, although the shallow water gillnet catches were more concentrated towards the slope area in Div. 3K in 2002 compared to 2001 (Brodie and Power, 2002).

In 2002, the total catch through July was similar to 2001, but declined afterwards compared to 2001. Just over half of the shallow gillnet fishery in 2002 occurred in July (Fig. 5), compared to only 30% in July of 2001. Temporal patterns for the deepwater gillnet and otter trawl fisheries in 2002 were similar to those seen in the 2001 fishery. Most of the catch from the deepwater gillnets occurred in June-August (Fig. 6), while most of the otter trawl fishery occurred during April-June (Fig. 7).

By-catches in the gillnet fishery include cod and snow crab, particularly in the GN<400 sector, while American plaice and witch flounder were important by-catches in the otter trawl fishery. By-catches of Greenland halibut in the Canadian shrimp fishery have been described in separate papers.

Catch at age

Details on the catch at age for previous years can be found in Bowering and Brodie (2000), and Brodie and Power (2001, 2002). Ages 6-8 dominated the Canadian catch in most years, both in the otter trawl and shallow water gillnet fisheries. The deep water gillnet fishery was comprised mainly of larger, older individuals.

Sampling data collected in 2002 by observers at sea and by port samplers, were available from Div. 2GHJ3KLO. The following table shows the number of length measurements by Division and gear type, and the number of otoliths (in italics). The otolith samples from the fixed gear sectors have been combined. In general, sampling levels were improved over 2001, particularly in Subarea 2. The high number of measurements from the otter trawl catch in Div. 3K and 3L is due to the requirement for these large vessels to have 100% observer coverage. For some port samples, the exact catch location in the fishery operating on the boundary of Div. 3K and 3L was not known, and these samples have been assigned as Div. 3K.

	Div. 2GHJ		Div. 3K		Div. 3L		Div. 3O	
Gill net < 400	270		5099		528			
Gill net > 400	5018	222	2534	918	730	101		49
Longline	441						531	
Otter trawl	303	75	19,791	1089	12,984	551		
Totals	6032	297	27,424	2007	14,242	652	531	49

Age compositions are presented for both gillnet components (GN<400 and GN>400) as well as for longline and otter trawl (Table 5). The peak age in the otter trawl and GN <400 sectors was 7 (1995 year-class), while age 10 (1992 year-class) was most abundant in the catches of deepwater gillnets. These peak ages are similar to those seen in the 2000 and 2001 fisheries. Overall, the catch at age in 2002 was dominated by the 1995 year-class, which accounted for 42% of the catch numbers and 29% of the catch weight. In 2001, the same age (7) accounted for 55% of the catch in numbers and 40% of the catch in weight. As was the case in 2000 and 2001, age 8 was second highest in the catch numbers, followed by age 6. Mean weights at age were calculated using the same length-weight relationship used for Greenland halibut catch at age in 1998-2001, which was the equation for all Divisions combined, year = 1997 (from Gundersen and Brodie, 1999). With the exception of ages 7, 8, and 14, weights at age in 2001 were lower than those in 2002, although most were quite similar (Brodie and Power 2002). The sum of the products (S.o.P.) of the weights and numbers at age vectors was 4% lower than the nominal catch (Table 5).

References

- Bowering, W. R. and W. B. Brodie. 2000. Calculation of catch-at-age for commercially caught Greenland halibut in NAFO Subarea 2 and Divisions 3KLMNO during 1975-99 with particular emphasis on construction of the catch-at-age matrix since 1989. *NAFO SCR Doc.*, No. 24, Serial No. N4253, 25 p.
- Brodie, W. B. and D. Power. 2001. The Canadian fishery for Greenland halibut in SA2 + Div. 3KLMNO, with emphasis on 2000. *NAFO SCR Doc.*, No. 65, Serial No. N4443, 13 p.
- Brodie, W. B. and D. Power. 2002. The Canadian fishery for Greenland halibut in SA2 + Div. 3KLMNO, with emphasis on 2001. *NAFO SCR Doc.* 02/39, Ser. No. N4650, 12 p.
- Gundersen, A.C. and W.B.Brodie. 1999. Length-weight relationships of Greenland halibut in NAFO Divisions 2GHJ and 3KLMNO, 1990-97. *NAFO SCR Doc.*, No. 31, Serial No. N4087, 21 p.

Table 1. Canadian catch of G. halibut, by gear type.

Table 2. Canadian catch of G. halibut, by Division.

Data in both tables from 1960-2002.

Year	GEAR					TOT	DIV							TOT	
	GNET	LL	MIS	UNSP	OT		2G	2H	2J	3K	3L	3M	3N		3O
1960				660		660			610	50					660
1961				741		741			613	128					741
1962				586		586			479	107					586
1963		5		771		776			592	184					776
1964				1757		1757			870	887					1757
1965				8082		8082			2129	5953					8082
1966	257	194	15	15640	120	16226			3691	12518		17			16226
1967	93	144	95	15478	798	16608			7	2892	13705		1	3	16608
1968		94		12766	493	13353			53	3672	9597		31		13353
1969	9980	850	69	412	245	11556				7140	4413		1	2	11556
1970	9818	371	119	318	85	10711				5937	4769		5		10711
1971	8947	153	55	180	75	9410				4160	5248		2		9410
1972	8775	34	22	50	71	8952				4736	4216				8952
1973	6546	35	70	102	95	6848			5	3602	3233		1	7	6848
1974	5500	49	16	8	184	5757			19	2817	2909		9	3	5757
1975	7510	3	53	1	247	7814			22	3245	4540		7		7814
1976	8500	6	41		767	9314	62	168	153	4779	4144	1	7		9314
1977	15038	33	36		2866	17973		72	419	10751	6725	1	2	3	17973
1978	20622	46	83		3951	24702		14	1255	15875	7548	1	5	4	24702
1979	24550	116	116		5183	29965		34	3163	18165	8578	2	17	6	29965
1980	27703	128	57		3946	31834		217	1157	17658	12742	14	43	3	31834
1981	17927	55	43		6155	24180	10	41	862	14379	8833		49	6	24180
1982	11038	69	59		8143	19309	15	5155	3942	6031	4105		55	6	19309
1983	9911	58	73		7085	17127		2578	2238	7679	4618		12	2	17127
1984	11100	27	100		6070	17297		1913	2796	7496	5078		12	2	17297
1985	7422	2	42		4847	12313		1758	3101	4395	3023		35	1	12313
1986	6293	7	20		1896	8216		82	2476	2886	2769		2	1	8216
1987	10849	22	115		2465	13451		6	4143	4740	4561		1		13451
1988	7715	70	53		629	8467	45	27	1867	4591	1921	2	12	2	8467
1989	10956	16	35		988	11995		190	2635	6342	2809	6	10	3	11995
1990	6732	18	15		2402	9167	57	171	2798	4075	2020	38	4	4	9167
1991	3440	36	9		3254	6739		50	3008	2215	1291	157	11	7	6739
1992	4470	30	1		2502	7003	428	230	476	3882	1951	4	10	22	7003
1993	3863	4	5		1034	4906	557	403	214	2398	880		19	435	4906
1994	2378				575	2953	1045	210	203	1032	258		1	204	2953
1995	2602	1			632	3235	1006	453	709	754	197			116	3235
1996	5134	1		1	1043	6179	688	639	1058	2567	888			339	6179
1997	5202	61			1017	6280	370	619	1513	2659	935			184	6280
1998	3963	108	4		46	4121	358	418	1234	1374	633		1	103	4121
1999	3870	65			81	4016	65	103	1094	1940	683			131	4016
2000	9271	18	5	14	1285	10593	45	81	1152	5845	2901	1	1	567	10593
2001	6395	123	14		1833	8365	63	251	1030	3999	2666		9	347	8365
2002	3854	652			1784	6290	374	360	1030	2933	1466	15		112	6290

Table 3a. Summary of Canadian catches of G. halibut in 2001 by area and gear.

	GN <400	GN >400	Longline	Ot trawl	Misc	Totals for		Can Total
						Can (N)	Can (SF)	
2GH	67	203	44			314		314
2J	280	519	10	218	3	1025	5	1030
3K	2471	895	1	622	10	3973	26	3999
3L	1190	480	2	993	1	2569	97	2666
3NO	21	269	66			354	2	356
Total	4029	2366	123	1833	14	8235	130	8365

Table 3b. Summary of Canada (NF) catches of G. halibut in 2002 by area and gear.

	GN<400fm	GN >400	Longline	Otter trawl	Can (N)
2GH	154	7	573		734
2J	389	597	9	35	1030
3K	1304	830	28	771	2933
3L	56	424	8	978	1466
3MO	93		34		127
Total	1996	1858	652	1784	6290

Table 4. Canadian catches of *G. halibut* in SA 2 + Div 3KLMNO in 2002 by area, gear, and month.

		Ma												Total
		Jan	Feb	r	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
2GH	GN<400 fm							5	36	99	14			154
	GN>400 fm							7						7
	Longline						38	149	253	130	3			573
	Total						38	161	289	229	17			734
2J	GN<400 fm						69	245	64	11				389
	GN>400 fm					5	222	292	75	3				597
	Otter Trawl										5	30		35
	Longline									9				9
Total					5	291	537	139	23	5	30		1030	
3K	GN<400 fm					1	171	756	302	70	4			1304
	GN>400 fm					73	219	337	190	11				830
	Otter Trawl		1	52	128	149	431	7				3		771
	Longline							1	26	1				28
Total		1	52	128	223	821	1101	518	82	4	3		2933	
3L	GN<400 fm						1	27	24	4				56
	GN>400 fm					92	12	59	221	39	1			424
	Otter Trawl		4	13	142	346	289	175			3	6		978
	Longline				4	4								8
Total		4	13	146	442	302	261	245	43	4	6		1466	
3MO	Gillnet	2	23	15	18	1	26	3	1	1			3	93
	Longline	2			15	1				1	13	2		34
	Total	4	23	15	33	2	26	3	1	2	13	2	3	127
TOTAL		4	28	80	307	672	1478	2063	1192	379	43	41	3	6290

Table 5. Catch at age for the Canadian catch of G.halibut in SA 2 + Div. 3KLMNO in 2002. Catch at age in thousands of fish. See text for definition of GN gear types.

Age	Gear				Total	Mean		S.O.P(t)
	Otter trawl	GN<400	GN>400	Long line		Len (cm)	Wgt (kg)	
3	*				0.4	32.6	0.278	0.1
4	10				10	32.9	0.283	2.8
5	72	3	*		75	37.5	0.430	32.3
6	421	49	1	1	471	41.8	0.609	286.8
7	1062	826	13	15	1916	47.7	0.917	1757.0
8	351	669	55	59	1134	52.1	1.210	1372.1
9	41	99	103	47	290	58.9	1.769	513.0
10	17	42	142	38	238	63.6	2.256	536.9
11	5	13	120	33	170	68.5	2.855	485.4
12	1	6	84	31	122	73.1	3.507	427.9
13	*	4	60	13	77	77.8	4.279	329.5
14	*	2	24	9	35	82.5	5.146	180.1
15	1	1	11	2	15	84.7	5.595	83.9
16	*	*	3	*	3	88.9	6.512	19.5
17			1	*	0.5	91.0	6.979	3.5
18			*	*	0.4	92.5	7.345	2.9
19			1	*	0.6	92.8	7.426	4.5
20					0			0.0
21					0			0.0
22			*	*	0.2	90.5	6.855	1.4
					4558			6040
								Catch=6290

* indicates catch < 500 fish

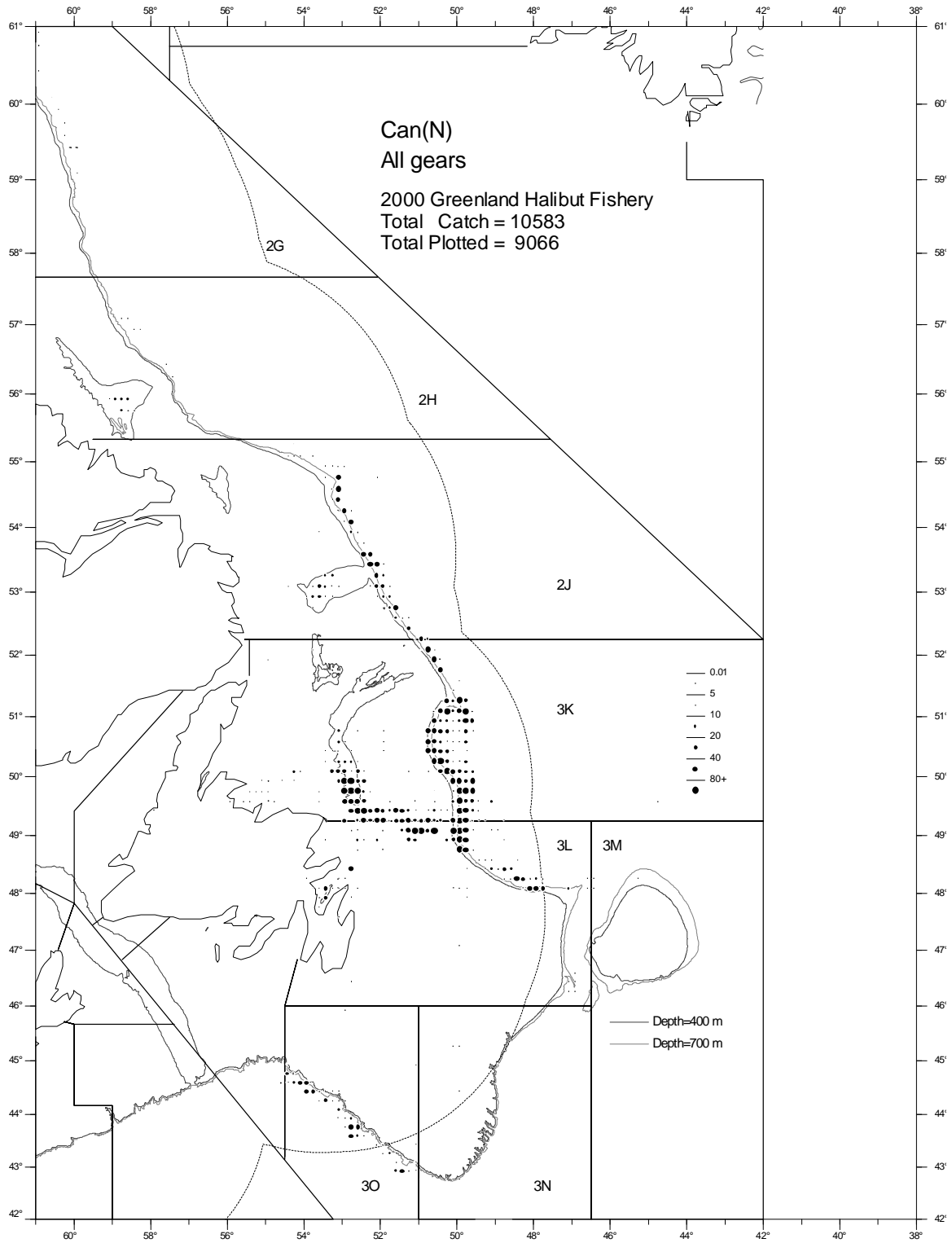


Fig. 1. Distribution of Can(N) Greenland halibut catch (tons) from the 2000 commercial fishery. Represented is catch from directed fisheries and by-catch from other fisheries aggregated by 10minute square for all gears from Div. 2G to Div. 3O where position was recorded on the logbook.

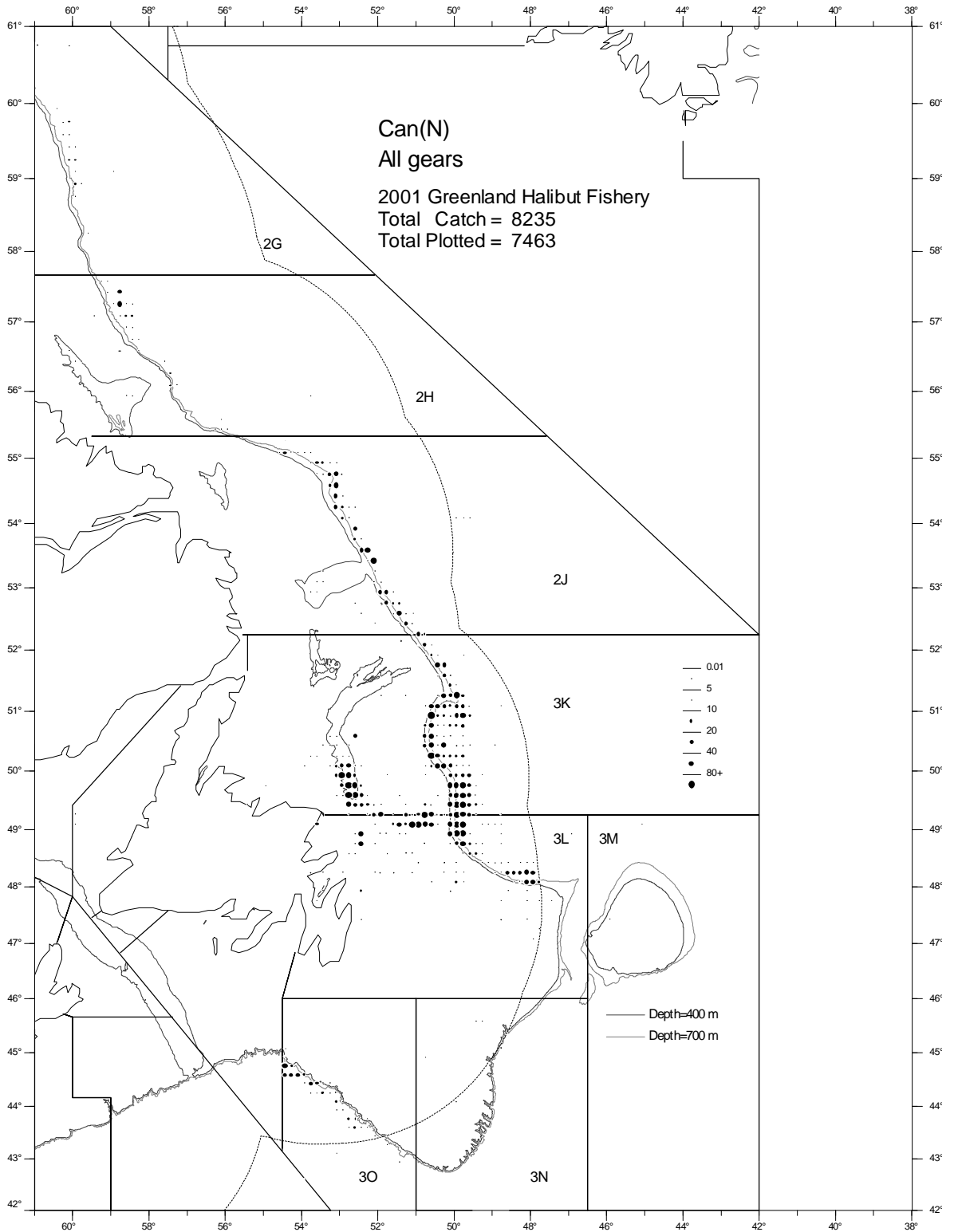


Fig. 2. Distribution of Can(N) Greenland halibut catch (tons) from the 2001 commercial fishery. Represented is catch from directed fisheries and by-catch from other fisheries aggregated by 10minute square for all gears from Div. 2G to Div. 3O where position was recorded on the logbook.

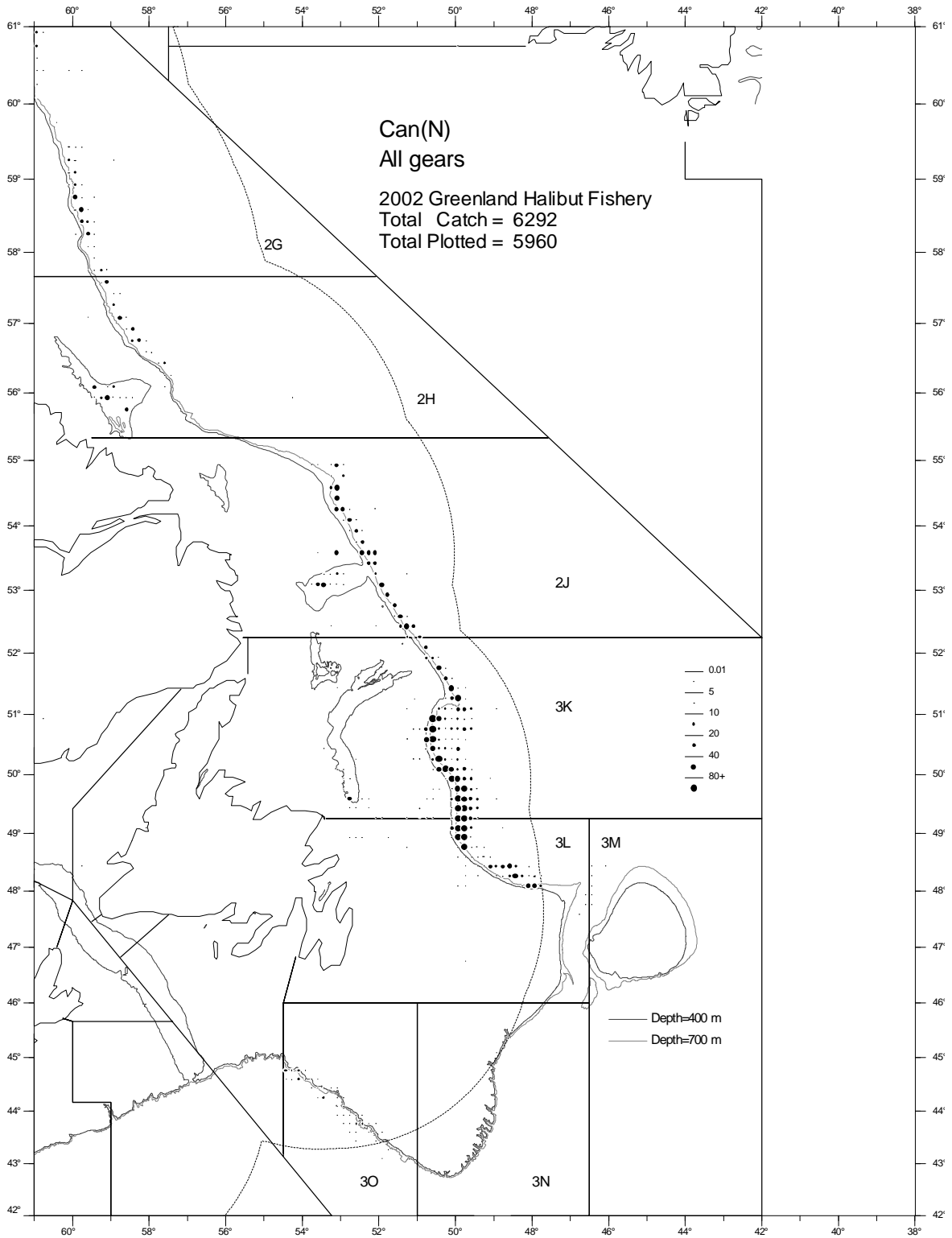


Fig. 3. Distribution of Can(N) Greenland halibut catch (tons) from the 2002 commercial fishery. Represented is catch from directed fisheries and by-catch from other fisheries aggregated by 10minute square for all gears from Div. 2G to Div. 3O where position was recorded on the logbook.

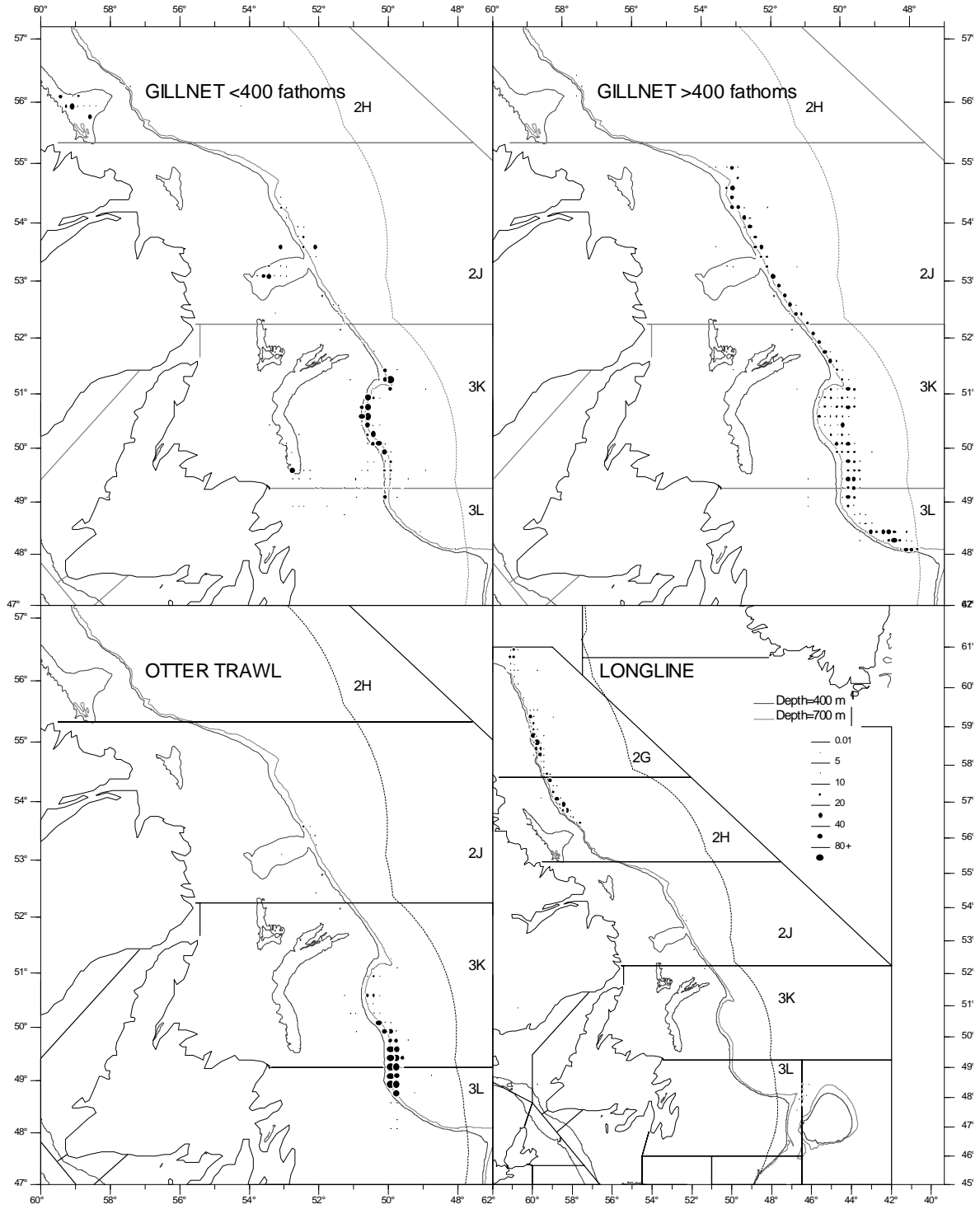


Fig. 4. Distribution of Can(N) Greenland halbut catch (tons) from the 2002 commercial fishery. Represented is GILLNET (<400 fathoms and >400 fathoms), LONGLINE and OTTER TRAWL from directed fisheries and by-catch from other fisheries. The data are aggregated by 10-minute square for Div. 2J3KL where position was recorded on the logbook.

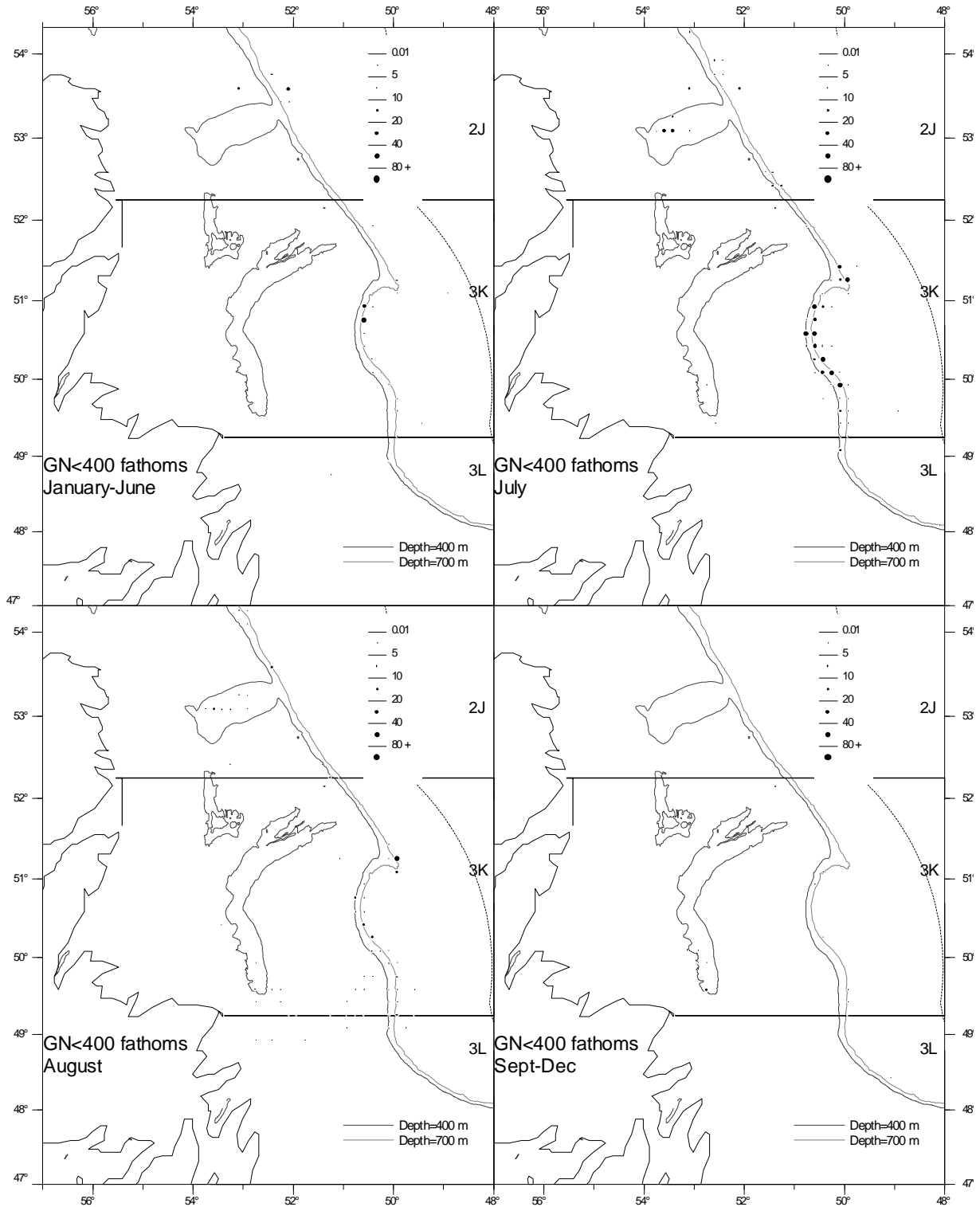


Fig. 5. Distribution of Can(N) Greenland halibut catch (tons) from the 2002 commercial fishery. Represented is GILLNET (<400 fathoms) for various months from directed fisheries and by-catch from other fisheries. The data are aggregated by 10-minute square for Div. 2J3KL where position was recorded on the logbook.

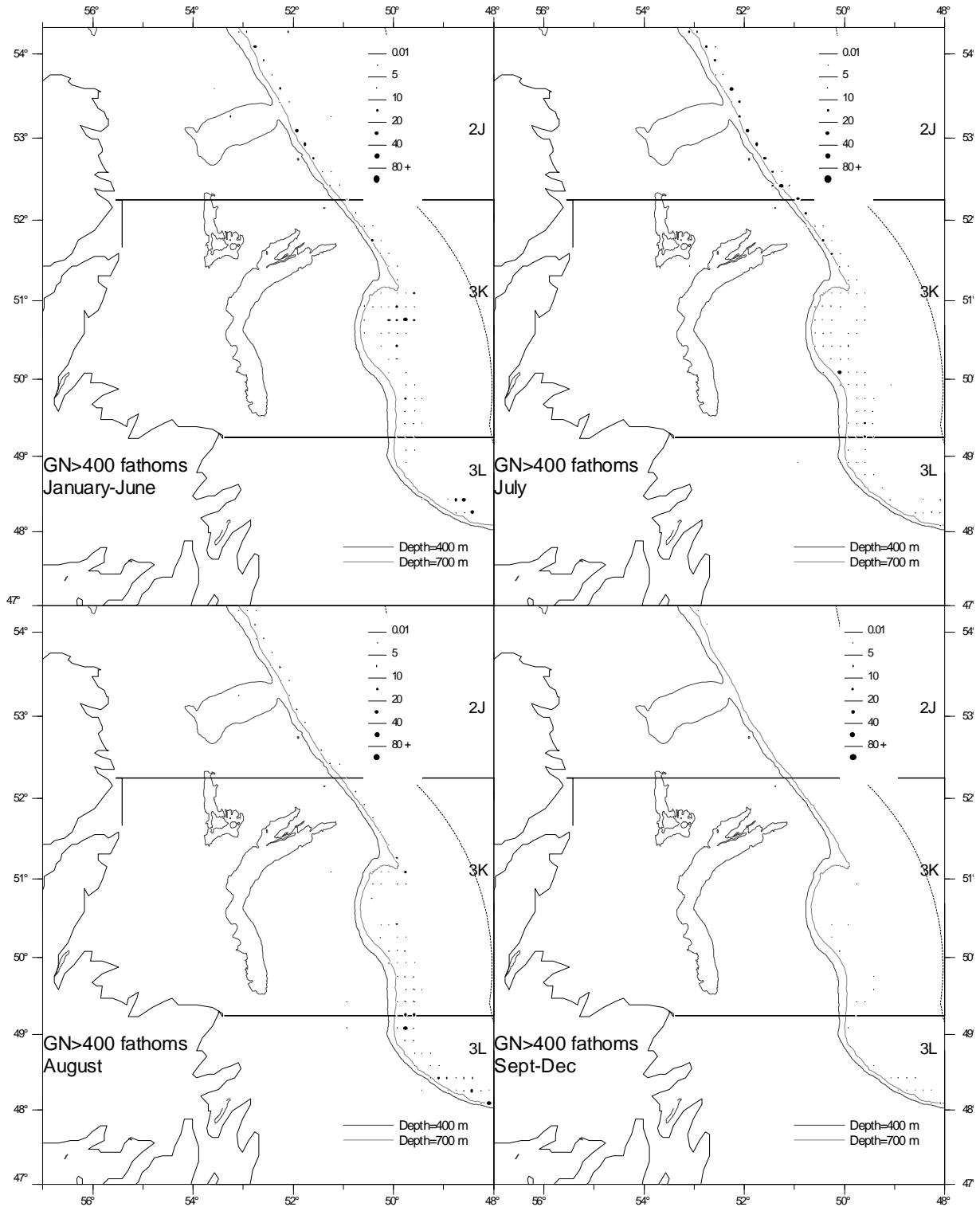


Fig. 6. Distribution of Can(N) Greenland halibut catch (tons) from the 2002 commercial fishery. Represented is GILLNET (>400 fathoms) for various months from directed fisheries and by-catch from other fisheries. The data are aggregated by 10-minute square for Div. 2J3KL where position was recorded on the logbook.

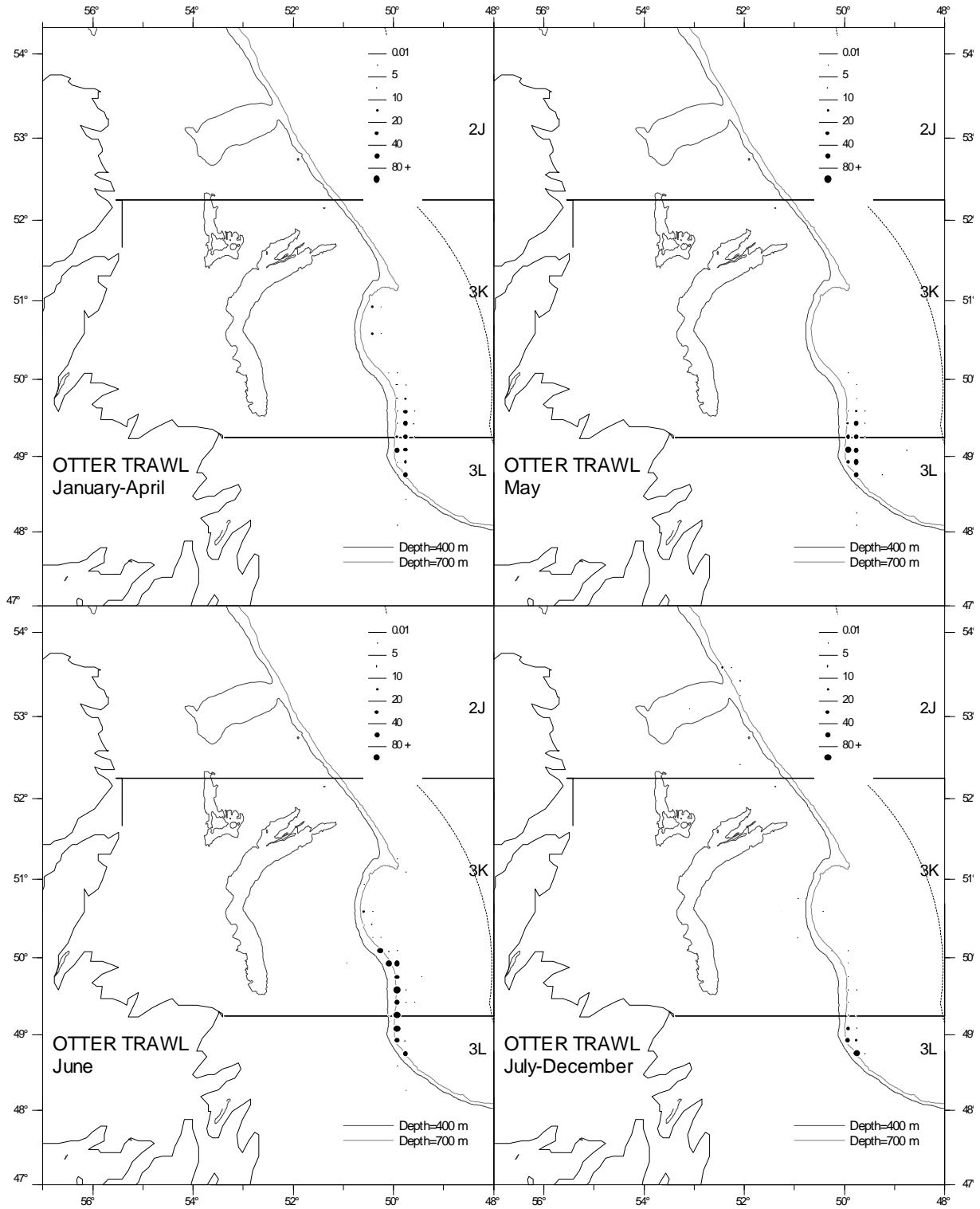


Fig. 7. Distribution of Can(N) Greenland halibut catch (tons) from the 2002 commercial fishery. Represented is OTTER TRAWL catch for various months from directed fisheries and by-catch from other fisheries. The data are aggregated by 10-minute square for Div. 2J3KL where position was recorded on the logbook.