Northwest Atlantic Fisheries Organization

Serial No. N1481

NAFO SCR Doc. 88/41

SCIENTIFIC COUNCIL MEETING - JUNE 1988

Post-stratified Biomass and Abundance Estimates of Greenland Halibut from USSR Surveys in Subareas 0+2 and Division 3K

by

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Introduction

Bottom trawl surveys by the USSR during fall and winter for Greenland halibut have been conducted in NAFO Subarea 0 and Div. 2GH annually since 1979. The survey coverage was extended to Div. 2J from 1980-86 although survey coverage (> 200 m) for the last 3 years of this period was less than 10%. In the fall-winter of 1980-81, 1982-83, and 1983-84, survey coverage was further extended to Div. 3K. Areal coverage in this division (> 200 m) ranged between 31 and 47%. Throughout the period of investigations, a variety of vessels were used to conduct the surveys. However, in most cases, the vessels were of similar tonnage and engine power. In all cases, the survey gear used was a 31/27.2 m bottom trawl towed at a speed of 3.5 knots. Each set was of 1-hour duration and fishing was always conducted on a 24-hour basis. More detailed information on the gear and vessels can be found in Bulatova and Chumakov (1986).

The fishing positions for all surveys were chosen randomly within 100-m depth intervals generally from 300-1300 m although there were a few occasions where fishing was conducted in depths < 300 m and from 1300-1500 m in some divisions. The areal coverage and fishing depths varied considerably from year to year mainly due to a variety of ice and weather conditions experienced during this particular time of year as well as unsuitable ground conditions. One of the major problems with surveying the northern areas has been the lack of accurate chartwork making it difficult to fish predetermined depths. This problem is further compounded by the lack of advance knowledge of bottom conditions. This made early versions of survey stratification schemes for Subarea 0 and Div. 2GH by Messtorff (1974, 1975), Minet et al. (1978), and Bowering (1982) impractical to use. Stratifications schemes, on the other hand, for the more southerly divisions of 2J and 3K have been used as NAFO standards as early as 1977. With the availability of many highly accurate "sounding" charts from the Canadian Hydrographic Service depth stratification charts were developed for a depth range of 200-1500 meters for a significant portion of Subareas 0 and 1 and up to 1500 m for all of Div. 2G and 2H. These charts are shown for Subareas 0 and 1 and Div. 2G and 2H in Fig. 1-3 respectively from Bowering (1987 a, b). The purpose of this paper is to "post-stratify" the observations from this series of USSR surveys according to these new stratification formats as well as the existing schemes for Div. 2J and 3K in order to obtain estimates of biomass. It should be noted, however, that the 1987 survey was stratified-random and was conducted using these new stratification charts. It was, in fact, expanded to include the Subarea 1 portion of the chart.

Materials and Methods

All the data were re-coded by associating each set position within a depth stratum. Since the new charts were highly accurate, no problems were encountered by having the depth and position in conflict with the appropriate depth stratum. The data were analyzed using the

standard Canadian stratified-random analysis program (STRAP) which provided abundance and biomass estimates by stratum and division. Using this program, all mean numbers and weights (kg) per set have been adjusted to reflect sets of 30-minute duration as opposed to 1-hour duration. Since the areal coverage differed so greatly over the time series, in order to standardize the estimates from year to year (even though crudely), each biomass estimate was adjusted proportionately to the total stratified area. In Subarea 0 and Div. 2G and 2H, the total stratified area was considered to be strata in a depth range of 300-1250 m; whereas, in Div. 2J and 3K, the depth range of 201-300 m was included in the adjustments. While these adjusted estimates are not meant to be taken as absolute, they should allow for evaluation of trends in biomass. The mean weight (kg) per set by stratum and year, the mean number per set by stratum and year, and the adjusted biomass estimates are presented in Tables 1-3 respectively for Div. 0B, Tables 4-6 for Div. 2G, Tables 7-9 for Div. 2H, Tables 10-12 for Div. 2J, and Tables 13-15 for Div. 3K. Trends in the adjusted biomass estimates are also shown graphically in Fig. 4 for Div. 0B, 2G, and 2H and in Fig. 5 for Div. 2J and 3K.

Results and Discussion

Baffin Island (Div. 0B)

Trends in biomass (Table 1; Fig. 4) indicate an increasing trend at quite high levels from 1979 to the 1982-83 period followed by a rather dramatic declining trend to very low levels. While the adjustments may be argued to some degree, it is difficult to dispute the systematic changes even without the adjustments. What is more difficult to explain is the very low estimate during the 1987 survey which was virtually complete. When examining strata that have been fished consistently or reasonably consistently over the time series (e.g. strata No. 4, 5, 6), there appears to be undoubtedly a decline; however, the magnitude of the decline from 1986 to 1987 is difficult to explain particularly in an area where there has been very little fishery. It is more likely to be largely due to a change in distribution possibly into deeper water. The only other survey conducted in the area was by Canada in 1986. The estimate of biomass for the whole stratified area of Subareas 0 and 1 was 282,000 t of which about 170,000 t was estimated to be in Subarea 0 very similar to the unadjusted USSR estimates (Bowering 1987c).

Northern and Central Labrador (Div. 2GH)

Similar trends generally occurred in these divisions as appeared to occur in Div. 0B although with the exception of a few strata, these areas were poorly covered. Considering strata fished relatively consistently such as 905, 906, and 920 in Div. 2G (Tables 4 and 5) and 940, 941, 962, and 963 it is readily apparent that abundance was high in these areas during these years with a substantial decline onward from 1984 (Table 6; Fig. 4). The results here are not particularly inconsistent with results of Canadian surveys conducted in 1978, 1979, 1981, and 1987 where estimates in the earlier years are higher than those in 1986 and 1987 (Bowering, MS 1988). In fact, in 1987 both the Canadian and USSR biomass estimates for Div. 2G were between 16,000-17,000 t for virtually the same coverage.

Southern Labrador-Eastern Newfoundland (Div. 2J and 3K)

The coverage in this area is rather minimal (Tables 10-15; Fig. 5) although for Div. 2J the trend is similar to the northern areas. In Div. 3K, on the other hand, the highest index is in 1980 and declines from there. Unfortunately, there is no information for recent years.

In general, there appeared to be increasingly high levels of biomass throughout all areas during the late 1970s to early 1980s beyond which indices declined rapidly through 1987. This is not particularly inconsistent with certain events in the fishery during this period. The magnitude of these apparent declines, however, during recent years merits further investigation. The levels of low abundance in 1985 and 1986 are complemented by the two lowest catches in the history of the fishery as well as being the two years of the most adverse environmental conditions. The low 1987 estimates however, are inconsistent with what appeared to be a very good fishery.

The data here are presented as a first look at trends in the Greenland halibut resource. However, further refinement and analyses including stratified estimates of the various age groups and year-classes are planned.

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Table 1. Stratified mean weight (kg) per set of Greenland halibut from USSR surveys in Division OB from 1979-87 (numbers in brackets are number of sets).

Stratum	Depth	Area	1979	1980-81	1981-82	1982-83	1983-84	1984	1985-86	1986	1987
1	201-300	2356								5 (2)	0.1 (3)
2	301-400	1844							10 (5)	12 (3)	6 (3)
3	401-500	2616	275 (2)			323 (2)		3 (2)	19 (4)		3 (3)
4	501-750	4671	460 (38)	71 (5)		286 (12)	490 (8)	250 (10)	127 (13)	207 (6)	23 (5)
5	751-1000	2070	366 (25)	1191 (14)	452 (8)	824 (20)	505 (18)	424 (23)	455 (27)	413 (18)	50 (6)
6	1001-1250	1975	429 (6)	1239 (6)	752 (4)	2300 (12)	1156 (18)	171 (14)	199 (7)	245 (3)	48 (5)
7	1251-1500	1641					654 (2)	209 (3)	263 (3)		
8	201-300	3550								5 (3)	0.1 (3)
9	301-400	4018		12 (9)					7 (3)	25 (3)	4 (4)
10	401-500	1566	284 (6)				37 (2)		37 (2)		5 (3)
11	501-750	2311	386 (20)	53 (8)		269 (3)	155 (12)		136 (5)	158 (4)	14 (4)
12	751-1000	943		153 (2)		388 (3)	462 (5)	247 (3)	156 (4)	543 (13)	70 (4)
13	1001-1250	343					1153 (4)				53 (3)
22	201-300	2225									1 (3)
23	301-400	935									7 (3)
24	401-500	1449									6 (3)
25	501-750	2130	176 (2)							61 (6)	13 (4)
Biomass			268567	218303	89480	390659	405887	124104	129062	175449	37819

Table 2. Stratified mean number per set of Greenland halibut from USSR surveys in Division OB from 1979-87 (numbers in brackets are number of sets).

Stratum	Depth	Area	1979	1980-81	1981-82	1982-83	1983-84	1984	1985-86	1986	1987
1	201-300	2356								15 (2)	0.35 (3)
2	301-400	1844							298 (5)	31 (3)	82 (3)
3	401-500	2616	115 (2)			198 (2)		64 (2)	31 (4)		3 (3)
4	501-750	4671	262 (38)	61 (5)		166 (12)	242 (8)	183 (10)	91 (13)	153 (6)	13 (5)
5	751-1000	2070	189 (25)	653 (14)	292 (8)	489 (20)	343 (18)	271 (23)	341 (27)	287 (18)	33 (6)
6	1001-1250	1975	146 (6)	598 (6)	451 (4)	1025 (12)	544 (18)	86 (14)	110 (7)	142 (3)	33 (5)
7	1251-1500	1641					182 (2)	130 (3)	123 (3)		
8	201-300	3550								13 (3)	1 (3)
9	301-400	4018		100 (2)					45 (3)	89 (3)	17 (4)
10	401-500	1566	176 (6)				112 (2)		127 (2)		6 (3)
11	501-750	2311	213 (20)	64 (8)		211 (3)	146 (12)		142 (5)	151 (4)	13 (4)
12	751-1000	943		154 (2)		238 (3)	422 (5)	191 (3)	164 (4)	378 (13)	44 (4)
13	1001-1250	343					875 (4)				32 (3)
22	201-300	2225									3 (3)
23	301-400	935									85 (3)
24	401-500	1449									30 (3)
25	501-750	2130	104 (2)							123 (6)	32 (4)
Numbers ('000's)			140487	143587	55272	215887	237775	90475	132488	153834	50546

Table 3. Adjusted estimated of biomass of Greenland halibut from USSR surveys in Division 0B from 1979-87.

Div.	Year	Trip	Biomass	Total area >300 m <1250 m	Area covered	% coverage	Adjusted biomass
0B	1979	Suloy 17	268567	34012	17339	50.98	526832
	1980-81	Kononov 18	218303	34012	15988	40.85	534341
	1981-82	Persey 16	89480	34012	4045	11.89	752405
	1982-83	Suloy 13	390659	34012	14586	42.89	910973
	1983-84	Suloy 15	405887	34012	15520	45.62	911586
	1984	Kuropatkin 19+Suloy 21	124104	34012	13916	40.92	303329
	1985-86	Kononov 24	129062	34012	23655	69.28	186276
	1986	Klintsy	175409	34012	25320	74.44	215840
	1987	Kapitan Shaitanov	37819	34012	25222	74.16	36750

Table 4. Stratified mean weight (kg) per set of Greenland halibut from USSR surveys in Division 2G from 1979-87 (numbers in brackets are number of sets).

Stratum	Depth	Area	1979	1980-81	1981-82	1982-83	1983-84	1984	1985-86	1986	1987
901	201-300	1213									7 (3)
902	301-400	120									1 (3)
903	401-500	80	114 (2)								16 (3)
904	501-750	153	209 (8)		136 (2)	1972 (5)		81 (8)			43 (3)
905	751-1000	164	599 (7)	2843 (3)	513 (3)	2379 (5)	1561 (4)	223 (4)			260 (3)
906	1001-1250	229		2444 (2)		1537 (2)	2453 (3)	304 (5)			76 (3)
907	1251-1500	360						252 (4)			
908	201-300	585		15 (2)							3 (3)
909	≤200	2773									
910	≤200	2339									
911	201-300	692									2 (3)
912	301-400	73									2 (3)
913	401-500	62									11 (3)
914	501-750	113	383 (2)								18 (3)
915	751-1000	96									62 (3)
916	1001-1250	146									134 (3)
917	1251-1500	165									
918	1251-1500	515						0 (2)			
919	1001-1250	316	764 (3)	2751 (2)			1475 (4)		80 (3)		142 (4)
920	751-1000	172	858 (6)	3226 (5)	1046 (5)	1892 (2)	2490 (11)	237 (9)	105 (6)		89 (3)
921	501-750	142	67 (4)	1880 (2)				332 (5)			40 (3)
922	401-500	186							5 (2)		11 (3)
923	301-400	186									5 (3)
924	201-300	756		13 (2)						28 (3)	6 (3)
925	≤200	1804									
926	201-300	433									
927	301-400	832									
928	401-500	783					19 (2)				7 (3)
929	501-750	1261									32 (4)
Biomass			21484	101136	10531	50613	63821	10982	1642	773	16826

Table 5. Stratified mean weight (kg) per set of Greenland halibut from USSR surveys in Division 2G from 1979-87 (numbers in brackets are number of sets).

Stratum	Depth	Area	1979	1980-81	1981-82	1982-83	1983-84	1984	1985-86	1986	1987
901	201-300	1213									31 (3)
902	301-400	120									2 (3)
903	401-500	80	104 (2)								25 (3)
904	501-750	153	170 (8)		201 (2)	1711 (5)		100 (8)			43 (3)
905	751-1000	164	300 (7)	2102 (3)	487 (3)	1885 (5)	1077 (4)	228 (4)			183 (3)
906	1001-1250	229		845 (2)		839 (2)	1596 (3)	169 (5)			32 (3)
907	1251-1500	360						125 (4)			
908	201-300	585		45 (2)							12 (3)
909	≤200	2773									
910	≤200	2339									
911	201-300	692									34 (3)
912	301-400	73									13 (3)
913	401-500	62									15 (3)
914	501-750	113	239 (2)								24 (3)
915	751-1000	96									52 (3)
916	1001-1250	146									87 (3)
917	1251-1500	165									
918	1251-1500	515						0 (2)			
919	1001-1250	316	274 (3)	1112 (2)			523 (4)		80 (3)		83 (4)
920	751-1000	172	335 (6)	1639 (5)	678 (5)	1086 (2)	1514(11)	147(9)	108 (6)		76 (3)
921	501-750	142	54 (4)	971 (2)				266 (5)			33 (3)
922	401-500	186							9 (2)		9 (3)
923	301-400	186									5 (3)
924	201-300	756		59 (2)						74 (3)	18 (3)
925	≤200	1804									
926	201-300	433									
927	301-400	832									
928	401-500	783					28 (2)				7 (3)
929	501-750	1261									26 (4)
Numbers (000's)			9701	51031	8396	35103	36570	7376	1676	2058	21581

Table 6. Adjusted estimates of biomass of Greenland halibut from USSR surveys in Division 2G from 1979-87.

Div.	Year	Trip	Estimated biomass	Total area >300 m <1250 m	Area surveyed (sq m)	% Coverage	Adjusted biomass
2G	1979	Suloy 17	21484	5699	1140	20.00	107397
	1980-81	Kononov 18	101136	5699	2364	41.48	243803
	1981-82	Persey 16	10531	5699	489	8.58	122727
	1982-83	Suloy 13	50613	5699	718	0.1208	401716
	1983-84	Suloy 15	63821	5699	1664	29.19	218571
	1984	Kuropatkin 19+Suloy 21	10982	5699	1735	30.43	36071
	1985-86	Kononov 24	1642	5699	674	0.1208	13883
	1986	Klintsy 26	773	5699	756	0.1380	5827
	1987	Kapitan Shaitanov	16826	5699	7528	100.00	16826

Table 7. Stratified mean weight (kg) per set of Greenland halibut from USSR surveys in Division 2H from 1979-87 (numbers in brackets are number of sets).

Stratum	Depth	Area	1979	1980-81	1981-82	1982-83	1983-84	1984	1985-86	1986	1987
930	≤200	1028									
931	201-300	276			4 (6)						
932	301-400	55	532 (14)		24 (3)	1096 (2)					
933	401-500	50	518 (6)								
934	501-750	78	289 (6)		139 (4)		1723 (2)		18 (2)		
935	751-1000	96				1486 (2)	4664 (3)		248 (3)		52 (3)
936	1001-1250	78					2074 (3)		190 (3)		22 (3)
937	1251-1500	94									
938	1251-1500	191									
939	1001-1250	130					3859 (2)	836 (3)	109 (2)	610 (3)	61 (3)
940	751-1000	97	188 (2)	2554 (5)	1116 (7)		3617 (5)	2642 (4)	17 (2)	352 (5)	110 (3)
941	501-750	89	452 (11)		131 (3)	1832 (2)	935 (2)	295 (2)			
942	401-500	55	403 (6)								
943	201-300	354	74 (2)		15 (4)	10 (3)				6 (2)	
944	301-400	860	216 (7)	54 (2)	33 (10)						
945	401-500	461	120 (2)			131 (2)					
946	501-750	721	141 (2)		476 (2)						
947	501-750	227									
948	401-500	246									
949	301-400	206									
950	201-300	261									
951	401-500	234									
952	301-400	177									
953	201-300	291									
954	≤200	971									
955	201-300	389		12 (3)	5 (2)		6 (2)				
956	≤200	1051									
957	≤200	1371									
958	201-300	294	24 (2)								
959	301-400	178	131 (3)								
960	401-500	107						18 (2)			
961	501-750	211	324 (9)	369 (3)		276 (3)	342 (4)	113 (4)			
962	751-1000	242	279 (2)		639 (3)	3449 (2)	995 (3)	448 (4)			86 (3)
963	1001-1250	265				1113 (4)	438 (3)	1295 (2)	233 (2)		30 (3)
964	1251-1500	342									
Biomass			25643	13929	24618	59791	78031	32097	4346	4277	4018

Table 8. Stratified mean number per set of Greenland halibut from USSR surveys in Division 2H from 1979-87 (numbers in brackets are number of sets).

Stratum	Depth	Area	1979	1980-81	1981-82	1982-83	1983-84	1984	1985-86	1986	1987
930	≤200	1028									
931	201-300	276			6 (6)						
932	301-400	55	249 (14)		25 (3)	347 (2)					
933	401-500	50	229 (6)								
934	501-750	78	90 (6)		150 (4)		1560 (2)		32 (2)		
935	751-1000	96				433 (2)	2525 (3)		430 (3)		37 (3)
936	1001-1250	78					676 (3)		240 (3)		12 (3)
937	1251-1500	94									
938	1251-1500	191									
939	1001-1250	130					1490 (2)	642 (3)	136 (2)	192 (3)	20 (3)
940	751-1000	97	69 (2)	1382 (5)	656 (7)		1909 (5)	2006 (4)	25 (2)	202 (5)	66 (3)
941	501-750	89	171 (11)		117 (3)	892 (2)	880 (2)	308 (2)			
942	401-500	55	168 (6)								
943	201-300	354	39 (2)		17 (4)	42 (3)				9 (2)	
944	301-400	860	106 (7)	15 (2)	67 (10)						
945	401-500	461	254 (2)			108 (2)					
946	501-750	721	163 (2)		623 (2)						
947	501-750	227									
948	401-500	246									
949	301-400	206									
950	201-300	261									
951	401-500	234									
952	301-400	177									
953	201-300	291									
954	≤200	971									
955	201-300	389		15 (3)	16 (2)		18 (2)				
956	≤200	1051									
957	≤200	1371									
958	201-300	294	15 (2)								
959	301-400	178	49 (3)								
960	401-500	107						45 (2)			
961	501-750	211	130 (9)	483 (3)		276 (3)	278 (4)	129 (4)			
962	751-1000	242	195 (2)		452 (3)	1227 (2)	494 (3)	324 (4)			52 (3)
963	1001-1250	265				383 (4)	131 (3)	857 (2)	264 (2)		14 (3)
964	1251-1500	342									
Number (000's)			18118	9394	26506	24448	40421	23755	5639	1767	2217

Table 9. Adjusted estimates of biomass of Greenland halibut from USSR surveys in Division 2H from 1979-87.

Div.	Year	Trip	Estimated biomass	Total area >300 <1250 m (sq m)	Area surveyed	% Coverage	Adjusted biomass
2H	1979	Suloy 17	25643	4863	3745	77.01	32711
	1980-81	Kononov 18	13929	4863	1557	32.59	42738
	1981-82	Persey 16	24618	4863	3161	66.17	37206
	1982-83	Suloy 13	59791	4863	1773	37.12	161103
	1983-84	Suloy 15	78031	4863	1545	32.35	241278
	1984	Kuropatkin 19+Suloy 21	32097	4863	1141	23.87	134387
	1985-86	Kononov 24	4346	4863	744	15.58	27906
	1986	Klintsy 26	4277	4863	581	12.16	35167
	1987	Kapitan Shaitanov	4018	4863	908	19.01	21139

Table 10. Stratified mean weight (kg) per set of Greenland halibut from USSR surveys in Division 2J from 1980-87 (numbers in brackets are number of set).

Stratum	Depth	Area	1980-81	1981-82	1982-83	1983-84	1984	1986
201	101-200	1427						
202	201-300	440						
203	301-400	480						
204	401-500	354						764 (5)
205	101-200	1823						
206	101-200	2582	26 (2)		6 (2)			
207	101-200	2246						
208	301-400	448						
209	201-300	1608						
210	201-300	774						
211	301-400	330						
212	501-750	664						
213	201-300	1725		23 (4)				
214	201-300	1171	2 (3)		6 (4)	3 (4)		
215	201-300	1270	23 (5)	7 (5)	12 (4)			26 (9)
216	301-400	384	6 (7)	57 (6)	53 (2)			
217	401-500	268	7 (2)					
218	501-750	420		83 (2)	1082 (2)		83 (2)	
219	751-1000	213	1000 (4)		2376 (3)		793 (3)	
220	1001-1250	324	420 (2)				221 (3)	
221	1251-1500	268					23 (2)	
222	301-400	441	9 (3)					
223	401-500	180						
224	501-750	270	364 (3)			1154 (2)		
225	1001-1250	177						
226	1251-1500	180						
227	401-500	686	41 (2)					
228	201-300	1428	1 (2)		18 (2)			
229	301-400	567			22 (3)			
230	501-750	237	259 (3)		419 (4)		394 (2)	
231	751-1000	182	1320 (15)		598 (4)		2176 (3)	
232	1001-1250	236						
233	1251-1500	180						
234	201-300	508						
235	401-500	420						
236	751-1000	122	1761 (2)			1633 (2)		
Biomass			38201	3879	46184	15340	28506	11200

Table 11. Stratified mean number per set of Greenland halibut from USSR surveys in Division 2J from 1980-86 (numbers in brackets are number of sets).

Stratum	Depth	Area	1980-81	1981-82	1982-83	1983-84	1984	1986
201	101-200	1427						
202	201-300	440						
203	301-400	480						
204	401-500	354						793 (5)
205	101-200	1823						
206	101-200	2582	184 (2)		11 (2)			
207	101-200	2246						
208	301-400	448						
209	201-300	1608						
210	201-300	774						
211	301-400	330						
212	501-750	664						
213	201-300	1725		26 (4)				
214	201-300	1171	7 (3)		7 (4)	4 (4)		
215	201-300	1270	38 (5)	9 (5)	68 (4)			23 (9)
216	301-400	384	7 (7)	53 (6)	47 (2)			
217	401-500	268	12 (2)					
218	501-750	420		58 (2)	546 (2)		68 (2)	
219	751-1000	213	541 (4)		1032 (3)		517 (3)	
220	1001-1250	324	226 (2)				102 (3)	
221	1251-1500	268					5 (2)	
222	301-400	441	14 (3)					
223	401-500	180						
224	501-750	270	218 (3)			727 (2)		
225	1001-1250	177						
226	1251-1500	180						
227	401-500	686	24 (2)					
228	201-300	1428	9 (2)		17 (2)			
229	301-400	567			43 (3)			
230	501-750	237	145 (3)		164 (4)		267 (2)	
231	751-1000	182	652 (5)		254 (4)		1172 (3)	
232	1001-1250	236						
233	1251-1500	180						
234	201-300	508						
235	401-500	420						
236	751-1000	122	994 (2)			404 (2)		
Numbers (000's)			40363	3690	26710	9239	16617	11456

Table 12. Adjusted estimates of biomass of Greenland halibut from USSR surveys in Division 2J from 1980-86.

Div.	Year	Trip	Estimated biomass	Total area >200 m <1250 m	Area covered	% Coverage	Adjusted biomass
2J	1980-81	Kononov 18	38201	16327	6996	42.85	89146
	1981-82	Persey 16	3879	16327	3799	23.27	16697
	1982-83	Suloy 13	46184	16327	5872	35.96	128405
	1983-84	Suloy 15	15340	16327	1563	9.58	160229
	1984	Kuropatkin 19+Suloy 21	28506	16327	1644	10.07	283081
	1986	Klintsy 26	11200	16327	1624	9.94	112592

Table 13. Stratified mean weight (kg) per set of Greenland halibut from USSR surveys in Division 3K from 1980-84 (numbers in brackets are number of sets).

Stratum	Depth	Area	1980-81	1982-83	1983-84
620	201-300	2709			
621	201-300	2859			
622	401-500	632	620 (2)		
623	301-400	1027			
624	201-300	668			
625	301-400	850			
626	301-400	919	332 (2)	395 (2)	
627	401-500	1194	736 (2)		
628	301-400	1085	50 (2)		
629	301-400	495			
630	301-400	544			
631	401-500	1202		135 (3)	
632	201-300	447			
633	301-400	2179	14 (3)	10 (5)	15 (3)
634	201-300	1618		13 (2)	9 (5)
635	201-300	1274		21 (2)	
636	201-300	1455		32 (2)	
637	201-300	1132			
638	301-400	2059		27 (5)	4 (2)
639	301-400	1463		4 (2)	
640	401-500	198	46 (2)	11 (3)	0 (2)
641	501-750	584	178 (3)	145 (4)	191 (4)
642	751-1000	931	161 (2)	343 (14)	150 (3)
643	1001-1250	1266	97 (2)	162 (3)	108 (4)
644	1251-1500	954			27 (2)
645	401-500	204		163 (2)	
646	501-750	333	166 (6)	361 (4)	
647	751-1000	409	177 (4)	510 (6)	130 (2)
648	1001-1250	232		588 (3)	
649	1251-1500	263			
Biomass			80078	66915	19342

Table 14. Stratified mean number per set of Greenland halibut from USSR surveys in Division 3K from 1980-84 (numbers in brackets are number of sets).

Stratum	Depth	Area	1980-81	1982-83	1983-84
620	201-300	2709			
621	201-300	2859			
622	401-500	632	783 (2)		
623	301-400	1027			
624	201-300	668			
625	301-400	850			
626	301-400	919	397 (2)	608 (2)	
627	401-500	1194	753 (2)		
628	301-400	1085	98 (2)		
629	301-400	495			
630	301-400	544			
631	401-500	1202		440 (3)	
632	201-300	447			
633	301-400	2179	13 (3)	14 (5)	17 (3)
634	201-300	1618		54 (2)	16 (5)
635	201-300	1274		79 (2)	
636	201-300	1455		67 (2)	
637	201-300	1132			
638	301-400	2059		49 (5)	5 (2)
639	301-400	1463		5 (2)	
640	401-500	198	20 (2)	7 (3)	0 (2)
641	501-750	584	125 (3)	93 (4)	119 (4)
642	751-1000	931	121 (2)	273 (14)	93 (3)
643	1001-1250	1266	72 (2)	101 (3)	52 (4)
644	1251-1500	954			11 (2)
645	401-500	204		56 (2)	
646	501-750	333	73 (6)	144 (4)	
647	751-1000	409	101(4)	241 (6)	67(2)
648	1001-1250	232		285 (3)	
649	1251-1500	263			
Numbers (000's)			82415	80235	12239

Table 15. Adjusted estimated of biomass of Greenland halibut from USSR surveys in Division 3K from 1980-84.

Div.	Year	Trip	Biomass	Total area >200 m <1250 m	Area covered	% coverage	Adjusted biomass
3K	1980-81	Kononov 18	80078	29968	9730	31.47	254476
	1982-83	Suloy 13	66915	29968	16326	47.00	142364
	1983-84	Suloy 15	19342	29968	10198	32.98	58645

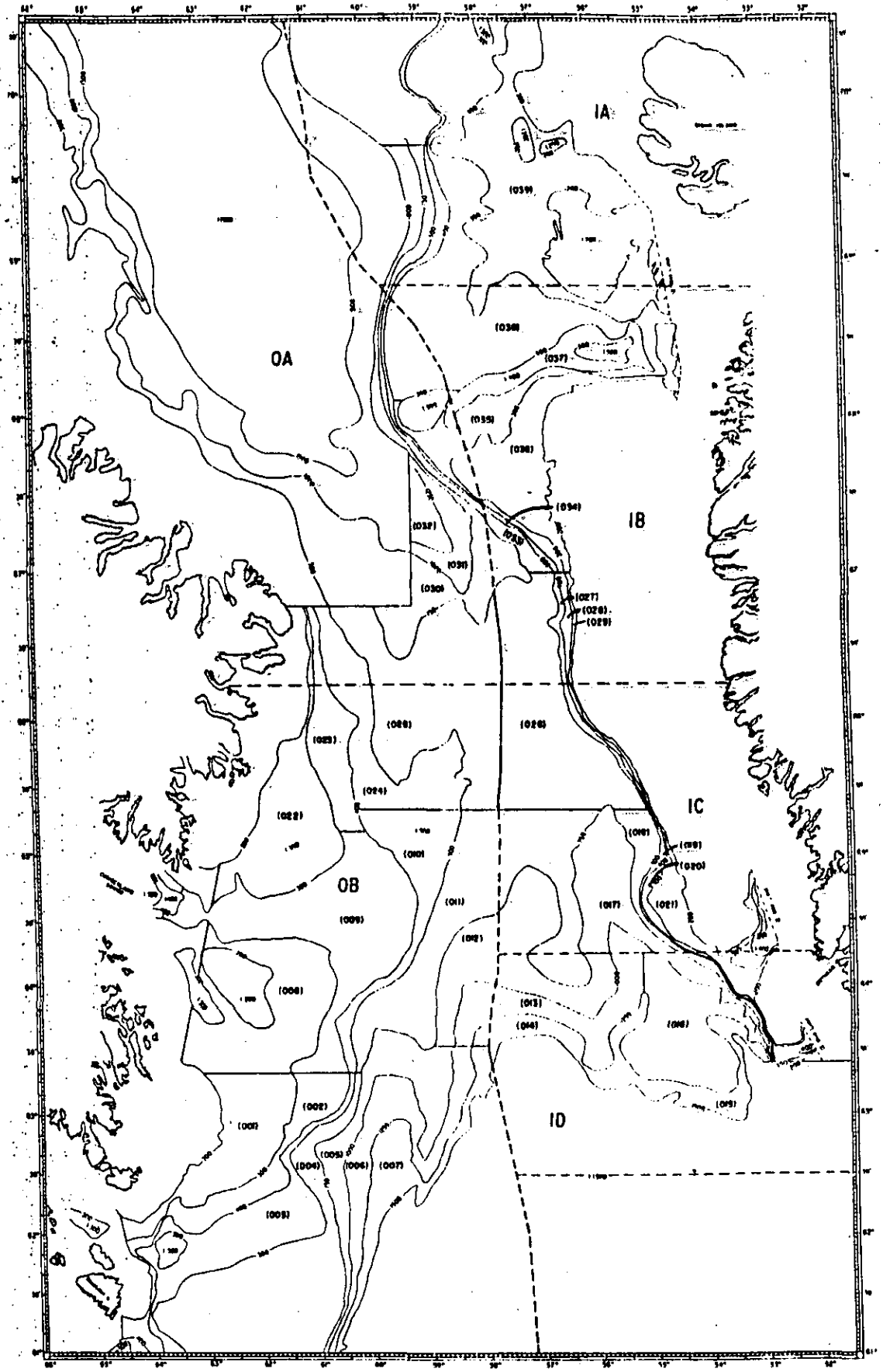

Fig. 1 Stratification scheme developed for a selected portion of NAFO Subareas Ø and 1.

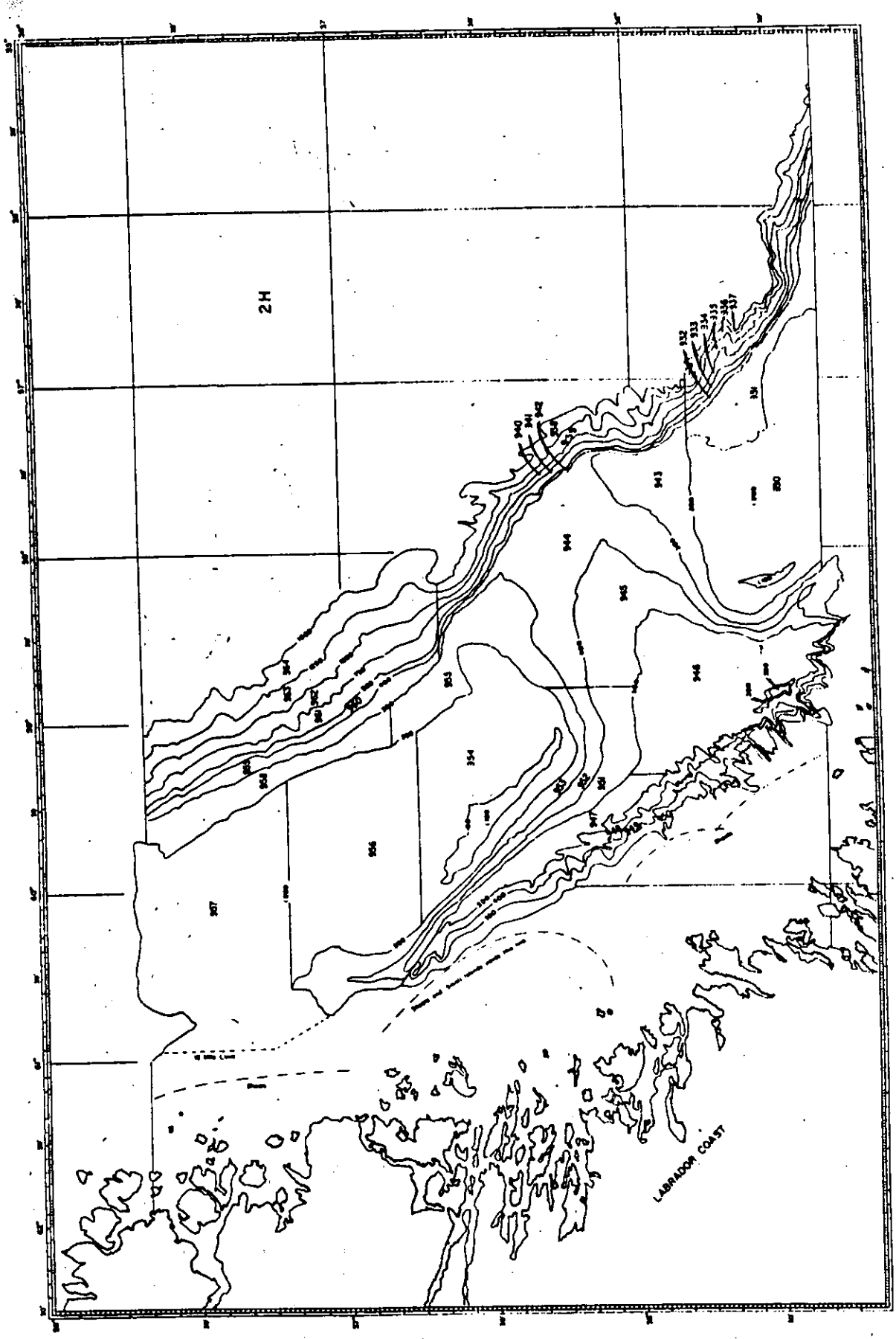

Fig. 2, Stratification scheme for NAFO Division 2H,

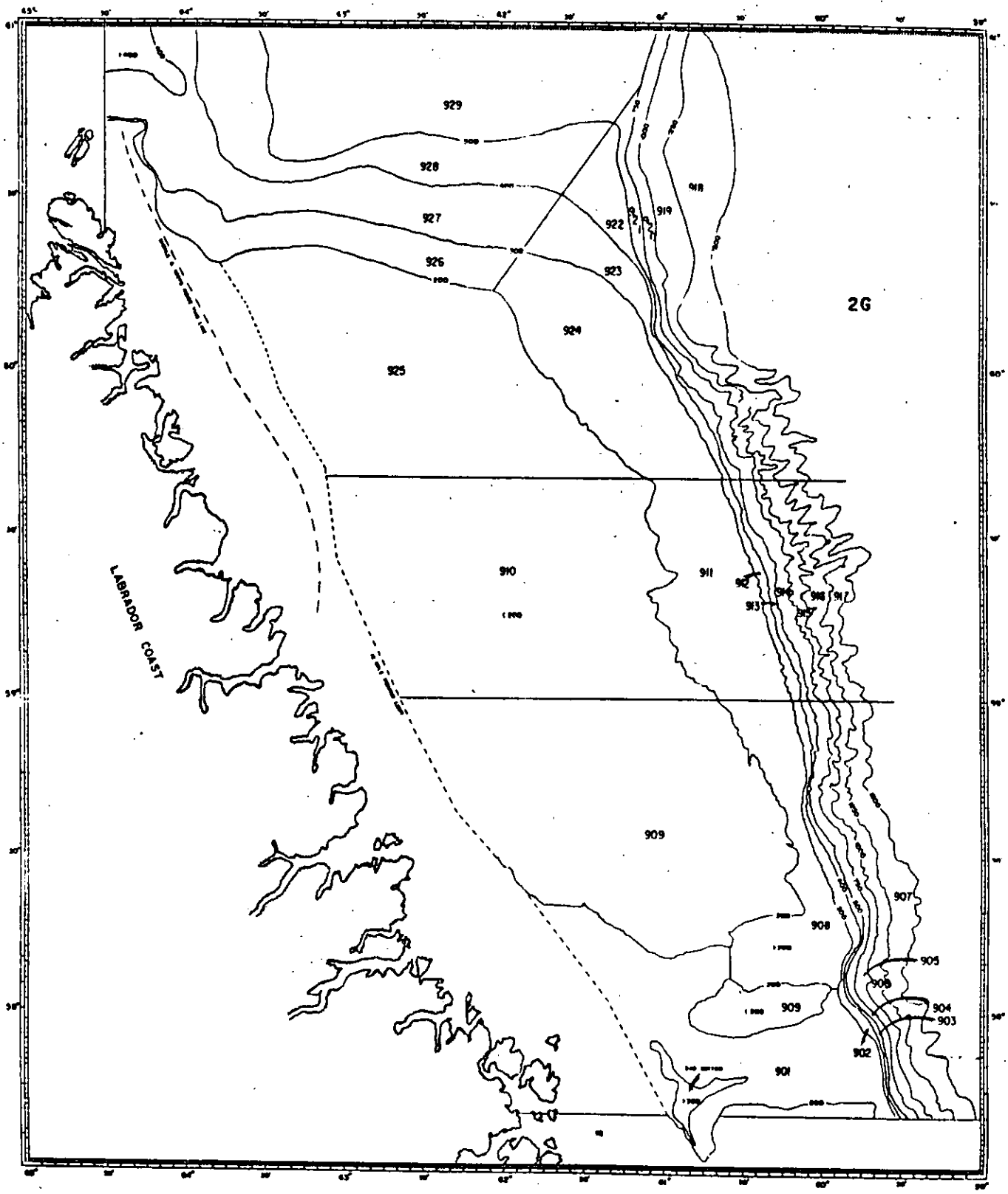

Fig. 3. Stratification scheme for NAFO Division 2G.

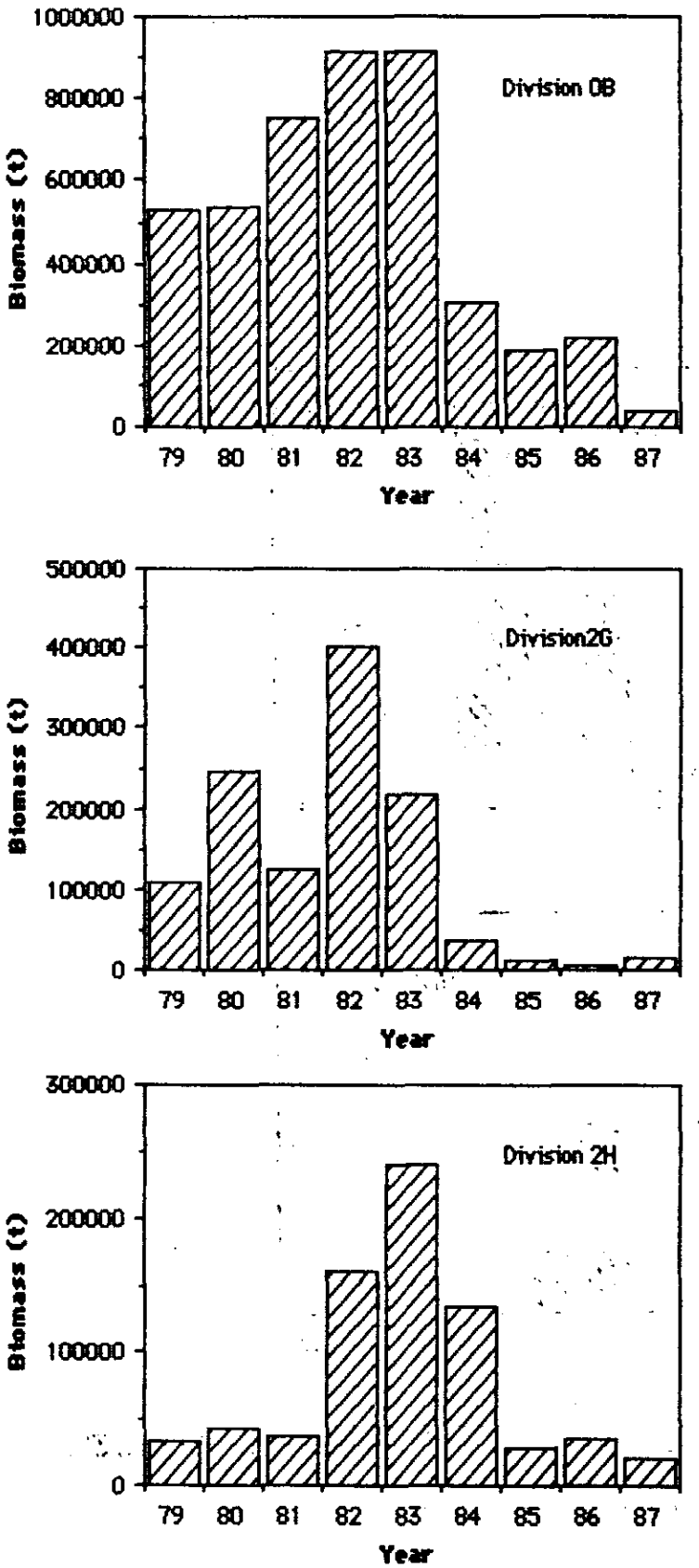

Fig. 4 Adjusted biomass estimates of G. halibut in Div. 0B,2G and 2H.

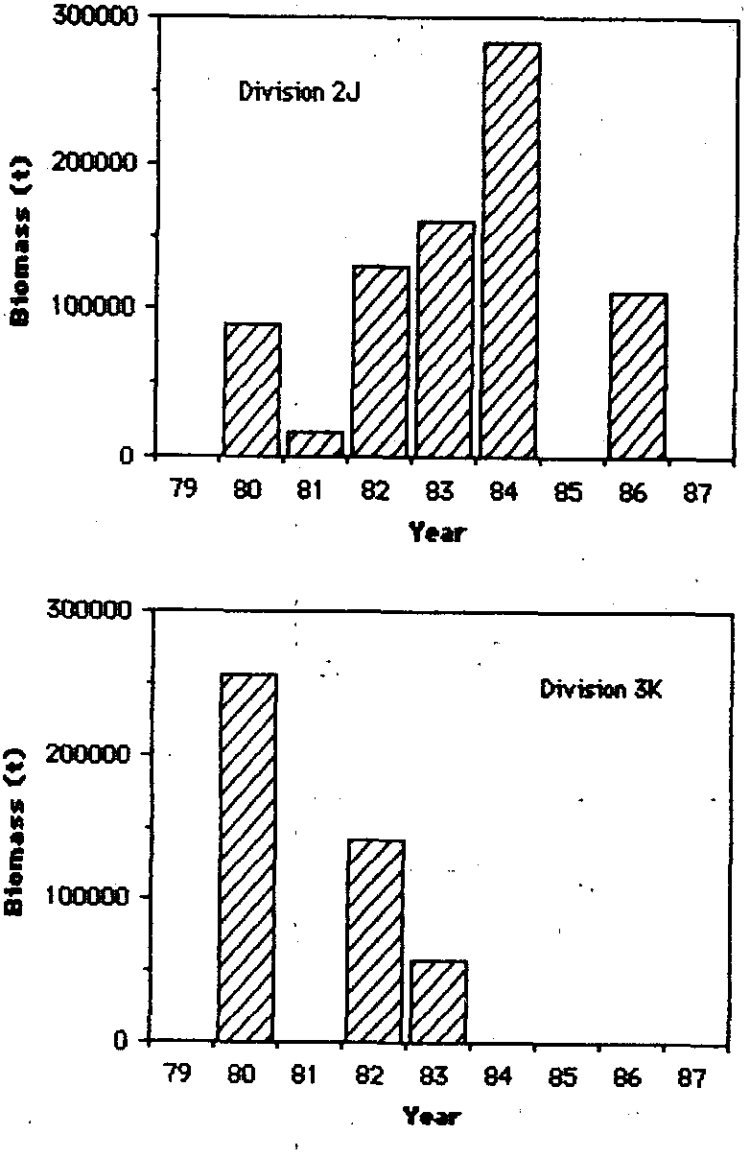

Fig. 5 Adjusted biomass estimates of G. halibut in Div. 2J and 3K.