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Minimum Trawlable Biomass Estimates of Greenland Halibut in NAFO Divisions

2G and 2H from Post-stratified Groundfish surveys

by

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**INTRODUCTION**

In the fall of 1978, 1979, and 1981, the Canadian research vessel "Gadus Atlantica" conducted surveys for groundfish in NAFO Divisions 2G and 2H. The surveys were carried out by means of line transects across depths according to the following depth ranges: 101-200, 201-300, 301-400, 401-500, 501-750, 751-1000, and >1000 meters. Since charting of these areas is rather poor, many fishing stations in the 1978 survey were moved from the original planned position in order to find the required depth range. Each subsequent survey was planned according to the successful fishing positions in the 1978 survey results with additional fishing stations inserted where time permitted.

**MATERIALS AND METHODS**

Stratification charts were constructed using the depth contours of the Fisheries Chart Nos. 8046 and 8047 of the Canadian Hydrographic Service. Each NAFO Division was divided into three zones with a stratum number assigned to each depth range for each zone. The stratification charts are shown in Fig 1 and 2 for Divisions 2G and 2H respectively. The area of each stratum was then determined using a planimeter and subsequently each stratum area was broken down into trawlable units. A trawlable unit was defined as the area swept by a trawl with a 45 foot (13.72 m) wing spread towed a distance of 1.8 nautical miles i.e. the distance usually towed per 30 minute fishing set. These calculations are shown in Table 1 for Div. 2G and Table 4 for Div. 2H.

For each survey, the fishing sets were assigned to the stratum in which it occurred and where the fishing depth did not agree with stratum in which the position occurred it was assigned to the nearest stratum containing the fishing depth. Estimates of biomass by stratum, zone, and depth range, were then calculated in the usual way. Variances and confidence intervals were not presented since the calculations were based upon fixed and not random stations. However, the estimates of biomass should be relative indicators of stock size throughout the area.

**RESULTS AND DISCUSSION**

Biomass estimates calculated by Stratum and year are presented in Tables 1-3 for Division 2G for 1978, 1979, and 1981 respectively. For strata fished, the estimates ranged from 77,000 t in 1978 to 54,000 t in 1979 and up to 71,000 t again in 1981. For Div. 2H the biomass estimates by stratum are shown in Tables 4-6 for 1978, 1979, 1981 respectively. These estimates were 71,000 t in 1978, 107,000 t in 1979, and 55,000 t in 1981. For the two divisions combined, estimates were 148,000 t in 1978, 171,000 t in 1979, and 126,000 t in 1981.

Biomass estimates were also calculated by depth range over the entire division for both divisions separately. For Div. 2H (Table 7) down to 1,000 m the estimates were 82,000 t in 1978, 123,000 t in 1979, and 52,000 t in 1981. For Div. 2G (Table 8), estimates were 165,000 t in 1978, 65,000 t in 1979, and 55,000 t in 1981. The combined estimates in this manner were 246,000 t in 1978, 187,000 t in 1979, and 107,000 t in 1981. Because of changes in distribution patterns, however, it is considered that the estimates by stratum are the more reliable estimates than by depth zone.

Bowering and Parsons (1981) and Bowering et al. (1982) indicated from shrimp surveys in the Hopedale and Cartwright Channel areas a high biomass of Greenland halibut in these areas particularly in 1979 and 1980, however, this was greatly reduced in 1981. This reduction would have to be due to emigration since no fishery for Greenland halibut occurs here to any extent. Recent results from tagging studies of Greenland halibut tagged in Hopedale Channel in 1980 (Bowering, this meeting) show more than half the returns taken in 1981 were reported from the Continental slope area which would explain this reduced biomass in the channels. Furthermore, since the surveys shown here have minimal coverage of the continental slope area, the 1981 estimates of biomass are probably underestimated. It would appear then based upon the results presented here that the minimum trawlable biomass of Greenland halibut in Divisions 2G and 2H combined may be in the order of 150,000 t to 200,000 t.

#### REFERENCES

- Bowering, W. R., G. R. Lilly, and D. G. Parsons. 1982. Predators of shrimp (Pandalus borealis) in the Cartwright (Div. 2J) and Hopedale (Div. 2H) Channels. CAFSAC Res. Doc. 82/9, 32 p.
- Bowering, W. R., and D. G. Parsons. 1981. Observations on the relationships between shrimp (Pandalus borealis) and Greenland halibut (Reinhardtius hippoglossoides) in two Labrador channels. CAFSAC Res. Doc. 81/5, 23 p.

Table 1. Minimum trawlable biomass estimates of Greenland halibut by Stratum for Div. 2G for the year 1978.

Stratum	Depth range	Area Sq. Mi.	Trawlable units	No sets	Ave Wt/Set (kg)	Est biomass (tons)
1	101-200	1,136	85,414	3	36.93	3,154
2	201-300	910	68,421	2	8.18	559
3	301-400	705	53,008	1	512.11	27,146
4	401-500	1,108	83,308	-	-	-
5	501-750	1,625	122,180	-	-	-
6	751-1,000	138	10,376	-	-	-
Total						30,859
7	101-200	4,022	302,406	10	64.45	19,489
8	201-300	975	73,308	4	6.59	483
9	301-400	160	12,030	2	263.78	3,173
10	401-500	103	7,744	3	604.58	4,682
11	501-750	105	7,895	-	-	-
12	751-1,000	88	6,617	-	-	-
Total						27,827
13	101-200	3,340	251,128	13	23.12	5,806
14	201-300	1,943	146,090	10	41.59	6,075
15	301-400	133	10,000	1	379.09	3,791
16	401-500	91	6,842	-	-	-
17	501-750	103	7,744	1	327.79	2,538
18	751-1,000	231	17,368	-	-	-
Total						18,210
			1,271,879			
	Division Total					76,896

Table 2. Minimum trawlable biomass estimates of Greenland halibut by stratum for Div. 2G for the year 1979.

Stratum	Depth Range	Area Sq. Mi.	Trawlable Units	No Sets	Ave Wt/Set (kg)	Est biomass (tons)
1	101-200	1,136	85,414	2	10.67	911
2	201-300	910	68,421	2	23.39	1,600
3	301-400	705	53,008	2	69.01	3,658
4	401-500	1,108	83,308	-	-	-
5	501-750	1,625	122,180	5	223.55	27,313
6	751-1,000	138	10,376	-	-	
Total						33,482
7	101-200	4,022	302,406	10	9.37	2,832
8	201-300	975	73,308	6	9.16	671
9	301-400	160	12,030	1	2.27	27
10	401-500	103	7,744	2	65.83	510
11	501-750	105	7,895	1	786.33	6,208
12	751-1,000	88	6,617	-	-	
Total						10,248
13	101-200	3,340	251,28	13	3.95	993
14	201-300	1,943	146,090	9	46.01	6,721
15	301-400	133	10,000	1	5.45	55
16	401-500	91	6,842	2	93.30	638
17	501-750	103	7,744	3	265.44	2,056
18	751-1,000	231	17,368	-	-	
Total						10,463
Division Total						54,193

Table 3. Minimum trawlable biomass estimates of Greenland halibut by stratum for Div. 2G for the year 1981.

Stratum	Depth Range	Area Sq. Mi.	Trawlable Units	No Sets	Ave Wt/Set (kg)	Est biomass (tons)
1	100-200	1,136	85,414	1	5.00	427
2	201-300	910	68,421	2	22.50	1,539
3	301-400	705	53,008	2	35.23	1,869
4	401-500	1,108	83,308	1	136.00	11,330
5	501-750	1,625	122,180	4	348.75	42,610
6	751-1,000	138	10,376	-	-	-
Total						57,775
7	101-200	4,022	302,406	10	10.10	3,054
8	201-300	975	73,308	4	10.38	761
9	301-400	160	12,030	2	82.00	986
10	401-500	103	7,744	2	31.00	240
11	501-750	105	7,895	-	-	-
12	751-1,000	88	6,617	-	-	-
Total						5,041
13	101-200	3,340	251,128	8	5.94	1,491
14	201-300	1,943	146,090	8	37.75	5,515
15	301-400	133	10,000	1	38.00	380
16	401-500	91	6,842	2	54.75	375
17	501-750	103	7,744	4	114.00	883
18	751-1,000	231	17,368	-	-	-
Total						8,644
Division Total						71,460

Table 4. Minimum trawlable biomass estimates of Greenland halibut by stratum for Div. 2H for the year 1978.

Stratum	Depth Range	Area Sq. Mi.	Trawlable Units	No Sets	Ave Wt/Set (kg)	Est. biomass (tons)
1	101-200	2,307	173,459	7	13.17	2,284
2	201-300	445	33,459	3	78.34	2,621
3	301-400	133	10,000	1	2.84	28
4	401-500	62	4,662	-	-	-
5	501-750	85	6,391	-	-	-
6	751-1,000	103	7,744	-	-	-
Total						4,933
7	101-200	1,791	134,662	5	1.50	202
8	201-300	1,066	80,150	3	120.46	9,655
9	301-400	1,019	76,617	6	91.78	7,032
10	401-500	584	43,910	4	101.02	4,436
11	501-750	424	31,880	1	316.44	10,088
12	751-1,000	569	42,782	2	101.93	4,361
Total						35,774
13	101-200	1,281	96,316	4	1.12	108
14	201-300	681	51,203	5	16.98	869
15	301-400	421	31,654	2	4.31	136
16	401-500	265	19,925	-	-	-
17	501-750	981	73,759	5	390.80	28,825
18	751-1,000	195	14,662	-	-	-
Total						29,938
Division Total						70,645

Table 5. Minimum trawlable biomass estimates of Greenland halibut by stratum for Div. 2H for the year 1979.

Table 6. Minimum trawlable biomass estimates of Greenland halibut by stratum for Div. 2H for the year 1981.

Table 7. Minimum trawlable biomass estimates of Greenland halibut by depth range in Div. 2H for 1978, 1979, and 1981.

Depth Range	Area Sq. Mi.	Trawlable Units	No Sets	Ave Wt/Set (kg)	Est biomass (tons)
<b>Gadus 13, 1978</b>					
101-200	5,379	404,437	16	6.51	2,633
201-300	2,192	164,812	11	61.94	10,208
301-400	1,573	118,271	9	62.46	7,387
401-500	911	68,497	4	101.02	6,920
501-1,000	2,357	177,218	8	309.29	54,811
<b>Total</b>					<b>81,959</b>
<b>Gadus 24, 1979</b>					
101-200	5,379	404,437	21	1.67	676
201-300	2,192	164,812	13	10.83	1,786
301-400	1,573	118,271	15	72.23	8,542
401-500	911	68,497	10	318.21	21,797
501-1,000	2,357	177,218	14	509.48	90,290
<b>Total</b>					<b>123,091</b>
<b>Gadus 57, 1981</b>					
101-200	5,379	404,437	22	4.98	2,013
201-300	2,192	164,812	15	33.50	5,521
301-400	1,573	118,271	15	90.40	10,692
401-500	911	68,497	14	117.04	8,017
501-1,000	2,357	177,218	16	144.38	25,586
<b>Total</b>					<b>51,829</b>

Table 8. Minimum trawlable biomass estimates of Greenland halibut by depth range in Div. 2G for 1978, 1979, and 1981.

Depth Range	Area Sq. Mi.	Trawlable Units	No Sets	Ave Wt/Set (kg)	Est biomass (tons)
<b>Gadus 13, 1978</b>					
101-200	8,498	638,948	26	40.60	25,941
201-300	3,828	287,819	16	28.66	8,250
301-400	998	75,038	4	354.69	26,615
401-500	1,302	97,894	3	604.58	59,185
501-750	1,833	137,819	1	327.79	45,176
Total					<u>165,167</u>
<b>Gadus 24, 1979</b>					
101-200	8,498	638,948	25	6.66	4,255
201-300	3,828	287,819	17	30.34	8,733
301-400	998	75,038	4	36.44	2,734
401-500	1,302	97,894	4	79.57	7,789
501-750	1,833	137,819	9	300.04	41,351
Total					<u>64,862</u>
<b>Gadus 57, 1981</b>					
101-200	8,498	638,948	19	8.08	5,136
201-300	3,828	287,819	14	27.75	7,987
301-400	998	75,038	5	54.50	4,090
401-500	1,302	97,894	5	61.50	6,020
501-750	1,833	137,819	8	231.38	31,889
Total					<u>55,122</u>

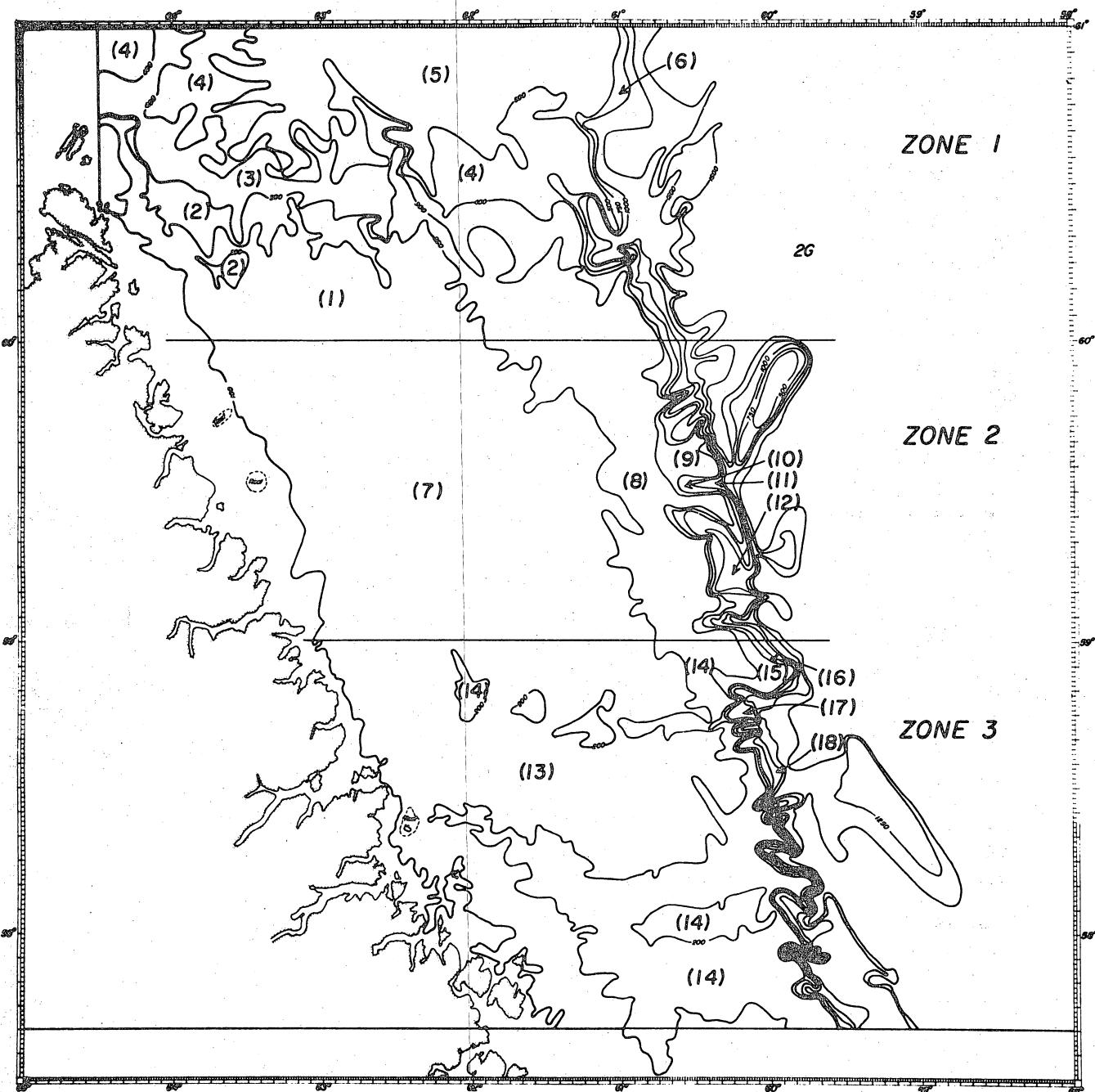


Fig. 1. Stratification Chart for NAFO Division 2G.

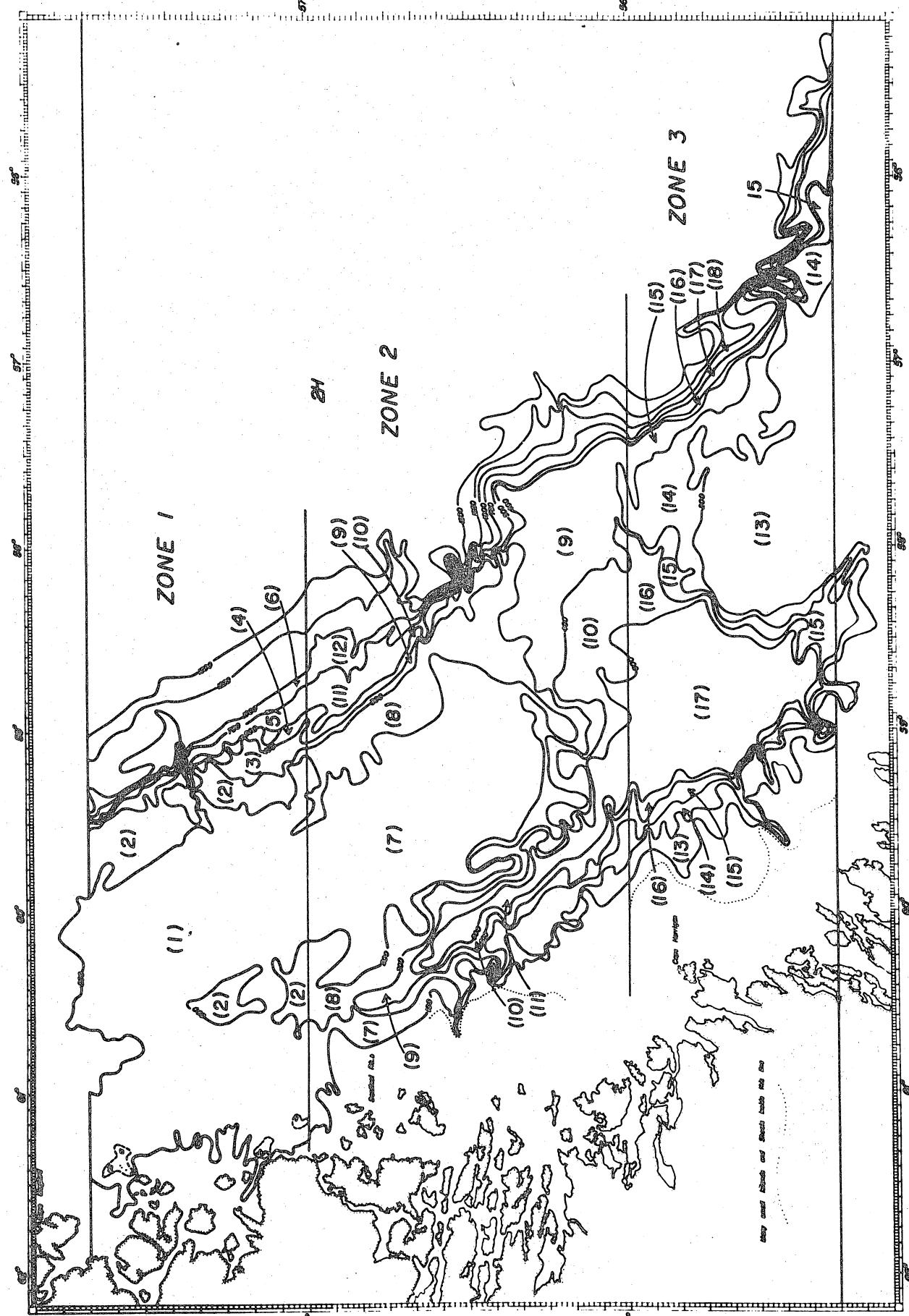


Fig. 2. Stratification Chart for NAFO Division 2H.