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CAFSAC Research Document 89/43

CSCPCA Document de recherche 89/43

Cod in NAFO Divisions 2GH

by

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Abstract

Nominal catches from this stock ranged from 94,000 t in 1966 to 131 t in 1987 and have been less than 500 t since 1985. Analytical assessments for this stock have not been possible in recent years because indices of abundance were not available. Research vessel survey data were available annually from 1986 to 1988 but were not used to provide an index of abundance because of limited spatial coverage and inappropriate seasonal timing. A TAC of 20,000 t was first introduced in 1974 and has been in effect since that time.

Résumé

Les prises nominales provenant du stock considéré se sont échelonnées entre 94 000 t en 1966 et 131 t en 1987. Depuis 1985, elles sont tombées en dessous de 500 t. On n'a pu effectuer d'évaluations analytiques du stock au cours des dernières années, en raison de l'absence d'indices d'abondance. Les données provenant des relevés réalisés par les navires de recherche entre 1986 et 1988 n'ont pas permis d'établir un indice d'abondance, étant donné que l'aire couverte était limitée et que les missions ont eu lieu à un moment inopportun de la saison. Un TPA de 20 000 t est en vigueur depuis 1974.

Introduction

Total annual catches from this stock have ranged from 94,000 t in 1966 to 131 t in 1987 (Table 1; Fig. 1) and have been less than 500 t since 1985. Catches relative to the TACs since 1979 are as follows (000 t):

| | <u>1980</u> | <u>1981</u> | <u>1982</u> | <u>1983</u> | <u>1984</u> | <u>1985</u> | <u>1986</u> | <u>1987</u> | <u>1988</u> | <u>1989</u> |
|---------------|-------------|-------------|-------------|-------------|-------------|-------------|------------------|------------------|------------------|-------------|
| TAC | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Nominal catch | 2.6 | 3.7 | 13.5 | 2.4 | 1.5 | 0.5 | 0.5 ^a | 0.1 ^a | 0.4 ^a | |

^aPreliminary

The commercial fishery

The commercial catch for 1988 (Table 2) by country and month was obtained from the Statistics and Systems Branch and FLASH of the Department of Fisheries and Oceans, Canada and NAFO circular letters. The total reported catch of 445 t was taken entirely from Div. 2H. Sampling data was not available to provide a length and age distribution of the catch. Catch rate data for the 1988 fishery was limited to that for Can (M)-TC7 during December (3.7 t/h).

Research vessel surveys

Groundfish research vessel surveys using the stratified-random sampling design (Figs. 2 and 3) have been conducted each year since 1986. However, the survey in 1986 was limited to a small number of strata in Div. 2H and there was restricted coverage (>200 m) in Div. 2G during 1987 and 1988. Abundance and biomass estimates from these surveys are shown in Tables 3-6. Within the area covered, these surveys would suggest very low biomass and abundance levels for both Divisions in 1987 and 1988. These results are undoubtedly influenced by the timing of the surveys. In the period mid-August to early September (1987 and 1988 surveys), cod distribution would be influenced by an offshore-inshore migration and consequently, a considerable portion of the stock might be outside the survey area. The survey in 1986 was conducted in late September. Although spatial coverage was limited, the biomass estimates obtained from this survey were considerably higher than estimates from surveys in both 1987 and 1988 when much larger areas were covered. This disparity is reflected in the mean numbers per tow at age estimates (Table 7). In spite of the substantial year-to-year differences in mean number per tow, there would appear to be some consistency with year-class strengths. The 1981 year-class was the most abundant in each of the surveys.

Discussion

An analytical assessment of this stock has not been conducted in recent years because required data have been insufficient or entirely lacking. Catch levels have been very low and representative sampling data hasn't always been available. Catch rate data are also limited and no consistent series is available. Survey data is of recent origin and of limited value because of problems with spatial coverage and timing.

The low catches of recent years are not considered to be the result of low catch rates. It is expected that catches will increase in the near future because of allocations to foreign fleets and increased interest by domestic fleets resulting from reductions in cod TAC's for other stocks.

Table 1. Cod landings (t) from Divisions 2G, 2H, and stock area 2GH for the period 1953-88.

| Year | 2G | 2H | 2GH | Year | 2G | 2H | 2GH |
|------|-------|-------|-------------------|------|------|-------|------------------|
| 1953 | 3296 | 50421 | 53717 | 1971 | | | 12639 |
| 1954 | 27 | 1672 | 1699 | 1972 | 88 | 13602 | 13690 |
| 1955 | 12 | 753 | 765 | 1973 | 15 | 282 | 297 |
| 1956 | 7 | 171 | 178 | 1974 | - | 4070 | 4070 |
| 1957 | - | 963 | 963 | 1975 | 1134 | 5825 | 6959 |
| 1958 | - | 2528 | 2528 | 1976 | 219 | 5710 | 5929 |
| 1959 | - | 2994 | 2994 | 1977 | 16 | 3642 | 3658 |
| 1960 | 278 | 8099 | 8377 | 1978 | 4 | 4854 | 4858 |
| 1961 | 8 | 4287 | 4295 ^b | 1979 | 7 | 2173 | 2180 |
| 1962 | | | 5451 ^b | 1980 | 1 | 2617 | 2618 |
| 1963 | 1341 | 2673 | 4014 | 1981 | 6 | 3644 | 3650 |
| 1964 | | | 9147 | 1982 | 3 | 13508 | 13511 |
| 1965 | | | 64245 | 1983 | - | 2381 | 2381 |
| 1966 | 15039 | 79150 | 94189 | 1984 | 41 | 1490 | 1531 |
| 1967 | | | 56113 | 1985 | 2 | 545 | 547 |
| 1968 | | | 84087 | 1986 | 5 | 490 | 495 ^a |
| 1969 | | | 60557 | 1987 | 15 | 116 | 131 ^a |
| 1970 | | | 17787 | 1988 | - | 445 | 445 ^a |

^aProvisional.

^bEstimates available by stock area only. Total includes estimates from some countries not separated by division.

Table 2. Cod landings (t) from Div. 2H during 1988. (No landings reported from Div. 2G.)

| Month | Can (N) | Can (M) | Faroes |
|--------------|----------|------------|----------|
| January | | | |
| February | | | |
| March | | | |
| April | | | |
| May | | | |
| June | | | |
| July | | | |
| August | | | |
| September | 6 | | |
| October | | | 1 |
| November | | | |
| December | | 438 | |
| Total | 6 | 438 | 1 |

Table 3. Cod abundance (No. $\times 10^{-3}$) estimates from research vessel cruises in NAFO Div. 2G.

| Depth zone (m) | Strata | Area | 1987 | 1988 |
|----------------|--------|-------------|-----------------|-----------------|
| ≤ 200 | 909 | 2773 | - | - |
| | 910 | 2339 | - | - |
| | 925 | <u>1804</u> | - | - |
| | Total | 6916 | | |
| 201-300 | 901 | 1213 | 23 | 36 |
| | 908 | 585 | 26 | 44 |
| | 911 | 692 | 0 | 0 |
| | 924 | 756 | 0 | 23 |
| | 926 | <u>433</u> | - | <u>0</u> |
| Total | 3679 | 49 | 103 | |
| 301-400 | 902 | 120 | 3 | 0 |
| | 912 | 73 | 0 | 5 |
| | 923 | 186 | 7 | 35 |
| | 927 | <u>832</u> | <u>0</u> | <u>125</u> |
| Total | 1211 | 10 | 165 | |
| 401-500 | 903 | 80 | 0 | 0 |
| | 913 | 62 | 0 | 0 |
| | 922 | 186 | - | - |
| | 928 | <u>783</u> | <u>0</u> | <u>0</u> |
| Total | 1111 | 0 | 0 | |
| 501-750 | 904 | 153 | 0 | 4 |
| | 914 | 113 | 0 | 0 |
| | 921 | 142 | 0 | 0 |
| | 929 | <u>1261</u> | <u>0</u> | <u>0</u> |
| Total | 1669 | 0 | 4 | |
| 751-1000 | 905 | 164 | - | 0 |
| | 915 | 96 | - | 0 |
| | 920 | <u>172</u> | <u>0</u> | <u>6</u> |
| Total | 432 | 0 | 6 | |
| 1001-1250 | 906 | 229 | 0 | 0 |
| | 916 | 146 | - | 0 |
| | 919 | <u>316</u> | <u>-</u> | <u>0</u> |
| Total | 691 | 0 | 0 | |
| Total | | 15709 | 59 | 279 |
| Upper | | | 132 | 701 |
| Lower | | | -14 | -143 |
| Trip No. | | | GA 143 | GA 156 |
| Dates | | | Aug. 26-Sept. 1 | Aug. 29-Sept. 5 |

Table 4. Cod biomass (t) estimates from research vessel cruises in NAFO Div. 2G.

| Depth zone (m) | Strata | Area | 1987 | 1988 |
|----------------|--------|-------------|-----------------|-----------------|
| ≤200 | 909 | 2773 | - | - |
| | 910 | 2339 | - | - |
| | 925 | <u>1804</u> | - | - |
| | Total | 6916 | - | - |
| 201-300 | 901 | 1213 | 32 | 38 |
| | 908 | 585 | 16 | 81 |
| | 911 | 692 | 0 | 0 |
| | 924 | 756 | 0 | 9 |
| | 926 | <u>433</u> | - | <u>0</u> |
| Total | 3679 | 48 | 128 | |
| 301-400 | 902 | 120 | 4 | 0 |
| | 912 | 73 | 0 | 4 |
| | 923 | 186 | 3 | 39 |
| | 927 | <u>832</u> | <u>0</u> | <u>125</u> |
| Total | 1211 | 7 | 168 | |
| 401-500 | 903 | 80 | 0 | 0 |
| | 913 | 62 | 0 | 0 |
| | 922 | 186 | - | - |
| | 928 | <u>783</u> | <u>0</u> | <u>0</u> |
| Total | 1111 | 0 | 0 | |
| 501-750 | 904 | 153 | 0 | 3 |
| | 914 | 113 | 0 | 0 |
| | 921 | 142 | 0 | 0 |
| | 929 | <u>1261</u> | <u>0</u> | <u>0</u> |
| Total | 1669 | 0 | 3 | |
| 751-1000 | 905 | 164 | - | 0 |
| | 915 | 96 | - | 0 |
| | 920 | <u>172</u> | <u>0</u> | <u>8</u> |
| Total | 432 | 0 | 8 | |
| 1001-1250 | 906 | 229 | 0 | 0 |
| | 916 | 146 | - | 0 |
| | 919 | <u>316</u> | <u>-</u> | <u>0</u> |
| Total | 691 | 0 | 0 | |
| Total | | 15709 | 55 | 308 |
| Upper | | | 162 | 698 |
| Lower | | | -52 | -82 |
| Trip No. | | | GA 143 | GA 156 |
| Dates | | | Aug. 26-Sept. 1 | Aug. 29-Sept. 5 |

Table 5. Cod abundance (No. $\times 10^{-3}$) estimates from research vessel cruises in NAFO Div. 2H.

| Depth zone (m) | Strata | Area | 1986 | 1987 | 1988 |
|-------------------|-------------|-------------|----------------------|----------------------|---------------------------|
| ≤ 200 | 930 | 1028 | 6312 | 86 | 93 |
| | 954 | 971 | - | 33 | 44 |
| | 956 | 1051 | - | 0 | 32 |
| | 957 | 1371 | - | 84 | 185 |
| | | <u>4421</u> | <u>6312</u> | <u>203</u> | <u>354</u> |
| 201-300 | 931 | 276 | 2538 | 47 | 166 |
| | 943 | 354 | 1262 | 13 | 684 |
| | 950 | 261 | - | - | - |
| | 953 | 291 | - | 102 | 15 |
| | 955 | 389 | - | 7 | 0 |
| | 958 | 294 | - | 7 | 29 |
| | <u>1865</u> | <u>3800</u> | <u>176</u> | <u>894</u> | |
| 301-400 | 932 | 55 | - | 0 | 6 |
| | 944 | 860 | 1153 | 13 | 32 |
| | 949 | 206 | - | - | - |
| | 952 | 177 | - | 22 | 58 |
| | 959 | 178 | - | 13 | 20 |
| | <u>1476</u> | <u>1153</u> | <u>48</u> | <u>116</u> | |
| 401-500 | 933 | 50 | - | - | 4 |
| | 942 | 55 | 4 | 1 | 0 |
| | 945 | 461 | - | 62 | 48 |
| | 948 | 246 | - | - | - |
| | 951 | 234 | - | 0 | 9 |
| | 960 | 107 | - | 0 | 0 |
| | <u>1153</u> | <u>4</u> | <u>63</u> | <u>61</u> | |
| 501-750 | 934 | 78 | 0 | 0 | 0 |
| | 941 | 89 | 0 | 0 | 0 |
| | 946 | 721 | - | 60 | 27 |
| | 947 | 227 | - | 6 | 9 |
| | 961 | 211 | - | 0 | 0 |
| | <u>1326</u> | <u>0</u> | <u>66</u> | <u>36</u> | |
| 751-1000 | 935 | 96 | - | 0 | 0 |
| | 940 | 97 | - | 0 | 0 |
| | 962 | 242 | - | 0 | 0 |
| | <u>435</u> | <u>-</u> | <u>0</u> | <u>0</u> | |
| 1001-1250 | 936 | 78 | - | 0 | 0 |
| | 939 | 130 | - | 0 | 0 |
| | 963 | 265 | - | 0 | 0 |
| | <u>473</u> | <u>-</u> | <u>0</u> | <u>0</u> | |
| Total | | 11149 | 11269 | 557 | 1460 |
| Upper | | | 19351 | 758 | 3596 |
| Lower | | | 3188 | 356 | -676 |
| Trip No. Dates | | | WT 52 Sept. 18-24 | GA 143 Aug. 15-26 | GA 156 Aug. 18-Sept. 6 |

Table 6. Cod biomass (t) estimates from research vessel cruises in NAFO Div. 2H.

| Depth zone (m) | Strata | Area | 1986 | 1987 | 1988 |
|----------------|--------|-------------|-------------|------------|-----------------|
| ≤200 | 930 | 1028 | 5476 | 95 | 132 |
| | 954 | 971 | - | 42 | 50 |
| | 956 | 1051 | - | 0 | 47 |
| | 957 | <u>1371</u> | - | <u>167</u> | <u>400</u> |
| | | 4421 | 5476 | 304 | 629 |
| 201-300 | 931 | 276 | 4030 | 54 | 131 |
| | 943 | 354 | 1541 | 18 | 858 |
| | 950 | 261 | - | - | - |
| | 953 | 291 | - | 128 | 25 |
| | 955 | 389 | - | 5 | 0 |
| | 958 | <u>294</u> | - | <u>14</u> | <u>46</u> |
| | 1865 | 5571 | 219 | 1060 | |
| 301-400 | 932 | 55 | - | 0 | 1 |
| | 944 | 860 | 1612 | 17 | 33 |
| | 949 | 206 | - | - | - |
| | 952 | 177 | - | 33 | 79 |
| | 959 | <u>178</u> | - | <u>8</u> | <u>30</u> |
| | 1476 | 1612 | 58 | 143 | |
| 401-500 | 933 | 50 | - | - | 2 |
| | 942 | 55 | 5 | 1 | 0 |
| | 945 | 461 | - | 121 | 74 |
| | 948 | 246 | - | - | - |
| | 951 | 234 | - | 0 | 19 |
| | 960 | <u>107</u> | - | <u>0</u> | <u>0</u> |
| | 1153 | 5 | 122 | 95 | |
| 501-750 | 934 | 78 | 0 | 0 | 0 |
| | 941 | 89 | 0 | 0 | 0 |
| | 946 | 721 | - | 74 | 41 |
| | 947 | 227 | - | 6 | 10 |
| | 961 | <u>211</u> | - | <u>0</u> | <u>0</u> |
| | | 1326 | 0 | 80 | 51 |
| 751-1000 | 935 | 96 | - | 0 | 0 |
| | 940 | 97 | - | 0 | 0 |
| | 962 | <u>242</u> | - | <u>0</u> | <u>0</u> |
| | 435 | - | 0 | 0 | |
| 1001-1250 | 936 | 78 | - | 0 | 0 |
| | 939 | 130 | - | 0 | 0 |
| | 963 | <u>265</u> | - | <u>0</u> | <u>0</u> |
| | 473 | - | 0 | 0 | |
| Total | | 11149 | 12663 | 783 | 1978 |
| Upper | | | 24110 | 1104 | 4633 |
| Lower | | | 1216 | 462 | -676 |
| Trip No. | | | WT 52 | GA 143 | GA 156 |
| Dates | | | Sept. 18-24 | Aug. 15-26 | Aug. 18-Sept. 6 |

Table 7. Mean number of cod per tow at age from research vessel surveys in NAFO Div. 2GH.

| Age | 1986 | 1987 | 1988 |
|------------------|-------|------|-------|
| 2 | 0.55 | .01 | 0.11 |
| 3 | 3.49 | .04 | .09 |
| 4 | 12.17 | .00 | .22 |
| 5 | 19.74 | .06 | .08 |
| 6 | 7.19 | .17 | .19 |
| 7 | 7.71 | .05 | .25 |
| 8 | 3.04 | .09 | .06 |
| 9 | .20 | .04 | .15 |
| 10 | .09 | | .05 |
| 11 | .37 | | .01 |
| 12 | .10 | | .01 |
| 13 | .00 | | |
| 14 | .10 | | |
| 15 | .00 | | |
| 16 | .05 | | |
| UK | | 0.01 | |
| Total | 54.79 | 0.46 | 1.22 |
| Upper | 94.08 | 0.61 | 2.74 |
| Lower | 15.50 | 0.31 | -0.31 |
| No. sets (Total) | 18 | 171 | 177 |
| No. sets 2G | 0 | 51 | 59 |
| No. sets 2H | 18 | 120 | 118 |

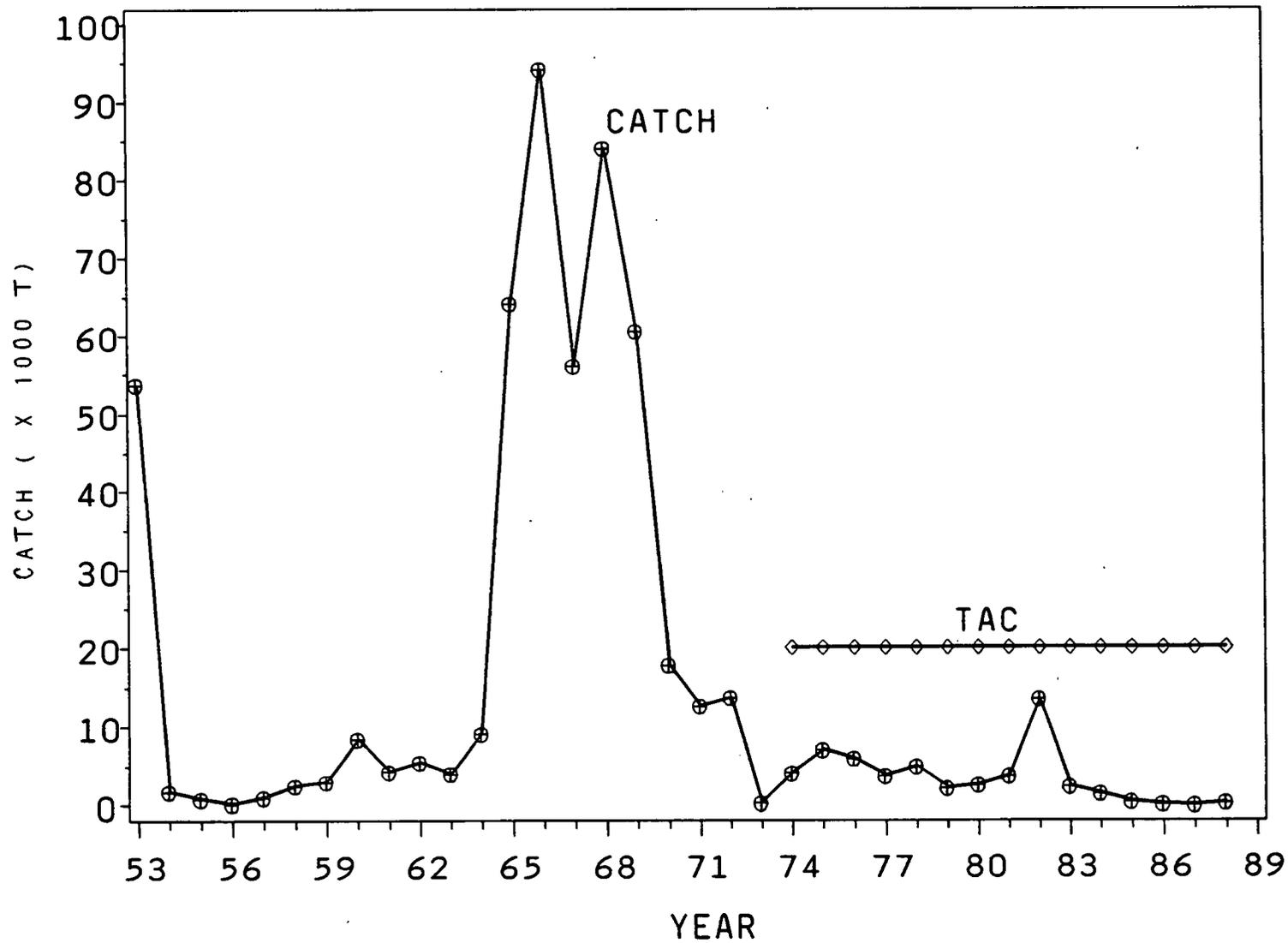


FIG. 1. COD CATCHES IN NAFO DIVISIONS 2GH FOR 1953-88.

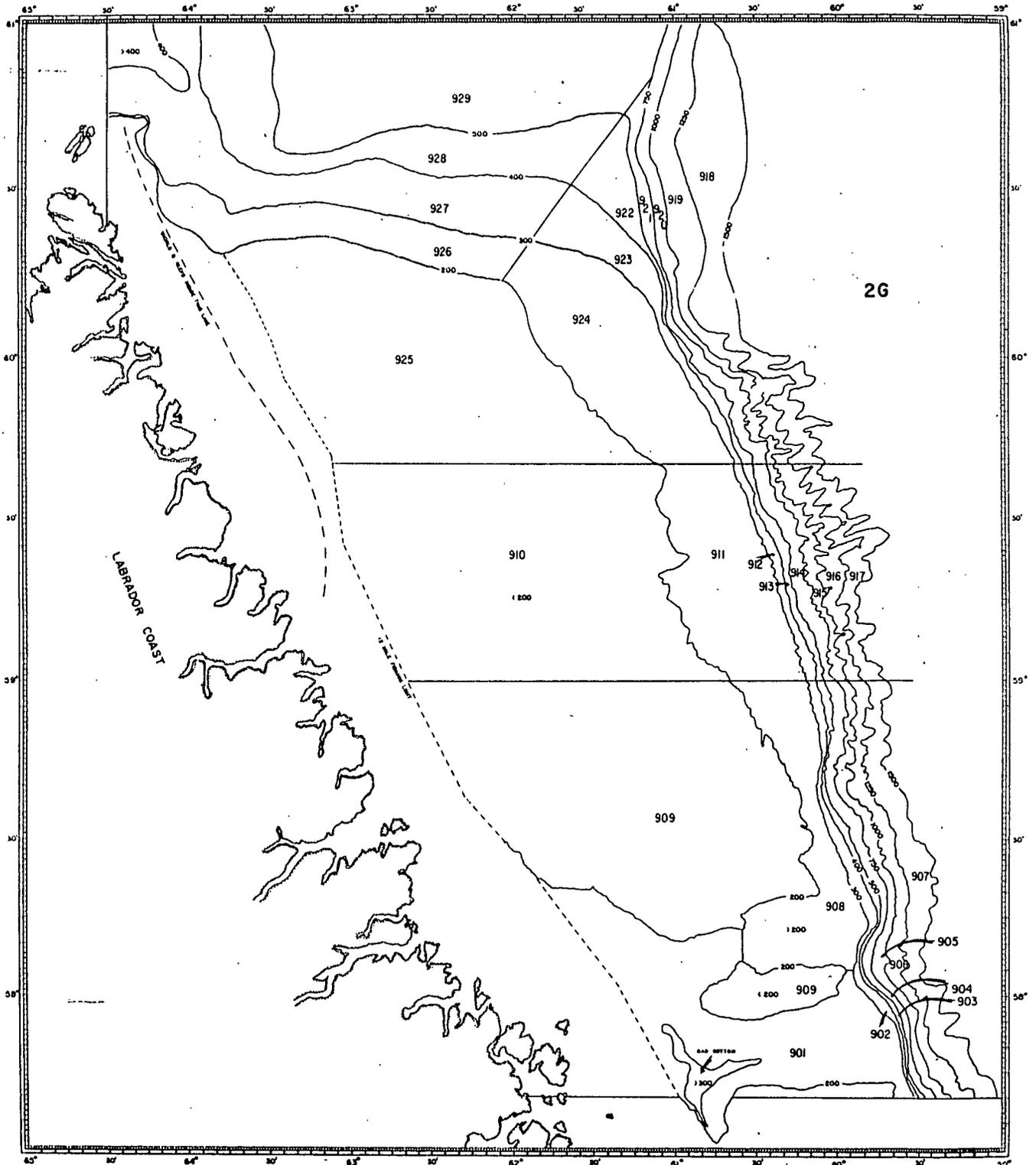


Fig. 2. Stratification scheme for NAFO Division 2G.

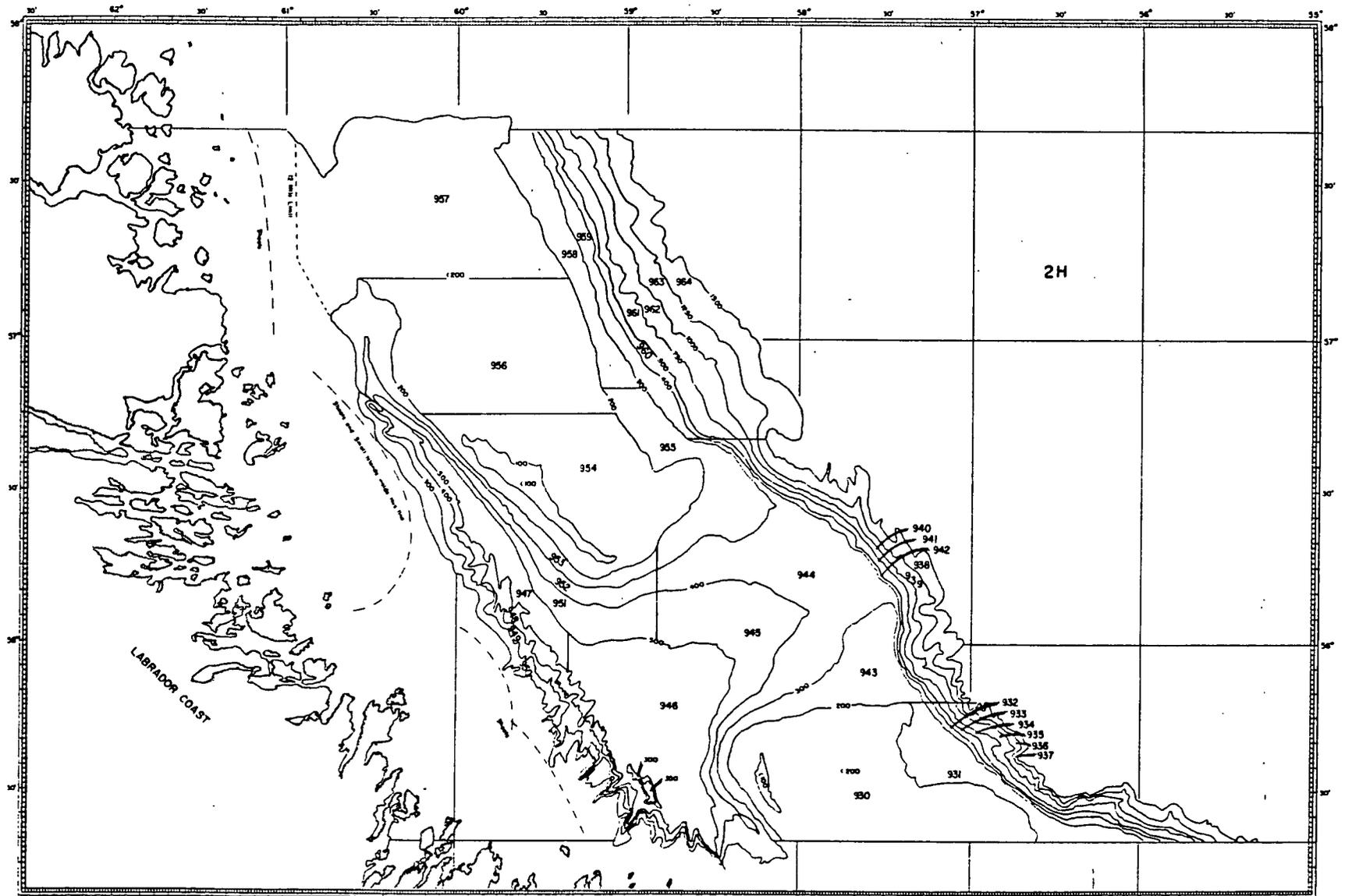


Fig. 3. Stratification scheme for NAFO Division 2H.