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Distribution and Abundance of Greenland Halibut in Davis Strait (NAFO Subareas 0 and 1)

from a Canadian Research Vessel Survey in 1986

by

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Introduction

Research vessel surveys in NAFO Subareas 0 and 1 have been conducted on occasion over the last 20 years, however, the surveys have been conducted usually in limited areas with various target species and objectives in mind. The only surveys directed towards Greenland halibut have been carried out by the Soviet Union over about the last 10 years. These, on the other hand, have usually been fixed station surveys confined to the southern part of Div. 0B and the amount of ice coverage often determined the intensity of the surveys since they were usually carried out in the late autumn and early winter.

Materials and Methods

In 1986, Canada mounted an extensive cruise to survey the ice-free area of subareas 0 and 1 in depths of 200-1500 m from about Cape Chidley, Labrador in the south (61°N) to Disko Island in the north (70°N). The survey was directed primarily towards Greenland halibut and roundnose grenadier and was conducted using a newly developed stratified-random survey design (Fig. 1). For details regarding this stratification scheme see SCR Doc. 87/... (this meeting). The area was stratified by depth zone prior to the cruise and the number of fishing stations (sets) selected in each stratum was proportional to its geographic area with an initial target of one set per each 350 square nautical miles and a minimum of 2 sets per stratum. Additional pre-selected sets also were fished in some strata. Duration of the cruise was 31 days and a total of 194 successful 30-minute sets were made in depths of 200-1250 m (Fig. 2). Fishing sets in strata of 1251-1500 m could not be conducted due to difficulties in keeping the fishing gear on the bottom. Bottom temperature was determined at each fishing station or the temperature at 750 m depth whichever is the lesser of the two.

Catches were separated by species, counted and weighed with detailed biological samples such as length, age, sex and maturity and stomach collections, etc. were obtained for the major species, Greenland halibut in particular.

Results

Distribution

Greenland halibut were caught throughout the range of the survey with the larger catches usually occurring in deeper waters (Fig. 1 and Fig. 3). The mean numbers per tow were relatively similar up to depths of 599 m (Fig. 4a), however, the mean numbers per tow began to increase from a depth of 600 m to maximize at a depth range of 900-1000 m beyond which the mean numbers per tow declined. The mean weight per tow showed a relatively similar pattern to numbers except that the increasing trend was more obvious (Fig. 4b).

Length distribution by depth is shown in Fig. 5. Lengths ranged from as small as 8 cm to as large as 110 cm throughout the cruise. Length compositions for the 200-299 m and 300-399 m depth ranges were similar with a high incidence of small fish having a mode of 12.5 cm. The length composition in the 400-499 m depth range had very few of these small fish represented with most fish occurring in the 20-40 cm length range. In 500-599 m depth range most fish were the 40-60 cm length range. For depths greater than 500 m there were few fish less than 40cm caught with most fish occurring in the 40-60 cm length range.

The associated age composition for the survey is presented in Fig. 6. The age ranged from 1 to 18 years, however, few fish were caught older than 10 years. A strong mode appeared at age 1 indicating the possibility of a strong 1985 year class. A large mode also occurred at age 7 representing the 1979 year class. Numbers at age caught beyond age 7 declined very rapidly.

Biomass estimates

Stratified mean weight per 30 minute set is shown by stratum in Table 1. The estimated biomass for the surveyed area is 282,404 t with upper and lower 95% confidence limits of 343,011 and 221,797 t respectively. The estimate is considered conservative since much of the area of distribution of Greenland halibut was not surveyed and many of the older mature fish are believed to be inhabiting the fjords of West Greenland at this time of year.

Catch curve

A catch curve was constructed from the catch at age data as some level of average mortality over the last several years (Fig. 7). This suggested average total mortality of about $Z=0.64$. However, this value is likely biased due to the lack of old fish in catch which nevertheless exist in the population as stated above. It is interesting to note the pattern in the ages 12-14 in the descending limb of the catch curve with the suggestion of stronger than average year classes. These ages represent the 1972, 1973, and 1974 year classes which considered strong in the NAFO Subarea 2 and Div. 3KL stock and are believed to have migrated to the Davis Strait area for spawning.

Table 1. Weight (kg) by stratum with a minimum estimate of total biomass for Greenland halibut in Davis Strait (NAFO Subareas 0+1) from a Canadian survey in 1986.

Stratum	No. Sets	Total (kg)	Av./Set (kg)
1	8	48.30	6.04
2	5	73.20	14.64
3	6	112.50	18.75
4	12	870.07	72.51
5	7	1444.68	206.38
6	5	473.10	94.62
8	8	14.70	1.84
9	9	92.25	10.25
10	7	180.00	25.71
11	15	1469.00	97.93
12	7	628.21	89.74
13	4	172.54	43.14
16	2	158.40	79.20
17	5	1309.60	261.92
18	2	180.80	90.40
19	2	7.00	3.50
20	2	1.90	0.95
21	5	13.50	2.70
22	5	36.10	7.22
23	4	104.70	26.17
24	5	166.00	33.20
25	8	550.50	68.81
26	10	450.30	45.03
27	3	96.50	32.17
28	3	29.00	9.67
29	2	16.50	8.25
30	7	1438.20	205.46
31	2	101.77	50.88
33	5	785.98	157.20
34	5	167.00	33.40
35	4	113.00	28.25
36	5	30.70	6.14
37	2	234.50	117.25
38	7	111.70	15.96
39	6	18.98	3.16
Biomass (tons)	Total	Total Upper	Total Lower
	282404	343011	221797

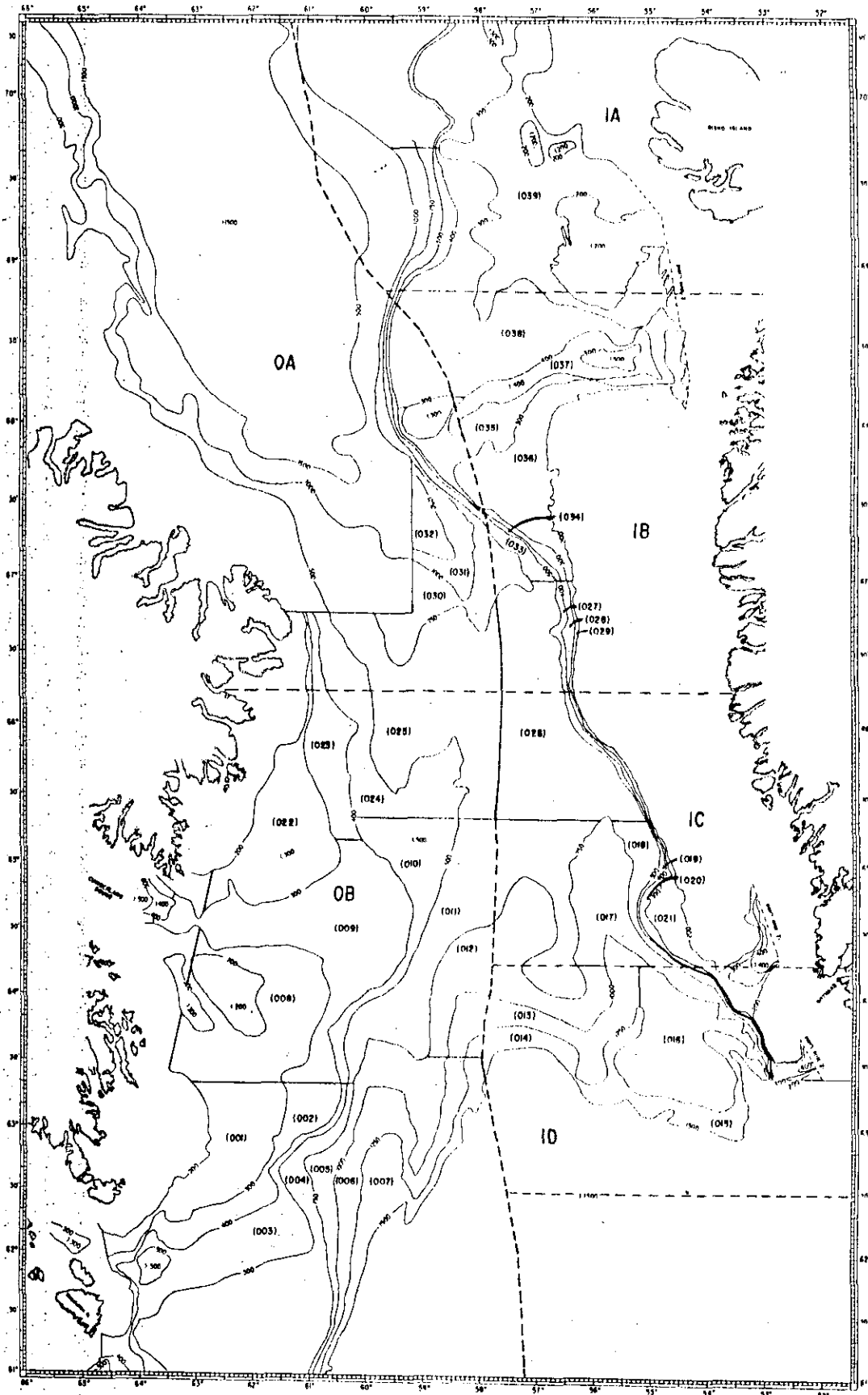


Fig. 1. Stratification scheme developed for a selected portion of NAFO Subareas 0 and 1.

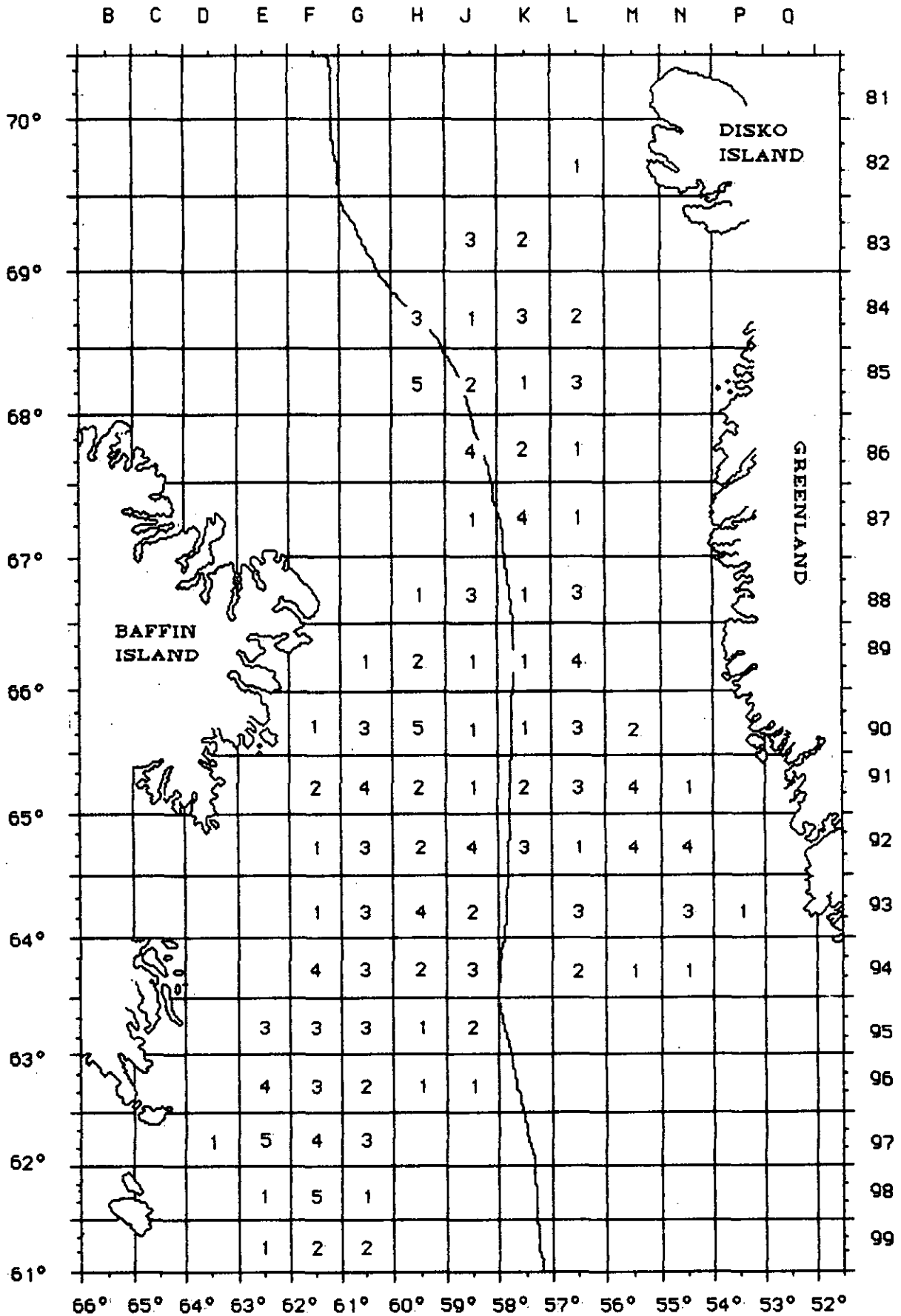


Fig. 2 Map of the Davis Strait area showing the International Boundary as well as the number of successful sets per Unit Area during the 1986 Canadian groundfish cruise to NAFO Subareas 0 and 1.

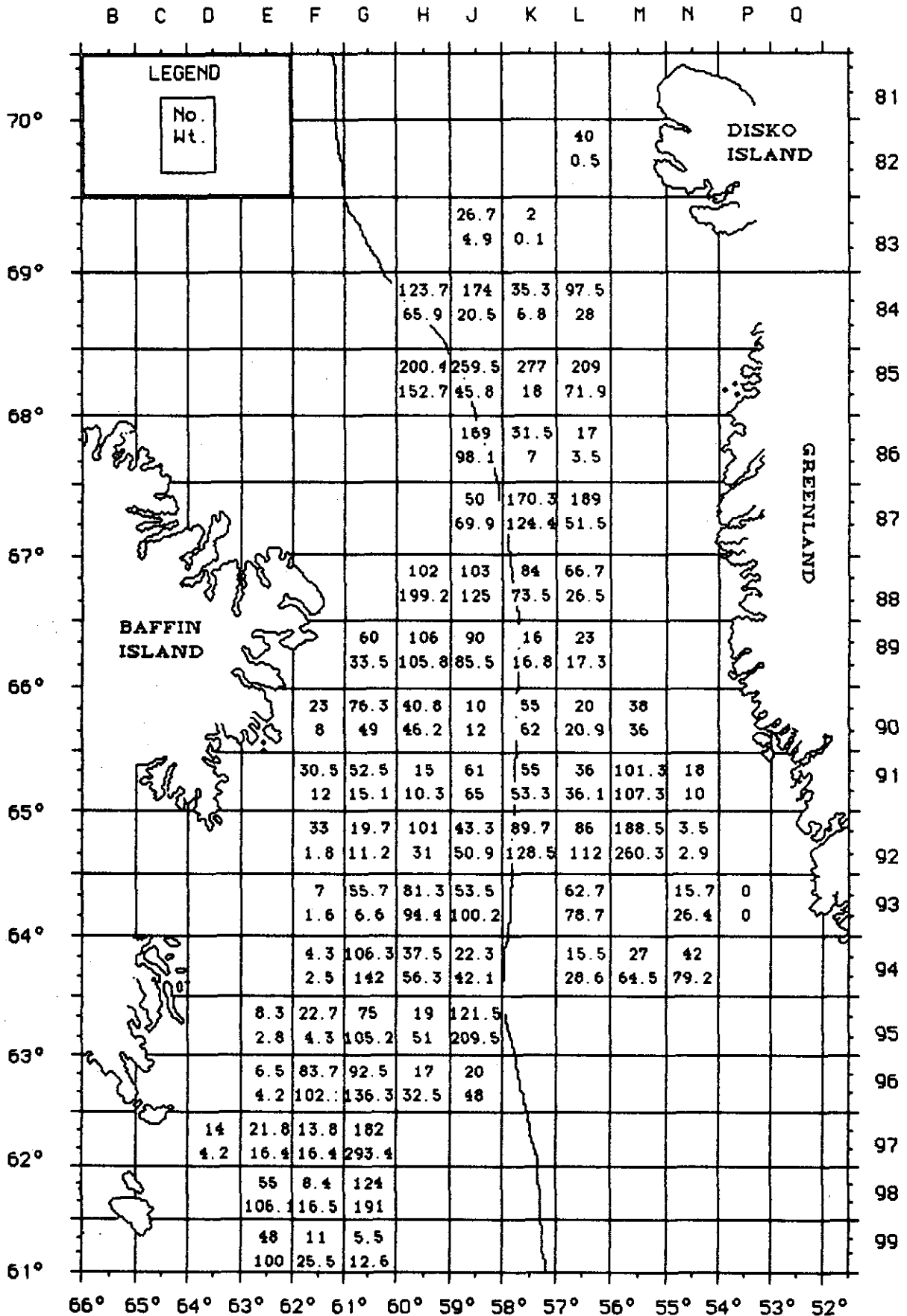


Figure 3 Distribution of Greenland halibut by Unit Area in NAFO Subareas 0+1 during Canadian bottom trawl survey in 1986.

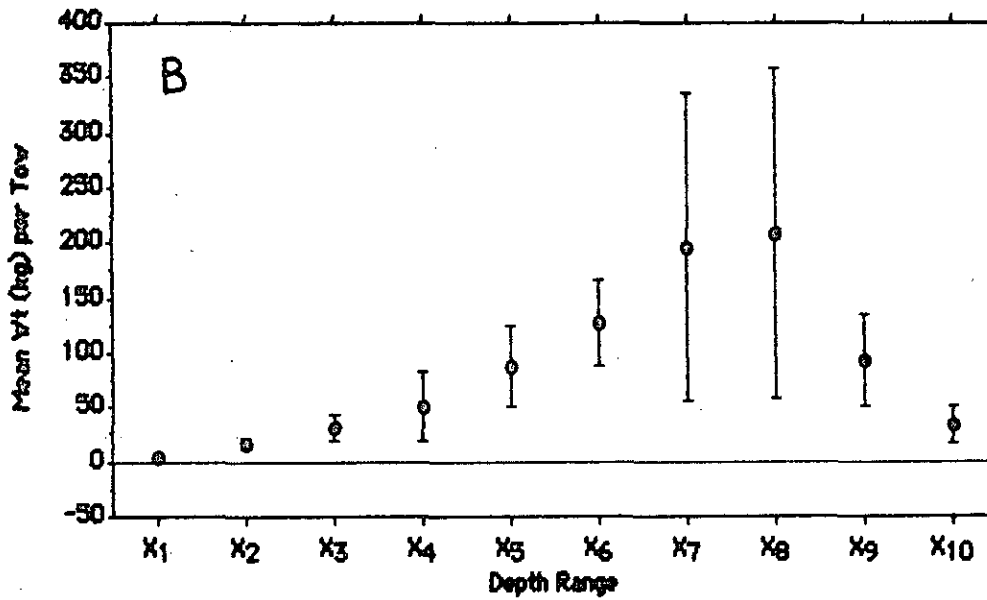
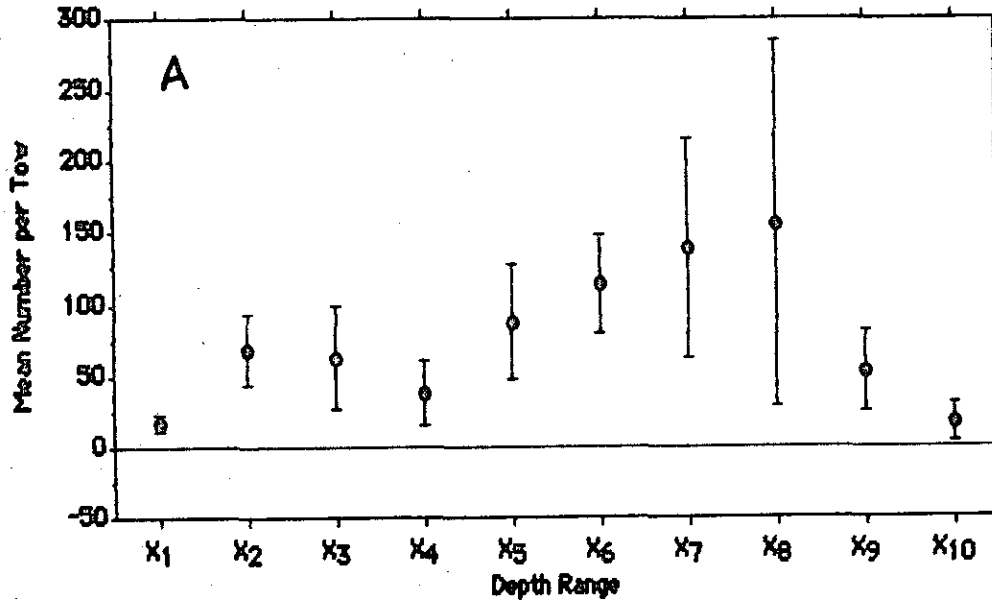


Fig. 4. Mean numbers and weights (kg) per 30 minute tow of Greenland halibut by depth range with 95% confidence limits.

Greenland Halibut

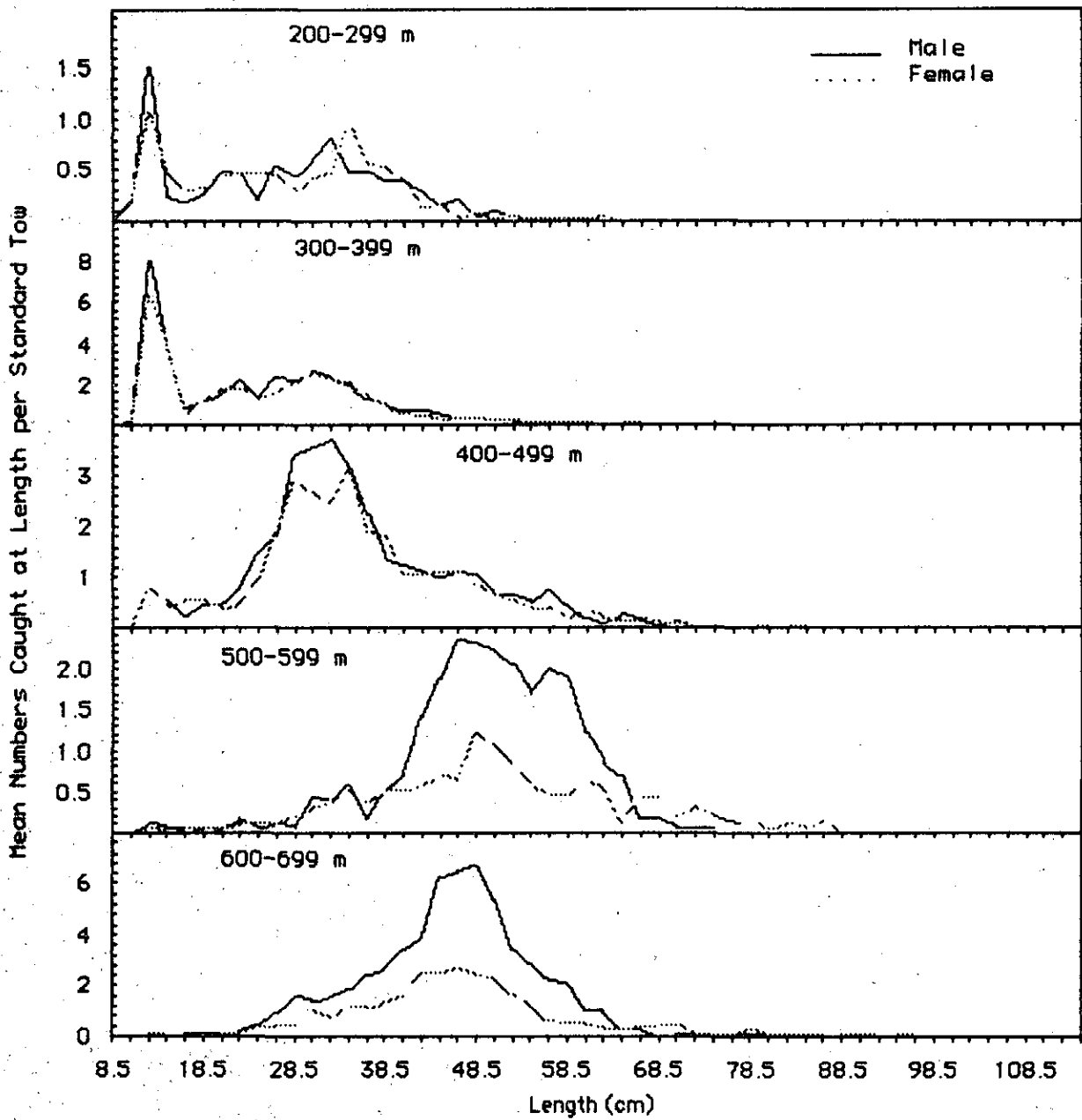


Fig. 5. Length frequency distributions of Greenland halibut by depth range.

GREENLAND HALIBUT

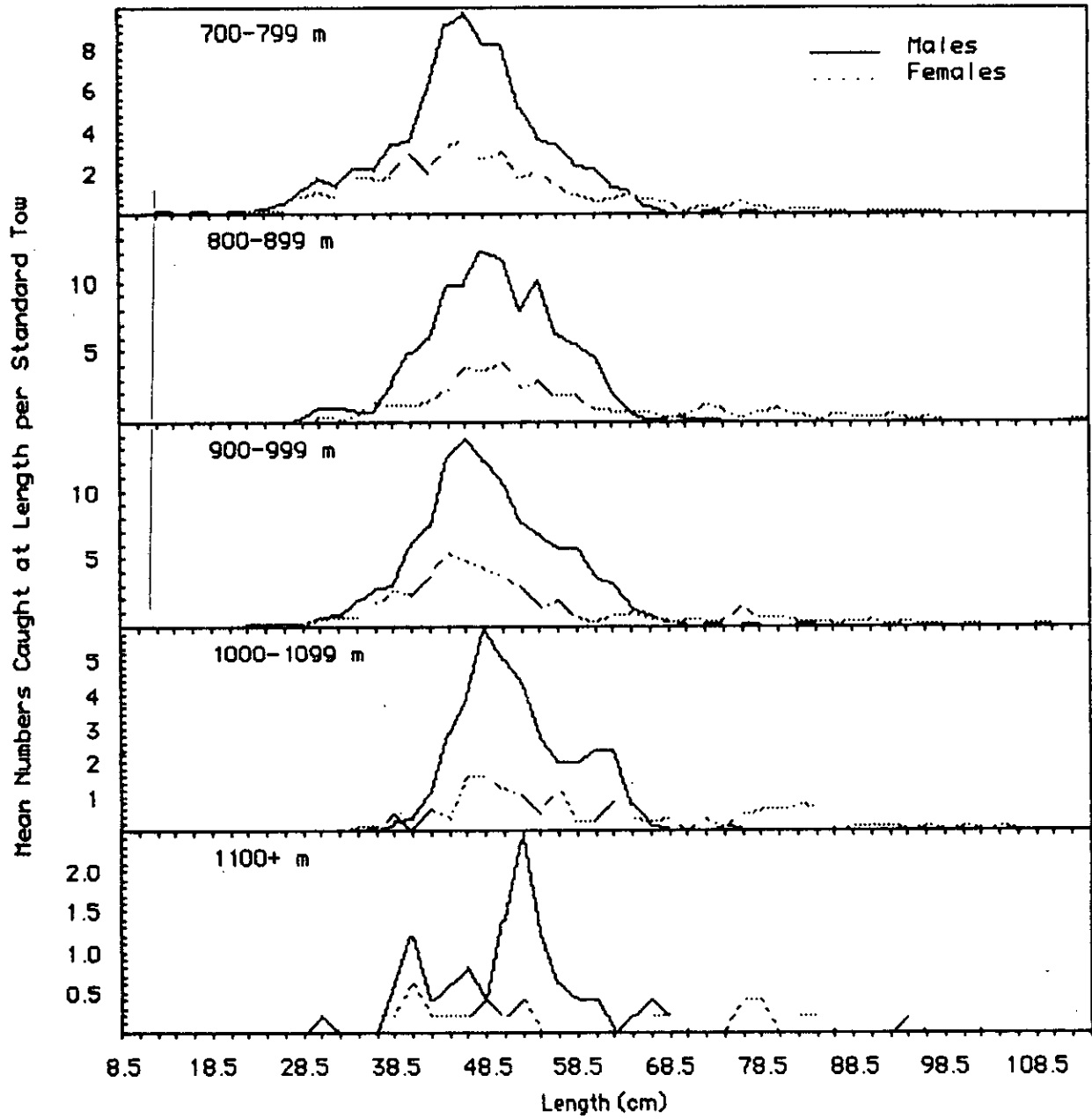


Fig. 5 Cont'd.

G. Halibut NAFO Subareas 0 and 1

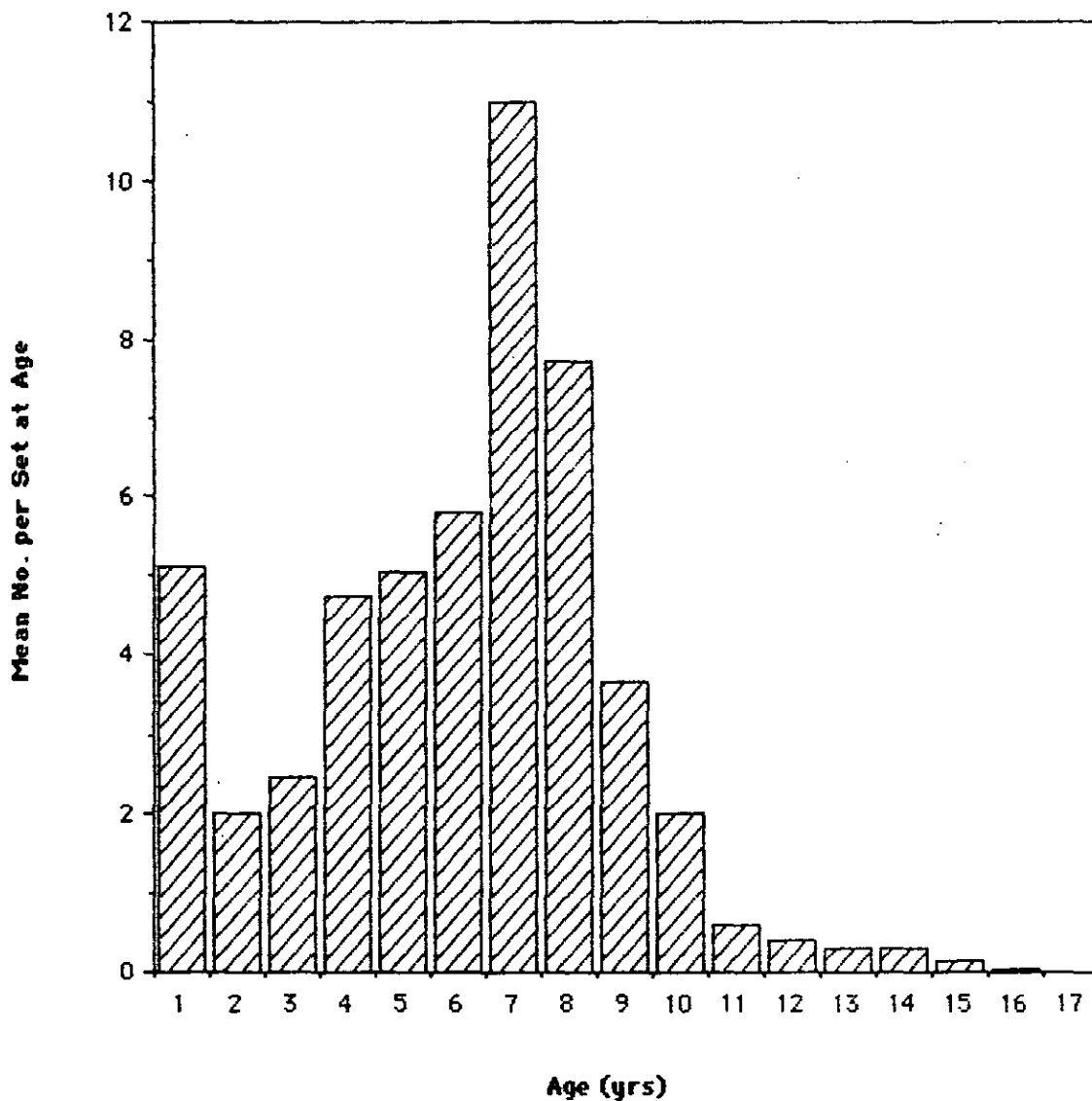


Fig. 6 Mean no. per set at age of Greenland halibut from a research survey in NAFO Subareas 0 and 1 during 1986.

Catch Curve of G.Halibut in SA 0+1, 1986

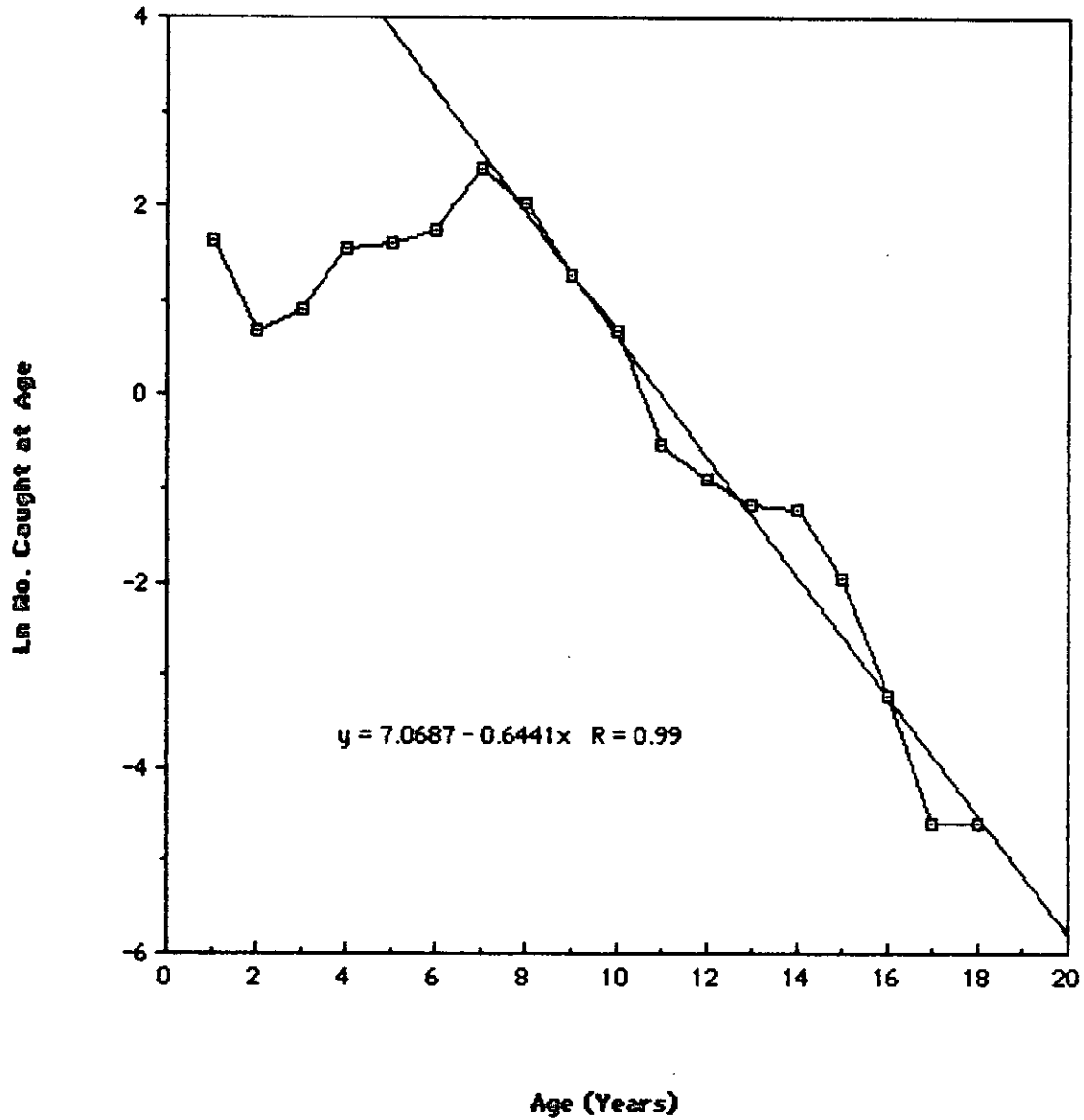


Fig. 7 Catch curve of Greenland Halibut in NAFO Subarea 0+1 from research vessel data collected during 1986.