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Data on the Shrimp Fishery in NAFO Subarea 1 in 1984 and 1985

by

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INTRODUCTION

The scientific advice for the total offshore catch of shrimp in NAFO Subareas 0 and 1 was raised to 36,000 tons for 1985 corresponding to the mean catch level during 1979 - 1984, after having been maintained at 29,500 tons per year since 1979. The effective TAC for offshore Subarea 1 was set by the Greenland Home Rule Authorities to 36,000 tons, including a Greenland allocation of 34,225 tons. Trawlers above 80 GRT reported a total catch in the Subarea of about 40,500 tons, however including a catch of 4,350 tons taken in a hitherto not exploited area in the Davis Strait north of $70^{\circ}52'N$. This area has not been considered part of the shrimp fishing area, for which advice on total catch has been given by STACFIS, and was therefore not included under the quota regulation of the fishery. Catches of smaller vessels including inshore catches were about 10,000 tons (January through November), of which about 7,500 are assumed to be inshore.

Logbooks from the fishery of nine trawlers owned by the Greenland Home Rule Administration (previously by the Royal Greenland Trade Department) have been available to the Greenland Fisheries and Environmental Research Institute since 1975. In 1985 through November these logbooks cover 21,388 hours of shrimp trawling and a total catch of 11,200 tons of shrimp in Subarea 1, i.e. about 33% of the Greenland offshore quota for this area.

The present paper updates earlier information compiled from the logbook data base on the geographical distribution of the offshore Subarea 1 shrimp fishery, on catch rates and on by-catches. Also information based on the analysis of 12 shrimp samples collected in the Davis Strait between $66^{\circ}N$ and $69^{\circ}N$ in July and August 1985 during a photographic survey is presented.

MATERIAL AND METHODS

Total catches and numbers of vessels in the shrimp fishery in NAFO Subarea 1 were compiled by nation and month based on the obligatory weekly reportings to Greenland authorities by all vessels above 80 GRT. Logbook data from nine trawlers were analysed to show the overall distribution of hauls and the monthly distribution of hauls and mean catch rates in 1984 and 1985.

Monthly mean catch rates in Division 1B from 1975 to November 1985 and the corresponding numbers of hours trawled were calculated from the logbook data base. Indices of mean catch rates for the July-September period used to evaluate the status of the shrimp stock in Division 1B in recent years were derived from the same data base, as were the levels of by-catches in the shrimp fishery in Subarea 1. Shrimp samples from a photographic research survey in the main distribution area of the offshore shrimp stock were sorted by stages of sexual development and measured to nearest 0.1 mm carapace length. Length-frequency diagrams were established to evaluate the occurrence of sexual stages in the shrimp stock.

RESULTS AND DISCUSSION

Reported catches in 1985.

Table 1 shows catches in Subarea 1 in 1984 and 1985 reported by vessels above 80 GRT and Table 2 the corresponding numbers of reporting vessels. The figures for Greenland in 1985 include catches in an offshore trial fishery north of 70°52'N, north of the hitherto exploited fishing grounds. Although changes in the geographical distribution of the fishery from year to year have been noticed in the past (e.g. Carlsson, 1983) and may be explained at least in part by extensive changes in distribution of the shrimp stock - in some years with a northward displacement of the stock -, Greenland authorities have considered these catches not to be covered by the advice given by STACFIS on TAC for 1985.

The shrimp catches (in tons) in Subarea 1 in 1985 (excluding December, November incomplete) by smaller Greenland vessels are

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	TOTAL
557	250	397	683	1799	1108	1283	909	1261	1443	288	9978

These figures include inshore catches, which are estimated to total about 7,500 tons.

The total shrimp catch in Subarea 1 in 1985 was thus more than 50,000 tons, not including supposed unreported discards in the offshore fishery.

Geographical distribution of the offshore fishery.

Figure 1, 2 and 3 show the distribution of hauls in 1983, 1984 and 1985 (through November) in the logbook data base. As in 1982 - but different from 1980 and 1981 (Carlsson, 1981) - the trawlers of the Greenland Home Rule Authorities expended very little fishing effort in Division 1A. In 1983 - 1985 the fishery concentrated in the northern and western slopes of the Store Hellefiske Bank, in the Holsteinsborg Deep and in the area off the main entrance to the Disko Bay. In 1984 and 1985, however, an extensive fishery also was performed on the fishing grounds in Division 1C and 1D.

Figure 4 shows the monthly distribution of effort (in nos. of hours trawled) and mean catch of shrimp per hour from January 1984 through November 1985. While severe ice conditions in 1982, 1983 and 1984 hampered the shrimp fishery in the main fishing area in the first months of each year (Carlsson, 1985), ice was a minor problem in 1985, when the fishery in the southernmost part of Division 1B began already in February.

Trends in catch rates.

Figure 5 shows the variation in mean catch rates by month from October 1975 through November 1985 in NAFO Division 1B based on logbook information and landings of seven trawlers (630-722 GRT) - Table 3 shows the corresponding

numbers of hours trawled. Spring peak catch rates in 1985 reached the same level as in 1982, but earlier in the year, reflecting the early access to the southernmost fishing grounds in Division 1B. As in earlier years catch rates declined steadily throughout the year, but still remaining at or above the levels found in earlier years in spite of the extended fishing season.

Table 4 shows the mean catch rates by division and month in a south to north 7.5' latitude grid in 1984 and 1985 (through November), and Table 5 shows the corresponding numbers of hours trawled. The northward shift in the fishery throughout the year, as found in previous years, but less pronounced in 1983 and 1984 (Carlsson, 1985), was evident again in 1985.

Comparison of catch rates between years in the Davis Strait fishery has been based on mean catch rate indices for the period July-September in Division 1B. CPUE indices for seven Greenland trawlers (630-722 GRT) from 1976 to 1985 are shown in Figure 6, based on the following figures:

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Hours										
trawled	1,005	2,966	3,446	3,588	1,872	5,285	3,543	3,967	2,784	3,817
kg/hour	743	549	501	379	468	438	550	490	495	556
Index	1.00	0.74	0.67	0.51	0.63	0.59	0.74	0.66	0.67	0.75

CPUE indices for 1981-1984 may not be directly comparable to those of earlier years due to the introduction of more efficient gears from 1980 (Carlsson, 1983). Also the reduction in total catches in spring in 1982 - 1984 due to ice may have caused relatively higher abundance of shrimp later in the fishing season. If it had been possible to account for this, the difference between the 1985-index and indices from the two preceeding years might have been even more pronounced.

In Figure 8 is shown the variation in CPUE in the July-September period in 30' latitude strips (see Figure 7) from 1976 to 1985. From 1982 to 1984, catch rates seem to have stabilized between 400-500 kg/hour in all strips, while in 1985 they all have increased.

By-catches in the shrimp fishery

Table 6 shows by-catches as reported in the logbook data in 1985 compared to earlier years. The by-catch level is similar between 1984 and 1985 when compared to the total shrimp catches and thus still low compared to 1978 and 1979 figures. Greenland shark is not reported as by-catch in the logbook system, although this species is known to occur frequently in the catches.

Biological samples

Figures 9-20 show length frequency distributions of 12 shrimp samples from research trawl catches in July and August 1985 in the Davis Strait between 66°N and 69°N. Table 7 shows a more extensive break-down of the samples by stages of sexual development. Samples were collected at the stations in the photographic survey in 1985 (Kannevorff, 1986), where trawling was performed. Compared to 1983 and 1984 fewer trawl hauls were taken during the photographic survey in 1985, and furthermore several hauls yielded catches too small even to establish a shrimp sample.

Except for the sample from statistical unit KL006 all available samples from the commercially important area west of Store Hellefiske Bank (KN003, KP440, KP004 and KS004) show a decrease in the relative proportion of males and juveniles compared to 1984-samples (Carlsson, 1985), and a corresponding

increase in relative numbers of transitionals and females. The same is the case for the sample from LB006, while the proportion of males increased in samples from LD439 and LD012. In KA011 the relative proportion of males was similar between the two years.

Males and juveniles were dominating by numbers in almost all samples, making up about 60% in most samples from west and northwest of Store Hellefiske Bank, up to 92% in the shallow water sample from KL006, and 70-80% in the southernmost sampling sites. In the Disko Bank area (LD012) there are indications of concentrations of males, while KZ014 shows a higher proportion of females, in consistency with photographic data (Kannevorff, 1986). Comparing shrimp samples from 1984 and 1985 there is a striking similarity in the shapes of the length-frequency distribution regarding modes, meaning that the same age-groups are present in both years, and also that the lack of smaller shrimps (below 15 mm carapace length) does not by itself indicate a future failure of recruitment, but rather the non-availability of small shrimps to the gear due to e.g. different geographical distribution, selectivity of gear etc.

CONCLUSIONS

The total offshore catch of shrimp in NAFO Subarea 1 is estimated to be about 43,000 tons in 1985 compared to about 34,500 tons in 1984. Actual catches may have been higher due to supposed non-reported discards of shrimp.

The offshore fishery in 1985 was not hampered by ice in spring as was the case in preceeding years, but otherwise the geographical distribution of the fishery was similar to 1984 except for a new trial fishery taking place north of 70°52'N in the Davis Strait.

Mean catch rates in Division 1B in the July-September period for Greenland trawlers increased compared to preceeding years, reaching at the level obtained in 1977. In a south to north grid of 30' latitude from 66°N to 69°N all mean catch rates also increased compared to 1984.

Reported by-catches in the shrimp fishery in 1985 were at the same low level as in 1984, redfish still being the dominant species.

Research shrimp samples from July-August 1985 showed the same age-groups to be present as in 1984-samples, however with a change in the relative abundance of different stages of sexual development, the relative numbers of males and juveniles having decreased especially in the area west of Store Hellefiske Bank.

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- Kannevorff, P., 1986. Biomass of shrimp (Pandalus borealis) in NAFO SA1 in 1981-1985 estimated by means of bottom photography. NAFO SCR Doc. 86/I/3, Ser.No. N1101.

Table 1. Offshore catches of shrimp (tons) by nation and month in NAFO Subarea 1 by trawlers above 80 GRT as reported to Greenland authorities in 1984 (a) and 1985 (b). Figures for Greenland in 1985 include catches in a trial fishery in the northern part of the Davis Strait.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
a. 1984													
Greenland	17	65	770	2641	4649	4307	5957	3086	1738	2424	3427	1248	30329
Denmark	13	-	-	-	113	45	-	-	69	150	-	-	390
Faroe Islands	-	-	-	-	-	57	54	-	1	100	120	51	383
Norway	-	-	-	-	113	58	266	17	-	-	-	-	454
France	-	-	-	-	-	-	60	183	161	-	-	-	404
Total	30	65	770	2641	4875	4467	6337	3286	1969	2674	3547	1299	31960
b. 1985													
Greenland	2298	2067	3276	3440	4978	2970	3086	3070	3010	4567	3259	2653	38674
Denmark	-	-	-	-	-	-	78	72	-	39	237	-	426
Faroe Islands	-	85	-	-	-	-	-	-	-	211	86	199	581
Norway	-	-	-	-	136	229	88	-	-	-	-	-	453
France	-	-	-	-	-	-	114	196	121	-	-	-	431
Total	2298	2152	3276	3440	5114	3199	3366	3338	3131	4817	3582	2852	40565
(Greenl. trial)	-	-	-	-	-	20	248	163	460	2096	1226	136	4349

Table 2. No. of vessels above 80 GRT by nation and month in the shrimp fishery in NAFO Subarea 1 as reported to Greenland authorities in 1984 (a) and 1985 (b).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
a. 1984													
Greenland	4	3	6	22	27	26	31	28	23	27	28	22	36
Denmark	2	-	-	-	1	1	-	-	1	1	-	-	2
Faroe Islands	-	-	-	-	-	1	1	-	1	2	3	1	4
Norway	-	-	-	-	1	1	2	2	-	-	-	-	4
France	-	-	-	-	-	-	1	1	1	-	-	-	1
Total	6	3	6	22	29	29	35	31	26	30	31	23	47
b. 1985													
Greenland	17	23	26	25	31	25	22	29	29	32	33	27	37
Denmark	-	-	-	-	-	-	1	1	-	2	2	-	2
Faroe Islands	-	1	-	-	-	-	-	-	-	4	3	1	5
Norway	-	-	-	-	3	4	2	-	-	-	-	-	4
France	-	-	-	-	-	-	1	2	1	-	-	-	2
Total	17	24	26	25	34	29	26	32	30	38	38	28	50

Table 3. No. of hours trawled per month and year from October 1975 through November 1985 in NAFO Divisions 1A and 1B in the shrimp fishery of seven trawlers (630-722 GRT) of the Royal Greenland Trade Department.

Div.	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1A	1975	-	-	-	-	-	-	-	-	-	-	-	-	0
	1976	-	-	-	-	-	-	2	-	-	-	-	-	2
	1977	-	-	-	-	-	-	-	4	58	-	-	-	62
	1978	-	-	-	-	-	-	-	10	-	-	-	100	110
	1979	77	-	-	91	65	143	-	-	-	-	-	-	376
	1980	39	118	93	46	70	979	171	199	255	319	-	-	2289
	1981	187	-	13	71	369	178	66	209	82	72	-	19	1266
	1982	6	-	-	-	6	-	35	14	-	20	25	-	106
	1983	-	-	-	-	5	-	13	20	5	24	9	-	76
	1984	-	-	-	34	45	-	3	-	-	20	20	49	171
	1985	-	-	-	-	-	-	-	17	22	43	4	-	86
Div.	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1B	1975	-	-	-	-	-	-	-	-	-	50	331	183	564
	1976	12	-	-	-	7	252	326	309	370	329	-	-	1605
	1977	104	84	245	391	643	839	874	1053	1039	1297	1293	957	8819
	1978	233	-	-	13	948	1209	1226	1326	894	1282	1199	626	8956
	1979	27	18	823	752	991	972	1191	1521	876	911	922	891	9895
	1980	771	627	685	670	1330	131	469	822	581	254	-	-	6340
	1981	857	172	366	729	1059	1167	1915	1816	1554	1436	1254	692	13017
	1982	169	-	-	220	711	1001	1301	1302	940	1258	684	13	7599
	1983	-	-	-	15	1032	1184	1244	1307	1416	1452	819	50	8519
	1984	-	-	3	543	1936	1800	1851	602	331	1512	1136	180	9894
	1985	19	146	606	728	1281	785	1244	1071	1502	1415	1417	-	10214

Table 4. Mean catch of shrimp (kg/hour) by month in 1984 and 1985 in NAFO Subarea 0+1 in the shrimp fishery of eight trawlers

Div.

8401

8402

8403

8404

8405

8406

8407

8408

8409

8410

8411

8412

8501

8502

8503

8504

8505

8506

8507

8508

8509

8510

8511

OA KP

KM

1A LV

LT

LP

LE

1B LD

LB

LA

KZ

KX

KV

KT

KS

KR

KP

KN

KM

KL

KK

KJ

KH

KG

KF

KE

KD

KB

1C KA

JZ

JX

JV

JT

JS

JR

JP

JN

JM

JL

JK

JJ

JW

JG

JF

1D JE

JD

JB

JA

HZ

HX

HV

HT

Table 5. No. of hours trawled by month in 1984 and 1985 in NAFO Subarea 0+1 in the shrimp fishery of eight trawlers (473-722 GRT) of the Royal Greenland Trade Department in a south to north grid (7.5 minutes latitude scale, see Fig. 1).

Div.

8401

8402

8403

8404

8405

8406

8407

8408

8409

8410

8411

8412

8501

8502

8503

8504

8505

8506

8507

8508

8509

8510

8511

0A KP

4

4

13

KN

5

1A LV

52

43

LT

1

4

LF

LE

34

45

3

20

17

49

1B LD

42

43

6

23

124

221

43

LB

103

46

12

60

162

425

51

LA

26

76

81

21

71

KZ

5

111

9

135

13

3

31

22

30

6

36

121

240

179

70

KX

12

307

19

168

2

439

37

6

10

444

23

4

273

473

331

205

KV

159

276

217

56

137

210

19

25

675

79

72

163

219

293

88

KT

1

11

35

69

234

103

47

22

22

40

195

169

97

5

KS

126

291

149

58

39

4

180

123

133

142

7

9

17

KN

157

211

36

14

11

127

58

18

42

KM

357

213

36

30

32

23

5

63

73

12

63

52

164

KL

140

112

42

7

10

101

116

5

283

142

17

100

47

158

KK

69

7

36

30

5

62

94

14

56

159

94

29

16

48

KJ

101

12

6

4

9

83

8

43

37

34

4

9

KH

8

2

3

8

10

192

83

31

4

14

KG

27

1

23

5

9

2

4

98

36

16

44

9

KF

26

3

4

9

63

19

19

4

23

39

KE

18

19

5

4

4

141

24

4

4

4

18

17

KD

3

184

162

159

85

53

5

32

12

21

9

15

154

200

129

46

89

38

55

106

122

KB

188

314

141

368

134

81

52

36

42

131

239

427

60

17

145

108

138

111

213

1C KA

1

126

161

107

16

270

46

84

17

112

4

14

79

37

48

141

129

50

57

217

79

JZ

93

69

2

7

64

178

140

213

90

30

21

25

130

200

96

315

61

177

25

JX

44

8

36

103

94

6

16

43

8

20

10

5

4

21

11

JV

3

1

21

65

67

20

8

58

9

20

55

43

3

6

6

JT

2

4

40

22

13

30

95

24

33

105

76

77

44

13

1

48

21

JS

85

8

15

9

4

17

99

22

32

141

16

24

12

1

25

37

JR

56

20

4

4

10

25

15

40

46

3

2

2

16

JP

70

2

2

30

14

28

45

7

50

8

JN

114

5

4

36

31

68

99

5

3

50

8

JM

6

112

29

46

42

13

25

87

48

28

8

86

3

15

JL

8

128

130

55

18

65

47

7

14

9

14

28

15

24

93

10

7

4

17

JK

8

74

27

29

53

48

22

7

4

9

46

74

17

22

99

13

6

117

6

JJ

1

54

69

105

131

23

6

10

11

4

24

60

46

69

4

61

4

9

20

JH

21

271

33

174

26

3

11

6

19

28

45

59

67

6

111

17

29

7

JG

17

40

81

2

27

146

67

3

13

10

20

52

29

118

37

7

12

5

8

JF

2

663

178

113

84

21

4

95

53

133

227

19

11

1D JE

11

381

161

30

19

12

3

47

257

274

24

6

14

7

9

JD

29

11

200

113

250

28

9

JB

199

6

26

5

JA

9

8

HZ

4

3

HX

21

11

58

164

BV

7

81

31

BT

Table 6. Reported by-catches (tons) in the shrimp fishery from 1977 to 1985 in NAFO Subarea 0 and 1 by eight trawlers (473-722 GRT) of the Royal Greenland Trade Department and a comparison with the corresponding total shrimp catches.

Species	1977	1978	1979	1980	1981	1982	1983	1984	1985
Div 0A Redfishes	4.2	9.2	132.7	106.9	0.1	0.3	-	-	-
Others	-	-	-	-	-	-	-	-	-
- 1A Redfishes	0.1	4.1	5.8	18.3	0.6	-	-	1.6	-
Others	-	-	-	-	-	-	-	-	1.4
- 1B Redfishes	102.3	1035.5	903.8	360.1	63.4	27.6	39.8	154.4	79.0
Others	1.2	19.9	8.4	1.6	-	21.0	-	0.2	54.4
- 1C Redfishes	2.8	15.6	39.3	40.4	6.9	5.6	29.1	49.2	28.9
Others	4.2	-	1.4	20.5	-	-	-	-	15.8
- 1D Redfishes	-	-	-	-	-	-	-	1.2	7.8
Others	-	-	-	-	-	-	-	-	4.8
BA 0+1 Redfishes	109.4	1064.4	1081.6	525.7	71.0	33.5	68.9	206.4	115.7
Others	5.4	19.9	9.8	22.1	-	21.0	-	0.2	76.4
- Total bycatch	114.8	1084.3	1091.4	547.8	71.0	54.5	68.9	206.6	192.1
- Total shrimp catch	5503	4703	6605	8484	9239	6946	6228	9907	10583
- Bycatch in % of total shrimp catch	2.1	23.1	16.5	6.5	0.8	0.8	1.1	2.1	1.8

Table 7. Composition by stages of sexual development (% by number) of samples of P. borealis from the photographic survey in the Davis Strait in 1985.

Station no.	Area kode	Number of specimens in groups, %								Totals, %			Tot. No.
		1	2	3	4	5	6	7	8	Mal	Tran	Fem	
08001	KA011	70.8	0.3	16.2	1.0	10.7	0	0	1.0	70.8	16.5	12.6	604
08005	KF007	80.7	0	2.4	0.3	16.6	0	0	0	80.7	2.4	16.9	564
08007	KL006	92.6	0	0.4	0.7	6.3	0	0	0	92.6	0.4	7.0	227
08008	KN003	59.3	0.7	16.2	5.2	17.4	0	0.3	0.9	59.3	17.0	23.8	661
08009	KP440	49.8	0.5	34.3	2.1	12.1	0	0	1.1	49.8	34.9	15.3	557
08019	KP004	61.6	0.1	11.6	8.8	15.9	0	1.0	0.9	61.6	11.7	26.7	757
08010	KT436	57.3	0	9.3	3.1	28.1	0	0.5	1.6	57.3	9.3	33.4	847
08014	KT002	61.5	0	21.6	2.7	12.7	0	0.3	1.2	61.5	21.6	16.9	659
08021	KZ014	35.2	0.6	9.7	21.2	20.6	0	9.7	3.0	35.2	10.3	54.5	489
08013	LB006	57.4	0.1	20.0	5.7	13.7	0	1.6	1.5	57.4	20.1	22.5	682
08012	LD439	54.5	0	10.1	7.5	27.0	0	0	0.9	54.5	10.1	35.3	554
08023	LD012	83.1	0.3	2.6	3.2	4.0	0	4.8	1.9	83.1	2.9	14.0	671

- Group 1. Juveniles and males.
- 2. Transitionals without roe.
 - 3. Transitionals with head roe.
 - 4. Females without roe.
 - 5. Females with head roe.
 - 6. Females, berried, with head roe.
 - 7. Females, berried.
 - 8. Females with egg hairs.

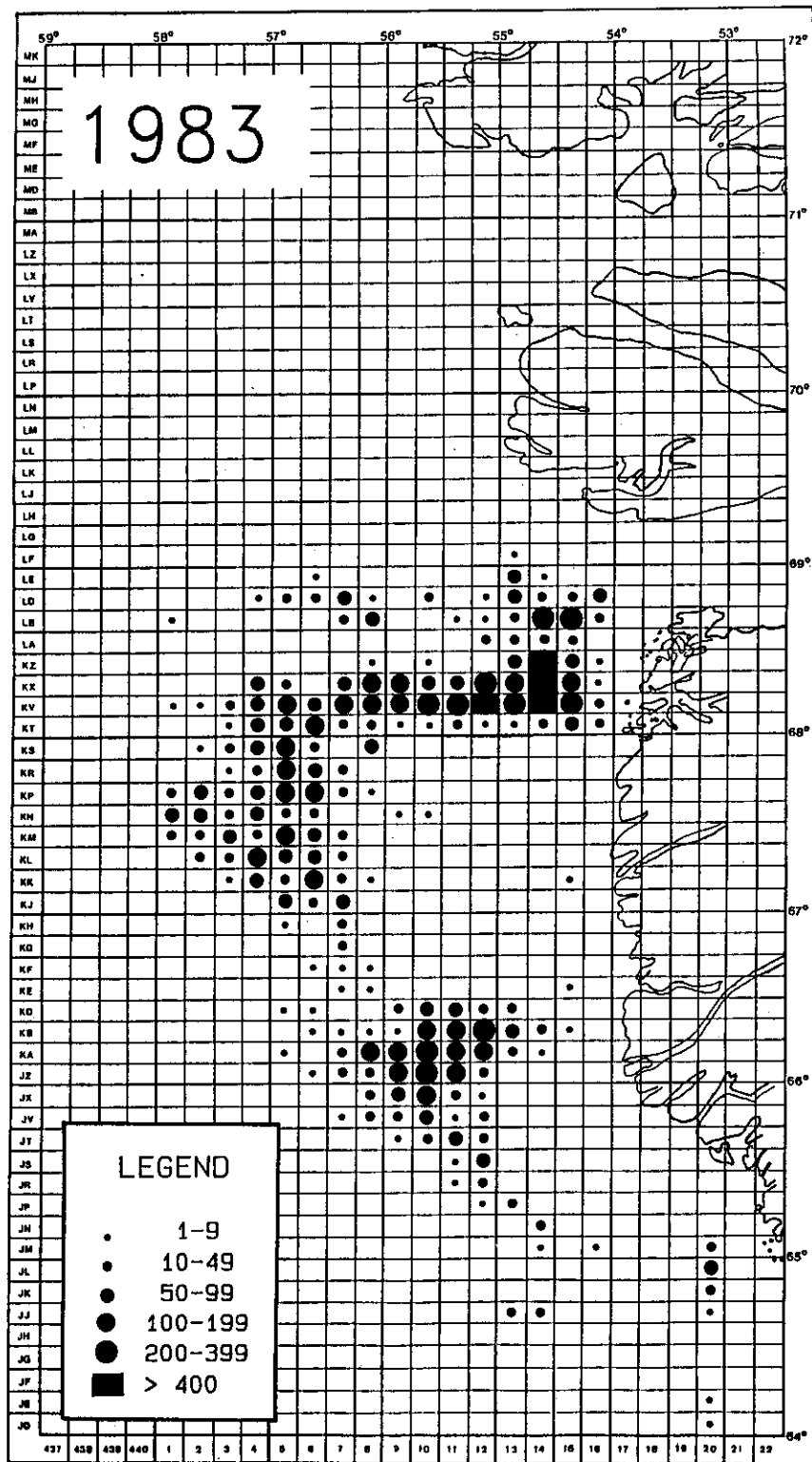


Figure 1. Distribution of hauls in 1983 in the shrimp fishery of seven trawlers (473-722 GRT) of the Royal Greenland Trade Department in NAFO Subarea 0 and 1 between 64°N and 72°N.

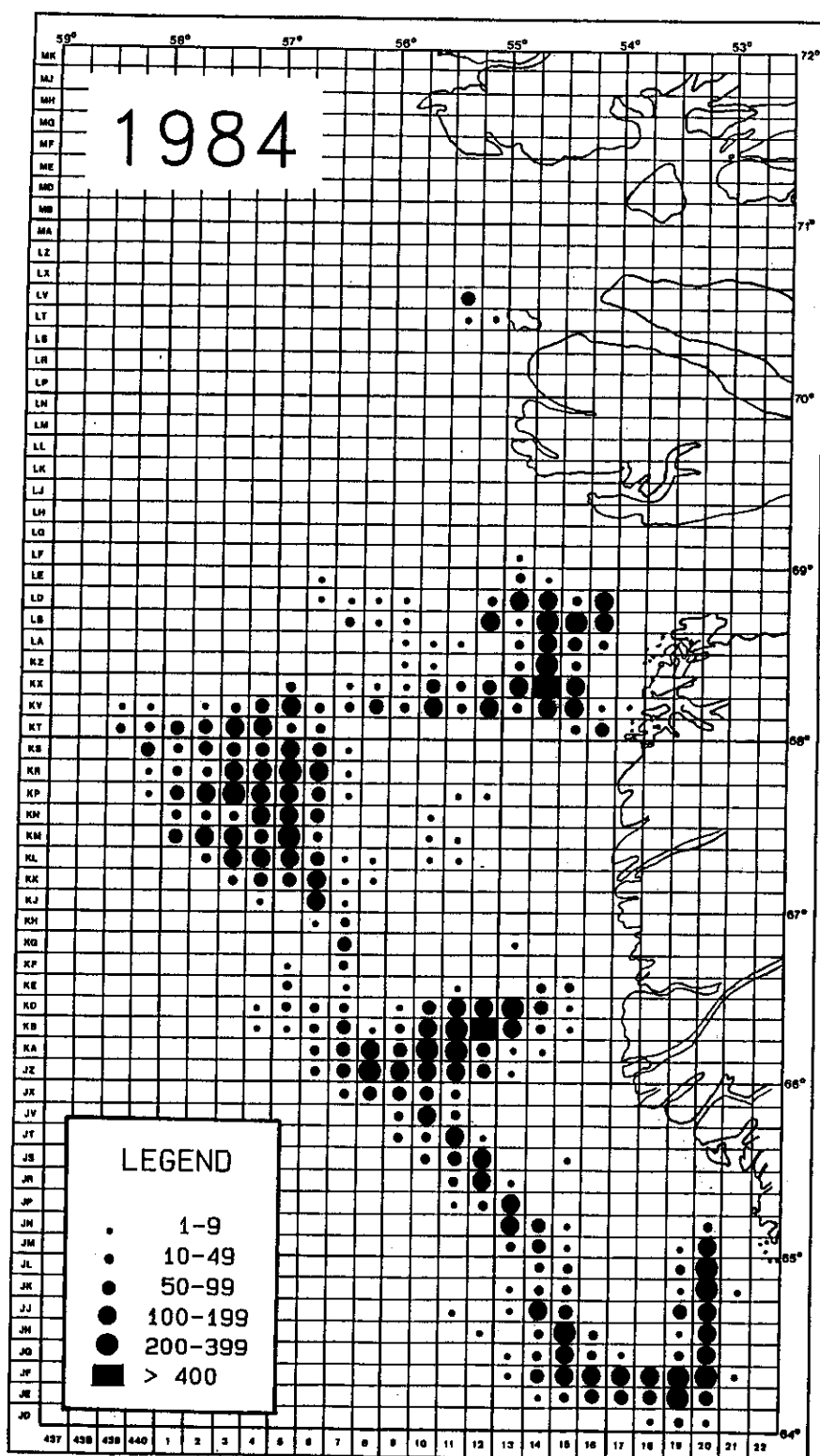


Figure 2. Distribution of hauls in 1984 in the shrimp fishery of eight trawlers (473-722 GRT) of the Royal Greenland Trade Department in NAFO Subarea 0 and 1 between 64°N and 72°N.

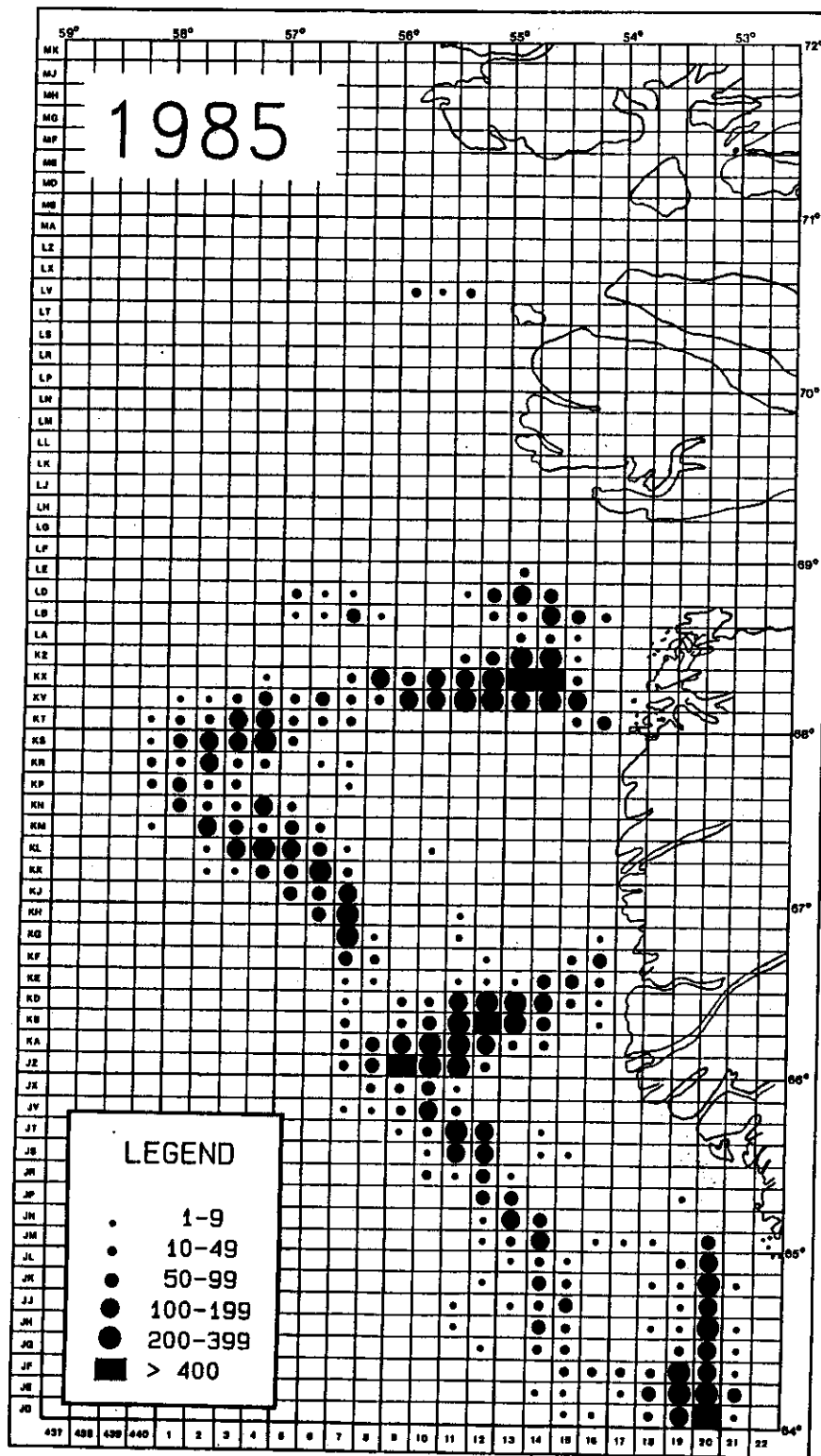


Figure 3. Distribution of hauls in 1985 in the shrimp fishery of eight trawlers (473-722 GRT) of the Royal Greenland Trade Department in NAFO Subarea 0 and 1 between 64°N and 72°N.

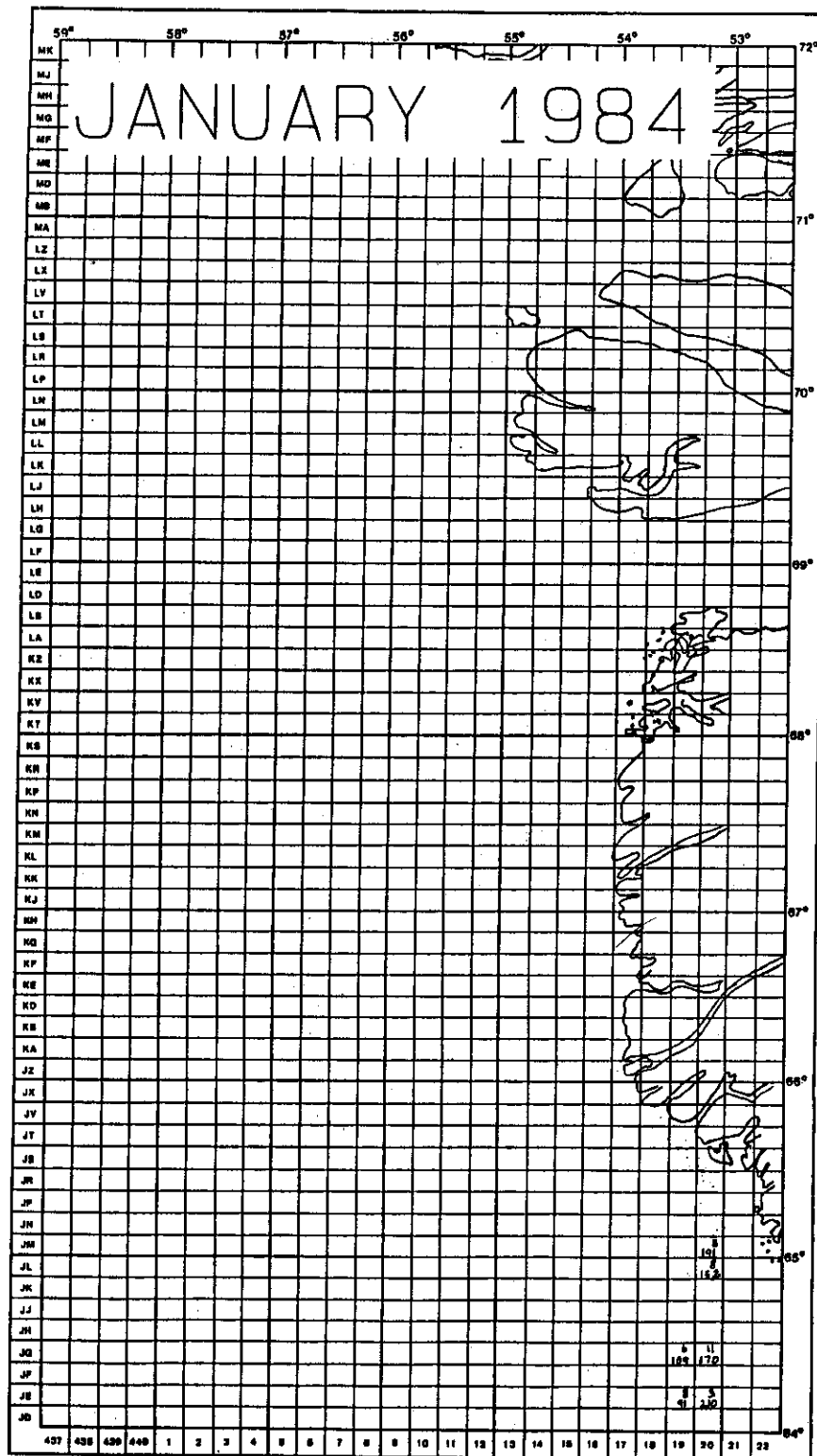


Figure 4. Distribution of effort and mean catch of shrimp per hour in January 1984 in NAFO Subarea 1 in the shrimp fishery of seven trawlers (473-722 GRT) of the Royal Greenland Trade Department. Upper figure in each statistical is no. of hours trawled, lower figure the mean catch rate (kg/hour).

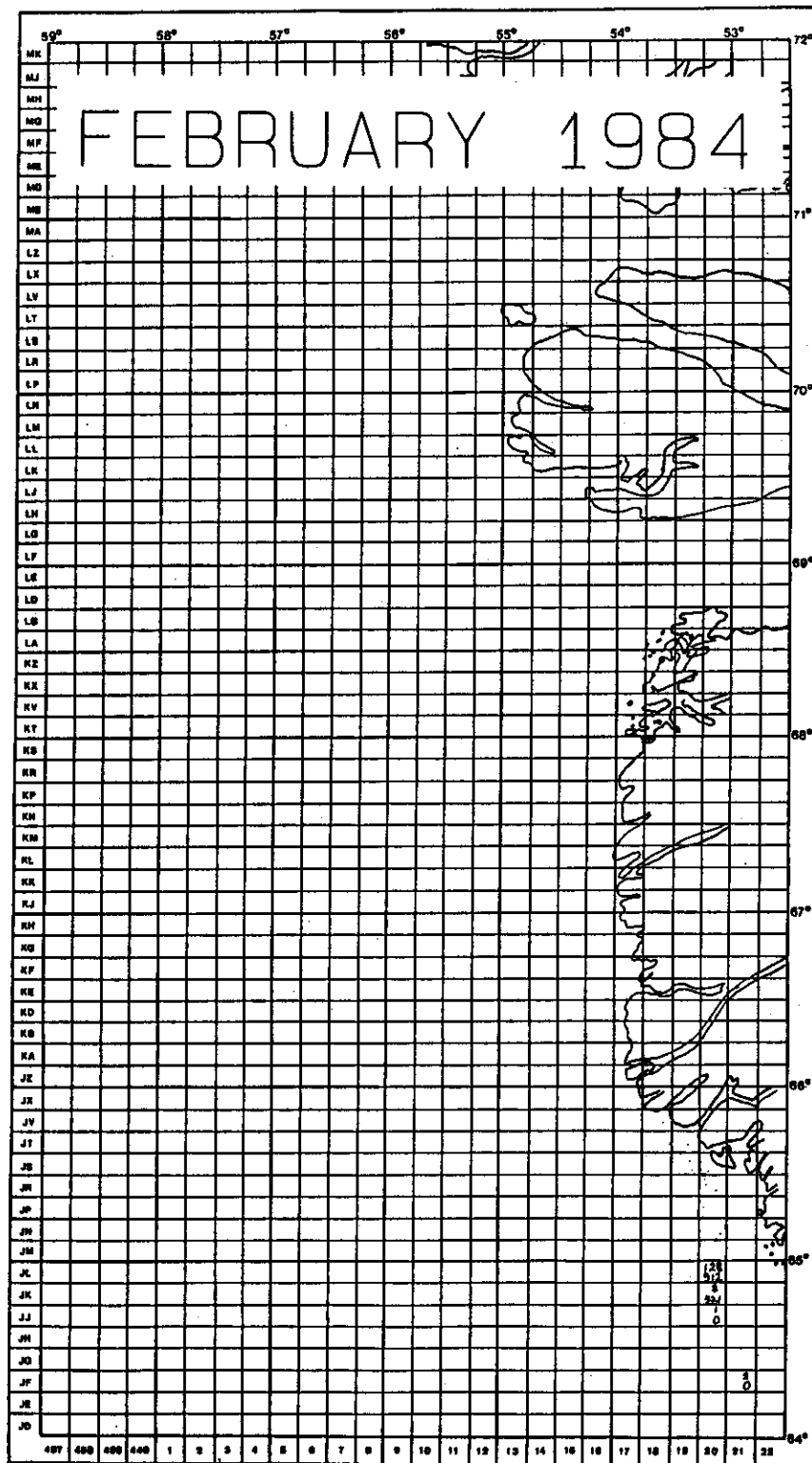


Figure 4. Continued. February 1984.

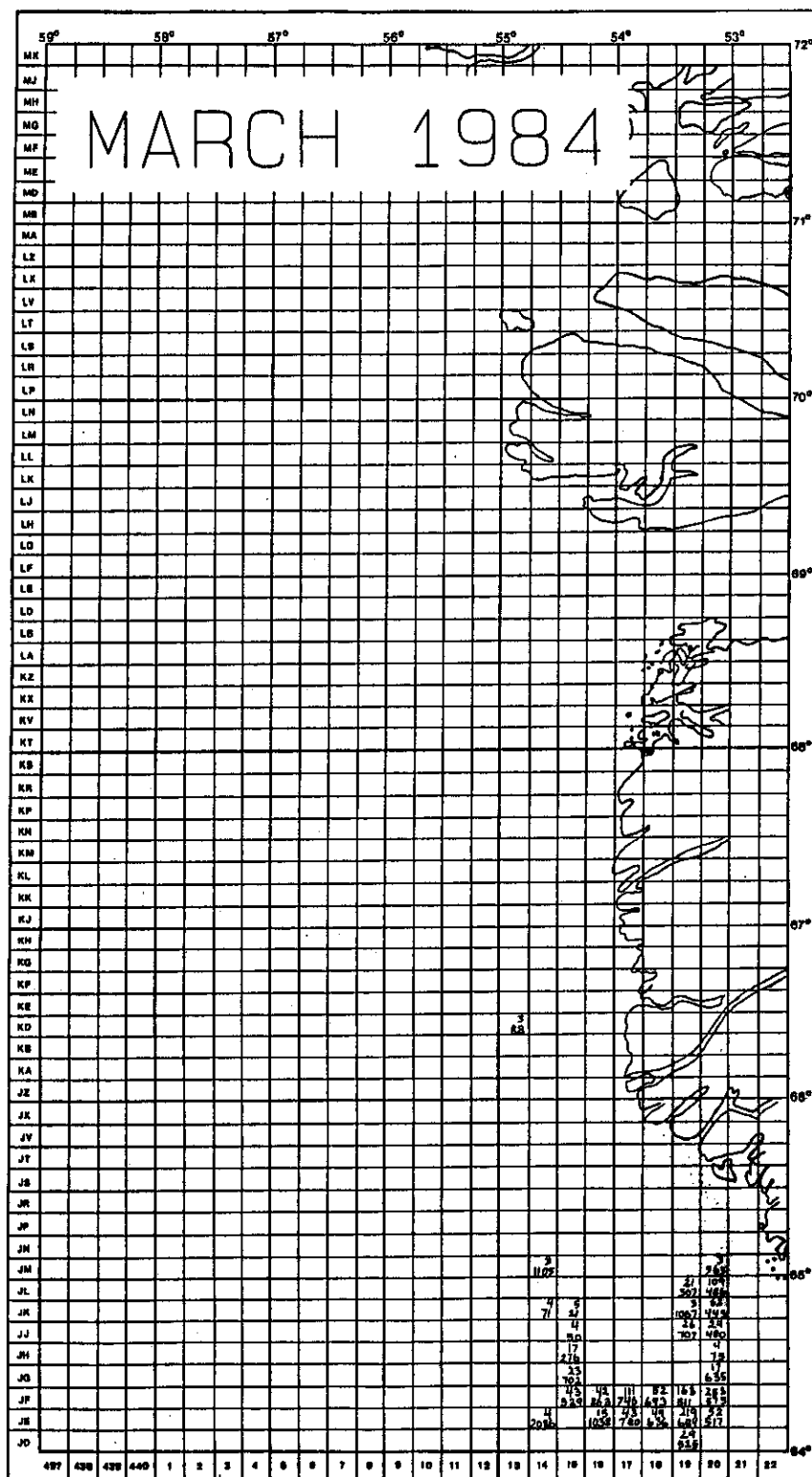


Figure 4. Continued. March 1984.

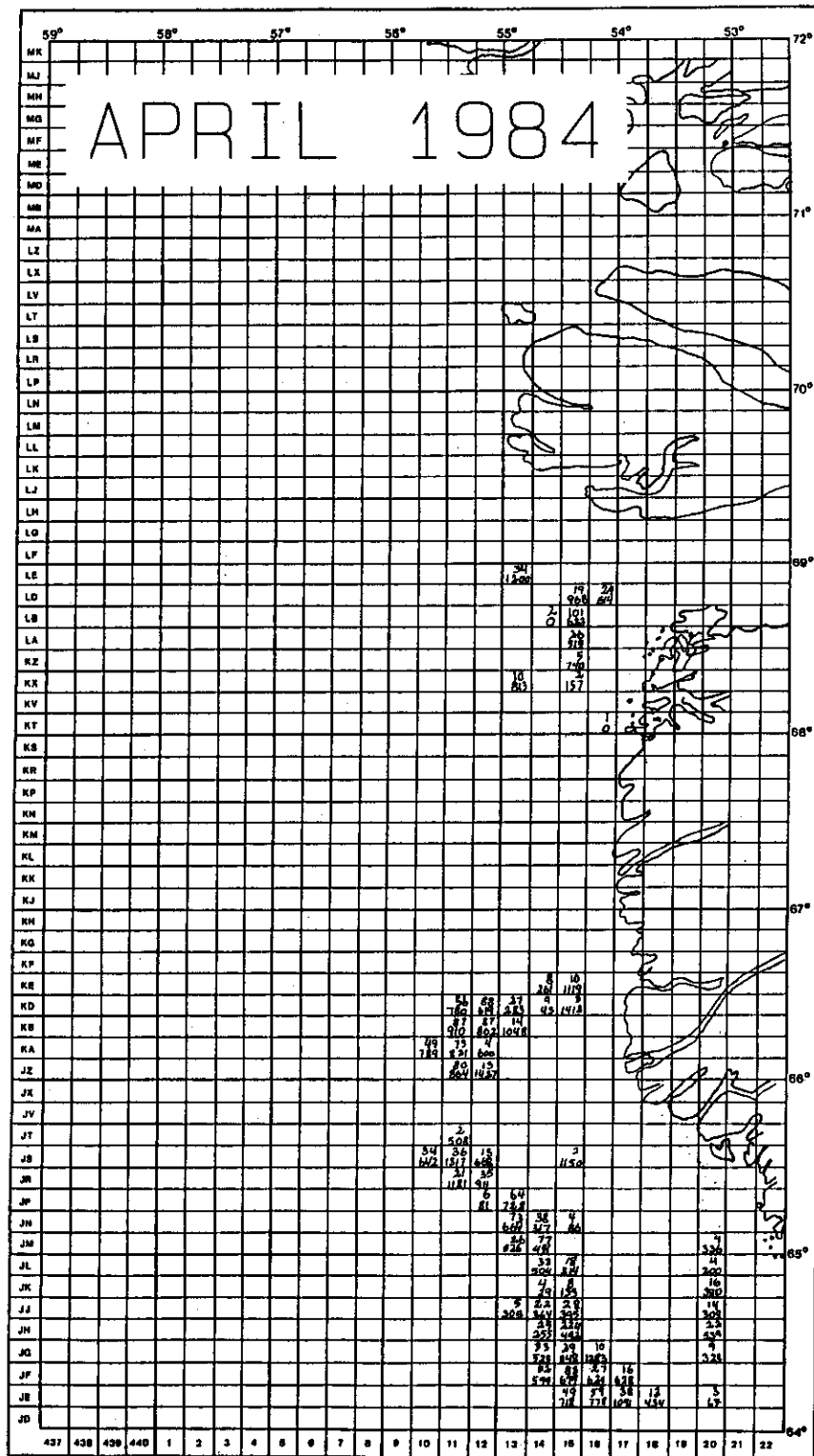


Figure 4. Continued. April 1984.

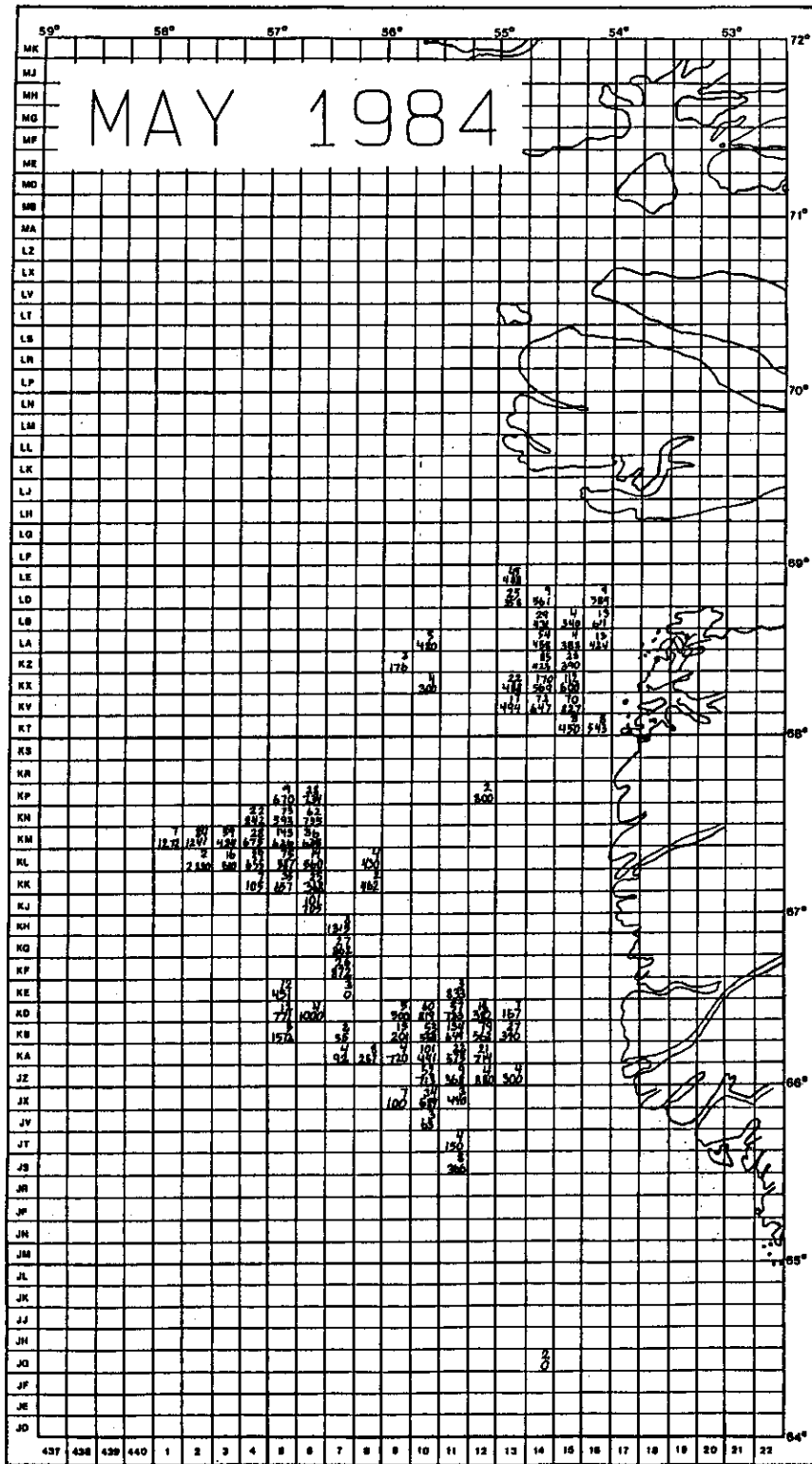


Figure 4. Continued. May 1984.

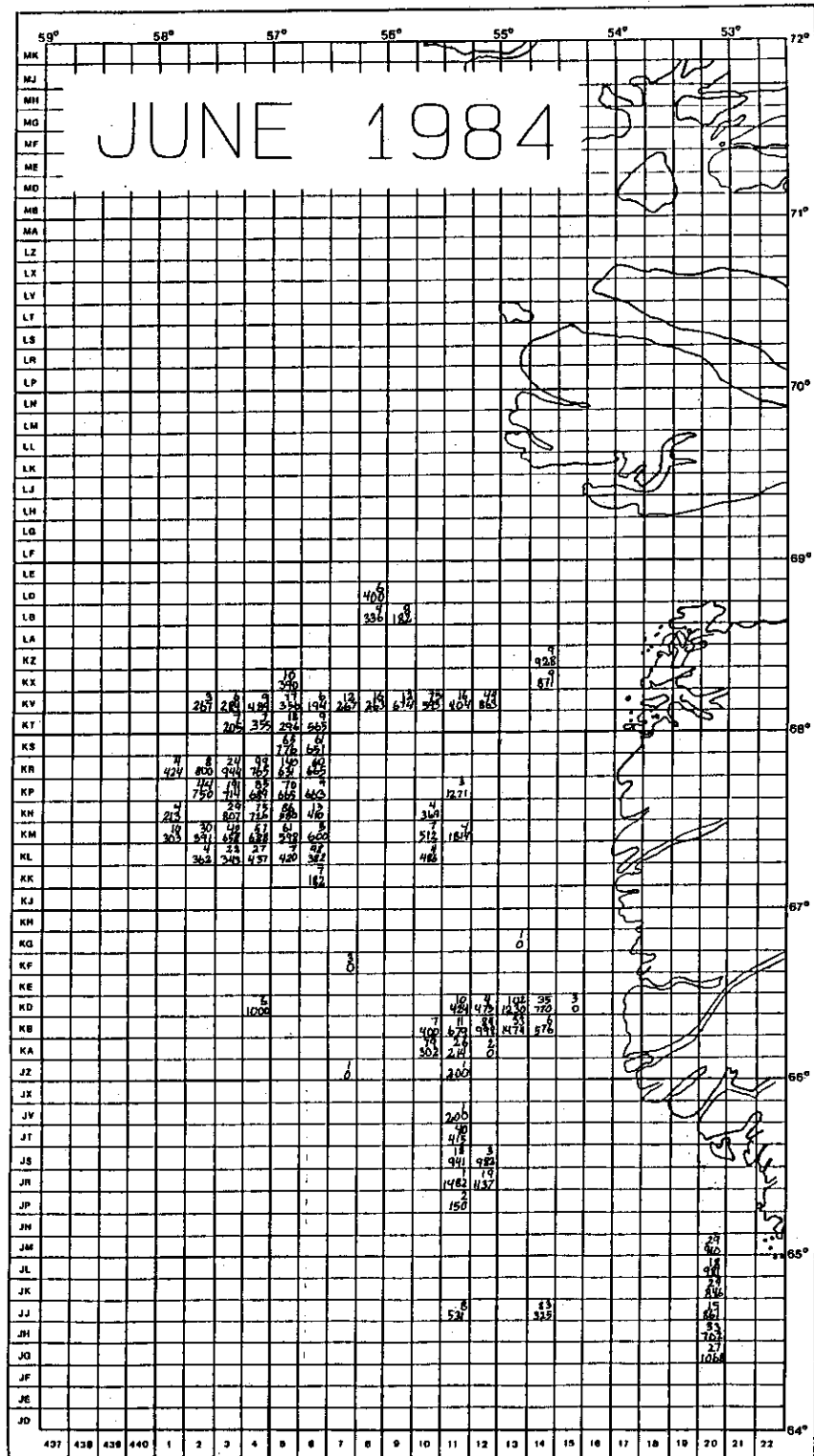


Figure 4. Continued. June 1984.

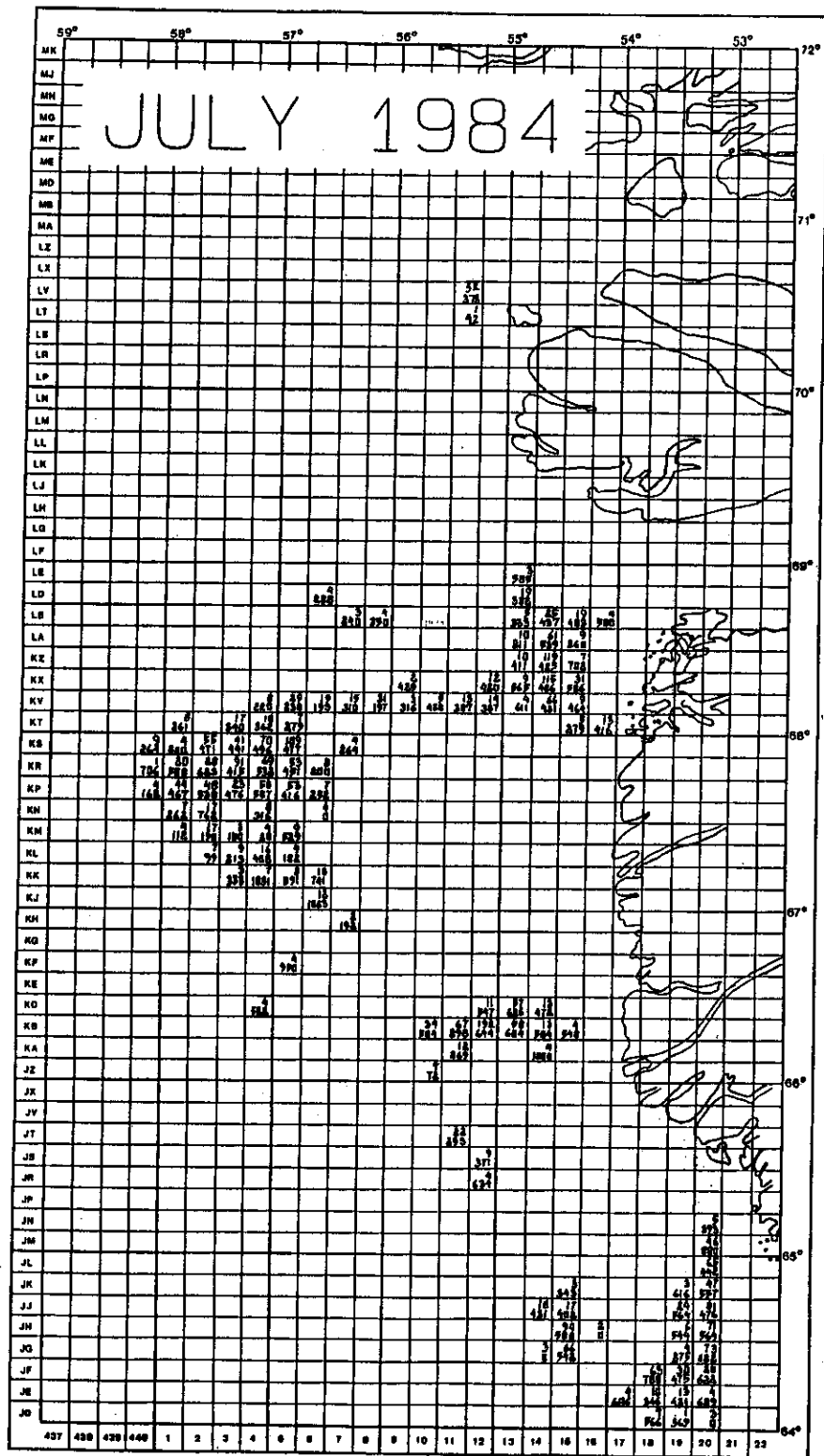


Figure 4. Continued. July 1984.

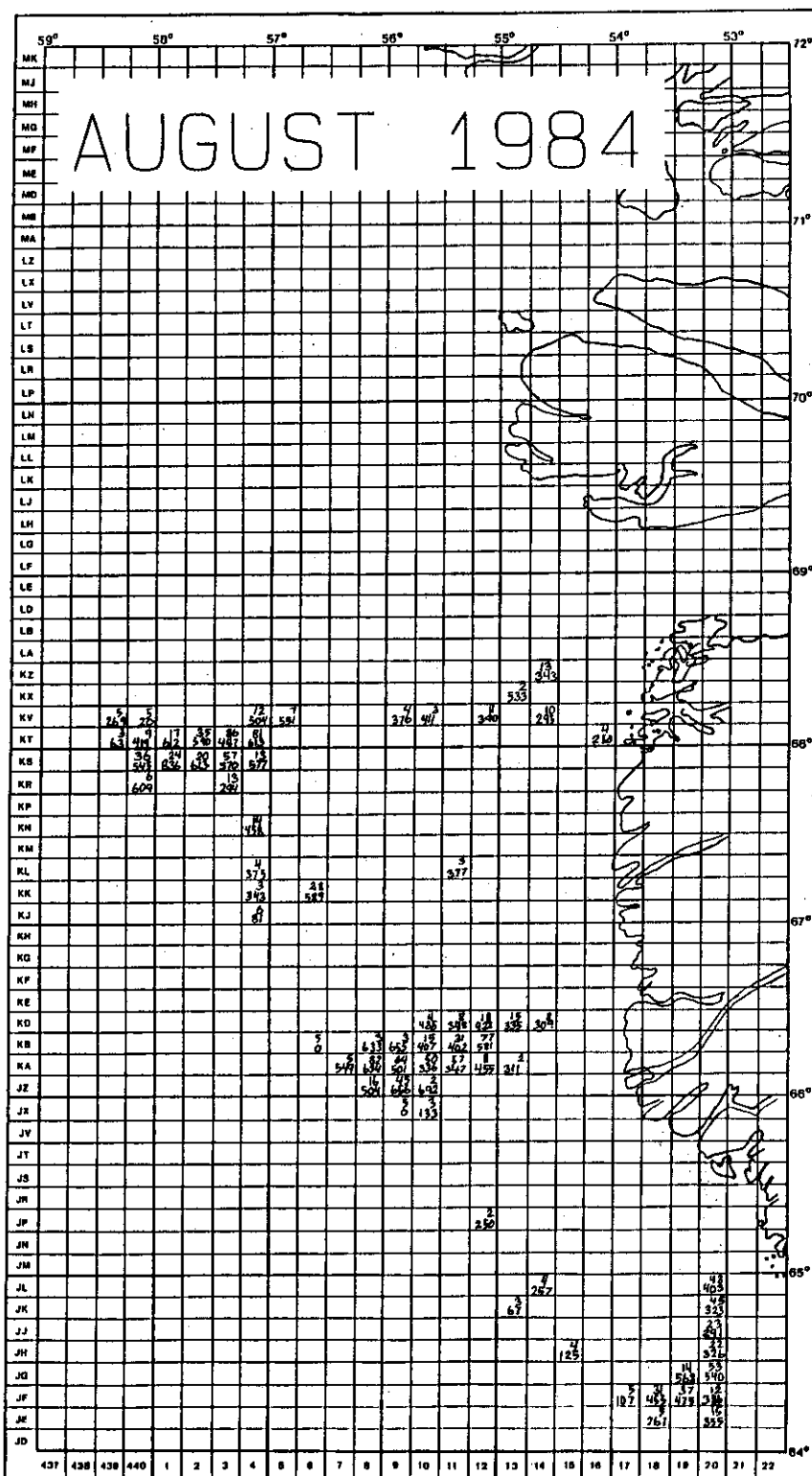


Figure 4. Continued. August 1984.

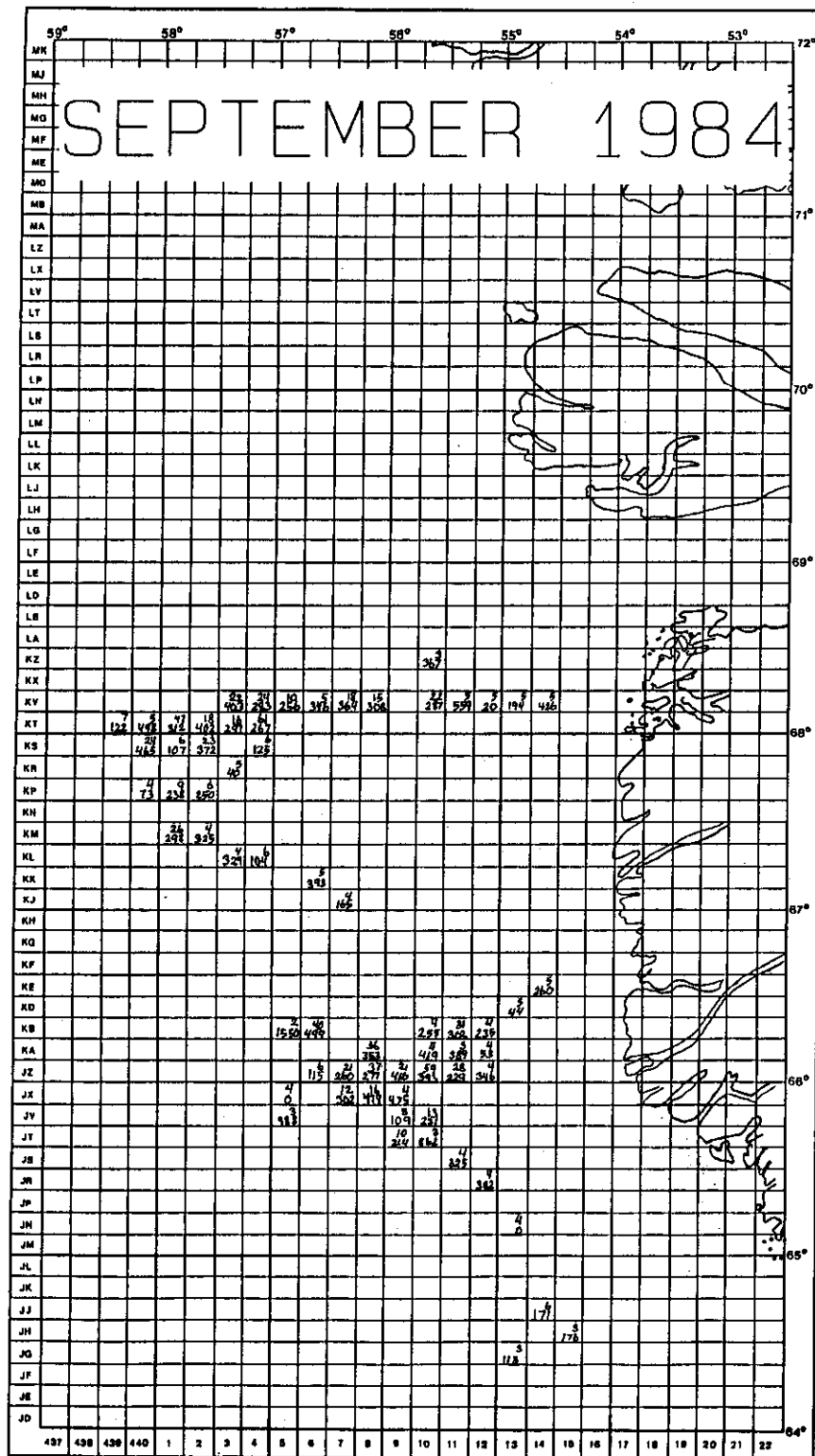


Figure 4. Continued. September 1984.

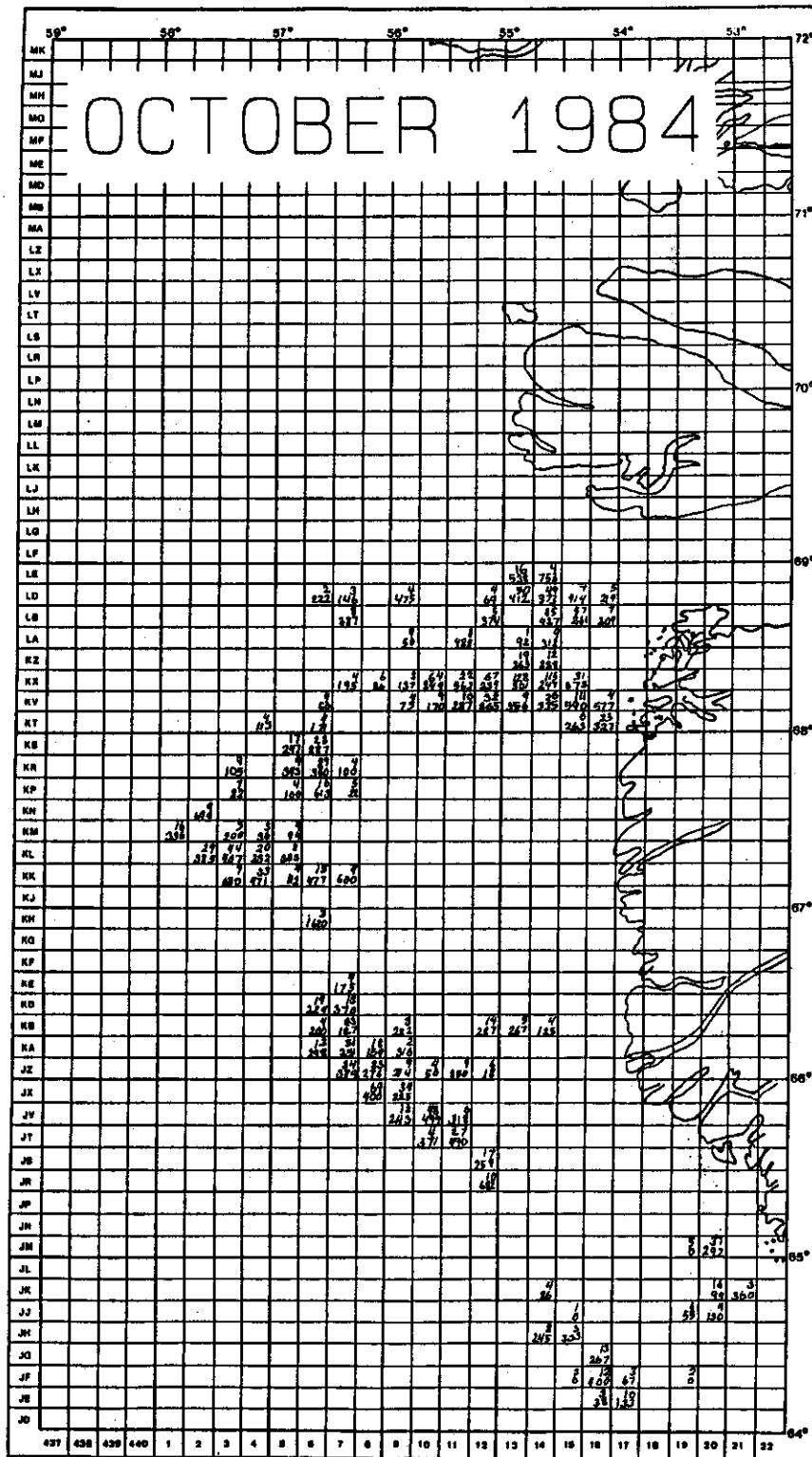


Figure 4. Continued. October 1984.

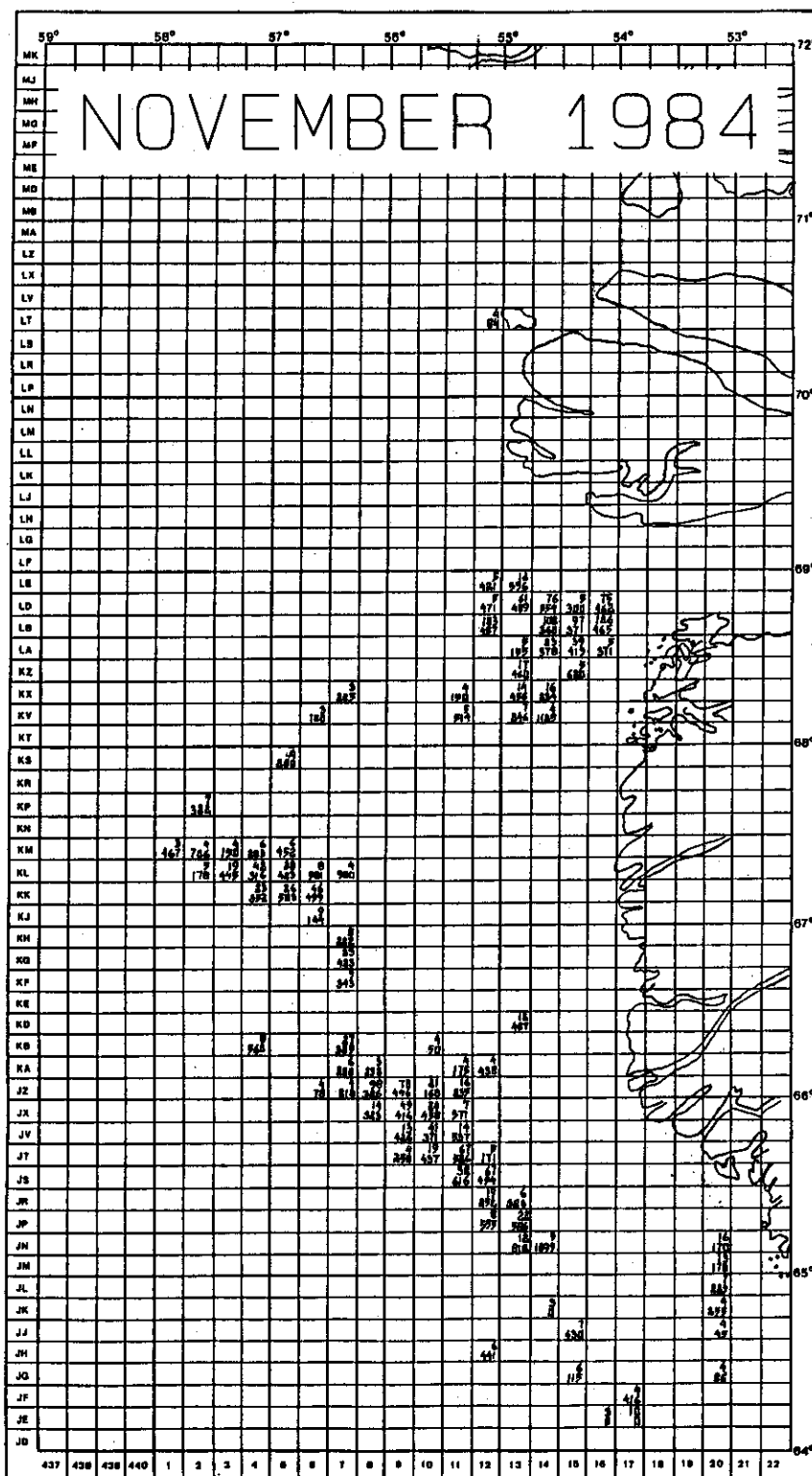


Figure 4. Continued. November 1984.



Figure 4. Continued. December 1984.

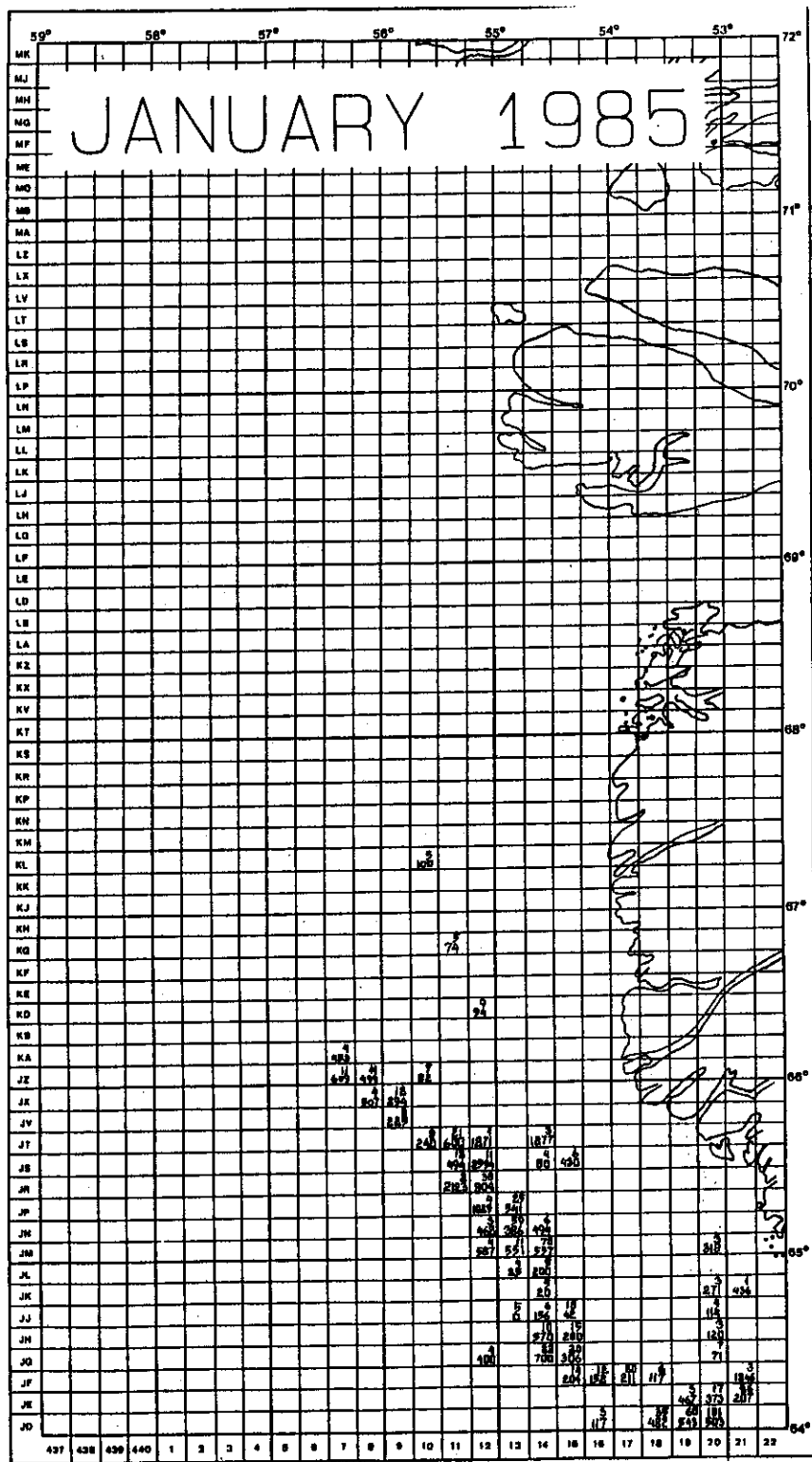


Figure 4. Continued. January 1985.

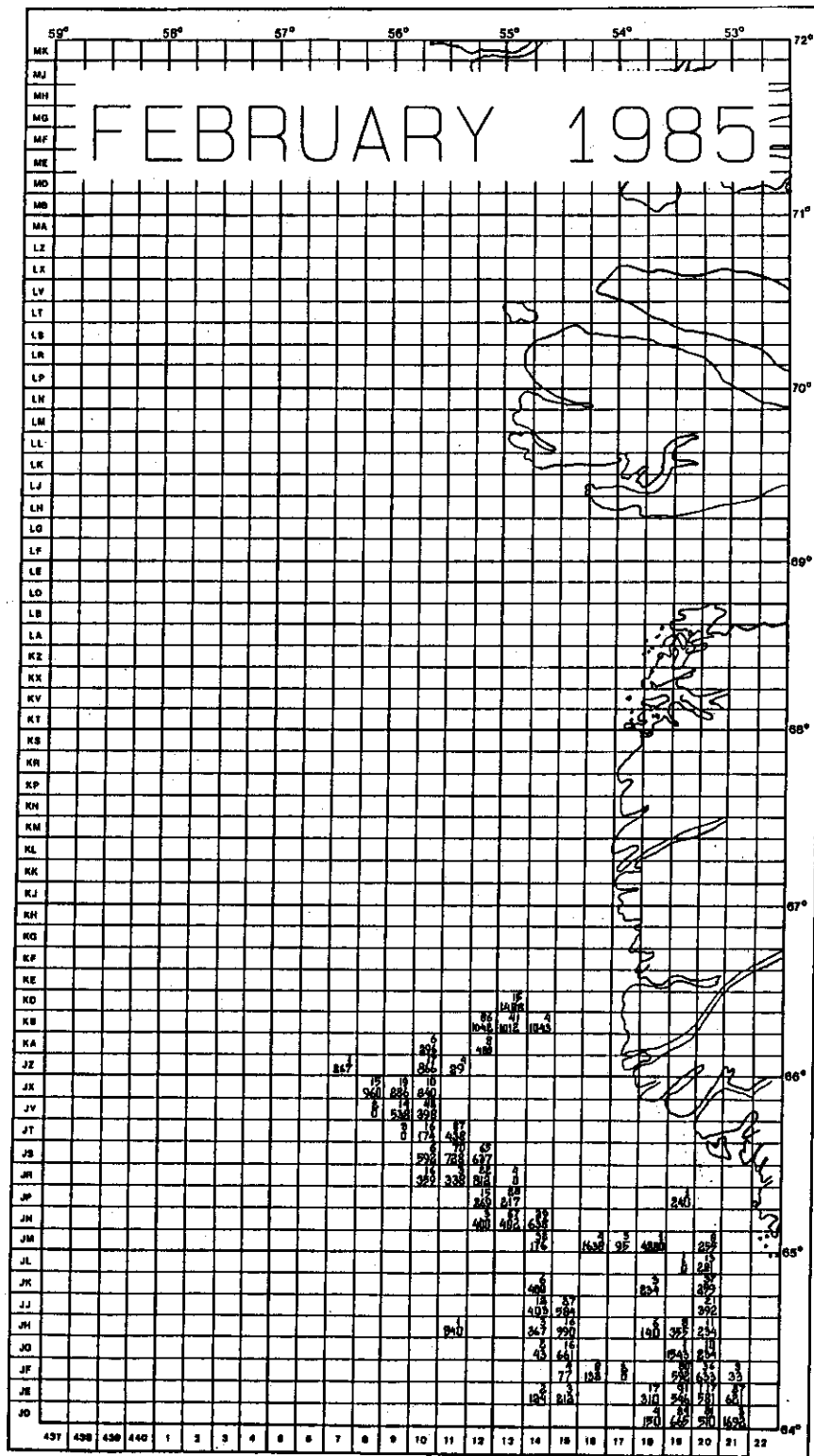


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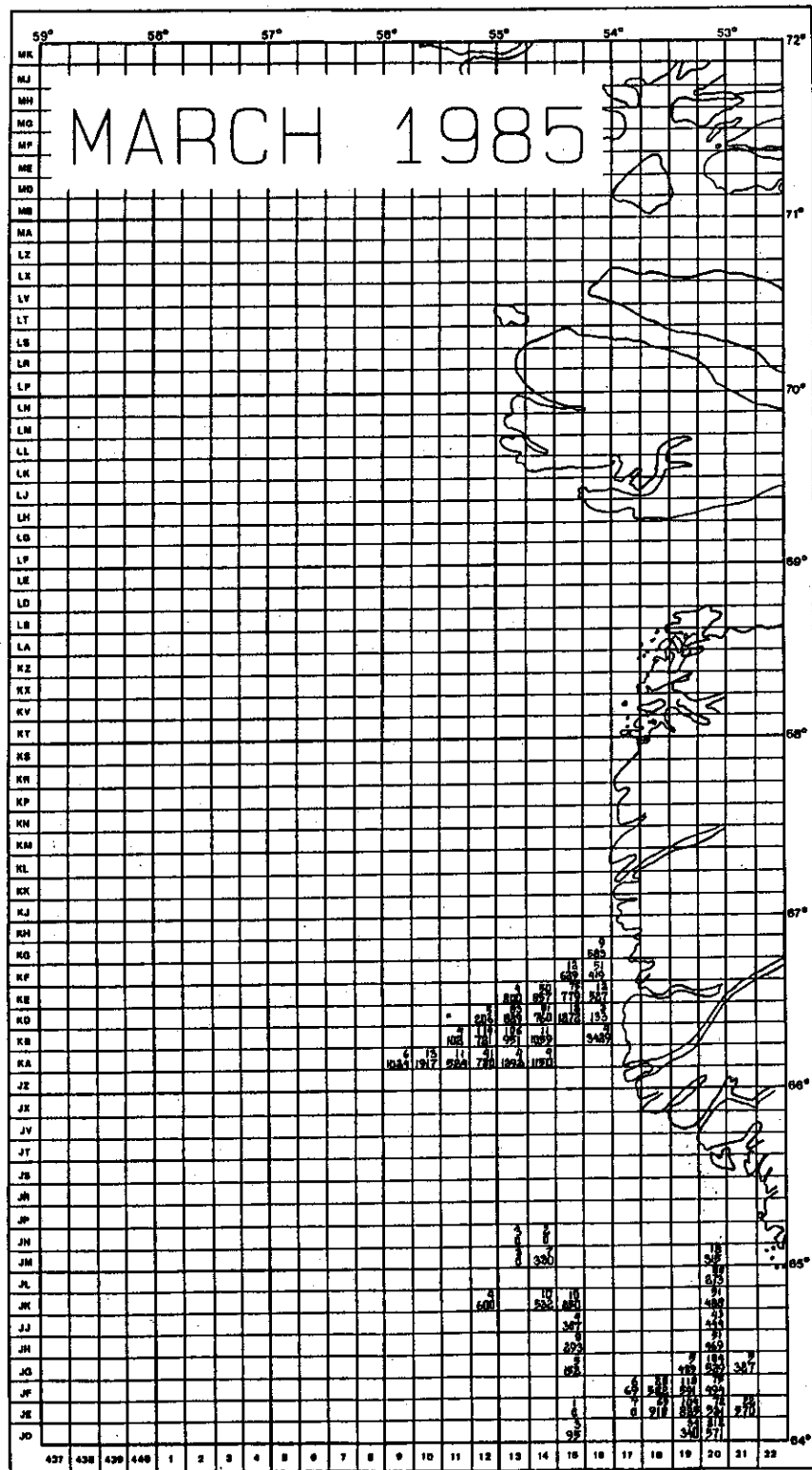


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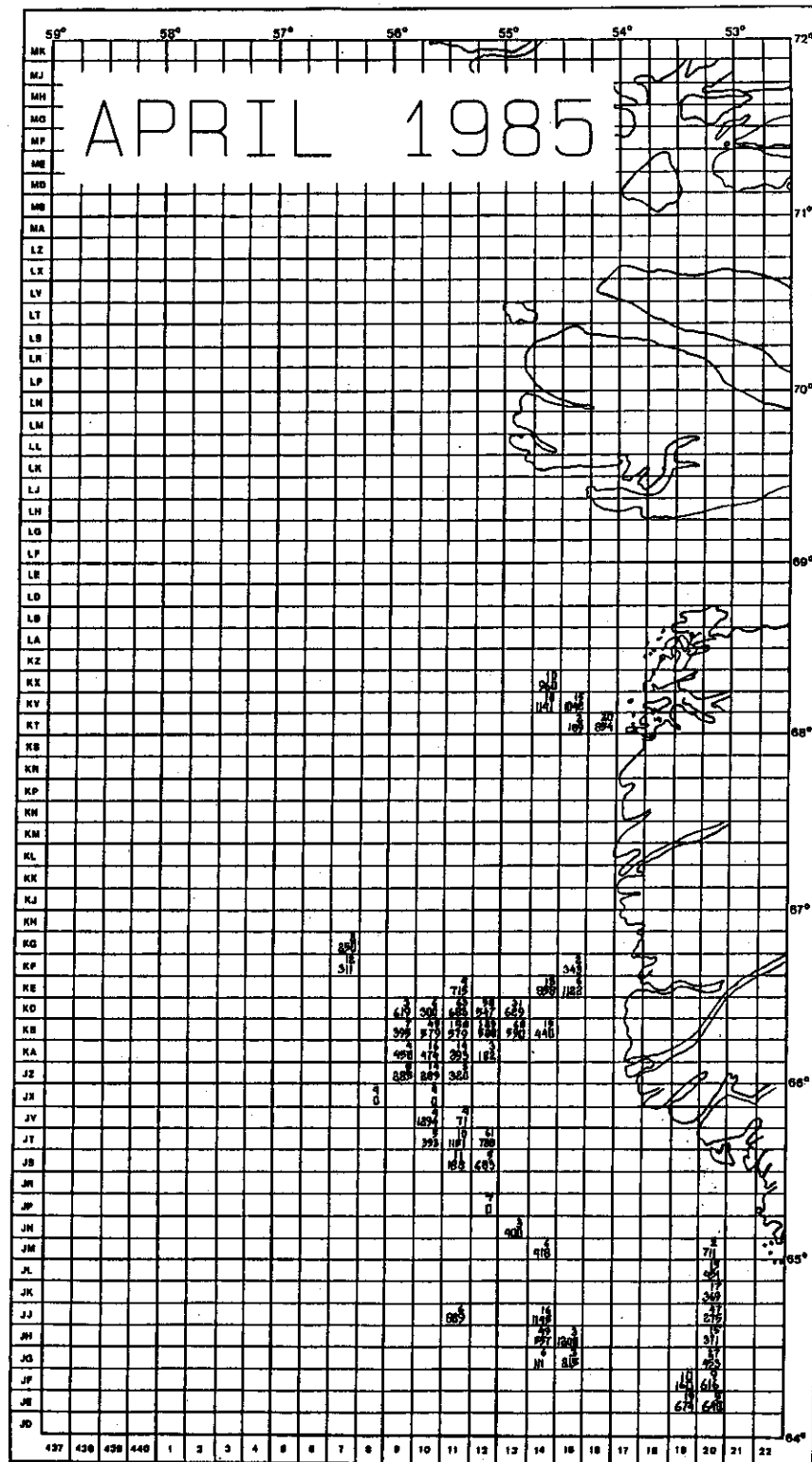


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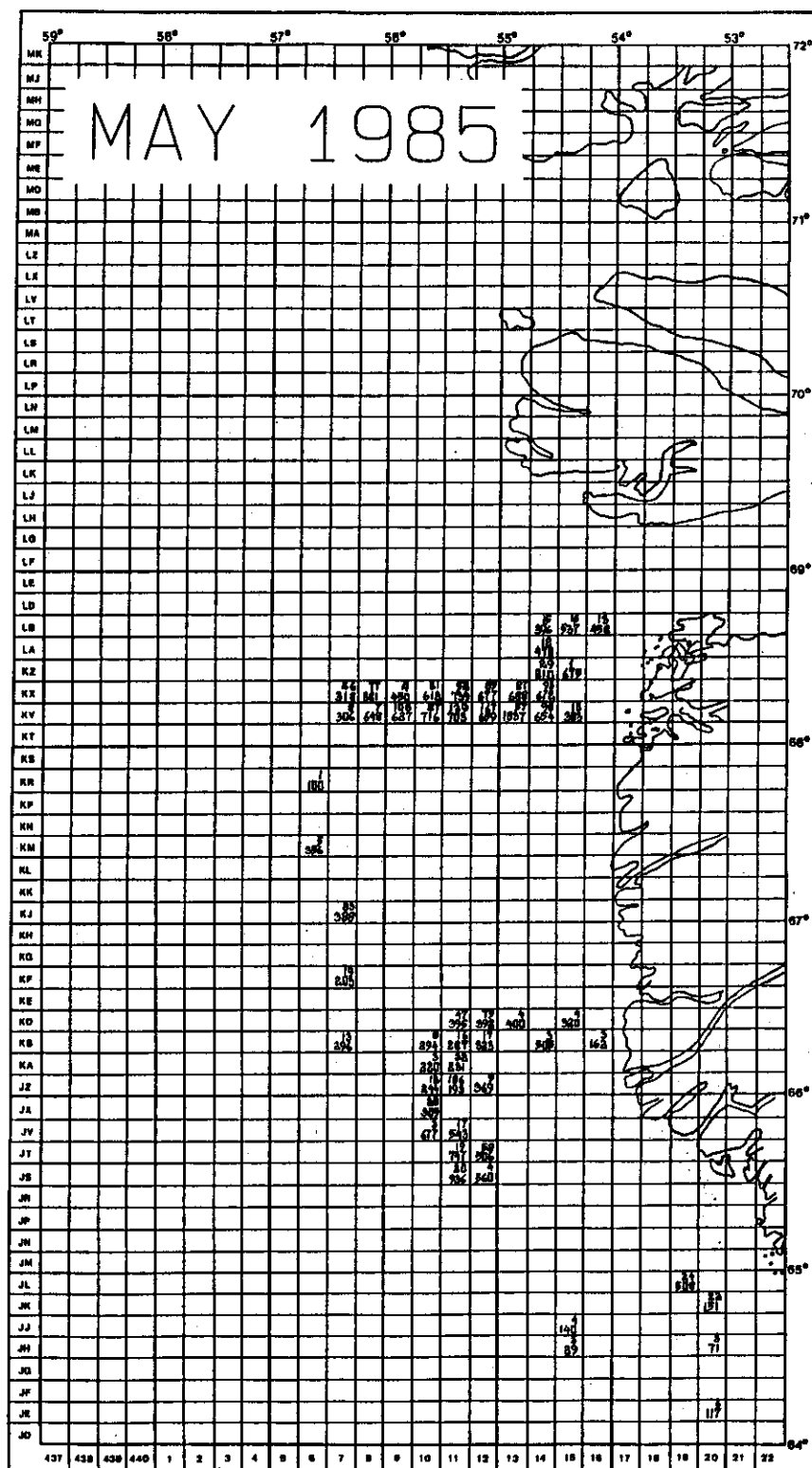


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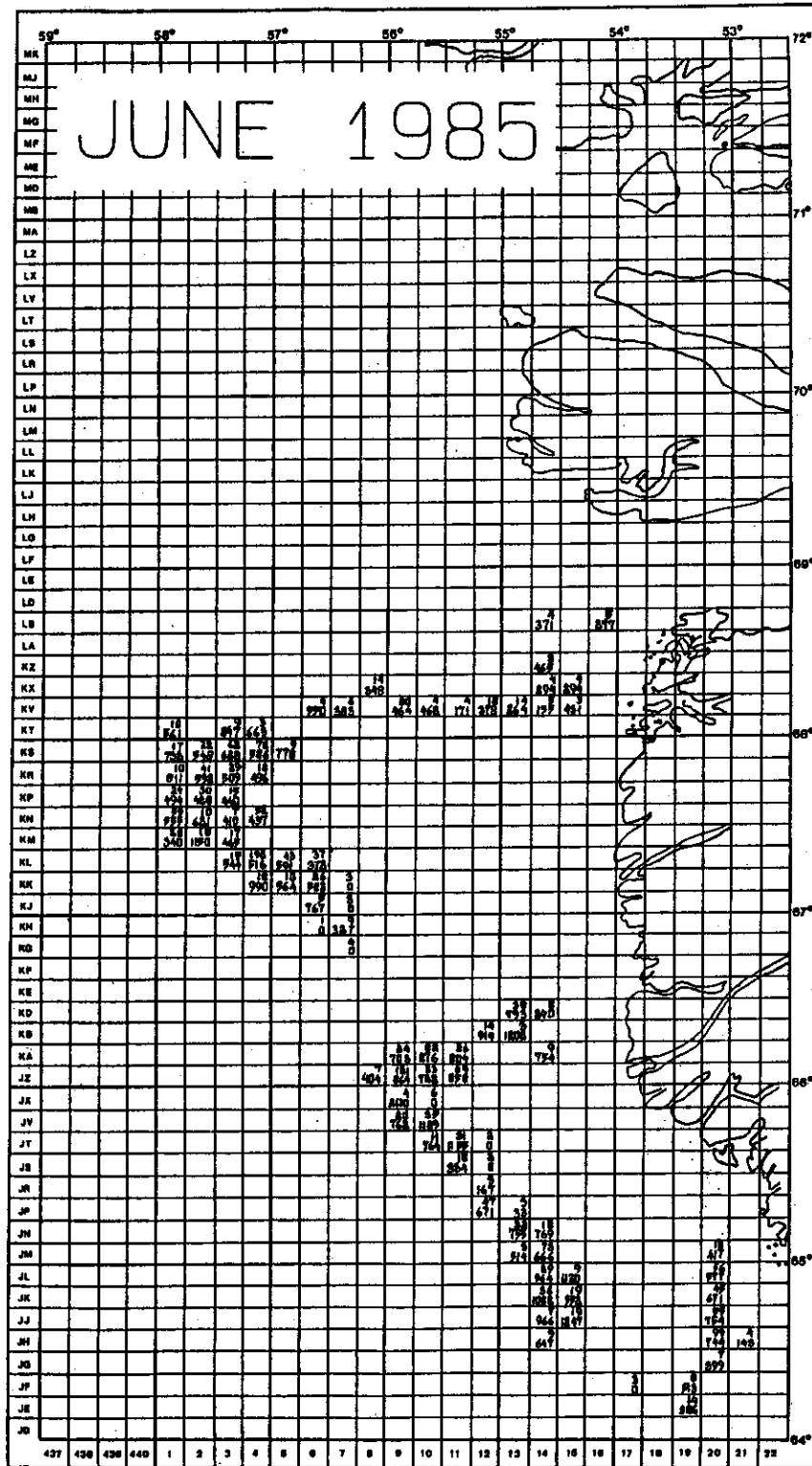


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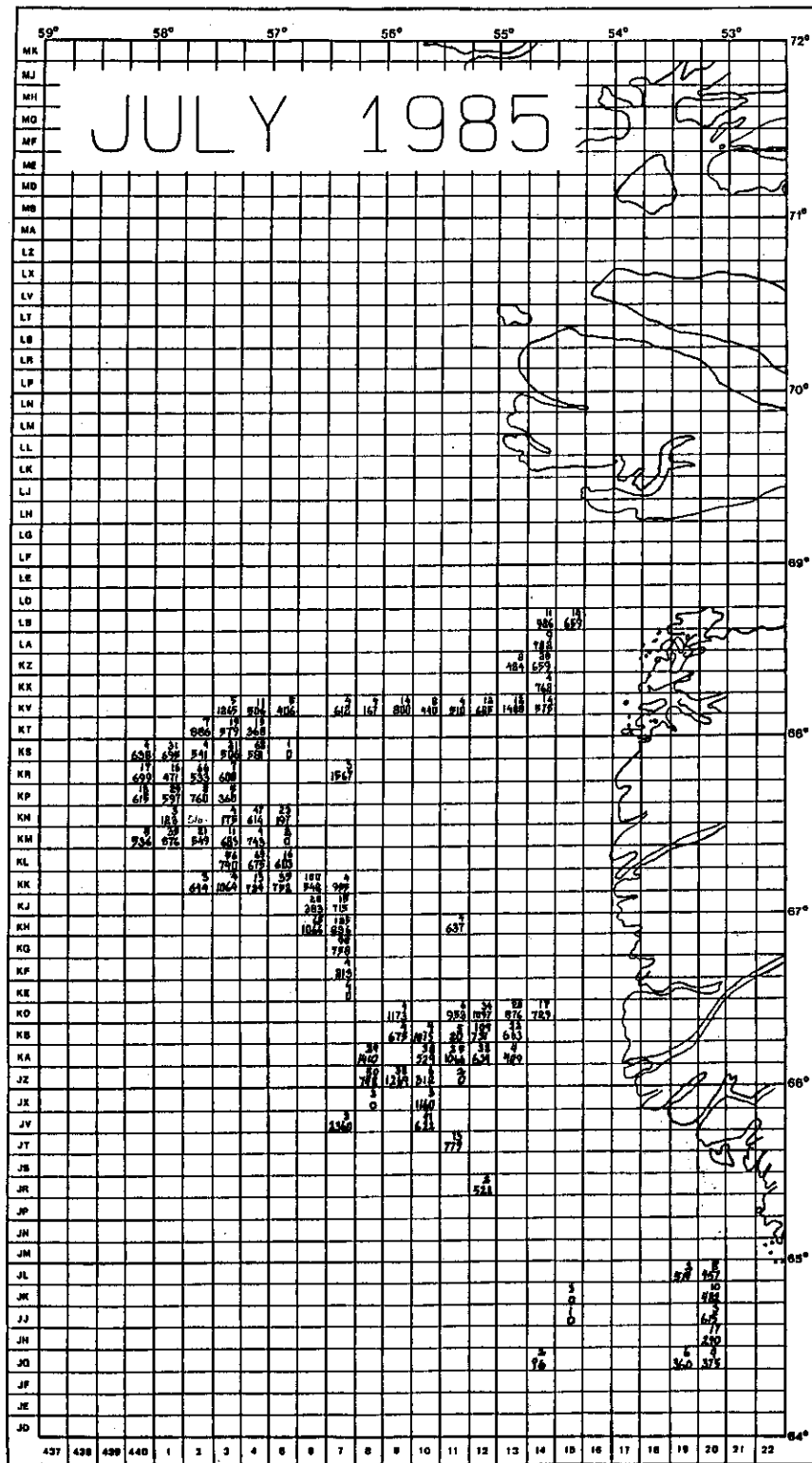


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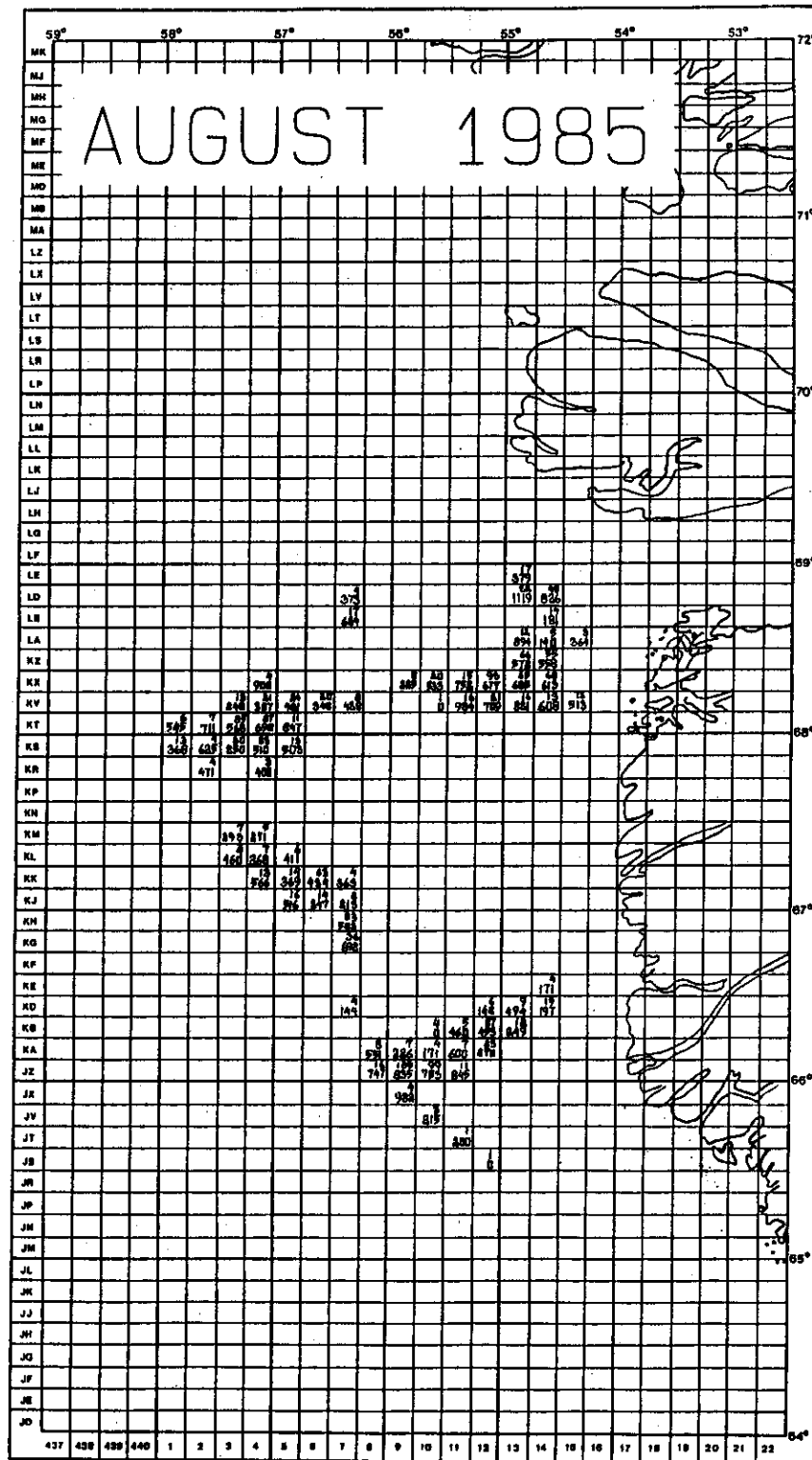


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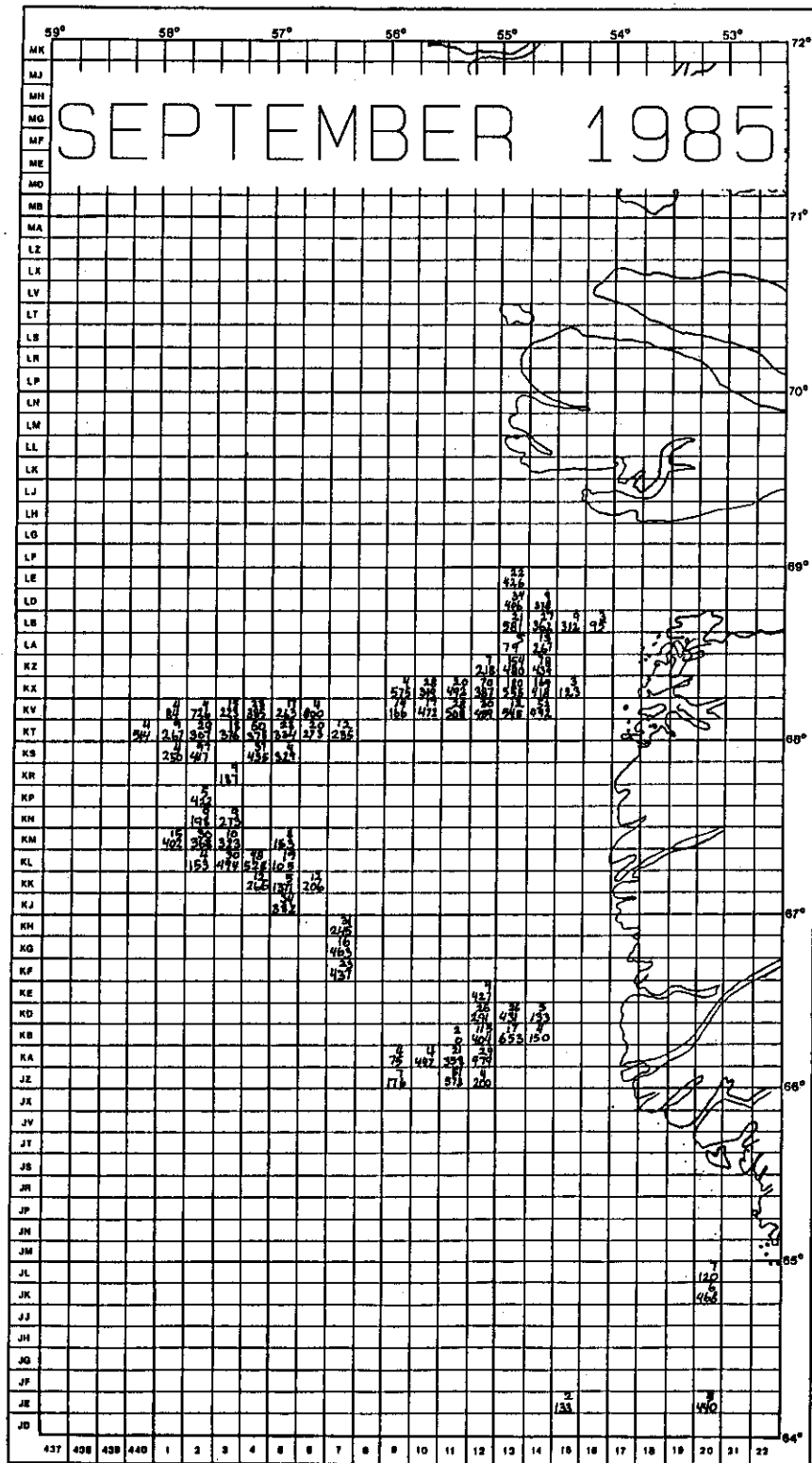


Figure 4. Continued. September 1985.

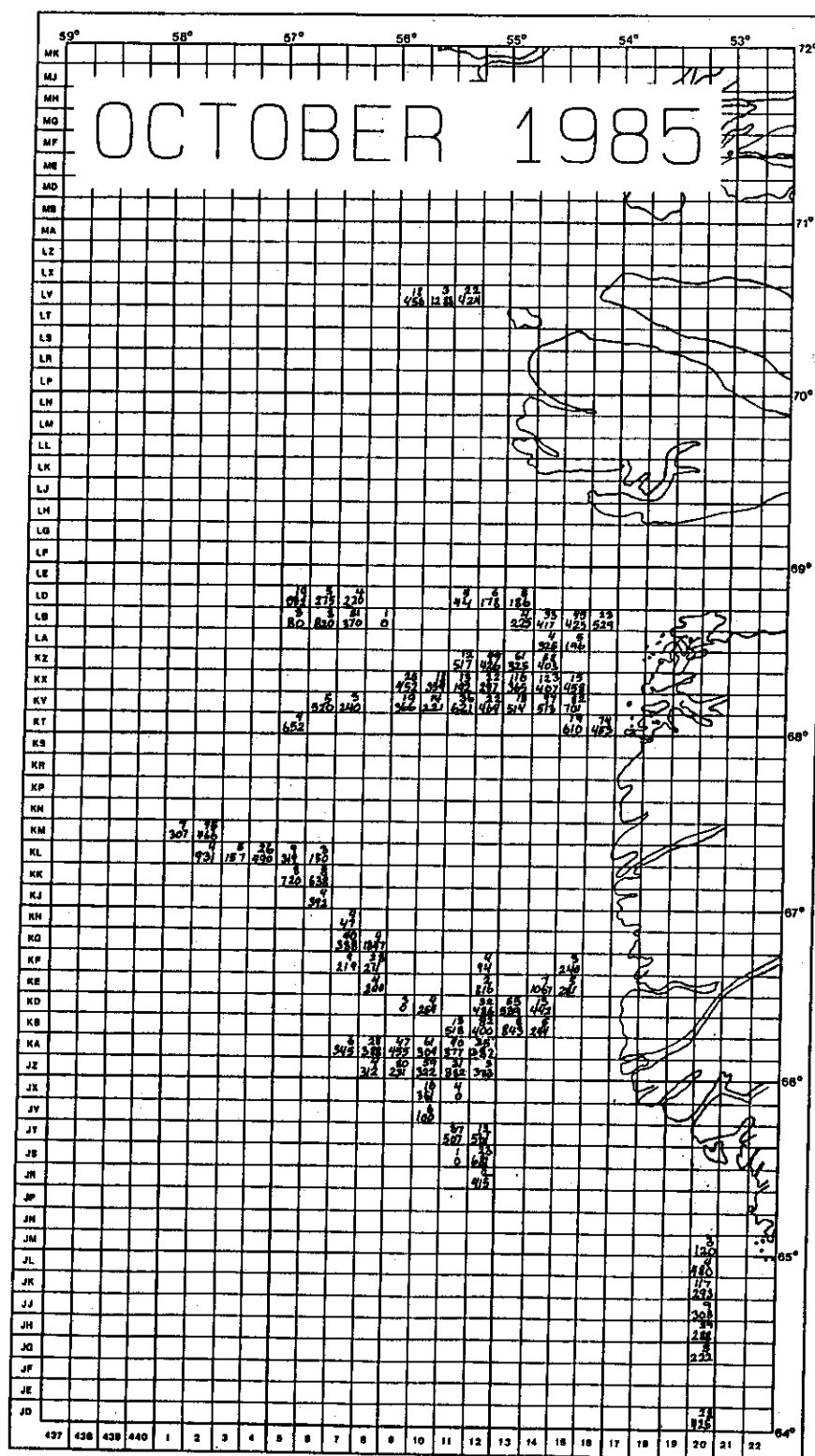


Figure 4. Continued. October 1985.

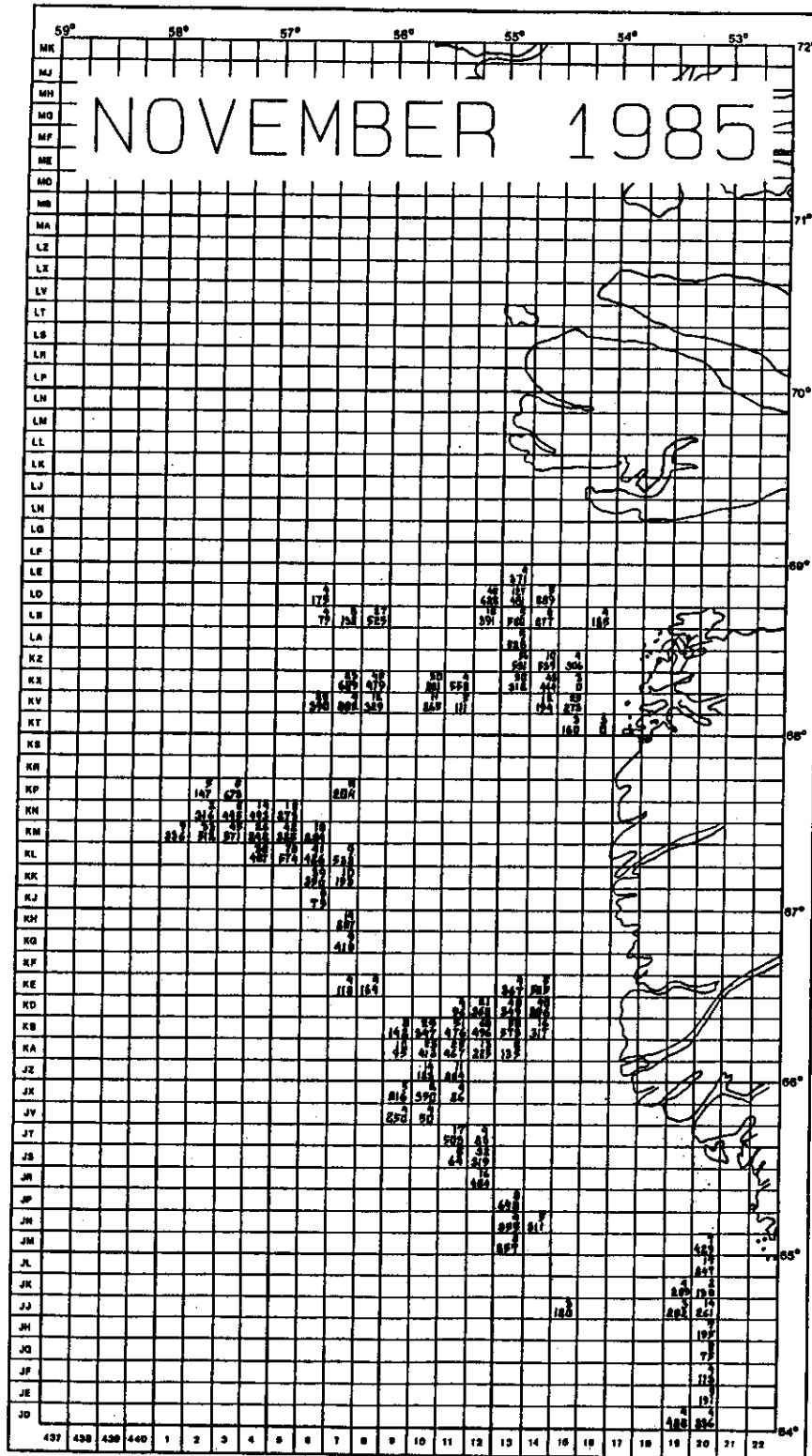


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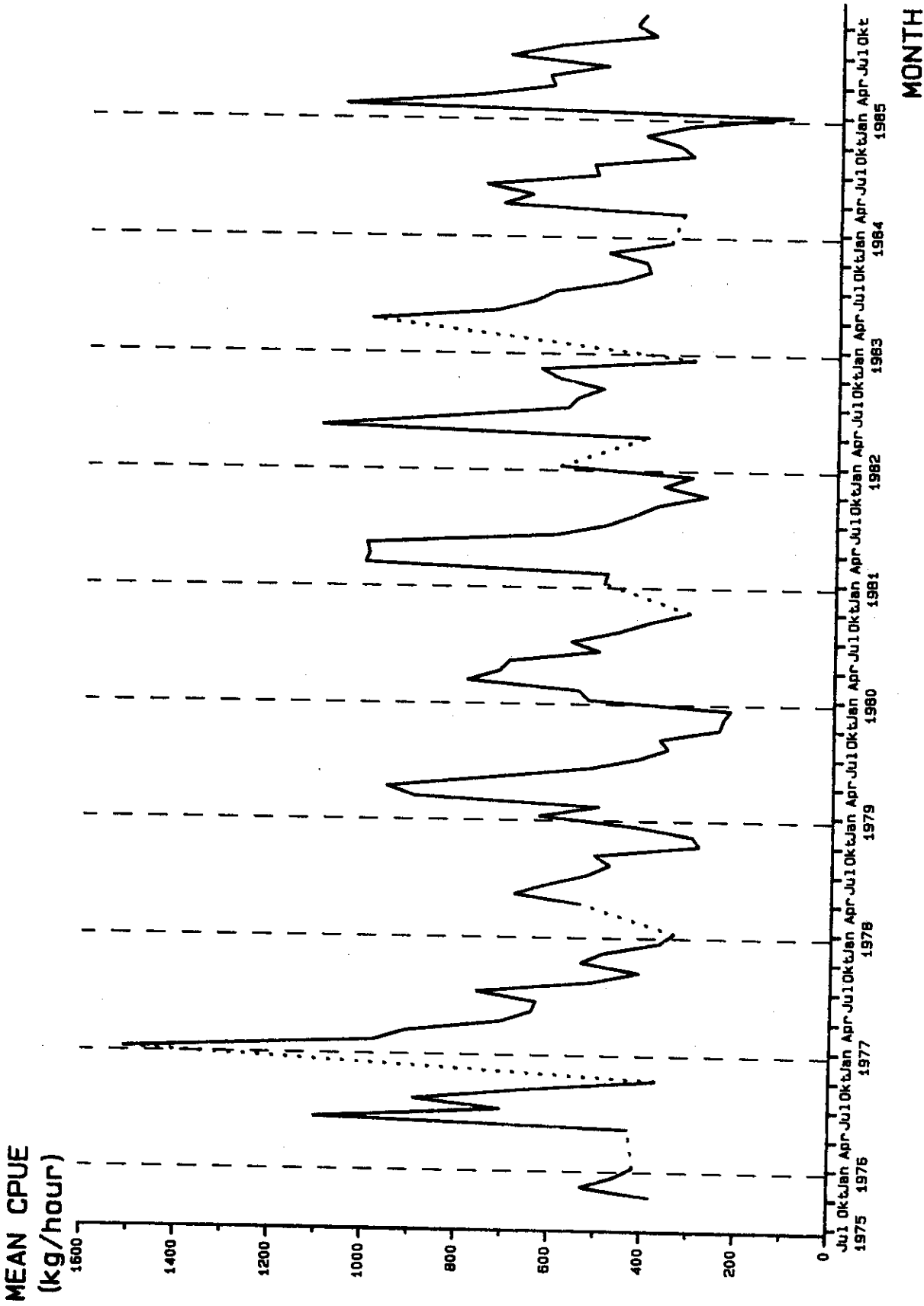


Figure 5. Monthly mean catch rate of shrimp (kg/hour) in NAFO Division 1B from October 1975 to November 1985 based on logbook information and landings from seven trawlers (630-722 GRT) of the Royal Greenland Trade Department (corresponding no. of hours trawled are given in Table 3).

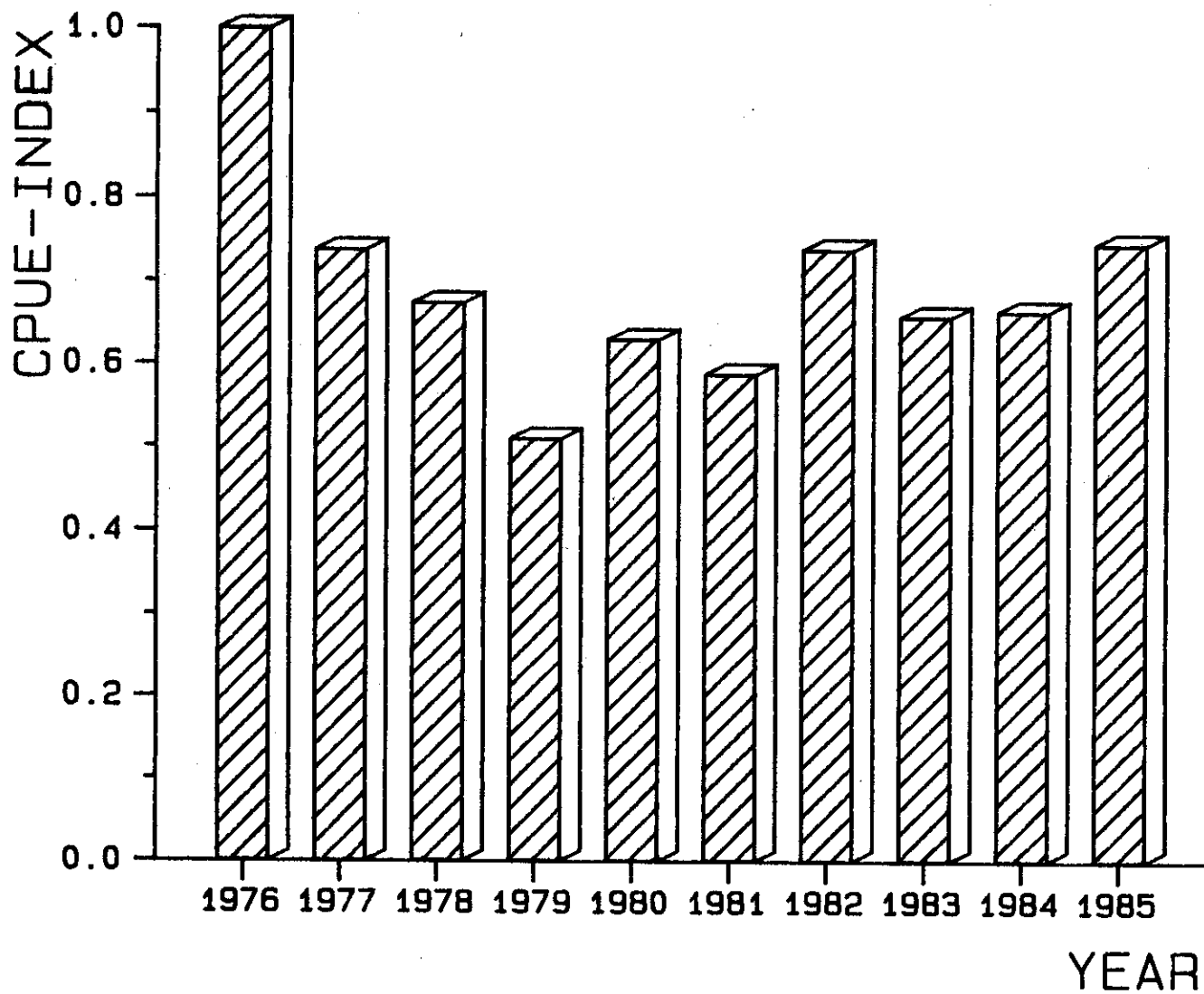


Figure 6. Indices of mean catch rates for the period July-September by year in NAFO Divison 1B from 1976 to 1985, based on logbook information and landings of seven trawlers (630-722 GRT) of the Royal Greenland Trade Department. Indices are calculated relative to the mean catch rate for the period in 1976.

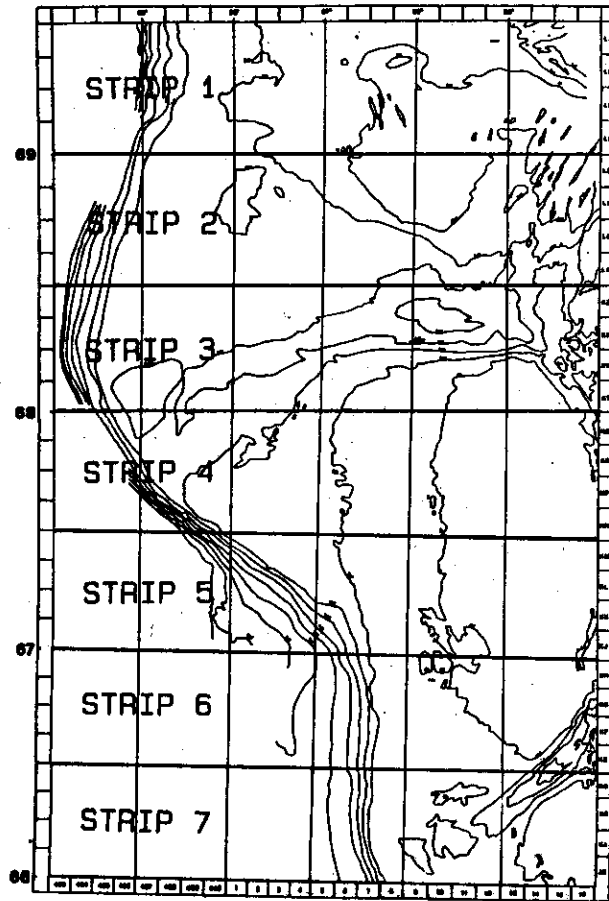


Figure 7. Map showing block-strips used in Figure 8.

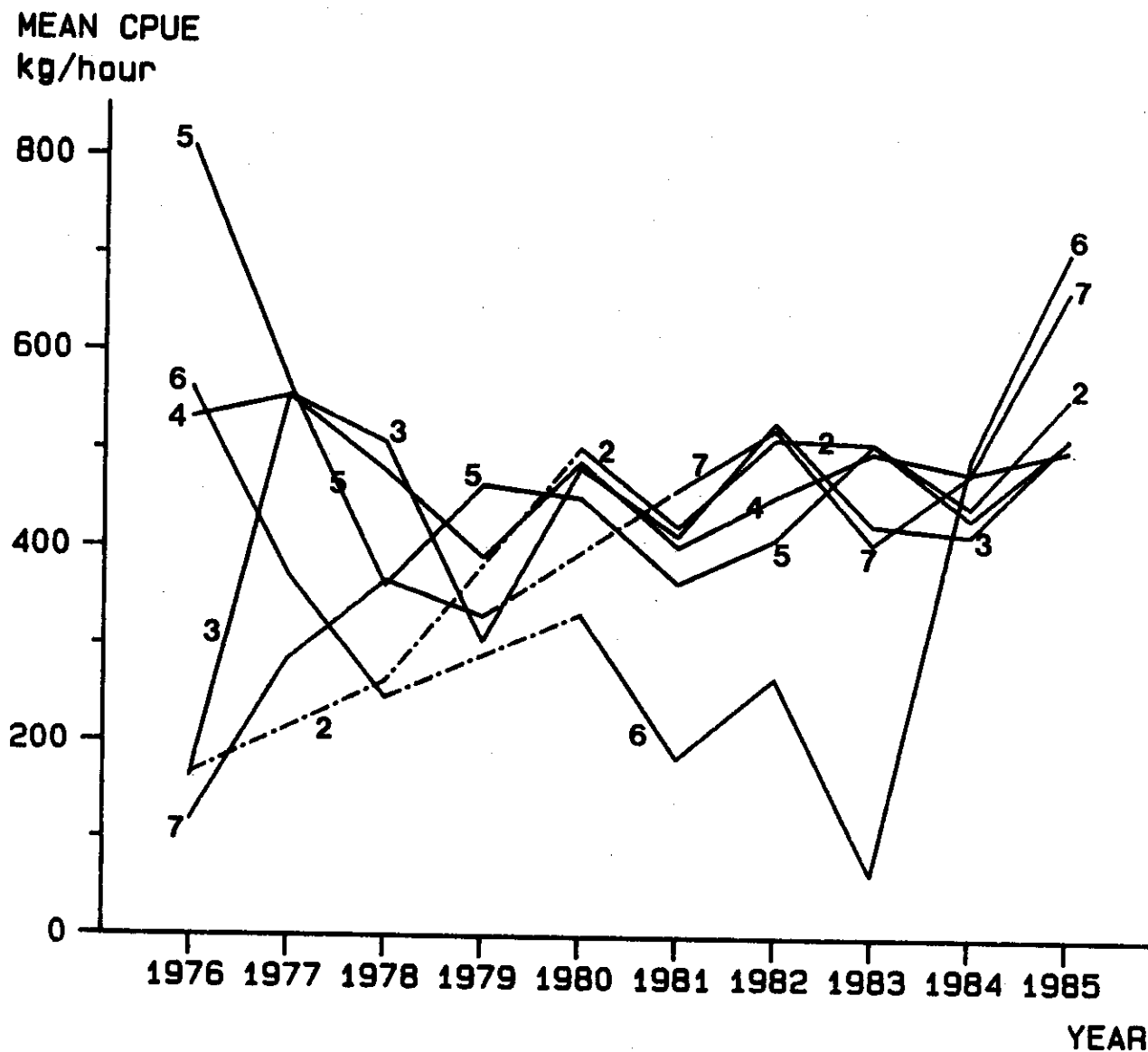


Figure 8. Mean catch rates (kg/hour) of shrimp for the period July-September in block-strips in NAFO Division 1 from 1976 to 1985, based on logbook information from eight trawlers (473-722 GRT) of the Royal Greenland Trade Department. Curve no.s refer to blockstrips shown in Fig. 7.

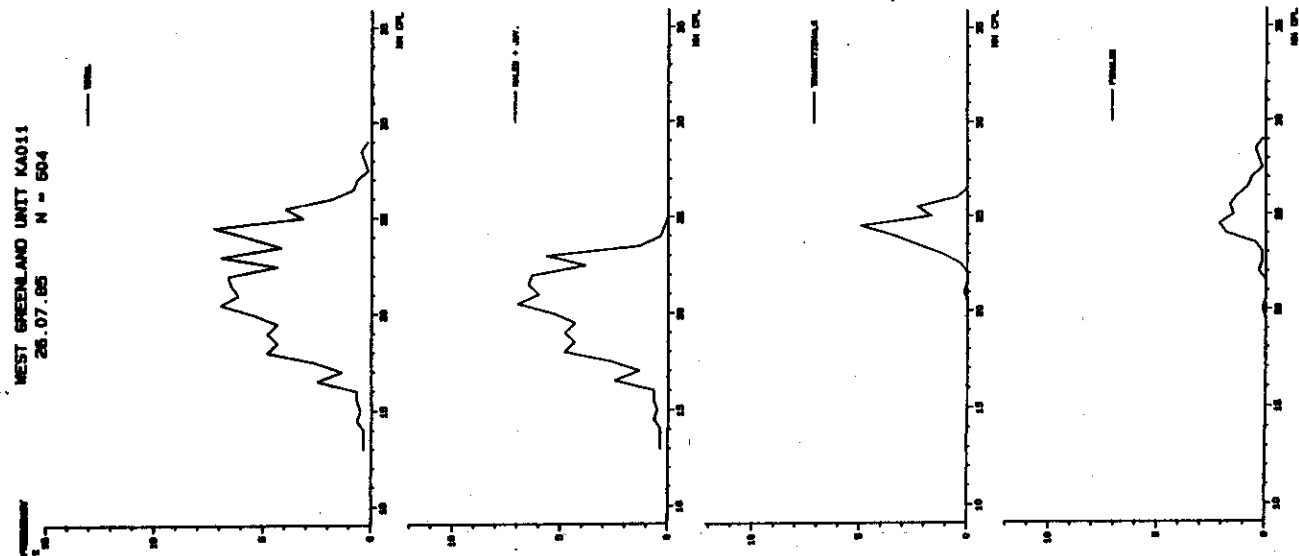


Figure 9. Length-frequency distribution of *P. borealis* in a research shrimp sample from statistical unit KA011 in July 1985.

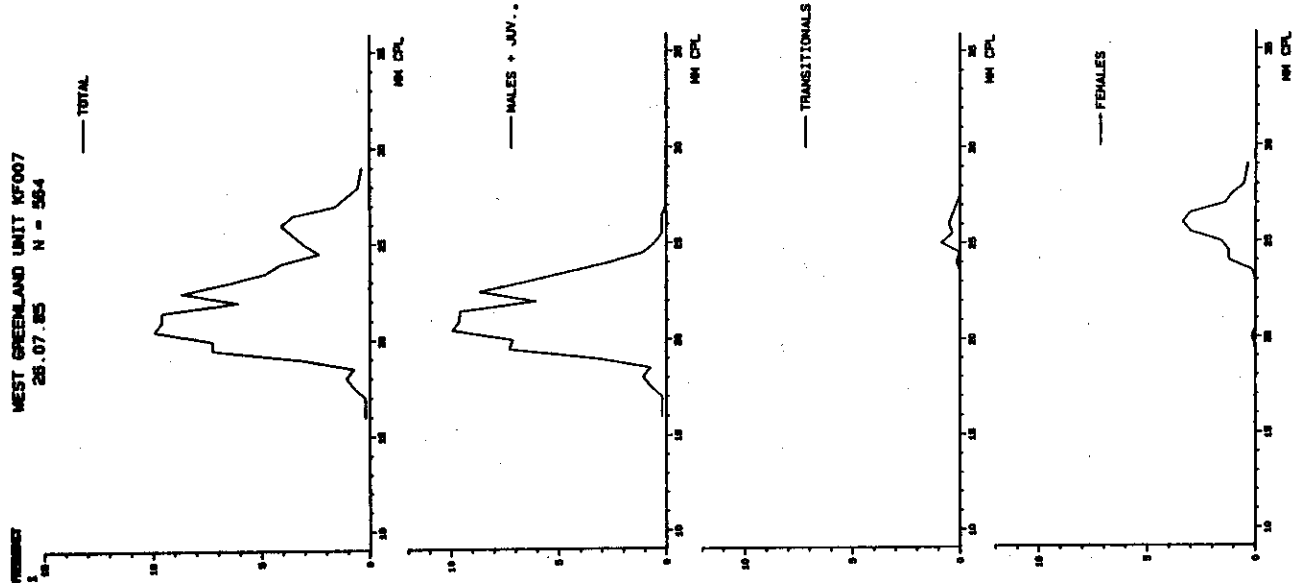


Figure 10. Length-frequency distribution of *P. borealis* in a research shrimp sample from statistical unit KP007 in July 1985.

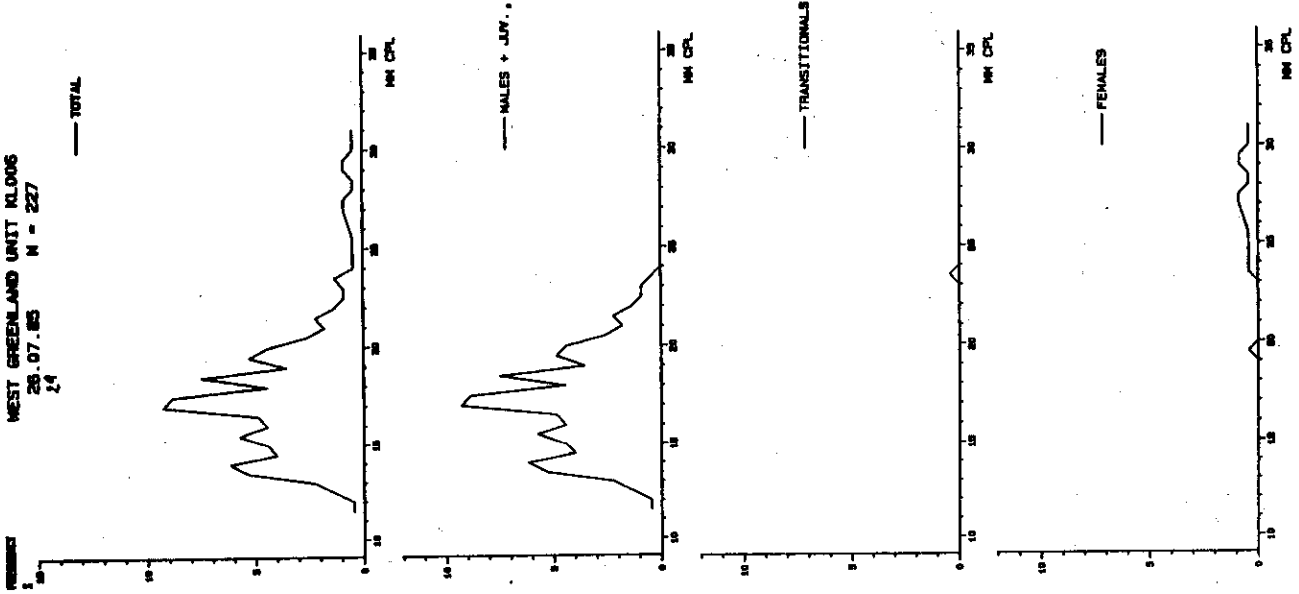


Figure 11. Length-frequency distribution of *P. borealis* in a research shrimp sample from statistical unit KL006 in July 1985.

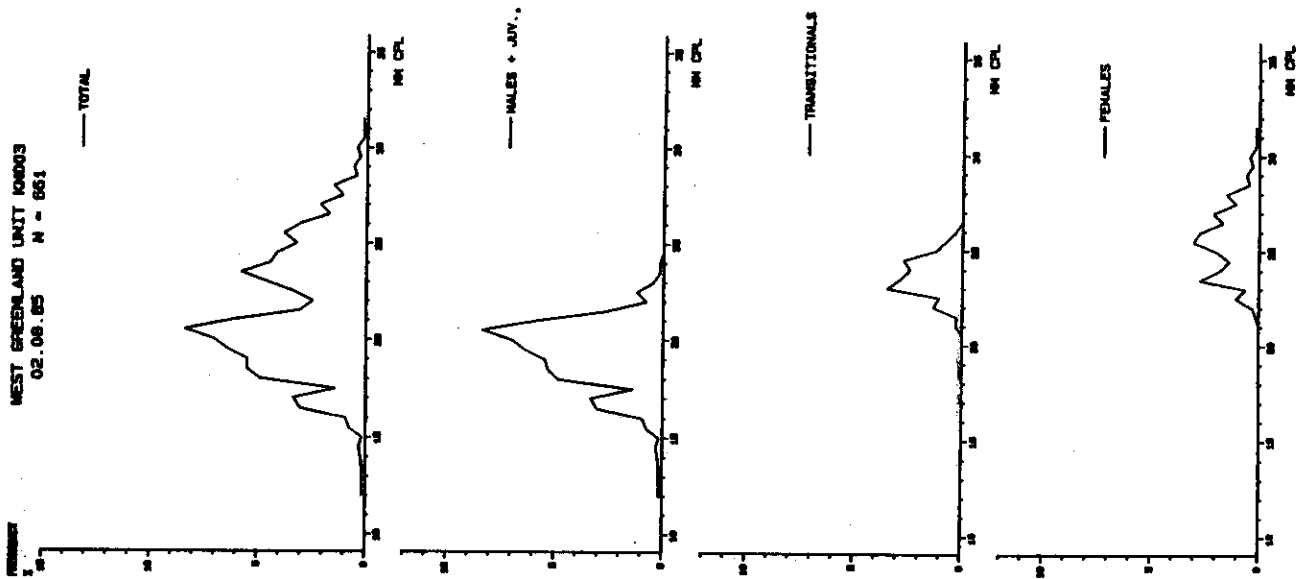


Figure 12. Length-frequency distribution of P. borealis in a research shrimp sample from statistical unit KN003 in August 1985.

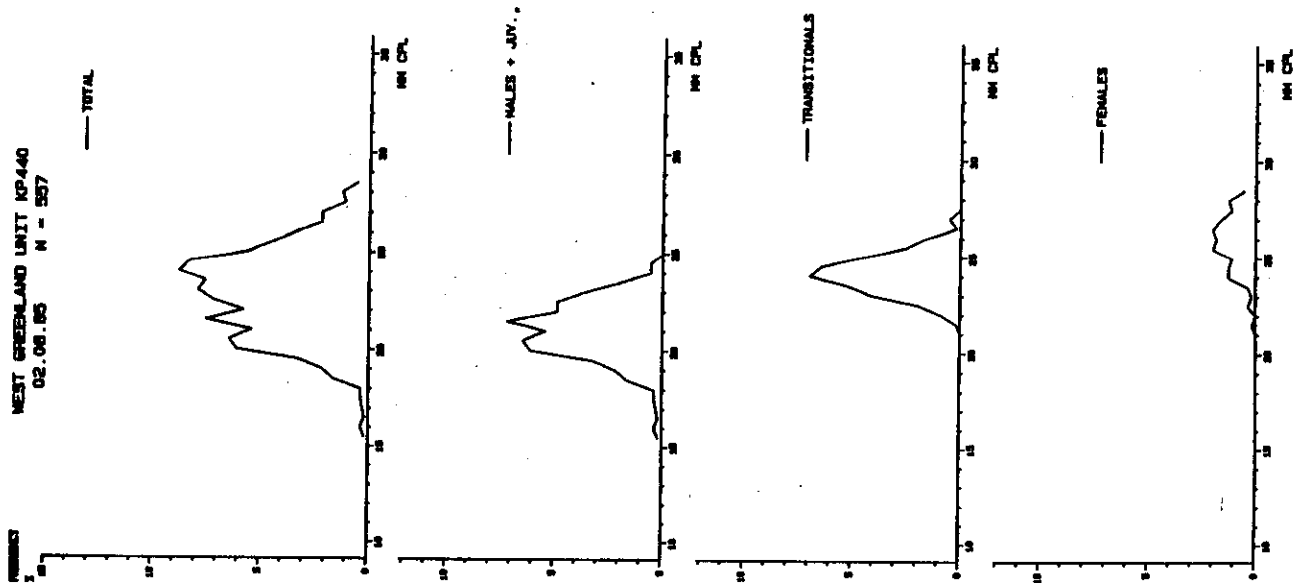


Figure 13. Length-frequency distribution of P. borealis in a research shrimp sample from statistical unit KP440 in August 1985.

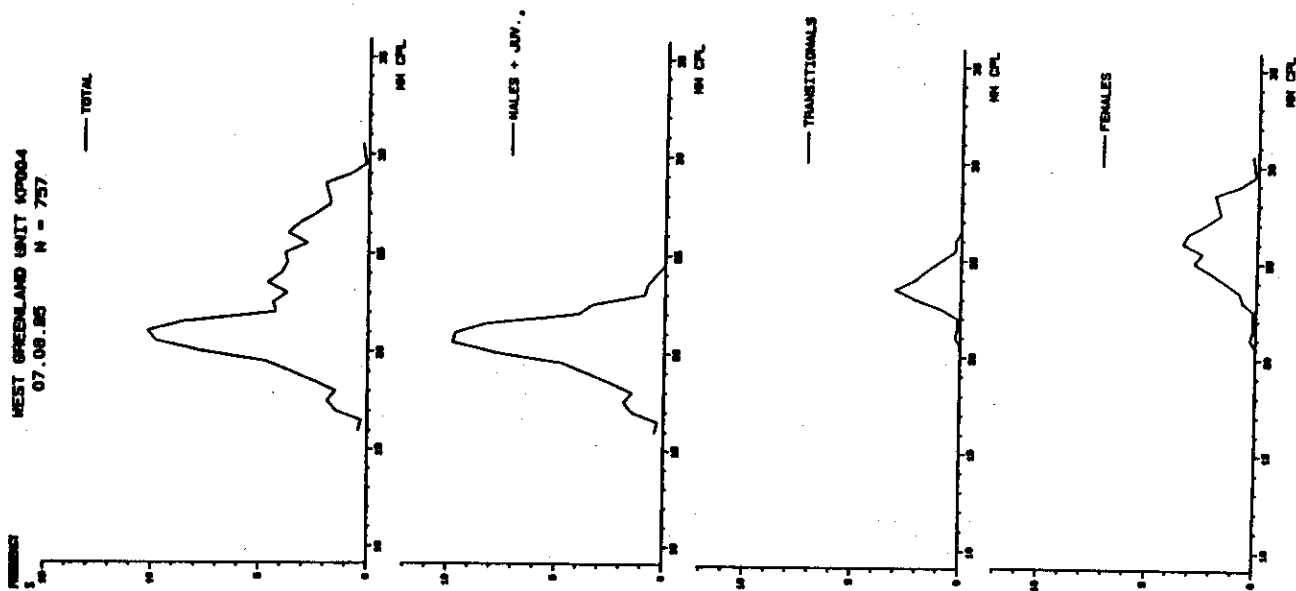


Figure 14. Length-frequency distribution of P. borealis in a research shrimp sample from statistical unit KP004 in August 1985.

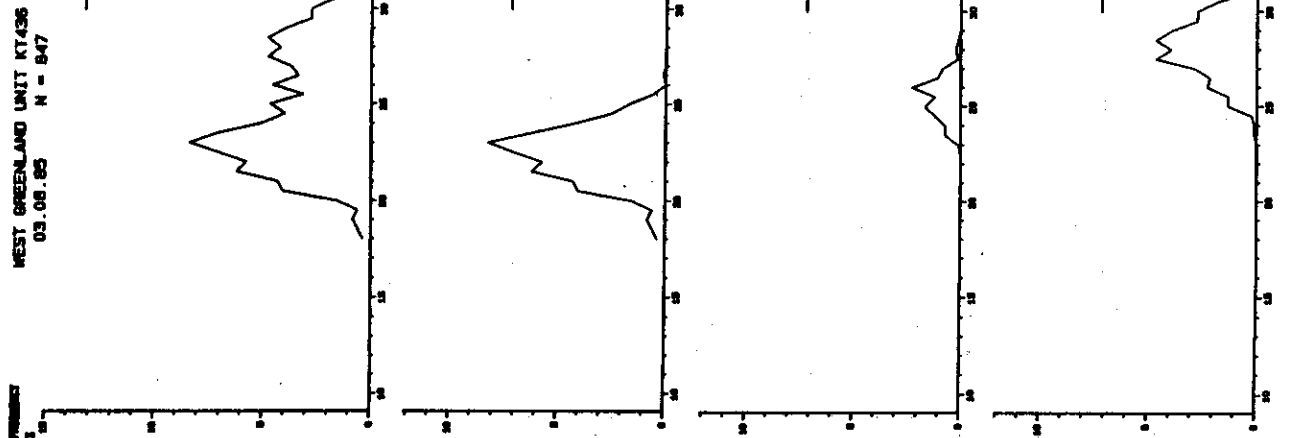


Figure 15. Length-frequency distribution of *P. borealis* in a research shrimp sample from statistical unit KT436 in August 1985.

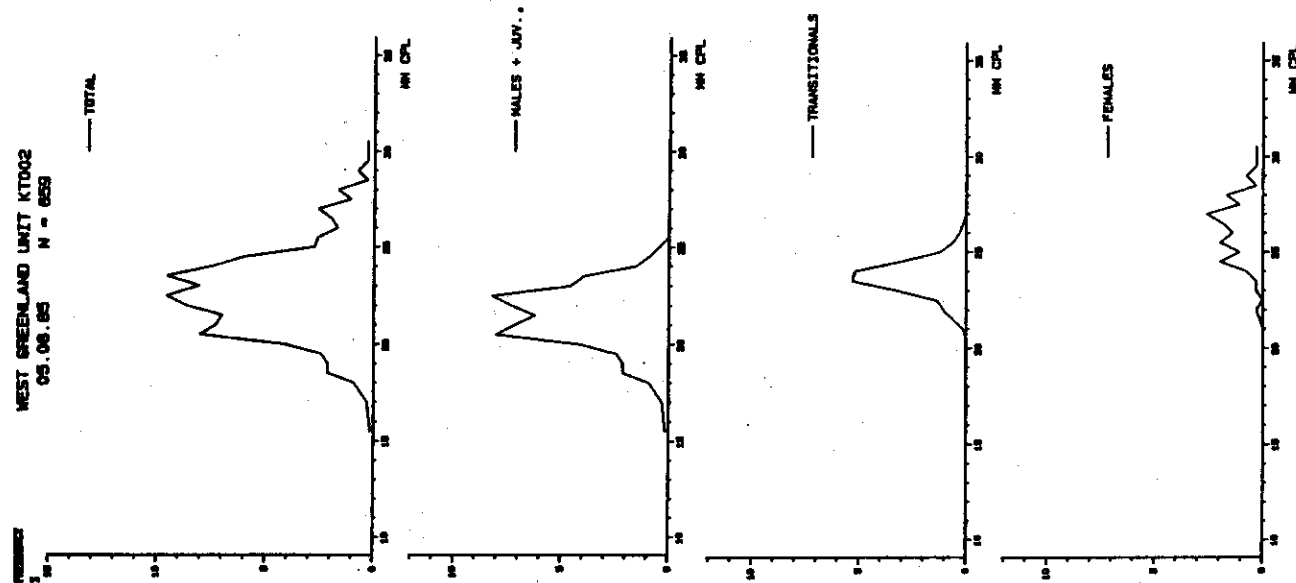


Figure 16. Length-frequency distribution of *P. borealis* in a research shrimp sample from statistical unit KT002 in August 1985.

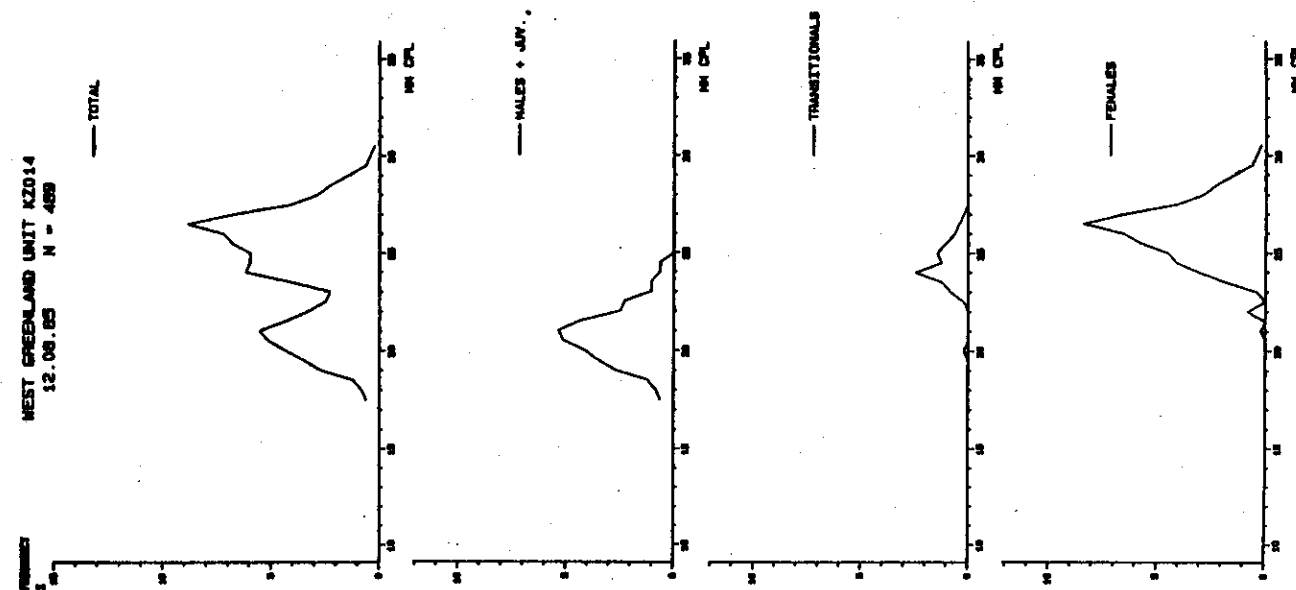


Figure 17. Length-frequency distribution of *P. borealis* in a research shrimp sample from statistical unit KZ014 in August 1985.

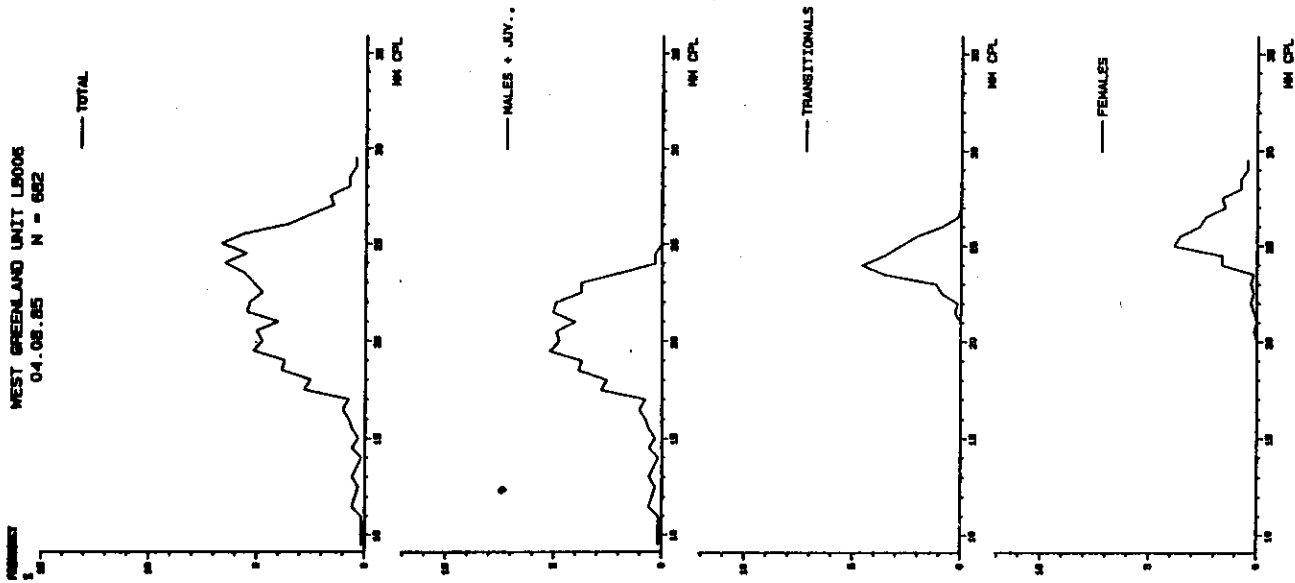


Figure 18. Length-frequency distribution of *P. borealis* in a research shrimp sample from statistical unit LB006 in August 1985.

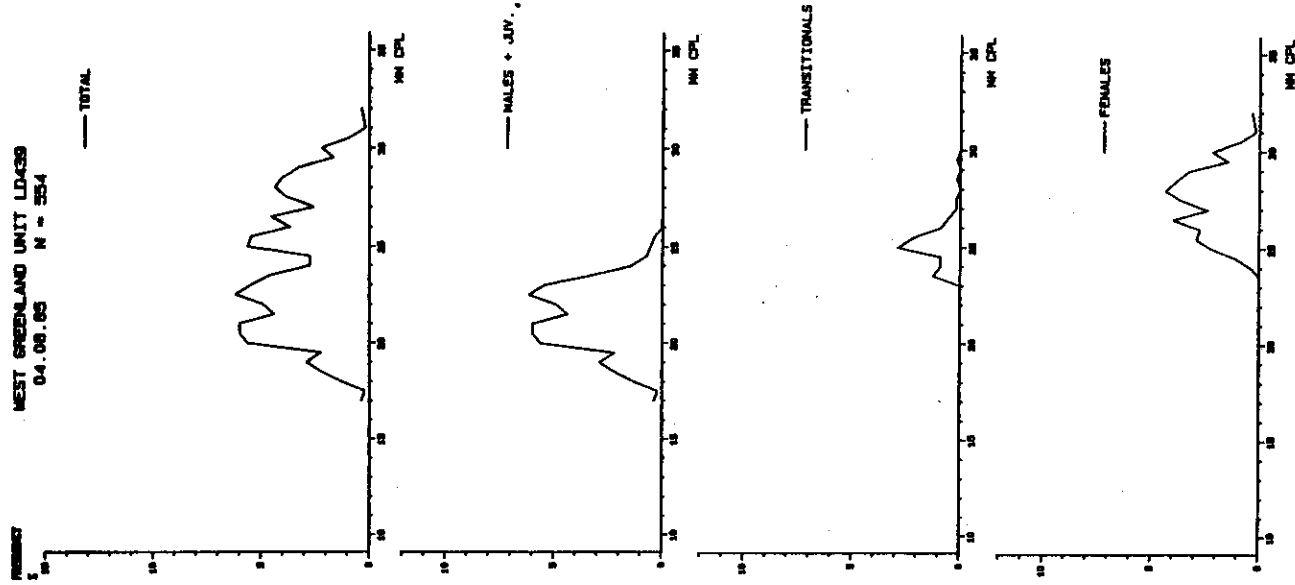


Figure 19. Length-frequency distribution of *P. borealis* in a research shrimp sample from statistical unit LD439 in August 1985.

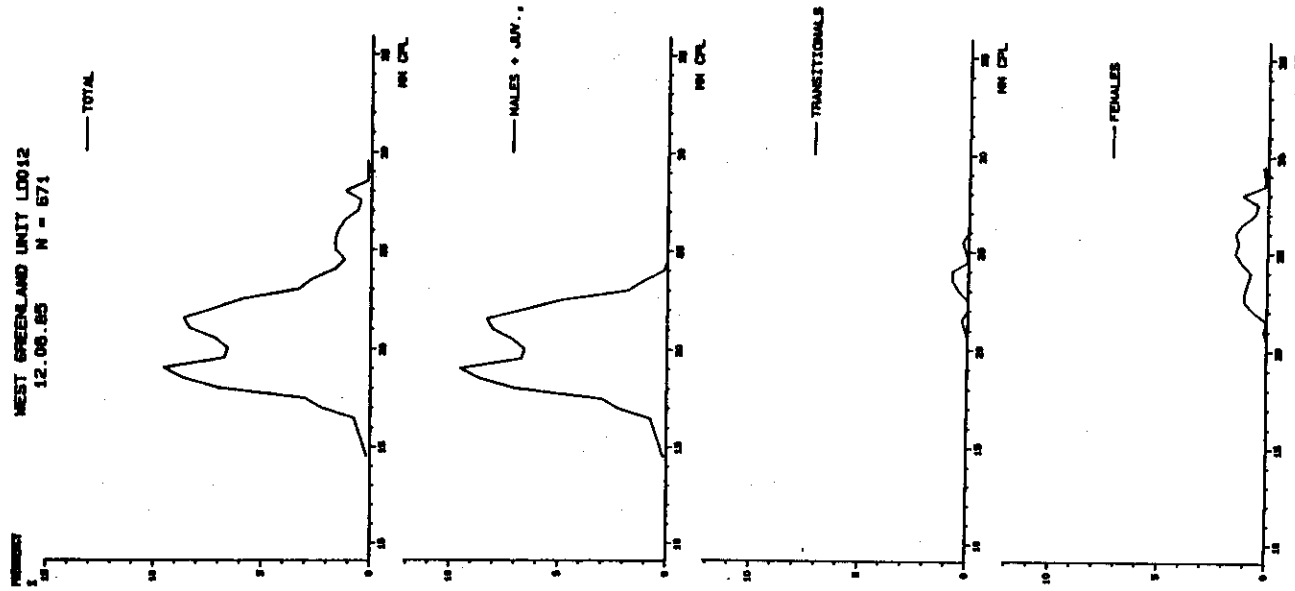


Figure 20. Length-frequency distribution of *P. borealis* in a research shrimp sample from statistical unit LD012 in August 1985.