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Report on a Stratified-Random Trawl Survey for shrimp
(*Pandalus borealis*) in ICES Division XIVb in 1990

by

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INTRODUCTION

In accordance with recommendations by NAFO a stratified-random trawl survey was carried out in August-September 1990 in Denmark Strait, ICES Subarea XIVb to determine the distribution and abundance of the shrimp stock at that time of the year.

In 1989, a similar trawl survey was carried out by Greenland to estimate the female component of the Denmark Strait shrimp stock (Lehmann & Kanneworff, 1990). Following conclusions from the 1989-survey it was decided that the present trawl survey should cover the total supposed distribution area for the stock.

Norwegian surveys have been carried out during the period 1983-1989, but this survey series was discontinued from 1990. The Norwegian surveys include most of the supposed stock distribution area, and the present survey was therefore planned to cover roughly the same area as the Norwegian survey area.

August-September was chosen as the survey period since this period is normally the best to avoid ice cover and bad weather in the area. Furthermore, the Norwegian surveys also did cover this season, and a direct comparison between the Norwegian surveys and the present would then be facilitated.

The survey was carried out from August 16 to September 12, 1990 with the Royal Greenland owned trawler MANITSOQ (722 GRT). The scientific staff was Klaus M. Lehmann, Jens P. Jeppesen and Kunuk Kloster. The weather and ice conditions were favorable during the survey period, and all planned fishing operations could be carried out. Icelandic authorities kindly granted permission to carry out research in Icelandic economic zone.

MATERIAL AND METHODS

The survey area covered the offshore part of Denmark Strait between 65°N and 68°N, bordered to the east by the 600 meters depth contour line (Fig. 1).

The trawling gear used was a SKJERVOY-type shrimp trawl, size 3300 meshes (20 mm), equipped with bobbin gear and a double-bag with 44 mm mesh size (stretched) in the codend. The trawl doors were of the type PERFECT.

The duration of hauls was held as close as possible to 60 minutes. To calculate the area swept by the trawl a mean distance of 26.5 meters between wings was used (measured by means of SCANMAR equipment). The length of the trawl track was estimated by calculating the distance between the setting and hauling positions for each trawl haul.

Due the uncertainties about the depth contour lines in available sea charts the survey area was stratified on basis of geographical latitudes and longitudes in a 30*60 minutes grid (Fig. 1). It was estimated that within the given time period about 100 hauls could be taken (4-5 trawl hauls per day), leaving three hauls per stratum. Each haul would then represent about 820 km² at average. The actual size of the strata is shown in Table 1.

The positions of the trawling sites were chosen at random inside each stratum (Fig. 2). Except for a few stations in the southeastern and southern part, which were skipped due to time constraint, all planned stations were occupied during the survey (in total 99). A low number of prechosen positions had to be adjusted due to bottom conditions. The trawl was slightly damaged at one station only.

For each stratum a mean biomass estimate was calculated, using the swept area method.

From all shrimp catches a biological sample was obtained. However, as many of the catches were extremely low, only few of these samples contained a sufficient number of individuals for describing the composition of the stock.

RESULTS AND DISCUSSION

Catches in all trawl hauls are tabulated in Table 2. The shrimp catch was extremely low in practically all hauls with a complete absence of shrimp at the major part of the stations. At the same time information from the commercial shrimp fishery exhibits very low catch rates and little fishing interest (low effort spent) for the East Greenland area (Carlsson & Kannevorff, 1991a).

The biomass estimate (Table 3) for the total area of only 1860 tons is, however, an obvious underestimate when compared to the fishery during the months following the survey period, unless a massive migration during the period of survey into the area is supposed, or shrimp by some other reason were not available to the gear. Up to the time of the survey the commercial fishery had taken about 7,800 tons in the East Greenland area, totalling about 10,000 tons by the end of the year.

An underestimate due to the survey technique can possibly be excluded in that the survey was carried out with the same gear and vessel and in direct continuation of a trawl survey off West Greenland, offering realistic levels of the biomass estimates (Carlsson & Kannevorff, 1991b). It is conceivable, however, that the expected distribution of the shrimp stock in Denmark Strait at the time of the survey did not agree with the actual distribution. Further, for some reason the stock might have been unavailable to the gear used, i.e. above or below the trawl.

Norwegian surveys during the period 1985-89 (Smedstad, 1989) indicate a consistently larger biomass of the shrimp stock (varying between 25 and 50 thousand tons) than does the present survey. This stock level seems more realistic compared to the fishery during the same years, but as only 50-70 trawling operations were carried out per year each of one nautical mile's length in this vast area and with a relatively small trawl (1800 mesh/20 mm) the sampling might have involved very high statistical variances. Furthermore, the station grid has been more or less fixed from year to year due to problems with bottom condition. By this special sites may have been selected with higher shrimp abundance than average for the stratum.

The main species in the by-catch were Greenland halibut and redfish (Table 2), however, all catches were extremely low.

CONCLUSION

The low trawlable biomass estimate compared to the commercial fishery and to the earlier conducted Norwegian surveys indicates that in 1990 it was not possible to estimate the shrimp biomass at that time of the year and with the method used. Unfortunately, this time of the year is optimal with respect to environmental conditions to cover the total supposed distribution area of the shrimp stock.

It is obvious that another design or other methods should be applied in the future to assess the stock in Denmark Strait.

REFERENCES

- Lehmann, K. M., and P. Kanneworff. 1990. Report on a Stratified-Random Trawl Survey for Shrimp (*Pandalus borealis*) in ICES Subarea XIVb. NAFO SCR Doc., No. 58. Serial No. N1779.
- Carlsson, D. M., and P. Kanneworff. 1991a. The commercial shrimp fishery in Denmark Strait in 1990 and early in 1991. NAFO SCR Doc., No. 53, Serial No. N1936 .
- Carlsson, D. M., and P. Kanneworff. 1991b. Report of a stratified-random trawl survey for shrimp (*Pandalus borealis*) in NAFO Subarea 0+1 in July-August 1990, and a comparison with earlier surveys. NAFO SCR Doc., No. 70, Serial No. N1954.
- Smedstad, O. M.. 1990. Preliminary Report of a Cruise with M/T HAAKOY-II to East Greenland Waters in September 1989. NAFO SCR Doc., No. 12. Serial No. N1724.

Table 1. Strata in the Denmark Strait survey and their area in km². The stratum numbers correspond to Fig. 2 for the Greenland economic zone. To all stratum numbers in the Iceland economic zone 50 have been added.

Stratum number	Area
1-5	2338
6-10	2387
11	1262
12-15	2437
16	2402
17	1201
18	70
19-22	2487
23	2379
24	512
27-31	2536
32	1400
34-35	2585
61	34
67	1236
68	1358
74	1975
75	2273
76	658
82	606
83	884

Table 2a. List of hauls in the trawl survey in Denmark Strait 1990. Catches are given in kg. For area codes, see Fig. 1.

STATION- IDENTIFICATION	AREA- CODE	DEPTH	TR- TIME	SHR	COD	GHL	RED	MIX	TOTAL

STRATUM 1									
90MA0200043	001 KN109	499.0	60	1	0	2	0	0	3
90MA0200046	019 KN111	219.5	60	1	0	0	0	0	1
90MA0200044	002 KP110	388.5	60	0	0	1	0	0	1
90MA0200048	003 KR112	360.0	60	1	0	0	0	0	1

STRATUM 2									
90MA0200047	006 KP113	304.5	60	0	0	0	0	0	0
90MA0200049	005 KR116	275.5	60	0	0	0	0	0	0
90MA0200050	004 KR116	277.5	60	0	0	0	0	0	0

STRATUM 3									
90MA0200059	009 KN119	289.0	60	0	0	0	0	7	7
90MA0200051	008 KR118	252.0	60	0	0	0	0	0	0

STRATUM 4									
90MA0200057	011 KN121	290.5	60	0	0	0	0	6	6
90MA0200056	007 KP121	276.5	60	0	0	1	0	0	1
90MA0200053	012 KR121	245.0	60	0	0	0	0	1	1
90MA0200052	010 KS121	258.5	60	0	0	0	0	1	1

STRATUM 5									
90MA0200079	015 KN128	464.0	60	0	0	0	0	0	0
90MA0200054	014 KR126	283.5	60	0	0	0	0	0	0
90MA0200055	013 KR126	353.0	60	0	0	0	0	0	0

STRATUM 6									
90MA0200040	018 KK106	410.0	60	1	0	0	0	1	1
90MA0200041	017 KL106	526.0	60	0	0	0	0	0	1
90MA0200042	016 KM107	406.0	60	0	0	0	0	0	0

STRATUM 7									
90MA0200039	021 KJ110	653.0	60	0	0	0	0	0	0
90MA0200038	041 KJ111	362.5	60	1	0	0	0	0	1
90MA0200045	020 KM111	288.0	60	176	0	0	0	1	177

STRATUM 8									
90MA0200064	022 KJ115	268.5	60	0	0	0	0	0	0
90MA0200065	023 KJ115	283.5	60	0	0	0	0	0	0
90MA0200063	110 KK113	199.0	60	0	0	0	0	0	0
90MA0200066	024 KL115	211.0	60	0	0	0	0	0	0

STRATUM 9									
90MA0200077	026 KJ119	346.5	60	1	0	0	0	0	1
90MA0200062	112 KL117	283.0	60	0	0	0	0	0	0
90MA0200061	027 KL118	266.5	60	0	0	0	0	0	0
90MA0200060	025 KM119	282.0	60	0	0	0	0	3	3

Table 2b. List of hauls in the trawl survey in Denmark Strait 1990. Catches are given in kg. For area codes, see Fig. 1.

STATION- IDENTIFICATION	AREA- CODE	DEPTH	TR- TIME	SHR	COD	GHL	RED	MIX	TOTAL
STRATUM 10									
90MA0200078	029 KK122	349.0	60	0	0	0	0	0	0
90MA0200058	028 KM121	303.0	60	0	0	0	0	0	0
STRATUM 11									
90MA0200080	032 KL127	564.0	60	0	0	10	0	2	12
STRATUM 12									
90MA0200031	035 KE103	357.5	60	0	0	4	0	0	5
90MA0200030	036 KG103	360.0	60	0	0	0	0	0	0
STRATUM 13									
90MA0200028	039 KE106	307.5	60	1	0	0	0	0	1
90MA0200029	038 KF107	402.5	60	1	0	0	0	0	1
90MA0200035	037 KH108	399.5	60	0	0	0	0	0	0
STRATUM 14									
90MA0200036	042 KH109	595.5	60	0	0	0	0	1	1
90MA0200037	040 KH111	374.0	60	1	0	1	0	0	2
STRATUM 15									
90MA0200069	045 KE116	324.0	60	7	0	0	0	0	7
90MA0200067	043 KF113	322.0	60	0	0	0	0	2	2
90MA0200068	044 KF114	328.5	60	0	0	0	0	2	2
STRATUM 16									
90MA0200073	048 KF120	310.5	60	57	0	0	0	3	60
90MA0200074	047 KF120	344.0	60	2	0	0	0	1	3
90MA0200076	046 KG119	335.5	60	4	0	0	0	0	4
90MA0200075	051 KG120	354.5	60	1	0	0	0	0	1
STRATUM 17									
90MA0200082	049 KH123	379.0	60	0	0	0	0	0	0
STRATUM 18									
90MA0200081	031 KH125	400.5	60	0	0	1	0	0	1
STRATUM 19									
90MA0200033	056 KB098	273.5	60	0	0	0	0	0	0
90MA0200034	057 KD097	291.5	60	0	0	0	0	0	0
STRATUM 20									
90MA0200004	060 KA102	285.5	55	3	0	0	0	0	3
90MA0200005	059 KA103	291.5	60	1	0	0	0	0	1
90MA0200006	058 KA103	272.5	60	0	0	0	0	0	0
90MA0200032	034 KD101	325.0	60	0	0	0	0	0	0

Table 2c. List of hauls in the trawl survey in Denmark Strait 1990. Catches are given in kg. For area codes, see Fig. 1.

STATION- IDENTIFICATION	AREA- CODE	DEPTH	TR- TIME	SHR	COD	GHL	RED	MIX	TOTAL

STRATUM 21									
90MA0200026	063 KB106	329.0	60	1	0	0	0	0	1
90MA0200025	062 KB108	432.0	60	0	0	0	0	0	0
90MA0200027	061 KD105	322.0	60	0	0	0	0	0	0

STRATUM 22									
90MA0200023	065 JZ110	510.5	60	0	0	0	0	0	0
90MA0200022	064 KA111	474.0	60	0	0	0	0	0	0
90MA0200024	066 KD109	402.0	60	0	0	0	0	0	0

STRATUM 23									
90MA0200070	068 KD114	318.0	60	0	0	0	0	0	1
90MA0200072	070 KD115	326.5	60	0	0	0	0	2	2

STRATUM 24									
90MA0200071	067 KD117	327.0	60	31	0	2	0	2	34

STRATUM 27									
90MA0200009	081 JS093	299.5	60	0	0	0	0	0	0
90MA0200010	079 JS093	343.0	60	0	0	0	0	0	0

STRATUM 28									
90MA0200015	107 JS100	282.0	60	0	0	0	0	2	2
90MA0200014	084 JT098	308.0	60	0	0	0	0	1	1

STRATUM 29									
90MA0200016	087 JS102	316.5	60	0	0	0	0	0	0
90MA0200017	085 JT103	341.5	60	0	0	0	0	0	0
90MA0200008	086 JX103	275.0	60	1	0	0	0	0	1

STRATUM 30									
90MA0200100	090 JS108	387.5	60	0	0	0	0	0	0
90MA0200018	088 JT105	296.5	60	0	0	0	0	0	0
90MA0200007	089 JX105	295.0	60	0	0	0	0	1	1

STRATUM 31									
90MA0200101	091 JT109	398.5	60	1	0	0	1	0	2

STRATUM 32									
90MA0200020	069 JX114	302.0	60	0	0	0	0	0	0
90MA0200021	094 JX114	314.5	60	0	0	0	0	11	11
90MA0200019	095 JX115	306.5	60	0	0	0	0	0	0

STRATUM 34									
90MA0200001	102 JN092	275.0	60	0	0	0	0	0	0
90MA0200002	100 JP092	271.0	60	0	0	0	0	0	0

Table 2d. List of hauls in the trawl survey in Denmark Strait 1990. Catches are given in kg. For area codes, see Fig. 1.

STATION- IDENTIFICATION	AREA- CODE	DEPTH	TR- TIME	SHR	COD	GHL	RED	MIX	TOTAL
STRATUM 35									
90MA0200012	103 JN095	314.0	60	0	0	0	0	4	4
90MA0200013	106 JN096	257.5	60	0	0	0	0	0	0
90MA0200011	104 JP093	276.5	60	0	0	0	0	1	1
STRATUM 61									
90MA0200083	033 KJ126	500.5	60	0	0	0	0	0	0
STRATUM 67									
90MA0200092	050 KE123	411.5	60	6	5	5	0	4	19
STRATUM 68									
90MA0200086	054 KE126	521.0	60	0	0	0	0	1	1
90MA0200085	052 KG125	532.0	60	0	0	0	0	0	0
90MA0200084	053 KH125	490.5	60	0	0	0	0	0	0
STRATUM 74									
90MA0200093	071 JZ118	402.0	60	0	0	0	0	1	1
90MA0200095	072 JZ120	461.0	60	0	0	0	0	1	1
STRATUM 75									
90MA0200089	073 KA123	510.0	60	0	0	5	0	2	7
90MA0200090	075 KB122	453.5	60	0	0	0	0	1	1
90MA0200091	074 KD121	376.5	60	1	0	1	0	1	3
STRATUM 76									
90MA0200088	076 KB125	513.5	60	0	0	0	0	1	1
90MA0200087	077 KD125	521.5	60	0	6	9	0	0	15
STRATUM 82									
90MA0200099	096 JX116	378.5	60	0	0	0	2	3	4
STRATUM 83									
90MA0200098	098 JX117	411.5	60	0	0	0	0	0	0
90MA0200097	099 JX118	479.5	60	0	0	0	0	2	2
90MA0200096	097 JX119	498.0	60	0	0	0	0	1	1

Table 3a. Estimated trawlable biomass in all strata surveyed in Denmark Strait in 1990.

STRATUM	SQKM	BIOMASS IN STRATA					
		TONS	HAULS	STD	STDERR	MIN	MAX
1	2338	10.6	4	4.4	2.2	7	17
2	2338	0.0	3	0.0	0.0	0	0
3	2338	0.0	2	0.0	0.0	0	0
4	2338	0.0	4	0.0	0.0	0	0
5	2338	0.0	3	0.0	0.0	0	0
6	2387	4.4	3	3.9	2.3	0	7
7	2387	1220.9	3	2106.3	1216.1	0	3653
8	2387	0.4	4	0.8	0.4	0	2
9	2387	6.7	4	4.6	2.3	0	10
10	2387	0.0	2	0.0	0.0	0	0
11	1262	0.0	1	.	.	0	0
12	2437	4.3	2	6.1	4.3	0	9
13	2437	8.5	3	7.6	4.4	0	15
14	2437	12.8	2	13.6	9.6	3	22
15	2437	51.5	3	81.3	47.0	4	145
16	2402	279.7	4	474.3	237.2	21	991
17	1201	0.0	1	.	.	0	0
18	70	0.0	1	.	.	0	0
19	2487	0.0	2	0.0	0.0	0	0
20	2487	23.5	4	27.3	13.6	7	64
21	2487	7.6	3	7.5	4.4	0	15
22	2487	0.0	3	0.0	0.0	0	0
23	2379	10.0	2	1.9	1.3	9	11
24	512	140.1	1	.	.	140	140
27	2536	0.0	2	0.0	0.0	0	0

Table 3b. Estimated trawlable biomass in all strata surveyed in Denmark Strait in 1990.

STRATUM	SQKM	BIOMASS IN STRATA					
		TONS	HAULS	STD	STDERR	MIN	MAX
28	2536	0.0	2	0.0	0.0	0	0
29	2536	4.6	3	7.9	4.6	0	14
30	2536	1.9	3	1.6	1.0	0	3
31	2536	18.6	1	.	.	19	19
32	1400	0.0	3	0.0	0.0	0	0
34	2585	0.0	2	0.0	0.0	0	0
35	2585	0.0	3	0.0	0.0	0	0
61	34	0.0	1	.	.	0	0
67	1236	43.8	1	.	.	44	44
68	1358	0.0	3	0.0	0.0	0	0
74	1975	0.0	2	0.0	0.0	0	0
75	2273	9.7	3	16.7	9.7	0	29
76	658	0.3	2	0.4	0.3	0	1
82	606	0.0	1	.	.	0	0
83	884	0.0	3	0.0	0.0	0	0

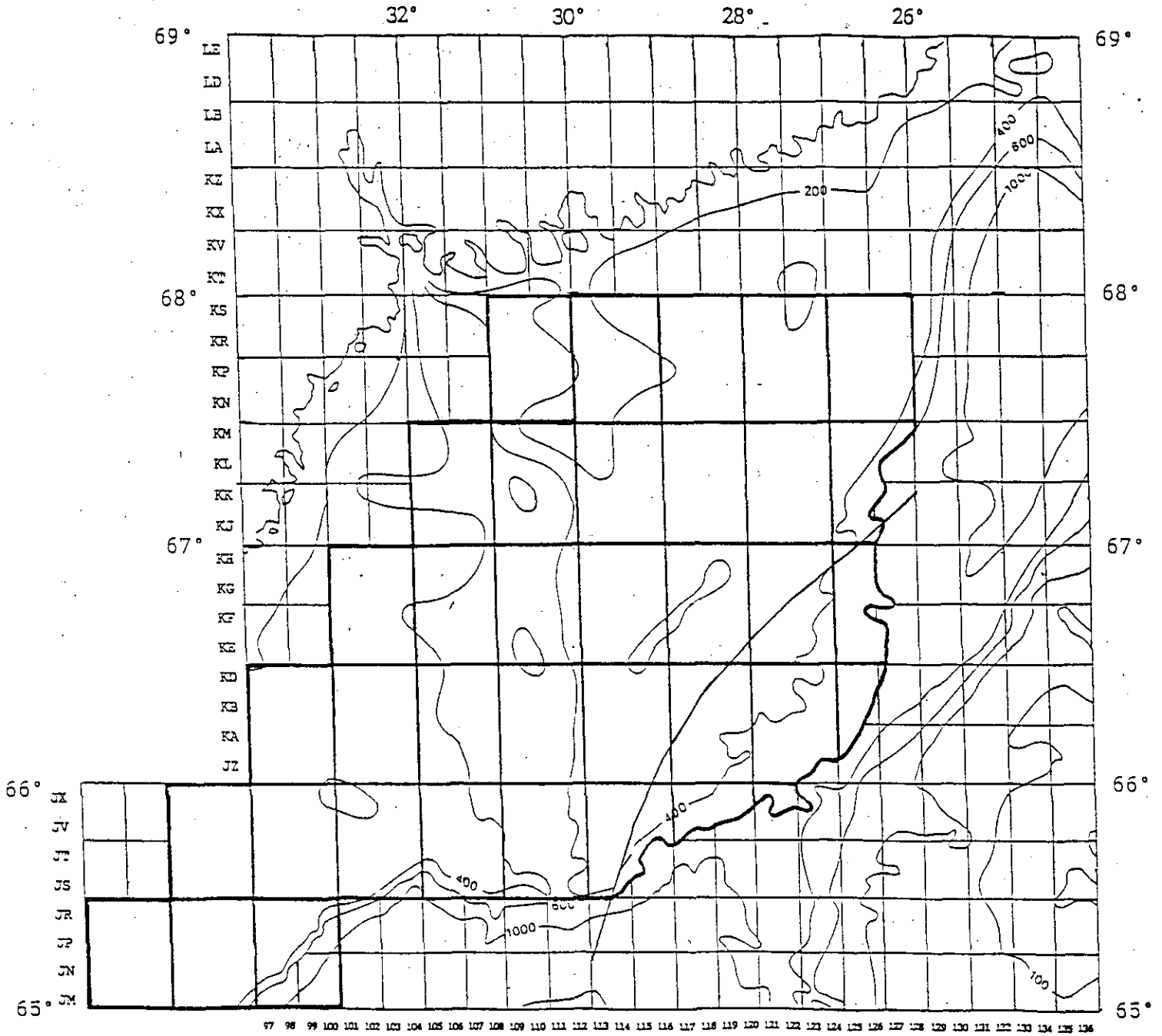


Fig. 1. Selected area for the stratified trawl survey in Denmark Strait in 1990.

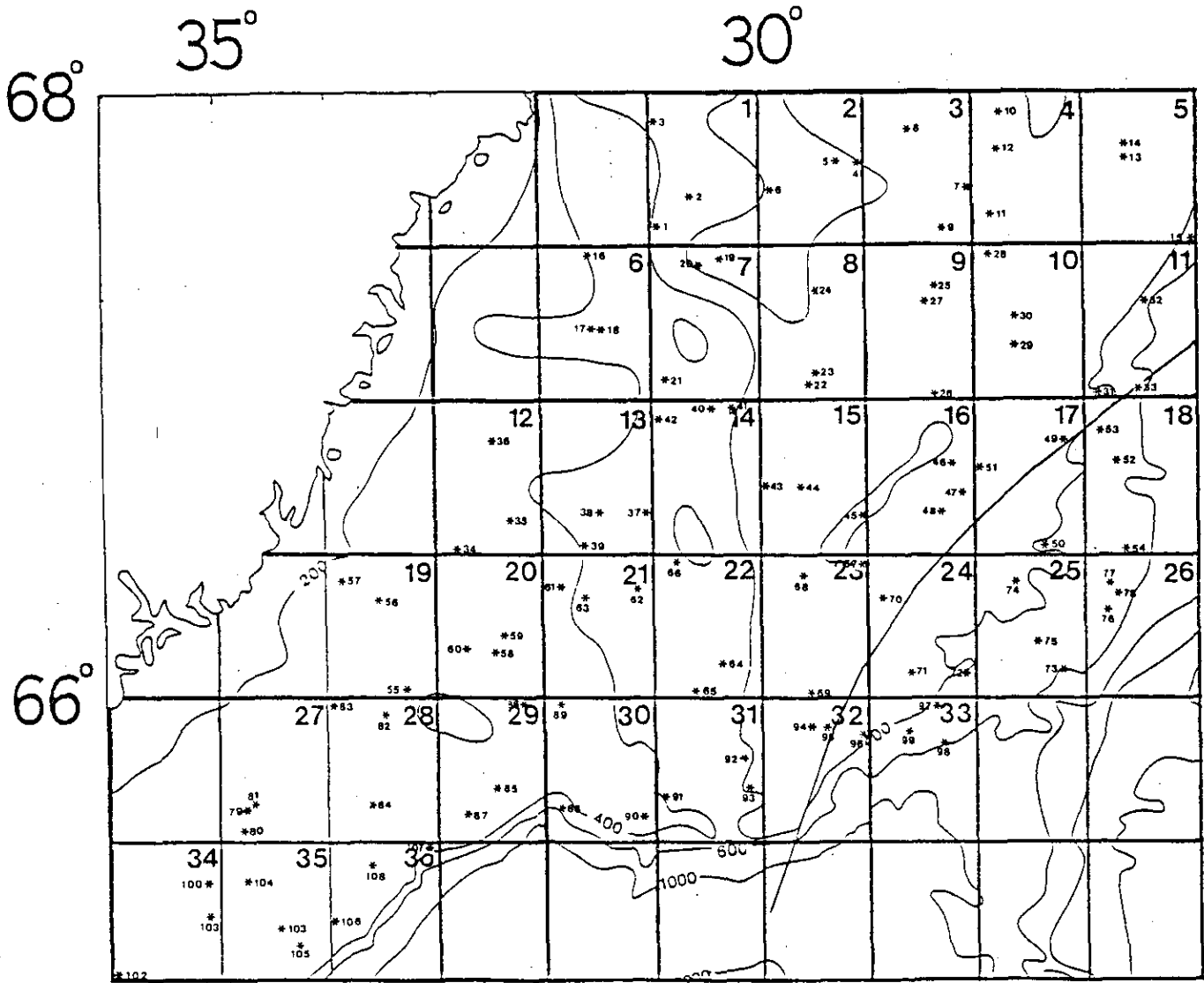


Fig. 2. Stratum numbers and planned trawl stations for the trawl survey in Denmark Strait in 1990.