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Report on a Stratified-random Trawl Survey for Shrimp (Pandalus borealis) in Inshore Areas West Greenland, NAFO Subarea 1, in 1991.

by

D.M. Carlsson, P. Kanneworff and K.H. Nygaard

Greenland Fisheries Research Institute
Tagensvej 135, 1.
DK-2200 Copenhagen N, Denmark

INTRODUCTION

Until the start of the offshore shrimp fishery in NAFO Subarea 1 around 1969 the inshore areas in the Disko Bay (NAFO Division 1A and 1B) contained the most important shrimp fishing grounds. As the fishery in these areas has been relatively stable since 1965 with catches from 5,000 to 8,000 tons of shrimp per year, the research effort of Greenland Fisheries Research Institute has been concentrated in the offshore areas. In recent years, however, yearly catches in the inshore areas have increased to about 14,000 tons, and it is felt necessary to evaluate the shrimp resources in these areas.

In September 1991 a stratified-random trawl survey was conducted in the inshore areas in Disko Bay and Vaigat. The survey, which was the first stratified-random trawl survey in inshore areas in Greenland, was carried out as a continuation of the West Greenland offshore shrimp survey, with the scope of assessing the minimum trawlable biomass and to collect biological samples for estimation of the size composition of the inshore stock component.

MATERIALS AND METHODS

The survey was carried out in the inshore area inside the 3-mile limit of Disko Bay and Vaigat between 68°42'N and 70°38'N in depths between 150 m and 600 m (Fig. 1).

The 722 GRT stern trawler M/TR PAAMIUT was used during the survey. This vessel is a sistership and of the same size as trawlers used since 1988 in Greenland offshore trawl surveys in Davis Strait (M/TR ELIAS KLEIST, M/TR SISIMIUT and M/TR MANIITSOQ).

As in the offshore surveys the trawl used was a Skjervoy 3000/20 with bobbin gear and a double-bag with 44 mm mesh size in the codend. The trawl doors used were of the "Perfect" type, and wing spread has been calculated from tank experiments and trawlpositioning systems (SCANMAR) to 27.7 m at average.

Due to changes in bottom topography over short distances in the area a trawling time of 30 minutes was chosen. The duration of the hauls was held as close as possible to this. In order to minimize the influence of vertical migration of shrimp the trawl operations were carried out only at day time (0900-1900 UTC).

Due to lack of reliable information on the distribution of depths it was not possible to stratify the area according to depth (as done in the major areas of the offshore surveys). The area was divided in nine strata based on knowledge on the distribution of the fishery, and the available no. of hauls was distributed between strata according to their relative areas. In each stratum trawl positions were drawn randomly. Figure 1 shows strata and fishing locations.

The catch from each station was sorted and the weight was recorded by species. When time allowed length samples were measured for the dominant by-catch species.

For each station a shrimp biomass estimate for the actual stratum was calculated by means of the swept area method. On the basis of these, a mean estimate for each stratum together with standard deviations of the means were calculated. Further a pooled standard deviation for the whole area was derived.

Biological samples were taken from all catches, if the catch was not too small or damaged to yield a proper sample. Shrimps were sorted by sexual characteristics and obligue carapace length were measured to the nearest .1 mm.

RESULTS

A total of 47 hauls were taken, but due to trawl damage during the survey, a cod-

end with a 20 mm mesh size was by mistake used for seven of these. To make direct comparisons possible these seven hauls and two hauls with hold (duration less than 20 min.) were disregarded, giving a total of 38 valid sets used in the calculations.

Shrimp catches from the trawl hauls were used to estimate the trawlable biomass for all strata. Catches from all valid sets are shown in Table 1, and the estimated biomasses and densities by stratum are given in Table 2.

Length frequency distributions were pooled by stratum weighted by catch (Table 4a-i, Fig. 2a-b), and a mean distribution for the total area was obtained by pooling after weighting by stratum biomass (Table 5, Fig. 3).

Biomass estimates and length distributions of by-catch fish species are described elsewhere (Pedersen and Nygård, 1992).

DISCUSSION

A total biomass of shrimp of 44,804 (+/- 20,358) tons was estimated for the whole area. As the present survey was the first inshore stratified-random trawl survey in Greenland, no comparison can be made with former years regarding the biomass estimate.

The mean density of shrimp in the Disko Bay and Vaigat area as a whole (4.8 tons/km²) is more than double the mean density in the offshore area south of 69°30'N (1.57 tons/km²) and much higher than the offshore density north of 69°30'N (0.13 tons/km²) (Carlsson and Kanneworff, 1992).

Densities were highest in the southern part of Disko Bay (9-10 tons/km² in stratum 1 and 2) and lowest in the eastern part (1-2 tons/km² in stratum 5 and 6), whereas the western part of Disko Bay and Vaigat had shrimp densities (4-5 tons/km²) around the mean for the whole area.

Table 3 shows the density of shrimp in numbers per sq. km in each stratum and overall. Except for stratum 9 males are more abundant than females in all strata. Highest abundance of males is found in the southern and southwestern part of the Disko Bay (stratum 1, 2, and 3). Females are most abundant in stratum 1, but higher than mean concentrations are also found in stratum 8 and 9 in the Vaigat.

The overall length-frequency distribution (based on pooling of all samples weighted by catch and stratum area - Fig. 3) shows that the males are dominated by two peaks, one around 17 mm CL and a second from 20.5 to 22 mm CL. These two peaks may be identified in all pooled samples from individual strata (Fig. 2a and 2b), but while the 17 mm size group is most abundant in stratum 2, the larger group is significant in stratum 1, 2, 3, and 4 and dominating in strata 1, 3, and 4. The shape of this distribution indicates that it may consist of several year-classes and/or shrimp from different areas with different growth patterns. Distributions of females indicate the occurrence of at least three size components, of which the one around 24.5 mm CL probably represents females after first spawning.

Compared to the overall length-frequency distribution obtained in the offshore survey in 1991 (Carlsson and Kanneworff, 1992) the overall distribution in the Disko Bay does not occur to be dominated to the same degree by one size group, and this may reflect that the stock situation in the inshore areas is much better than in the offshore areas.

References

Carlsson, D.M. & P. Kanneworff, 1992. Report on a stratified-random trawl survey for shrimp (Pandalus borealis) in NAFO Subarea 0+1 in July-September 1991, and a comparison with earlier surveys. NAFO SCR Doc. 92/67, Serial N2121.

Pedersen, S. & K.H. Nygård, 1992. Survey biomass of fishes in the Disko Bay area, West Greenland - September 1991. NAFO SCR Doc. 92/43, Ser.no. N2094.

Table 1. List of valid trawl hauls by stratum.

STATION-IDENTIFICATION	AREA-CODE	DEPTH	TR-TIME	SHR	TOTAL
STRATUM 1					
91PA0100014 999	LD020	537.0	33	6	6
91PA0100013 999	LD022	275.0	30	3523	3523
91PA0100012 999	LD023	328.0	32	6	6
91PA0100011 999	LD025	203.0	31	15	15
91PA0100007 999	LE024	209.0	32	10	10
91PA0100008 999	LE026	326.0	32	102	102
STRATUM 2					
91PA0100010 999	LD026	307.0	31	233	233
91PA0100009 999	LE026	333.0	32	289	289
91PA0100047 999	LE027	309.0	30	1012	1012
STRATUM 3					
91PA0100002 999	LF019	296.5	34	249	249
91PA0100001 999	LG018	329.5	32	428	428
91PA0100003 999	LG020	493.0	33	216	216
91PA0100004 999	LH019	259.5	30	292	292
STRATUM 4					
91PA0100005 999	LF022	353.0	32	253	253
91PA0100006 999	LF022	340.0	29	342	342
91PA0100045 999	LF026	405.0	30	111	111
91PA0100019 999	LG023	498.5	33	259	259
91PA0100018 999	LG024	376.5	30	214	214
91PA0100021 999	LH023	395.5	30	301	301
91PA0100017 999	LH024	323.0	30	424	424
91PA0100016 999	LH026	393.0	31	313	313
STRATUM 5					
91PA0100044 999	LF026	350.0	33	83	83
91PA0100046 999	LF027	341.5	30	94	94
91PA0100043 999	LG027	401.0	30	70	70
91PA0100015 999	LH027	391.0	30	73	73
STRATUM 6					
91PA0100022 999	LJ026	256.5	31	215	215
91PA0100023 999	LK025	227.5	31	67	67
STRATUM 7					
91PA0100024 999	LN023	379.5	30	368	368
91PA0100036 999	LN023	383.5	30	9	9
91PA0100025 999	LP022	372.0	30	419	419
STRATUM 8					
91PA0100026 999	LR022	155.5	30	136	136
91PA0100028 999	LS019	173.5	31	197	197
91PA0100027 999	LS020	246.0	30	610	610
91PA0100034 999	LV018	482.5	30	293	293
STRATUM 9					
91PA0100031 999	LS013	209.5	31	14	14
91PA0100032 999	LS013	235.0	33	74	74
91PA0100030 999	LS015	347.5	30	1200	1200
91PA0100033 999	LT014	268.0	32	106	106

Table 2. Biomass and density of shrimp in strata.

STRATUM	SQKM	BIOMASS IN STRATA					
		TONS	HAULS	STD	STDERR	MIN	MAX
AREA 1	819	8412.5	6	19745.2	8061.0	66	48706
AREA 2	566	5254.4	3	4982.5	2876.7	2224	11005
AREA 3	1124	5162.0	4	1649.3	824.7	3533	7165
AREA 4	1834	8220.5	8	2931.1	1036.3	2864	12438
AREA 5	612	816.1	4	201.2	100.6	688	1115
AREA 6	1014	2506.4	2	1917.4	1355.8	1151	3862
AREA 7	1447	5551.8	3	4681.5	2702.9	155	8526
AREA 8	652	3334.9	4	2254.6	1127.3	1322	6402
AREA 9	1296	5545.8	4	8526.8	4263.4	260	18279

STRATUM	SQKM	DENSITY IN STRATA					
		KG	HAULS	STD	STDERR	MIN	MAX
AREA 1	819	10271.7	6	24109.0	9842.4	80	59470
AREA 2	566	9283.3	3	8803.0	5082.4	3930	19443
AREA 3	1124	4592.5	4	1467.4	733.7	3144	6375
AREA 4	1834	4482.3	8	1598.2	565.1	1562	6782
AREA 5	612	1333.5	4	328.7	164.3	1124	1822
AREA 6	1014	2471.8	2	1890.9	1337.1	1135	3809
AREA 7	1447	3836.7	3	3235.3	1867.9	107	5892
AREA 8	652	5114.9	4	3458.0	1729.0	2028	9818
AREA 9	1296	4279.1	4	6579.3	3289.7	200	14104

Table 3. Density of shrimp in numbers ('000) per sq. km.

Stratum	sq.km	males	females	total
1	819	975	464	1439
2	566	1867	182	2049
3	1124	721	138	860
4	1834	419	167	587
5	612	171	45	215
6	1014	435	103	539
7	1447	269	152	420
8	652	392	213	605
9	1296	210	235	445
Total	9364	523	186	709

Table 4a. Numbers of shrimp per length group (CL) in the biomass estimate from stratum 1, based on pooling of individual samples weighted by catch and stratum area.

STRATUM	LENGTH	MALES	PRIM.FEM	MULTI.FEM	TOTAL
1	10	8788	0	0	8788
	10.5	8788	0	0	8788
	11	104399	0	0	104399
	11.5	130197	0	0	130197
	12	346453	0	0	346453
	12.5	326704	0	0	326704
	13	120841	0	0	120841
	13.5	196209	0	0	196209
	14	350856	0	0	350856
	14.5	1298593	0	0	1298593
	15	3466656	0	0	3466656
	15.5	3361563	0	0	3361563
	16	10168133	0	0	10168133
	16.5	16504375	0	0	16504375
	17	24048402	0	0	24048402
	17.5	19381323	0	0	19381323
	18	19869422	0	0	19869422
	18.5	29787487	0	8788	29796275
	19	28145574	0	8788	28154362
	19.5	53424044	0	26365	53450409
	20	84720287	0	2098	84722385
	20.5	82985371	0	1737	82987108
	21	101171400	0	84157	101255557
	21.5	90102737	0	3445898	93548635
	22	112596556	0	1821966	114418522
	22.5	60677247	0	5432141	66109388
	23	25202359	0	18963114	44165473
	23.5	16634514	0	14418428	31052942
	24	10016849	0	37306464	47323313
	24.5	1660118	0	30299373	31959491
	25	0	0	30207203	30207203
	25.5	1737	0	18509167	18510904
	26	1658381	0	53275844	54934225
	26.5	0	0	33380005	33380005
	27	0	0	29994600	29994600
	27.5	0	0	35009768	35009768
	28	0	0	16684000	16684000
	28.5	0	0	19973347	19973347
	29	0	0	11627674	11627674
	29.5	0	0	9950287	9950287
	30	0	0	6635262	6635262
	30.5	0	0	3315025	3315025
	ALL	798476363	0	380381499	1178857862

Table 4b. Numbers of shrimp per length group (CL) in the biomass estimate from stratum 2, based on pooling of individual samples weighted by catch and stratum area.

STRATUM	LENGTH	MALES	PRIM.FEM	MULTI.FEM	TOTAL
2	7.5	894711	0	0	894711
	10.5	172426	0	0	172426
	11	1239563	0	0	1239563
	11.5	4862555	0	0	4862555
	12	1456135	0	0	1456135
	12.5	3590410	0	0	3590410
	13	4312695	0	0	4312695
	13.5	3040549	0	0	3040549
	14	1467699	0	0	1467699
	14.5	6863256	0	0	6863256
	15	23993161	0	0	23993161
	15.5	37487376	0	0	37487376
	16	77390764	0	0	77390764
	16.5	108868636	0	0	108868636
	17	122249322	0	0	122249322
	17.5	90958627	0	0	90958627
	18	72018279	0	0	72018279
	18.5	56596907	0	0	56596907
	19	65113904	0	0	65113904
	19.5	54269187	0	0	54269187
	20	62220600	0	0	62220600
	20.5	80614114	0	0	80614114
	21	52351271	0	433145	52784416
	21.5	46246125	0	1078701	47324826
	22	31231743	0	1295273	32527016
	22.5	23240345	0	3978274	27218619
	23	13375392	0	13582508	26957900
	23.5	7429974	0	19843221	27273195
	24	2005995	0	19471081	21477076
	24.5	894711	0	10168685	11063396
	25	0	0	5451267	5451267
	25.5	0	0	4483987	4483987
	26	0	0	4933990	4933990
	26.5	0	0	5740408	5740408
	27	0	0	3722849	3722849
	27.5	0	0	3389562	3389562
	28	0	0	3433708	3433708
	28.5	0	0	894711	894711
	30	0	0	1111284	1111284
	ALL	1056456432	0	103012654	1159469086

Table 4c. Numbers of shrimp per length group (CL) in the biomass estimate from stratum 3, based on pooling of individual samples weighted by catch and stratum area.

STRATUM	LENGTH	MALES	PRIM.FEM	MULTI.FEM	TOTAL
3	10	303056	0	0	303056
	10.5	864262	0	0	864262
	11	1683619	0	0	1683619
	11.5	2232746	0	0	2232746
	12	3748026	0	0	3748026
	12.5	4442127	0	0	4442127
	13	4157379	0	0	4157379
	13.5	6165595	0	0	6165595
	14	7129131	0	0	7129131
	14.5	16387329	0	0	16387329
	15	31250532	0	0	31250532
	15.5	43000797	0	0	43000797
	16	55978417	0	0	55978417
	16.5	49981064	0	0	49981064
	17	53363782	0	0	53363782
	17.5	37773962	0	0	37773962
	18	32788247	0	0	32788247
	18.5	35414347	0	0	35414347
	19	36986164	0	0	36986164
	19.5	49544469	0	0	49544469
	20	67426885	0	459315	67886200
	20.5	72742468	0	717465	73459933
	21	55925866	0	1894246	57820112
	21.5	48834070	0	3587327	52421397
	22	39929447	0	4615867	44545314
	22.5	26676769	0	5619253	32296022
	23	14108240	0	8785669	22893909
	23.5	7553493	0	12711841	20265334
	24	2767699	0	11134246	13901945
	24.5	1498489	0	14606160	16104649
	25	0	0	13242733	13242733
	25.5	303056	0	12789919	13092975
	26	0	0	12335661	12335661
	26.5	0	0	13172570	13172570
	27	0	0	15703588	15703588
	27.5	0	0	10388490	10388490
	28	0	0	4698078	4698078
	28.5	0	0	3502645	3502645
	29	0	0	2325864	2325864
	29.5	0	0	1820126	1820126
	30	0	0	1011404	1011404
	30.5	0	0	184029	184029
	31.5	0	0	184029	184029
	ALL	810961533	0	155490525	966452058

Table 4d. Numbers of shrimp per length group (CL) in the biomass estimate from stratum 4, based on pooling of individual samples weighted by catch and stratum area.

STRATUM	LENGTH	MALES	PRIM.FEM	MULTI.FEM	TOTAL
4	11.5	285810	0	0	285810
	12	801874	0	0	801874
	12.5	285810	0	0	285810
	13	377779	0	0	377779
	13.5	882126	0	0	882126
	14	516064	0	0	516064
	14.5	2202141	0	0	2202141
	15	4430194	0	0	4430194
	15.5	6935229	0	0	6935229
	16	16141574	0	167925	16309499
	16.5	23370119	0	0	23370119
	17	28315542	0	0	28315542
	17.5	28292362	0	0	28292362
	18	26040080	0	0	26040080
	18.5	25443300	0	0	25443300
	19	19232284	0	222022	19454306
	19.5	45900475	0	671812	46572287
	20	63283441	0	222022	63505463
	20.5	86275385	0	553476	86828861
	21	87206138	0	1229802	88435940
	21.5	88242746	0	1080330	89323076
	22	81460770	0	2265635	83726405
	22.5	63845319	0	7124874	70970193
	23	39137258	0	18226558	57363816
	23.5	18196515	0	23829582	42026097
	24	7227229	0	32396230	39623459
	24.5	3310298	0	34712631	38022929
	25	1175308	0	31419808	32595116
	25.5	372003	0	25993753	26365756
	26	367230	0	24268858	24636088
	26.5	0	0	22766663	22766663
	27	0	0	23104738	23104738
	27.5	0	0	20058495	20058495
	28	0	0	15471855	15471855
	28.5	0	0	10609465	10609465
	29	0	0	5722149	5722149
	29.5	0	0	2268284	2268284
	30	0	0	1391953	1391953
	30.5	0	0	83737	83737
	31.5	0	0	294042	294042
	ALL	769552403	0	306156699	1075709102

Table 4e. Numbers of shrimp per length group (CL) in the biomass estimate from stratum 5, based on pooling of individual samples weighted by catch and stratum area.

STRATUM	LENGTH	MALES	PRIM.FEM	MULTI.FEM	TOTAL
5	12	246013	0	0	246013
	12.5	136090	0	0	136090
	13.5	85405	0	0	85405
	14	98195	0	0	98195
	14.5	554094	0	0	554094
	15	766674	0	0	766674
	15.5	1609710	0	0	1609710
	16	3811439	0	0	3811439
	16.5	5864748	0	0	5864748
	17	5658518	0	0	5658518
	17.5	5116719	0	0	5116719
	18	4347608	0	0	4347608
	18.5	4148269	0	0	4148269
	19	4572014	0	0	4572014
	19.5	7449053	0	0	7449053
	20	10390944	0	0	10390944
	20.5	11388000	0	42703	11430703
	21	11067721	0	124707	11192428
	21.5	10651132	0	128108	10779240
	22	7443036	0	445577	7888613
	22.5	4415865	0	1085567	5501432
	23	3168419	0	2351316	5519735
	23.5	912379	0	3528600	4440979
	24	376589	0	4181498	4558087
	24.5	137496	0	3526741	3664237
	25	110984	0	2210435	2321419
	25.5	0	0	1761802	1761802
	26	0	0	1191135	1191135
	26.5	0	0	1458755	1458755
	27	0	0	1735154	1735154
	27.5	0	0	1221866	1221866
	28	0	0	851372	851372
	28.5	0	0	848806	848806
	29	0	0	226303	226303
	29.5	0	0	98195	98195
	30	0	0	175392	175392
	30.5	0	0	93387	93387
	ALL	104527114	0	27287419	131814533

Table 4f. Numbers of shrimp per length group (CL) in the biomass estimate from stratum 6, based on pooling of individual samples weighted by catch and stratum area.

STRATUM	LENGTH	MALES	PRIM.FEM	MULTI.FEM	TOTAL
6	10	89893	0	0	89893
	10.5	290705	0	0	290705
	11	1419576	0	0	1419576
	11.5	1301524	0	0	1301524
	12	899336	0	0	899336
	12.5	1121175	0	0	1121175
	13	1198302	0	0	1198302
	13.5	1827551	0	0	1827551
	14	2714904	0	0	2714904
	14.5	6670282	0	0	6670282
	15	9928109	0	0	9928109
	15.5	19503662	0	0	19503662
	16	31220606	0	0	31220606
	16.5	36968297	0	0	36968297
	17	28741235	0	0	28741235
	17.5	24333327	0	0	24333327
	18	19579888	0	0	19579888
	18.5	19015720	0	0	19015720
	19	22369481	0	0	22369481
	19.5	25492388	0	0	25492388
	20	31982238	0	0	31982238
	20.5	30477808	0	0	30477808
	21	33904412	0	0	33904412
	21.5	31490758	0	200812	31691570
	22	22569237	0	1449992	24019229
	22.5	18276626	0	2497196	20773822
	23	11035380	0	5342545	16377925
	23.5	3504295	0	9280007	12784302
	24	1729806	0	12934835	14664641
	24.5	825402	0	15586513	16411915
	25	0	0	12924326	12924326
	25.5	312295	0	6885469	7197764
	26	624590	0	7168293	7792883
	26.5	0	0	6874431	6874431
	27	0	0	6808722	6808722
	27.5	0	0	5516925	5516925
	28	0	0	3799884	3799884
	28.5	0	0	4149164	4149164
	29	0	0	1553214	1553214
	29.5	0	0	735509	735509
	30	0	0	624590	624590
	31	0	0	423214	423214
	31.5	0	0	193115	193115
	ALL	441418808	0	104948756	546367564

Table 4g. Numbers of shrimp per length group (CL) in the biomass estimate from stratum 7, based on pooling of individual samples weighted by catch and stratum area.

STRATUM	LENGTH	MALES	PRIM.FEM	MULTI.FEM	TOTAL
7	10.5	78680	0	0	78680
	11.5	558234	0	0	558234
	12	265789	0	0	265789
	12.5	272432	0	0	272432
	13	476030	0	0	476030
	13.5	210242	0	0	210242
	14	1990058	0	0	1990058
	14.5	2112765	0	0	2112765
	15	5393384	0	0	5393384
	15.5	8450811	0	0	8450811
	16	13657882	0	0	13657882
	16.5	15820624	0	0	15820624
	17	15837293	0	0	15837293
	17.5	11930834	0	0	11930834
	18	12456745	0	131562	12588307
	18.5	11468615	0	0	11468615
	19	14471704	0	0	14471704
	19.5	18678146	0	0	18678146
	20	28319204	0	0	28319204
	20.5	35149310	0	0	35149310
	21	41635122	0	0	41635122
	21.5	39749942	0	131562	39881504
	22	36024783	0	689795	36714578
	22.5	36514380	0	2570059	39084439
	23	20436819	0	6205239	26642058
	23.5	10735635	0	10955326	21690961
	24	2908097	0	15051210	17959307
	24.5	1891819	0	22649569	24541388
	25	578909	0	22265541	22844450
	25.5	6643	0	16586394	16593037
	26	265789	0	16929566	17195355
	26.5	322429	0	14672251	14994680
	27	0	0	23063210	23063210
	27.5	0	0	21194215	21194215
	28	0	0	16699576	16699576
	28.5	0	0	11618874	11618874
	29	0	0	7906985	7906985
	29.5	0	0	5186390	5186390
	30	0	0	1247860	1247860
	30.5	0	0	2698432	2698432
	31	0	0	479125	479125
	31.5	0	0	351111	351111
	ALL	388669149	0	219283852	607953001

Table 4h. Numbers of shrimp per length group (CL) in the biomass estimate from stratum 8, based on pooling of individual samples weighted by catch and stratum area.

STRATUM	LENGTH	MALES	PRIM.FEM	MULTI.FEM	TOTAL
8	10	69598	0	0	69598
	10.5	69598	0	0	69598
	11	330885	0	0	330885
	12	87850	0	0	87850
	12.5	69598	0	0	69598
	13	261288	0	0	261288
	13.5	335486	0	0	335486
	14	139195	0	0	139195
	14.5	855722	0	0	855722
	15	3580335	0	0	3580335
	15.5	5058979	0	0	5058979
	16	5898783	0	0	5898783
	16.5	9205333	0	0	9205333
	17	10499328	0	0	10499328
	17.5	7083051	0	0	7083051
	18	7754166	0	0	7754166
	18.5	9369780	0	0	9369780
	19	10482722	0	0	10482722
	19.5	13475654	0	0	13475654
	20	17296901	0	0	17296901
	20.5	18417631	0	0	18417631
	21	22656399	0	0	22656399
	21.5	27868800	0	159787	28028587
	22	27807662	0	479360	28287022
	22.5	22285972	0	609372	22895344
	23	19147110	0	1724180	20871290
	23.5	9639286	0	3206456	12845742
	24	4076364	0	6553310	10629674
	24.5	942519	0	9939193	10881712
	25	247636	0	10403597	10651233
	25.5	655059	0	10781714	11436773
	26	118700	0	12299339	12418039
	26.5	0	0	13550889	13550889
	27	0	0	12138584	12138584
	27.5	0	0	17811835	17811835
	28	0	0	12577592	12577592
	28.5	0	0	11174055	11174055
	29	0	0	7052581	7052581
	29.5	0	0	4097899	4097899
	30	0	0	1959392	1959392
	30.5	0	0	1524510	1524510
	31	0	0	682362	682362
	31.5	0	0	159787	159787
	ALL	255787390	0	138885794	394673184

Table 4i. Numbers of shrimp per length group (CL) in the biomass estimate from stratum 9, based on pooling of individual samples weighted by catch and stratum area.

STRATUM	LENGTH	MALES	PRIM.FEM	MULTI.FEM	TOTAL
9	13	234996	0	0	234996
	13.5	289561	0	0	289561
	14	331517	0	0	331517
	14.5	428037	0	0	428037
	15	1875842	0	0	1875842
	15.5	6379998	0	0	6379998
	16	6789589	0	0	6789589
	16.5	5933515	0	0	5933515
	17	8255918	0	0	8255918
	17.5	7019911	0	0	7019911
	18	7592340	0	0	7592340
	18.5	4795658	0	0	4795658
	19	10046759	0	0	10046759
	19.5	13459844	0	0	13459844
	20	14538150	0	0	14538150
	20.5	24519210	0	0	24519210
	21	26689690	0	862223	27551913
	21.5	27612159	0	0	27612159
	22	31616351	0	958743	32575094
	22.5	25918845	0	138476	26057321
	23	20144973	0	2725145	22870118
	23.5	14064196	0	8183448	22247644
	24	7843763	0	10787089	18630852
	24.5	3815982	0	20598463	24414445
	25	1044285	0	20229431	21273716
	25.5	138476	0	28433266	28571742
	26	138476	0	29874534	30013010
	26.5	0	0	31512102	31512102
	27	0	0	33761262	33761262
	27.5	0	0	38291349	38291349
	28	0	0	21780433	21780433
	28.5	0	0	23096624	23096624
	29	0	0	16432206	16432206
	29.5	0	0	12146075	12146075
	30	0	0	2725145	2725145
	30.5	0	0	1724446	1724446
	31	0	0	862223	862223
	ALL	271518041	0	305122683	576640724

Table 5. Numbers of shrimp per length group (CL) in the total biomass estimate, based on pooling of individual samples weighted by catch and stratum area.

LENGTH, CPL	MALES	PRIM.FEM	MULTI.FEM	TOTAL
7.5	894711	0	0	894711
10	471335	0	0	471335
10.5	1484459	0	0	1484459
11	4778042	0	0	4778042
11.5	9371066	0	0	9371066
12	7851476	0	0	7851476
12.5	10244346	0	0	10244346
13	11139310	0	0	11139310
13.5	13032724	0	0	13032724
14	14737619	0	0	14737619
14.5	37372219	0	0	37372219
15	84684887	0	0	84684887
15.5	131788125	0	0	131788125
16	221057187	0	167925	221225112
16.5	272516711	0	0	272516711
17	296969340	0	0	296969340
17.5	231890116	0	0	231890116
18	202446775	0	131562	202578337
18.5	196040083	0	8788	196048871
19	211420606	0	230810	211651416
19.5	281693260	0	698177	282391437
20	380178650	0	683435	380862085
20.5	442569297	0	1315381	443884678
21	432608019	0	4628280	437236299
21.5	410798469	0	9812525	420610994
22	390679585	0	14022208	404701793
22.5	281851368	0	29055212	310906580
23	165755950	0	77906274	243662224
23.5	88670287	0	105956909	194627196
24	38952391	0	149815963	188768354
24.5	14976834	0	162087328	177064162
25	3157122	0	148354341	151511463
25.5	1789269	0	126225471	128014740
26	3173166	0	162277220	165450386
26.5	322429	0	143128074	143450503
27	0	0	150032707	150032707
27.5	0	0	152882505	152882505
28	0	0	95996498	95996498
28.5	0	0	85867691	85867691
29	0	0	52846976	52846976
29.5	0	0	36302765	36302765
30	0	0	16882282	16882282
30.5	0	0	9623566	9623566
31	0	0	2446924	2446924
31.5	0	0	1182084	1182084
TOTAL	4897367233	0	1740569881	6637937114

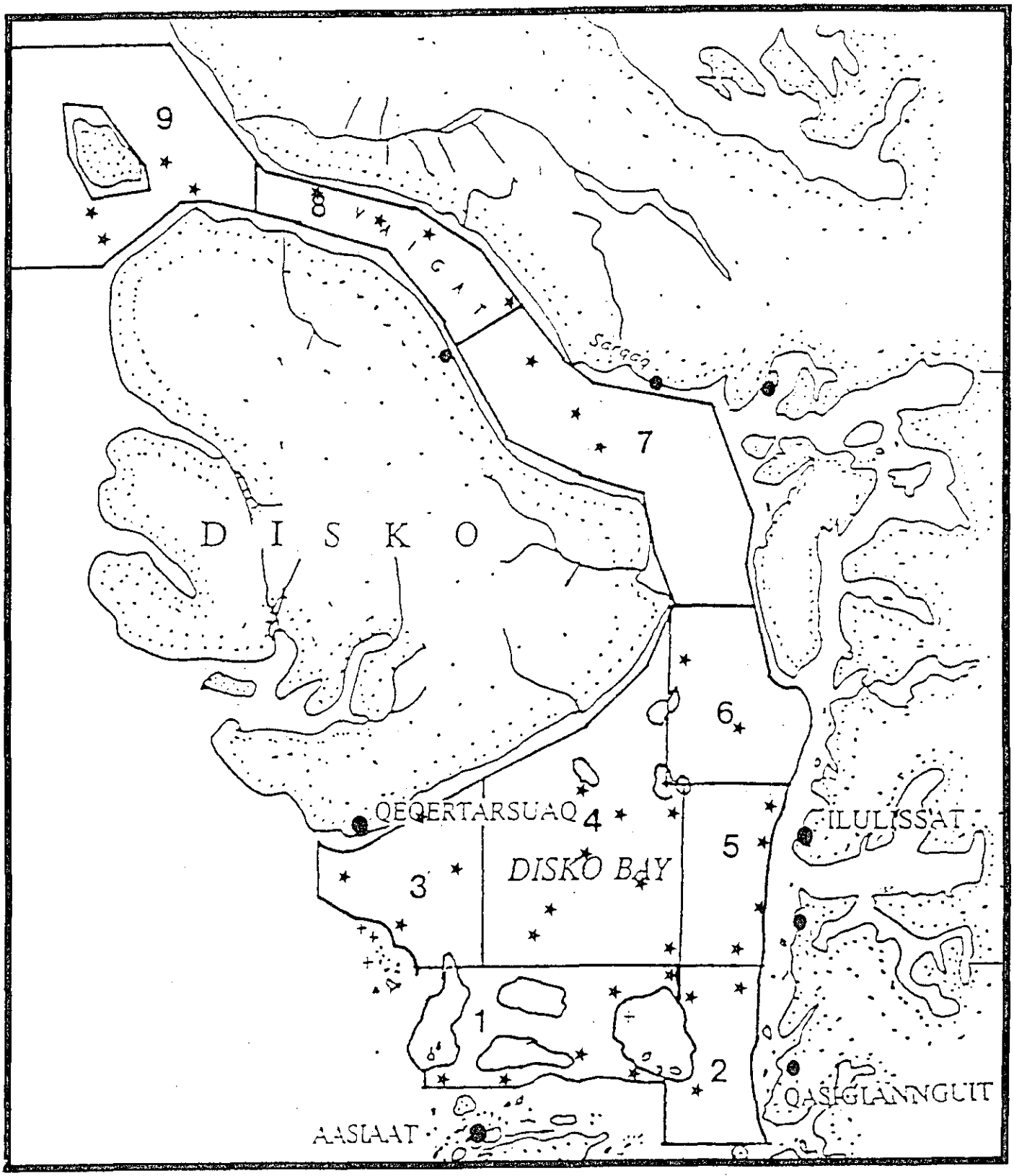

Figure 1. Map of strata and fishing stations.

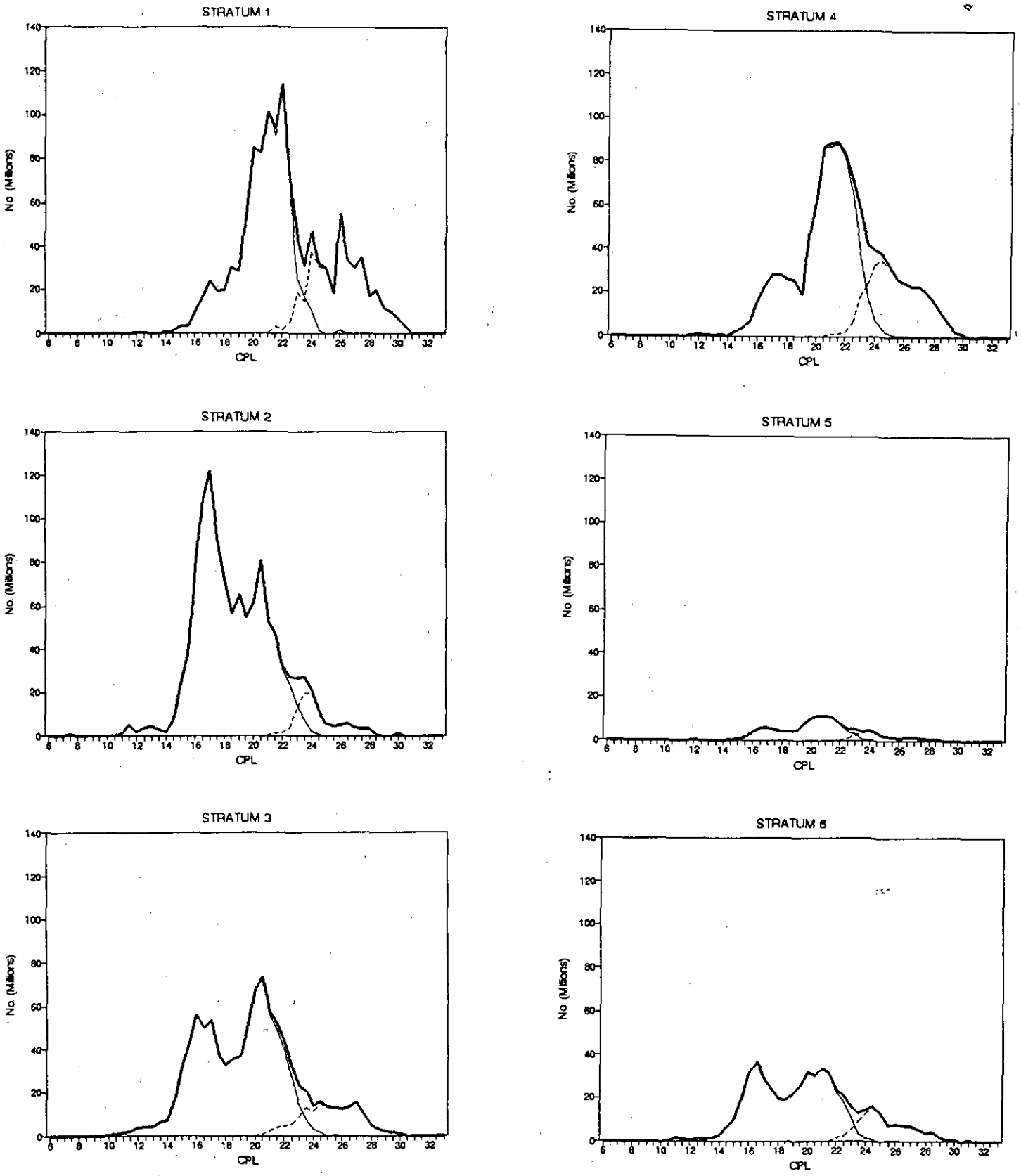

Figure 2a. Numbers of shrimp per length group (CL) in the biomass estimate from stratum 1-6, based on pooling of individual samples weighted by catch and stratum area.

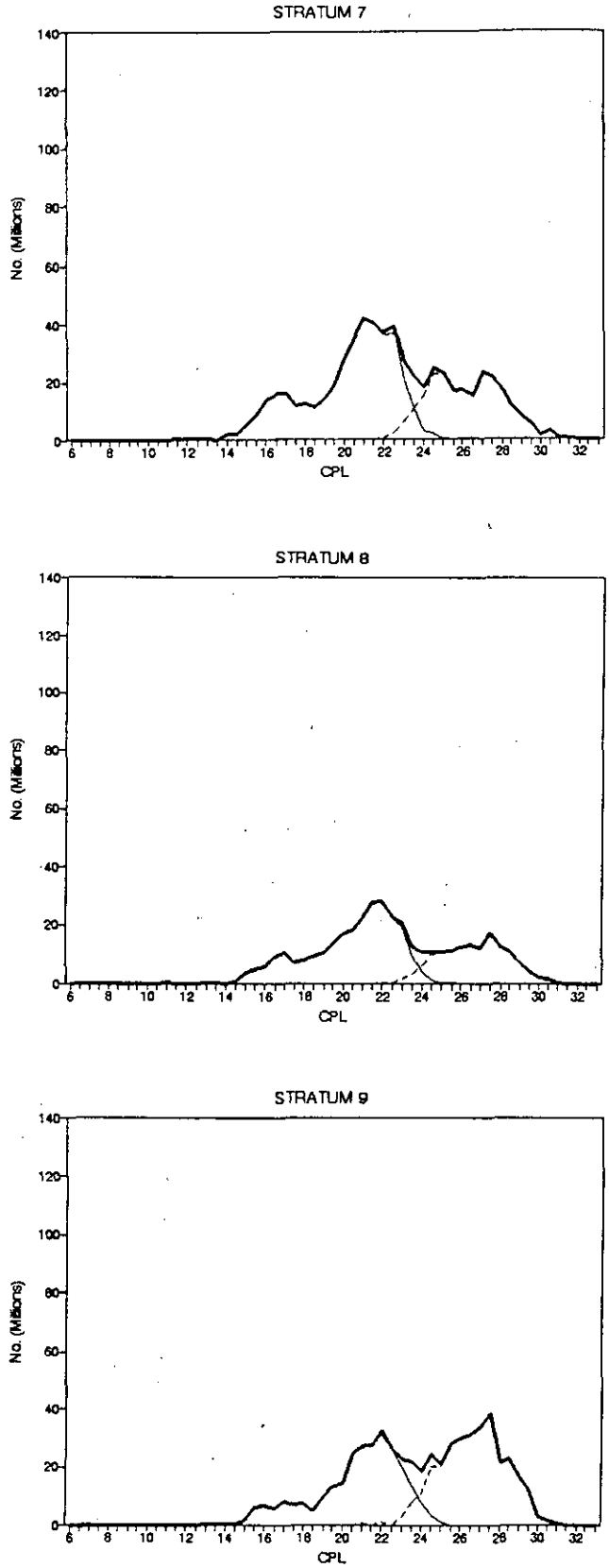

Figure 2b. Numbers of shrimp per length group (CL) in the biomass estimate from stratum 7-9, based on pooling of individual samples weighted by catch and stratum area.

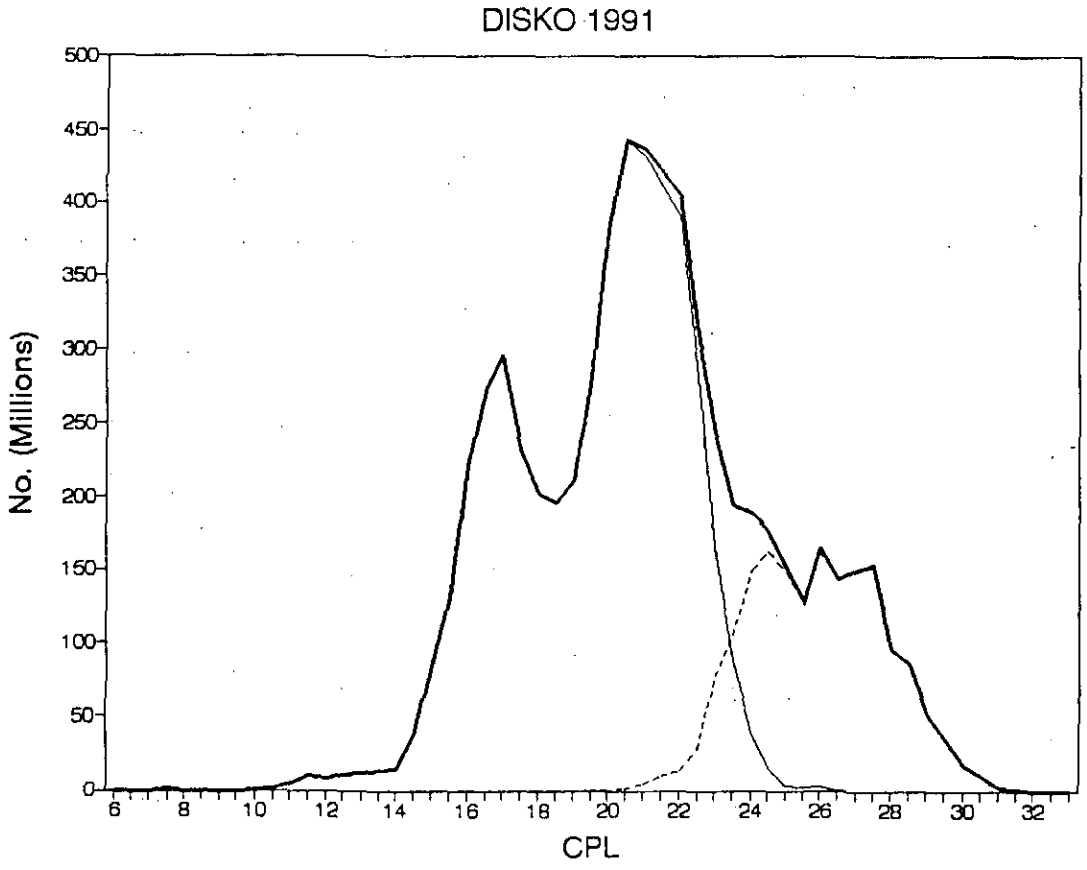

Figure 3. Numbers of shrimp per length group (CL) in the total biomass estimate, based on pooling of individual samples weighted by catch and stratum area.