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A Trawl Survey with R/V *Dana* on the Offshore Shrimp Grounds in Div. 1B, July-August 1982

by

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INTRODUCTION

In the period from 24 July to 7 August, the new Danish R/V *Dana* carried out a pilot study designed as a stratified random trawl survey in the offshore West Greenland area between latitudes 66°N and 69°N (i.e. Div. 1B and adjacent parts of Div. 1A and 1C). Altogether 29 stations were occupied with trawl and/or hydrography, but trawling was not possible on three of these. On the 26 trawl stations the trawl was set altogether 32 times, but due to gear damage or malfunction only 17 hauls may be taken as comparable indices of shrimp abundance.

METHODS AND GEAR

The planned survey area (originally between 66°N and 69°30'N in the depth interval 100-500 m) was stratified according to depth contour lines. Generally, 50 m intervals were chosen for the stratification, except for the area between 66°N and 66°30'N where 100 m intervals were used (maps with 50 m intervals not yet worked out for this area). Furthermore, the larger of the areas obtained by depth stratification were broken down by east-west or north-south lines chosen at what would seem "natural" places for a division of a vast area into meaningful strata.

The number of strata obtained in this way is 42 for the area defined above. The size of a stratum varies between as little as 56 km^2 and 9004 km^2 (measured by planimeter), the total area being 51005 km^2, i.e. mean stratum size 1214 km^2.

In the planning phase of the cruise it was judged that time would allow 54 hauls to be made, i.e. that each haul would represent as much as 945 km^2. It was, therefore, considered that in order to be represented amongst the strata with trawl hauls, a stratum would have to be a size at or above half the 945 km^2. On the other hand, strata larger than about 1.5 x 945 km^2 would be represented by two (or more) hauls.

In practice, 16 of the strata were too small to become represented by a haul leaving 26 strata for

the planned hauls. The smallest stratum represented in the plan was 453 km^2. In the largest stratum (9004 km^2) ten hauls were planned.

If more than one haul had to be placed in a stratum, this stratum was divided by east-west and/or north-south running lines in a corrsponding number of substrata of about equal size. Inside each substrata the mid-point position of the haul was then selected at random.

In practice, of course, several other factors determined the actual coverage. First of all, the operational time available became shorter than expected, and the area north of 69°N (containing 8 stations) was therefore eliminated rather early in the survey, and so were two stations east of 55°W (plus the five stations planned in the depth interval 100-150 m). At three stations the bottom structure was found (by echo sounding) to be too bad for trawling. Some of the western-most stations were covered by ice and not operated. Altogether 26 stations, representing 12 of the strata were operated, but as already stated some of the hauls are not indicative of the shrimp density due to damage or malfunction of the gear.

The gear was a so-called Qalut trawl developed in Hirtshals, Denmark (described in Fishing News International, Feb. 1982), 2200 meshes (20 mm bar length). Cod-end mesh size 41 mm according to the manufacturer but 1-2 mm larger when measured with a wedge-shaped flat gauge (unoffical gauge made on board). The trawl was rigged with 390 8-inch floaters, preventing much gear damaged by lifting the trawl net well from the bottom. Large iron bobbins, 61 mm in length.

The otter boards bought a couple of years ago did, however, not fit well with the rest of the gear. After a number of hauls with malfunction of the gear, it was decided to call at Holsteinsborg to buy doors of the so-called Perfect-type, 3.5 x 2.2 m, now used by most of the commercial fleet in this fishery. Thereafter, the gear functioned very well. Whenever possible, each haul was of a duration of 1 hour effective fishing time on bottom. Hauls were made only in the daytime to minimize the influence of vertical migration. Samples were taken of shrimp and of the major components of the by-catch. Hydrographical observations were made on each station by a CTD recorder.

RESULTS AND DISCUSSION

The results of the trawl hauls are listed in Table 1. As will be seen from the table, the individual hauls rendered quite different catches. This is to be expected in any stratified trawl survey. However, the variation in catch per hour between hauls is to a great extent due to non-biological factors. Thus hauls with ref. no. from 11 to 18 were made with relatively short, most likely too short, wire lengths, and the qenerally poor results of these hauls may be ascribed to this fact. For those hauls for which it was noted that the gear was twisted, it is difficult to say whether this happened when shooting or hauling took place. Anyway the poor results of these hauls seems to indicate malfunction of the gear during fishing. Hauls no. 1-18 were all made by a speed of 3 knots, while those later on were made with speed

about 2.2-2.5 knots.

All these factors make comparison between hauls difficult. However, hauls with reference no. 19-40 were all performed in a very similar way in terms of speed and relative wire length, and the gear seems to have operated very well in these hauls. A good functioning may also have taken place for haul no. 6 (second haul), but the speed (3 knots) and the otter boards used does not make this haul comparable with hauls 19-40 so far as density of shrimp is concerned.

Those stata represented by one or more hauls of those in ref. no. series 19-40 are listed in Table 2 together with the catch-per-hour of the hauls. The best results are from hauls in depths between 150 and 350 m. Except in one case (the stratum represented by hauls no. 19 and 20) there is a very high variation in catch rate between hauls inside each single stratum, especially pronounced for the stratum represented by hauls no. 26 and 29. Thus, to use the material for a biomass estimate does not seem proper. Rather the material indicates that either the coverage of each stratum is much too low (at the best 767 km^2 as a mean per haul in stratum represented by hauls 19 and 20) or that in any case some of the strata are far too large to be meaningful area units. Temperature conditions and bottom habitat may play a major role for the distribution and density of the shrimp. Temperatures will, therefore, have to be measured in each survey to allow for some post-survey adjustment of a stratification and bottom habitat should be taken into account in the stratification when more knowledge has been obtained.

One piece of information about the bottom habitat: In the area north of roughtly 68°15"N and west of 57°W, the bottom seems much more rough and consisting of hard material than on the slopes west of St. Hellefiske Bank. Hauls no. 37, 39 and 40 are from this area, and Table 1 shows the result of these hauls to be generally below the other hauls of those characterized as successful hauls. The commercial fleet does not seem to have shown much interest in this area, and it is, therefore, likely that the area stated has less dense occurrence of shrimp than the more commonly fished part of the area.

Table 1. Trawl hauls by the R/V *Dana*, Subarea 1, July-August 1982, listed in chronological order.

Cruise 10/1982 ref. no.	Date	Hour (GRT)	Fishing depth (m to bottom)	Bottom temp.[1] (°C)	Toal catch all species (kg)	Shrimp (kg)	Position (rectangle no.)	Notes
1	24 Jul	09.20-10.20	156-158	0.5	11	4	FZ 012	Gear slightly damaged.
2	"	13.45-14.45	185-194	1.5	33	33	KB 010	Trawl twisted.
3	"	17.52-18.12	213-218	1.1	-	-	KD 011	Gear lost after 20 minutes fishing.
6	27 Jul	19.25-20.25	210-218	1.1	9	9	KP-KR 004	Trawl twisted.
6	"	21.40-22.40	210-218	1.1	138	129	KP-KR 004	
7	28 Jul	09.04-10.02	273-291	0.2	12	12	KP 001,440	Trawl twisted.
7	"	11.27-12.15	270-289	0.2	3	3	KP 001,440	Trawl twisted.
8	"	16.35-17.38	310-322	2.1	16	15	KR-KS 440	Trawl twisted.
11[2]	29 Jul	17.15-18.15	216-231	1.5	80	64	KD 011,012	New otter boards (type's Perfect)
12[2]	"	20.40-21.43	190-199	1.1	152	135	KD 011	
13[2]	02 Aug	18.40-19.10	169-188	0.8	3	3	KE 010	Hauled after 30 min. due to rough bottom.
14[2]	"	21.53-23.01	166-190	0.7	13	2	KF 008	
17[2]	03 Aug	09.12-10.07	206-223	0.6	5	4	KV 011	
18[2]	"	12.50-13.51	370-425	2.2	2	1	KX 006,007	
19	"	16.15-17.15	357-361	2.2	386	347	KV 004	
20	"	19.40-20.44	380-394	2.2	420	361	KV 004	
21	"	22.31-23.31	363-397	No info.	61	47	KX 003	
22	04 Aug	08.57-10.06	202-212	1.0	740	729	LB 009	
23	"	12.15-13.13	370-379	2.1	356	274	LA 007,008	61 kg Grl. halibut
24	"	15.47-16.50	419-423	2.2	330	281	LA 008,009	
25	"	19.07-19.42	451-554	2.3 (470 m)	128	103	KZ 010,011	Haul shortened due to rough bottom.
26	05 Aug	09.00-10.03	193-200	0.6	175	130	KV 011	
28	"	12.54-14.02	345-351	2.2	789	666	KX 007	80 kg redfish. 41 kg Grl. halibut.
29	"	16.10-17.15	175-185	0.6	1888	1858	KT 006,007	
30	"	20.35-21.45	314-328	2.1	373	324	KZ 003-KX 002	
31	06 Aug	09.02-10.08	332-339	1.6	390	299	4B 006,007	81 kg Grl. halibut.
32	"	12.03-13.08	271-290	1.2	815	789	4B 007,008	
33	"	15.01-16.05	157-170	0.8	-	-	LD 007,008	Codend damaged by stones.
37	07 Aug	09.13-09.41	308-315	1.7	57	44	LD 003	Haul shortened due to rough bottom.
39	"	13.50-14.55	321-324	No info.	66	46	LD 440	Bottom hard.
40	"	18.20-19.22	309-316	2.0	193	140	LA 001,440	Bottom hard.

[1] Temperatures are generally for depths 10-50 m less than the fishing depths.

[2] Haul ref. no. 11-18 were likely made with warps too short to be effectively fishing on bottom all the time.

Table 2. List of strata, their area and the shrimp catch per hour in hauls made in these strata. Only technically successful hauls (i.e. nos. 19-40 (except 33) in Table 1) are included. Block numbers of each stratum refer to numbers established by Carlsson and Kanneworff (1980, areas of basic strata in West Greenland, ICNAF/NAFO Subarea 1. ICNAF Res Doc. 79/XI/11) published in NAFO Scientific Council Studies 2 (Doubleday, ed;, 1981).

Trawl ref. no.	Stratum occupying (part of) block number	Stratum depth (m)	Stratum area (km^2)	Shrimp catch per hour per each haul (kg)
19,20	316-318 414-418	350-400	1534	347, 338
21,23	414-417 514-516	350-400	1670	47, 283
22	113-116 213-216 513-515	200-250	3175	634
24	317 413-417 513-515	400-450	1824	268
25		450-500 and 500-550	840 plus 341	177
26,29	215 315 414-415	150-200	2171	124, 1715
28	215-216 316-317 414-416	300-350	1509	588
30,31,37 39,40	415-418 514-518 116-117 216-217	300-350	9004	278,272,94,42,135
32	514-516 114-116 216-217	250-300	1828	728