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An assessment of the deep sea shrimp (*Pandalus borealis*) in West Greenland waters (Subarea 1), based on Faroese catch/effort data and information on fishing areas from the Faroese fishery

by

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SUMMARY

Based on 5828 hauls of Faroese shrimp trawlers catch per unit effort is calculated. Estimates of fishing areas and area swept by the trawl in one hour are presented and this information is used to estimate the total offshore stock in Greenland waters. Reasons are given why this estimate of a total stock of 86 000 tons must be considered a minimum estimate.

INTRODUCTION

The commercial fishery on deep sea shrimp on the offshore grounds of West Greenland began in 1969 and was started by Faroese vessels.

In 1971 Norway entered this fishery, and in 1974 Spain and USSR seem to have entered according to information from Faroese skippers.

In this period the knowledge of the fishery has increased considerably and due to the introduction of larger and more efficient vessels, the areas fished have been extended, and the vessels have been able to work more rough bottom.

At the end of 1975 11 Faroese vessels took part in the fishery. The Faroese Fisheries Laboratory has in 1976 started research work by placing observers on board the vessels and by sampling the catch.

Older catch data on a haul by haul basis exist since 1973. The shrimp trawlers are obliged to send a copy of their fishing log to the Fisheries Lab. where the data are punched and stored in the data bank of the local FISKHAG ADP-system.

MATERIALS AND METHODS

In 1975 the total shrimp landings from Greenland waters by Faroese vessels amounted to 5 300 metric tons. At the moment data covering about 3 500 tons have been processed and form the data base of this study.

The catches are given by statistical rectangles of $\frac{1}{2}$ degree latitude, by 1 degree longitude.

In order to define more precisely the areas fished by Faroese vessels two of the most experienced skippers, Jon Dam and Dánjal Pauli Danielsen, were asked to outline the limits of these areas in the charts. The sizes of the areas were then estimated and are given in Table 1.

From the computer runs based on the logbook returns catch per hour's trawling by area and month was obtained. By weighing the monthly CPU's by corresponding catches, an average catch per hour's trawling was estimated for each area.

The larger Faroese shrimp trawlers use a 1800 meshes "Sputnik" trawl, with a ground-rope of 51 meters' length. By information from the manufacturers it is estimated that a sector of 30 m width at average is swept by the trawl. Bridles seem to have no effect in this fishery. The towing speed is usually 3 miles an hour. Thus the area swept in one hour is a rectangle of 30 m by 3×1852 m corresponding to a swept area of 0.167 km^2 . Hence the stock density is estimated by the following formula:
$$\frac{\text{Fishing area} \times \text{CPU}}{\text{Area swept by the trawl}}$$

RESULTS

The basic data and the results are given in Table 2. It is estimated by this method, that in the areas fished by Faroese vessels the stock biomass amounts to about 49 000 metric tons.

To give an estimate of the total stock on the offshore grounds, some areas not fished by the Faroese vessels have to be added. These areas are about $17\ 000 \text{ km}^2$ according to Danish investigations (Res.Doc. /76). Assuming the intermediate CPU in Divs. 10 of 0.368 tons/hour the stock in this area can be estimated to 37 000 tons.

The total estimate then will be:

In the area fished by Faroese vessels	49 000 tons
Outside this area	37 000 "
Total	<hr/> 86 000 tons <hr/>

For several reasons this estimate must be considered as a minimum estimate.

1. It is assumed that the trawl effectively catches every shrimp in the area swept. This is hardly the case.
2. It is not taken into account that the vertical distribution of the shrimps may exceed the height of the headline of the trawl.
3. The estimate of CPU is based on eleven vessels with very different performances. A CPU based on the most effective two or three vessels, only, would render higher CPUs.
4. It is an established fact, that the skippers always underestimate their catches in the logbooks. An analysis of the Faroese cod fishery showed that on average the skippers' estimates put down in the logbooks were lower by about 10% and in the industrial fishery it was about 15% lower than the actual landings.

Also the estimate of the area swept by the trawl is critical. An underestimated of this could result in considerable overestimate of stock size.

To minimize this risk, the trawl of the largest trawler has been used for the calculations, and the smaller trawls in the older part of the fleet have not been included.

From these reasons a stock size of the order of 80 000 to 90 000 tons, should be considered as a minimum estimate.

DISCUSSION

It has been pointed out that an estimate of the order of 80 000 to 90 000 tons for the stock size of the deep sea shrimp at Greenland is a minimum estimate.

It is possible to make a more thorough analysis of the more than 5000 hauls which form the database of this study. Using a model where the catch per hour is calculated as a result of: Density plus a vessel factor, a weather factor and eventually other factors plus a stochastic component might give a more reliable estimate of the density than the rather crude analysis in this paper. There has not been the time to perform this analysis of variance for this year's meeting in April, but it will be possible to do it for a later meeting of the Assessment Subcommittee.

However, a more serious problem will not be solved by such an approach. It is a problem of judging what kind of situation we have in the stock. The offshore fishery started in 1969 but was not performed by many vessels before 1974. The question is then if we have to consider the estimate of this study as an estimate of the situation in a virgin stock, where we are fishing on an accumulated biomass, or if we have reached the kind of equilibrium which would be expected in a stock under fishery pressure.

Further at present very few data are at hand about a sensible level of fishing mortality in a shrimp stock. The lack of data on age compositions of the catch, natural mortality and stock-recruitment, relationships etc. makes it difficult to make any estimate of a TAC on the basis of this analysis.

We hope through our newly started sampling and reporting work from the Faroese shrimp trawler fleet and a closer analysis of the data accumulated since 1973 to be in a better position next year.

TABEL 1 Estimated size of areas with commercial concentrations of shrimps
fished by Faroese vessels in Subarea 1.

<u>DIVISION</u>	<u>NAME OF AREA</u>	<u>SIZE OF AREA, km²</u>
1B	Northern edge of Store Hellefisk Bank	2.2 x 10 ³
	West of Store Hellefisk Bank	3.7 x 10 ³
	Holsteinsborg Deep	1.7 x 10 ³
	68°N, 58°W	.6 x 10 ³
	West of Lille Hellefisk Bank	.8 x 10 ³
	TOTAL 1B	<u>9.0 x 10³</u>
1C	Sukkertoppen Deep	<u>2.3 x 10³</u>
1D - 1E	Frederikshåb Deep	.5 x 10 ³
	Godthåb Deep	1.0 x 10 ³
	Dana Deep	.3 x 10 ³
	Fiskenæs Deep	.8 x 10 ³
	Off Qingigtuarssuk	.03 x 10 ³
	Edge off Frederikshåb	.3 x 10 ³
	TOTAL 1D - 1E	<u>2.9 x 10³</u>

Table 2

FAROESE DATA 1975

CATCH, CATCH PER HOUR, NUMBER OF HAULS

Based on logbook returns from 11 vessels.

MONTH	1 B		1 C		1 D		1 E		AREA NK						
	CATCH	CPU	HAULS	CATCH	CPU	HAULS	CATCH	CPU	CATCH	CPU	HAULS	HAULS			
1	231	.585	343	4	.240	13	106	.152	397	<1	.045	5	1	.110	2
2	273	.814	307	28	1.003	31	100	.232	230	-	-	-	-	-	-
3	-	-	-	1	.105	5	60	.186	200	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	164	1.067	210	8	.341	26	-	-	-	-	-	-	-	-	-
6	312	.614	453	4	.080	22	39	.182	216	-	-	-	25	.771	25
7	656	.975	450	129	.338	188	220	.292	396	163	.408	206	19	.304	31
8	-	-	-	-	-	-	-	-	-	-	-	-	18	.260	45
9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	183	.372	347	50	.165	121	135	.252	272	98	.332	143	-	-	-
11	274	.677	313	6	.098	28	61	.147	190	44	.145	116	-	-	-
12	269	.320	499	-	-	-	-	-	-	-	-	-	-	-	-
Total	2 362		2 922	230		434	721		1 901	305		470	63		101
Weighted average CPU		.721			.368					.263					
Area of commerc. fishing		9.0 x 10 ³ km ²		2.3 x 10 ³ km ²		2.9 x 10 ³ km ²									
Standing stock		39 000 tons		5 000 tons		5 000 tons									total 49 000 tons

