This paper not to be cited without prior reference to the author

International Council for the Exploration of the Sea C. M. 1975/K: 52 Shellfish and Benthos Committee

By-catches in fisheries for <u>Pandalus borealis</u> from the northern part of the Norwegian Deeps in 1965 - 1972

by

THORE THOMASSEN

Institute of Biology and Geology University of Tromsø

N-9000 TROMSØ Norway

1. Introduction

This contribution gives some information on the composition and magnitude of the by-catches in the fisheries for the deep sea prawn (Pandalus borealis) in the northern part of the Norwegian Deeps (ICES area 4 A). The data used were brought forward both by investing catch-statistics covering the period 1965 - 1972, and subsampling commercial by-catches landed throughout a year.

Only catch-data from prawn-trawling west of Sotra, Hordaland, were regarded. Statistical data were used to calculate catch per unit off effort (kg/10 hours) both for fish used for human consumption, and for the part of the by-catches used for industrial reduction. A total of 1051 fishingdays throughout 8 years were examined.

To learn the composition of the "industrial" part of the by-catches, subsampling from commercial prawn-trawlers fishing in the actual area were accomplished. From May 1971 to July 1972, 42 catches spred on 27 days were sampled.

2. Results

The calculated figures for the total by-catch per 10 hours a year, show that none of the years (1965 - 1972) are deviating from the mean (1 256.5 kg) by more than 16 per cent. Regarding the two groups

"consumption" and "reduction" separately, the diviations from the means reach 25 - 26 per cent (Table 1, a).

The monthly means for 10 hours fishing (Table 1, b) show that fish for consumtion amounts well over 500 kg in the winter months, while only about 200 kg in the summer. Fish for reduction purposses, however, show two peaks, one in the winter and one in April-May, both reaching 1 200 - 1 300 kg.

Fish for consumption broken down to species show that in the 1960's <u>Squalus acanthias</u> by far was the dominating species in the annual 10 h. catches, but was passed over by <u>Molva dyperygia</u> in the seventies. While 10 h. fishing gave about 190 kg in 1965, only 96 kg was gained in 1972. <u>M. dypterygia</u> increased from 56 kg to 103 kg respectively (Table 2).

Of the other consumption species both Raja sp.,
Gadus morhua, Brosme brosme and Lophius piscatorius
give about 20 kg per 10 hours fishing annually,
while Merluccius merluccius and Molva molva each
reaches about 30 kg. Sebastes marinus gave in
1966 41 kg per 19 h., but only 2 kg in 1969.
Pollachius pollachius, P. virens and Hippoglossus
hippoglossus are all of minor importance in these
catches. One should note, however, the increased
catches of P. virens in 1970 and onward (Table 2).

The weight-composition of the by-catches of fish for consumption throughout a year, is shown in Table 3. In the three first months of the year this part of the by-catches is dominated by the <u>S</u>. acanthias, which also contributes with at least one fourth until June. In April and May, the

share of <u>M. merluccius</u> reaches about 42 and 28 per cent respectively. From July until Oktober <u>M. dyperygia</u> by far is the most dominant species with more than forty per cent. Then for the two last months <u>S. acanthias</u> again tops the list with two thirds of the "consumption" by-catches (Table 3).

Table 4 gives the composition in number per species of the samples taken from the commercial by-catches The monthly distribution by for reduction purposses. weight in these samples is shown in Table 5. these by-catches are by far dominated by Micromesistius poutassou (85%). Already in June the situation have Now Argentina sp. make up for 50 per cent, changed. while M. poutassou is redused to nearly 40 per cent. These two species together with Sebastes viviparus, which in August comes up to fairly twenty per cent, are the dominating species up to and including October. As there were no fishing in the area examined in November and Desember in 1971, there are no samples from these months. The first four months in 1972 are characterized by great changes in the composition of these by-catches from month to month. S. viviparus are among the dominating species throughout this period. Argentina sp., which in January amounts to 30 per cent, will for the next three months not exceed 9 per cent. In February and April Etmopterus spinax and M. poutassou together with S. viviparus together make up for about 60 per cent, while in March S. viviparus and M. dyperygia both reach about 35 per cent, while E. spinax and M. poutassou are not present In may and July 1972, the composition of these at all. by-catches look very much the same as in 1971, however, M. poutassou not so dominent now as in 1971. of all the sampled months shows that M. poutassou contributes with 29 per cent of these by-catches, while Argertina sp. and S. viviparus stand for about 25 and 17 per cent respectively (Table 5).

3. Comments

Comperable data to those here reported, are given by SMIDT (1970, Table 6), in his co-ordination of data conserning Pandalus fisheries in the ICES area. In July 1969, M. poutassou and Argentina sp. are the dominating species also in the Coral- and Viking-bank area together with T. esmarkii. The abundence here of this last species is obvious a result of the different depths examined, 218 - 254 m in the Coral- and Viking-banks compared to 280 - 310 m in the area taken into consideration in this paper.

In February and March, 1956, "Anton Dohrn" made a survey in the northern part of the North-Sea. RAHARDJO(1961) reports from that survey that the catches of M. molva were three times the catches of M. dyperygia, and that B. brosme did not occure in the 64 hauls executed. The different proportions between the two Lings, seems again to be explained by the different depths examined. M. molva was caught between 150 - 270 m while M. dyperygia between 200 - 310 m (RAHARDJO, op.cit.). The report on B. brosme, however, stands in contrast to what was found in the present paper (Table 3).

4. References

RAHARDJO-JOENOES, G. 1961. Uber die Biologie und fischereiliche Bedeutung der Lenfische (Molva molva L., M. byrkelange Walb.) und des Lumb (Brosmius brosme Asc.). Ber. dt. wiss. Kommn. Meeresforsch. (N. F.) 16 (2): 129 - 160.

SMIDT, E. (ed.) 1970. The <u>Pandalus</u> fisheries of the ICES area. Coun. Meet. int. Coun. Explor. Sea, 1970

(K 20) 1911. [1 meo.

Table 1. By-catches in kg per 10 hours fishing.

a) annually, b) monthly mean for the years 1965 - 1972

907.3	718	1 058	997	802	853	757	1 366	1 271	515	631	704	1 215	reduction:	For
349.5	560	564	253	287	246	186	219	268	302	475	311	523	consumption:	子OK
Mean	XII	IX	×	IX	VIII	VII	VI	V	VI	III	II	H	Month:	(ط
	·													
	1 256.5	L 263	458 .1	1 4.	1 174	1 226	1 196	236	<i>Ο</i> 1	1 195	1 304		Total:	
	907.0	894	149	1 14	892	788	875	893	2	872	893	reduction:	For reduc	
	349.5	369	309	3(282	438	321	343	ω	323	411	consumption:	For consu	
•	Mean	1972		1971	1970	1969	1968	1967		1966	1965		Year:	<u>a</u>)

Total:

1 738

1 106

817

1 539

1 585

943 1 099

1 089

1 250

Annual by-catch of fish for consumption broken down to species $(kg/10\ h)$.

				Year:	ir:				
Species:	1965	1966	1967	1968	1969	1970	1971	1972	1
Squalus acanthias	189	76	138	111	178	60	76	96	
Raja sp.	22	23	13	16	23	30	œ	30	
Pollachius pollachius	1	1	į	ı	2	ı	ω	I	
" virens	Н	Н	Н	Н	Н	. 7	0	42	
Gadus morhua	σı	10	20	. 16	14	10	35	20	
Brosme brosme	20	ယ္	17	14	18	18	17	ω	
Merluccius merluccius	18	28	26	ა ნ	61	25	39	19	
Molva molva	32	36	28	29	31	19 .	22	26	
" dypterygia	<u>г</u>	43	61	75	ව ග	8 3	84	103	
Sebastes marinus	22	41	20	ហ	2	∞	0	18	
Hippoglossus hippoglossus	2	2	2	 	2	Н	Н	Ъ	
Lophius piscatorius	43	25	17	17	20	21	12	19	

Table 3. Monthly by-catch of fish for consumption broken down to species in per cent of weight. Mean of the period 1965 - 1972.

Total	Others	Lophius piscatorius	Sebastes marinus	M. dypterygia	Molva molva	Merluccius merluccius	Brosme brosme	Gadus morhua	Raja sp.	Squalus acanthias	Species
100.0	1.0	8.2	3. 8	13.0	4.8	6.8	2.8	ა 8	6.6	49.2	H
100.0	3.9	7.5	တ <u>ယ</u>	5. 6	6.6	12.5	7.8	14.1	14.1	21.6	II
100.1	0.4	3.2	0.6	6.5	1.9	12.7	5. 1	₽ • 5	3.2	65.0	III
100.1	2.2	7.6	1. 3	ω •	3.2	42.4	7.9	1.6	5.1	25.0	VI
100.0	1.1	රා ර	1.5	10.3	5.1	27.8	7.7	1.8	6.6	ω - 5	V
100.1	2.6	12.7	3 . 9	30.6	11.4	11.4	12.2	2.6	9.2	ω •	VI
100.0	1.1	9.9	4.7	45.0	16.8	1.0	9.9	3.7	7.9	i	VII
99.9	1	7.6	6.4	42.6	17.7	0.4	12.0	5.6	7.2	0.4	VIII
99.9	1.4	6.2	5.9	48.8	18.0	0.3	9.3	ω •	ហ ហ	1.0	XI
100.0	1.2	ე • ⊗	ω •5	42.4	9.7	1	5 H	ω • •	4.3	24.5	×
100.0	1.0	2.7	1.9	12.9	ω	0.2	1. 7	3.4	1.9	66.0	IX
100.1	1.9	ω • ਯ	0.9	13.2	7.6	0.5	2.1	0.9	2.1	67.4	IIX

Squalus acanthias Etmopterus spinax Raja sp. Chimaera monstrosa ហ 78 Argentina silus A. sphyraena ∞ $\Omega \cdot N$ Micromesistius ω, 62 poutassou Trisopterus esmarkii 12 7 -O 'P トュ Gadiculus argenteus Pollachius virens Melanogrammus aeglefinus Merluccius merluccius Molva dypterygia Rhinonemus cimbrius 4 10 \sim Sebastes viviparus 0 σ ω σ Clyptocephalus cynoglossus -Hippoglossoides platessoides σ Others

239

188 235 206 208

Total

255

185

Subsamples from by-catches for reduction purposses.

Date: 1971
Sep 16.
Okt 27.
1972
Jan 7.
" "
Feb 15
" 21.
" 25.
" 25.
" 3.
" 3.
" 12.
" 33.
" 33.
" 33.
July 18.

İ						'															
ı	10	7	6	G	ı	. 1	. 1	ı	Н	ı	I	1	ı	۳	တ	ı	5		ı	i	Squalus acanthias
2	113	70	25	32	ω	42	15	46	64	ı	218	431	65	38	54	1	. <u>4</u> .5		34	70	Etmopterus spinax
1	, 1		1	1	1	2	ł	. 1	ŲΊ	1	1	1	. 1	ſ	ъ	, 1	۳		2	ı	Raja sp.
	υ	4	Œ	ω	t,	۳	~.1	ტ	11	ω	1	H-	i	7.	16	ن	13		9	11	Chimaera monstrosa
) - -	82	90	69	54	51	ģ	14	19	11	13	13	9	10	7	7	21	27		26	38.	Argentina silus
ı	. 1	μ,	ω	μ	i	ı	2	1	ı	15	H	1	—	4	15	ω	2	, '	٣	ı	A. sphyraena
94	56	75	194	138	237	137	95	239	28	15	17	ω	25	30	165	4	ω		36	108	Micromesistius poutassou
ω.	သူ	22		32	25	12	16	55	1	161	77	117	G	693	744	293	171		67	98	Trisopterus esmarkii
238	10	7	67	112	50	73	31	40		126	29	55	i	200	47	1	نــر		12	83	Gadiculus argenteus
1	1	I,	, F	1	سإ	ì	í	1	ı	1	۳	i	1	I	w	2	ţ		ł	 	Pollachius virens
1	1	I.	ì		ŀ	ı	ı	ı	1	О	ı	٢	1.	1	7	ŧ	ı		1	⊣	Melangogrammus aeglefinus
	1	۳	i	1	2	, N	4	ω	i	ω	-	1	2	∞	2	1	1		i	ı	Merluccius merluccius
ω	ω	ω	. 1	ω	. 1	ł	۲	2	Մ	57	&	17	9	11	σı	œ	i		5	ŀ	Molva dypterygia
1	4	 	ţ	ł	, ω	w	2	μ2	, 1	11	ω	11	. 1	1	۳	ì	42		∞	12	Rhinonemus cimbrius
22	6	13	14	26	28	39	10	38	38	85	124	36	119	49	51	25	t		18	55	Sebastes viviparus
1	21	17	ı	15	-	ı	16	19	30	24	47	104	ω	C٦	11	(9	20		∞	7	Glyptocephalus cynoglossus
1	44	18	30	25	ω	1	23	19	20	41	34	84	4	4	10	20	19		17	16	Hippoglossoides platessoides
Ų.	ω	۳,	1	ωt	· f]	1	ŧ	i	į	∞	2	9	1	۳	12	2	ł		۳	_	Others
418	390	330	413	445	403	317	236	490	213	568	575	875	243	1058	1163	388	311		244	501	Total

Table 5. Monthly by-catch of fish for reduction broken down to species in per cent of weight.

	Hippoglossoides platessoides C	Glyptocephalus cynoglossus O	Sebastes viviparus C	Rhinonemus cimbrius 0	Molva dyperygia	Merluccius merluccius	Melanogrammus aeglefinus	Pollachius virens	Gadiculus argentus	Trisopterus esmarkii	Micromesistius poutassou 85	Argentina sp. "10	Chimaera monstrosa 0	Raja sp.	Etmopterus spinax 1	Squalus acanthias 0] M
0.3	0.1). 7	0.7	ω		1	1	I	. 1 	ļ	.2	10.5	Ui	ì	6	-	1971 May
0.5	0.6	0.9	3.0	0.1	0.2	1	ſ	0.3	į	0.1	38.8	50.8	1.9	i	2.8	ı	un
0.1	0.2	0.9	9.4	0.1	ı	ı	ı	ì	ı	3.4	36.8	45.7	0.2	J	3.2	ı	Jul
0.5	11.2	1.5	22.5	2.0	ı	ı	0.2	ı	1.8	1.9	26.2	28.5	0.1	0.4	3.2	1	Aug
0.3	10.0	2.5	26.9	1.3	0.3	Ι,	0.1	0.2	1.4	2.3	24.0	23.1	ω. ₅	0.2	з . 9	ı	Sep
8.6	13.8			1.9	4.4	1	ı	ı	0.3	3.1	15.9	24.1	0.3	1.3	8	ı	0kt
0.2	6. 8	5. 8	12.2	0.5	5.1	ı	1	1.7	ı	12.9	2.9	30.9	7.8	0.5	5.6	7.1	1972 Jan
0.1	3.9	5.7	28. 2	0.3	5.6	1.7	0.6	0.5	1.3	9.4	15.6	5.9	8	0.6	14.8	1.0	Feb
ı	4.8	5.4	34.6	ı	38.2	ı	ı	t	ω. 8	4.6	1	8.6	ı	ı	ı	ı	Mar
0.1	3.2	14.2	28.5	ı	4.2	ľ	ł	ı	ı	ì	11.7	7.1	υ • ∞	5.8	18.1	Ľ ω	Apr
0.2	1.5	2.4	8.4	0.4	1.1	0.7		i	0.8	0.7	53.8	19,8	2.0	ı	4.5	3.7	Мау
ı	i	1	11.3	ł	2.6	. 1	i	ı	4.6	0.3	40.0	40.9	1	ſ	0.4	ł	Jul
0.9	4.7	ω . υ	16.8	0.6	5.1		0.1	0.2	1.2	3.2	29.2	24.7	2.2	0.7	5.6	1,1	Mean