

NOT TO BE CITED WITHOUT PRIOR
REFERENCE TO THE AUTHOR(S)

Northwest Atlantic



Fisheries Organization

Serial No. N1956

NAFO SCR Doc. 91/72

SCIENTIFIC COUNCIL MEETING - JUNE 1991

The Icelandic Shrimp Fishery (*Pandalus borealis*)
in the Denmark Strait in 1989 and 1990

by

U. Skuladottir

Marine Research Institute, Skulagata 4
P. O. Box 1390, 121 Reykjavik, Iceland

In 1989 the fishery was carried out mainly from May onwards. The total catch of the year was 1326 tons and the mean CPUE for the whole year was 71 kg (Table 1) as compared to 58 kg of 1988. In spite of the much higher overall CPUE of 1990, or 76 kg. The total catch was very low - 281 tons. It is suspected that there were some logbook data missing where fishing was tried in vain but not reported. The total catch data are always checked very carefully from the producer-reports so as to get the nominal catch. The catch has been raised to the nominal catch per stratum (Fig. 1) as well (Tables 2 and 3) for the years 1989 and 1990. This is done to prepare the catch at age/length matrix in the future for the Denmark Strait area. The samples are compiled by the same strata.

In 1989 alas, only one sample was obtained from the fishery (Table 4, Fig. 2). That was from stratum No. 627 in May. Of the females without spines (WO) 67 out of 82 were still carrying external eggs with eye spots (em), see the legend for Tables 4-12. This high percentage 81.7% suggests that no hatching had taken place where this sample was taken. It has been pointed out that more than 20% of females without spines do not spawn every year (Skuladottir, 1989). Smedstad (1989) find that in September 1988, 20.2% and 17.7% of females respectively in two adjacent strata, 677 and 628 are not spawning in the season 1988-1989.

The sample of February 1990 is exceptional in that males make up 77% of the sample. About 35.3% of the females without spines did not spawn in the period 1989-1990 in Str. No. 627. According to Smedstad (1990) 22.2% of all females did not spawn nor prepare spawning in September in Str. No. 628. In July there are samples from 3 strata, namely 627, 628 and 677.

The proportion of females having already spawned, out of all that appear to have prepared spawning is from 10%-67% in July. This could be analysed further with regards to the more accurate dating of each sample. There is also a proportion that has not yet released the larvae in July, namely 3.2-13.5% suggesting a very long egg-bearing period like what is experienced in the north of Iceland.

The percentage of females that do not seem to be preparing spawning varies considerably, or from 19 (Table 6) to 68% (Table 7). One wonders whether the biologist analysing the sample made a mistake not detecting the developing headroes. In September, the females not spawning in the season 1990-1991 swing from 18.2 and 20.9% in Str. Nos. 627 and 628 to 33.7% in both Str. Nos. 677 and 678. By the middle of September practically all shrimp had spawned except for 0.8% in Str. No. 627 and 0.5% in Str. No. 628 judging by the occurrence of females with head roes. Looking at the occurrence of males, these vary in the samples here presented, or from 41%-77% in 1990. If the proportions are compared to the previous years (Table 13) it appears that the percentage of males has almost doubled on the average since 1987 (Hallgrímsson and Skuladóttir, 1988). The males do also seem to be responding to diminishing numbers of females by changing sex sooner than usual. In 1988 the smallest females without spines were 27 mm (except for 1 specimen). In 1987, however, 1.5% of females was smaller than 27 mm. In 1990 the July and September samples show a substantial increase in females <27 mm without sternal spines or up to 21.5%. There is a mode around 25-26 mm. The mode is particularly pronounced in September Str. No. 627.

References

- HALLGRIMSSON, I. and Skuladóttir, U. 1988. The Icelandic shrimp (*Pandalus borealis*) fishery in the Denmark Strait in 1987. NAFO SCR Doc. No. 64, Serial No. N1506, 10 p.
- SKULADÓTTIR, U. 1989. The Icelandic shrimp fishery (*Pandalus borealis*) in the Denmark Strait. NAFO SCR Doc. No. 50, Serial No. N1628. 5 p.

SMEDSTAD, O. M. 1989. Preliminary Report of the cruise with M/T "Hakoy-II" to East Greenland Waters in September 1988. NAFO SCR Doc. No. 19, Serial No. N1595, 11 p.

1990. Preliminary Report of a cruise with M/T "Hakoy-II" to East Greenland waters in September 1989. NAFO SCR Doc. No. 12, Serial No. N1724, 13 p.

Table I. The catch, effort and CPUE as reported by Icelandic logbooks, and the nominal catch in the Denmark Strait in 1989 and 1990

YEAR	FROM LOGBOOKS			NOMINAL
	CPUE kg/hr	EFFORT Tr. hours	CATCH Tons	CATCH Tons
1989				
May	154	2234	344.9	
June	84	4188	349.6	
Σ May-June	108	6422	694.5	847.3
August	51	3910	197.5	
September	41	4558	186.4	
October	27	321	8.5	
Σ Jul-Nov	45	8789	392.4	478.7
Total 1989	71	15211	1086.9	1326.0
1990				
February	44	11	0.5	
April	12	9	0.1	
June	81	2347	190.2	
Σ Jan-Jun	81	2367	190.7	203.8
July	84	41	3.4	
August	69	168	11.7	
September	65	835	54.3	
October	62	47	3.0	
Σ Jul-Nov	66	1091	72	77.2
Total 1990	76	3458	263.0	281.0

Table 2. Catch (tonnes) per stratum and month in 1989 raised from logbook data to the nominal catch 1326 tonnes.

Month	Stratum number				
	626	627	628	677	678
January					
February					
March					
April		0.74			
May	3.66	380.26	1.69	78.59	
June	1.17	273.84	57.02	50.30	
July		0.03	0.02		
August		79.35	124.92	40.79	1.25
September		36.01	132.93	44.40	4.26
October		0.07	10.41		0.03
November		0.04	0.02	0.01	4.22
Total	4.83	770.34	327.01	214.09	9.76

Table 3. Catch (tonnes) per stratum and month in 1990 raised from logbook data to the nominal catch 281 tonnes.

Month	Stratum number			
	627	628	677	678
January		0.03		0.02
February	0.50			
March				
April	0.12			
May				
June	171.77	0.19	31.17	
July	1.87	0.43	1.34	
August	4.20	2.70	5.51	0.04
September	3.98	48.14	3.77	2.07
October		0.13	3.02	
Total	182.44	51.62	44.81	2.13

The legend for the different sex categories of *P. borealis* in the Denmark Strait, see tables 4-12:

- ma Males.
- mi Transitionals.
- mg Females with sternal spines, no headroes.
- gm Females with sternal spines, with headroes.
- ag Females without sternal spines, no headroes, not berried but at times with eggheads.
- ga Females without sternal spines, with headroes, not berried.
- ea Females with green eggs, no eyespots.
- em Females with eggs with eyespots.
- eg Females with eggs with eyespots and also with headroes.
- wi Primiparous females, mi+mg+gm.
- wo Multiparous females, ag+ga+ea+em+eg.

Table 4. The length distribution by 4 major categories and sums by 9 sexual categories as explained above.

May 1989, Stratum 627						
CL(1/10)	ma	wi	wo	mawi	Σ	%
180	1	0	0	1	1	0.86
205	1	0	0	1	1	0.86
210	1	0	0	1	1	0.86
215	1	0	0	1	1	0.86
230	2	0	0	2	2	1.72
235	2	1	0	3	3	2.59
240	2	0	0	2	2	1.72
245	1	0	1	1	2	1.72
250	1	1	0	2	2	1.72
255	2	0	0	2	2	1.72
260	1	0	0	1	1	0.86
265	1	0	0	1	1	0.86
270	1	0	0	1	1	0.86
275	2	0	0	2	2	1.72
280	1	0	1	1	2	1.72
285	2	0	2	2	4	3.45
290	2	0	1	2	3	2.59
295	0	1	3	1	4	3.45
300	0	2	8	2	10	8.62
305	0	1	8	1	9	7.76
310	1	1	14	2	16	13.79
315	0	1	10	1	11	9.48
320	0	1	8	1	9	7.76
325	0	0	8	0	8	6.90
330	0	0	9	0	9	7.76
335	0	0	3	0	3	2.59
340	0	0	3	0	3	2.59
345	0	0	2	0	2	1.72
350	0	0	1	0	1	0.86
Total	25	9	82	34	116	99.97
Mean CL	252.40	292.22	314.57	262.94	299.44	

	ma	mi	mg	gm	ag	ga	ea	em	eg
Σ	25	0	0	9	2	7	0	67	6
mean CL	252.40	0.00	0.00	292.22	315.00	327.14	0.00	313.66	310.00
%	21.55	0.00	0.00	7.76	1.72	6.03	0.00	57.76	5.17

Table 5. The length distribution by 4 major categories and sums by 9 sexual categories as explained above.

February 1990, Stratum 627						
CL (1/10)	ma	wi	wo	mawi	Σ	%
165	1	0	0	1	1	0.70
180	1	0	0	1	1	0.70
185	2	0	0	2	2	1.41
190	4	0	0	4	4	2.82
200	5	0	0	5	5	3.52
205	9	0	0	9	9	6.34
210	8	0	1	8	9	6.34
215	8	0	0	8	8	5.63
220	6	0	1	6	7	4.93
225	5	1	0	6	6	4.23
230	10	0	0	10	10	7.04
235	2	0	0	2	2	1.41
240	8	1	0	9	9	6.34
245	4	0	0	4	4	2.82
250	2	0	0	2	2	1.41
255	6	0	0	6	6	4.23
260	5	1	1	6	7	4.93
265	5	0	0	5	5	3.52
270	6	0	0	6	6	4.23
275	5	1	0	6	6	4.23
280	3	0	2	3	5	3.52
285	2	1	0	3	3	2.11
290	1	4	0	5	5	3.52
295	1	1	0	2	2	1.41
300	1	1	2	2	4	2.82
305	0	0	4	0	4	2.82
310	0	2	1	2	3	2.11
315	0	2	2	2	4	2.82
325	0	0	2	0	2	1.41
330	0	0	1	0	1	0.70
Total	110	15	17	125	142	100.02
Mean CL	234.36	286.00	293.53	240.56	246.90	

	ma	mi	mg	gm	ag	ga	ea	em	eg
Σ	110	3	0	12	0	6	1	10	0
Mean CL	234.36	258.33	0.00	292.92	0.00	308.33	210.00	293.00	0.00
%	77.46	2.11	0.00	8.45	0.00	4.23	0.70	7.04	0.00

Table 6. The length distribution by 4 major categories and sums by 9 sexual categories as explained above.

July 1990, Stratum 627						
CL (1/10)	ma	wi	wo	mawi	Σ	%
175	1	0	0	1	1	0.68
180	1	0	0	1	1	0.68
185	2	0	0	2	2	1.37
190	5	0	0	5	5	3.42
195	4	0	0	4	4	2.74
200	7	0	0	7	7	4.79
205	3	0	0	3	3	2.05
210	3	0	0	3	3	2.05
215	5	0	1	5	6	4.11
220	10	0	0	10	10	6.85
225	10	0	1	10	11	7.53
230	6	0	0	6	6	4.11
235	7	2	0	9	9	6.16
240	5	0	0	5	5	3.42
245	5	0	2	5	7	4.79
250	2	1	4	3	7	4.79
255	1	1	4	2	6	4.11
260	4	1	1	5	6	4.11
265	0	0	3	0	3	2.05
270	2	1	4	3	7	4.79
275	1	0	2	1	3	2.05
280	1	0	5	1	6	4.11
285	1	0	2	1	3	2.05
290	0	0	2	0	2	1.37
295	0	0	3	0	3	2.05
300	1	0	3	1	4	2.74
305	0	0	2	0	2	1.37
310	0	0	4	0	4	2.74
315	0	0	1	0	1	0.68
320	0	1	3	1	4	2.74
325	0	0	1	0	1	0.68
330	0	0	2	0	2	1.37
335	0	0	1	0	1	0.68
350	0	0	1	0	1	0.68
Total	87	7	52	94	146	99.91
Mean CL	224.71	260.71	283.94	227.39	247.53	

	ma	mi	mg	gm	ag	ga	ca	em	cg
Σ	87	0	0	7	9	4	32	7	0
Mean CL	224.71	0.00	0.00	260.71	295.56	317.50	274.06	295.00	0.00
%	59.59	0.00	0.00	4.79	6.16	2.74	21.92	4.79	0.00

Table 7. The length distribution by 4 major categories and sums by 9 sexual categories as explained above.

July 1990, Stratum 628						
CL (1/10)	ma	wi	wo	mawi	Σ	%
145	1	0	0	1	1	0.28
165	1	0	0	1	1	0.28
170	6	0	0	6	6	1.68
175	4	0	0	4	4	1.12
180	3	0	0	3	3	0.84
190	7	0	0	7	7	1.96
195	5	0	0	5	5	1.40
200	8	0	0	8	8	2.23
205	6	0	0	6	6	1.68
210	8	0	0	8	8	2.23
215	9	0	1	9	10	2.79
220	19	1	2	20	22	6.15
225	16	0	0	16	16	4.47
230	22	2	3	24	27	7.54
235	22	1	4	23	27	7.54
240	16	3	1	19	20	5.59
245	14	0	5	14	19	5.31
250	10	1	3	11	14	3.91
255	11	3	6	14	20	5.59
260	8	0	3	8	11	3.07
265	8	0	1	8	9	2.51
270	5	1	2	6	8	2.23
275	4	0	5	4	9	2.51
280	6	1	0	7	7	1.96
285	3	4	2	7	9	2.51
290	2	3	4	5	9	2.51
295	1	2	4	3	7	1.96
300	1	0	13	1	14	3.91
305	1	0	10	1	11	3.07
310	1	1	7	2	9	2.51
315	1	0	12	1	13	3.63
320	0	0	4	0	4	1.12
325	0	0	5	0	5	1.40
330	0	0	3	0	3	0.84
335	0	0	3	0	3	0.84
340	0	0	2	0	2	0.56
350	0	0	1	0	1	0.28
Total	229	23	106	252	358	100.01
Mean CL	232.29	265.65	289.91	235.34	251.49	

	ma	mi	mg	gm	ag	ga	ea	em	eg
Σ	229	0	0	23	84	14	4	4	0
Mean CL	232.29	0.00	0.00	265.65	287.50	303.21	302.50	281.25	0.00
%	63.97	0.00	0.00	6.42	23.46	3.91	1.12	1.12	0.00

Table 8. The length distribution by 4 major categories and sums by 9 sexual categories as explained above.

July 1990, Stratum 677						
CL (1/10)	ma	wi	wo	mawi	Σ	%
170	1	0	0	1	1	0.61
175	1	0	0	1	1	0.61
180	1	0	0	1	1	0.61
185	2	0	0	2	2	1.23
190	1	0	0	1	1	0.61
195	5	0	0	5	5	3.07
200	2	0	0	2	2	1.23
205	8	0	0	8	8	4.91
210	9	0	0	9	9	5.52
215	14	0	0	14	14	8.59
220	16	1	0	17	17	10.43
225	6	2	0	8	8	4.91
230	4	2	1	6	7	4.29
235	9	1	0	10	10	6.13
240	6	1	0	7	7	4.29
245	5	0	4	5	9	5.52
250	5	2	1	7	8	4.91
255	3	4	1	7	8	4.91
260	5	1	0	6	6	3.68
265	2	0	2	2	4	2.45
270	6	0	3	6	9	5.52
275	2	0	1	2	3	1.84
280	1	1	0	2	2	1.23
285	2	0	1	2	3	1.84
290	1	0	2	1	3	1.84
295	0	0	3	0	3	1.84
300	0	2	2	2	4	2.45
305	0	0	4	0	4	2.45
310	0	0	1	0	1	0.61
315	0	0	1	0	1	0.61
320	0	0	1	0	1	0.61
335	0	0	1	0	1	0.61
Total	117	17	29	134	163	99.96
Mean CL	228.42	250.88	282.07	231.27	240.31	

	ma	mi	mg	gm	ag	ga	ca	em	eg
Σ	117	0	1	16	11	8	8	2	0
Mean CL	228.42	0.00	255.00	250.62	271.36	293.12	285.00	285.00	0.00
%	71.78	0.00	0.61	9.82	6.75	4.91	4.91	1.23	0.00

Table 9. The length distribution by 4 major categories and sums by 9 sexual categories as explained above.

September 1990, Stratum 627						
CL (1/10)	ma	wi	wo	mawi	Σ	%
160	1	0	0	1	1	0.43
165	1	0	0	1	1	0.43
170	4	0	0	4	4	1.72
175	1	0	0	1	1	0.43
180	1	0	0	1	1	0.43
185	2	0	0	2	2	0.86
190	1	0	0	1	1	0.43
195	1	0	0	1	1	0.43
200	6	0	0	6	6	2.59
205	4	0	0	4	4	1.72
210	4	0	0	4	4	1.72
215	3	0	0	3	3	1.29
220	6	0	0	6	6	2.59
225	14	0	0	14	14	6.03
230	8	1	2	9	11	4.74
235	10	0	3	10	13	5.60
240	4	0	4	4	8	3.45
245	6	0	3	6	9	3.88
250	2	0	7	2	9	3.88
255	1	0	11	1	12	5.17
260	4	0	10	4	14	6.03
265	6	0	9	6	15	6.47
270	1	0	7	1	8	3.45
275	0	0	7	0	7	3.02
280	1	0	4	1	5	2.16
285	3	0	2	3	5	2.16
290	1	0	6	1	7	3.02
295	1	0	7	1	8	3.45
300	0	0	13	0	13	5.60
305	1	0	7	1	8	3.45
310	1	0	9	1	10	4.31
315	0	0	9	0	9	3.88
320	0	0	6	0	6	2.59
325	0	0	2	0	2	0.86
330	0	0	2	0	2	0.86
335	0	0	2	0	2	0.86
Total	99	1	132	100	232	99.99
Mean CL	229.29	230.00	282.35	229.30	259.48	

	ma	mi	mg	gm	ag	ga	ea	em	eg
Σ	99	0	0	1	24	0	108	0	0
Mean CL	229.29	0.00	0.00	230.00	270.21	0.00	285.05	0.00	0.00
%	42.67	0.00	0.00	0.43	10.34	0.00	46.55	0.00	0.00

Table 10. The length distribution by 4 major categories and sums by 9 sexual categories as explained above.

September 1990, Stratum 628						
CL (1/10)	ma	wi	wo	mawi	Σ	%
175	3	0	0	3	3	0.35
180	5	0	0	5	5	0.58
185	5	0	0	5	5	0.58
190	8	0	0	8	8	0.93
195	9	0	0	9	9	1.04
200	7	0	0	7	7	0.81
205	10	0	0	10	10	1.16
210	13	0	0	13	13	1.50
215	11	0	1	11	12	1.39
220	17	0	2	17	19	2.20
225	22	0	0	22	22	2.55
230	22	0	1	22	23	2.66
235	19	0	3	19	22	2.55
240	30	0	10	30	40	4.63
245	32	0	7	32	39	4.51
250	29	0	14	29	43	4.98
255	18	0	12	18	30	3.47
260	17	0	10	17	27	3.12
265	21	0	10	21	31	3.59
270	7	1	12	8	20	2.31
275	13	0	16	13	29	3.36
280	11	0	23	11	34	3.94
285	6	0	24	6	30	3.47
290	11	0	30	11	41	4.75
295	7	1	50	8	58	6.71
300	3	0	53	3	56	6.48
305	0	0	40	0	40	4.63
310	1	0	49	1	50	5.79
315	1	0	52	1	53	6.13
320	0	0	28	0	28	3.24
325	0	0	31	0	31	3.59
330	0	0	9	0	9	1.04
335	0	0	7	0	7	0.81
340	0	0	6	0	6	0.69
345	0	0	3	0	3	0.35
350	0	0	1	0	1	0.12
Total	358	2	504	360	864	100.01
Mean CL	241.02	282.50	296.29	241.25	273.36	

	ma	mi	mg	gm	ag	ga	ca	cm	eg
Σ	358	0	2	0	104	2	398	0	0
Mean CL	241.02	0.00	282.50	0.00	290.10	290.00	297.94	0.00	0.00
%	41.44	0.00	0.23	0.00	12.04	0.23	46.06	0.00	0.00

Table 11. The length distribution by 4 major categories and sums by 9 sexual categories as explained above.

September 1990, Stratum 677						
CL (1/10)	ma	wi	wo	mawi	Σ	%
170	1	0	0	1	1	0.22
175	1	0	0	1	1	0.22
180	2	0	0	2	2	0.44
185	1	0	0	1	1	0.22
190	3	0	0	3	3	0.67
195	6	0	0	6	6	1.33
200	10	0	0	10	10	2.22
205	17	0	0	17	17	3.77
210	11	0	0	11	11	2.44
215	33	0	1	33	34	7.54
220	28	0	1	28	29	6.43
225	26	0	1	26	27	5.99
230	17	0	2	17	19	4.21
235	13	0	2	13	15	3.33
240	22	0	7	22	29	6.43
245	19	0	3	19	22	4.88
250	10	1	10	11	21	4.66
255	6	0	6	6	12	2.66
260	5	0	7	5	12	2.66
265	13	0	7	13	20	4.43
270	9	1	3	10	13	2.88
275	7	1	8	8	16	3.55
280	3	0	7	3	10	2.22
285	9	0	6	9	15	3.33
290	4	0	6	4	10	2.22
295	5	0	12	5	17	3.77
300	1	0	13	1	14	3.10
305	0	0	14	0	14	3.10
310	0	0	11	0	11	2.44
315	0	0	15	0	15	3.33
320	0	0	5	0	5	1.11
325	0	0	7	0	7	1.55
330	0	0	7	0	7	1.55
335	0	0	4	0	4	0.89
340	0	0	1	0	1	0.22
Total	282	3	166	285	451	100.01
Mean CL	233.69	265.00	288.19	234.02	253.96	

	ma	mi	mg	gm	ag	ga	ea	em	eg
Σ	282	0	3	0	56	0	110	0	0
Mean CL	233.69	0.00	265.00	0.00	292.32	0.00	286.09	0.00	0.00
%	62.53	0.00	0.67	0.00	12.42	0.00	24.39	0.00	0.00

Table 12. The length distribution by 4 major categories and sums by 9 sexual categories as explained above.

September 1990, Stratum 678						
CL (1/10)	ma	wi	wo	mawi	Σ	%
180	1	0	0	1	1	0.43
185	3	0	0	3	3	1.29
190	3	0	0	3	3	1.29
195	3	0	0	3	3	1.29
200	2	0	0	2	2	0.86
205	4	0	0	4	4	1.72
210	11	0	0	11	11	4.74
215	12	0	0	12	12	5.17
220	9	0	0	9	9	3.88
225	12	0	0	12	12	5.17
230	15	0	2	15	17	7.33
235	5	0	3	5	8	3.45
240	9	0	0	9	9	3.88
245	7	0	2	7	9	3.88
250	3	0	3	3	6	2.59
255	13	0	4	13	17	7.33
260	3	0	3	3	6	2.59
265	4	0	1	4	5	2.16
270	6	0	3	6	9	3.88
275	2	0	6	2	8	3.45
280	3	0	5	3	8	3.45
285	7	0	3	7	10	4.31
290	1	0	4	1	5	2.16
295	1	0	7	1	8	3.45
300	0	0	9	0	9	3.88
305	2	0	3	2	5	2.16
310	2	0	7	2	9	3.88
315	0	0	6	0	6	2.59
320	0	0	5	0	5	2.16
325	0	0	5	0	5	2.16
330	0	0	1	0	1	0.43
335	0	0	4	0	4	1.72
340	0	0	2	0	2	0.86
350	0	0	1	0	1	0.43
Total	143	0	89	143	232	100.02
Mean CL	237.10	0.00	292.25	237.10	258.25	

	ma	mi	mg	gm	ag	ga	ea	cm	eg
Σ	143	0	0	0	30	0	59	0	0
Mean CL	237.10	0.00	0.00	0.00	292.67	0.00	292.03	0.00	0.00
%	61.64	0.00	0.00	0.00	12.93	0.00	25.43	0.00	0.00

TABLE 13. The percentage of males in the Icelandic commercial samples of the years 1987-1990.

Month/Year	1987	1988	1989	1990
Feb				77.5
May			21.6	
Jul				65.1
Aug		25.6		
Sep	27.9	20.3		52.1
Oct	58.9			
Nov	21.2			
Dec	28.5			
Mean	34.1	23.0	21.6	64.9

