Northwest Atlantic Fisheries Organization

Serial No. N1613

NAFO SCR Doc. 89/36

SCIENTIFIC COUNCIL MEETING - JUNE 1989

A Review of the Shrimp Fishery, Pandulus borealis in Denmark Strait

by

U. Skuladottir

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

Abstract

In this paper an effort has been made to gather and combine all information available on the effort and CPUE from the shrimp fishery of all countries in Denmark Strait. Total effort and mean CPUE of all countries combined has been calculated using the figures for nominal catch for every country. It is considered here that the shrimp stock is the same on both sides of the midline between Iceland and Greenland.

The Denmark Strait area was first found in September 1976 by the Icelandic research vessel Bjarni Sæmundsson. It was not untill 1978 that there was carried out an extensive survey of the area under the leadership of Mr Ingvar Hallgrímsson of the Marine Research Institute of Iceland. From then on the fishery in the Denmark Srait area commenced. In the following year the Norwegians started to fish in the area. They did not report on effort nor CPUE. By 1980 almost all the countries that are fishing now had started fishing. The shrimp trawl used by the *Icelanders* was small in the beginning. However the CPUE in the Icelandic fishery was highest in 1978 , see table 4.

In the tables 1-6 all avilable data on CPUE effort and corresponding catch is gathered together. Usually there is one table for every country. The exception from this rule is to be found in table 1 where the data for Greenland and Denmark had to be combined for the years 1980-1982 as Carlson (1981 and 1984) did not distinguish between the effort and CPUE data of those two countries. See also NAFO Scientific Council Reports 1983. In general the CPUE and effort was taken from the NAFO Scientific Council Reports. When authors published later different figures for effort and CPUE where effort was higher than in the previous year these were preferred, taking into account that most of the NAFO meetings on the Denmark Strait shrimp took place in January which in some cases led to preliminary figures being given by respective countries. Sometimes there was discrepancy between the catch figures by month, by Carlson (1981, 1984, 1985, 1986, 1987 and 1988) and the respective authors. In that case the higher figure was believed to be the nominal catch and the effort was corrected by dividing the nominal catch of every half year by the CPUE of the same half year by every country respectively. It is considered more correct now to correct the effort for every country first, assuming less variability in gear size between boats from the same country than between different countries, rather than correcting for all countries together by every month as has been done previously (Skúladóttir 1985).

The tables 1-6 form the basis of table 7 where the total effort for the whole area on both the Greenland and Iceland side is summed up. Only the figures from countries which provide effort and CPUE data are used in calculating the subtotal of both effort and catch. Then the mean CPUE for every half year is found by dividing the catch in kgs by the effort. The corrected effort is then calculated by dividing the total nominal catch of all countries by the mean CPUE, see table 7. Table 6 from Denmark includes only nominal catch data by months but no effort. The same is true for the Faroe Islands except in the year 1980. The catch figures for these two countries are therefore included in the sum total for all countries of the nominal catch every half year and thus we can also get a measure of the total effort. In order to get the mean CPUE per year the two periods. january-June and July-december are added in the same manner in table 8. Table 9 is the same as has been published uptill now in the Scientific Reports of NAFO every year. There were some errors in the Icelandic figures in 1980 and 1986 which is hereby corrected.

It is important to evaluate whether the stock is increasing or declining. Catch rate is one of the indications of stock size. From table 8 and fig. 1 it can be deduced that CPUE was falling steadily in the years 1980-1983. In the period 1983-1986, CPUE is swinging but still going down a we bit. The stock size today is influenced by the toll taken in the past few years. In this one can assume that the shrimp in the Denmark Strait area is contributing to the fishery for 3-5 years. The effect of fishing e.g. 10000 tons per year is not evident until that amount of catch has been removed for som years. If we look at the catch of every 3 years against the CPUE in the 4th year we see that there appears a sort of reflection's pattern, see fig. 1. A linear regression is fitted to these values , see table 10. The fit is significant at the level of $p = 0.02$ ($r=0.8046$). From this a CPUE of 145 kg for the year 1988 was forecasted. The catch value for the years 1988 was put to 12178 ton, or the same as that of 1987 and hence the value for the mean catch for the years 1986-1988 became 11773 tons giving rise to a CPUE of 129 kgs for the year 1989. In this any improvement or enlargement of gear is ignored as well as a possible enlargement of fishing grounds. Not to mention variation in the size of year-classes. In connection to this it is worth noting that the Icelandic shrimp trawls e.g. have been enlarging for some years. Before 1984 the mean size of trawls was probably much less than 1700 meshes. In the years 1984, 1985, 1986,1987 and 1988, the mean size of the shrimp trawl used in the Denmark Strait area was 1748, 1865, 1980, 2371 and 2385 meshes respectively. According to most investigators there has also been an improvement in other countries' gear. But there is little concrete evidence on the size of gear apart from the Icelandic data. It might also be mentioned here that the measurement of stock size by swept area in the Denmark area (Smedstad 1988) show great fluctuations in stock size but the ups and downs in those values occur in the same years as the ups and downs of the mean CPUE of all nations per year. However the fluctuations of the CPUE values are much less pronounced.

References:

Bertrand, J., Battaglia A., Derible P. and Poulard J.C., 1988. Catch Effort and Biological Data of Shrimp (Pandalus borealis) in the French Fisheries off Greenland in 1986 and 1987. NAFO SCR Doc. 88/50, Ser. No. N1490. 17p.

Carlson, D.M. 1981. Data on the Shrimp Fishery at East Greenland in 1980 and 1981. NAFO SCR Doc. 81/XI/165, Ser. No. N473. 14p.

1984. Data on the Shrimp Fishery at East Greenland in 1983 compared to earlier years. NAFO SCR Doc. 84/I/5, Ser. No. N774.12p.

1985. Data on the Shrimp Fishery at East Greenland in 1984 compared to earlier years. NAFO SCR Doc. 85/I/12, Ser. No. N946.14p.

1986. Data on the Shrimp Fishery at East Greenland in 1985 compared to earlier years. NAFO SCR Doc. 86/5, Ser. No. N1103.14p.

1987. The Commercial Shrimp fishery in the Denmark Strait in 1986. NAFO SCR Doc. 87/09 Ser. No. N12.

1988. The Commercial Shrimp fishery in the Denmark Strait in 1987. NAFO SCR Doc. 88/57, Ser. No. N1497. 12p.

Hoydal, K. 1980. Observations on the Faroese Prawn Fishery in East Greenland, March to June 1980. NAFO SCR Doc. 80/XI/172, Ser. No. N259. 9p.

Hallgrímsson, I. and Skúladóttir, U. 1985. The Icelandic shrimp (Pandalus borealis)fishery in the Denmark Strait in 1984. NAFO SCR Doc. 85/I/11, 5p.

1988. The Icelandic shrimp (Pandalus borealis) fishery in the Denmark Strait in 1987. NAFO SCR Doc. 88/64, 5p. Ser. No. N1506.10p.

NAFO Scientific Council Reports 1979-80

NAFO Scientific Council Reports 1983

NAFO Scientific Council Reports 1987

Skúladóttir, U. 1985. The sustainable Yield of Pandalus boralis in the Denmark Strait Area. NAFO SCR Doc. 85/I/15. Ser. No. N949 6p.

Skúladóttir, U. and Ingvar Hallgrímsson. 1987. The Icelandic shrimp (Pandalus borealis) fishery in the Denmark Strait in 1986. NAFO SCR Doc. 87/04, 15p.

Smedstad, O.M., Torheim, S. 1988. A preliminary Report of a cruise with M/T "Masi" to East Greenland Waters in september 1987. NAFO SCR Doc. 88/48, Ser. No. N1488. 10p.

1987. A preliminary Report of a cruise with M/T "Masi" to East Greenland Waters in september 1986. NAFO SCR Doc. 87/2, 12p.

1986. A preliminary Report of a cruise with M/T "Masi" to East Greenland Waters in september 1985. NAFO SCR Doc. 86/8, 12p.

Table 1. Catch rates (kg per hour trawling) and corresponding effort (hours trawling) and catch (tons) from the shrimp fishery in Denmark Strait by Greenland (and Denmark in the years1980-1982) in two periods of the year.

	January - June				July - December		
Year	Month	Cpue	Effort	Catch	Month	Cpue	Effort	Catch
1980	Apr	672	35	23.5	Jul	71	60	4.2
	May	392	1295	507.6	Aug	17	32	0.5
	Jun	139	315	43.8	Sep	181	482	87.2
					Oct	107	1165	124.7
					Nov	145	465	67.4
	Subtotal	350	1645	575.0	Subtotal	129	2204	284.0
	Total	350	1665	582.0	Total	129	2483	320.0
1981	Apr	486	1343	652.7				
	May	263	914	240.4				
	Jun	123	6	0.7				
	Subtotal	395	2263	893.8				
	Total	395	4013	1585.0				
1982	Mar	160	763	122.1				
	Apr	195	1570	306.2				
	May	280	1394	390.0				
	Subtotal	220	3727	818.3				
	Total	220	8432	1855.0				
1983	Mar	345	2623	905.0				
	Apr	160	1894	303.0				
	Subtotal	267	4517	1208.0				
	Total	267	5494	1467.0				
1984	Jan	600	588	353.0				
	Feb	356	1320	470.0				
	Mar	224	5116	1146.0				
	Subtotal	280	7024	1969.0				
	Total	280	8027	2250.0				
1985	Jan	311	1878	584.0	Oct	138	51	7.0
	Feb	302	1924	581.0	Nov	228	360	82.0
	Mar	271	1288	349.0	Dec	276	300	82.8
	Apr	222	865	192.0				
	Subtotal	287	5955	1706.0	Subtotal	242	711	171.8
	Total	287	8232	2358.5	Total	242	983	237.5
1986	Jan	193	759	146.5	Nov	465	271	126.0
	Feb	212	1314	278.6	Dec	766	113	86.6
	Mar	380	1801	684.4				
	Apr	236	725	171.1				
	May	118	505	59.6				
	Subtotal	263	5104	1340.2	Subtotal	554	384	212.6
	Total	263	19000	4990.0	Total	554	1430	791.0
1987	Jan	360	5619	2023.0	Aug	121	59	7.1
	Feb	330	5815	1919.0	Sep	258	386	99.6
	Mar	303	3515	1065.0	Oct	205	698	143.1
	Apr	216	1866	403.0	Nov	152	1685	256.1
	May	307	345	106.0	Dec	117	3473	406.3
	Subtotal	321	17160	5516.0	Subtotal	145	6301	912.2
	Total	321	17280	5547.0	Total	145	7448	1080.0

Table 2. Catch rates (kg per hour trawling) and corresponding effort (hours trawling) and catch (tons) from the shrimp fishery in Denmark Strait by France in two periods of the year.

	January - June				July - December			
Year	Month	Cpue	Effort	Catch	Month	Cpue	Effort	Catch
1981	Apr	433	157	68.0				
	May	261	522	136.2				
	Jun	144	257	37.0				
	Subtotal	258	936	241.2				
	Total	258	1368	353.0				
1982	Apr	216	426	92.0				
	May	264	1011	267.0				
	Jun	185	297	55.0				
	Total	239	1734	414.0				
1983	Apr	165	479	79.0				
	May	254	476	121.0				
	Jun	162	451	73.0				
	Subtotal	194	1406	273.0				
	Total	194	1500	291.0				
1984	Mar	316	132	42.0				
	Apr	487	723	352.0				
	May	304	349	106.0				
	Total	415	1204	500.0				
1985	Apr	342	500	171.0	Oct	252	294	74.0
	May	299	930	278.0	Nov	243	37	9.0
	Jun	219	192	42.0				
	Subtotal	303	1622	491.0	Subtotal	251	331	83.0
	Total	303	1665	504.0	Total	251	550	138.0
1986	Mar	372	43	16.0	Sep	365	156	57.0
	Apr	255	831	212.0	Oct	333	327	109.0
	May	266	1073	285.0	Nov	185	27	5.0
	Jun	180	245	44.0				
	Subtotal	254	2192	557.0	Subtotal	335	510	171.0
	Total	254	2350	597.0	Total	335	546	183.0
1987	Apr	333	1147	382.0	Sep			94
	May	365	668	244.0	Oct			59
					Nov			17.0
	Total	345	1816	626.0	Total			405.0

Table 3. Catch rate (kg per hour trawling) and cooresponding effort (hours trawling) and catch (tons) from the shrimp fishery in Denmark Strait by Norway.

	January - June				July - December			
Year	Month	Cpue	Effort	Catch	Month	Cpue	Effort	Catch
1980	Mar	904	398	360.0	Aug	95	874	83.0
	Apr	704	793	558.0	Sept	145	2883	418.0
	May	378	1071	405.0	Oct	99	3071	304.0
	Jun	98	714	70.0	Nov	160	1181	189.0
	Subtotal	468	2976	1393.0	Subtotal	124	8009	994.0
	Total	468	3108	1455.0	Total	124	8106	1006.0
1981	Mar	364	137	50.0	Aug	42	167	7.0
	Apr	296	3848	1139.0	Sep	46	65	3.0
	May	161	4057	653.0				
	Jun	119	1101	131.0				
	Subtotal	216	9143	1973.0	Subtotal	43	232	10.0
	Total	216	9296	2006.0	Total	43	232	10.0
1982	Mar	197	1548	305.0				
	Apr	171	4450	761.0				
	May	248	3339	828.0				
	Total	203	9337	1894.0				
1983	Apr	128	2734	350.0	Jul	133	45	6.0
	May	255	1439	367.0	Aug	98	622	61.0
	Jun	143	1797	257.0				
	SubTotal	163	5970	974.0	Subtotal	101	667	67.0
	Total	163	6830	1114.0	Total	101	6100	613.0
1984	Feb	232	341	79.0				
	Mar	224	2777	622.0				
	Apr	183	4000	732.0				
	May	167	2994	500.0				
	Subtotal	191	10112	1933.0				
	Total	191	11141	2128.0				
1985	Mar	184	4130	760.0				
	Apr	166	5994	995.0				
	May	137	1964	269.0				
	Subtotal	166	12088	2024.0				
	Total	166	12355	2051.0				
1986	Jan	112	277	31.0	Jul	71	28	2.0
	Feb	141	1475	208.0	Aug	131	885	116.0
	Mar	166	4400	737.0	Sep	110	427	47.0
	Apr	133	4120	548.0				
	May	131	2573	337.0				
	Total	145	12845	1861.0	Total	123	1340	165.0
1987	Feb	187	802	150.0	Aug	124	258	32.0
	Mar	140	4036	565.0	Sep	135	1659	224.0
	Apr	123	4886	601.0	Oct	91	2055	187.0
	May	125	1473	196.0	Nov	47	1213	57.0
	Subtotal	135	11197	1512.0	Subtotal	96	5185	500.0

Table 4. Catch rates (kg per hour trawling) and corresponding effort (hours trawling) and catch (tons) from the shrimp fishery in Denmark Strait by Iceland in two periods of the year.

	January - June				July - December			
Year	Month	Cpue	Effort	Catch	Month	Cpue	Effort	Catch
1978	May	191	52	9.9	Jul	160	238	38.1
	Jun	221	246	54.3	Aug	164	111	18.2
					Sept	277	198	54.7
					Oct	462	149	68.9
					Nov	567	176	99.8
					Dec	243	80	19.5
	Total	215	298	64.2	Total	314	952	299.2
1979	May	239	31	7.4	Jul	178	37	6.6
	Jun	174	135	23.5	Aug	214	656	140.0
					Sep	255	561	142.9
					oct	283	276	78.1
					nov	194	342	66.3
					dec	187	110	20.5
	Total	186	166	30.9	Total	229	1982	454.4
1980	Jun	125	1425	177.6	Jul	90	1478	133.6
					Aug	104	1176	121.8
					Sep	123	851	104.2
					Oct	96	802	77.2
					Subtotal	101	4307	436.8
	Total	125	1760	219.3	Total	101	5318	539.4
1981	Jun	99	688	68.0	Jul	79	603	47.3
					Aug	39	245	9.6
	Total	99	688	68.0	Total	67	848	56.9
1982	No fishery							
1983	Jun	99	52	5.1	Oct	172	80	13.8
					Nov	155	158	24.5
	Total	99	52	5.1	Total	161	238	38.3
1984	Jun	42	53	2.2	Jul	69	655	45.4
					Aug	69	116	8.0
					Sep	99	1546	152.7
					Oct	154	1887	291.0
					Nov	74	2391	175.7
					Dec	118	569	66.8
	Total	42	53	2.2	Total	103	7164	739.6
1985	Feb	105	60	6.3	Jul	100	3477	347.1
	Mar	13	8	0.1	Aug	82	3393	278.6
	Apr	22	22	0.5	Sep	90	4377	392.2
	May	70	2558	179.0	Oct	82	2022	166.2
	Jun	114	1837	210.1	Nov	83	1232	101.9
					Dec	253	443	112.0
	Total	88	4485	396.0	Total	94	14944	1398.0
1986	Apr	21	19	0.5	Jul	123	92	11.2
	May	74	2806	206.7	Aug	95	2163	204.8
	Jun	53	64	3.4	Sep	94	2689	251.6
					Oct	82	1892	155.7
					Nov	96	947	91.4
					Dec	494	228	112.8
	Subtotal	73	2889	210.6	Subtotal	103	8011	827.5
	Total	73	3205	234.0	Total	103	8893	916.0
1987					Jul	98	447	43.7
					Aug	83	3399	283.6
					Sep	92	3078	251.4
					Oct	61	2012	123.3
					Nov	75	1482	111.8
					Dec	106	259	27.3
					Subtotal	79	10677	841.1
					Total	79	16835	1330.0

Table 5. Catch rates (kg per hour trawling) and corresponding effort (hours trawling) and catch (tons) from the shrimp fishery in Denmark Strait by Faroe Islands.

	January - June				July-December	
Year	Month	Cpue	Effort	Catch	Month	Catch
1980	Mar	1015	40	40.5	Oct	128.0
	Apr	641	1159	743.1	Nov	213.0
	May	373	1011	377.1		
	June	210	1001	210.3		
	Subtotal	427	3212	1371.0	Subtotal	
	Total	427	9115	3892.0	Total	341.0
1981	Apr			41.0	Sep.	22.0
	May			430.0	Oct.	5.0
	June			215.0		
	Total			686.0	Total	27.0
1982	Feb			94.0		
	Mar			308.0		
	Apr			243.0		
	May			92.0		
	Total			737.0		
1983	Mar			185.0		
	Apr			122.0		
	May			63.0		
	June			73.0		
	Total			443.0		
1984	Mar			220.0	Nov	43.0
	Apr			193.0	Dec	49.0
	May			163.0		
	Total			576.0	Total	92.0
1985	Feb			46.0	Oct	78.0
	Mar			136.0	Nov	101.0
	Apr			209.0	Dec	91.0
	May			13.0		
	Total			404.0	Total	270.0
1986	Jan			185.0	Sept	2.0
	Feb			158.0	Oct	3.0
	Mar			87.0	Nov	94.0
	Apr			41.0	Dec	122.0
	May			35.0		
	June					
	Total			506.0	Total	221.0
1987	Jan			84.0	Oct	1.0
	Feb			184.0	Nov	80.0
	Mar			70.0	Dec	139.0
	May			37.0		

Table 6. Catch (tons) from the shrimp fishery in Denmark Strait by Denmark.

	January-June		July-December	
Year	Month	Catch	Month	Catch
1983	Mar	38.0		
	Apr	166.0		
	Total	204.0		
1984	Jan	284.0		
	Feb	102.0		
	Apr	57.0		
	Total	443.0		
1985	Mar	44.0		
	Apr	96.0		
	May	10.0		
	Total	353.0		
1986	Jan	260.0	Nov	27
	Feb	28.0	Dec	30
	Mar	54.0		
	Apr	51.0		
	May	50.0		
	Total	443.0	Total	57
1987	Feb	99.0	Sept	4
	Mar	173.0	Oct	26
	Apr	141.0	Nov	20
	May	18.0	Dec	74
	Total	431.0	Total	124

Table 7. Catch rates (kg per hour trawling) and corresponding effort (hours trawling) and catch (tons) from the shrimp fishery in Denmark Strait by all natons combined. In two periods of the year.

		January-June			July - December		
Year	Country	Cpue	Effort	Catch	Cpue	Effort	Catch
1978	Iceland	215	298	64.2	314	952	299.2
1979	Iceland	186	166	30.9	229	1982	454.4
1980	Greenland, Danmark	350	1665	582.0	129	2483	320.0
	Norway	468	3108	1455.0	124	8106	1006.0
	Iceland	125	1760	219.3	101	5318	539.4
	Faroe Islands	427	3212	3892.0			341.0
	Subtotal	631	9745	6148.3	117	15907	1865.4
	Total	631	9745	6148.3	117	18858	2206.4
1981	Greenland, Danmark	395	4013	1585.0			
	France	258	1368	353.0			
	Norway	216	9296	2006.0	43	232	10.0
	Iceland	99	688	68.0	67	848	56.9
	Faroe Islands			686.0			27.0
	Subtotal	261	15365	4012.0	62	1080	66.9
	Total	261	18000	4698.0	62	1515	93.9
1982	Greenland, Danmark	220	8432	1855.0			
	France	239	1734	414.0			
	Norway	203	9337	1894.0			
	Faroe Islands			737.0			
	Subtotal	213	19503	4163.0			
	Total	212	23113	4900.0			
1983	Greenland	267	5494	1467.0			
	France	194	1500	291.0			
	Norway	163	6830	1114.0	101	6100	613.0
	Iceland	99	52	5.1	161	238	38.3
	Danmark			204.0			
	Faroe Islands			443.0			
	Subtotal	207	13876	2877.1	103	6338	651.3
	Total	207	17025	3524.1	103	6338	651.3
1984	Greenland	280	8027	2250.0			
	France	415	1204	500.0			
	Norway	191	11141	2128.0			
	Iceland	42	53	2.2	103	7164	739.6
	Danmark			443.0			
	Faroe Islands			576.0			92.0
	Subtotal	239	20425	4880.2	103	7164	739.6
	Total	239	24683	5899.2	103	8074	831.6
1985	Greenland	287	8232	2358.5	242	983	237.5
	France	303	1665	504.0	251	550	138.0
	Norway	166	12355	2051.0			
	Iceland	88	4485	396.0	94	14944	1398.0
	Danmark			353.0			
	Faroe Islands			404.0			270.0
	Subtotal	199	26737	5309.5	108	16477	1773.5
	Total	199	30485	6066.5	108	18985	2043.5
1986	Greenland	263	19000	4990.0	554	1430	791.0
	France	254	2350	597.0	335	546	183.0
	Norway	145	12845	1861.0	123	1340	165.0
	Iceland	73	3205	234.0	103	8893	916.0
	Danmark			443.0			57.0
	Faroe Islands			506.0			221.0
	Subtotal	205	37400	7682.0	168	12209	2055.0
	Total	205	42102	8631.0	168	13887	2333.0
1987	Greenland	321	17280	5547.0	145	7448	1080.0
	Norway	135	11356	1533.0	96	5261	507.0
	Iceland				79	16835	1330.0
	France	345	1816	626.0			405.0
	Danmark			431.0			124.0
	Faroe Islands			375.0			220.0
	Subtotal	253	30452	7706.0	99	29544	2917.0
	Total	253	33644	8512.0	99	37030	3666.0

Table 8. Catch rates (kg per hour trawling) and corresponding effort (hours trawling) and catch (tons) from the shrimp fishery in Denmark Strait by years .

Year	Periods	Cpue	Effort	Catch
1980	Jan-Jun	631	9745	6148.3
	Jul-Dec	117	18858	2206.4
	Mean/Total	292	28603	8354.7
1981	Jan-Jun	261	18000	4698.0
	Jul-Dec	62	1515	93.9
	Mean/Total	246	19515	4791.9
1982	Jan-Jun	212	23113	4900.0
	Jul-Dec	-	-	-
	Mean/Total	212	23113	4900.0
1983	Jan-Jun	207	17025	3524.1
	Jul-Dec	103	6338	651.3
	Mean/Total	179	23363	4175.4
1984	Jan-Jun	239	24683	5899.2
	Jul-Dec	103	8074	831.6
	Mean/Total	205	32757	6730.8
1985	Jan-Jun	199	30485	6066.5
	Jul-Dec	108	18985	2043.5
	Mean/Total	164	49470	8110.0
1986	Jan-Jun	205	42102	8631.0
	Jul-Dec	168	13887	2333.0
	Mean/Total	196	55989	10964.0
1987	Jan-Jun	253	33644	8512.0
	Jul-Dec	99	37030	3666.0
	Mean/Total	172	70674	12178.0

Table 9. Nominal catches and TACs (tons) of shrimp (Pandalus borealis) in Denmark Strait, 1978-87

Country	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Greenland	-	-	200	1004	1115	1467	2250	2596	5781	6627
France	-	-	50	353	414	291	500	642	780	1030
Norway	-	800	2461	2016	1896	1727	2128	2051	2026	2041
Iceland	363	485	759	125	-	43	742	1794	1150	1330
Denmark	-	-	702	581	740	204	443	353	500	555
Faroe Islands	-	-	4233	713	737	443	668	674	727	595
Total	363	1285	8405	4792	4902	4175	6731	8110	10964	12178
Adviced Tac	-	-	-	-	4200	4200	4200	5000	-	10000
Effective Tac*	-	-	-	8000	4500	5725	5245	6090	7225	7225

Table 10. The shrimp catch of every 3 years against the CPUE in the 4th year. The values are calculated or taken from tables 8 and 9. The values of 1988 and 1989 are forecasted from the linear regression:
Y = - 0.01042 * X + 253.44 r = 0.8046

3 YEARS	CATCH TONS	4th YEAR	CPUE KG
1977-79	549	1980	242
1978-80	3351	1981	245
1979-81	4827	1982	212
1980-82	6033	1983	179
1981-83	4623	1984	205
1982-84	5269	1985	164
1983-85	6339	1986	196
1984-86	8602	1987	172
1985-87	10417	1988	? 145
1986-88	? 11880	1989	? 129

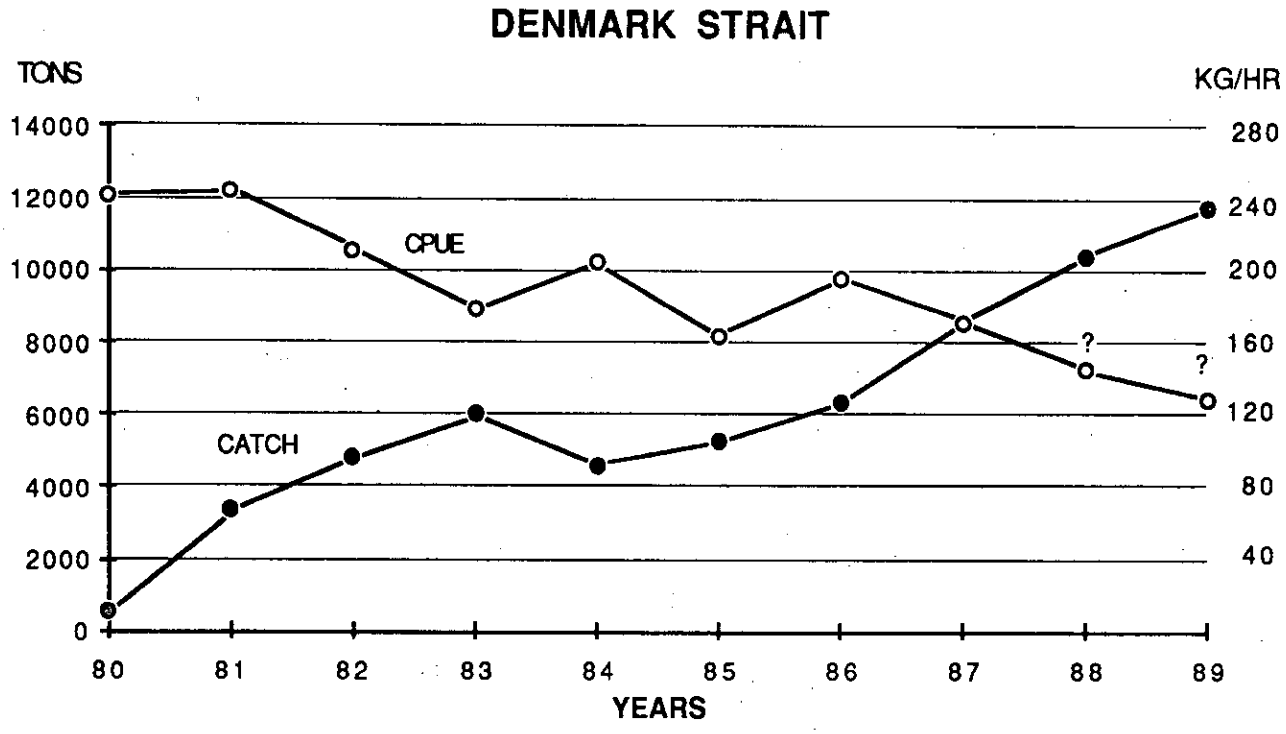

Fig. 1. The shrimp catch of every 3 years in Denmark Strait against the CPUE in the 4th year. As an example the mean catch of the years 1983-85 was 6339 tons against the mean CPUE 196 kg for the whole year 1986 of all countries, see the 1986 values on the picture.