

Northwest Atlantic



Fisheries Organization

Serial No. N1109

NAFO SCS Doc. 86/1

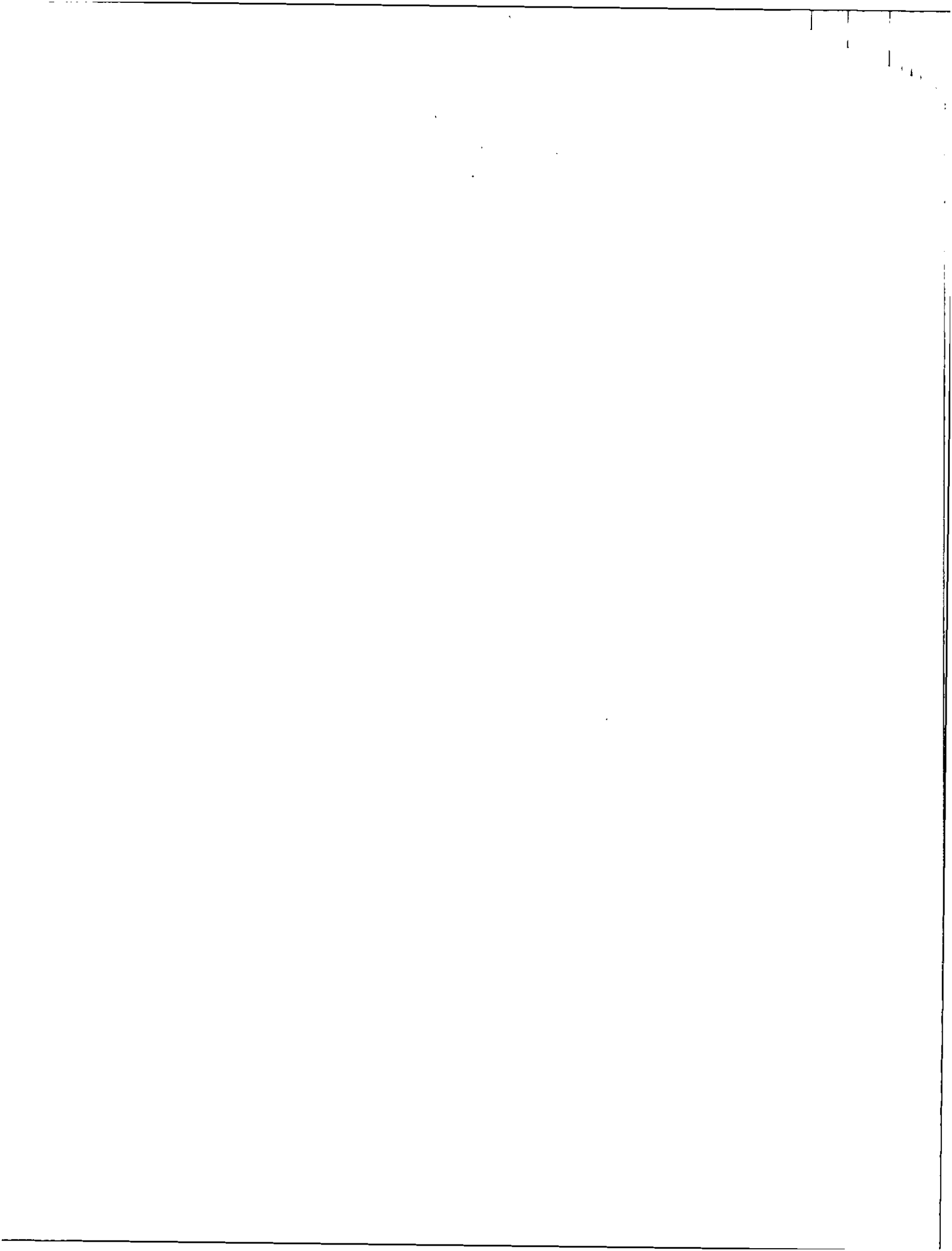
PROVISIONAL REPORT OF SCIENTIFIC COUNCIL

January 1986 Meeting

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REPORT OF SCIENTIFIC COUNCIL

January 1986 Meeting

Acting Chairman: J. S. Beckett

Rapporteur: R. Noé

The Council met at the Bedford Institute of Oceanography, Dartmouth, Nova Scotia, Canada, during 14-18 January 1986, to provide advice on the status of the shrimp stocks in Subareas 0 and 1 and on the scientific basis for their management in 1986 and as many years onward as the data allow for; as requested by Canada and Denmark on behalf of Greenland, and at the request of Denmark on behalf of Greenland to provide advice on status and management options for shrimp at East Greenland. With reference to a new regulation on discards of small shrimp, the Council addressed specific questions by Denmark on behalf of Greenland.

With respect to the justification for a special meeting in January each year, the agenda was further expanded to cover the items requested on its own initiative by the Scientific Council as mentioned in its report of June 1985: (i) if quantitative estimates of recruitment are not available for 1986, when can STACFIS expect to have the information on which to base recruitment prediction? and (ii) how big a change in assessment parameters, in particular commercial catch rates and photographic survey estimates of stock size, and recruitment estimates if such should be derived, would be required before this would be interpreted as indicating a significant change in stock abundance, and how might advice on the TAC change as a result?

The Vice-Chairman of the Scientific Council (J. S. Beckett) acted as Chairman for this meeting. Representatives attended from Canada, Denmark for Greenland, EEC (France and the Commission of the European Communities), Iceland and Norway.

The stock assessments were undertaken by the Standing Committee on Fishery Science (STACFIS) whose report, as approved by the Scientific Council at this meeting is at Appendix I.

The agenda for the meeting, the requests by Canada and Denmark (on behalf of Greenland), the list of relevant documents and the list of participants are given respectively in Appendices II, III, and IV. Brief summaries of the stock assessments and other matters considered by the Council are given below.

I. STOCK ASSESSMENTS

1. Assessment of Shrimp Stock in Subareas 0 and 1

In 1979 and 1980 the offshore shrimp fishery in the Davis Strait region was regulated by an overall TAC (total allowable catch) of 29,500 tons with nominal catches of 27,000 and 37,000 tons in the respective years (Table 1). The same TAC was advised for the years 1981-84 inclusive, however, the coastal states involved set respective TACs of 35,000, 34,800, 34,625 and 34,925 tons. For 1985, a TAC of 36,000 tons was advised by the Scientific Council. The coastal states implemented a combined TAC of 42,120 tons. Provisional statistics for 1985 indicate an offshore catch of 47,000 tons, the highest annual catch since the beginning of the fishery. This nominal catch figure, however, includes 4,300 tons of shrimp in a trial fishery by Greenland north of 70°52'N which was considered to be outside the fishing area for which advice on TAC has previously been given. The 1985 fishery was not hampered by ice as it had been during the 1982-84 period and the fishing grounds were open to the fishery at the beginning of the year. Greenland vessels which comprise the largest component of this fishery, fished Div. 1B, 1C and 1D throughout the year with more effort being expanded in these areas than in earlier years. From April and May, the fishing grounds north and west of Store Hellefiske Bank in Div. 1A and 1B were also exploited by Greenland vessels.

Table 1. Nominal catches (metric tons) of shrimp in Subarea 0 and the offshore grounds in Subarea 1 in 1976-85 with advised and effective TACs for 1977-85.

	1976	1977	1978	1979	1980	1981	1982	1983	1984 ¹	1985 ¹
Catch	42,766	34,300	26,869	27,087	36,652	37,300	36,827	39,267	36,765	46,961 ⁵
Advised TAC	-	40,000	40,000	29,500	29,500	29,500	29,500	29,500	29,500	36,000
Effective TAC ²	-	36,000	40,000	29,500	29,500	35,000 ³	34,800 ³	34,625 ³	34,925 ³	42,120 ⁴

¹ Provisional data.

² Total of Canada and EEC TACs.

³ Includes TAC of 5,000 tons for Subarea 0.

⁴ Includes TAC of 6,120 tons for Subarea 0.

⁵ Includes 4,349 tons taken in trial fishery north of 70°52'N.

All available biological information on length distribution and sexual components of the catches as well as trends in commercial catch rates and indices of abundance determined from photographic surveys were examined before advising on management of the shrimp resources in 1986.

There was a decline in abundance observed during the 1976-78 period followed by a general upward trend in overall catch rates during 1979-82. Since that time both catch rates and abundance indices from surveys have shown relative stability. It is believed however that these recent catch rates could be biased upwards due to possible influence of improved trawl designs since 1980 as well as the effect of possible influences of unfavourable ice conditions in the spring of 1982-84. Although the effects of these factors cannot be quantified, it is possible that they could account for the observed increase and subsequent stability since 1979.

A TAC of 40,000 tons was advised for 1977 and 1978. The advised TAC for 1979 was reduced by about 26% to 29,500 tons in recognition of the decrease in abundance from 1976 to 1978. Since 1979, an increase in the TAC was not advised because of interpretation of the catch-rate series and because of concerns about recruitment prospects for the stock. Despite continuing uncertainties about recruitment, catch rates have not decreased. Because of the apparent stability of the stock and the fact that higher-than-advised yields have been realized during this period of stability, the Council advised at its January 1985 Meeting that the overall TAC for the offshore grounds of Subarea 1 and adjacent parts of Subarea 0 in 1985 should not exceed 36,000 tons, which corresponds to the average catch during 1979-84. This stability is again apparent in the 1985 catch rates and survey data, subject to the uncertainties about bias in the commercial catch rates. Because of this apparent stability and despite the high catch in 1985, the Council advises that the overall TAC for the offshore grounds of Subarea 1 and Subarea 0 in 1986 should be set at the same level as advised for 1985 (i.e. 36,000 tons).

The response to specific questions by Denmark (on behalf of Greenland) regarding a regulation on discarding of small shrimp is given in Section 1(d) of Appendix I and stresses the need for more detailed data.

2. Assessment of Shrimp Stock in Denmark Strait

The shrimp fishery in this area expanded rapidly from 1978 to 1980. The total catch on both sides of the midline between Greenland and Iceland was about 8,300 tons in 1980 (Table 2) and declined sharply to 4,800 tons in 1981 when the fishery in the area west of the midline was regulated by a TAC of 8,000 tons set by the EEC. TACs of 4,500, 5,725 and 5,245 tons were set by the EEC for 1982, 1983 and 1984 respectively. Catches in Denmark Strait in these years were 4,900, 4,200 and 6,700 tons respectively. Catches in 1985 totalled 7,500 tons while the effective TAC was set at 6,090 tons.

Table 2. Nominal catches (metric tons) of shrimp in Denmark Strait in 1978-85, with advised and effective TACs for 1981-85.

	1978	1979	1980	1981	1982	1983	1984	1985
Catch	363	1,285	8,260	4,792	4,902	4,175	6,731 ¹	7,539 ¹
Advised TAC	-	-	-	-	4,200	4,200	4,200	5,000
Effective TAC ²	-	-	-	8,000	4,500	5,725	5,245	6,090

¹ Provisional data.

² Pertains to western side of the midline.

As in 1984, the 1985 fishery took place in the area of Stredde and Dohrn Banks as well as the slopes of the Storfjord Dyb. Due to favourable ice conditions in the area, the fishery was more widespread in 1985 than in previous years. The main fishing areas in 1985 extended from 65°30'N-66°30'N and around 30°W. According to CPUE data from March-May period, catch rates declined from 1978-80 and have remained relatively stable since through to 1985. It was noted that since 1980, the stock has sustained catches averaging 6,000 tons annually without any apparent drop in the commercial catch rate or any decrease in the size range of shrimp. These observations suggest the following scenarios: (a) that the fishery began at a time when the stock was expanding and that since 1980 average catches have approximated the surplus production; if this is correct, a TAC for 1986 of 6,000 tons is implied; and (b) that the stock was at maximum equilibrium levels in the late 1970's and accumulated catches since then have not had a significant impact on stock abundance; if this is correct, a catch level of 6,000 tons in 1986 is conservative. Due to uncertainties in the catch rate data however, the Council is unable to advise on which of the scenarios is correct.

II. OTHER MATTERS

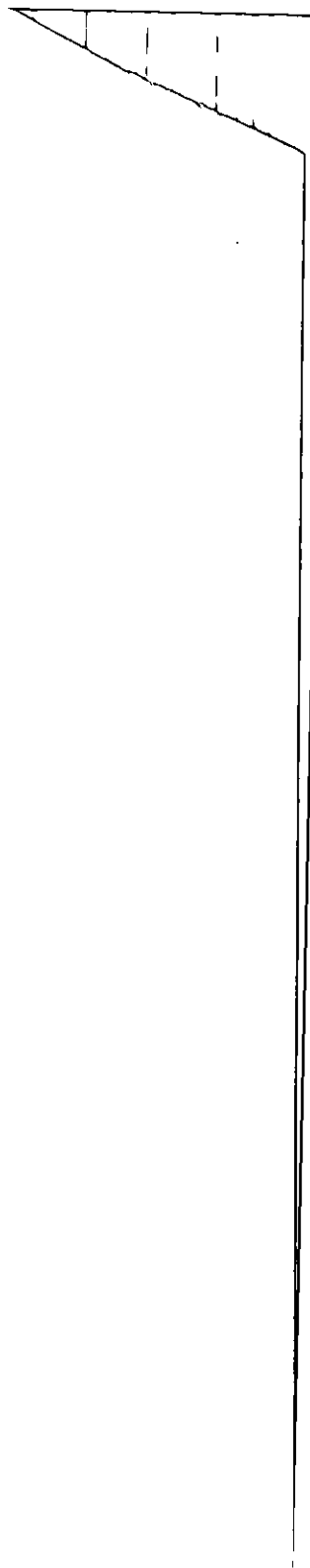
1. Review of Future Meeting Arrangements

The Scientific Council considers that a midterm meeting to assess shrimp is appropriate at least until quantitative recruitment estimates are available. Until that time, the fact that an assessment in June would use data a year older than an assessment at a midterm meeting, means that any adjustments to the TAC to take into account sudden changes in abundance, as has been observed elsewhere for other shrimp stocks, would only be possible two years after the changes. Furthermore, since data from the fishery in July-September are important, it is not appropriate to assess the stock until January.

The Council notes also that the work of STACFIS would be facilitated by meeting at a site where the data-base is accessible.

2. Adjournment

The Acting Chairman on behalf of the Council, expressed thanks to the Chairman and members of STACFIS for their hard work and noted in particular, the excellent assistance and support of the NAFO Secretariat. The meeting adjourned at 1610 hr on 18 January 1986.



APPENDIX I. REPORT OF STANDING COMMITTEE ON FISHERY SCIENCE (STACFIS)

Chairman: W. R. Bowering

Rapporteurs: Various

The Committee met at the Bedford Institute of Oceanography, Dartmouth, Nova Scotia, Canada, during 14-18 January 1986 to review the status of the shrimp stock in Subareas 0 and 1, as referred to it by the Scientific Council, based on the requests of Canada and Denmark (Greenland) (Appendix II, Annexes 1, 2 and 3). As requested by Denmark (Greenland), the Committee reviewed the status of the shrimp stock in Denmark Strait (Appendix II, Annex 1). It also addressed specific questions with respect to the justification of the special meeting in January, as requested by the Scientific Council in June 1985 (NAFO SCS Doc. 85/22, page 5). Scientists attended from Canada, Denmark (Greenland), EEC (France and the Commission of the European Communities), Iceland and Norway.

I. ASSESSMENT OF SHRIMP STOCKS

1. Assessments of Shrimp in Davis Strait (Subareas 0 and 1)

a) Fishery trends (SCR Doc. 86/4, 7, 10)

The nominal catch of shrimp in the offshore areas of Subareas 0 and 1 increased from less than 1,000 tons prior to 1972 to almost 43,000 tons in 1976, decreased to 27,000 tons in 1978 and 1979 and increased to about 38,000 tons annually in 1981-84 (Table 3). Preliminary statistics for 1985 indicate a total catch of 47,000 tons, which is the highest catch since the fishery began. However, the nominal catch figure of Greenland offshore in Subarea 1 in 1985 includes a catch of 4,349 tons of shrimp taken in a trial fishery north of 70°52'N, which was considered to be outside the fishing area for which advice on TAC has been given previously. The West Greenland inshore fishery has been relatively stable with estimated catches of 7,000-8,000 tons annually since 1972 (except 10,000 tons in 1974).

Table 3. Nominal catches and TACs (metric tons) of shrimp (*Pandalus borealis*) in Subarea 0 and 1, 1976-1985.

		1976	1977	1978	1979	1980	1981	1982	1983	1984 ¹	1985 ¹
SA 0	Canada	-	-	-	-	59	1,590	858	2,030	448	206
	Denmark	-	68	86	67	-	1,923	946	2,627	223	203
	Faroes	-	239	-	115	-	1,686	-	756	729	-
	France	-	-	21	7	-	-	-	-	436	-
	Greenland	-	-	-	149	815	85	8	-	488	2,662
	Norway	65	150	15	791	-	-	-	-	-	-
	Spain	327	-	-	-	-	-	-	-	-	-
	Total	392	457	122	1,129	874	5,284	1,812	5,413	2,324	3,071
SA 1	Canada	-	-	-	245	590	-	-	-	-	-
	Denmark	2,717	5,842	3,382	1,327	872	995	959	451	397	426
	Faroes	11,179	12,612	8,070	6,867	3,554	1,234	530	1,583	360	581
	France	803	924	805	353	247	535	672	408	404	431
	F. R. Germany	-	31	-	-	-	-	-	-	-	-
	Greenland (inshore)	7,300	7,800	7,600	7,500	7,500	7,500	7,500	7,500	7,500	7,500
	Greenland (offshore)	2,478	7,081	5,531	12,527	27,501	28,197	32,016	30,929	32,829	42,000 ²
	Japan	146	-	-	-	-	-	-	-	-	-
	Norway	11,658	7,353	8,959	4,639	3,014	1,055	838	483	451	452
	Spain	6,925	-	-	-	-	-	-	-	-	-
	USSR	6,468	-	-	-	-	-	-	-	-	-
	Total	49,674	41,643	34,347	33,458	43,278	39,516	42,515	41,354	41,941	51,390 ²
Offshore	42,374	33,843	26,747	25,958	35,778	32,016	35,015	33,854	34,441	43,890 ²	
SA 0+1 Offshore Catch	42,766	34,300	26,869	27,087	36,652	37,300	36,827	39,267	36,765	46,961 ²	
SA 0+1 Advised Offshore TAC	-	40,000	40,000	29,500	29,500	29,500	29,500	29,500	29,500	36,000	
SA 0+1 Effective Offshore TAC	-	36,000	40,000	29,500	29,500	35,000 ³	34,800 ³	34,625 ³	34,925 ³	42,120 ⁴	

¹ Provisional data.

² Includes 4,349 tons from Greenland trial fishery north of 70°52'N.

³ Includes TAC of 5,000 tons in Subarea 0.

⁴ Includes TAC of 6,120 tons in Subarea 0.

The offshore fishery has been regulated by TAC since 1977. Advised TACs by the Scientific Council have been 40,000 tons for 1977 and 1978, 29,500 tons for the years 1979-1984, and 36,000 tons for 1985. Both effective TACs and nominal catches were below or at the advised level in 1977-1979, but they have since been substantially higher. Since 1981, Canada and the EEC (from 1986 the Greenland Home Rule Authorities) have set separate TACs for Subareas 0 and 1 respectively. The effective TAC for Subarea 0 was 5,000 tons annually during 1981-84 and 6,120 tons for 1985, whereas TACs in Subarea 1 were in the range of 29,625-30,000 tons in 1981-84 and 36,000 tons in 1985.

Ice conditions in the springs of 1982, 1983 and 1984 severely hampered the access to the main fishing grounds in the Davis Strait; the 1985 situation was more similar to earlier years and the fishing grounds in the southern part of Div. 1B were open to the fishery from the beginning of the year. Greenland vessels fished in Div. 1C, and 1D and on the southern grounds in Div. 1B throughout the year, with more effort being expended in these areas than in earlier years. From April and May the fishing grounds north and west of Store Hellefiske Bank in Div. 1A and 1B were also exploited by Greenland vessels. The Norwegian fishery in 1985 occurred in Div. 1C and 1D, somewhat further south than in previous years. A French vessel fished west of Store Hellefiske Bank south to 68°N in Div. 1B in August and September. In Subarea 0, Canadian, Danish and Greenland vessels fished from June through November, mainly in the region of 58°-59°W and 67°-68°N as in previous years. There was no information available on the distribution of fishing effort by other countries.

In Subarea 1, a total of 50 vessels (>80 GRT) participated in the fishery in 1985, compared to 56, 48 and 47 in 1982, 1983 and 1984 respectively. The Greenland trial fishery north of 70°52'N took place from June to December, 21 vessels all above 80 GRT participated in the fishery. Only preliminary information on the geographical distribution of the fishery was available.

b) Input data

i) Commercial fishery data (SCR Doc. 86/4, 7, 10)

Catch rates. Catch and effort data on the shrimp fishery in 1985 were available from Canadian logbook records and observer reports for Subarea 0, Norwegian and French logbook records for Subarea 1 and Greenland logbook records and corresponding landings for Subarea 1.

Canadian data from both sources showed only a slight decrease in catch rates from 1984 to 1985 which was not considered significant. Norwegian logbook data were available from Div. 1D and 1E and showed that catch rates in the former (213 kg/hr) were similar to those obtained in the same area in 1984 (209 kg/hr).

Catch and effort data from one French trawler showed that catch rates achieved primarily in Div. 1B in August 1985 were similar to those obtained in the same month and division in 1981 and 1982 (approximately 330 kg/hr). Catch rates of seven Greenland trawlers (630-722 GRT) increased sharply from January to March and were followed by the typical decline over the remainder of the season. Catch rates from April to June were lower than in 1984 but the March 1985 rate was considerably higher. The Greenland data showed that fishing occurred in Div. 1B during all months of the year, reflecting the favourable ice conditions in 1985.

Indices of mean catch rates during the July-September period from 1976 to 1985 for the national fisheries in Div. 1B (standardized to 1976) and for the Canadian fishery in Div. 0A (standardized to the average of the other indices in 1980) are given in Table 4. The Greenland data also are illustrated in Fig. 1. Generally, all indices declined by about the same proportion from 1976 to 1979 and fluctuated similarly from 1980 to 1984, except for the abnormally high 1981 value for the French fishery (no index available from 1983 to 1985) and the stabilization of the Norwegian index from 1982 to 1983 (no index available for 1985). These exceptions, however, were derived from relatively small catches. The 1985 Greenland index is about the same level as observed in 1982 and 12% higher than the 1984 value. The Canadian index is slightly lower (3-5%) than the values of the previous two years.

Table 4. CPUE indices (July-September) for Greenland, Norwegian and French fisheries for shrimp in Div. 1B and the Canadian fishery in Div. 0A, 1976-85.

	Div.	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Greenland	1B	1.00	0.74	0.67	0.51	0.63	0.59	0.74	0.66	0.67	0.75
Norway	1B	1.00	0.84	0.60	0.47	0.60	0.43	0.57 ¹	0.56	0.61 ¹	-
French ¹	1B	1.00	1.13	0.61	0.48	0.58	0.80	0.60	-	-	∞
Canada ²	0A	-	-	-	-	0.60	0.66	0.78	0.63	0.64	0.61

¹ July only.

² Div. 0A (1980 is average of the other 3 indices)

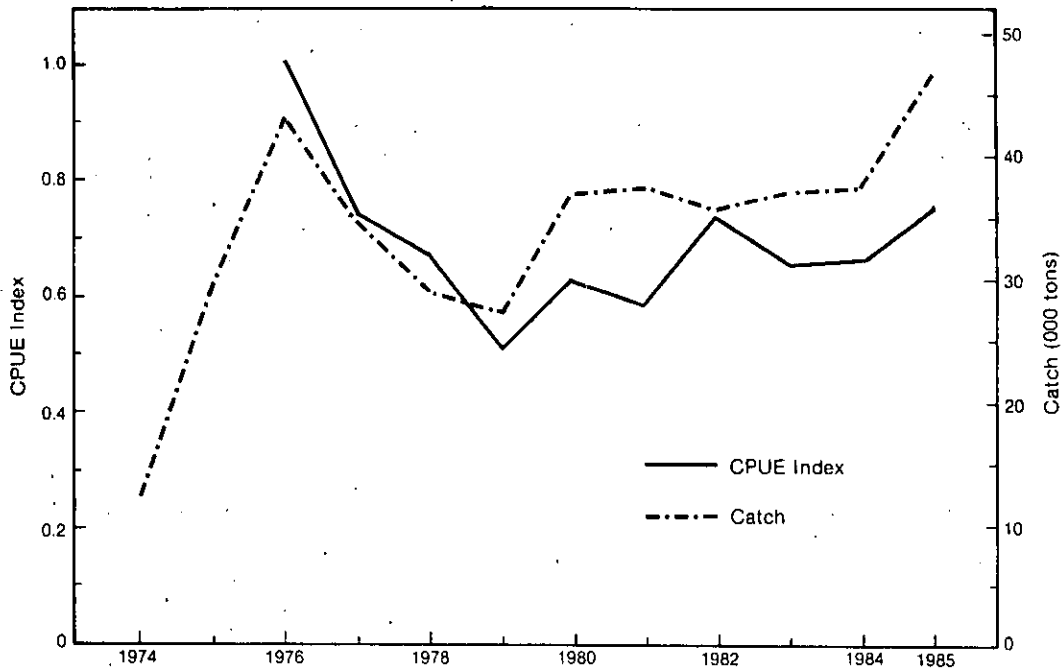


Fig. 1. Shrimp CPUE indices for the July-September period of 1976-85 in Div. 1B compared to total offshore catches in Subareas 0 to 1. (Mean CPUE values are based on logbook records of seven trawlers of the Royal Greenland Trade Department. Catch for 1985 is provisional.)

No information exists on the introduction of more efficient fishing gear around 1980 to determine the effects on catch rate indices, but it was agreed that an upward bias would be expected. Also, the late opening of the fishery in 1982, 1983 and 1984 due to ice resulted in a reduction of fishing pressure on spring concentrations of berried females which might have resulted in higher than normal abundance later in the season in these years. Therefore, it was agreed that the July-September catch rates index from 1980 to 1984 is likely biased upwards but it is not possible to quantify the effects of either of these factors.

Biological data. No shrimp samples were available from the commercial fishery in 1985 from which sex and maturity data, spawning success and age structure could be obtained. Length frequencies from the Canadian fishery in Div. OA showed that two size groups dominated in the catches. The modal group at approximately 21 mm (presumably males) could represent the 1980 year-class and the mode at 25 mm (presumably females) likely represents a number of year-classes, primarily 1978 and 1979. The data also indicated that smaller males (possibly age four) present in commercial length frequencies in previous years were lacking in 1985, suggesting the possibility of a weak 1981 year-class. However, no data were available from the other components of the fishery or the photographic survey to determine the relative strength of this group.

Shrimp discards. The observed discarding of shrimp in Div. OA during 1985 ranged from 4.0% in June to 2.2% in November. Except for October the discard rates were lower than those observed in 1984 and they appeared similar to the lower rates observed in 1982 and 1983. The size range of discarded shrimp was similar to that observed in the total catch (SCR Doc. 86/4).

By-catches. Logbook records for eight Greenland trawlers showed a by-catch of 1.8% by weight of the shrimp catch in 1985, compared to 2% in 1984 and about 1% in the period 1981-1983. The dominant species in the by-catch was redfish (SCR Doc. 86/10). In the 1985 Canadian fishery in Div. OA the observed by-catch was around 10% of the total catch weight but as in previous years the by-catch increased in October-November due to increased incidence of Greenland sharks. The dominant commercial species in the by-catch was redfish which comprised about 5% of the total catch (SCR Doc. 86/4).

ii) Research vessel surveys (SCR Doc. 86/3, 10)

Abundance estimates from photographic surveys. Data from photographic surveys in 1977-85 have been used for describing the distribution of five size groups of shrimp in the region 66°00'N to 69°30'W. Data have also been incorporated into a multiple regression model to derive biomass estimates for each of the size groups in the period 1981-85. It was noted,

that parts of the area exhibit some stability in the density of shrimp from year to year, but also that high concentrations occur at different locations in different years. The observed stability may be associated with certain bottom types, but STACFIS was unable to evaluate this possibility at this time. (Fig. 2).

The regression models applied to the photographic material indicate that environmental parameters, such as bottom temperatures, affect the five size groups in different ways.

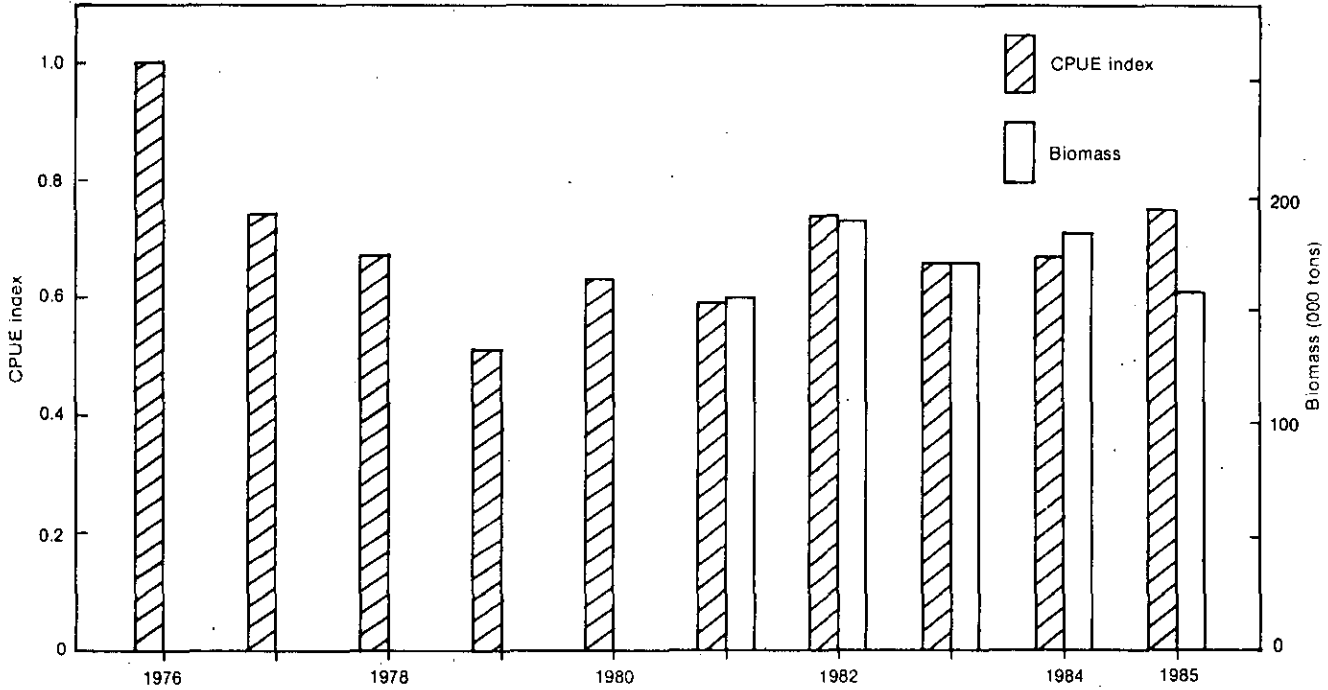


Fig. 2. Shrimp CPUE indices for commercial trawlers in Div. 1B and estimates of total biomass from photographic surveys at depths of 100-600 m in the area from 66°00'N to 69°70'N during 1981-85.

STACFIS noted that still only half of the observed variation in biomass can be accounted for by the model, but that improvement can be expected if the bottom type is included in the analyses. STACFIS noted further that despite the relatively low coefficient of determination, the trends in the estimates for total biomass in the area agree fairly well with the trends in the CPUE-figures for the same years, and that no larger variation in the biomass is observed during the last three years. However, the slight decrease in the biomass estimates from 1984 to 1985, which contrasts to an increase in the CPUE-index for Greenland trawlers (SCR Doc. 86/10), might be due to an underestimate of the biomass in the area around Holsteinsborg Dyb (Div. 1B and 1C) caused by low sampling intensity.

Biological data. Shrimp samples from the Greenland photographic survey from 66°N to 69°30'N in July-August 1985 were analyzed for sex, maturity and age composition. The samples showed a wide variation in composition of size groups (year-classes), indicating differences in distribution of the various size groups. Although the samples have been caught with a trawl mesh size of 36 mm stretched mesh, which according to previous studies should yield a 50% retention length of about 16 mm carapace length, only a minor proportion of males and juveniles below 20 mm carapace length were present in most of the samples. However, this was consistent with sampling from research surveys in previous years, and no conclusions could be made about relative year-class strength.

c) Prognoses

Catch rates from the Canadian fishery in Div. 0A for the July-September period were only slightly lower than in the previous two years. The Norwegian data indicated similar catch rates in Div. 1D in 1984 and 1985 and the catch rate from a French trawler fishing mainly in Div. 1B in August was similar to levels observed in 1981 and 1982. The Greenland data showed a catch rate similar to that obtained in 1982, both of which were higher than in the intervening two years. The trend from the Greenland data was overall stability from 1982 to 1985.

Although the CPUE indices indicated that the stock showed an increasing trend from 1979 to 1982 and stability since then, these indices may be biased upwards in recent years because of possible influences of improved trawl design since 1980 and unfavorable ice conditions in

spring of 1982, 1983 and 1984. Although the effects of these factors cannot be estimated, it is quite possible that they could account for the observed increase and subsequent stability of the stock, and that the stock may not have increased since 1979 (Fig. 1).

In 1985, STACFIS recognized that, despite concerns about possible poor recruitment, catch rates in recent years has not declined (NAFO Sci. Coun. Rep., 1985, page 20). Also, because of the apparent stability of the stock and higher-than-advised yields had been attained during the period of stability, STACFIS advised an overall TAC of 36,000 tons, corresponding to the average catch from 1979-84. The data presented at this meeting, both from the commercial fishery and from the photographic survey, indicate continued stability in abundance since 1982. Therefore, based on the apparent stability of the stock, STACFIS advises that the overall TAC for the offshore grounds in Subarea 1 and the adjacent parts of Subarea 0 in 1986 should not exceed 36,000 tons.

Historically, concentrations of shrimp have not been known to occur in the area north of 70°52'N where the trial fishery by Greenland occurred in 1985 and the possible relationships with the traditionally fished grounds are unknown at this time. Therefore, it was agreed that this area not be included in the 1986 TAC. However, because these concentrations may be part or an extension of the traditional stock, STACFIS recommends a cautious approach to exploitation in this area. If continued in 1986, this trial fishery must be monitored closely and systematically sampled to obtain information on distribution of the fishing effort and the resource as well as biological characteristics of shrimp occurring in the catches.

d) Response to Denmark (Greenland) request for further advice on shrimp in SA1 (Annex III)

Denmark on behalf of Greenland requested the Scientific Council of NAFO to provide further advice on the shrimp fishery in Subarea 1 as follows:

i) Paragraph 2 of Article 6 of the regulation of the Greenland Home Rule Government establishing certain technical measures for the regulation of fisheries stipulates that shrimp which weight 2 g or more must not be discarded.

ii) Denmark, on behalf of Greenland, requests the Scientific Council of NAFO to provide advice on the following:

- Whether the catches which are given in its reports, upon which TACs for shrimp in Greenland waters are based, are total catches or only landings (i.e. total catches minus rejects).

Catches in the most recent year include some reported discards but those are subsequently updated by NAFO and represent landings (i.e. nominal catches) as given in STATLANT reports.

- The estimated total catches, if the reported data are landings.

STACFIS has repeatedly requested that efforts be made to obtain better estimates of discards in the SA 0+1 shrimp fishery. However, due to the variability in discard practices between vessels resulting from different processing methods and seasonal and geographical changes in catch composition, objective estimates are not available and, therefore, the total catches cannot be estimated at this time. Independent estimates currently exist in vessel log records and observer's reports. These sources are seldom in agreement as evident in recent data collected from the Davis Strait fishery. Estimates reported in vessel logs are generally less than 1% of the total catch whereas observers frequently report discards in excess of 5% and up to 20%. Reliable estimates of discards can be obtained only through intensive sampling of the catch before and after discarding has occurred.

- The weight distribution of the total catches and the proportion of small shrimp (2-5 g) therein.

To obtain a weight distribution for the total catches, samples are required from the various vessel sizes, gear types, areas and seasons. In the absence of such intensive sampling, a reliable estimate of the proportion of small shrimp cannot be obtained.

- The probable conservation of the above regulation on the long-term available yield.

If the above regulation is properly adhered to for the existing TAC, total removals by fishing will be lower than under the present discarding practices. However, if the total annual discards in the years of assumed stability of the stock had been well known, the advised TAC for 1985 would have been increased accordingly. Under the existing TAC, the regulation might increase the long-term available yield, provided there are no changes in fishing pattern. Under a TAC revised upwards to account for

discards, no effect would be anticipated. These conclusions assume that no discarded shrimp survive.

- Whether the regulation has any consequence for the size of the recommended TACs for 1986.

Until reliable estimates of the discards can be obtained, the regulation will have no consequences for the recommended TACs.

- What practical technical measures (such as minimum mesh sizes, closed areas, etc.), if any, could be taken to minimize the catches of small shrimp (2-5 g).

The mesh size regulation of 40 mm was imposed in the late 1970's when very little was known about the sizes of shrimp occurring offshore in the Davis Strait. Further selectivity studies are necessary before revisions can be made to this regulation.

Small shrimp are known to occur in specific areas at certain times of the year. However, the present knowledge of the distribution of various sizes of shrimp is not sufficient to advise on closed seasons or closed areas.

e) Future research requirements

Some of the recommendations from the January 1984 Meeting (NAFO Sci. Coun. Rep., 1985, page 14) were addressed during the year while others were considered as regional problems. Danish scientists continued the redefinition of size categories of shrimp in the photographic model and work began on the potential effects of substrate on shrimp distribution. Most logbooks for vessels fishing in Div. OA for Canada were returned to authorities in time for the January Meeting. It was determined that no information exists to quantify the recent effects of changes in gear on the CPUE index and this recommendation was dropped.

Other recommendations were not addressed and it was agreed that they be restated. Obtaining data on the Greenland trial fishery north of 70°52'N was considered a high priority item for 1986. STACFIS

recommends

- i) that stratified-random trawl surveys be conducted on a seasonal basis for a number of years to determine seasonal and annual changes in distribution and abundance;
- ii) that observer programs be continued and extended to cover a greater portion of the fleet;
- iii) that the interpretation of age and growth of shrimp presented in 1985 be verified and an attempt made to separate shrimp catch sampling data into year-classes; and
- iv) that an intensive sampling program be established to monitor the trial fishery in Subarea 1 north of 70°52'N.

In response to the request from Denmark (Greenland) for further advice on shrimp in Subarea 1, STACFIS

recommends

- v) efforts be made to develop objective methods for estimating discards;
- vi) sampling of the commercial catches in the Davis Strait should be intensified to cover all components of the fishery in order to adequately represent the total catches in terms of length, weight and age;
- vii) selectivity studies be conducted for shrimp in the Davis Strait to determine optimal mesh sizes; and
- viii) research surveys should be conducted to determine possible existence of nursery grounds for shrimp in the Davis Strait.

2. Assessment of Shrimp in Denmark Strait (ICES Div. XIVb and Va)

a) Fishery trends (SCR Doc. 86/1, 5, 6, 9)

The shrimp fishery in Denmark Strait began in 1978 by an Icelandic vessel on the eastern side of the midline between Greenland and Iceland (Table 5). Nominal catches increased to 1,300 tons in 1979, when Norwegian trawlers participated in the fishery on the western side of the midline, and exceeded 8,200 tons in 1980 with the additional involvement of Danish, Faroese, French and Greenland vessels. In 1981, the total catch on both sides of the midline declined to 4,800 tons, well below the level of 8,000 tons that was aimed at by the EEC for regulation

Table 5. Nominal catches and TACs (tons) of northern shrimp (Pandalus borealis) in Denmark Strait, 1978-85¹

Country	1978	1979	1980	1981	1982	1983	1984 ¹	1985 ²
Denmark	-	-	702	581	740	204	443	353
Faroe Islands	-	-	4,233	713	737	443	668	674
France	-	-	50	353	414	291	500	642
Greenland	-	-	200	1,004	1,115	1,467	2,250	2,596
Iceland	363	485	614	125	-	43	742	1,223
Norway	-	800	2,461	2,016	1,896	1,727	2,128	2,051
Total	363	1,285	8,260	4,792	4,902	4,175	6,731	7,539
Advised TAC	-	-	-	-	4,200	4,200	4,200	5,000
Effective TAC ²	-	-	-	8,000	4,500	5,725	5,245	6,090

¹ Provisional data.

² On western side of midline only.

of the fishery in the area west of the midline. For 1982, a TAC of 4,500 tons was set by the EEC for the western side of the midline, whereas the Scientific Council advised an overall TAC of 4,200 tons; the reported catch in 1982 totalled 4,900 tons. For 1983, the EEC set a TAC of 5,725 tons, whereas the Scientific Council advised an overall TAC of 4,200 tons (as in 1982); the reported catch totalled 4,200 tons. In 1984, the EEC set a TAC of 5,245 tons, the Scientific Council advised an overall TAC of 4,200 tons as previously, and the reported catch totalled 6,700 tons. In 1985, the Greenland authorities set a TAC of 6,090 tons for the Greenland side of the midline, the Scientific Council advised an overall TAC of 5,000 tons, and the reported catch totalled 7,500 tons.

The shrimp fishery in Denmark Strait in 1985 took place in the area of Strede and Dohrn Banks as well as the slopes of the Storfjord Dyb. Due to favourable ice conditions in the area the fishery was more widespread in 1985 compared to earlier years. The main fishing area in 1985 extended from 65°30'N to 66°30'N and around 30°W.

In 1983, the overall fishing period extended from March to November, with the main fishing period from March to June. In 1984, the fishing periods west and east of the Greenland-Iceland midline differed considerably. West of the midline, the fishing period extended mainly from January to May, ending in May when most national allocations had been taken. The Faroese however continued fishing in November and December. East of the midline, on the other hand, the fishing period extended from June to December, the main fishing period being in September and October.

In 1985, fishing took place throughout the year with the larger proportion (31%) of the catch taken in the second half of the year than in 1984 (12%) and previous years. In 1983 and 1984, 41 vessels participated in the fishery compared to 47 vessels in 1985 (excluding Icelandic vessels).

b) Input data

i) Commercial fishery data (SCR Doc. 86/1, 5, 6, 9)

Catch rates. Monthly catch rates and corresponding fishing effort based on logbook data for the French, Greenland, Icelandic and Norwegian fisheries in 1980-85, are listed in Table 6. In 1980, 1981 and 1983 catch rates were highest during March-April, whereas in 1982 catch rates were highest in May. In 1984, the catch rates for Greenland vessels in January were almost as big as the highest rate observed in the period, but then declined through February and March. This high January catch rate did not occur in 1985, but the level for the other months is similar to the respective rates in previous years. The catch rates for the French vessels were considerably higher in April and May in 1981 and 1984, compared to the same months in 1982, 1983 and 1985, however, the catch rates in 1985 were above the corresponding rates in 1982 and 1983. The catch rates for Norwegian vessels have shown little change from year to year since 1982, but the catch rates in 1985 were somewhat lower than in 1984. The Icelandic catch rates were stable in June from 1980 to 1983 (no fishing took place in 1982). They declined in 1984, but increased again in 1985. The October and November catch rates declined from 1983 to 1985.

Ice conditions differed considerably from month to month throughout the years and thereby affected the distribution of the fishery, making the evaluation of CPUE data difficult. This difficulty was compounded by incomplete data on catch location and fishing effort for a substantial portion of the fleet. Although it was not possible in previous assessments

Table 6. Monthly catch rates (kg per hour trawling) and corresponding effort (hours trawling) from available logbooks of vessels involved in the shrimp fishery off East Greenland, 1980-84.

Year	Month	Greenland ¹		France		Norway		Iceland ²		
		CPUE	Effort	CPUE	Effort	CPUE	Effort	CPUE	Effort	
1980	Mar	-	-	-	-	904	398	-	-	
	Apr	672	35	-	-	704	793	-	-	
	May	392	1,295	-	-	378	1,071	125	1,425	
	Jun	139	315	-	-	98	714	90	1,478	
	Jul	71	60	62	40	-	-	104	1,176	
	Aug	17	32	-	-	95	874	123	851	
	Sep	181	482	-	-	145	2,883	96	806	
	Oct	107	1,165	-	-	99	3,071	-	-	
	Nov	145	465	-	-	160	1,181	-	-	
	1981	Mar	-	-	-	-	364	137	-	-
Apr		486	1,343	433	157	296	3,848	-	-	
May		263	914	261	522	161	4,057	-	-	
Jun		123	6	144	257	119	1,101	99	688	
Jul		-	-	-	-	-	-	78	603	
Aug		-	-	-	-	42	167	39	245	
Sep		-	-	-	-	46	65	-	-	
1982		Mar	160	763	-	-	197	1,548	-	-
	Apr	195	1,570	216	331	171	4,450	-	-	
	May	280	1,394	264	563	248	3,339	-	-	
	Jun	-	-	185	238	-	-	-	-	
1983	Mar	345	484	-	-	-	-	-	-	
	Apr	160	457	165	248	128	2,734	-	-	
	May	-	-	254	245	255	1,439	50	2	
	Jun	-	-	162	206	143	1,797	99	52	
	Jul	-	-	-	-	133	45	-	-	
	Aug	-	-	-	-	98	622	-	-	
	Sep	-	-	-	-	-	-	-	-	
	Oct	-	-	-	-	-	-	172	80	
	Nov	-	-	-	-	-	-	155	158	
	1984	Jan	600	105	-	-	-	-	-	-
		Feb	356	312	-	-	232	341	-	-
Mar		224	281	316	132	224	2,777	-	-	
Apr		-	-	487	723	183	4,000	-	-	
May		-	-	304	349	167	2,994	-	-	
Jun		-	-	-	-	-	-	42	53	
Jul		-	-	-	-	-	-	69	655	
Aug		-	-	-	-	-	-	70	116	
Sep		-	-	-	-	-	-	99	1,546	
Oct		-	-	-	-	-	-	154	1,887	
Nov		-	-	-	-	-	-	74	2,391	
Dec		-	-	-	-	-	-	118	569	
1985		Jan	311	647	-	-	-	-	-	-
	Feb	302	610	-	-	-	-	105	53	
	Mar	271	697	-	-	181	3,094	13	7	
	Apr	222	625	342	257	163	4,510	22	19	
	May	-	-	299	402	128	1,386	70	2,256	
	Jun	-	-	219	137	-	-	114	1,620	
	Jul	-	-	-	-	-	-	100	3,066	
	Aug	-	-	-	-	-	-	82	2,992	
	Sep	-	-	-	-	-	-	88	3,337	
	Oct	-	-	252	294	-	-	49	247	
	Nov	-	-	243	37	-	-	55	317	

¹ Includes logbook data for Danish vessels in 1980, 1981 and 1982.

² Data for Iceland side of midline; all other data for Greenland side of midline.

to clearly understand the reason for the trends observed in catch rates in recent years, the inclusion of the 1985 data continued to suggest stability in the stock based upon second quarter catch rates for Norway and Greenland. Despite this indication of stability from the CPUE series, it was agreed that a more detailed analysis of the existing data was needed.

Biological data. Data on the biology of shrimp in Denmark Strait were available from Icelandic, French and Norwegian trawlers in 1985. Size composition of the catches from the three countries were similar, ranging in size from about 20 to 35 mm with a dominant mode at approximately 30 mm. Samples from Iceland, however, had proportionately more male shrimp ranging in size from 20 to 29 mm.

Icelandic samples indicated that males were abundant in July, decreased up to October and increased again in November and December. The ovigerous period for females is long, beginning in July-August and lasting for at least eight months. A small proportion of females spawns every second year, as indicated by the absence of head roe in some individuals. Two age groups of males were present and were interpreted to be ages 4 and 5. Female modes were difficult to interpret but it was assumed that most were 6 and 7 years old. A weight distribution of the October samples indicated up to 5 age classes of females without spines which were not apparent in the length distribution. Weight-length relationships also were provided for ovigerous and non-ovigerous animals.

French sampling data indicated that hatching of eggs occurred in April-May, about two weeks earlier than in the previous two years. Length frequencies showed a dominance of female shrimp in the catches in both spring and autumn in 1985. Sampling from 1982 to 1985 showed similarity in size distribution of the catches over that period.

Norwegian samples from March-April consisted of 10% males, 1.6% transitionals and 88.4% females. The size composition of the catch was similar to that observed in previous years.

Shrimp discards (SCR Doc. 86/6, 9). Information from one French trawler indicated a discard rate of 0.6% by weight, which is at the same level as reported in 1984. For one Norwegian trawler information from an observer onboard indicated discards between 0.1 and 7.8% with an average of 2.3%. The discarded shrimp mostly consisted of broken shrimp of somewhat smaller size than observed in the catches (modes around 25 and 30 mm carapace length respectively).

By-catches (SCR Doc. 86/5, 9). Data on by-catches of fish in the shrimp fishery were reported for two Greenland vessels (logbook information) and for one Norwegian vessel (observer recordings).

The total by-catch appears to be lower in 1985 than in the earlier years, the major component being small redfish.

The reported by-catches in the Greenland fishery decreased from 9.1% in 1984 to 0.2% in 1985 by weight of the total shrimp catch, while the observed number of fish per kg shrimp in the Norwegian fishery decreased from 0.24 to 0.13. In contrast to the year before, no large amount of Greenland halibut was recorded in the Norwegian fishery in 1985.

ii) Data from research surveys (SCR Doc. 86/8)

The Norwegian research cruise to Denmark Strait in September 1985 provided additional information on the biology of this stock. Males were found in highest numbers in the west and north and in smallest numbers around 66°N, 30°W. For the total investigated area about 43% of the shrimp in numbers were males.

Females were also found in greatest numbers to the west and north. Most of the females were ovigerous, very few had head roe and 21% of the females were without roe. The highest frequencies of females without roe were found in the north and the lowest frequencies around 66°N, 30°W.

The highest biomass observed in the survey was therefore west and north of the main area fished in 1985. This is probably a reflection of seasonal migrations since the distribution is different at other times of the year.

Length frequencies show an increase in length from north to south and from west towards east. The smallest males were mainly found in the most northerly and westerly areas of the distribution. In spite of using a small mesh liner (4 mm square) in the codend no specimen smaller than 20 mm carapace length were found in the samples. This is not necessarily an indication of poor recruitment but from similar surveys of shrimp in other areas, may reflect the nonavailability of these length groups to the trawl.

Biomass calculations using swept area gave an estimate of 31,000 tons for the investigated area. However, the precision of the estimate cannot be determined and a time series is needed so that the estimates could be used as an index of abundance.

c) Estimation of parameters (SCR Doc. 86/2)

A general production model (Fox, 1970) was used to calculate maximum sustainable yield. Data

for all countries involved in the fishery from 1978 to 1984 were used, except for the first 2 years (1978 and 1979) when only Icelandic catch and effort data were available. There were more difficulties in calculating the total effort in 1984 for all nations than ever before as no effort data came from the Faroe Islands, and only one Greenland vessel reported effort. Moving averages of 3 years on effort were used in the model.

d) Assessment results (SCR Doc. 86/2)

The maximum sustainable yield from the general production model was 5,000 tons. Similar analysis has been presented in previous assessments and has been used, in the absence of other information, as a guide in assessing the yield from the stock. However, such models in general provide only a very approximate estimate of MSY levels. In this particular case, the short time series and the lack of a standardized catch rate implies that the estimated MSY level of 5,000 tons cannot be accepted with any degree of confidence.

e) Prognoses

According to CPUE data during the March-May period, catch rates declined from 1978-80 and have remained relatively stable since then. Since catches in 1978 and 1979 were relatively small (363 tons and 1,285 tons respectively) they could not have had a significant impact on stock abundance and therefore the 1978-79 CPUE data must be considered to be unreliable as indices of stock size. STACFIS notes that since 1980 this stock has sustained average catches of 6,000 tons without any apparent drop in commercial catch rates. Furthermore, length frequency data taken from catches during this period have not shown any decrease in size of shrimp in the catches. Taken together, these observations suggest two possible scenarios which could explain stock dynamics of shrimp in Denmark Strait since the late 1970's: (i) that the fishery began at a time when the stock was expanding and that since 1980 average catches have approximated the surplus production, or (ii) that the stock was at maximum equilibrium levels in the late 1970's and accumulated catches since then have not had a significant impact on stock abundance.

Because of the uncertainties in the catch rate data and the lack of an independent stock size index, STACFIS is unable to advise which of the above two scenarios is the correct interpretation of stock status. Accepting scenario (i) as the most appropriate reflection of stock dynamics, a TAC of 6,000 tons for 1986 is implied. This catch level would, of course, be conservative if scenario (ii) is the correct interpretation of stock status. The Committee noted, that the impact on recruitment of the fishery on the berried female component of the stock still can not be measured because of the short time series of data available, and the time lag of five years necessary for such recruitment effects to be shown.

f) Future research requirements

Some information on the biology of the shrimp stock in Denmark Strait was contained in reports from Norway, France and Iceland, but its usefulness in assessing this stock was limited by the lack of information on a year-round and year to year basis.

STACFIS noted, that some of the recommendations from the January 1985 Meeting were addressed during the year. However, some other recommendations were not addressed, and it was agreed that these be reiterated. STACFIS expressed its concern, that still few data were available on the environmental conditions and biological characteristics of shrimp in this area, and therefore

recommends

- i) that biological samples be obtained from all components of the fishery in Denmark Strait on a monthly basis;
- ii) that research vessel surveys in the area be continued and increased, and that plankton surveys be carried out to observe the distribution of shrimp larvae; and
- iii) that a study on environmental conditions be undertaken, particularly temperature, ice conditions and currents in the area.

3. Reference-cited

FOX, W. W. 1970. An exponential surplus-yield model for optimizing exploited fish populations. Trans. Amer. Fish. Soc., 99(1): 80-88.

II. OTHER MATTERS

1. STACFIS, at the June 1985 Meeting, agreed that reconsideration of the justification for a special meeting in January of each year is required, and that the matter be reviewed at the June 1986 Meeting. It was further agreed that the agenda for the January 1987 midterm meeting should include

the following items:

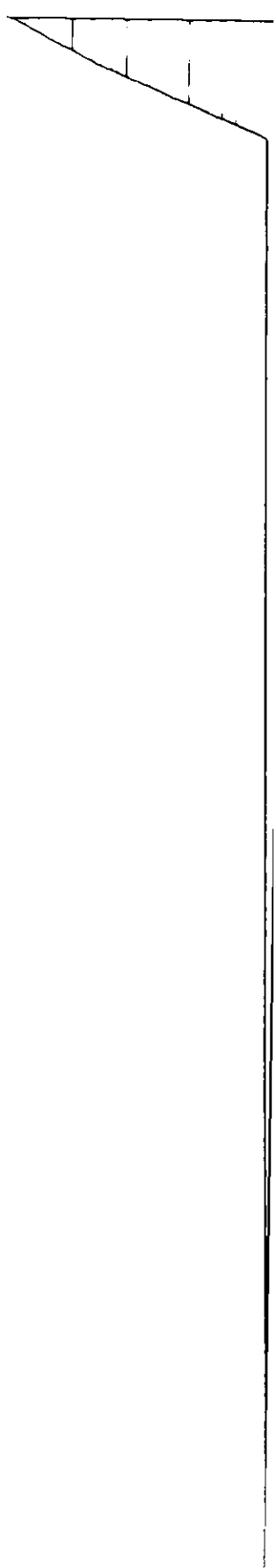
- i) if quantitative estimates of recruitment are not available for 1986, when can STACFIS expect to have the information on which to base recruitment predictions? and
- ii) how big a change in assessment parameters, in particular commercial catch rates and photographic survey estimates of stock size, and recruitment estimates if such should be derived, would be required before this would be interpreted as indicating a significant change in stock abundance, and how might advice on the TAC change as a result?

It was agreed at this meeting, that in relation to the first question, it may take two to three years before methods to obtain quantitative estimates of recruitment are developed and that information on which to base recruitment predictions will depend on those results. In relation to the second question, it was agreed that, although a specific figure could not be given, if all abundance indices showed a substantial and consistent change from one year to the next, then the advice on TAC would be changed accordingly.

Other shrimp stocks have been known to collapse over a short period, probably due to a combination of environmental factors and high exploitation (e.g. Alaska offshore and Gulf of Maine stocks). Should this occur in the Davis Strait stock, it was agreed that controls on the fishery would be required immediately. STACFIS noted that data from the fishery in the July-September period play an important role in assessing the status of the Davis Strait shrimp stock. Thus, by meeting in June, it would be necessary to base the advice for the following year on two year old data. As the fishery depends mainly on two or three year-classes, it was agreed that a more immediate evaluation of stock status would be necessary.

Although quantitative estimates of recruitment are not yet available, work is currently being conducted to address this problem. STACFIS agreed that when such information is available, confidence in projecting TACs over two years would be increase greatly and the need for midterm meetings could be reviewed at that time.

2. There being no further business, the Chairman thanked the participants for their interest and cooperation during the course of the meeting and expressed the appreciation of the Committee to the Secretariat for their usual efficiency in support of the meeting.



APPENDIX II. AGENDA FOR JANUARY 1986 MEETING

- I. Opening (Vice-chairman: J. S. Beckett)
 1. Appointment of rapporteur
 2. Adoption of agenda
 3. Plan of work

- II. Fishery Science (STACFIS Chairman: W. R. Bowering)
 1. Assessment of Shrimp Stocks
 - a) Shrimp in Subareas 0 and 1 (Annexes 1, 2 and 3)
 - i) Review of fishery trends
 - ii) Distribution and biology
 - iii) Catch and effort
 - iv) By-catches in shrimp fishery
 - v) Biomass estimates
 - vi) Total allowable catches
 - vii) Future research needs

 - b) Shrimp at East Greenland (Annex 1)
[items (i) to (vii) as in 1(a) above]

 - c) Other matters
 - i) Review of necessity for future midterm shrimp meetings.

- III. Other Matters
 1. Review of Future Meeting Arrangements (if needed)
 2. Adjournment

ANNEX 1. DENMARK (GREENLAND) REQUEST FOR SCIENTIFIC ADVICE ON MANAGEMENT
IN 1986 OF CERTAIN STOCKS IN SUBAREA 1

1. Denmark, on behalf of Greenland, requests the Scientific Council of NAFO at its June 1985 Meeting to provide advice on the status of the stocks and on the scientific basis for management in 1986 and as many years onward as the data allow for the following stocks:
 - a) Stocks occurring in Subarea 1
 - Atlantic cod
 - Redfish by species, if possible
 - Wolffish by species (spotted and striped), if possible
 - b) Stocks overlapping Subareas 0 and 1 (subject to the concurrence of Canada)
 - Greenland halibut
 - Roundnose grenadier
 - Northern shrimp (*Pandalus borealis*)
2. In the analyses on which management advice will be based, the following should be included:
 - a) For cod in Subarea 1, the current stock size and its composition and distribution should be analyzed and form the basis for management options in which catch and catch composition (by age-groups) and the resultant stock size and spawning stock size are to be given, with the examples of options:
 - i) $F = F_{0.1}$ from 1986 onward
 - ii) $F = F_{(max)}$ from 1986 onward
 - iii) $F = F_{(1984)}$ from 1986 onward
 - iv) A steady catch level from 1986 onward with the annual catch level equal to (1) TAC for 1985 (25,000), (2) any other qualified estimate of the 1985 catch, and (3) the catch for 1985 calculated by the above options for $F_{(1986)}$.

The maximum potential for rebuilding the spawning stock (i.e. complete stop of cod fishing) should also be analyzed up to and including the stock size by January 1989.

A graph should be produced illustrating the resulting spawning stock by 1 January 1987 for any given 1986 catch level between zero and that for $F_{(max)}$, assuming that the catch level in 1985 is equal to the above-mentioned TAC for that year.

The possibility and the advantages and disadvantages of combining, in future, the annual analyses of cod at West and East Greenland should be discussed.
 - b) For redfish and wolffish in Subarea 1, options for management should, if possible, be expressed graphically in terms of catches in 1986 and the stock and spawning stock biomass by 1 January 1987 for a range of F-values covering at least half to double that in 1984.
 - c) For Greenland halibut and roundnose grenadier in Subareas 0+1, the guidelines provided above for redfish and wolffish in Subarea 1, supplemented by any other guidelines provided by Canada, should form the basis for the analyses and advice.
 - d) The Scientific Council should feel free to report on such other invertebrate and finfish stocks in Subarea 1 and on such other scientifically-based management options for the above-mentioned Subarea 1 stocks as it feels applicable.
3. As in the past, advice on status of stock and management options for shrimp at East Greenland should also be provided in cooperation with ICES.

K. Trolle
Ministry for Greenland
Copenhagen, Denmark

ANNEX 2. CANADIAN REQUEST FOR SCIENTIFIC ADVICE ON MANAGEMENT IN 1986
OF CERTAIN STOCKS IN SUBAREAS 0 TO 4

1. Canada requests that the Scientific Council, at its meeting in advance of the 1985 Annual Meeting, provide advice on the scientific basis for the management of the following fish and invertebrate stocks in 1986:

Cod (Div. 2J, 3K and 3L; Div. 3N and 3O; Div. 3Ps)
Redfish (Div. 3L and 3N)
American plaice (Div. 3L, 3N and 3O)
Witch flounder (Div. 3N and 3O)
Yellowtail flounder (Div. 3L, 3N and 3O)
Greenland halibut (Subarea 2 and Div. 3K and 3L)
Roundnose grenadier (Subareas 2 and 3)
Silver hake (Div. 4V, 4W and 4X)
Capelin (Div. 3L; Div. 3N and 3O)
Squid (Subareas 3 and 4)

It is further suggested that, subject to the concurrence of the other coastal states concerned, the Scientific Council, prior to the 1985 Annual Meeting of NAFO, provide advice on the scientific basis for management in 1986 of the following stocks:

Shrimp (Subareas 0 and 1)
Greenland halibut (Subareas 0 and 1)
Roundnose grenadier (Subareas 0 and 1)

2. Canada requests the Scientific Council to consider the following options in assessing and projecting future stock levels for those stocks listed above and for the Flemish Cap (Div. 3M) stocks:
- a) For those stocks subject to analytical dynamic-pool type assessments, the status of the stock should be reviewed and management options evaluated in terms of their implications for fishable stock size in both the short and long term. In those cases where present spawning stock size is a matter of scientific concern in relation to the continuing productive potential of the stock, management options should be evaluated in relation to spawning stock size. As a general reference point, the implications of continuing to fish at $F_{0.1}$ in 1986 and subsequent years should be evaluated. The present stock size should be described in relation to those observed historically and those expected at the $F_{0.1}$ level. Opinions of the Scientific Council should be expressed in regard to stock sizes, catch rates, and TACs implied by these management strategies for 1986 and the long term.
- b) For those stocks subject to general production-type assessments, the status of the stock should be reviewed and management options evaluated in the way described above to the extent possible. In this case, the general reference point should be the level of fishing effort (F) which is two-thirds that calculated to be required to take the MSY catch in the long term.
- c) For those resources on which only general biological and/or catch data are available, no standard criteria on which to base advice can be established. The evidence on stock status should, however, be weighed against a strategy of optimum yield management and maintenance of stock biomass at levels of about two-thirds that of the virgin stock.

L. S. Parsons, Assistant Deputy Minister
Atlantic Fisheries, Department of Fisheries and Oceans
Ottawa, Ontario

ANNEX 3. DENMARK (GREENLAND) REQUEST FOR FURTHER ADVICE
ON THE SHRIMP FISHERY IN SUBAREA 1

1. Paragraph 2 of Article 6 of the regulation of the Greenland Home Rule Government establishing certain technical measures for the regulation of fisheries stipulates that shrimp which weigh 2 g or more must not be discarded.
2. Denmark, on behalf of Greenland, requests the Scientific Council of NAFO to provide advice on the following:
 - a) Whether the catches which are given in its reports, upon which TACs for shrimp in Greenland waters are based, are total catches or only landings (i.e. total catches minus rejects).
 - b) The estimated total catches, if the reported data are landings.
 - c) The weight distribution of the total catches and the proportion of small shrimp (2-5 g) therein.
 - d) The probable conservation of the above regulation on the long-term available yield.
 - e) Whether the regulation has any consequence for the size of the recommended TACs for 1985.
 - f) What practical technical measures (such as minimum mesh sizes, closed areas, etc.), if any, could be taken to minimize the catches of small shrimp (2-50 g).

Received via the Ministry of
Fisheries and Trade
Greenland Home Rule Government

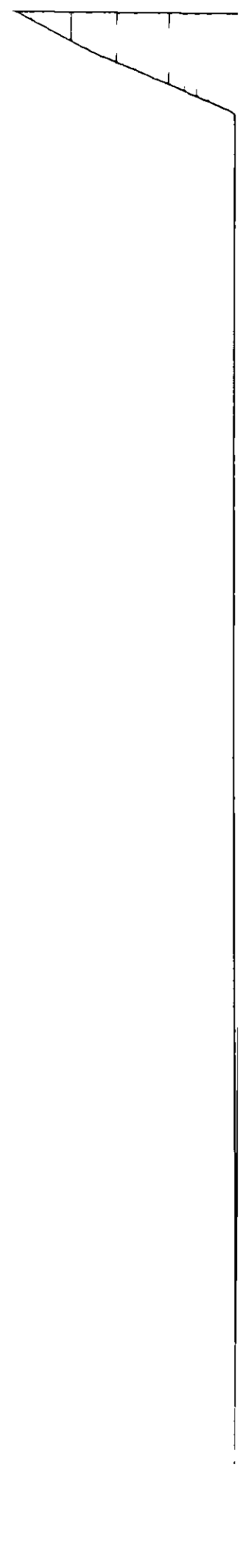
APPENDIX III. LIST OF RESEARCH AND SUMMARY DOCUMENTS

RESEARCH DOCUMENTS

<u>SCR #</u>	<u>Ser. #</u>	
86/1	N1099	<u>I. HALLGRIMSSON, and U. SKULADOTTIR.</u> The Icelandic shrimp (<u>Pandalus borealis</u>) in the Denmark Strait in 1985.
86/2	N1100	<u>I. SKULADOTTIR, and I. HALLGRIMSSON.</u> The sustainable yield of shrimp (<u>Pandalus borealis</u>) in the Denmark Strait area, 1978 to 1984.
86/3	N1101	<u>PER. KANNEWORFF.</u> Biomass of shrimp (<u>Pandalus borealis</u>) in NAFO SA1 in 1981 - 1985 estimated by means of bottom photography.
86/4	N1102	<u>D. G. PARSONS, and P. J. VEITCH.</u> The northern shrimp (<u>Pandalus borealis</u>) fishery in Division OA, 1985.
86/5	N1103	<u>D. M. CARLSSON.</u> Data on the shrimp fishery at East Greenland in 1985 compared to earlier years.
86/6	N1104	<u>J. C. POULARD, B. FONTAINE, A. BATTAGLIA, and P. DERIBLE.</u> Catch, effort and biological data of shrimp (<u>Pandalus borealis</u>) in the French fishery off East Greenland in 1985.
86/7	N1105	<u>J. C. POULARD.</u> Data on French shrimp fishery off West Greenland in 1985.
86/8	N1106	<u>O. M. SMEDSTAD.</u> Preliminary report of a cruise with M/T "MASI" to East Greenland waters in September 1985.
86/9	N1107	<u>O. M. SMEDSTAD, and S. TORHEIM.</u> Investigations on shrimp (<u>Pandalus borealis</u>) in the Norwegian fishery off East Greenland in 1985.
86/10	N1108	<u>D. M. CARLSSON.</u> Data on the shrimp fisheries in NAFO Subarea 1 in 1984 and 1985.

SUMMARY DOCUMENTS

86/1	N1109	<u>NAFO.</u> Provisional Report of Scientific Council, January 1986 Meeting.
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APPENDIX IV. LIST OF PARTICIPANTS

LIST OF PARTICIPANTS

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