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Report of Standing Committee on Research and Statistics (STACRES)

Special Meeting on Seals and Shrimp, November 1978

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REPORT OF STANDING COMMITTEE ON RESEARCH AND STATISTICS (STACRES)

Special Meeting on Seals and Shrimp, November 1978

Chairman: G. H. Winters (Acting) Rapporteur: V. M. Hodder

STACRES met at the Institute of Marine Research, Bergen, Norway, during 13-17 November 1978. In the absence of the Chairman (Dr E. C. Lopez-Veiga, Spain), it was unanimously agreed that Dr G. H. Winters (Canada) be the Chairman for this meeting. The main purpose of the meeting was (a) to provide advice for the management of the harp and hooded seal stocks as requested by Canada (Com. Doc. 78/VI/13), and (b) to assess the status of the shrimp (=northern deepwater prawn) stocks in Subarea 1 and Statistical Area 0 at the request of Canada and the European Economic Community (EEC) (Com. Doc. 78/VI/3; 78/VI/5; *ICNAF Redbook* 1978, p. 39).

Meetings of *ad hoc* Working Groups on Seals (convened by A. W. Mansfield) and on Shrimp (convened by Ø. Ulltang) were held concurrently during 14-16 November, and their reports, as approved by STACRES, are given in Appendices I and II respectively. In addition, the *ad hoc* Working Group on Standardization of Reporting Procedures for Sampling Data (convened by W. G. Doubleday), which was established by STACRES at its 1978 Annual Meeting (*ICNAF Redbook* 1978, p. 41-42) met during 13-16 November, and its report (Appendix III) was adopted by STACRES. The agenda for the meetings is given in Appendix IV. Scientists attended from Canada, Denmark, France, Norway, USSR, and USA (Appendix V). Research documents presented for consideration are listed in Appendix VI. Brief summaries of the reports of the Working Groups, together with other matters considered by STACRES, are given below.

1. Assessment of Seal Stocks (App. I)

a) Harp seals

A new estimate of natural mortality (M) of 0.10 is identical to the value used in the 1977 assessment. A difference in pregnancy rate between females sampled early and late in pregnancy, evidently a result of intra-uterine mortality, indicated that only late-term pregnancy rates should be considered in population models. However, data were not now sufficient to warrant using a value different from 0.92, the average value of all pregnancy rates so far estimated. No density-dependence in the late-term pregnancy rate was evident in the data available. A slightly increased median age of whelping (4.9 years) was noted, but this could be explained by intra-uterine mortality and sampling error.

Pup production estimates were available from catch-effort data, tagging-recapture data and sequential population analysis. Estimates ranged from 338,000 to 378,000, the latter value being subject to significant downward revision if further tagged young-of-the-year seals are recaptured. Projections for 1979 indicated pup productions ranging from 345,000 at a stock size of 1.32 million to 358,000 at a stock size of 1.4 million. Under a continuing total allowable catch (TAC) of 180,000 (80% pups), one analysis predicted an increase in pup production and stock size of 2% per year over the 1979-83 period. A second analysis, assuming density-dependence of up to three vital rates, predicted increases from a starting population population of 1.40 million in 1979 to 1.55-1.73 million in 1988.

Replacement yield, defined as the catch which maintains the same stock size from one year to the next, was estimated to range from 198,000 to 205,000 in 1979. Estimates of sustainable yield ranged from 214,000 to 240,000, depending on the ratio of the number of pups to the number of older seals killed. With catches of this magnitude, the stock size would be expected to decrease for a period of 5-6 years until the strong year-classes from 1972 onwards enter the breeding stock.

The evidence for separate Gulf and Front herds still remains equivocal. Tag returns indicate that there is a large admixture of immature animals but generally a separation of adults. In view of this, it would be prudent to divide the catch between the two areas in proportion to the estimated herd sizes to avoid the risk of temporary depletion of one herd. All evidence indicates that the Northwest Atlantic harp seal population is continuing to increase, after declining to its lowest level of about one million animals in 1972.

b) Hooded seals

The limited amount of data available makes the estimates of stock size, production and sustainable yield uncertain. A new sequential population analysis indicated that the stock size of females has been relatively stable since the 1960's, varying between 48,000 and 55,000, whereas a similar analysis in 1977 based on slightly different assumptions indicated an increase in the stock size of age 1+ females from 53,000 to 77,000 over the same period. Pup production, based on the most recent estimate of stock size, appears to have fluctuated between 24,000 and 30,000

since the 1960's and is projected to be 28,500 in 1979. The sustainable yield is estimated at 12,500 pups, 1,100 adult females and 1,400 adult males, assuming that the proportion of adult females in the catch is maintained at the present level of 7.5% or less.

The great difference in the two estimates of population size, based on essentially the same data, underscores the need for a conservative policy in harvesting hooded seals. Since the best estimate of sustainable yield appears to be between 15,000 and 20,000, STACRES advises that it would not be prudent to increase the TAC from the present level of 15,000. The lack of adequate data for assessment purposes provides ample justification for substantially increasing the research effort on hooded seals.

2. Assessment of Shrimp Stocks (App. II)

The shrimp fishery was brought under quota regulation in 1977 with a TAC of 36,000 tons for the offshore grounds in Subarea 1. The total nominal catch of shrimp in Subarea 1 was about 42,000 tons in 1977, of which 34,000 tons were taken on the offshore grounds. For 1978, the TAC was set at 40,000 tons for Subarea 1 (offshore) and Statistical Area 0. It seems unlikely that the overall TAC will be fully utilized in 1978, as the total catch in the management areas amounted to only 22,000 tons up to the end of September. New information from surveys in Statistical Area 0 revealed that the only commercially-valuable shrimp concentrations were located in the boundary area of Statistical Area 0 and Subarea 1. Within Subarea 1, both research and commercial data for 1978 are consistent with earlier observations that the highest levels of offshore abundance occur in Div. 1B.

Catch-per-unit-effort data for fisheries by Denmark (F), Denmark (G), France and Norway indicate decreasing catch rates from 1976 to 1978, with the largest decline from 1977 to 1978. The very high catch rates experienced periodically by Norwegian and Faroes vessels in Div. 1B during the first half of the years 1975 to 1977 were not obtained in 1978, although the large Greenland trawlers had higher catch rates in May 1978 than in the first quarter of the year. The differing catch rates in the first half of 1978 were due in part at least to ice conditions which limited the fishing activities of some vessels, while other vessels, among them the Greenland trawlers, were able to fish among the drift ice. For the period of July-September, when fishing activities were not affected by ice, catch-per-unit-effort data indicate an overall gradual decline in catch rate of about 32% from 1976 to 1978. The results of photographic surveys and the catch-per-unit-effort data indicated that the fishable biomass of shrimp decreased by about 20% from 1977 to 1978.

The observed decline in biomass was not unexpected, because the exploitation of a new resource normally starts with a relatively high catch rate which declines as the biomass is reduced by fishing and ultimately results in a lower level of catch rate at the sustainable level of fishing. In view of the evidence pointing to a decreasing biomass, it was generally agreed that a more cautious approach should be taken in advising a TAC for 1979 than previously. Various points of view were noted in evaluating the degree of reduction in TAC to be advised for 1979. Considering the observed 20% decline in biomass from 1977 to 1978 as one reference point, STACRES agreed that a reduction in TAC of 20% should be regarded as the minimum advisable reduction. However, concern was expressed that the catch rate (although declining) may have been maintained at high levels due to the continued searching for and the progressive exploitation of new shrimp concentrations during the 1975-78 period, thus indicating the need for a larger reduction in the TAC of about 32% based on the decline in catch rate from 1976 to 1978. Further justification for a cautious management regime in 1979 relates to the observations during the photographic surveys in 1978 of numerous small shrimp which will recruit to the fishable biomass in 1979 but will mainly occur in the catches as male shrimp at the lower part of the size distribution, whereas by 1980 this group will occur as larger female shrimp and thus may contribute to improved fishing prospects in that year.

Taking into consideration the range of viewpoints discussed by the Working Group, STACRES agreed with the conclusions regarding a TAC for 1979, and accordingly advises that the 1979 TAC for shrimp should be set at a level in the range of 20-32% below the advised 1978 TAC of 40,000 tons (including discards) from the biomass on the offshore grounds in Subarea 1, including that portion of the biomass in Statistical Area 0 which is an extension of the biomass found in Div. 1A and 1B. This implies a TAC in the range of 27,200-32,000 tons for 1979. No attempt was made to determine a TAC for the remainder of Statistical Area 0.

STACRES noted that the advice involving a range of TAC for 1979 reflects the necessity of having much better data than are now available to adequately assess the current state of the stock, and endorsed the recommendations of the Working Group (Appendix II) concerning the need for (i) extensive trawl and photographic surveys in order to update the estimate of the minimum trawlable biomass of shrimp in Subarea 1 beyond the 1976 reference point, and (ii) an extensive observer program on a year-round basis to monitor the shrimp fishery and collect detailed information on catch-per-unit-effort, size composition, by-catches and discards.

3. Standardization of Reporting Procedures for Sampling Data (App. III)

STACRES noted that the Working Group had reviewed present standards and practices in the reporting of commercial catch samples. It was pointed out that the sampling requirements and observer programs of some of the coastal states have substantially increased the quantity and detail of data collected in a large part of the ICNAF Area, but have resulted in deviation from uniform reporting procedures. It was noted that the coastal states' representatives favoured the reporting of individual samples to the ICNAF Secretariat, and a review of the proposed NAFO Convention indicated a continuing role for the Secretariat in maintaining a sampling data base. It was agreed that standardized reporting of sampling data was desirable throughout the ICNAF (NAFO) Area, and STACRES therefore

recommends (1)

that individual length samples of commercial catches and the corresponding age-length keys be made available to the ICNAF (NAFO) Secretariat for ultimate incorporation into its sampling data base.

STACRES noted that the reporting of individual samples would increase the key-punching workload of the Secretariat, unless the data are received in machine-readable form. The cost of maintaining the data base is not expected to be substantially increased. STACRES noted further that data for individual samples may be accompanied by detailed information of a confidential nature, and therefore

recommends (2)

i) that an inventory of the sampling data be published annually;

ii) that the data be made available to the members of STACRES at present and to members of the Scientific Council of NAFO in the future; and

iii) that further distribution of the data be subject to the approval of the country on whose vessels the samples were collected and also to the approval of the coastal state for samples taken within a national fishing zone.

STACRES accepted the form for the reporting of length frequency samples, as proposed by the Working Group (see App. III, Annex 1), and

recommends (3)

that the form be used for the reporting of length samples to the ICNAF Secretariat from 1 January 1979.

STACRES noted that time at this meeting did not permit the development of a form for the reporting of age samples, although a list of contents was proposed. STACRES accordingly

recommends (4)

that the ICNAF Secretariat design a draft form for reporting age samples based on the contents listed in Appendix III to this report and circulate it to members of STACRES for comment prior to its consideration and possible adoption by STACRES at its Special Meeting in February 1979.

STACRES recognized the practical difficulties of obtaining suitable age-length keys corresponding to individual length samples, and

recommends (5)

that data from samples taken for ageing not be combined for periods exceeding one calendar month or for areas greater than one ICNAF division (or subdivision, where applicable).

4. Other Matters

a) Future scientific meetings

STACRES reviewed the scheduling of meetings for the first half of 1979 and confirmed the following:

i) Special Meeting of STACRES on Capelin and Squid will be held at Tokyo, Japan, during 14-21 February 1979.

ii) Regular spring meeting of the Assessments Subcommittee will be held at St. John's, Newfoundland, Canada, during 28 March-9 April 1979, a portion of this period being allotted for a meeting of the Biological Surveys Subcommittee and a joint meeting of the two subcommittees.

iii) The Second International Symposium on the Early Life History of Fish (ICES/ICNAF/FAO) will be

held at Woods Hole, Massachusetts, USA, during 2-5 April 1979.

iv) The Annual Meeting of STACRES and its Subcommittees will be held at ICNAF Headquarters, Dartmouth, Nova Scotia, Canada, during 22-29 May 1979.

b) Publication of papers on shrimp

STACRES noted that *ICNAF Selected Papers* No. 4, containing 11 scientific papers on shrimp presented at meetings in 1976, was now available, and expressed appreciation to the Secretariat for its efficiency in producing this publication.

5. Acknowledgement

The Chairman expressed his appreciation to the Director and Staff of the Institute of Marine Research for the service and facilities provided for the meeting and for their generous hospitality, to all participants including the conveners of the working groups and the rapporteurs for their interest and cooperation during the course of the meeting and finally to the Secretariat for their usual efficient work. STACRES expressed its thanks to Dr G. H. Winters for agreeing to preside over this meeting upon very short notice.

APPENDIX I. REPORT OF *AD HOC* WORKING GROUP ON SEALS

Convener: A. W. Mansfield

Rapporteur: C. E. Button

The *ad hoc* Working Group on Seals met during 14-16 November 1978 to review the status of the harp and hooded seal populations in the Northwest Atlantic, as requested by Canada (Com. Doc. 78/VI/13; *ICNAF Meet. Proc.* 1978, No. 7, page 37). Representatives attended from Canada (W. D. Bowen, C. E. Button, W. G. Doubleday, P. F. Lett, A. W. Mansfield, D. E. Sergeant and G. H. Winters), Denmark (F. O. Kapel), and Norway (B. Bergfløt and T. Øritsland). The Working Group reviewed the information presented in several working papers and the following research documents: 77/XI/68 (revised); 78/XI/84, 85, 86, 90, 91, 92 and 98.

1. Conservation of Harp Seals

a) Research in 1978

Canada reported the results of studies on tagging and recapture, age composition of the catch, maturity and fecundity, and mixing of the Front and Gulf herds (Res. Doc. 78/XI/85), estimates of pup production utilizing catch and effort data, and sustainable yield (Res. Doc. 77/XI/68 (revised)), the influence of density-dependent processes on population dynamics (Res. Doc. 78/XI/84), and genetic variability between herds of harp seals in the Northwest Atlantic (Res. Doc. 78/XI/90). Norway reported on the recapture of previously tagged seals and the status of age frequency analyses of specimens collected at the Front in 1977 and 1978 (Res. Doc. 78/XI/92). Denmark presented historical and recent data on the catches of seals in West Greenland (Res. Doc. 78/XI/98).

b) Population assessment

i) Vital rates

Natural mortality (M) was calculated at 0.10 (standard error 0.03) (Res. Doc. 78/XI/84), which is identical to the value used by the Working Group at its Meeting in November 1977 (*ICNAF Redbook* 1978, page 17). The Working Group agreed that this rate applied to age 1+ animals, but noted possible density-dependence of M for age-group 0, as suggested for some other pinnipeds.

Attention was drawn to a reduction in pregnancy rate between early- and late-term samples, attributable to normal intra-uterine losses (Res. Doc. 78/XI/85). The calculated late-term pregnancy rate (0.90) was based on data including four animals reported as immature, which the Working Group agreed should be excluded. Removing these anomalous data gives an estimated pregnancy rate of 0.94 for late-term females in 1978. The Working Group agreed that a late-term pregnancy rate of 0.92, calculated by averaging all available historical data, was the best estimate for use in subsequent calculations. Density-dependence in the late-term pregnancy rate was not evident in data available to the Working Group.

A median age of whelping of 4.9 years was estimated from late-pregnancy samples from the Gulf in 1978 (Res. Doc. 78/XI/85). This compares with an estimate of 4.6 years from early-pregnancy samples taken at the Front in 1976. Intra-uterine loss and sampling error could both contribute to the observed difference.

ii) Pup production

An update of catch/effort analyses (Winters, 1978)[1] to include 1978 data resulted in an estimated mean pup production of 213,000 animals at the Front over the 1965-78 period and a production of 199,000 animals in 1978. The Working Group noted that the late availability of the northern patch of harp seals to inshore sealers at the Front in 1978, and the method of calculation, would tend to produce an underestimate of production. A sequential population analysis estimated total production in the Northwest Atlantic in 1978 of 338,000 animals (Winters, 1978)[1].

Pup production in the Gulf was estimated by a sequential population method (Res. Doc. 77/XI/68 (revised)) to be 103,000 in 1978, the mean pup production being estimated at 98,000 for the 1972-78 period.

Calculations, based on tagging-recapture data from the 1978 study (Res. Doc. 78/XI/85), gave a mean estimate of pup production of 121,000 in the Gulf (excluding the northern Gulf Mecatina patch) and 257,000 at the Front, for a total production of 378,000 pups. The Working Group noted that the exclusion of data for the Mecatina patch from the calculations

[1] Winters, G. H. 1978. Production, mortality, and sustainable yield of Northwest Atlantic harp seals (*Pagophilus groenlandicus*). J. Fish. Res. Bd. Canada, 35(9): 1249-1261.

would tend to reduce the estimate of total production, and that any late reporting of a small number of tags from Newfoundland would result in a significant downward revision of the estimate.

iii) Stock relationships

Evidence presented in 1978 confirms previous observations on interbreeding of harp seal herds at the Front and in the Gulf. Observations of the proportion of younger whelping females during 1976-78 and maturity data do not support the hypotheses of Front and Gulf herd segregation (Res. Doc. 78/XI/85). The author of this document reported the first confirmed recoveries from the Front of adult seals tagged as pups in the Gulf in 1969.

Studies reported in Res. Doc. 78/XI/90 indicate that the Gulf and Front herds were indistinguishable using tissue enzyme electrophoresis, thus implying interbreeding of seals from the two areas. The Working Group suggested that the authors calculate the rate of interbreeding required to explain their observations and also noted the need for further estimates of cross-over. The degree of interbreeding, or cross-over, between the Front and Gulf herds cannot be quantified from existing data. Therefore, the Working Group advises that the total catch of harp seals in the Gulf and at the Front be subdivided in proportion to the estimated herd sizes in these areas to avoid the risk of temporary depletion of one herd.

iv) Stock size and pup production in 1979

Winters (1978)[1], by assuming a catch of 180,000 animals (80% pups) in 1978 with mortality distributed over age-groups according to recent patterns and a pregnancy rate of 0.92, estimated the age 1+ population in the Northwest Atlantic in 1979 to be 1.32 million animals with a pup production of 345,000. Using the model applied in Res. Doc. 77/XI/68 (revised) with a provisional 1978 catch of 163,000, a pregnancy rate of 0.92, a density-dependent maturity ogive incorporating the most recent data, and a historical catch distribution over all age-groups, the age 1+ population in 1978 was estimated to be 1.4 million animals with a pup production of 358,000.

v) Trends in stock size under varying TACs

In the following calculations, the TACs were assumed to be equal to the actual catch. For a TAC of 180,000 animals (80% pups) with mortality distributed over age-groups according to recent patterns, Winters (1978)[1] predicted an increase in pup production and population size of 2% per year over the 1979-83 period. The simulation in Res. Doc. 78/XI/84 was used to project the 1979 population size forward to 1988, giving a TAC of 180,000 under three options of density-dependent vital rates. The three options are (1) density-dependent whelping, (2) density-dependent whelping and pregnancy, and (3) density-dependent whelping, pregnancy and pup mortality. The resulting projections of population size (millions of animals) for an annual catch of 180,000 are as follows:

	Population size (millions)		
	Option 1	Option 2	Option 3
1979	1.397	1.397	1.397
1980	1.414	1.421	1.411
1981	1.440	1.455	1.430
1982	1.469	1.489	1.446
1983	1.504	1.528	1.467
1984	1.542	1.571	1.488
1985	1.581	1.613	1.507
1986	1.612	1.653	1.522
1987	1.653	1.691	1.533
1988	1.692	1.733	1.548

For a TAC of 200,000 animals, the stock size would stabilize in 1979 and increase slowly thereafter. Future trends in stock size for TACs corresponding to estimated sustainable yields are considered in the following section.

vi) Sustainable yield

Estimates of sustainable yield were developed based on the sequential population analysis of Winters (1978)[1] and new calculations presented at this meeting. Vital rates used in the analysis were 0.10 for natural mortality and 0.92 for the pregnancy rate.

Assuming a pup production of 335,000 animals, a catch consisting of 80% pups and 20% age 1+ seals, and mortality distributed over age-groups according to recent patterns, Winters (1978)[1] estimated the sustainable yield to be 220,000 under equilibrium conditions.

On the basis of calculations presented at this meeting and a pup production of 358,000, the sustainable yield in 1979 ranged from 214,000 to 240,000 animals, depending upon the ratio of pups to age 1+ animals in the catch and the allocation of catch to large vessels, small vessels and landsmen. Replacement yield, defined as the catch which would maintain the population from year to year, was estimated at 198,000 to 205,000 for 1979 under the same assumptions.

For a TAC in the range of 220,000-240,000 animals, which is estimated to be within the limits of sustainable yield for pup production of 335,000-358,000 respectively, the stock size would decrease for a period of 5 to 6 years until the strong year-classes of 1972 and onwards entered the breeding stock.

c) Future research on harp seals

The Working group acknowledged the promising results from the 1978 tagging experiment and indicated a desire that such work be continued. In addition, the need for further data on age composition of the catch, fertility rates and mean age of whelping was emphasized. The Working Group accordingly

recommends (6)

i) that a tagging experiment be carried out on harp seals in the Front and Gulf areas in 1979;

ii) that age and reproductive samples, segregated by sex, be collected from the large vessel catches of age 1+ harp seals in the Front and Gulf areas in 1979; and

iii) that a re-examination of ovaries previously collected be carried out and that fresh samples from the winter catch of late pregnancy animals be collected for anatomical examination.

2. Conservation of Hooded Seals

a) Research in 1978

Canada reported the results of hooded seal tagging and branding activities in 1972-78 (Res. Doc. 78/XI/86), presented an assessment of stock size, pup production and sustainable yield (Res. Doc. 78/XI/91), and noted the results of an aerial survey in Davis Strait in 1978 and studies on the use of immobilizing drugs in tagging adults. Norway reported on the collection of age samples from the Front area (Res. Doc. 78/XI/92). Denmark presented historical and recent catch statistics and trends for the Greenland area (Res. Doc. 78/XI/98).

b) Population assessment

The variety of recent data and the short time series available for hooded seals limits the precision and confidence of estimates of current stock size, production and sustainable yield. The estimation of parameters, presented in Res. Doc. 78/XI/91, was considered by the Working Group in the light of these uncertainties.

i) Vital rates

Catch curve analysis of female hooded seals from Norwegian samples collected during 1971-76 produced a mean estimate of total mortality of 0.27 (range 0.19-0.35) for the 1960-75 period, and natural mortality was estimated at 0.135 (Res. Doc. 78/XI/91).

ii) Stock size

A sequential population analysis of the herd exploited off Newfoundland indicated that the population of age 1+ females has been relatively stable since the early 1960's, fluctuating between 48,000 and 55,000 animals (Res. Doc. 78/XI/91). These calculations indicate that regulations limiting the percentage of adult females in the total catch since 1976 are increasing the breeding potential of the stock.

iii) Pup production

Functional regression analyses of survival index data, as computed from Norwegian sampling data (1971-76) of age 5 females, produced a mean pup production of 27,000 for the 1966-71 year-classes (Res. Doc. 78/XI/91). This compares with an estimated production of 25,000 animals calculated from survival indices of age 5 females for the 1966-72 year-classes (Res. Doc. 77/XI/57), and a production of 32,000 animals estimated by the same method for age-

groups 5-10 and year-classes 1966-70 (Res. Doc. 75/122). The present study indicates that pup production has fluctuated within the narrow range of 24,000-30,000 since the early 1960's and is projected to be 28,500 in 1979.

iv) Sustainable yield

Under equilibrium conditions with vital rates and pup production in 1979 as specified above, a sustainable yield of 12,500 pups, 1,100 adult females and 1,400 adult males was estimated (assuming the continuation of the 7.5% limit of adult females in the catch in 1979). The analysis indicates that this stock has been exploited at approximately the sustainable yield level since the early 1960's.

The Working Group agreed that survival indices at age 5 (as used in Res. Doc. 78/XI/91) may be more reliable than those for older ages due to variation in cumulative hunting mortality and sampling error, but indicated survival indices for older animals should not be disregarded. Consequently, the Working Group concluded that the results presented in Res. Doc. 78/XI/91 could not be accepted as providing the best possible analysis of available data. In view of the lack of additional data beyond those considered in previous years, the Working Group concluded that the best estimate of sustainable yield, based on existing data, lies between 15,000 and 20,000 animals, and therefore advises that the TAC of 15,000 animals should remain unchanged for 1979.

c) Future research on hooded seals

In order to improve the basis for assessment of the hooded seal population, the Working Group

recommends (7)

i) that analyses of material and data collected on fecundity, maturity and age composition of hooded seals be completed as soon as possible;

ii) that a review of present knowledge on stock identification and interrelationships, including analysis of tag recoveries, be undertaken as soon as possible;

iii) that a minimum of 500 age and reproductive samples from adult females be collected at the Front in 1979;

iv) that sufficiently detailed information be collected about the hunt in 1979 to permit a catch-effort analysis; and

v) that the tagging of hooded seals on an opportunistic basis be continued in 1979.

APPENDIX II. REPORT OF *AD HOC* WORKING GROUP ON SHRIMP

Convener: Ø. Ulltang

Rapporteur: Sv. Aa. Horsted

The *ad hoc* Working Group on Shrimp met during 14-16 November 1978 to assess the status of the shrimp (=northern deepwater prawn) stocks in Subarea 1 and Statistical Area 0, the matter having been referred to STACRES at the time of the Meeting of the Assessments Subcommittee in April 1978 at the request of Canada and the European Economic Community (ICNAF Com. Doc. 78/VI/3 and 78/VI/5), but recommended by STACRES to be considered near the end of the year when information about the major part of the 1978 fishery would be available (*ICNAF Redbook* 1978, page 39; *ICNAF Meet. Proc.* 1978, No. 7, page 37). Scientists attended from Canada, Denmark (Greenland and Faroes laboratories), France, Norway and USA. The Working Group reviewed the most recent data on the fisheries in 1978 and new information relating to the biology, abundance and distribution of shrimp presented in Res. Doc. 78/XI/87, 88, 89, 93, 94, 95, 96 and 97, and several working papers.

1. Fishery Trends

Nominal catches of shrimp in Subarea 1 and Statistical Area 0 (Table 1) increased from less than 10,000 tons prior to 1973 to 50,000 tons in 1976. The 1977 fishery was regulated by a total allowable catch (TAC) of 36,000 tons (including discards) for the offshore grounds of Subarea 1, with a breakdown over four management areas, and provisional catch statistics for 1977 indicate a nominal catch of nearly 42,000 tons (including the inshore fishery) in Subarea 1 and 457 tons for Statistical Area 0.

Table 1. Nominal catches (metric tons) of shrimp (*Pandalus borealis*) in Statistical Area 0 and Subarea 1, 1970-78.

Area	Country	1970	1971	1972	1973	1974	1975	1976	1977	1978[2]	
SA 0	DEN-F	-	-	-	-	-	-	-	239	669	(Sep)
	DEN-M	-	-	-	-	-	-	-	68	80	(Sep)
	FRA-M	-	-	-	-	-	-	-	-	8	(Sep)
	NORWAY	-	-	-	-	-	-	65	150	618	(Oct)
	SPAIN	-	-	-	-	-	-	327	-	-	
	TOTAL SA 0	-	-	-	-	-	-	392	457	1,375[3]	
SA 1	DEN-F	130	496	755	1,371	2,023	5,300	11,179	12,612	5,995	(Sep)
	DEN-G (a)[1]	8,264	8,741	7,342	7,950	10,064	8,700	7,300	7,800	6,569	(Sep)
	(b)	165	200	150	185	180	1,089	2,478	7,136	4,166	
	DEN-M	-	-	-	196	308	1,142	2,717	5,842	2,722	(Sep)
	FRA-M	-	-	-	-	-	-	803	934	559	(Sep)
	FRG	-	-	-	-	-	-	-	31	...	
	JAPAN	-	-	-	-	-	-	146	-	-	
	NORWAY	-	-	1,409	2,940	5,917	8,678	11,658	7,353	7,047	(Oct)
	SPAIN	-	-	-	-	-	6,948	6,925	-	-	
	USSR	-	-	-	-	3,517	6,033	6,468	-	-	
	TOTAL SA 1	8,559	9,437	9,656	12,642	22,009	37,890	49,674	41,708	27,058	
	OFFSHORE	295	696	2,314	4,692	11,945	29,190	42,374	33,902	20,489	

[1] a = inshore, b = offshore grounds.
[2] Preliminary statistics to end of month indicated in parentheses.
[3] West of median line in Canadian zone.

The fishery in 1978 was regulated by an overall TAC for Subarea 1 (offshore) and Statistical Area 0 of 40,000 tons, of which 5,000 tons are allocated to the Canadian fishing zone, while the 35,000 tons on the Greenlandic side of the median line are broken down over four management areas, as in 1977. Preliminary catch statistics for January-September 1978 indicate that the total catch in the management

areas of Subarea 1 and Statistical Area 0 was about 22,000 tons, with the inshore catch in Subarea 1 being about 7,000 tons. It seems doubtful that the whole TAC for the regulated areas will be taken in 1978 and further comment on this is given in Section 6 below.

2. Distribution (Res. Doc. 78/XI/87, 88, 89, 94, 95, 96)

Statistical Divisions 0A and 0B. New information on the distribution of shrimp was presented by Canada. Shrimp catch rates from two surveys in August-September 1978 indicate low abundance in Div. 0A and 0B. Exploratory fishing by Denmark during the same period (unpublished data) corroborates these results. The best catches were obtained between 64°30' and 65°30'N in depths of 290-310 m. These fall within the range of highest concentrations of shrimp reported for a survey in 1977 (Res. Doc. 77/XI/70). The only areas of commercially important shrimp concentrations were encountered on both sides of the Canada-Greenland median line in Statistical Area 0 and Subarea 1 in areas where the traditional fishery exists. It was pointed out, however, that the coverage by these surveys was minimal and that the possibility of commercially-productive shrimp concentrations being missed cannot be ruled out.

Investigations on vertical movement and diel availability of shrimp, based on percentage of ovigerous females in catches at different times of the day, resulted in hourly corrective factors to a maximum of 2.47. This maximum figure falls within the range obtained from commercial data in previous studies (Res. Doc. 76/VI/113, 76/XII/149 and 150).

Subarea 1. For the area off West Greenland, Denmark reported that a Greenland trawler made an exploratory trip in September 1978 to offshore grounds in Div. 1A between Disko Island and Upernavik. Nineteen hauls were made, but, apart from one haul northwest of Disko Island (within the 12-nautical mile zone), none produced catch rates attractive to commercial fishing, most hauls yielding less than 100 kg per hour fishing. Also, the average size of the shrimp was somewhat smaller (95-206 specimens per kg) in this area than on the main shrimp grounds in Div. 1B.

Research and commercial data for 1978 are consistent with earlier observations, indicating the highest levels of offshore abundance in Div. 1B. Commercial data showed the same seasonal northward shift in fishing activity in this division as that noted in 1976 and 1977. This shift could be due partly to ice conditions in the area, but it is also observed later in the year when ice is no longer a limiting factor in the choice of fishing grounds. Moreover, throughout the three years (1976-78), there seems to be a tendency toward a general northward displacement inside Div. 1B superimposing the seasonal shift in fishing activity. Thus, in the latter half of 1978, much of the fishing activity seems to have occurred in the area around 68°N latitude, the border line between the management area off Disko Bay and the area west of Store Hellefiske Bank. The extremely high densities of shrimp, observed on the basis of high catch rates in the commercial fishery in the first half of 1976 and 1977 in the southern part of Div. 1B were not observed to the same extent in 1978. This may be due to ice being a limiting factor in the first part of 1978 but may also be due to differences in the pattern of shrimp occurrence and abundance between the years.

A photographic survey, conducted by Denmark (Res. Doc. 78/XI/89), confirmed the general distribution of shrimp in Div. 1A and 1B. More small (pre-recruit) shrimp were observed at some of the photographic stations than in the previous year, and one of the stations in the deep to the north of Store Hellefiske Bank was outstanding from other stations in the same area by showing an unusually high density of very small shrimp (of a size which would escape through the meshes of a (legal) commercial trawl). This is the first time that such small shrimp were observed in the main offshore area.

The Working Group took note of information in Res. Doc. 78/XI/96 which describes the proportion inside the 12-nautical mile zone of those shrimp grounds which have been considered as "offshore" grounds in the assessment of shrimp in Subarea 1. In terms of area, not more than 6% of the total "offshore" grounds are distributed inside the 12-mile zone. To indicate the possible distribution of "offshore" shrimp biomass in relation to the 12-nautical mile line requires knowledge and/or assumption of shrimp density on either side of the line for each specific ground in question. Assuming a uniform density of shrimp on each ground, about 7% of the "offshore" shrimp biomass on the Greenland side of the Canada-Greenland median line may be distributed inside the 12-nautical mile fishing zone. For the present management area between 64°15'N and 68°00'N, about 5% of the shrimp biomass may be distributed inside the zone under the aforementioned assumption.

3. Biology (Res. Doc. 78/XI/87, 89, 93, 95)

Observations relating to the occurrence of pre-recruit shrimp were mentioned in the preceding section. Further observations on the diurnal vertical migration of shrimp were made on Canadian surveys and on a French trawler. Samples taken at various times of the 24-hour period showed ovigerous females to have much less tendency to diurnal vertical movement than smaller shrimp. It seems necessary to take this observation into account in sampling schemes and in analyses of samples.

New information on the occurrence of shrimp larvae in Davis Strait and of currents over the shrimp grounds off West Greenland is given in Res. Doc. 78/XI/93. Whereas a general northward drift of shrimp larvae (and fish larvae) seems to occur over the West Greenland Shelf, thus supplying some larval recruitment from the southern spawning stocks to the stock in Div. 1B, the spawning stock in Div. 1B itself seems to be very important for the recruitment of shrimp to this area, since the net drift by currents decreases significantly from south to north and also, in the northern part of Div. 1B, from surface to bottom. There are also strong indications that the area to the west and southwest of Disko Bay produces shrimp larvae, many of which drift into Disko Bay. Some of the larvae produced in Disko Bay may drift out of the Bay mainly to areas west and northwest of Disko Island.

4. Catch and Effort Data (Res. Doc. 78/XI/94, 95, 97)

Catch and effort data were available for fisheries by Denmark (Faroes and Greenland), France and Norway. Data for the Norwegian fleet fishing in Div. 1B showed a decreasing trend in annual mean catch rates from 1975 to 1977. In each of the three years mentioned, very high catch rates were obtained in one or another period during the first half of the year, with catch rates significantly lower in the last half of the year. Norwegian data for 1978 indicate much lower catch rates in the first half of the year than in any of the previous years, but the catch rates after June were more similar to but generally somewhat lower than those in the second half of the previous years. The trends in catch rates for the Faroese fleet in the same area and period were very similar to those observed for Norwegian vessels.

Data for the Greenlandic fleet of large trawlers, covering the period from June 1976 to September 1978 in Div. 1B, showed the same seasonal decline in catch rates in 1976 and 1977 as that described above, although not so drastic seasonal changes as indicated by Norwegian data. The catch rate for Greenlandic trawlers in January-April 1978 was considerably less than for the same period in 1977, thus showing the same change as observed in the catch rates of Faroese and Norwegian trawlers. However, whereas Norwegian vessels did not show any noteworthy improvement in catch rate after April and up to September 1978, the catch rate of Greenlandic trawlers was higher in May 1978 than in the first quarter of the year, but declined after July, as in previous years. Since the three fleets mentioned very often fish close to each other, one would expect to find reasonably close agreement in their catch rates. However, ice conditions was a limiting factor for the fishery in the first half of 1978. This may explain why fishing in the first four months occurred mainly in Holsteinsborg Deep, as also shown by the fishing activity of a French trawler. In May, the fleets appeared to move to the main fishing area at the western slope of Store Hellefiske Bank, but ice may still have hampered fishing operations at that time for some vessels. Consequently, those vessels which are most able to conduct fishing in drift ice, among these the Greenland trawlers, were less influenced by the ice than other vessels.

Danish (Faroese and Greenlandic) and French data for 1978 show that after April the fishing activity in Div. 1B was spread over a rather wide area. The tendency to search for better fishing seems to have been greater in 1978 than in previous years when in any given period most of the shrimp-fishing fleet was concentrated in a very small area. The best catch rates were obtained around 67°30'N but there was a greater tendency than in previous years to fish around 68°N.

As indicated above for Div. 1B, catch rates have generally been much higher in the first half than in the second half of the year. However, on the average, catch rates seem to have declined over the last three years. Due to the apparent atypical situation in the first half of 1978, average catch rates based on preliminary data for 1978 are not directly comparable with those for previous years. However, using the data for the July-September period when ice should not influence fishing operations, the following unweighted mean catch-per-unit-effort values (kg/hr) are obtained for Div. 1B:

Year	Norwegian trawlers	Greenland trawlers
1975	393	No fishing
1976	404	746
1977	336	566
1978	269	453

Catch and effort data for other divisions are more limited. Norwegian data for Div. 1C and 1D indicate a decrease in catch rate from 1977 to 1978 in all months for which comparison can be made. The decrease is about 28% for Div. 1C and about 39% for Div. 1D. There is no overlap on a monthly basis between 1977 and 1978 for the very limited amount of data available for Div. 1A, and there seems to have been virtually no shrimp fishing activity in Div. 1E and 1F. Also, the available commercial data on catch rates in Statistical Area 0 are so limited that comparison between 1977 and 1978 cannot be made at present.

5. Biomass Estimates (Res. Doc. 78/XI/87, 88, 89)

Direct biomass estimates based on trawl surveys and a stratification scheme were provided by Canada for shrimp grounds in Statistical Area 0 and part of Subarea 1. Despite correction of data for diel variability of shrimp in a survey in August 1978 (Res. Doc. 78/XI/87), the estimated minimum trawlable biomass did not exceed 35,000 tons for an area including part of the commercially-important shrimp grounds in Div. 1B and 1C, the southernmost part of Div. 0A and all of Div. 0B. The second survey in September 1978 (Res. Doc. 78/XI/88) indicated an estimate of 3,500 tons in Div. 0B in depths between 276 and 550 m. These estimates are used only as supportive evidence that areas to the west of the traditional shrimp grounds are commercially unproductive, not so much because of the relatively low biomass as because of the wide distribution of this biomass and thereby the low densities.

Denmark provided biomass estimates on the basis of stratified bottom photography of the grounds in Div. 1B. Although the photographic survey generally covered the same area as in 1977, the distribution of stations was somewhat different. Due to variation in density between the various strata, it is not possible to directly compare biomass estimates for strata covered in 1977 with those obtained for other strata in the 1978 survey. However, indirect comparison through data from the 1976 trawl survey does indicate a decrease of about 20% in biomass from 1977 to 1978. As indicated in Section 2 above, the photographs taken in 1978 show more small shrimp than those taken in 1977.

6. Total Allowable Catch

At its meeting in November 1977, the Working Group considered the mean fishable biomass of shrimp in Subarea 1 for 1977 to be at the same level as that estimated for 1976 and consequently did not change its advice on a TAC for 1978 from that for 1977. However, present analyses of available data point to a decrease in the fishable biomass since 1976. Catch-per-unit-effort data indicate an overall gradual decline in catch rate (with great seasonal variation) of about 32% from 1976 to 1978, and evidence from photographic and trawl survey data suggest a decrease in the fishable biomass of about 20% from 1977 to 1978. It was therefore the general consensus of the Working Group that a somewhat lower catch level would be advisable for 1979. The Working Group agreed to use the same approach to arrive at advice on a TAC as in the two previous years, i.e. the spawning (hatching) stock size should not be reduced below 50% of the virgin stock. However, in the absence of any firm conclusion on the absolute mean fishable biomass in 1978, the matter was discussed in relation to previous observations, with several points being raised reflecting uncertainties both in the interpretation of data and in the degree of caution which members of the Working Group felt should be taken.

Part of the discussion focussed on the change in size distribution of shrimp from 1977 to 1978 as observed in the photographic survey data. The greater abundance of small shrimp in 1978 suggests a relatively strong year-class, which would recruit to the fishable stock during 1979 but occur mainly as male shrimp at the lower part of the normal commercial size distribution. By 1980, this group would occur mainly as female shrimp in the upper part of the size distribution. Although recruitment prospects during 1979 seem to be good, the information available is too scanty to predict a relationship between pre-recruits and subsequent recruitment. The Working Group, therefore, considered it advisable to be cautious in proposing a TAC for 1979, noting the prospect of improved fishing on larger shrimp in 1980.

The Working Group also discussed whether the likely shortfall of 1978 catches compared to the 1978 TAC should influence the advice for 1979. Since most of these shrimp (not caught in 1978) would not contribute to the stock in 1979 under the present assumption of high natural mortality after first spawning (hatching), it was agreed that the shortfall should not influence the advice on a TAC for 1979. However, it was emphasized that the shortfall in 1978 implies a higher spawning (hatching) potential at the beginning of 1979 than would otherwise be the case.

The Working Group recognized that the exploitation of a new resource normally starts by producing relatively high catch rates but that the exploitation will decrease the biomass and subsequently result in lower catch rates at the sustainable level of fishing, and indicated that this fact should be recognized by fishermen and administrators. In the West Greenland area, it is likely that this basic effect of fishing on the stocks would be less evident from catch statistics, since environmental factors may cause great year-to-year variation in larval survival and subsequent recruitment. In any case, the observed decline in catch rates is not unexpected and fishing activity will have to be adjusted accordingly. In considering the degree of reduction to be advised for 1979, the Working Group considered that one reference point might be the observed decrease of about 20% in stock biomass from 1977 to 1978, implying a corresponding decrease in the TAC. Since the basic approach in the model used for the first assessments in 1976 and 1977 was considered to be rather cautious in terms of spawning stock conservation, and since the initial estimate of fishable biomass in 1976 was a minimum estimate, the Working Group agreed that a 20% reduction in the TAC was a reference point to be regarded as the minimum advisable reduction.

Concern was expressed, however, that the gradual change of fishing activity by areas during the 1975-78 period indicated the maintenance of a relatively high level of annual catch (although decreasing from

1976 to 1978) due to the continued searching for and progressive exploitation of new shrimp concentrations during these years. Consequently, the advisability of a greater reduction in fishing activity than that inferred in the preceding paragraph was considered, with the view that, if this was not done now, a relatively larger reduction might have to be applied in the future. From this point of view, since catch rates have declined by about 32% from 1976 to 1978, a corresponding reduction in TAC might be considered advisable, taking also into consideration the need for conservative action regarding the many new recruits which are expected to enter the fishery in 1979 and 1980.

Although advice involving a range of TAC is difficult for decision by management, the Working Group agreed that the range of reduction (20-32%) in TAC reflects the present knowledge and the various points of view raised during the discussion. It also reflects the necessity of having much better data than are currently available where advice of great significance for the fisheries is to be given. The Working Group accordingly advises that the 1979 TAC for shrimp should be set at a level in the range of 20-32% below the advised 1978 TAC of 40,000 tons (including discards) for the offshore shrimp grounds in Subarea 1.

No new arguments were presented for or against the breakdown of the TAC by management areas, reference being made by the Working Group to previous discussions on this matter and on the possible interrelationships between shrimp on offshore grounds and those in Disko Bay (*ICNAF Redbook* 1977, page 16; 1978, page 13). The Working Group did, however, note that, of the shrimp grounds and biomass found in Statistical Area 0, only those in direct contact with the grounds in Div. 1A and 1B are to be taken into account as covering the stock for which the advice on a TAC is given (*ICNAF Redbook* 1978, page 13).

7. Discarding of Shrimp

Some shrimp are known to be discarded for various reasons and probably with a high degree of variation among vessels. Discards may consist of shrimp too small to be processed and/or marketed, soft-shelled shrimp (just moulted) which cannot be used for some products, and so-called "black-headed" shrimp which cannot be mixed with whole frozen shrimp but can be used for peeled shrimp products. Occasionally an entire haul may be discarded if the net is filled with mud, but this source of discarding is probably negligible.

The "black-headed" phenomenon in shrimp may occur in specific areas and seasons, but no good information on its occurrence is available. "Black-headed" shrimp are not discarded by vessels whose catches are used for peeled shrimp products. This applies to the Greenland fleet and since 1976 to the Norwegian fleet and in 1977 to a part of the Faroese fleet. Discarding of commercially-undersized shrimp may vary among vessels. Greenland trawlers land their entire catches, but some, if not all, vessels producing shrimp products at sea sort the shrimp into size categories, of which the smallest size group may be discarded. Observations made by Norwegian observers on a commercial vessel indicated that the rate of discarding (mainly "undersized" shrimp) was about 8% in Div. 1B during July-August 1976, about 22% and 13% in Div. 1B and 1C respectively during June-July 1977, and about 10% in Div. 1B during July-August 1978.

Vessels fishing within the Greenland fishing zone are requested to report information on discards (TACs include discards) but only a very limited amount of data are available at present. More information is needed, including the possible survival of discarded shrimp, before a better evaluation of discarding can be made.

8. By-catch in the Shrimp Fishery (Res. Doc. 78/XI/87, 88, 94)

New information on by-catch of finfish in the shrimp fishery in Subarea 1, presented by Norway (statistics collected by observer at sea) and by Denmark (G) (statistics from logbooks), confirmed earlier observations that the major finfish by-catch consists mainly of small redfish and Greenland halibut and some other species. Statistics available for Greenland trawlers show that by-catches during the period from October 1977 to September 1978 amounted to approximately 2,600 tons of redfish and 45 tons of other finfish in catches totalling 5,500 tons of shrimp. Thus, by-catches may be roughly equal to about one-half of the shrimp catch. However, both the Greenlandic and Norwegian data indicate that by-catch ratios vary considerably by time and area, so that a longer period of observation is needed in order to fully evaluate the problem.

The Canadian surveys in Statistical Area 0 indicate that small redfish and Greenland halibut are common as by-catch but Arctic cod (*Boreogadus saida*) frequently occurs, 5 tons being taken in a 10-minute haul at one location.

9. Future Research Requirements

The Working Group noted that some of the recommendations made at the November 1977 Meeting of STACRES (*ICNAF Redbook* 1978, page 14) were followed up in 1978, including studies on vertical distribution of shrimp and expansion of the photographic surveys, the latter showing some potential to assess recruitment. Future requirements in terms of priority were reviewed, and the Working Group

recommends (8)

i) that extensive stratified surveys using "swept area" and photographic techniques be carried out, with a view to updating the estimate of the minimum trawlable biomass of shrimp in Subarea 1 beyond the 1976 reference point; and

ii) that an extensive observer program designed to closely monitor the shrimp fishery on a year-round basis be implemented, in order to provide more detailed information on catch-per-unit-effort, size composition, by-catches and discards.

The Working Group noted that the surveys recommended in (*i*) above would require a considerable amount of sea time, and that such surveys could also provide data leading to mortality estimates, recruitment estimates, and additional knowledge on vertical migration and its variability.

10. Other Matters

The Working Group was pleased to note that *Selected Papers* No. 4, containing shrimp papers presented at meetings in 1976, was now available, and expressed appreciation to the Secretariat for its efficiency in producing this publication. It was also noted that shrimp stocks in other parts of the world were being assessed and managed and that it would be valuable to follow the developments and experience in such areas, e.g. in Alaskan waters.

APPENDIX III. REPORT OF *AD HOC* WORKING GROUP ON STANDARDIZATION OF REPORTING PROCEDURES FOR SAMPLING DATA

Convener: W. G. Doubleday Rapporteur: V. M. Hodder

The *ad hoc* Working Group met at Bergen, Norway, on 13-16 November 1978 in accordance with the recommendation of STACRES at the 1978 Annual Meeting (*ICNAF Redbook* 1978, page 41) to consider the advisability of reporting individual length and age samples to the Secretariat and to develop suitable formats for reporting as required. Representatives attended from Canada, Denmark, USSR, USA, and the ICNAF Secretariat. The terms of reference for the Working Group, as specified by STACRES, were adopted as the agenda for the meeting and are indicated as headings for the following eight sections.

1. Review of the Present Situation

The Working Group was referred to the present ICNAF sampling standards as outlined in *ICNAF Sampling Yearbook* Vol. 20 for 1975. The most recent review of sampling activity in the ICNAF Area showed that sampling efficiency had improved slightly from 1975 to 1976 (Sum. Doc. 78/VI/11). However, it was noted that the number of samples was still inadequate in some cases, that sampling by sex for flatfish species was not always carried out and that the time of sampling did not always correspond with the period of major fishing activity. Furthermore, there has been no recent review to consider whether ICNAF sampling standards are complied with, and such compliance could not be inferred from the data reported to the Secretariat.

The Working Group noted that the institution of observer schemes by some coastal states had significantly improved both the distribution and the number of samples. Concern was expressed that samples from joint ventures were not appearing in data submitted to ICNAF.

The Danish representative indicated that there were at present no special international requirements for sampling data in Subarea 1 but expected the minimum ICNAF requirements to be met by those countries fishing in the area. He indicated that weekly reporting to the coastal state of catch and effort data was required in the regulated fisheries.

The Canadian representative indicated that sampling plans are requested in conjunction with the submission of fishing plans and that the number of samples taken is requested to be reported together with weekly catch and effort data to permit the monitoring of sampling performance in relation to progress toward the quotas in the Canadian zone. Sampling coordinators have been appointed to positions at St. John's and Halifax. The sampling requirements generally follow ICNAF standards with some additions, particularly the reporting of individual length and age samples from within the Canadian fishing zone.

The USA representative indicated that ICNAF sampling guidelines are generally followed but that the minimum requirement has been increased to one sample per 1,000 tons per month per 30' x 30' unit area for distant-water fleets fishing in the USA zone. This standard is presently being exceeded due to an extensive observer program. Individual length samples collected by USA observers from the distant-water fleets for 1977 and 1978 have not yet been computerized nor have the age samples been processed. Samples from USA landings for this period have been processed and are available.

The USSR representative indicated that the ICNAF guidelines given in *Sampling Yearbook* Vol. 20 have generally been followed, and that for some species (e.g. silver hake and squids) the minimum requirements have been exceeded by 4 to 5 times. It was pointed out that the Canadian deadline of 60 days for the submission of samples could not always be met due to the extended periods that the vessels are at sea, and it was proposed that the deadline of 60 days should be counted from the date of delivery of the samples on shore. It was noted that samples taken in the USA fishing zone are not reported to the ICNAF Secretariat. It was also noted that the current practice of having a uniform minimum sampling rate for all stocks was not optimal since fewer samples would be needed for short-lived species than for long-lived species.

2. Review of Coastal States' Positions Regarding Requirements for Sampling Data

a) The representative of Canada favoured the submission of data on individual samples to the ICNAF Secretariat, but takes a flexible view regarding the format of reporting.

b) The representative of Denmark raised no objection to the reporting of individual samples, while indicating that catch and effort statistics for the Greenlandic fleet of large vessels are collected by 7½ x 15' unit areas, and may become mandatory for national vessels greater than a certain size.

c) No statement on requirements was available for France.

d) The representative of USA favoured the reporting of individual samples, but pointed out the need for linkage between sampling and corresponding catches for estimation of appropriate weighting factors and expressed concern about the possibility of misinterpretation of individual sampling data.

3. Review of Proposed NAFO Convention in Relation to Research and Statistics

The Working Group referred to Articles VI and XX of the NAFO Convention and concluded that the Scientific Council has a role in maintaining a sampling data base, that coordination of the reporting of sampling within the Convention Area would facilitate the provision of advice by the Council, and that the reporting of individual samples would facilitate any future revisions of statistical boundaries in the Convention Area.

4. Evaluation of the Need for Standardized Reporting of Individual Samples

The Working Group agreed that standardized reporting was desirable for countries whose vessels fish widely in the Convention Area, and stressed the need for coordination of sampling standards and procedures for stocks overlapping the 200-mile zone boundaries. It was also noted that the Scientific Council of NAFO would require a data base to aid in its formulation of management advice. In view of these considerations, the Working Group

recommends (1)

that individual length samples of commercial catches and the corresponding age-length keys be made available to the ICNAF (NAFO) Secretariat for final incorporation into its sampling archives.

5. Implications on the Secretariat of Reporting and Processing of Individual Samples

Adoption of the above recommendation would result in a substantial increase in the number of samples submitted to the Secretariat (from about 1,000 presently to somewhere in the range of 2,000-10,000) with a corresponding increase in the number of age-length keys. This would substantially increase the key-punching workload of the Secretariat, unless data were submitted in machine-readable form. However, the cost of maintaining the more detailed data base would not significantly increase over the present level. Countries fishing in the ICNAF (NAFO) Regulatory Area would be expected to submit their samples directly to the Secretariat, while countries fishing within the 200-mile zones might, in some instances, by bilateral agreement, arrange for sampling data to be key-punched and forwarded to the ICNAF (NAFO) Secretariat by the coastal states.

6. Implications on Member Countries

None of the country representatives present foresaw any serious problems for their own country in the reporting of individual length and age samples of commercial catches.

7. Availability of Sampling Data Through the Secretariat

The Working Group noted that the proposed sampling data base will contain considerably more detail, some of which is of a confidential nature, than at present and that STACRES might wish to limit the distribution of the data. However, the Working Group

recommends (2)

i) that an inventory of the sampling data be published annually; and

ii) that the data be available to members of STACRES at present and to members of the Scientific Council of NAFO in the future.

8. Design of Forms and Procedures

The Working Group discussed the contents of forms and proposed a form similar to the attached for the reporting of individual length samples. Time did not permit the development of a format for the reporting of age samples. However, the Working Group agreed on a list of contents and proposed that the Secretariat develop a draft form for the reporting of age-length keys to be circulated to members of STACRES for comment prior to discussion and possible adoption by STACRES at its Special Meeting in February 1979. The list of contents is as follows:

a) Year
b) Country
c) Vessel name
d) Vessel side number
e) National registration number
f) ICNAF gear abbreviation
g) Mesh size
h) Observer
i) Date (month/year)
j) Starting position of set (latitude, longitude)
k) Starting time of set (local time)
l) Fishing depth (m)
m) Species
n) Sex (where applicable)
o) Sampling method
p) Method of measuring length (fork, total, mantle, etc.)
q) Recorded measurement (nearest cm, to cm below)
r) Structures used in ageing
s) Weight of age sample (kg), if available
t) Were individual weights taken?
u) Age-length key
v) Mean weight-at-length, if available

The Working Group recognized that combination of ageing material from several length samples is practically necessary in some cases. However, the Working Group

recommends (5)

that data from samples taken for ageing not be combined for periods exceeding one calendar month or for areas greater than one ICNAF division (or subdivision, where applicable).

9. Acknowledgements

The Chairman thanked the participants for their contributions to the Working Group.

COMMERCIAL FISHERY LENGTH SAMPLES

Year	Country	Vessel name	Side no.
National reg. no.	Gear	Mesh size (mm)	Observer

Date (month/day)															
Start of set position Lat.															
Start of set position Long.															
Starting time of set (local)															
Fishing depth (m)															
SPECIES SAMPLED															
Catch or Landing															
Method of measuring															
Recorded meas.															
Length interval															
1cm	2cm	3cm	5mm	M	F	M	F	M	F	M	F	M	F	M	F
0	16-	15-													
1	18-	18-													
2	20-	21-													
3	22-	24-													
4	24-	27-													
5	26-	30-													
6	28-	33-													
7	30-	36-													
8	32-	39-													
9	34-	42-													
0	36-	45-													
1	38-	48-													
2	40-	51-													
3	42-	54-													
4	44-	57-													
5	46-	60-													
6	48-	63-													
7	50-	66-													
8	52-	69-													
9	54-	72-													
0	56-	75-													
1	58-	78-													
2	60-	81-													
3	62-	84-													
4	64-	87-													
5	66-	90-													
6	68-	93-													
7	70-	96-													
8	72-	99-													
9	74-	102-													
0	76-	105-													
1	78-	108-													
2	80-	111-													
3	82-	114-													
4	84-	117-													
5	86-	120-													
Number measured															
Sample weight (kg)															
Catch weight (kg)															
No. for ageing															

Form CFS-1 (12/78)

See overleaf for Notes

NOTES FOR COMPLETION OF FORM CFS-1

1. The form is designed to facilitate the reporting of (a) several species from the same set, or (b) the same species from several sets. In order to facilitate data-processing, it is essential that all of the information required for each sample be entered in the appropriate spaces on the form.

2. In the space "National reg. no.", record the national registration number of the fishing vessel.

3. In the space for "Gear", record the appropriate abbreviation for the gear type used based on the ICNAF Gear classification for reporting sampling data, as follows:

OTB	-	Bottom otter trawl (side and stern)
OTM	-	Midwater otter trawl (side and stern)
PTB	-	Bottom pair trawl (2 boats)
PTM	-	Midwater pair trawl (2 boats)
SN	-	Seine net (Danish and Scottish seines)
SB	-	Beach seines
PS	-	Purse seines
GN	-	Gillnets (set and drift)
LL	-	Longlines (set)
LHP	-	Handlines and pole-lines (including mechanized lines)
FPN	-	Uncovered pound nets
FWR	-	Weirs, barriers, fences, etc.
DRB	-	Boat dredges
HAR	-	Harpoons

4. In the space for "SPECIES SAMPLED", record the common English name of the species, supplemented by the ICNAF 3-digit code as given in *ICNAF Statistical Bulletin* Vol. 26.

5. In the space for "Method of measuring" length, record one of the following as appropriate: Fork, Total, Mantle, Carapace. If other methods of length measuring are used, please specify.

6. In the space for "Recorded meas.", enter one of the following as appropriate: Nearest cm, Cm below, Nearest half-cm, Half-cm below.

7. In the space for "Length interval", record the appropriate length group used, i.e. 1 cm, 2 cm, 3 cm, or 5 mm, etc. For the "1 cm" and "5 mm" intervals, please ensure that the appropriate starting length group is given in the relevant column.

8. In the columns labelled "M" and "F", enter the actual length frequencies for species required to be sampled by sex. For species not required to be sampled by sex, enter the actual length frequency in the "M" column.

9. At the bottom of the form, the "Sample weight" refers to the actual weight (kg) of the length frequency sample recorded in the column above. The "Catch weight" refers to the actual weight (kg) of the sampled species in the set, where the sample pertains to an individual haul, and in the landing, where port sampling is carried out.

10. Where samples are taken for ageing, record in the "No. for ageing" space the actual number of specimens in each sample.

APPENDIX IV. AGENDA FOR SPECIAL MEETING OF STACRES, NOVEMBER 1978

1. Opening (Acting Chairman: G. H. Winters)

   a) Appointment of rapporteur
   b) Adoption of agenda
   c) Assignment of work to *ad hoc* working groups

2. *Ad hoc* Working Group on Seals (Convener: A. W. Mansfield)

   a) Conservation of harp seals
      i) Research in 1978
      ii) Population assessment
         - Stock size
         - Pup production
         - Sustainable yield under present regime and under varying options of age composition of catch
         - Trends in stock size with different TACs
      iii) Future research requirements

   b) Conservation of hooded seals
      i) Research in 1978
      ii) Population assessment
         - Stock size
         - Pup production
         - Sustainable yield
      iii) Future research requirements

3. *Ad hoc* Working Group on Shrimp (Convener: Ø. Ulltang)

   a) Review of fishery trends
   b) Distribution and biology
   c) Catch and effort data
   d) Biomass estimates
   e) Total allowable catch
   f) By-catch in shrimp fishery
   g) Future research requirements

4. Other Matters

   a) Consideration of report of *ad hoc* Working Group on Standardization of Reporting Procedures for Sampling Data (Convener: W. G. Doubleday). (Terms of reference are given in *ICNAF Redbook* 1978, page 49.)

   b) Publication of shrimp papers in *Selected Papers* No. 4

5. Future Meetings of STACRES

6. Adjournment

APPENDIX V. LIST OF PARTICIPANTS

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Mr L. R. Day, Executive Secretary
Mr V. M. Hodder, Assistant Executive Secretary
Mrs V. C. Kerr, Senior Secretary

APPENDIX VI. LIST OF RESEARCH DOCUMENTS PRESENTED TO STACRES MEETING, NOVEMBER 1978

Res. Doc.	Ser. No.	
78/XI/84	5299	Lett, P. F., R. K. Mohn, and D. F. Gray. Density-dependent processes and management strategy for the northwestern Atlantic harp seal.
78/XI/85	5301	Sergeant, D. E. Research on harp seals in 1978.
78/XI/86	5302	Sergeant, D. E. Results of tagging and branding of hooded seals, 1972-1978.
78/XI/87	5303	Jones, B. C., and D. G. Parsons. Assessment of pink shrimp (*Pandalus borealis*) fishery potential in Davis Strait and northeastern Canadian waters.
78/XI/88	5304	Veitch, P. J., D. G. Parsons, and A. Duthie. An exploratory survey for shrimp (*Pandalus borealis*) in Statistical Areas 0A and 0B.
78/XI/89	5305	Kanneworff, P. Density of shrimp (*Pandalus borealis*) in 1978 in ICNAF Subarea 1 based on bottom photography.
78/XI/90	5306	Lavigne, D. M., J. P. Bogart, R. G. H. Downer, R. Danzman, W. W. Barchard, and M. Earle. Genetric variability in Northwest Atlantic harp seals, *Pagophilus groenlandicus*.
78/XI/91 (Rev.)	5307	Winters, G. H., and B. Bergflødt. Mortality and productivity of the Newfoundland hooded seal stock.
78/XI/92	5308	Øritsland, T. Norwegian report on seal research in 1977 and 1978.
78/XI/93	5309	Horsted, Sv. Aa., P. Johansen, and E. Smidt. On the possible drift of shrimp larvae in the Davis Strait.
78/XI/94	5310	Ulltang, Ø., and P. Øynes. Norwegian investigations on the deep sea shrimp, *Pandalus borealis*, in West Greenland waters, 1977 and 1978.
78/XI/95*	5311	Fontaine, B. Data relative to the French fishery for the northern shrimp (*Pandalus borealis*) at West Greenland in 1978.
78/XI/96	5312	Horsted, Sv. Aa. On the distribution of the shrimp grounds off West Greenland in relation to the local fisheries zone.
78/XI/97	5313	Hoydal, K. Catch-per-unit-effort estimates from the Faroese prawn fishery off West Greenland, 1974-1978.
78/XI/98	5314	Kapel, F. O. Present catches of harp and hooded seals in West Greenland, and a note on the level of catches in previous periods.

* To be distributed at a later date after translation into English.