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Capelin in SA2 + Div. 3KL

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Les documents de recherche sont publiés dans la langue officielle utilisée dans le manuscrit envoyé au secrétariat.

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Abstract

This document contains a number of discrete research results which were considered during the 1998 assessment of capelin in SA2 + Div. 3KL. These results are arranged in seven chapters. In addition, a meeting report, cross-referenced by chapter, is provided. The data available included the results of studies on inshore capelin, 0-group and larval capelin, bycatches of capelin in groundfish surveys and capelin lengths.

Résumé

Le document contient divers résultats de recherches distinctes qui ont été examinés au moment de l'évaluation de 1998 du capelan de la sous-zone 2 et des divisions 3KL. Les résultats sont répartis en sept chapitres. On y trouve aussi un rapport de réunion avec renvois aux chapitres. Les données présentées ont trait aux résultats d'études portant sur le capelan côtier, les capelans du groupe d'âge 0 ou de stade larvaire, les capelans ayant fait l'objet de prises accidentelles au moment des relevés du poisson de fond et la longueur des capelans.

Capelin in SA2 + Div. 3KL

1) Introduction

A capelin assessment committee met during March and April 1998 at NAFC, St. John's to assess the capelin stock in SA2 + Div. 3KL. A list of attendees is given in Appendix 1. Since 1994, capelin in SA2 and Div. 3KL have been assessed as one stock, based on evidence of movement of capelin in these areas.

2) Catch Trends

i) SA2 + Div. 3K

The capelin fishery in NAFO SA2 + Div. 3K was, until 1972, limited to inshore catches during the spawning season. In 1972, substantial catches were taken offshore by vessels from several countries. Catches peaked in 1976 at 212,000 t before declining in the late 1970's to 11,000 t in 1979.

Offshore catches during 1980-91 were restricted by quota and ranged between 500 and 57,000 t. The offshore fishery was generally conducted during August-November. The offshore fishery was closed beginning in 1992.

During the 1980's, an inshore directed roe fishery during June and July has occurred, primarily in Div. 3L. Beginning in 1988, landings increased because of an increased share of the market for Canadian capelin with the closure of the Barents Sea capelin fishery. TACs generally reflected market demand and the increase of the TACs during the late 1980's can be attributed to the larger market share. These did, however, remain below the 10% of total spawning biomass that had been set as the biological criterion for setting the TAC.

During 1994 and 1995, a fishery was not prosecuted largely because female fish were too small to meet the size criterion in the management plan (sea run 50 count/kg). This size criterion was excluded from the 1996 management plan and a fishery proceeded when fish were marketable based on monitoring. Preliminary

landings in SA2 + Div. 3K during 1997, were 5,500 t compared to the quota of 11,400 t.

ii) Div. 3L

Catches in NAFO Div. 3L were less than 4,000 t prior to 1970, increased to a peak of 58,000 t in 1974, and declined to 12,000 t in 1979. During the 1980's an inshore roe fishery employing purse seines, capelin traps and beach seines occurred during June and July. This fishery has been later since 1991 due to the late arrival of capelin. In recent years, TACs have reflected market demand. In years when biological data were adequate to advise a specific TAC, the actual TACs have been less than advised on a biological basis.

The situation in Div. 3L regarding low landings in 1994 and 1995, the exclusion of the size criterion in the management plan in 1996 and 1997, and the monitoring programme in 1996 and 1997 were similar to that in Div. 3K. Preliminary landings in Div. 3L during 1997 were 3,600 t compared to a quota of 21,730 t.

Area	1991	1992	1993	1994	1995	1996	1997
SA2 + Div. 3K							
Offshore							
TAC							
Nominal Catch	57	0	0	0	0	-	-
	0.5	0	0	0	0	-	-
Inshore							
TAC							
Nominal Catch	29	17	11.4	11.5	11.5	9.7	11.4
	20	18	13a	11.5	1a	8.9a	5.5a
				<.1a			
Div. 3L							
Inshore							
TAC							
Nominal Catch	56	19.3	21	21	22	18.3	21.7
	22	3	23a	1a	1a	16.8	3.6a
SA2 + Div. 3KL							
Total nominal catch	42.5	21	36	1	1	25.7	9.1

a provisional

3) Information from Licensed Fixed Gear Fishers (Chapter 1)

During 1994-95, a questionnaire was designed to quantitatively evaluate biological and fishery-related information obtained from capelin fishermen. This survey was undertaken because of concerns about the utility of qualitative information coming from comments in some research logbooks or made directly to research personnel.

For the 1997 survey, the survey population size (n = 1830) was defined as all capelin fixed gear (traps and beach seines) fishermen licenced to fish capelin in NAFO Div. 3L and 3K in 1997. Employing a simple random sampling design and an expected response rate of 85% a sample population with 219 names was chosen to achieve a ±7% margin of error with 95% confidence intervals. Telephone interviews were completed between October 6 and November 16, 1997. The 189 completed questionnaires represented an 86% response rate compared to the 85% expected.

Most respondents indicated that capelin abundance in their area was low with a mean response equal to 3.8. This is lower than 5.4 in 1996 and comparable to 3.4 in 1995. The abundance of capelin in 1996 was estimated to be 4.7 by respondents of this survey which was slightly lower than the 5.4 estimate from the 1996 survey. Unlike the last two years, the perception was that the relative abundance the previous year declined with time. Respondents clearly indicated that capelin abundance in 1997 was lower than when they first started to fish capelin. This response has been the same for all four surveys. Generally, most respondents considered capelin abundance to be low and to have decreased from 1996.

According to the respondents, capelin occupied a small proportion of the spawning beaches in 1997. The number of respondents reporting no spawning increased from 1996. The intensity of spawning was 4.1 (scale of 1, lowest, to 10, highest) compared to 6.5 in 1996 and 3.8 in 1995.

Spawning times were again delayed compared to the 1980's. The distribution of spawning times was similar to 1995 and marginally later than 1996.

The general size of females in 1997 was reported to be small or average with few reports of large females.

4) Inshore Data

i) Sampling

Commercial and monitoring samples were collected where possible. Age-composition data for these samples were not presented since ageing difficulties have not yet been resolved. Since the catch rate data were not used in the multiplicative analysis, age compositions from these collections were not relevant to the quantitative analysis of stock status.

ii) Aerial Survey (Chapter 3)

From 1990 to 1996, school areas had been estimated from digital imagery but 1997, a video camera was used. The switch to video technology was necessitated by budget reductions.

The total number of hours flown in 1997 was one of the highest since surveys began. Two transects, both in the inside part of Conception and Trinity Bays respectively, instead of three transects, allowed for greater coverage. However, the impact of deleting the third transect has not been evaluated.

In Trinity Bay, the highest school area estimate was observed on July 13-14, similar to 1994-96. This time also corresponds to the peak period (July 11-21) of egg deposition on Bellevue Beach. In Conception Bay, the highest total school area (Trinity Bay and Conception Bay) was also observed on July 14. The total school surface area in 1997 was lower than the 1996 estimate and fourth highest in the series. The 1997 estimate was 554,095 m^2 (range 107,736 m^2 (1984) to 759,486 m^2 (1996)).

iii) Beach Survey (Chapter 4)

In 1990, spawning times, egg deposition and development, larval emergence and various environmental variables were monitored on two spawning beaches located at Arnold's Cove (Div. 3Ps) and Bellevue Beach (Div. 3L). The number of sites was expanded in 1991 to include five

additional beaches in Div. 3KL. In 1995 only two beaches, Chapels Cove and Bellevue Beach were sampled and in 1996 and 1997, only Bellevue Beach was sampled.

The 1997 spawning population mainly consisted of the 1994 yearclass (49%) followed by the 1993 yearclass (32%). This dominance by three-year-olds is similar to previous years from 1990 to 1996, except 1991 and 1992 when four-year-olds dominated. In 1997, the proportion of age 2 fish was considerably higher for females than for males. The 1995 yearclass represented 10% of the overall mature population spawning at Bellevue Beach.

Four modes of egg density assumed to represent spawning runs were observed on Bellevue Beach in early July, mid-July, late July and early August. Egg densities on Bellevue Beach were the second highest since 1990 and slightly higher than 1996. This implies that the mature biomass was similar in the last two years.

The majority of pre-emergent larvae observed in beach sediments in Bellevue Beach in 1997 occurred between August 7 and 13. The annual mean of the normalized estimates indicates that overall pre-emergent larval densities in 1997 were the fourth highest since 1990. This implies that the 1997 yearclass is of average strength for the 1990's, stronger than the 1991 and weaker than the 1992 yearclasses.

Data are no longer being collected on emerging larvae.

iv) Research Logbooks (Chapter 2)

The return rate of completed logbooks was lower than in previous years, 29% for fixed gear and 66% for mobile gear. In most of Div. 3L, the fixed gear fishery never opened and the mobile fishery was opened for less than a day in many bays. The main reasons for discarding (live and dumped) capelin were variable but the ones mentioned most often were low percentage of females, small fish size, redfeed and boat quotas. The overall discarding rate of 75% for traps was comparable to the highest rate in 1987 and the rate of 44% for purse seines was higher than 1996 and similar to 1990. Fishing effort for traps and purse seines was the lowest since data have been collected. Although catch rates for

1997 were high, it is suspected that these values should not be compared directly to catch rates from the 1980's. Effort has steadily declined from the early 1980's and most recently has been low due to monitoring. The effect has been to concentrate fishing effort only when capelin are most available.

Because of the very low effort concentrated over a short time period and the lack of a fishery in Div. 3L, catch rates for 1997 were not accepted for use in the multiplicative model.

5) Offshore Data

i) Bycatch in Bottom Trawl Surveys in Div. 2J3KL (Chapter 6)

Capelin are frequently caught during bottom trawl surveys directed towards groundfish off southern Labrador and eastern Newfoundland. The distribution and magnitude of capelin catches from the surveys in Div. 2J and 3K during the autumns of 1978-94 have been compared with acoustic surveys for capelin to help evaluate acoustic survey coverage. As a result of these comparisons, acoustic surveys were expanded temporally and spatially during the late 1980's and 1990's.

Beginning in 1995, fall groundfish surveys have been conducted differently. The major difference was the adoption of a Campelen 1800 shrimp trawl as the sampling gear. Comparative fishing for capelin between the old and new gear was not conducted so the results starting in 1995 are not directly comparable to results from previous years. As a result trawl bycatch data after 1994 have not been incorporated into the multiplicative model.

The autumn distribution of capelin in Div. 2J and 3K changed in the early 1990's. In years prior to 1991 most of the capelin in Div. 2J3K were concentrated either in Div. 2J or in central Div. 3K, but after about 1991 most of the capelin caught during the bottom-trawl surveys or found in stomachs of cod caught during those surveys came from southeastern Div. 3K. In 1997 the distribution was still concentrated toward the southeast but with some indication of a return to the west. The geographic distribution of mean

capelin weights is in agreement with previous studies that showed that the large capelin were mainly toward the north and that small capelin were mainly toward the south, especially on the northern slope of Grand Bank.

In 1997 both the frequency of occurrence and minimum trawlable biomass of capelin were intermediate between values from the 1995 and 1996 surveys.

In the spring surveys in Div. 3L, the Campelen trawl was not used until 1996. The extensive distribution and moderate to large catches of capelin in Div. 3L in the springs of 1996 and 1997 contrast markedly with the very small catches in 1991-95. Part of the increase may be attributed to the change of the Campelen trawl in 1996. However, the Engels trawl was capable of making substantial catches of capelin in years prior to 1991, so the increase in 1996 may also reflect increased abundance in the survey area at the time of the survey.

There is a notable contrast between the autumn surveys and the spring surveys with respect to the increase in trawlable biomass of capelin attending the change to the Campelen trawl. In the autumn series the biomass estimates in 1995-97 were about an order of magnitude greater than estimates in the mid-1980's. The extent of the increase in the spring series is less clear because of the considerable difference between the estimates of 1996 and 1997. However, the estimate in 1997 was of similar magnitude to several estimates in the 1970's and 1980's. This might indicate that the quantity of capelin in Div. 3L at the time of the survey in 1997 was substantially lower than the quantity present at the time of several of the surveys in the 1970's and 1980's.

ii) Catches of Pelagic 0-group Surveys (Chapter 7)

A research program to develop a multispecies, pre-recruit survey was carried out during 1991-93, as part of the Northern Cod Science Program. Beginning in 1994, a two-ship survey was initiated to measure pre-recruit abundances of cod and capelin throughout NAFO Div. 2J3KLNO, including both inshore and offshore areas. Large and small gear types were used to sample capelin in the upper water column, for the larval state (0-group; 3-50 mm), one year old

(50-120 mm), and two year old capelin (2+, >120 mm). The intent of the survey was to sample pelagic juvenile cod, before they settle to the bottom and larval capelin, released from beach and bottom sediments.

The abundance data for larval (0-group) capelin were adjusted to account for different survey times in different years.

In 1997, the survey was conducted earlier than 1994 and 1996 by about 8 days and 1995 by about 24 days. The number of null catches of 0-group capelin in areas common to all years was the highest of all surveys, indicating that capelin were not dispersed as widely in 1997 and consistent with the earlier survey. However, the mean length of capelin in the bongos was 10.0 mm, similar in mean lengths in 1994-96. The adjusted larval capelin abundance (0-group) in 1997 ranked second for all areas with non-zero catches and fifth for common areas, null catches (1991-97 time series). Capelin larvae were abundant along the northeast coast and none were observed off southern Labrador.

The abundance of one-year-old capelin (1996 yearclass) was the highest in the time series (1991-96 yearclasses). The mean length of one-year-olds at 88 mm was similar to 1995 and 1992 yearclasses, smaller than the 1994 yearclass and bigger than the 1990 and 1991 yearclasses. One-year-old capelin were distributed mainly within the northeast coast bays and offshore on the northern Grand Bank with few off southern Labrador or on the Northeast Newfoundland Shelf.

6) Information on Capelin Predators

The timing of egg-laying by black-legged kittiwakes in southeastern Newfoundland during 1997 was later than 1996, which had been considered more "normal", and more similar to other years in the 1990's. It appears that water temperatures and breeding times are correlated with later breeding occurring in cold years. There has been an improvement in the number of two-egg clutches in 1996 and 1997 with a movement towards the situation in the 1960's. In contrast, during 1991-93, there were more one-egg clutches. Kittiwakes are surface-feeders and the poor success in the early 1990's has been considered to be linked to the vertical distribution of capelin. Gulls are also surface feeders and

during those years, gull predation on kittiwakes chicks also increased.

In contrast, puffins are deep-divers and they have experienced good breeding success throughout the 1990's. Data from the 1960's, 1980's and mid-1990's indicates that the size of food loads to chicks was similar. However, since the mean length of capelin was smaller in the 1990's, more individual capelin were being fed.

On the Gannet Islands, near Labrador, the proportions of capelin in the diet of common murres and thick-billed murres declined dramatically in 1996 and 1997 compared to 1982 and 1983. However, breeding success for both species showed no significant change between the time periods. Chick growth in thick-billed murres during 1996 and 1997 was better than many other colonies worldwide. For common murres, early season growth was high but final fledging weights were slightly lower than in the 1980's. For both species, the time spent at the nesting sites was less than other sites indicating more time was spent foraging.

On Funk Island, the diet of gannet chicks has changed between 1977 and 1997. In warm water years, mackerel, saury and/or squid were common in the diet. In cold-water years, such as the 1990's, capelin have been important. The appearance of capelin in the diets coincides with the later spawning time of capelin, which makes them more available to foraging gannets. It is possible that it represents a spatial shift as well.

There is a considerable database on seabirds and capelin being accumulated. It may be possible to eventually incorporate data from the seabird observations into the multiplicative model. However, the different diving habits and how they affect the interpretation of capelin data must be accounted for prior to the incorporation into the model.

7) Other Studies

i) Predicting Mean Lengths (Chapter 5)

During recent assessments, positive relationships between mean lengths from fall offshore surveys and inshore the following year had been used to predict mean lengths of ripe females. In the 1997 assessment, two relationships were

used to predict the likely sizes of mature females in 1997. The existing relationship between maturing capelin in the fall and mature capelin the next year indicated that female capelin in 1997 would be about the same size as the 1981-96 mean, slightly shorter than the 1981-90 mean but larger than the mean observed during the 1990's. The second relationship used was the relationship between immature females in the spring and mature females the following year. Using the mean lengths of females from the 1996 acoustic survey indicated that capelin in 1997 would be larger than the early 1990's.

The female capelin in 1997 did not achieve the mean lengths predicted using the relationships outlined above. The relatively small sizes, especially in Div. 3L, resulted in a poor or non-existent fishery. The reasons for the failed prediction are not known but could include: inadequate sampling either offshore in 1996, inshore in 1997 or both; inappropriate gear during the fall (Campelen has been used in recent years compared to midwater trawl previously); the source of the fall samples in recent years is the groundfish survey which is later than the source of samples in previous years, the acoustic survey; the growth between the fall and spring has not been as great in the 1990's as in the 1980's. In the latter case, the points from the 1990's form a cluster in the regression that is separate from the 1980's cluster. This shift in the 1990's is consistent with other biological changes such as later spawning and change in distribution.

Growth increments of maturing females between fall 1997 and spawning season 1998 cannot be predicted. Probability distributions for the mean length in 1998 were calculated separately for data from the 1980's and 1990's, based on a mean length of 144 mm observed in bycatch from the Campelen trawl from the fall groundfish surveys in Div. 2J3KL. If growth is similar to that observed during the 1990's there is about a 60% chance that the average length will exceed 151 mm (approximately equal to 50 count). However, the probability is zero that the average mean length will exceed 155 mm which means the average count is unlikely to be less than 45 count. However, if growth increments are more comparable to those observed in the 1980's, there is a 100% probability that the average mean length will be greater than 151 mm (50 count) and about a 65% chance that the average mean length will correspond to 40 count or lower. This analysis describes

only the variation observed since 1981 and cannot rule out circumstances as yet unobserved. The analysis also uses pooled data from Div. 2J3KL and as such cannot account for variations that might be observed in local geographical areas and different spawning runs.

ii) Incidence of Repeat Spawning

Spawning mortality of capelin has been considered high based on the age structure of the population, observations of dead capelin near spawning beaches, and estimates derived analytically. Based on a study presented last year, histological examination of female gonads collected in the fall indicated that 20% and 60% of fish were recovering in 1995 and 1996, respectively. The present method using visual examination resulted in lower proportions of recovering females.

There were no histological results available for 1997. However, from 290 females (mean length >130 mm) collected in the fall and examined visually, about 40% were recovering compared to about 30% in 1996 and about 10% in 1995.

The capelin database back to 1978 was examined for the occurrence of recovering fish in females >130 mm, in NAFO 2J3KL, September-December. In most years between 1978 and 1991, the proportion of maturing females was less than 2%. Exceptions were 1980 (15%) and 1987 (5%). However, between 1992 and 1997, the proportions of maturing females ranged from 3% to about 11%.

Biology and Resource Status

During the 1990's, several biological changes, coincident with below normal water temperatures, have been documented. During offshore fall surveys in the 1980's, capelin were widely distributed from Div. 2J to Div. 3L, with a cline of larger to smaller capelin from north to south. In the 1990's, few capelin have been observed in Div. 2J and northern Div. 3K while most have been detected in southern Div. 3K and northern Div. 3L. The trends in size have been similar to the 1980's with larger capelin occurring in the northern part of the new distribution range and smaller capelin in the south. Also during the 1990's, capelin abundance measured by acoustic surveys was low.

During the late 1980's and through the 1990's, capelin bycatches increased one hundred fold in groundfish surveys on the eastern Scotian Shelf (Div. 4VW). Capelin occur sporadically in this area and as a result, it is not known whether the increase was a result of immigration or enhanced reproductive success. Capelin also appeared on the Flemish Cap (Div. 3M) during the 1990's as bycatch in groundfish surveys and the shrimp fishery. Capelin are rare here and this appearance was most likely due to migration. Increases in abundance in both areas, both historically and recently, have coincided with cold water.

The average size of capelin has declined during the 1990's. At the same time, the timing of inshore spawning has been delayed by up to four weeks. The later spawning has been correlated with colder water and smaller fish size.

Other observations of unusual characteristics of capelin biology during the 1990's, not documented in the scientific literature, include: an increase in the relative proportion of spawning at night; changes in physical structure of the otoliths causing problems in age determinations; an increased incidence of females with ovaries full of unspawned eggs in the fall; a consistent and relatively high level of the proportions of spent females in the fall since 1992.

In the evaluation of resource status, seven partially overlapping series of indicators were combined in a mathematical model to provide relative estimates of yearclass strength (Chapter 8). The indicators used in the model were:

1) aerial survey index 1982-97
2) purse seine catch rate index 1981-96
3) trap catch rate index 1981-93
4) groundfish 3L fall bycatch 1985-94
5) groundfish 2J3K fall bycatch 1985-94
6) Russian 2J3K fall commercial catch rate index 1972-91
7) egg deposition index 1990-97

The aerial survey and egg deposition index provided the only information on the 1995 yearclass and the 1997 mature biomass in this formulation of the mathematical model. The 1997 aerial survey index was lower than the 1996 estimate. It was the fourth

highest in the series and higher than all but one (1987) of the estimates from the 1980's. Egg densities in Bellevue Beach were the second highest in the series (highest in 1993). Catch rate data from purse seines and traps for 1997 were not considered to be indicative of stock status because the fishery was very contracted both spatially and temporally. A change in the gear in the fall groundfish survey in Div. 2J3KL in 1995 has effectively produced a new series which is too short to use.

Results from the model (Fig. 1) indicate that the 1983, 1986 and 1990 yearclasses were strong. Yearclasses since 1992 also appear strong but the standard errors were so large that the relative abundance of these yearclasses is statistically indistinguishable from both large and less abundant yearclasses.

A second mathematical model (Chapter 8) using results from surveys for larvae and one-year-olds produced a recruitment index (Fig. 2). The indicators used in the model were:

1) oceanic 0-group index 1991-97
2) sediment larval index 1990-97
3) emergent larval index 1990-96
4) Conception Bay sediment larval abundance 1987-93
5) oceanic age 1 index 1992-97

This recruitment index shows trends in yearclasses up to 1993 that are similar to trends in the cohort index. After 1993, the largest difference between these two indices occurs for the 1994 yearclass which in the recruitment index is relatively weak. The 1995, 1996, and 1997 yearclasses appear strong with the 1996 yearclass as strong as any in the series. Although the estimates of yearclass strength exhibit considerable variation, the statistical uncertainties are large.

A third (Chapter 8) mathematical model (using the same seven series of indicators as the cohort model and which includes an assumption that recruitment does not change) provided trends in mature biomass (Fig. 3). The trends indicate that biomass was relatively high in the late 1980's and in the more recent years in the 1990's, consistent with the presence of strong yearclasses. However, standard errors are large and biomasses from the mid-1980's to the present are not statistically different.

The assessment of the capelin stock described above is more optimistic than the results from an opinion survey of capelin fixed gear fishermen. Most respondents considered capelin abundance to have decreased from 1996. This survey has been conducted for four years and in each year, fishers indicated that the abundance of capelin has been lower than when they first started fishing capelin.

Sources of Uncertainty

Many sources of uncertainty have been cited in previous stock status reports. These included the large-scale changes in distribution, the irreconciled divergence between low offshore acoustic estimates and inshore indices in the 1990's, difficulties in ageing capelin in the 1990's compared to earlier years and the large statistical uncertainties from the mathematical model. The mathematical models used assume that a number of things are constant over time; for example, maturity schedules, survival rates and for the biomass model, yearclass strengths. The effects of violations of these assumptions have not been examined.

There is particular concern about whether the individual indices are now providing reliable indicators of stock status. During the 1980's, catch rates and other indices showed similar annual patterns. However, catch rates may now be poor indicators of stock status. Fishing effort has declined in recent years, due in part to monitoring for quality and fishing only when the fish meet market requirements. This results in catch rates which probably cannot be compared to the 1980's and may not reflect stock status. Both the aerial survey and egg deposition studies which provide fishery-independent indices, have been reduced in geographical coverage and/or intensity. The aerial survey now covers only the transects in the inner parts of Trinity and Conception Bays. The only beach study area is Bellevue Beach compared to six study beaches (three in each of Div. 3L and 3K) in the original study. There are two major concerns with the 1997 aerial and beach surveys: 1) they are so limited in geographical coverage compared to the overall stock area that the results may not reflect status of the whole stock, and 2) there are indications from the opinion survey that abundance may be changing at different rates within the stock area, for example, within the bays versus near headlands. If this is the case, the limited geographical coverage by the aerial and beach survey may not detect these changes. While the offshore surveys for early life

stages (primarily 0- and 1-group) are continuing, acoustic surveys for older juveniles and adults have been discontinued. Scientific investigations have been reduced to such an extent that it may not be possible to assess the status of capelin stocks.

There is also concern over the divergence between the assessment using the mathematical model and the opinions of fixed gear fishermen, particularly the contradiction in comparisons between the 1990's and earlier periods. A longer timeseries and further evaluation are necessary to determine whether the opinion survey can be used as a stock status indicator but this evaluation will be very difficult without other sources of data, which as noted, may be compromised by reduced coverage.

Outlook for 1998

The 1994 and 1995 yearclasses are expected to be major contributors to the 1998 spawning stock. The results from this and previous assessments on the relative strength of the 1994 yearclass are contradictory. The recruitment index indicates the 1994 yearclass is relatively weak while the cohort index indicates this yearclass is relatively strong. The 1995 yearclass is stronger than the 1994 yearclass from both the recruitment and cohort indices. The recruitment index, which incorporates several observations of the strength of this yearclass, indicates that it is about average strength (1987-97 yearclasses). If the conservative estimates of yearclass strength for the 1994 and 1995 yearclasses as derived from the recruitment index are considered, the 1998 mature biomass would be expected to be no better than average, when compared to biomasses of the 1990's.

There have been many problems and uncertainties in assessing the capelin stocks in recent years related in part perhaps to changing behaviour during unusual oceanographic conditions, as well as reduced directed scientific research. It is unlikely that future assessments will be improved at the current level of research activity.

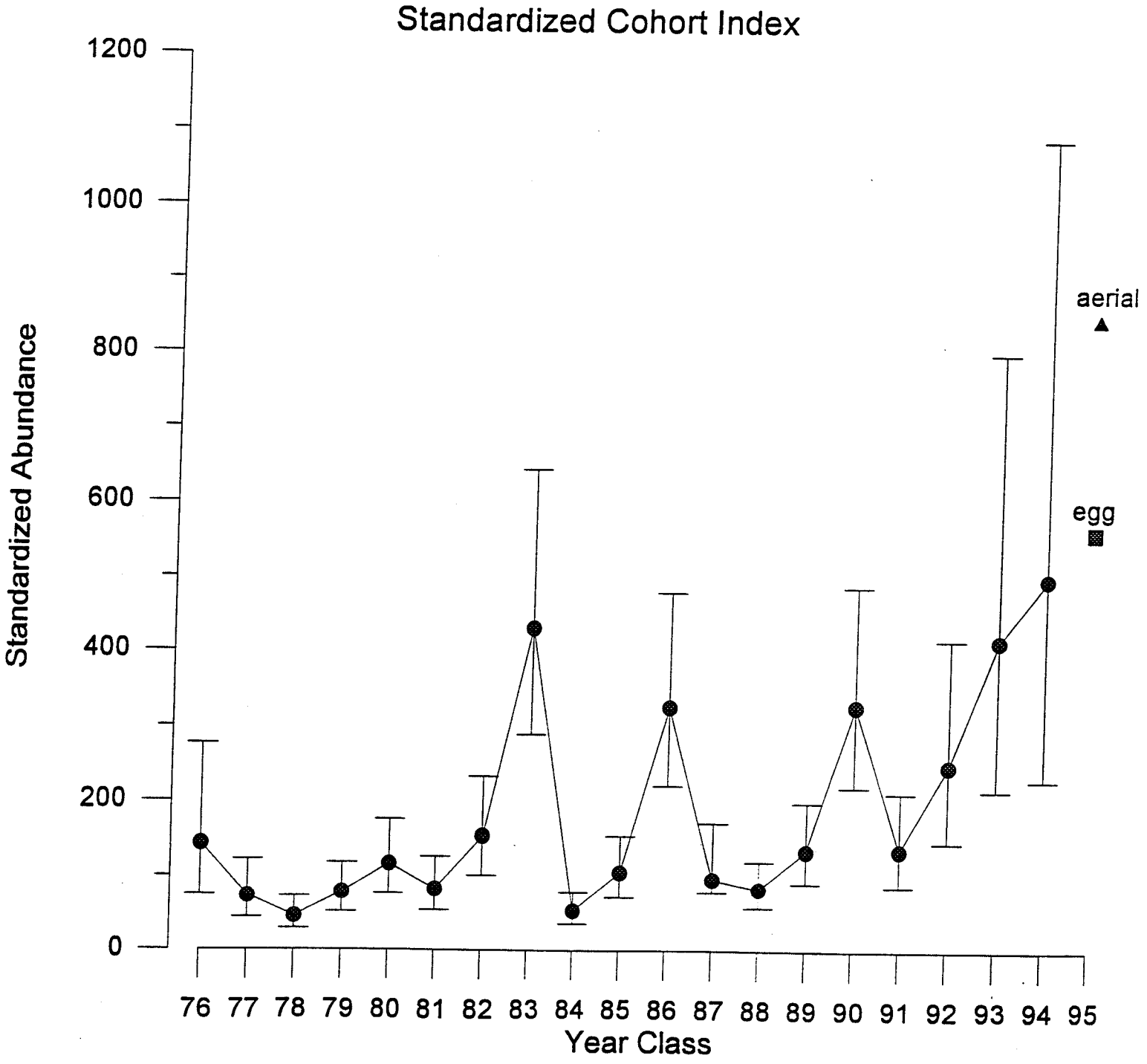

Fig. 1. Standardized cohort index derived from the multiplicative model.

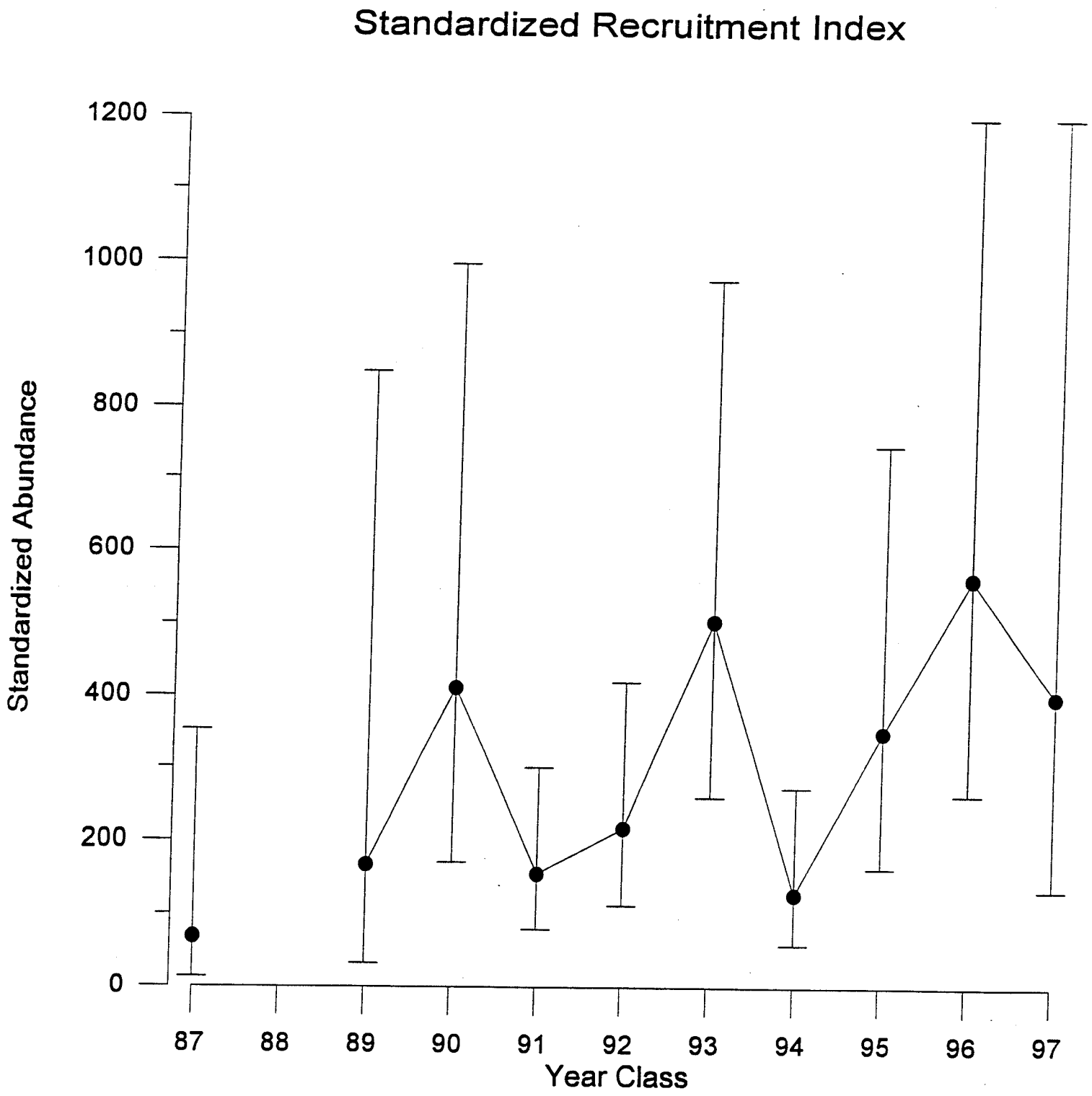

Fig. 2. Standardized recruitment index derived from the multiplicative model.

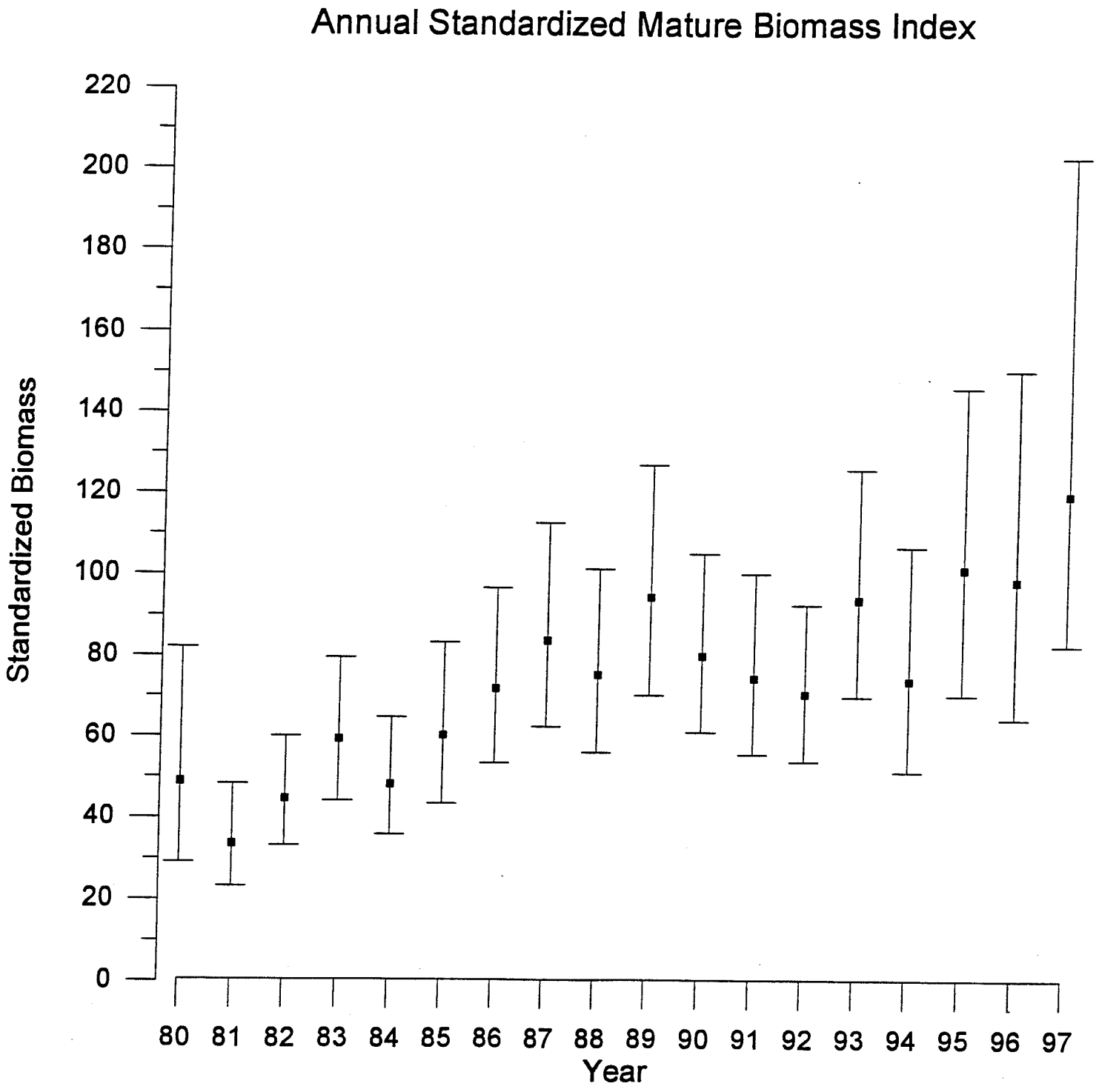

Fig. 3. Standardized mature biomass index derived from the multiplicative model.

Appendix 1

List of Participants

Name	Affiliation
Anderson, J.	Ocean Ecology
Bryant, R.	M.U.N.
Carscadden, J.	PSSMM
Chardine, J.	CWS
Clark, M.	PSSMM
Dalley, E.	Ocean Ecology
Eustace, P.	PSSMM
Evans, G.	PSSMM
Lilly, G.	Groundfish
Mayne, B.	Resource Management
Miller, D.	PSSMM
Montevecchi, W.	M.U.N.
Nakashima, B.	PSSMM
Redmond, Greg	Ocean Ecology
Slaney, B.	PSSMM
Stansbury, D. (Chair)	Groundfish
Wheeler, J.	PSSMM
Winters, G.	PSSMM