STOCK STATUS REPORT

CAPELIN IN SUBAREA 2 + DIV. 3KL

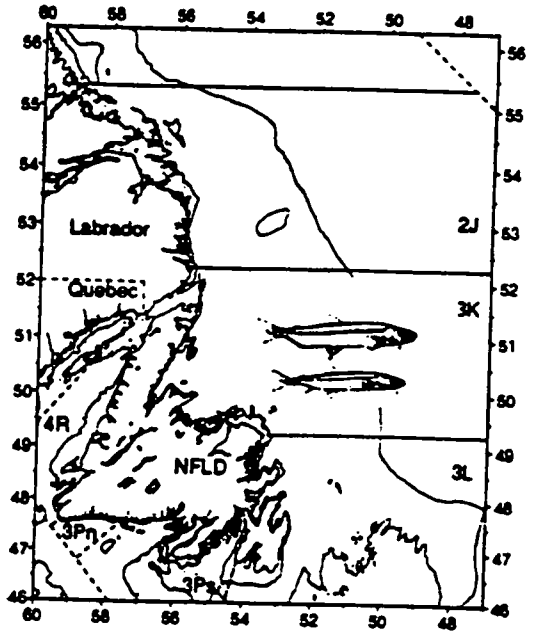
Background

Capelin is a small pelagic schooling species with major populations occurring in the Northwest Atlantic, in waters around Iceland, in the Barents Sea and in the northern Pacific. For several years, capelin in SA2 + Div. 3K and Div. 3L were treated as two stocks but, as a result of accumulated evidence, scientists recommended in 1992 that capelin in these areas be considered one stock complex.

Adult fish range in size from about 12 to 23 cm with males being larger than females. The spawning populations are comprised of mainly three and four year old fish. This, coupled with low spawning survival and variable recruitment, offers the potential for frequent and dramatic changes in mature biomass.

Juvenile capelin of the SA2 + Div. 3KL stock can be found both in major bays and in offshore waters although the northern Grand Bank and Northeast Newfoundland Shelf are thought to be major nursery areas. At maturity, schools of adults migrate inshore to spawn on Newfoundland beaches during June and July. After the eggs have hatched, the larvae exit the beach gravel and most are carried out of the bays rapidly by surface currents.

Capelin are preyed upon by many predators including seals, whales, cod, Greenland halibut, salmon and seabirds. They are considered to be a key element in the food chain. This prominent position in the ecosystem has resulted in a conservative approach to their management. In the late 1970's, scientists recommended that no more than 10% of the projected mature biomass be removed annually in a commercial fishery.



The Fishery

Historically, a small domestic fishery (annual harvest estimated at about 25,000 t) for capelin on the Newfoundland spawning beaches existed to provide food, bait and fertilizer. A directed foreign offshore fishery began in the early 1970's and was closed in Div. 3L and in Div. 2J3K beginning in 1979 and 1992, respectively. During the late 1970's, an inshore fishery for roe capelin began. Throughout the 1980's, the inshore fishery usually started by mid-June in the south and finished about mid-July in the north.

The main gear types in the inshore fishery are traps, purse seines and, to a lesser extent, beach seines. The primary market is for frozen roe-bearing female capelin in Japan. This market is limited and the demand for quality is high. Failure to meet quality standards results in discarding. Most males are discarded.

Inshore catches during the 1980's were usually about the same as the TAC, largely because the TAC was based on expected market demand. Catches in the 1990's have been more variable when compared to the TAC. This was especially evident in Div. 3L in 1992 and throughout the area in 1994 when catches were well below the TAC's. A summary of catches and TACs (tons x 10^{-3}) since 1989 is given below.

	1989	1990	1991	1992	1993	1994	1995
SA2 + Div. 3K							
Offshore							
Advised TAC	b	107	57	-	-	-	-
TAC	20	71	57	0	0	0	0
Nominal catch	22	57	0.5	0	0	0	0
Inshore							
Advised TAC	b	107	f	d	d	a	-
TAC	24.1	29	29	17	11.4	11.5	11.5
Nominal catch	28	33	20	18	13c	<.1c	<.1c
Div. 3L							
Advised TAC	335	350	e	e	d	a	-
TAC	46	56	56	19.3	21	21	22
Nominal catch	52	48	22	3	23c	1c	1c
SA2 + Div. 3KL							
Total nominal catch	102	138	42.5	21	36	1	1

a data not adequate to advise a TAC
b total inshore and offshore catches could be 200,000-250,000 t without exceeding 10% target exploitation rate
c provisional
d lowest possible level
e NAFO concluded that a catch of 50,000 t as in recent years would not exceed a 10% exploitation rate
f catch should not exceed that of previous year

In 1995, the fishery did not open. In 1994 and 1995, the average size of female capelin was too small to meet the management plan size criterion of 50 count/kg.

Since 1991, the fishery has been delayed by up to four weeks because of the late arrival of capelin, probably linked with unusually cold water temperatures. In 1994 and 1995, capelin were again later than normal arriving inshore although not as late as in 1993.

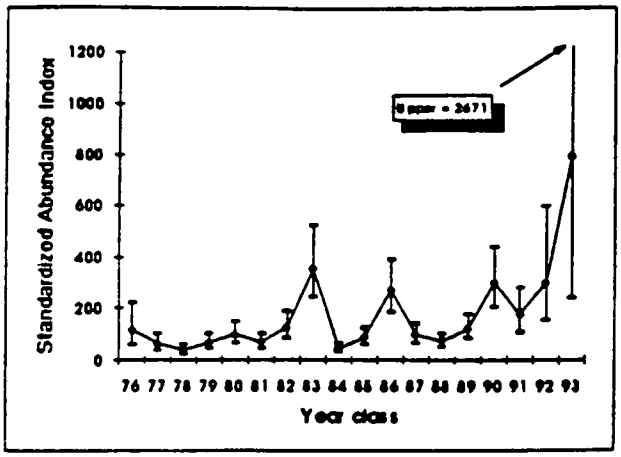
Resource Status

In the evaluation of resource status, several indicators were combined in a mathematical model which averaged the information from the different indicators and provided relative estimates of yearclass strength. The indicators used in the model were:

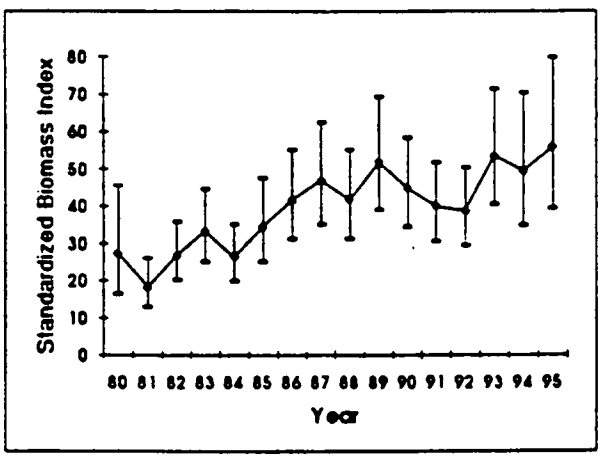
1) aerial survey index 1982-95
2) purse seine catch rate index 1981-93
3) trap catch rate index 1981-93
4) groundfish 3L fall bycatch 1985-94
5) groundfish 2J3K fall bycatch 1985-94
6) Russian 2J3K fall commercial catch rate index 1972-91
7) egg deposition index 1990-95

Only the aerial survey and the egg deposition indices provided information on the 1993 yearclass and the 1995 mature biomass. The 1995 aerial survey index was the third highest in the series and the egg deposition index was the second highest.

Results from the model indicate that the 1983 and 1986 yearclasses were strong and that those of the early 1990's (i.e. 1990 to 1993, inclusive) also were very abundant. The 1993 yearclass appears exceptionally strong but there is uncertainty (large 95% confidence intervals) about the estimate.



Results from other surveys at early life stages also indicate that the 1990, 1992, 1993 and 1994 yearclasses are abundant. Large yearclasses in the 1990's would imply that biomass should have been increasing. However, the decline in mean individual fish size during the same time period tends to counterbalance the increase in numbers. The annual biomass index was estimated to be at an historically high level during the 1993-95 period but not dramatically higher than during the mid to late 1980's when strong yearclasses contributed to the population.



The results from the scientific assessment are in contrast to those from an opinion survey of capelin fixed gear fishers, the majority of whom felt that capelin abundance in 1995 was below average.

Sources of Uncertainty

There are different types of uncertainty within the assessment. The statistical uncertainties, expressed as 95% confidence intervals in the figures, are large, especially for the 1993 yearclass. They express the statistical uncertainty of the model itself but do not include the unquantified statistical uncertainty contributed from the different data sources. Therefore, the illustrated uncertainty is underestimated. Another area of unquantified uncertainty, noted in earlier assessments, is the use of ancillary data from other sources as indices of capelin abundance (e.g. capelin by-catch in groundfish surveys).

Stock status has been difficult to determine in recent years because of the divergence between inshore indices and offshore acoustic surveys. No large-scale acoustic surveys to estimate biomass were conducted in 1995 and the divergence noted in earlier years has not been fully explained. However, new data accumulated each year provide a better basis to evaluate the divergence and stock status. For the acoustic surveys, there is evidence to suggest that poor acoustic detectability, when capelin are dispersed, and unusual geographic distributions in recent years may be contributing to abundance estimates that are lower than the true population size and not comparable to the estimates from the 1980's.

On the other hand, indices of abundance for mature capelin inshore have remained at levels higher than would have been expected from the acoustic surveys. Furthermore, results from surveys that monitor capelin abundance as larvae and one-year-olds are in general agreement with the estimates of relative yearclass strength from the inshore indices during the 1990's.

Outlook for 1996

The 1992 and 1993 yearclasses are expected to be major contributors to the 1996 spawning stock. The results from this assessment show that both yearclasses are strong although, as earlier noted, there is considerable uncertainty in the estimate of the 1993 yearclass. Results from other surveys at early life stages also indicate the 1992 and 1993 yearclasses are relatively abundant. No absolute estimates of these yearclasses presently are available. However, during 1982-89, catches in Div. 3L averaged only 4.3% of the mature biomass projected from the 3L acoustic survey (Shelton et al., 1993). This corresponds to an annual average catch in Div. 3L of 35,000 tons. During the same period, inshore catches averaged 12,000 tons in SA2+Div. 3K. Based on these comparisons and the estimated strength of the 1992 and 1993 yearclasses relative to those in the 1980's, the total TAC of about 33,000 tons in SA2+Div. 3K in the tentative management plan would be less than 10% of the expected mature biomass in 1996.

Capelin of the 1993 yearclass and older captured during fall surveys in 1995 were small and comparable in size to capelin captured in fall surveys in recent years. Based on historical trends in size in the fall and size inshore the following year, capelin in the 1996 stock likely will be small. The overall average size in the spawning stock will also be dependent on the relative proportions of the yearclasses present. During the 1990's, two year old capelin have appeared in high proportions in the spawning stock and have contributed to the small average size. The 1994 yearclass was second behind the 1993 yearclass in relative abundance in a short time-series (1991 - 1994 yearclasses) that monitored abundance of one year-olds. Based on these observations, it would appear that two-year-old capelin may again contribute to a small overall mean size in the 1996 spawning stock.

For More Information

Research Document: Anonymous. 1996. Capelin in SA2 + Div. 3KL. DFO Atl. Fish. Res. Doc. 96/38.

Shelton, P.A., J.E. Carscadden and J.M. Hoenig. 1993. Risk evaluation of the 10% harvest rate procedure for capelin in NAFO Division 3L. in Smith, S.J., J.J. Hunt and D. Rivard [ed.]1993. Risk evaluation and biological reference points for fisheries management. Can. Spec. Publ. Fish. Aquat. Sci. 120: 193 - 210.

Contact:
Jim Carscadden
Tele.(709)772-5541
Fax.(709)772-4105
email: Carscadden@nflorc.nwafc.nf.ca