



Capelin in Subarea 2 + Div.

3KL - Update

Introduction

A formal assessment of capelin in Subarea 2 + Divisions 3KL was not conducted in early 2001 due to lack of data. This document contains observations from the 2000 fishery and 2000 research data as well as general summaries of unusual biological conditions exhibited by capelin in recent years.

The Fishery

The landings for 2000 estimated from quota reports were 16,400 t, about 46% of the 35,580 t quota and about 2000 t less than in 1999. There were no landings reported from the Southern Shore and fixed gear landings in St. Mary's and Conception Bays were very low. Only 30 out of 142 fixed gear fishers who were sent logbooks actually fished in 2000, indicating low participation in the 2000 capelin fishery.

There were approximately equal proportions of ages 2 and 3, and lower proportions of age 4 in the commercial fishery samples

when sexes were combined. For males, age 3 dominated and for females, age 2 dominated.

Research at Bellevue Beach

In collections of capelin spawning at Bellevue Beach, age 3 (1997 year class) dominated, followed by age 2 (1998 year class) and age 4 (1996 year class) when sexes were combined. For males, ages 3 and 4 dominated with few age 2 fish but for females, age 2 were almost as dominant as age 3. The average lengths of both males and females increased, continuing a trend that began in 1997.

The egg deposition at Bellevue beach was less than half that of 1999, which indicates that spawner abundance at Bellevue was lower in 2000. Similarly, peak capelin densities, measured acoustically in near shore strata during the spawning season, were substantially lower than in 1999. This is in contrast to the results of the opinion survey in which fixed gear fishermen suggested the 2000 abundance was about the same as the previous year. The overall egg abundance was the third lowest in the series (1990-2000). In contrast, the survival to emergent larvae was three times higher than in 1999. The distribution of off-beach spawning was much more restricted than in 1999; subsequent larval contribution from off-beach spawning at Bellevue Beach was negligible in 2000. This observation was also in contrast to the results from the opinion survey of fixed gear fishermen who were of the opinion that off-beach spawning was generally higher in 2000. The distribution of capelin, as measured acoustically in the Bellevue near shore area,

differed substantially from 1999 to 2000. In 1999, peak capelin densities occurred in early July and most capelin, during the spawning period, were distributed from Bellevue Beach to Green Head. In contrast, in 2000, most capelin were distributed immediately adjacent to Bellevue Beach and peak densities occurred in late July, subsequent to beach spawning.

Opinion Survey

Out of a total of 1459 licenced fixed gear fishermen, 184 were surveyed by telephone and of this group, only 33 had fished in 2000. Fixed gear fishermen reported that the abundance of capelin in 2000 was similar to the abundance during 1997-1999 (range of 3.8 to 4.1 on a scale of 10). About 63% of respondents reported incidences of off-beach spawning, a response rate which is high compared to previous years. Capelin spawned mainly in July, continuing the trend of later spawning that has occurred throughout the 1990's. Many respondents echoed the concerns of past surveys and suggested that the capelin fishery should be closed.

Acoustic Survey

An acoustic survey for capelin was conducted in May 2000 in the offshore areas of NAFO Div. 3L (46°N to 49.5°N) and in Trinity Bay. Fishing for species identification and biological samples was conducted with both the IYGPT and Campelen trawls, depending on the vertical distribution of the acoustic signal. Additional sets were also conducted periodically in areas with no acoustic signal to check for the presence of capelin close to the bottom in an acoustically undetectable zone.

Capelin were detected offshore at low densities throughout the 3L survey area.

Overall densities were only slightly lower than those observed in May 1999 and remained at least one order of magnitude lower than those typical of the late 1980s. Capelin in the offshore were primarily found in carpet-like layers near bottom in waters 150-400 m deep, with little or no vertical migration observed. Mixing of capelin with arctic cod was less problematic than in 1999, though mixing with shrimp continued to pose problems in separating the acoustic signal between species in some areas.

Maturation and inshore migration appeared to be slightly earlier than in 1999, although this was not considered significant given the continuation of later spawning than observed historically. The percentage of roe in 2000 (8.1%) was comparable to that in 1999 (7.5%), and a higher proportion of capelin offshore were maturing, particularly in the southern portions of the survey area. In no areas was maturation sufficiently advanced that sex could be determined externally even though slightly less than half of the age 2 fish and nearly all of the older fish were maturing. In most areas, maturing 2 year-old fish were predominately female and larger in size than in the previous year.

Abundance estimates derived from the acoustic survey cannot be considered an indicator of stock status. Only a part of the stock distribution area can be surveyed in the time available and the proportion of the stock found therein is unknown and probably highly variable. Nonetheless, acoustically derived estimates of capelin density have been extrapolated to the surveyed area to permit inter-annual comparisons of biological characteristics and to provide an index of local abundance.

Abundance in the systematically surveyed offshore area was estimated at 115,000 t. Opportunistically collected data from another stratum, which was not surveyed in

the usual fashion, indicate it may have contained an additional 30,000 t. Bottom trawling in some areas revealed low densities (mean of 0.1 fish/m²) of capelin within the bottom trawl zone, though few or no capelin were evident on echograms. Acoustic abundance estimates were not adjusted to include fish not detected by acoustics. Offshore aggregations were composed of 75% age 2 fish (1998 year class), with ages 3 and 4 accounting for most of the rest.

Capelin in Trinity Bay were densest in the channel running down the center of the Bay. Trinity Bay capelin were generally off-bottom and exhibited a greater range of vertical movement than their offshore counterparts. Capelin densities in the Bay were the highest observed during the course of the entire survey, reminiscent of those seen offshore during the mid and late 1980s. Abundance in the surveyed portion of Trinity Bay was estimated at 104,000 t (95% confidence limits, 22,000-269,000 t) and was composed of mostly age 2 fish but with the highest proportion of age 1 in any area. As in the offshore, a greater proportion (about 50%) of the age 2 fish were maturing, compared with only 20% in the previous year.

Seabird-Capelin Interactions

In 2000, capelin remained the main prey item in diets of Common Murres (99%) and Northern Gannets (99%) studied at Funk Island. Similar to other years, the majority of capelin in murre diets was female (83%), while the majority of capelin in gannet diets was male (96%). The proportion of spent females continued to increase in the diet of murres (94%), compared to the early 1990s when murres mainly harvested gravid females. The length of gravid capelin continued to be small (140.3 ± 5.6 mm) compared to the early 1990s; however, spent

females were larger than in recent years (157.6 ± 1.5 mm). Murre chick condition continued to be low (3.4 ± 0.3 g/mm) compared to the early 1990s.

Sources of Uncertainty

In past assessments, an estimate of the relative strength of each year class has been calculated by combining several indices of individual year classes using a mathematical model. In the 2000 assessment, indices from four sources were available, namely, from egg deposition and emergent larvae collected at Bellevue Beach and from 0-group and 1-year-old indices from an offshore survey. With the cancellation of the offshore survey in 2000, only the indices from Bellevue Beach are available from sampling in 2000. In previous stock status reports concerns were raised about the use of the egg deposition and emergent larvae indices from only one beach. These concerns were ameliorated somewhat by the fact that other indices derived from surveys covering a large proportion of the stock management area were included in the mathematical model thereby reducing the impact of the Bellevue Beach indices on the derivation of the final estimate. This is now not the case and as a result, the use of the mathematical model with only two indices from only one beach from the entire stock area is not considered to be scientifically defensible in assessing the status of the stock.

Indices resulting from research designed to provide information on the status of capelin and which were considered synoptic (eg. offshore acoustic survey, offshore 0- and 1-group survey and fisheries catch rates from research logbooks) are no longer available or (aerial survey) not available in a timely fashion. Consequently, in future, it is highly unlikely that relative estimates of year class

strength and an assessment of stock status will be possible.

Comments

Although it is not possible to evaluate stock status, some general comments about capelin biology can be made. A recent study (Carscadden et al. 2001) evaluated the data on exploitation of capelin in the SA2 + Div. 3KL stock and concluded that “there is no evidence that overexploitation of capelin has occurred at any point in the history of the fisheries in SA2 + Div. 3KL where most of the fishery has occurred. Indeed, when contrasted with other pelagic fisheries (Beverton 1990), the fishing pressure exerted on capelin in Canadian waters must be judged to have been minimal.” While this conclusion is important in a historical context, it is not possible to judge the impact of the present exploitation levels in the absence of knowledge regarding stock status.

Highest catches were recorded during the 1970’s, soon after the inception of the commercial capelin fishery. Average catches have generally declined since then with the lowest commercial catches recorded in the 1990’s.

Changes in Distribution

Higher than normal abundances of capelin have been reported on the Eastern Scotian Shelf and Flemish Cap, which are outside the normal capelin distribution area. Frank et al. (1997) noted that increases in abundance in these areas, both historically and during the early 1990s, coincided with below normal water temperatures. Water temperatures have generally returned to normal yet capelin have persisted in both areas up to 2000. Also during the 1990s, capelin occurrences in fall research surveys off the coast of Labrador declined and the

centre of distribution shifted south to be located in northern Div. 3L and southern Div. 3K. In 1998, the distribution of capelin was more reminiscent of distributions observed during the 1980s, rather than the 1990s. However, during 1999 and 2000, capelin had not returned to the offshore waters off the Labrador coast, an occurrence that might have been expected given the shift in distribution observed in 1998.

Delayed Spawning

Capelin spawning has been delayed since 1991 and in some years by as much as 4 to 6 weeks. Carscadden et al. (1997) showed that spawning time was correlated with sea temperatures and mean length of mature fish. Colder temperatures and smaller mean lengths which were observed during the early 1990s, also coincided with later spawning. During the past few years, spawning has generally occurred at a time which is later than traditionally observed but somewhat earlier than observed during the early 1990s. During this later time period, water temperatures have warmed while mean fish length has remained smaller than during the 1980s.

Mean Fish Size and Age Compositions

Mature capelin have been smaller during the 1990s. At the same time, a lower proportion of older fish and a higher proportion of younger fish have occurred in the spawning population. The reasons for these shifts in size and age composition are not known. The implications of these changes on the long-term population dynamics of the stock cannot be predicted. However, it is clear that if even if numbers of capelin during the 1990s remained the same as the 1980s, the population biomass would have declined with a decline in individual fish weight.

Abundance Indices

Beginning in 1991 and continuing throughout the 1990s, acoustic densities of capelin offshore have been substantially lower than densities recorded during the 1980s. At the same time, other indicators of abundance, most notably those collected inshore during the spawning season, did not decline to the degree that would have been predicted from the acoustic estimates. These discrepancies and the uncertainties around all of the abundance indices have been discussed in past Stock Status Reports and will not be repeated here. However, the abrupt decline in offshore acoustic densities between 1990 and 1991, the continuing low offshore acoustic densities and the discrepancies between the acoustic indices and other indices have never been explained.

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