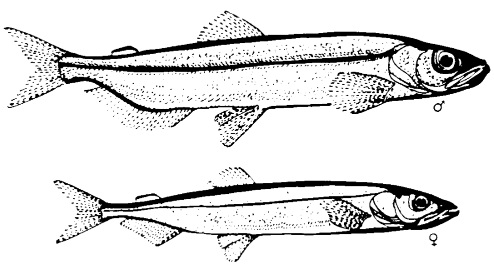
ASSESSMENT OF CAPELIN IN SA2+DIV. 3KL IN 2010



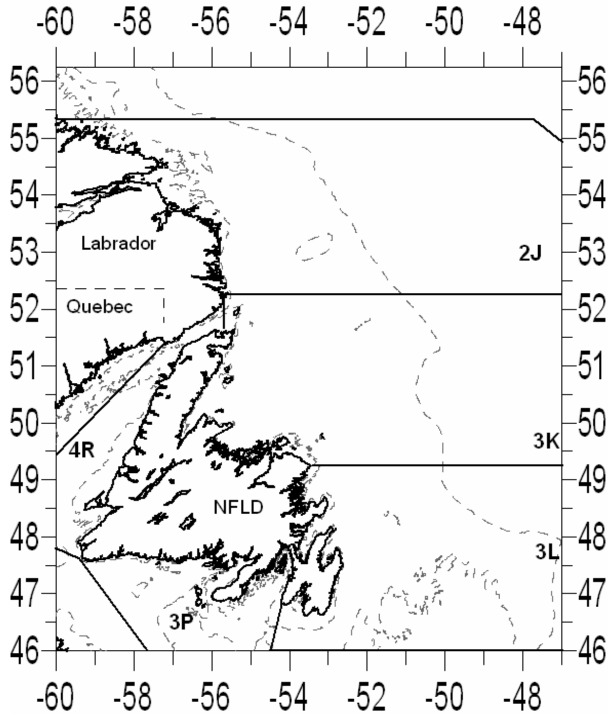


Figure 1: Capelin stock area with 100 m and 500 m contours.

Context :

Capelin (<u>Mallotus</u> <u>villosus</u>) 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.

Prior to 1992, capelin in NAFO SA2 + Div. 3K and in Div. 3L were treated as two separate stocks however, as a result of accumulated evidence, scientists recommended in 1992 that capelin in these areas be considered one stock complex. Four other recognized capelin stocks occurring in Canadian waters are the Southeast Shoal (Div. 3NO), St. Pierre Bank (Subdiv. 3Ps), Gulf of St. Lawrence (Div. 4RST), and the Scotian Shelf (Div.4W).

Historical catches of capelin for food, fertilizer, and bait in Newfoundland have not exceeded 25,000 t. An offshore foreign fishery for capelin occurred in the 1970s with a peak catch of 250,000 t in 1976. The offshore fishery was closed in Div. 3L in 1979 and in Divs. 2J3K in 1992. An inshore fishery started in Divs. 3KL in the late 1970s with peak landings of about 80,000 t from 1988-90. Recent landings have been closer to 30,000 t.

Capelin are eaten by many predators including seals, whales, cod, Greenland halibut, salmon and seabirds and are considered a key forage species. Because of its prominent position in the ecosystem a conservative approach to their management has been adopted. Since 1979 a conservative exploitation rate not to exceed 10% of the projected spawning biomass was advised for capelin stocks in the Northwest

Atlantic. This advice has not been implemented since 2000 due to the inability to predict stock biomass.

The last assessment for this stock was in 2008 (DFO 2008). Until 2001, stock status had been assessed and a stock status report produced on an annual basis. The fishery for capelin in SA2+Div 3KL has been managed with three-year capelin management plans from 1999 to 2008. Since 2009 the fishery has been managed with single year management plans.

The present review is the result of a request for science advice from the Fisheries and Aquaculture Management (FAM) Branch, Newfoundland Region prior to the formulation of the Integrated Fisheries Management Plan for Capelin in 2011.

A meeting of the Regional Advisory Process was held on October 26-28, 2010 in St. John's NL to address the above request. Participants included researchers and fisheries managers from the Department of Fisheries and Oceans, representatives from the Newfoundland and Labrador provincial government and the Fish, Food and Allied Workers Union, fish harvesters, and faculty and graduate students from Memorial University.

SUMMARY

- The Total Allowable Catch (TAC) in Div. 3KL was not taken in 2009 or 2010. Preliminary landings in 2010 were 15,470 t, 55% of the TAC, possibly due to a combination of poor market conditions, mismatches in fishery timing and spawning, and poor capelin availability.
- Fish harvesters report observing increases in capelin abundance locally and offshore.
- Fall distribution is contracted southerly compared to the 1980s. In spring 2010 capelin were located in deeper water along the shelf edge, and not in strata which have had typically high densities during the last decade.
- Capelin vertical distribution remains deeper with less diurnal migration than in the 1980s.
- The size and age of capelin continue to reflect changes that occurred in the early 1990s. Mean length, weight and age of capelin in 2009 were the lowest in their respective series.
- The proportion of maturing two year olds observed in a spring acoustic survey has increased since the mid-1990's, and continues to increase. In most years since 1999 the majority of capelin had matured at age 2.
- Condition has been gradually declining for most lengths and both sexes since the early 1990s and was the lowest in the time series in 2009.
- Beach spawning times in 2009 were one of the latest in the series; larval survival is lower when spawning is late.
- Larval densities from the Trinity Bay September 0-group index are lower than during the mid 1980s, and the mean length of larvae is smaller.
- Four recruitment indices are coherent and indicate that the 2008 and 2009 year classes are lower than the 2007 year class.
- The 2010 estimate of abundance from the spring acoustic survey in Div. 3L is the lowest in the series, about 10% of recent values and less than 1% of historic levels.
- Physical and biological oceanographic conditions in 2009 were not favorable for capelin growth, distribution and spawning.
- Fish and seal predation on capelin has increased in recent years.

INTRODUCTION

Species Biology

Adult fish range in size from about 12 to 23 cm with males being larger than females. Historically, the spawning populations were composed of mainly three and four year old fish. Since the early 1990s, spawning populations have consisted predominantly of two and three year old fish. The short life span and variable recruitment offer the potential for frequent and dramatic changes in the 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, during June and July, schools of adults migrate inshore to spawn on Newfoundland beaches and on demersal sites. Since 1991 spawning has been delayed up to four weeks with spawning taking place in July and August. After the eggs have hatched, the larvae exit the gravel and most are carried out of the bays by surface currents. The average size of mature capelin continues to be smaller than observed during the 1980s.

In summary, capelin biology and behaviour continue to reflect the patterns observed during the 1990s. The dramatic shifts, first observed in the early 1990's, appeared to be linked with below normal seawater temperatures; however, the changes continue to persist despite higher seawater temperatures since the mid-1990s. Recent analyses suggest that changes in prey quality in offshore feeding areas may be involved.

Fishery

Historically, capelin were fished domestically on spawning beaches for food, bait and fertilizer (annual harvest estimated at about 25,000 t). A directed foreign offshore fishery began in the early 1970's and was closed in Div. 3L in 1979 and in Div. 2J3K in 1992. The peak offshore catch of 250,000 t occurred in 1976.

During the late 1970's, an inshore fishery for roe-bearing female 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. Since the early 1990's the inshore fishery has operated mainly in July and at times, especially in Div. 3K, in early August. Peak inshore landings of approximately 80,000 t occurred in 1988-90. The TAC was not caught in 2009-10 (Fig. 2).

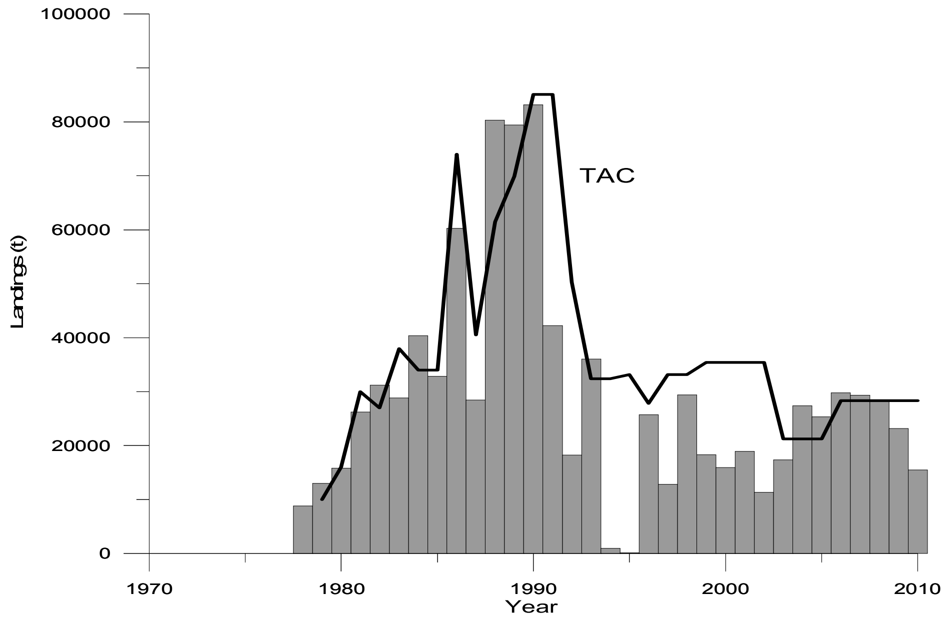


Figure 2: Inshore landings (bars) and TAC (line) for Div. 3KL in 1978-2010.

The inshore fishery has been prosecuted by capelin traps, purse seines and, to a lesser extent, beach seines. Since 1998, modified beach seines, called "tuck seines" have been deployed because capelin stayed in deep water and were unavailable to capelin traps and beach seines. The use of tuck seines or capelin traps has varied from location to location. The majority of the inshore landings in recent years comes from purse seines and tuck seines.

The primary market for frozen roe-bearing female capelin in Japan is limited and the demand for quality is high. Inshore TACs have been tied to market constraints until the late 1990s. Discarding at sea and dumping of capelin, predominantly males which are unsuitable for the Japanese market, were major concerns in the 1980's. In recent years, several management measures and access to other markets have mitigated these concerns. Monitoring capelin quality prior to opening the fishery and relatively short fisheries (two to three days) have significantly reduced at-sea discarding. A condition of provincial processing licenses requiring full utilization of capelin has been instituted since 2006. This requirement along with new markets for male capelin have improved the utilization of male capelin.

In 1994 and 1995, the average size of female capelin in most areas was too small to meet a conservation criterion of 50 count / kg (sea run) in the capelin management plan. As a result, the fishery either did not open or opened for only a short time and catches were low. In 1996, this size criterion was removed.

Landings from 1996-2003 were less than the TAC as a result of reduced fishing effort due to low prices, small females, and lack of interest by processors. Interest in the capelin fishery has steadily increased since 2004 coincident with a closure of the Barents Sea capelin fishery. The Barents Sea fishery reopened in 2009.

In the Integrated Fisheries Management Plan for Capelin 2003-05, there was a 40% reduction in TACs attributed to uncertainty around the status of capelin at the time and its role in cod recovery. In the Integrated Fisheries Management Plan for Capelin 2006-08, TACs were increased by 33%; at the time there were indications that capelin status was improving based on observations of capelin in northern portions of the stock area, an increase in the size of spawners, and indications of more and earlier beach spawning.

Capelin landings have declined in Conception Bay since 2008, in Notre Dame Bay in 2010, and in White Bay for fixed gear in 2010. This may be due to a combination of poor market conditions (particularly in 2010), mismatches in fishery timing and spawning, and poor capelin availability. A continuation or increase in these trends may mean recruitment is becoming more dependent on spawning sites located in a smaller portion of the stock area.

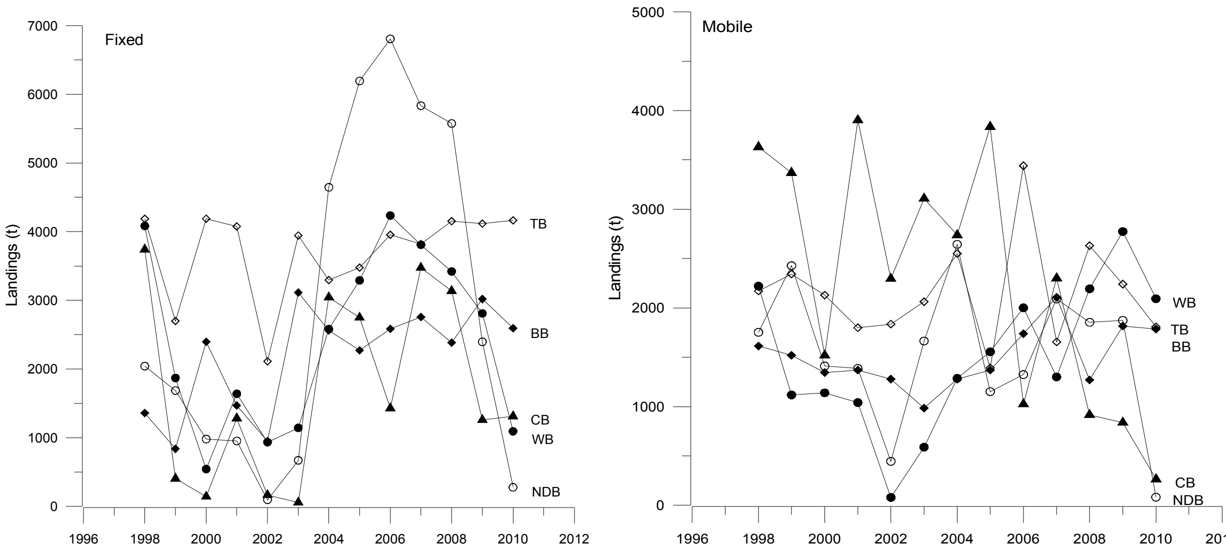


Figure 3: Trends in fixed and mobile gear landings (t) in Conception Bay (CB closed triangle), Trinity Bay (TB open diamond), Bonavista Bay (BB closed diamond), Notre Dame Bay (NDB open circle), and White Bay (WB closed circle) 1998-2010.

ASSESSMENT

There are no reliable estimates of current spawning biomass for the entire stock although an index of abundance is available from the spring acoustic survey which covers about one third of the potential area of distribution. The assessment is therefore based on trends in indices and distribution, behavioural changes, and biological descriptors.

The sources of data for consideration are as follows:

1) abundance estimates, and biological samples from spring offshore acoustic surveys predominantly in Div. 3L 1984-92, 1996, 1999-2005, 2007-10;
2) distribution from spring offshore acoustic surveys and fall multi-species research vessel bottom trawl surveys in Div. 2J3KL (1985-2009);
3) egg deposition index (1990-2009), larval emergence index (1990-96, 1998-2009), and surface tows (2003-09) from Bellevue Beach, Trinity Bay;
4) 0-group surveys of larval capelin in Trinity Bay (1982-86 and 2003-10);
5) spawning times from two capelin beaches 1978-2010;
6) biological samples collected from the commercial inshore fishery 1981-2009;
7) spring offshore feeding (1999-2009) and
8) environmental/ecosystem considerations.

Trends

Spring Acoustic Survey

Information from spring acoustic surveys was available for 1988-92, 1996, 1999-2005, and 2007-10. Estimates of capelin numbers, including 95% confidence limits, were calculated using a simulation technique that incorporated variability over time associated with advances in hydro-acoustic technology and calibration, changes in spatial and vertical distribution patterns, and changes in the size of capelin. Acoustic survey data from 1984 to 1987 could not be processed in the same way as was the earlier data to extend the time series back in time. Abundance at age 3 was strongly correlated with abundance at age 2 indicating that the survey does consistently track stock size. Abundance of capelin surveyed increased slightly from 2007–09, but declined in 2010. Abundance estimated for 2010 was the lowest in the time series, at about 10% of recent levels and less than 1% of historic levels (Fig. 4). The spring survey covers only a part of the stock area and as such these are considered to be minimum abundance estimates.

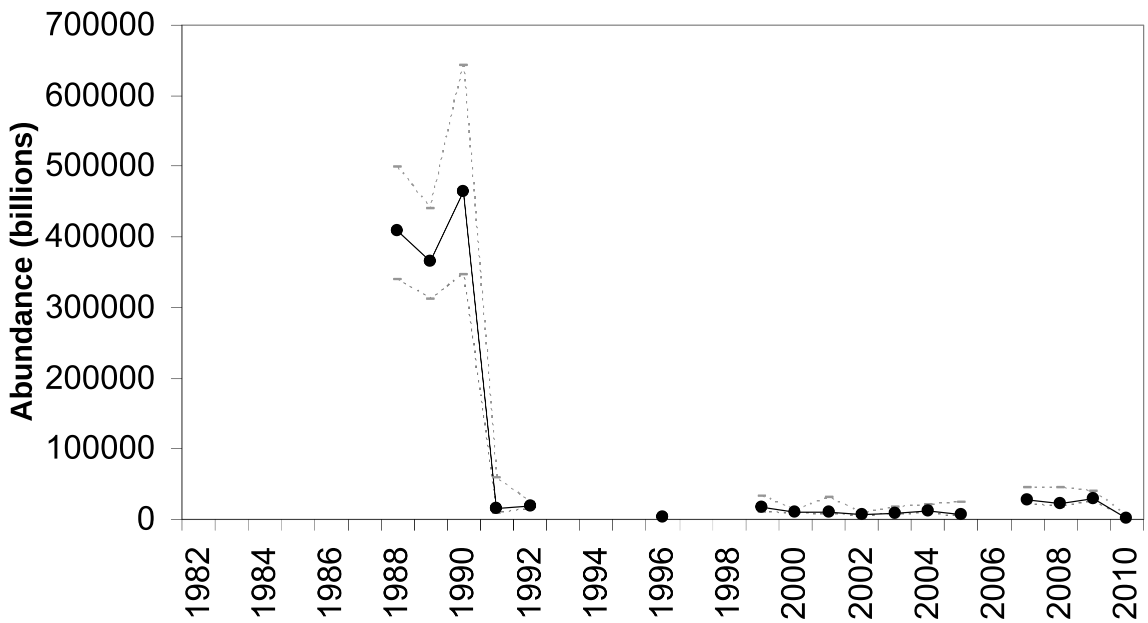


Figure 4: Simulated spring offshore abundance estimates (line) with 95% confidence intervals (broken lines) for an index area (mostly NAFO Div. 3L).

Preliminary results of a recently implemented acoustic component in the fall multi-species bottom trawl survey showed promise for describing both distribution and abundance of capelin at this time of year. This would be a useful addition as the survey covers a large part of the known distribution of capelin in the fall, including maturing fish which may not be available to the spring survey.

Egg and Larval Studies

Trends in two indices from a single capelin spawning beach at Bellevue Beach in Trinity Bay, Div. 3L were evaluated. Egg deposition is based on the amount of stage I-II eggs (viable eggs less than 36 hrs old) per cm^2 of beach gravel (Nakashima and Slaney 2001). Egg deposition in

2009 was less than in 2007 and equal to the long-term average (Fig. 5). If egg deposition is considered a proxy for spawner abundance, then abundance in 2009 was average.

Annual estimates of larval capelin emerging from beach gravel at Bellevue Beach were available from 1990 to 2009 except for 1997. Larvae were enumerated from plankton tows over the intertidal zone at every high tide (Nakashima and Slaney 2001). Larval release from beaches has been shown to be related to recruitment in capelin (Carscadden el al. 2000). If so then the 2009 year class, which is below average, would be relatively weak as age 2 in 2011 and the 2008 year class which was slightly above average in the series would be at average as three-year olds in 2011 (Fig. 5).

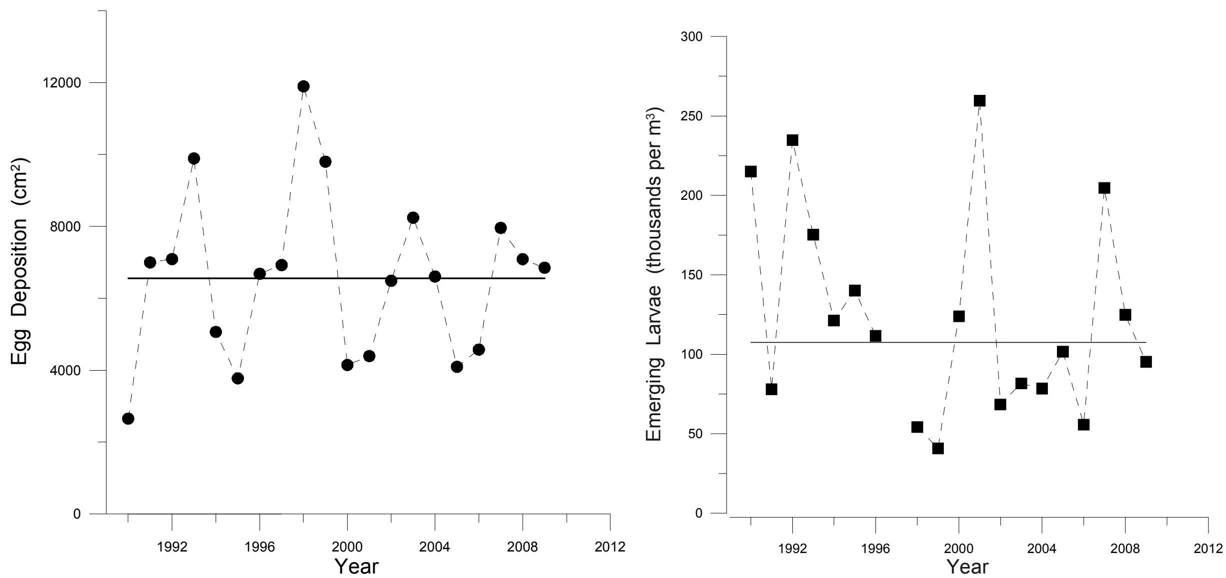


Figure 5: Egg deposition (circles) from 1990-2007 and larval emergence (squares) from 1990-96, 1998-2009 for Bellevue Beach, Trinity Bay. The solid line represents the average egg deposition and average larval emergence, respectively.

From 2003-09 larval capelin within Trinity Bay have been surveyed each September with double oblique 333 µm mesh bongo nets towed at each of 19 fixed stations. The methodology employed was consistent with that used by Dalley et al. (2002) from 1982-86. Comparison of results from the two time periods revealed that capelin larvae in the 2000s were smaller and less abundant than in the previous period. 0-group survey estimates tracked age 2 abundance estimates from the offshore acoustic survey, but were not coherent with the age 1 estimates from the same survey. Larval estimates from Bellevue Beach (surface tows and emergent larvae) and Trinity Bay 0-group surveys and the age 2 acoustic index were all coherent and indicated that the 2 most recent year classes are smaller than the 2007 year class (Fig 6).

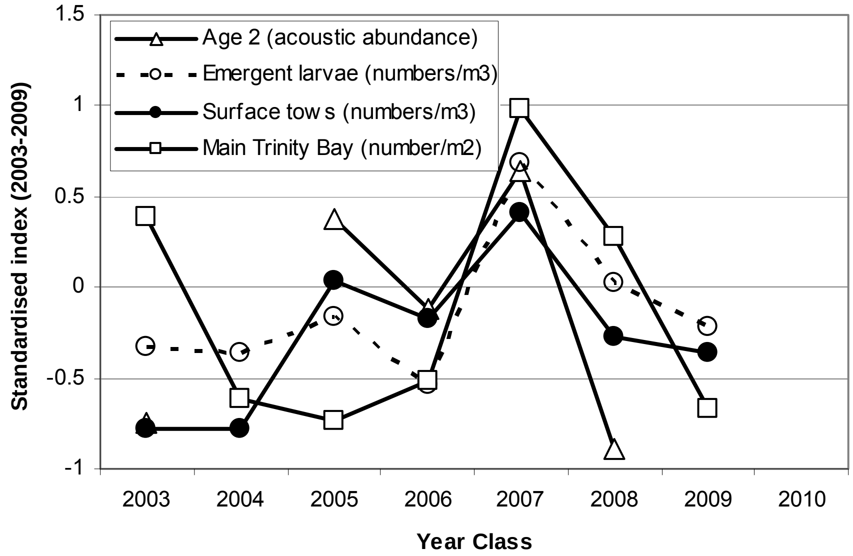


Figure 6: Standardized recruitment indices for Bellevue emergent larvae (open circles) and surface tow larvae (closed circles), Trinity Bay 0-group (squares), and spring age 2 acoustic abundance estimates (triangles) for 2003-2009 year classes.

Behavioural Information

Horizontal Distribution

Distribution of capelin during the spring acoustic survey has changed over time. Prior to 1991 high densities of capelin were spread throughout the survey area with the highest densities near to mid shore the northern Grand Bank. Since 1999 capelin densities on the Bank have been low all over with the highest densities in deeper water stratum (>200 m) off Bonavista and along the shelf break. In 2010 capelin densities were extremely low in all strata, although in the deepest shelf break stratum (300-500 m) and the only inshore stratum (Trinity Bay) the declines were less marked.

In the fall of the year both immature and maturing capelin are distributed offshore in 2J3KL. Bottom trawl survey data indicate that densities of capelin in Div. 2J declined sharply in 1990, with some short term improvements in the northerly distribution in 1998-99 and 2007-08. Few capelin were evident in bottom trawl catches in Div 2J in 2009.

Vertical Distribution

Vertical distribution, as measured from the spring acoustic surveys, shows that since 1991 capelin in Div. 3L are found deeper in the water column, are not undergoing diurnal migrations as observed in the 1980s, and tend to be located in areas of greater bottom depths (Fig. 7).

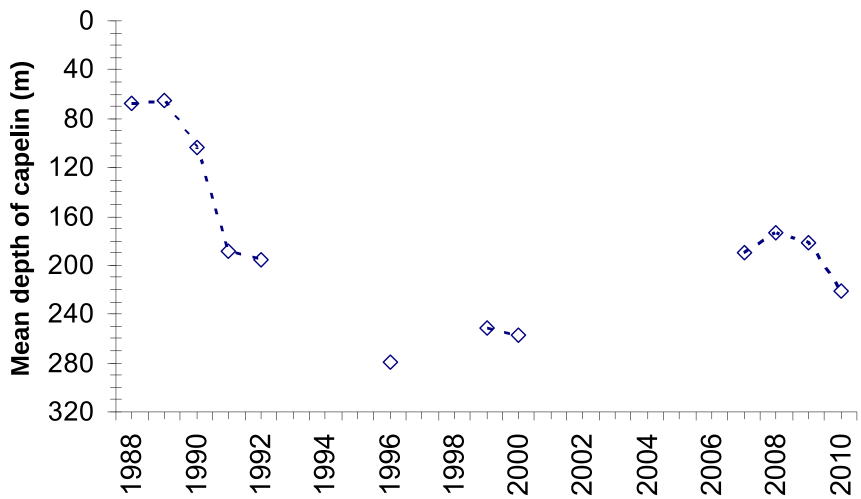


Figure 7: Mean depth of capelin aggregations in Div. 3L in the spring.

Spawning Time

A time series consisting of the annual date of peak spawning was available for two beaches (Fig. 8). The data from Bryants Cove, Conception Bay (Div. 3L) were from 1978-2010 and is the only location where peak spawning has been documented before 1990. The data from Bellevue Beach, Trinity Bay is the only location where peak spawning has been documented continuously from 1990-2010. Observations from 1991-2010 from four other spawning beaches in White Bay, Notre Dame Bay, Bonavista Bay, and Conception Bay mirrored the trend of peak spawning reported for Bryants Cove and Bellevue Beach. Capelin beach spawning continues to be about 4 weeks later than observed historically.

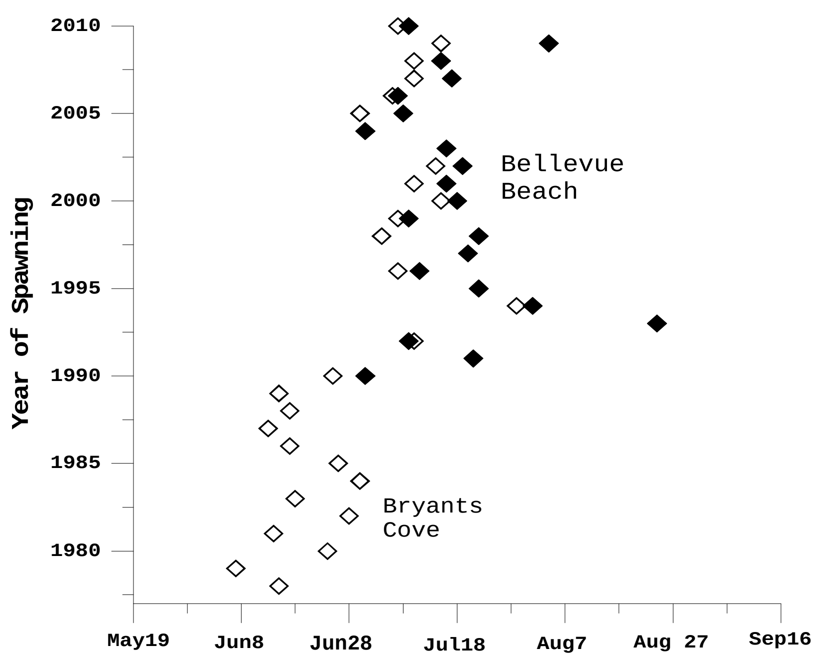


Figure 8.: Peak spawning times at Bryants Cove, Conception Bay (open diamond) and Bellevue Beach, Trinity Bay (closed diamond).

Biological Information

Biological samples from the commercial inshore capelin fishery have been collected and processed since the early 1980s. Results were available to 2009 for this assessment. Mean total lengths of males and females in both Div. 3L and Div. 3K describe similar trends (Fig. 9). Mean lengths since 1992 have been, on average, 15 to 18 mm less than those measured prior to 1992. Mean lengths in 2009 were the lowest observed.

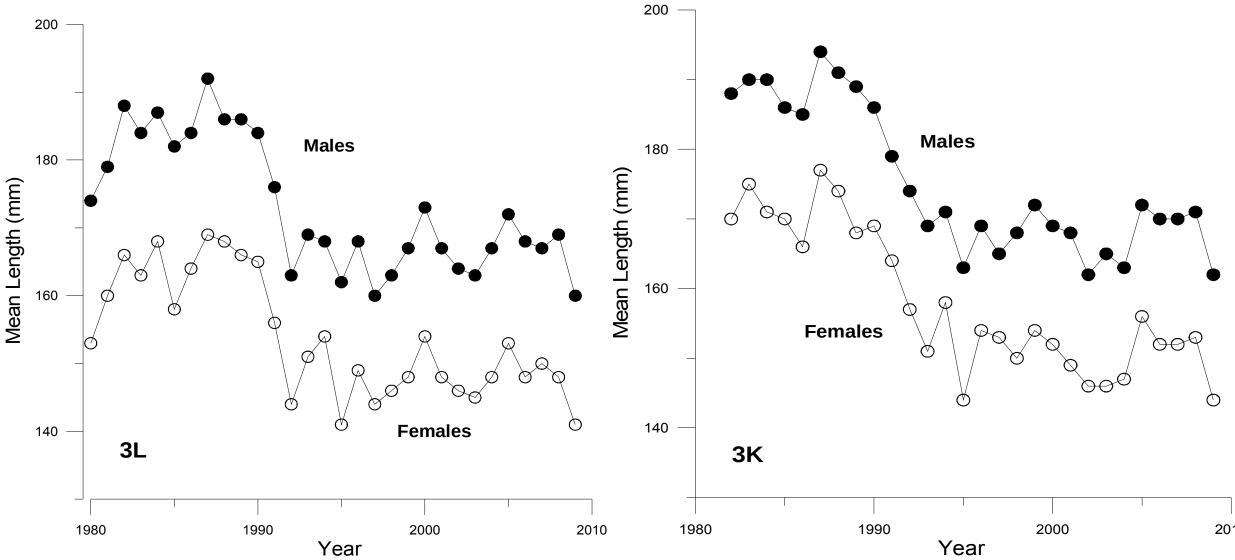


Figure 9: Mean total lengths of males (closed circles) and females (open circles) in Divs. 3L and 3K.

The mean age of capelin sampled from the inshore commercial fishery has been younger since 1992 compared to the 1980s (Fig. 10). From 1980-91 the spawning biomass was predominantly comprised of three and four year-old fish. Since 1992 the spawning biomass has been dominated by two and three year-old fish. The mean spawning age in 2009 was one of the lowest observed.

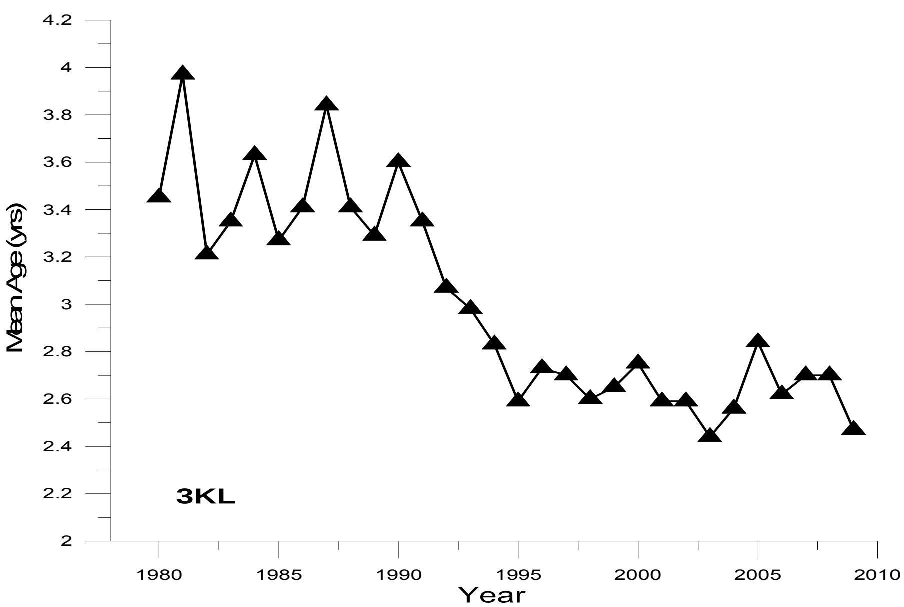


Figure 10: Mean age of mature capelin (sexes combined) in Div. 3KL.

Biological samples collected during the spring acoustic survey in recent years have a higher proportion of mature two-year olds (Fig. 11). In the 1980's two year old capelin in the offshore were predominantly immature. These observations are consistent with the increase in the proportion of mature two year olds observed in the commercial inshore fishery since the mid-1990's.

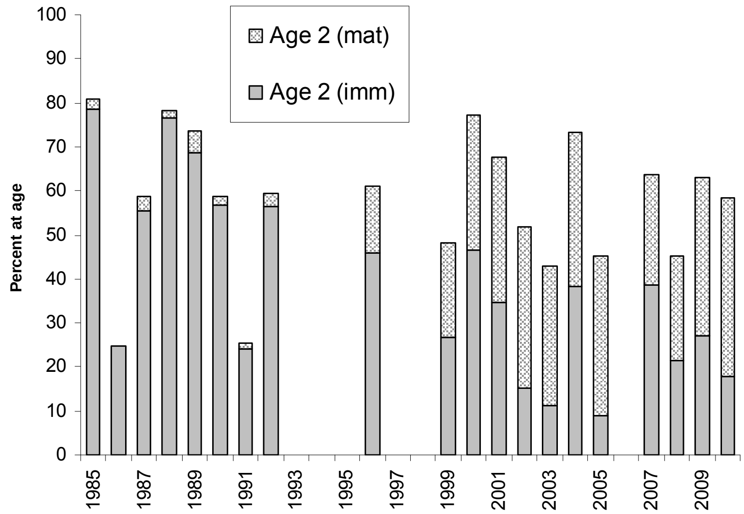


Figure 11: Proportion of two year old capelin in the spring survey, by maturity status (solid fill is immature, hatched fill is mature).

The body condition and gonad development of capelin sampled during the spring acoustic survey have tended to vary together since at-sea measurements became available in 1996. Small gonads in May are indicative of delayed development and spawning. Capelin condition was highest and gonad development was most advanced in 2005 and 2007 but has since declined. Condition in 2009 was the lowest in the series but has returned to more average levels in 2010. Gonad development in 2010 was again delayed.

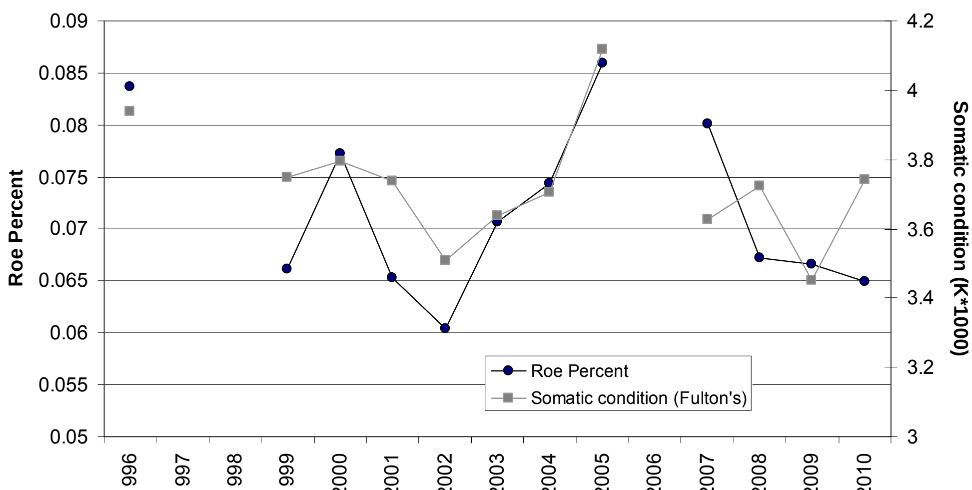


Figure 12: Fulton's condition index (squares) and roe percentage (circles) of female capelin sampled during the spring offshore acoustic survey.

Environmental/Ecosystem Considerations

The extent of the cold intermediate layer (CIL, <0°C) is generally regarded as a robust index of ocean climate conditions off the eastern Canadian continental shelf. The cross sectional area of the CIL on standard transects off Bonavista and the southern Labrador shelf has been increasing since the mid 2000s, with values in 2009 the second largest since 1994 (http://www.nafo.int/science/frames/ecosystem.html). Above normal extents of the CIL were pervasive throughout the late 1980s and early 1990s and may be associated with later spawning and smaller sizes of capelin (Nakashima 1996).

An abundance index of the primary capelin prey item, *Calanus finmarchicus,* is available from the Atlantic Zonal Monitoring program since 1999. The abundance of *Calanus finmarchicus* has been declining since 2006 along the Flemish Cap and Bonavista transects, with current levels similar to early 2000s. Similarly the abundance of hyperiids have declined while the abundance of euphausiids have shown a gradual increase.

Biomass indices for fish functional groups and commercial invertebrates (shrimp and crab) are available from DFO spring and fall multi-species bottom trawl surveys. According to these surveys, overall fish biomass showed an increasing trend between 2003 and 2007. Current overall fish biomass is higher than in the mid-1990s but still well below pre-collapse levels. The biomass of shrimp, which had been at record high levels in the late 1990s and 2000s, declined markedly in 2009 (Fig 13). Based on data from 2J3KL fall survey, capelin was the single most important prey item in the Greenland Halibut diet between 1980 and 2008, though its dominance in the diet was higher in the 1980s. Capelin was the main prey species of cod until the 1990s when it was replaced by shrimp.

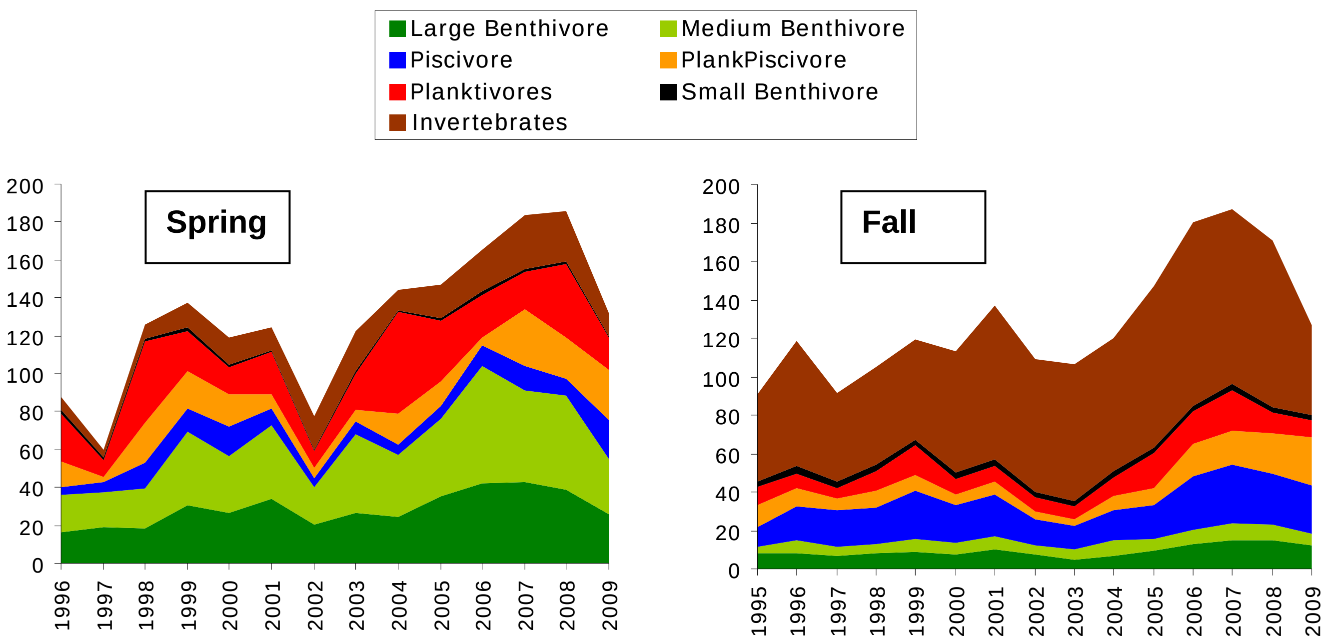


Figure 13: Relative biomass indices (kg/tow) of fish and commercial invertebrates from core strata in the DFO multi-species bottom trawl surveys in NAFO Divisions 3LNO in the spring 1996-2009 and 2J3KL during fall 1995-2009. The invertebrates index primarily reflects northern shrimp biomass.

Seals are also important capelin predators. The most important component of harp seal diets in Div. 2J3KL is capelin (Hammill and Stenson 2000). The abundance of seals has been increasing since the early 1970s (Hammill and Stenson 2009).

Given the population increases in capelin predators, and the decline in alternate prey items such as shrimp, predation pressure on capelin has most likely increased in recent years.

Sources of Uncertainty

There are no estimates of current stock size for capelin in SA2+Div.3KL. As a result the impact of current catches on spawning biomass cannot be evaluated.

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. 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.

ADDITIONAL STAKEHOLDER PERSPECTIVES

Fish harvesters have observed increases in capelin abundance. TAC has been harvested in a very short time, an indication of good catch rates. Fish harvesters conducting other fisheries such as shrimp, have reported occurrences of capelin in the offshore areas, which also indicates higher abundance.

It should be noted that due to poor market price and the late start of the snow crab fishery there was reduced fishing effort in the 2010 capelin fishery. Fish harvesters recommend TAC be maintained at its current levels.

In addition, fish harvesters would like to see additional science on the capelin resource.

CONCLUSIONS AND ADVICE

Higher offshore abundance estimates of capelin from 2007 to 2009 from spring acoustic surveys complemented observations by fish harvesters that abundance had been increasing since 2006. However, abundance in 2010 was the lowest in the series, an order of magnitude lower than estimated for 2007-09 and less than 1% of historical levels. The four recruitment indices examined were coherent and indicated that the 2008 and 2009 year classes, which will be the basis of the 2011 spawning biomass, are weaker than the 2007 year class, which was the strongest in the last 5 years.

The biological and behavioral indicators examined during this assessment are similar to, or have deteriorated since the last assessment (DFO 2008). The new biological and behavioural information indicate that capelin continue to be small, are maturing at an earlier age, are in poor condition, are late spawning, remain close to the bottom and at greater depths in the offshore, and have contracted their distribution. This assessment indicates that the acoustic abundance index is at an historical low and short term prospects for recruitment are poor. Because there is no overall abundance estimate for this stock, exploitation levels cannot be estimated. Considering the above indicators, the unknown level of exploitation on this stock, the importance of capelin as a key forage species, and the recent decline of shrimp (another important forage species that may result in higher predation pressure on capelin), extreme caution is advised.

SOURCES OF INFORMATION

This Science Advisory Report is from the Fisheries and Oceans Canada, Canadian Science Advisory Secretariat, Regional Advisory Process of October 26-28, 2010 on the Assessment of Capelin in SA2 + Div. 3KL in 2010. Additional publications from this process will be posted as they become available on the DFO Science Advisory Schedule at http://www.dfo-mpo.gc.ca/csas-sccs/index-eng.htm.

Carscadden, J.E., Frank, K.T., and Leggett, W.C. 2000. Evaluation of an environment-recruitment model for capelin (*Mallotus villosus*). ICES J. Mar. Sci. 57:412-418.

Carscadden, J.E., Frank, K.T., and Leggett, W.C. 2001. Ecosystem changes and the effects on capelin (*Mallotus villosus*), a major forage species. Can. J. Fish. Aquat. Sci. 58: 73-85.

Carscadden, J.E., Nakashima, B.S. and Frank, K.T. 1997. Effects of fish length and temperature on the timing of peak spawning in capelin (*Mallotus villosus*). Can. J. Fish. Aquat. Sci. 54: 781-787.

Dalley, E. L., Anderson, J. T. and deYoung, B. 2000. Atmospheric forcing, larval drift and recruitment of capelin (*Mallotus villosus*). ICES J. Mar. Sci. 59: 929-941.

DFO. 2008. Assessment of capelin in SA 2 + Div. 3KL in 2008. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2008/054.

Hammill, M.O. and Stenson, G. B. 2000. Estimated prey consumption by harp seals (*Phoca groenlandica*), hooded seals (*Cystophora cristata*), grey seals (*Halichoerus grypus*) and harbour seals (*Phoca vitulina*) in Atlantic Canada. J. Northw. Atl. Fish. Sci. 26:1-23.

Hammill, M. O. and Stenson, G. B. 2009. Abundance of Northwest Atlantic harp seals (1952-2010) DFO Can. Sci. Advis. Res. Doc. 2009/114, 12p.

Mowbray, F.K. 2001. Changes in the vertical distribution of capelin (*Mallotus villosus*) off Newfoundland. ICES J. Mar. Sci. 59:942-949.

Nakashima, B.S. 1996. The relationship between oceanographic conditions in the 1990's and changes in spawning behaviour, growth and early life history of capelin (*Mallotus villosus*). NAFO Sci. Coun. Stud. 24: 55-68.

Nakashima, B.S. and Slaney, B.W. 2001. Spawning and early development of capelin (*Mallotus villosus*) at Bellevue Beach, Trinity Bay in 1999, pp. 75-87. In Anon. Capelin in SA2 + Div. 3KL during 1999. DFO Can. Sci. Advis. Res. Doc. 2001/161.

Nakashima, B.S. and Wheeler, J.P. 2001. Capelin (*Mallotus villosus*) spawning behaviour in Newfoundland waters – the interaction between beach and demersal spawning. ICES J. Mar. Sci. 59: 909-916.

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