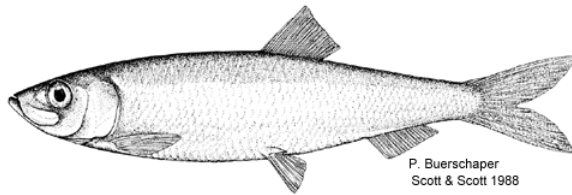


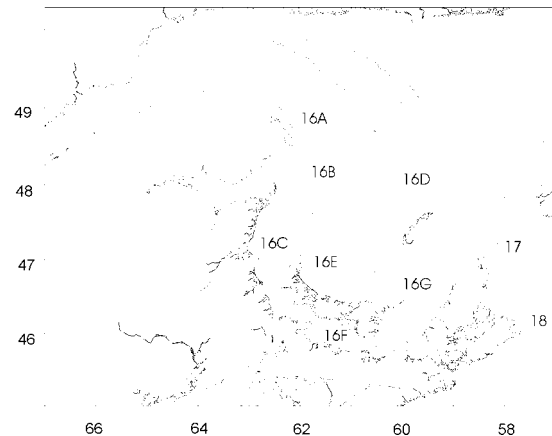


Gulf Region

Stock Status Report 2003/035



Southern Gulf of St. Lawrence (4T) Herring



Background

Herring are a pelagic species which form schools during feeding and spawning periods. Herring in the southern Gulf of St. Lawrence consist of a spring spawner component and a fall spawner component. Spring spawning occurs primarily in April-May but extends into June at depths <10m. Fall spawning occurs from mid-August to October at depths 5 to 20m. Eggs are attached to the bottom and large females produce more eggs than small females. First spawning occurs primarily at age four. The largest spring spawning populations are in the Escuminac, southeast New Brunswick and Magdalen Islands areas and the largest fall spawning population is in Chaleur Bay.

The stock area for southern Gulf of St. Lawrence herring extends from the north shore of the Gaspé Peninsula to the northern tip of Cape Breton Island and includes the Magdalen Islands. Adults overwinter off the east coast of Cape Breton in NAFO area 4Vn.

Southern Gulf of St. Lawrence herring are harvested by an inshore gillnet fleet on spawning grounds and a purse seine fleet (vessels >65') in deeper water. The percentage of spring and fall spawner component in the catch varies according to season and gear type. As a result, landings during the fall and spring fisheries must be separated into the appropriate spring and fall spawning groups to determine if the TAC for these groups has been attained. Spawning group assignment is done using a gonado-somatic index to assign maturity stage and a monthly key that links maturity stage and month to spawning group. Juvenile spawning group assignment is done by otolith shape type.

The inshore fleet harvests almost solely the spring spawner component in the spring and almost solely the fall spawner component in the fall. The purse seine fleet harvests a mixture of spring and fall spawner component during their spring fishery which occurs in the area between Cape Breton Island and the Magdalen Islands. In the fall, the purse seine fleet concentrates in Chaleur Bay, north PEI and western Cape Breton, and harvests a mixture of fall and spring spawner component.

TAC management was initiated in 1972. Currently there are approximately 3,500 inshore licenses and 6 active seiners (>65').

Summary

Fall Spawner Component

- Reported 2002 landings of the fall spawner component were 50,642t against the fall spawner TAC of 51,500t. There was no fishery in the 4Vn (Area 17) overwintering area.
- Inshore catch rates in 2002 were similar to 2001, which were among the highest in the time series starting in 1978.
- The 2002 telephone survey of fish harvesters indicated that the abundance of fall herring was considered equal to or higher than abundance in the previous year.
- The 1995, 1996 and 1998 year-classes are estimated to be well above average.
- Estimates of population biomass and abundance are currently high, however retrospective patterns indicate a tendency to overestimate the size of the biomass in the current year.

- The age 7+ exploitation rate in 2002 is estimated to be below the target.
- After adjusting for the tendency to overestimate fall component population numbers, the estimated catch at $F_{0.1}$ for 2003 is 65, 500t.
- Until the uncertainty surrounding the retrospective patterns is resolved, a cautious approach is suggested.

- The $F_{0.1}$ catch for the spring spawner component in 2003 is 14,000t.

The Fishery

The catch allocations for the fall and spring seasons are based on the TACs set for each spawning component. Landings are compiled by fishing season.

Spring Spawner Component

- Reported 2002 landings of spring spawner component were 9,210t against a TAC of 8,000t.
- Inshore catch rates in 2002 were similar to those from 1999 to 2001; these were the lowest since 1990.
- Opinions of fishers from the telephone survey vary according to their fishing area. Fishers from Escuminac, southeast NB and PEI thought that the abundance was similar or slightly lower than in 2001. Fishers from the Magdalen Islands consider the abundance to be high.
- Year-classes produced after 1991 are estimated to be below average. The 1998 year-class is estimated to be low, however indications from the fishery and experimental nets suggest that this may be an underestimate.
- Age 4+ spawning biomass has declined since 1995 and is estimated to be 51,000t at the beginning of 2003.
- The fully recruited ages 6 to 8 exploitation rate was slightly below the target in 2002.

2002 FALL FISHERY

Area	Fall spawner Allocation TAC	Fall season Landings (t)	Fall spawner component Landings in the fall (t)
INSHORE			
Isle Verte	309	20	20
Chaleur Bay	18,622	18,854	18,235
Escuminac-			
West PEI	6,179	7,206	7,178
Magdalen	1,288	0	0
Pictou	6,387	6,935	6,935
Fisherman's Bank	6,387	6,517	6,492
4Vn (Area 17)	515	-	-
Total Inshore	39,687	39,532	38,860
Seiners (>65')			
4T	11,813	11,783	11,017
Grand Total	51,500	51,315	49,877

2002 SPRING FISHERY

Area	Spring spawner Allocation TAC	Spring season Landings (t)	Spring spawner component Landings in the spring (t)
INSHORE			
Chaleur Bay (Jan-June 15)	388	365	356
Escuminac (Jan-May)	1,987	1,543	1,516
Magdalen Islands			
16D (Jan-June15) *	583	2,036	2,036
Southeast NB – West PEI (Jan-May)	2,472	2,853	2,775
Bait and Roe all 4T (Jan – June 30)	731	856	653
Total Inshore	6,161	7,653	7,336
Seiners (>65') 4T	1,839	884	436
Grand Total	8,000	8,537	7,772

*16D landings include 505t bait fishery not counted against the spring TAC

Catches made throughout the year are attributed to the spring or fall spawning components based on visual examination and a gonado-somatic index to assign maturity stage, coupled to a monthly key that links maturity stage and month to spawning group. Juvenile spawning group assignment is made using otolith characteristics.

2002 Percentage of Spring and Fall Spawning Components by Season and Gear Type

Season	Gear	Spawning Group %	
		Spring	Fall
Spring	Inshore	96	4
	Seiner	49	51
Fall	Inshore	2	98
	Seiner	6	94

The TAC has been set separately for spring and fall spawner components since 1985. As in previous years, for both spring and fall, 77% of the TAC is allocated to the inshore fleet and 23% to the seiner (>65') fleet.

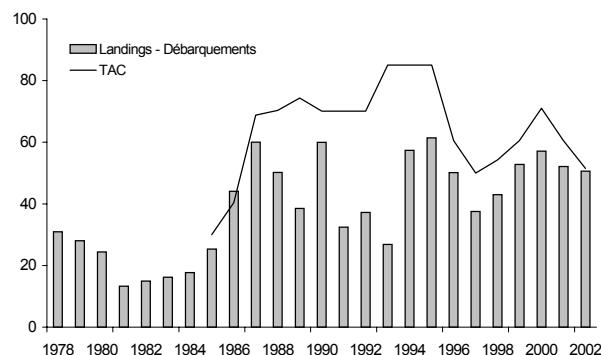
The TAC for the fall spawner component in 2002 was 51,500t, compared to 60,500t in 2001. The allocation for 4Vn (Area 17) is included with the fall spawner component. The combined 2002 **landings of the fall spawner component** in both the spring and fall fisheries were 50,642t. Fall inshore landings are primarily driven by the roe market.

Total Fall Component Landings (000s t)

Year	Average				
	1988-98	1999	2000	2001	2002
TAC	70.5	60.5	71.0	60.5	51.5
Landings	50.3	53.6	59.1	52.1	50.6

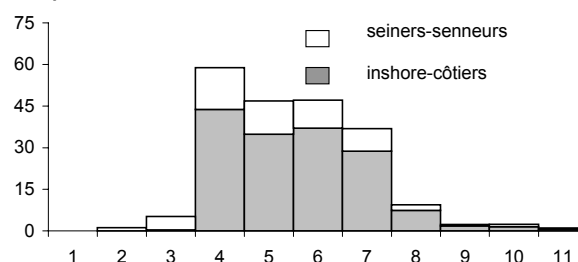
In 2002, the TAC was nearly attained. Landings of the fall spawner component had been significantly below the TAC in previous years.

4T Total Fall Spawner Component Landings and TAC (000t)



For the **fall spawner component**, the 1995-1998 year-classes (age 4-7) were dominant in the 2002 **catch-at-age**.

Fall Spawner 2002 Catch-at-Age (millions of fish)



Since 1990, the **average weights-at-age** for the fall spawner component have been below those observed during the 1980s. This decline in mean weights has levelled off for most ages in recent years and a slight increase was observed in 2002.

Fall Spawner Component Weight-at-Age 5 (kg)



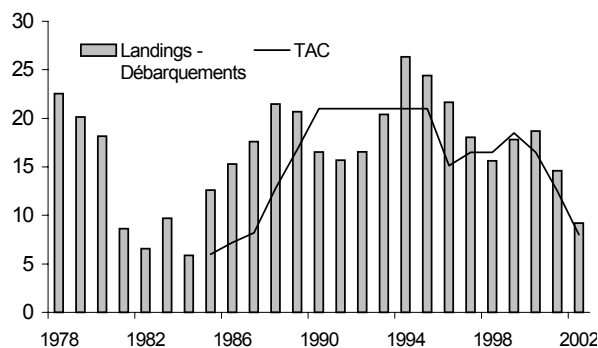
The 2002 TAC for the spring spawner component was 8,000t compared to

12,500t in 2001. The combined 2002 landings of the spring spawner component in both the spring and the fall fisheries were 9,210t. The overrun results mostly from the Magdalen Islands spring gillnet fishery. The market for the spring fishery is different from that of the fall fishery. Spring herring caught by the inshore fleet are sold primarily for bait and to the bloater (smoked herring) markets.

Total Spring Component Landings (000s t)

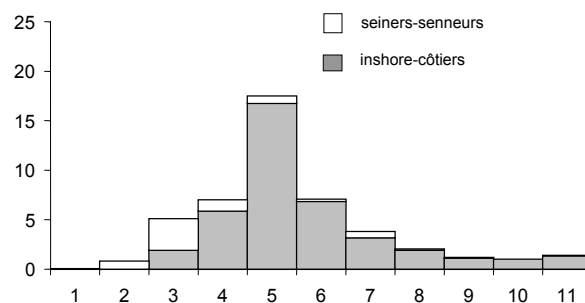
Year	Average				
	1988-98	1999	2000	2001	2002
TAC	17.6	18.5	16.5	12.5	8.0
Landings	17.0	17.0	16.7	14.6	9.2

4T Total Spring Spawner Component Landings and TAC (000t)



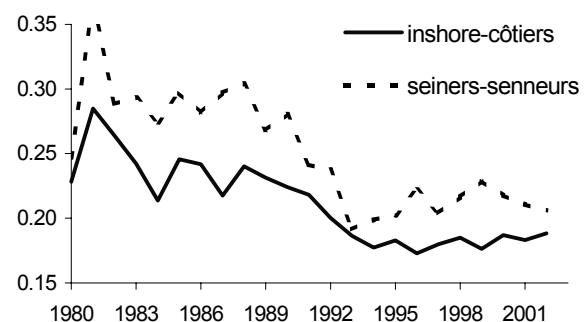
The catch-at-age of the 2002 spring spawner component was composed of many age groups. The 1997 year-class (age 5) was dominant in the 2002 catch.

Spring Spawner 2002 Catch-at-Age (millions of fish)



Since 1990, average weights-at-age for the spring spawner component also have been below those observed during the 1980s. This decline in mean weights has levelled off for most ages in recent years.

Spring Spawner Component Weight-at-Age 5 (kg)



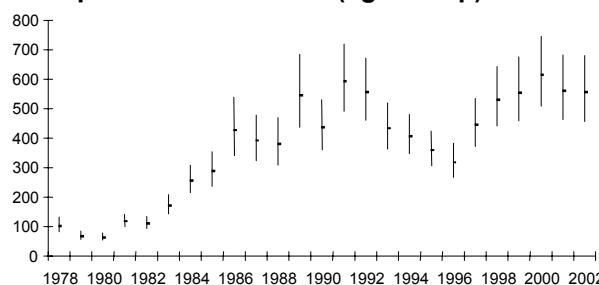
FALL SPAWNER COMPONENT

Resource Status

The principal abundance index for the fall spawning component is a catch rate (CPUE) index based on fishery data of inshore catches determined from purchase slips and effort information derived from a telephone survey of approximately 25% of the active inshore fishers. This index covers the entire inshore fleet and extends from 1978 to 2002. The CPUE in 2002 was similar to 2001. CPUE in the last two years is slightly less than 2000, but has been

high recently compared to the mid-1990s.

Fall Spawner CPUE index (kg/net/trip)



In previous assessments, the CPUE index was split into two series (1978-1991 and 1992-2001) because of a marked change in the proportion of 2 5/8 (small) and 2 3/4 (large) inch mesh net that were used in the gillnet fishery. Larger mesh was being used in the mid-1990's. In the last few years, the percentage of large mesh has declined. The split in the CPUE series has subsequently appeared to contribute to the tendency to overestimate current biomass. As a result, the catch rate series was not split in 2002.

The acoustic survey in 2002 indicates that abundance was lower than in 2001. The age 4+ estimate is the lowest for the time series. For the fall spawning component, this survey index is not used to calibrate the sequential population analysis because it does not follow year-class strength consistently.

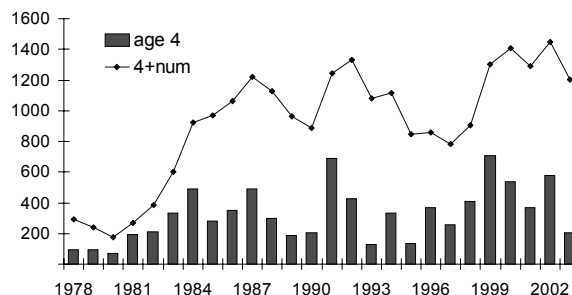
Opinions of the abundance of the stock expressed by gillnet fishers during the annual telephone survey indicated equal or higher abundance from 2001 to 2002 in all major fishing areas.

In the 2001 assessment, the retrospective patterns (in this case, a tendency to overestimate stock abundance) were worse than in previous years. Thus, the population

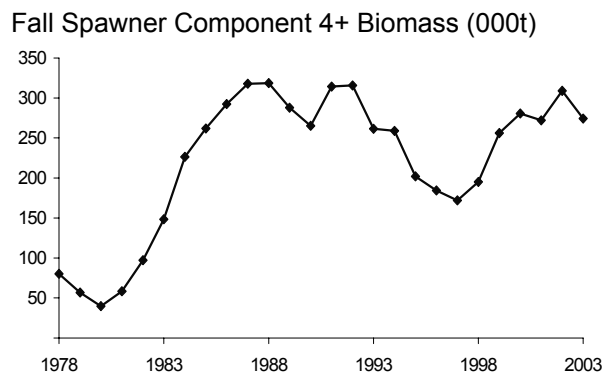
estimates from that analysis were considered unreliable. In this assessment, there is still a retrospective pattern, but less severe. The retrospective pattern indicated that final estimates of overall numbers are usually about 30% lower than the initial estimates. To take into account this tendency, population numbers in 2003 were reduced by 30% equally for all ages. All fall spawner results given incorporate this reduction.

Recruitment estimates (age 4) from the analysis suggest that the abundance of the 1995, 1996 and 1998 year-classes in the commercial fishery is well above average and that overall abundance is currently high.

Fall Spawner Component Population Numbers (millions of fish)

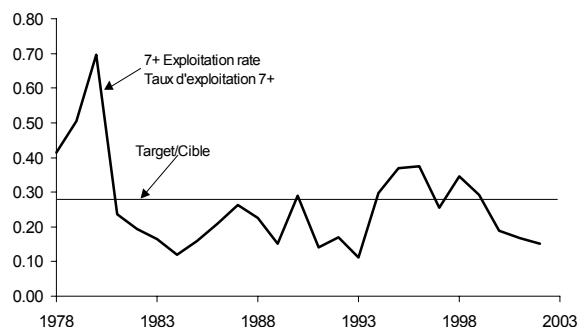


The analysis indicates that **population biomass** of age 4+ fall spawner component peaked in 2002, when the large 1998 year-class entered the fishery as 4 year-olds. Biomass has increased since 1998. The 2003 beginning-of-year age 4+ biomass is estimated to be about 274,000t



The target **exploitation rate** for fall spawner component is about 27% for fully recruited age-groups (7+). Exploitation rate has decreased over the last few years and is now below the target.

Fall Spawner Age 7+ Exploitation Rate



Sources of Uncertainty

The estimated population numbers in 2003 have been reduced by 30% to account for a potential overestimation of population size in the current year, evidenced by the retrospective patterns. The tendency for retrospective patterns in recent years is a source of uncertainty.

Catch rates from the gillnet fishery continue to be among the highest in the series. There is concern that catch rates may not accurately track population biomass because of the nature of the fishery. Boat limits, saturation of nets and searching

behaviour may also impact the CPUE series.

There is uncertainty about the recent year-classes (1999-2001) as there are no estimates of recruitment prior to age 4.

Outlook

Overall, the stock appears to remain at a high level relative to the 1970's and early 1980's. The $F_{0.1}$ estimation of fall spawner catch for 2003 is 65,500t. This level includes adjustment for potential over-estimation of population numbers in the current year. Until the uncertainty surrounding the retrospective patterns is resolved, a cautious approach is suggested.

In recent years, the numbers of older fish in the catch at age were reduced and estimates of total mortality had increased. In 2002, the situation appears to have improved.

SPRING SPAWNER COMPONENT

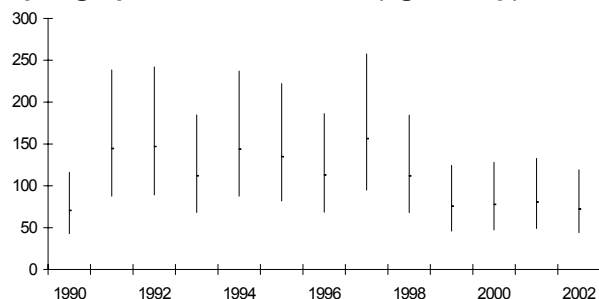
Resource Status

Resource status of the 4T spring spawning herring was determined using an SPA that included both the gillnet catch rate (CPUE) and acoustic survey indices.

The spring CPUE analysis included dockside monitoring data from all areas with recorded landings data. Effort was calculated using the average number of nets used in each area, as determined by the telephone survey. CPUE was defined as kg/net/trip. **Spring spawner catch rates in 2002** were similar to those from 1999 to 2001; these are the

lowest in the series that starts in 1990. However, comparisons with catch rates from the late seventies and early eighties indicate that recent catch rates are higher than in that earlier period.

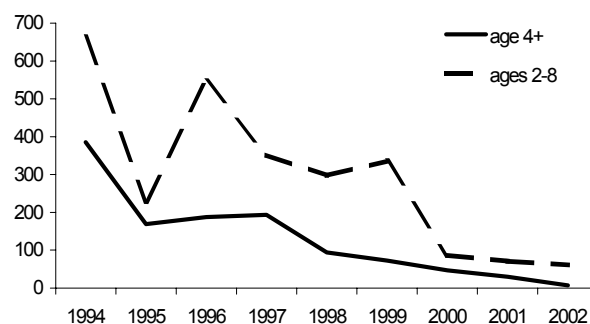
Spring Spawner CPUE index (kg/net/trip)



Opinions of abundance from fishers from three main fishing areas (Escuminac, southeast New Brunswick and western Prince Edward Island) contacted in the **telephone survey** were that herring abundance was similar or lower in 2002 than in 2001. The opinion from the Magdalen Islands was that it was higher. These areas account for at least 70% of the spring inshore landings.

The 2002 **acoustic survey abundance** of the spring spawner component was the lowest in the series. This index has been declining during recent years. In addition to a decline in abundance, this may be related to an earlier migration in relation to the survey timing.

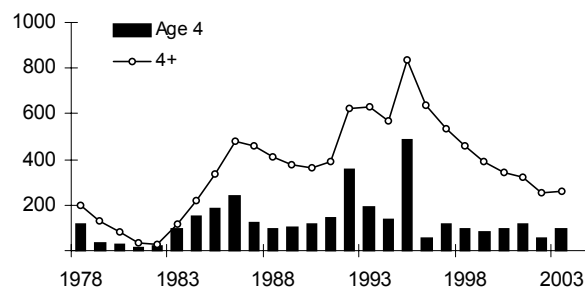
Spring Spawner Component Acoustic Survey Index (millions of fish)



As in previous assessments, an SPA including the gillnet CPUE index and the acoustic survey index was conducted. The analysis showed no retrospective pattern. Because the two abundance indices suggest diverging trends in recent years, an internal weighting procedure was used to estimate population abundance. This approach examines the two indices and gives more weight to the index that is more consistent with the population reconstruction.

Recruitment estimates (age 4) from the analysis indicate that year-classes after 1991 were below average (age 4 from 1996 – 2002). The estimate of the 1998 year-class is low. Information from the fishery and from experimental nets suggests that this may be an underestimate.

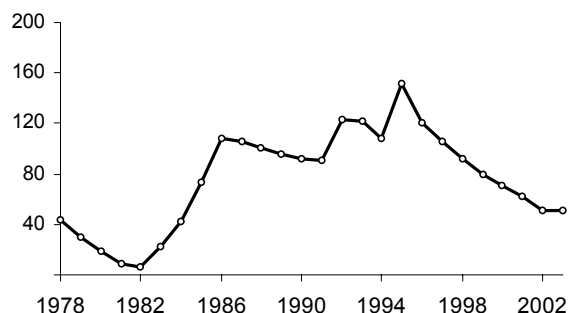
Spring Spawner Component Population Numbers (millions of fish)



The analysis indicates that both **population abundance and biomass**

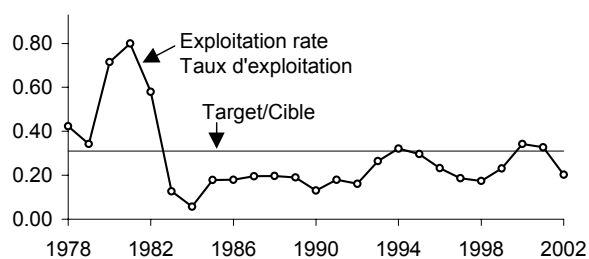
of ages 4+ spring spawner component peaked in 1995, when the large 1991 year-class entered the fishery as 4 year-olds. Biomass has declined since 1995. The 2003 beginning-of-year age 4+ biomass is estimated to be about 51,000t. and is similar to 2002.

Spring Spawner Component Age 4+ Biomass (000t)



The target **exploitation rate** at $F_{0.1}$ for the spring spawner component is about 31% over fully recruited ages 6 to 8. The estimated exploitation rate has been close to the target in recent years, but was slightly below in 2002.

Spring Spawner Exploitation Rates (ages 6 to 8)



Sources of Uncertainty

The acoustic survey index is at its lowest level in the time series and suggests a large decline in the population since the mid-1990's. The survey may not cover the entire distribution range during that time of the year and might not survey a consistent portion of the stock. An earlier migration

relative to the survey timing may also contribute to this decline. Despite large reductions in the abundance of older fish in the survey, the relative importance of these fish has not declined appreciably in the fishery. Other sources of information need to be examined to determine the reliability of the survey.

While recent gillnet catch rates are lower than in the mid-1990's, they appear to have levelled off. There is uncertainty relative to the catch rates particularly as it relates to the amount of effort used (number and size of nets).

There is uncertainty about the recent year-classes (1999-2001) as there are no recruitment estimates prior to age 4.

Outlook

The estimated $F_{0.1}$ catch for the spring spawner component in 2003 is 14,000t. This is a more optimistic view of the resource than the one presented last year. The change in perception is not caused by an increase in the abundance indices. Rather it is due to the fact that, this year, because of increased uncertainties as to the reliability of the acoustic survey, analyses suggest that more credence be given to the CPUE index. The CPUE index of abundance had declined from the mid-1990's but now appears to be stable over recent years.

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