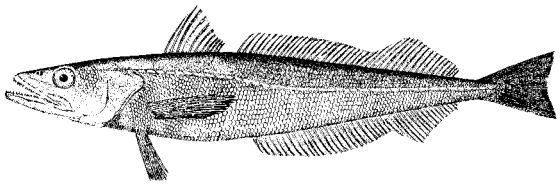


Scotian Shelf Silver Hake

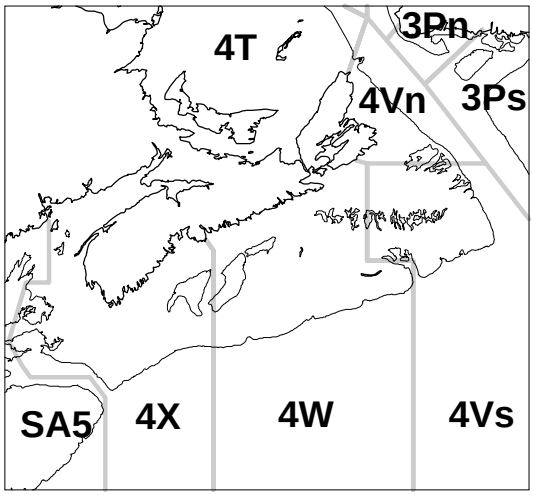
Background

Silver hake is a bottom dwelling member of the gadoid family, found from Cape Hatteras to the Grand Banks and the Gulf of St. Lawrence. A major concentration of silver hake occurs on the Scotian Shelf.

Scotian Shelf silver hake are generally found between 7 and 10^{o} C, in deeper water on the shelf edge and in the Emerald and LaHave basins. Seasonal movements occur during the summer, as silver hake move into shallow water on Sable and Western banks to spawn. Scotian Shelf silver hake feed primarily on invertebrates, with krill the predominant prey item. Older fish are piscivorous and exhibit a high degree of cannibalism.

Silver hake exhibit relatively rapid growth with females growing faster than males. Maturity is relatively early, with a majority of males maturing at age 2, and females at 3. Maximum age is 12 years.

Prior to 1977, fishing on the Scotian Shelf was unrestricted in terms of area, mesh size and season. During this period fishing was conducted over the entire shelf, and the use of trawl mesh as small as 40 mm was common. In 1977, fishing for this species was restricted to the seaward side of the Small Mesh Gear Line (SMGL), west of 60^{o} W longitude, with a minimum mesh size of 60 mm. In 1994, further restrictions were introduced to minimise incidental catches of cod, haddock and pollock in the silver hake fishery. These included a repositioning of the SMGL to prevent fishing in depths less than 190 m and the mandatory use of a separator grate in the lengthening piece of the trawl.



Summary

- Canadian catches of Scotian Shelf silver hake are rising, and exceed foreign catches for the first time in 1998.
- There is a long-term declining trend in survey mean weights-at-age from 1970 through to the early 1990's. Weights-at-age have since recovered, slightly, but remain low.
- The most recent survey estimates of abundance and biomass show a decline.
- The cold temperatures observed on the Scotian Shelf in 1997-8 may reduce recruitment.
- The 1996 year-class is above average in size, while the 1997 year-class appears to be below average.
- It would be prudent not to allow catches to increase from recent levels.

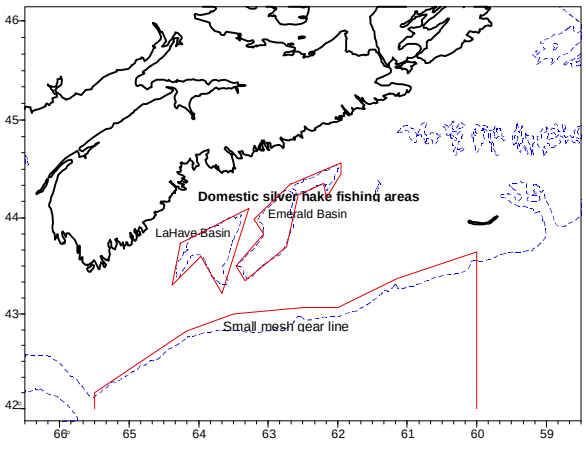
Canada

The Fishery

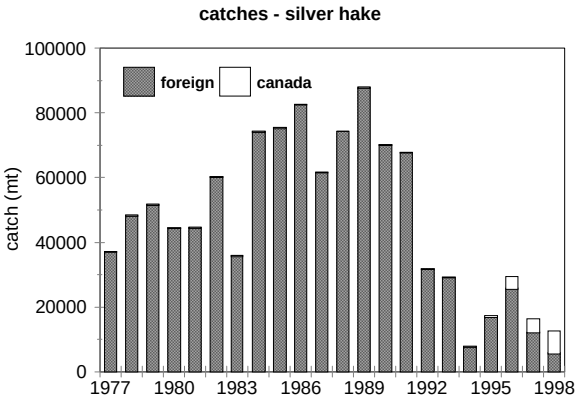
Landings ('000 mt)

Year	1992	1993	1994	1995	1996	1997	1998
TAC	105	86	30	50	60	50	55
Canada	+	+	+	+	4	4	
Foreign	60	56	8	17	22	12	
Total	60	56	8	17	26	16	

The silver hake fishery has been conducted on the Scotian Shelf since the early 1960's, primarily by the distant water fleets of Russia/USSR, Cuba, and Japan. Since 1977, fishing for silver hake has been restricted by Canadian regulations to deeper water on the shelf edge. In recent years, the Canadian mobile gear fleet has conducted a fishery for this species in Emerald and LaHave basins.



Nominal catches range from a high of 300,000 mt in 1973 to a low of 8,000 mt in 1994. Catches by the foreign fleet were generally high during the mid to late 1980's, with catches in recent years much lower. The proportion of the catches made by Canadian vessels has increased in recent years, and in 1998 was more than half, with the preliminary catch by Canada in excess of 7,500 mt, while the catch by foreign vessels has dropped to less than 6,000 mt.



The **size composition** of the catch differed between the foreign and Canadian fisheries, with the inshore Canadian fishery catching a high proportion of age 2 fish (44%) whereas the foreign offshore fishery caught primarily age 3 and 4 fish.

Commercial mean weight-at-age for this stock has declined since 1979. While weights were relatively stable from 1985 to 1992, they declined sharply in 1993 and have remained at this lower level subsequently.

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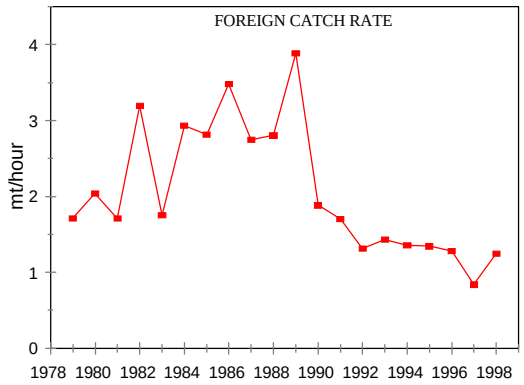
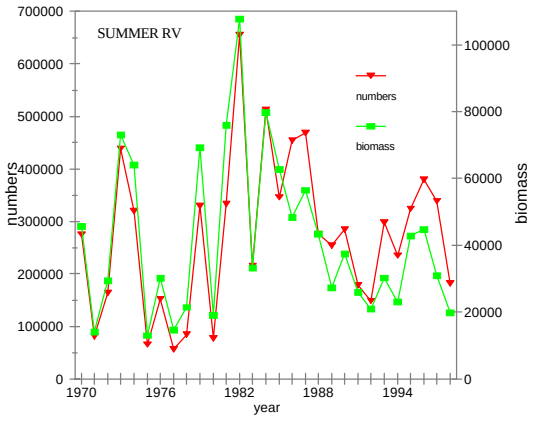
Resource Status

Catch rate trends for the foreign fishery showed an increasing trend from 1979 to 1989, but then dropped sharply in 1990 through 1992. Catch rates have remained relatively stable at a lower level subsequently. However, there is concern that changes in recent fishing practices for the foreign fleet make it difficult to interpret trends in their catch rate. Canadian catch rates increased markedly in 1996 compared to 1995, which was the first year of a true commercial fishery for this fleet, and have remained stable since. As the Canadian fleet

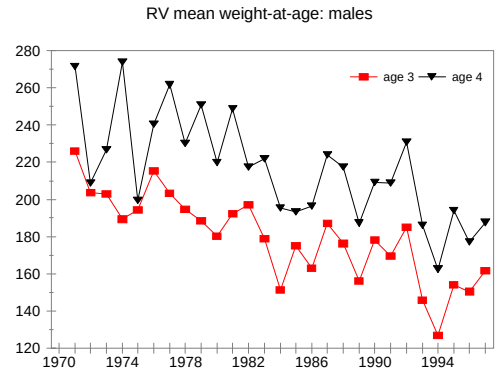
was developing expertise in fishing this species, these trends are not useful as indices of abundance.

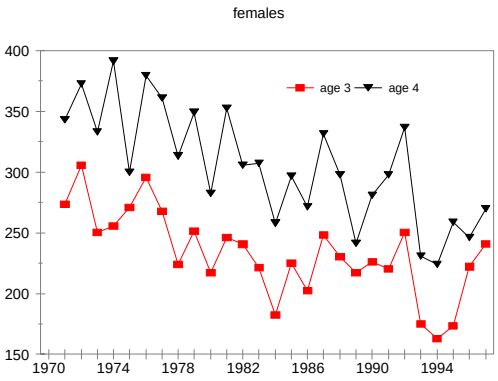


The summer RV **groundfish survey** shows relatively high abundance and biomass in the early to mid-1980's, followed by a decline to relatively low levels over the period 1988-94. Abundance and biomass increased in 1995 and 1996, but have subsequently declined in 1997 and 1998.



There is a long-term declining trend in mean weights-at-age from 1970 through to the early 1990's. Weights-at-age have since recovered, slightly, but remain low.





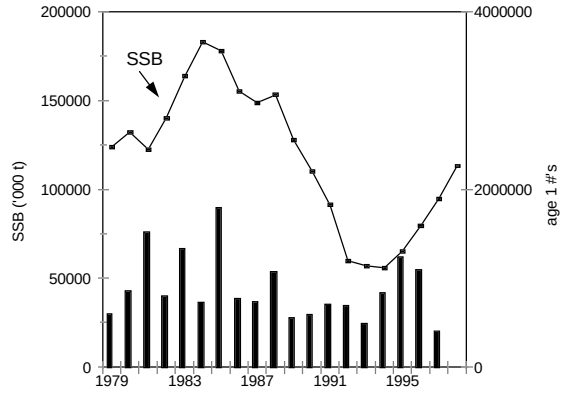
The 1995 and 1996 **year-classes** appear to be of above average strength at ages 2 and 1 respectively in the July 1997 survey. The 1994 year-class at age 3 in 1997 is about average. Based on the 1998 survey, the 1997 year-class is below average.

There is some uncertainty in the results of the **population analysis**, in that estimates of biomass and fishing mortality from the VPA in the most recent years show an increase, while the RV survey declined in 1997. Results of the 1998 survey, which was not included in the model, show abundance and biomass have declined further.

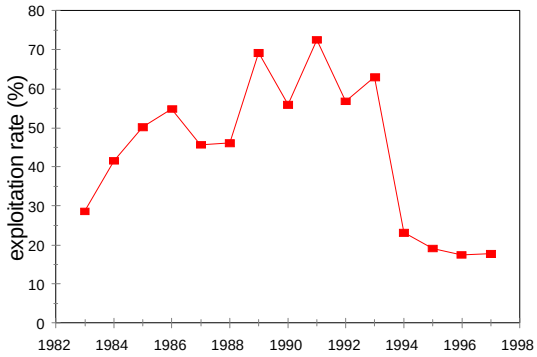
Assessment results show changes with the addition of data for subsequent years, with a tendency for the current estimate of population size to be optimistic

(retrospective pattern). Ages 1-4, which will represent the bulk of the catch in 1999, are apparently overestimated by approximately 20%, with older ages overestimated by higher amounts. Numbers from the model were reduced to reflect this pattern, following methodology used in previous assessments of this resource. The underlying causes of the retrospective pattern remain obscure, and the discounting of year-class size is an adjustment for the effect, rather than a correction to the model. Consequently, the results should be interpreted cautiously.

Spawning stock biomass was highest in the early to mid 80's, supported by the strong 1983 and 1985 year-classes. Biomass then declined from 1984 to a low in 1992. Subsequently SSB has risen modestly, with the 1998 beginning of year just above half that seen in 1984.



Exploitation rate for ages fully recruited to the fishery, was generally above the $F_{0.1}$ level of 0.7 (exploitation rate = 43%) through the 1980's and early 1990's, peaking in 1991. A marked decrease in exploitation rate was seen starting in 1994, falling to around 20%. This reduced exploitation rate has resulted in increased survival of older (5+) fish in the population. However, the present estimates of exploitation in recent years may prove to be too low, as further years of data correct for the retrospective pattern.



Outlook

The analysis, adjusted for the retrospective pattern, indicated that the catch in 1999 corresponding to fishing at $F_{0.1}$ is 48,000 t. However, in deciding on an appropriate

catch level, there are several factors that suggest a very cautious approach should be adopted. In spite of low catches in recent years, this resource exhibits several negative features. RV trends in abundance and biomass have declined in 1997 and 1998, and the 1997 year-class appears to be weak. There is a long-term declining trend in mean weight-at-age in the population from 1970 through to the early 1990's and while weights-at-age have since recovered slightly, they still remain below the long-term average. In addition, estimates of total mortality from the RV survey for the ages most important to the fishery have not declined in recent years. Commercial catch rates have remained persistently low in recent years, and the Canadian fishery is harvesting an increasing proportion of the catch composed primarily of fish younger than those seen in foreign catches. The recent incursion of cold water on the Scotian Shelf is also of concern, as the last period of cold temperatures in the basins corresponded with recruitment failure in silver hake. Until the dynamics of this stock under these changing conditions is understood, it would be prudent not to allow catches to increase from recent levels.

Reference

Showell, M.A. Assessment of the Scotian Shelf silver hake population in 1997, with projection of yield to 1999. DFO. Can. Stock Assess. Sec. Res. Doc. 98/141.

For More Information

Contact:

Mark Showell
Marine Fish Division
Bedford Institute of Oceanography
P.O. Box 1006, Dartmouth
Nova Scotia, B2Y 4A2
TEL (902) 426-3501
FAX (902) 426-1506
Email showellm@mar.dfo-mpo.gc.ca

This report is available from the:

Maritimes Regional Advisory Process
Department of Fisheries and Oceans
P.O. Box 1006, Stn. B203
Dartmouth, Nova Scotia
Canada B2Y 4A2
Phone number: 902-426-7070
e-mail address: myrav@mar.dfo-mpo.gc.ca

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