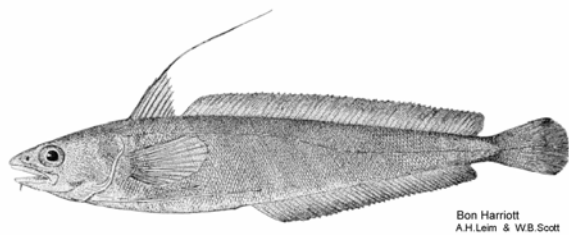


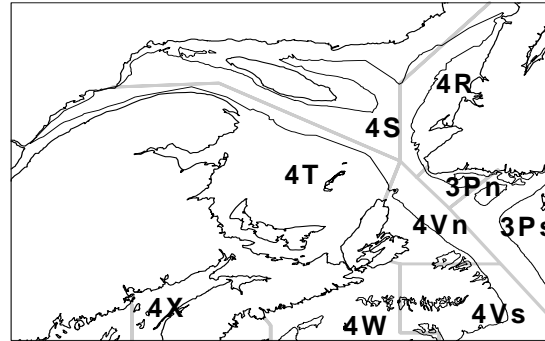


Gulf Region

Canadian Science Advisory Secretariat Science Advisory Report 2005/009



White Hake in the Southern Gulf of St. Lawrence (Div. 4T)



Background

White hake (*Urophycis tenuis*) are found from southern Labrador and the Grand Bank southward to North Carolina. This species is exploited throughout its geographical range by directed, seasonal fisheries. The most important catches have been taken in the southern Gulf of St. Lawrence (NAFO Division 4T). Temperatures of 5 - 11°C seem to be favored, as well as soft bottoms. White hake are among the most fertile of the commercial groundfish species, with a single female producing several million eggs each spawning. In the southern Gulf, male and female white hake reach sexual maturity at different sizes (at about 41 cm and 44 cm respectively) and at ages of 2 to 5 years. Spawning commences in the southern Gulf in early June and peaks in the second half of the same month. The diet of white hake is dominated by other fish species (such as cod, herring and flatfish).

The fishery for white hake in NAFO Division 4T has historically been the third or fourth most important groundfish fishery in the southern Gulf, with annual landings that averaged 5,675 t from 1960-1994. The hake fishery was carried out mainly by small inshore vessels and was strongly affected by weather and local market conditions. Both fixed and mobile gears were used in the hake fishery, which was concentrated in the Northumberland Strait, on the western end of P.E.I., and between P.E.I. and Cape Breton Island.

Stock structure has been a long-standing issue with this resource. The combined evidence from several studies indicates that there are at least two different stock components in NAFO Division 4T, one occupying shallow inshore areas in summer, principally the Northumberland Strait area (the 'Strait' component) and another occupying deep water along the Laurentian Channel in summer (the 'Channel' component). The extent of mixing between these two stock components is presently unknown and recent analyses indicate that the distribution of southern Gulf white hake extends outside of NAFO Division 4T in winter. The white hake fishery in NAFO Division 4T has remained under moratorium since 1995, with the only removals occurring as by-catch or landings in the sentinel survey.

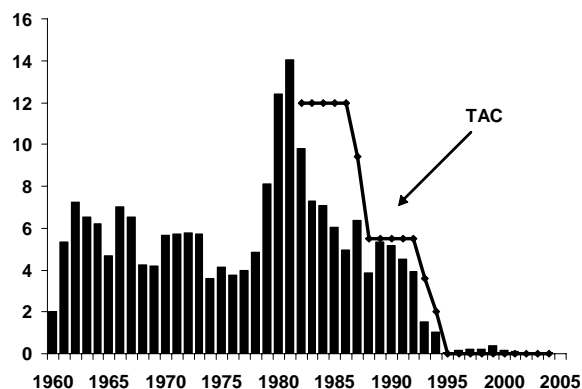
The most recent full assessment of this resource was conducted in February 2001 (Hurlbut and Poirier 2001; SSR A3-12 (2001)). This report updates fishery and survey data on this resource up to 2004.

Summary

- The directed fishery for white hake in NAFO Div. 4T has remained under moratorium since 1995.
- In 2002, the last year in the RV survey time series, the indices of abundance and biomass were the lowest observed, comparable to those observed when the directed fishery was closed in 1995.
- The index of abundance from the research vessel survey has not been updated since 2002. The scheduled survey vessel, the CCGS *Alfred Needler*, was disabled shortly before the September 2003 survey and was replaced by the CCGS *Wilfred Templeman* in 2003 and the CCGS *Teleost* in 2004. The relative fishing efficiency of these vessels is unknown, but comparative fishing experiments are planned for 2005.
- Catch rates by longliners in the sentinel survey declined steadily from 1999 to 2003 and remained at a low level in 2004.

- The indices of abundance and biomass from the 2003 and 2004 mobile sentinel surveys were not significantly different.
- Since the early 1990s, the distribution of white hake has been concentrated in a small part of the range that it occupied before then.
- Despite very low reported landings since 1995 there has been no recovery of this resource.
- Stock structure is a major source of uncertainty for this resource.

Landings and TAC's (thousands of tonnes)



The Fishery

A precautionary quota of 12,000t was established for white hake in NAFO Division 4T in 1982, and the total allowable catch (TAC) has been reduced on five occasions since then. Directed fishing for white hake has been closed in the southern Gulf since 1995 and daily by-catch limits have been imposed on fisheries targeting other species.

Landings were fairly stable and averaged 4,684t from 1971-1978, rose sharply to 14,039t in 1981, and then declined rapidly to an average of 5,023t from 1985-1992. A substantial drop in landings occurred in 1993, concurrent with the closure of the cod fishery. Since the moratorium on the hake fishery in 1995, the landings have ranged in magnitude from 399t in 1999 to 36t in 2003. The reported landings for 2004 were 55t, of which 15t were taken by longliners in the sentinel survey (less than 0.5t was taken by mobile gears in the sentinel survey).

Year	1981-90 ¹ Avg.	1991-95 ² Avg.	1996-2000 Avg.	2001	2002	2003	2004 ^{3,4}
TAC	9.5	3.3	0	0	0	0	0
Total	7.0	2.2	0.2	0.12	0.07	0.04	0.05

¹ - First TAC was established in 1982
² - Moratorium began in 1995
³ - Preliminary Statistics
⁴ - From 2000 to 2004 TAC was from May 15 to May 14 of following year

Resource Status

Catch rates in the **annual research vessel (RV) survey** have been used as an index of abundance for this resource beginning in 1984 when inshore areas were added to the survey.

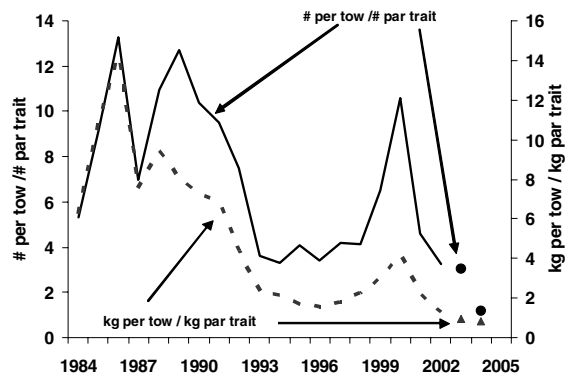
In 2002, the indices of abundance and biomass for white hake (all ages) declined to their lowest levels in the time series for this resource (3.3 fish/tow and 1.3 kg/tow). These indices were well below the average values for the years preceding the moratorium on the fishery for white hake in the southern Gulf (1984-1994) (averages of 8.4 fish/tow and 7.2 kg/tow).

In the 2000 survey, four sets in the Cape Breton Trough yielded a relatively large number of small white hake between 30 and 40 cm (ages 2-4). It was the increased abundance of these sizes of fish that contributed most to the increase in the abundance index in 2000.

The indices of stock status from the annual RV survey cannot be updated in 2003 and 2004 because of the unavailability of the regular survey vessel, the CCGS *Alfred Needler* (the CCGS *Alfred Needler* was replaced by the CCGS *Wilfred Templeman* in 2003 and by the CCGS *Teleost* in 2004). The relative fishing efficiency of these three vessels is unknown but comparative fishing experiments are planned for 2005.

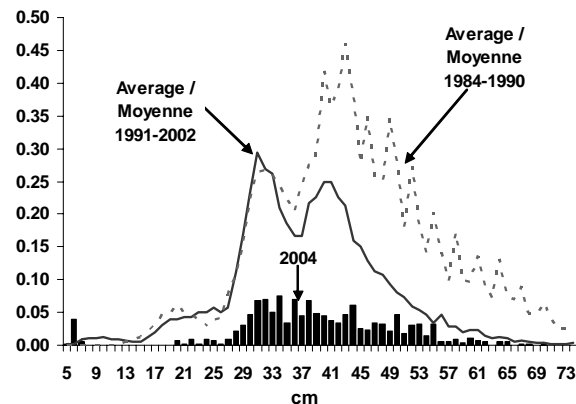
The uncalibrated catch rate in the 2004 survey (1.3 fish/tow and 0.8 kg/tow) was considerably lower than in 2002 but this may well reflect differences in fishing efficiency between the regular and replacement survey vessels.

Indices of abundance and biomass from the RV surveys



The length distribution of white hake caught during the annual RV survey has been progressively shifting to smaller sizes since the early 1980s. The majority of white hake caught in the 2004 RV survey were between 28-55 cm but few were of commercial size (greater than or equal to 45 cm). The length frequency has a mode at 6 cm which represents the catch from one set in the Northumberland Strait in which numerous 5-7 cm (age-0) hake were caught.

Length frequency (mean number per tow) from the 2004 RV survey

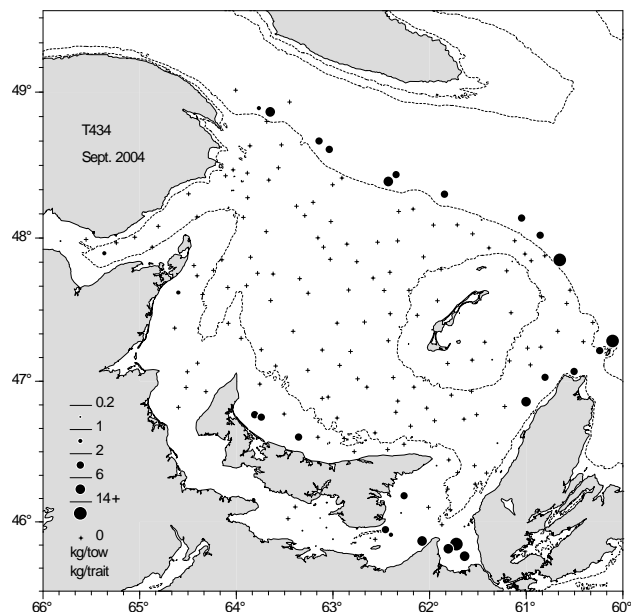


During the RV surveys of the southern Gulf, white hake have tended to exhibit a disjunct distribution, with concentrations occurring in warmer waters, either in shallow inshore areas or in deep water along the Laurentian Channel. The constancy of this pattern from

year to year lends support to the idea that there are separate stock components inhabiting these areas in September.

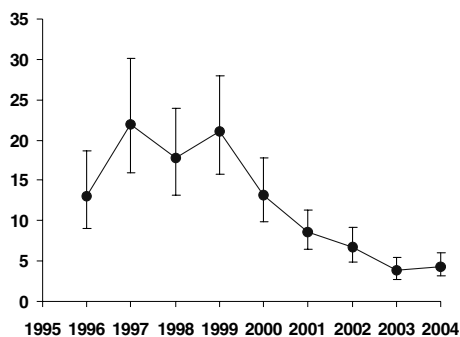
The geographical distribution of hake catches in the 2004 RV survey was very similar to recent years with the main concentrations being found in St. Georges Bay, the Cape Breton Trough and along the Laurentian Channel. White hake have seldom been caught in the shallow, central zone adjacent to the Magdalen Islands. Few white hake have been caught in the western part of the southern Gulf since 1991, suggesting that there may have been a contraction of the geographic range. The information from the 1994 and 1995 surveys, which extended into NAFO 4Vn, suggested that the distribution of white hake is continuous between this area and NAFO 4T in September.

Distribution of catches (kg) of white hake during the 2004 RV survey (Teleost)



Since the establishment of the sentinel survey in the southern Gulf in 1994, longliners have taken the greatest proportion (more than 75%) of the white hake caught in this program. Their catch rates declined steadily from 1999 to 2003 and remained at a low level in 2004.

Catch rate index for longliners in the sentinel survey

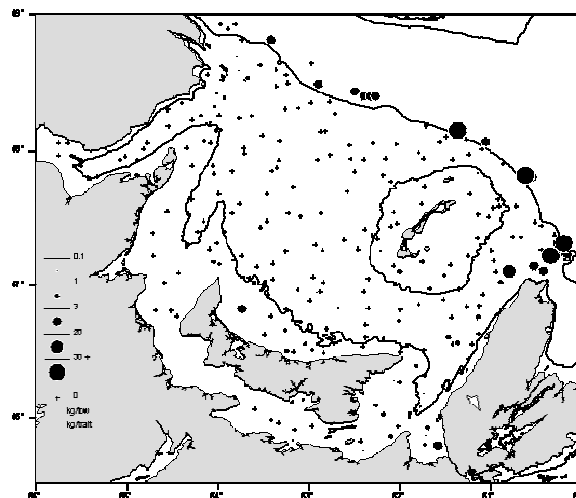


In August 2003, a new mobile gear (bottom trawl) survey of the southern Gulf was initiated as part of the sentinel survey program. Four commercial otter trawl vessels participate in this three-week long survey which follows the same stratified random design used for the annual (Sept.) RV survey.

There is some uncertainty concerning the relative fishing efficiency of the four survey vessels at capturing white hake. The indices of abundance and biomass from the 2003 and 2004 mobile sentinel surveys were not significantly different (the mean number per tow was 2.4 in 2003 and 2.5 in 2004; the mean weight per tow was 1.1 in 2003 and 1.6 in 2004).

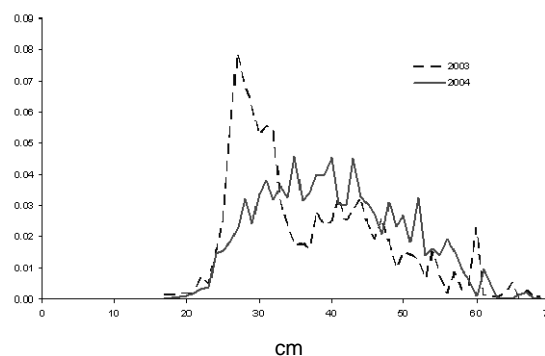
During the August 2004 survey, white hake were captured in the same general areas where they have been found in the annual (Sept.) RV survey (in the deep-water strata along the Laurentian Channel, with smaller catches off western Cape Breton, eastern P.E.I. and in St. Georges Bay). This is similar to the distribution of catches in the August 2003 survey.

Distribution of catches (kg) of white hake during the August 2004 mobile sentinel survey



Comparison of the length frequencies from the 2003 and 2004 mobile sentinel surveys show that a larger percentage of commercial size (greater than or equal to 45 cm) hake were caught in 2004 (32% in 2004 compared to 22% in 2003).

Length frequency (mean number per tow) from the 2003 and 2004 mobile sentinel surveys



Sources of Uncertainty

The absence of the RV survey indices of abundance and biomass in 2003 and 2004 is a major source of uncertainty. The white hake catch rate (mean number per tow) in the 2004 survey was considerably lower than in 2002, but this may well reflect differences in fishing efficiency between the regular and replacement survey vessels.

There is uncertainty concerning the stock structure of white hake in the southern Gulf

and the adequacy of the present management unit (NAFO Division 4T). There is also uncertainty about the stock affiliation of white hake that occur in the Cape Breton Trough. Migration into or out of the survey area or between the areas occupied by the two stock components could influence mortality estimates. Until these uncertainties can be resolved, it may be prudent to continue to consider white hake in NAFO Division 4T as a stock complex.

There is uncertainty concerning the distribution and abundance of white hake in the areas of the Northumberland Strait that are not sampled during the annual RV survey.

Although there is much uncertainty concerning the composition of seal diets in the southern Gulf of St. Lawrence, white hake has been observed in the diets of grey seals. The latest analysis indicates that up to 1,900 tonnes of white hake may have been consumed in 2001.

Outlook

In 2002, the last year in the RV survey time series, the indices of abundance and biomass were the lowest observed, comparable to those observed when the directed fishery was closed in 1995.

Catch rates by longliners in the sentinel survey declined steadily from 1999 to 2003 and remained at a low level in 2004.

The abundance of commercial-sized fish (greater than or equal to 45 cm in length) declined from 1988-2002 and the abundance of incoming size-classes (less than or equal to 25 cm) was at a very low level in 2001 and 2002. Very few age-0 fish (less than 10 cm) have been caught since the 1996 survey. Furthermore, the distribution of white hake continues to be concentrated in a small part of the range that it occupied before the early 1990s. Despite very low reported landings since 1995 there has been no recovery of this resource.

For More Information

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References

- Beacham, T.D., and S.J. Nepszy. 1980. Some aspects of the biology of white hake (*Urophycis tenuis*), in the southern Gulf of St. Lawrence. J. Northw. Atl. Fish. Sci. 1:49-54.
- DFO, 2001. White Hake in the Southern Gulf of St. Lawrence. DFO Science Stock Status Report A3-12 (2001).
- Hammill, M.O., and G.B. Stenson. 2002. Estimated consumption of Atlantic cod (*Gadus morhua*) and some other prey by grey seals (*Halichoerus grypus*) and harp seals (*Phoca groenlandica*), in the southern Gulf of St. Lawrence (NAFO Division 4T). DFO Can. Sci. Adv. Sec. Res. Doc. 2002/054.
- Hurlbut, T., and G. Poirier. 2001. The Status of White Hake (*Urophycis tenuis* Mitchell) in the southern Gulf of St. Lawrence (NAFO Division 4T) in 2000. DFO Can. Sci. Advis. Sec. Res. Doc. 2001/024.
- Musick, J.A. 1969. The comparative biology of two American Atlantic hakes, *Urophycis chuss* and *U. tenuis* (Pisces, Gadidae). Ph.D. thesis, Harvard University, Cambridge.
- Musick, J.A. 1974. Seasonal distribution of sibling hakes, *Urophycis chuss* and *U. tenuis* (Pisces: Gadidae) in New England. Fish. Bull. 72:481-495.

Nepszy, S.J. 1968. On the biology of the hake (*Urophycis tenuis*, Mitchill) in the southern Gulf of St. Lawrence. M.Sc. thesis, McGill University, Montreal.

Poirier, G.A., and L. Currie. 2005. Results from the August 2004 Sentinel mobile survey of the Southern Gulf of St. Lawrence. DFO Can. Sci. Advis. Sec. Res. Doc. 2005/009.

Poirier, G.A., T. Hurlbut, D.P. Swain, G.A. Chouinard, H.P. Benoît, C. LeBlanc, R. Morin and L. Currie. 2004. Preliminary Results from the September 2004 Bottom-trawl Survey of the Southern Gulf of St. Lawrence. DFO Can. Sci. Advis. Sec. Res. Doc. 2005/008.

Scott, W.B., and M.G. Scott. 1988. Atlantic fishes of Canada. Can. Bull. Fish. Aquat. Sci. 219: 731 pp.

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ISSN 1480-4913
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Correct citation for this publication:

DFO, 2005. White Hake in the Southern Gulf of St. Lawrence (Div. 4T). DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2005/009.