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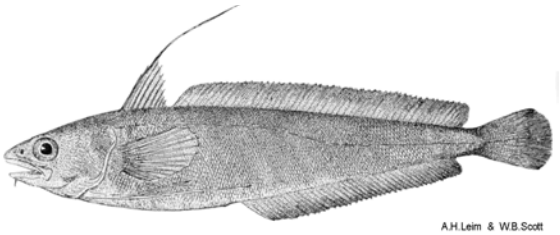
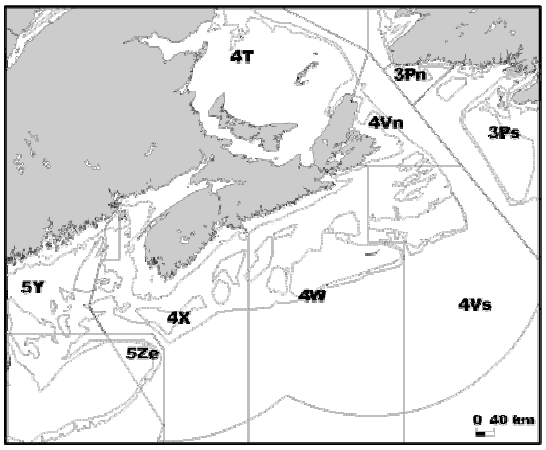
Maritimes Region **Stock Status Report A3-10(2002)**



White Hake in 4VWX and 5



Background

White hake (Urophycis tenuis) are bottom dwelling fish found in areas with a mud bottom from the southern Grand Banks to the mid-Atlantic Bight. Their depth range varies with life history stage, with age 2 and older fish occurring predominantly at depths between 50 to 200m. They favour temperatures between 3° and 10°C.

The spawning areas and times on the Scotian Shelf and in the Bay of Fundy are not well understood. There appear to be two spawning components -- late spring/early summer and late summer/early autumn. White hake are highly fecund, having several million eggs per female. They are pelagic spawners, with the eggs and larvae drifting in the upper 50 meters for about a month. The larvae change shape into juveniles in the pelagic zone and subsequently migrate into the shallow coastal zone. At an age of about 2 months the small pelagic juveniles (approximately 4cm) move to the bottom in shallow water. They appear to stay in shallow water for a year and then migrate to the offshore adult distributional area at some time during their second year. In the Bay of Fundy they are about 10cm in length in August of the first year, and 30cm in length at age 1 (August). Growth rate varies with area. In the Gulf of Maine area, white hake begin maturation and reproduction at ages two and three, at lengths between 35 and 45cm. The age span is about 20 years, with fish potentially growing to lengths as large as 135 cm.

The stock structure in 4VWX and 5Zc may be complex, with several self-sustaining components. White hake in the 4Vn Laurentian Channel slope waters are contiguous with 4T. Those in the Bay of Fundy and approaches are contiguous with 5Z and 5Y (i.e. the Gulf of Maine area). The central Scotian Shelf (parts of 4X and 4W) may be separate from those to the east and west. The present management units (4T, 4VWX+5Zc, and USA 5+6) in the Northwest Atlantic, do not reflect discontinuities in adult distributions. On the Scotian Shelf white hake is assessed as three components; 4Vn, 4VsW and 4X/5 in keeping with regional management areas. About two thirds of the white hake landed in 4VWX and 5Zc are from 4X and 5Zc.

The landings from all areas have declined in recent years. Canadian fishing effort for this species was unregulated in 4VWX and 5 until 1996. Longliners take about 55% of the catch, gillnets take about 29% of the catch each, and small otter trawlers (less than 65') taking most of the rest.

Summary

- Total landings have declined since 1987.
- White hake is caught as by-catch in longline, gillnet and otter trawl fisheries targeting halibut, redfish, cod, pollock and other groundfish. This has management implications in an ecosystem context.
- Fishing mortality is low in all areas since the introduction of catch limits.
- Total mortality is high.
- The status of white hake in 4Vn and 4VsW is poor and requires rebuilding.
- The status of white hake in 4X has been poor but shows signs of recovery.
- An increase in catch could jeopardise rebuilding or recovery of white hake.

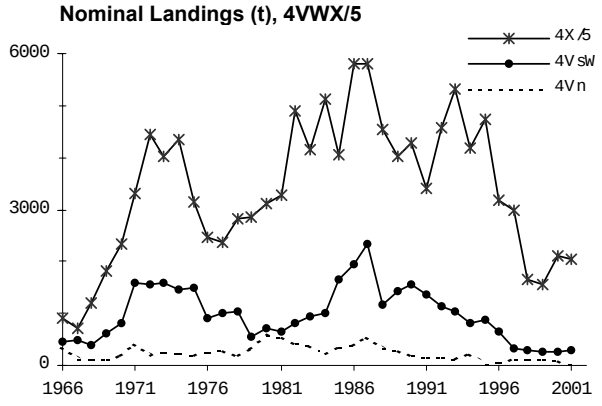
The Fishery

Landings (thousands of tonnes)

Year	1970-79 Avg	1980-89 Avg	1990-97 Avg	1998	1999[1]	2000	2001[3]	2002[3]
TAC[2]				3.5				
Quota					1.7	1.4	2.8	2.8
Cap[2]	4.7	6.2	5.2	2.1	2.2	2.5	2.3	
Landings								

[1] Fishing year and landings refer to the 15-month period from January 1, 1999, to March 31, 2000.
[2] Catch limit allocated to the fixed gear sector <45 ft.
[3] Quota cap includes 2168t for the fixed gear sector <45 ft., and 650t. for the mobile fleet and fixed gear >45 ft.

Reported landings throughout 4VWX/5 have been declining since 1987. This trend continues in 4Vn and 4Vs, whilst in 4W and 4X/5, landings reached an all time low in 1999, then increased slightly since. Landings as of October 24th in 4VWX/5 were 2213t.



Until 1996, there were no restrictions on fishing effort for white hake in 4VWX/5, when the first catch limit (TAC) was introduced and allocated to the fixed gear sector. In addition, other fleet sectors were regulated through by-catch restrictions (20% for the ITQ fleet, 10% for large trawlers). The TAC was restrictive to fishing until 1998, when the TAC was not reached. In 1999, the FRCC recommended that white hake be caught as by-catch only, and a quota cap was placed on the catch of the fixed gear fleet < 45 ft. In 1999, the quota cap was 1692t, and transfers between Community Management Boards were not permitted. The quota cap was reduced again in 2000 to 1429t, whilst in 2001, it was increased and remains at 2168t. In addition, the mobile fleet and fixed gear >45 ft has been managed on a quota cap basis since 2001. The quota cap in 2002 is 650t, and as of October 24, 2002, 603t has been caught. Since 2000, the fixed gear industry has reported difficulties staying within white hake catch restrictions while fishing for other species. In 2002, the otter trawl fleet in 4X reported similar difficulties.

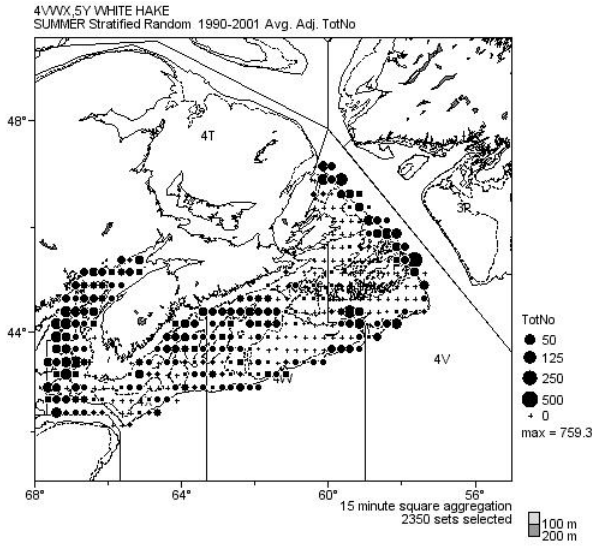
An **analysis of the species composition** of white hake landings (1993-2001) indicates that longliners in all areas of 4VWX/5 are landing between 90 and 50% of white hake as the main species and not as by-catch. These landings have declined through time. In the 4X gillnet fishery since 1998, between 21 and 43% of white hake was landed as main species, whilst the remainder was landed as by-catch, mainly in the pollock and cod directed fisheries. In the otter trawl fishery since 1998, over 90% of white hake is a by-catch of groundfish fisheries, predominately haddock and redfish. Overall, around 67% of white hake was landed as by-catch in 1999 and 2000. This has increased from a low of 36% in 1994. This has management implications in an ecosystem context.

The **size composition** of catches by longline, gillnet and otter trawl gears are variable through time, with no overall trend. However, fish caught in 4VW are on average 10cm smaller than fish caught in 4X/5.

Commercial **catch rates** of index white hake fishermen in 4X/5 have increased across all fleets since a low in 1998. This is compatible with observations by Industry of recent increases in white hake

catch rates in 4X/5. In 4VsW, there has been a decline in longline catch rates since the early 1990s, with the most recent years near record lows. The available 4Vn longline data series indicates a sharp increase in catch rates between 1996 and 1998, since which time they have only declined slightly. Only the 4VsW longline catch rate analysis was used as an index of abundance (see Resource Status below) because it has a consistent time series and 73% of white hake was landed as main species from 1990 to 2000. The 4X/5 catch rates for all gears were not used as indices of abundance as only 33% of white hake is landed as main species in 4X/5, catch rates are likely to be affected by varying management conditions, predicted catch rates were inconsistent between gears, and were incomplete, over the time period. The 4Vn catch rates were not used as an index of abundance because there is a likelihood that some of their catch is 4T white hake.

Resource Distribution

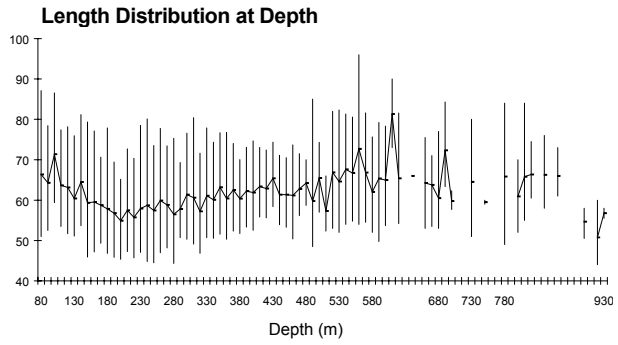


White hake are distributed over the entire management area, but are concentrated along the Laurentian Channel, the shelf edge, around Emerald and LaHave basins and the Bay of Fundy. There are differences between these areas in several key indices such as abundance, catch per tow and size of white hake estimated from the summer RV survey. The largest fish are found in 4X, the highest mean number per tow is in 4Vn, whilst the highest mean weight per tow is in 4X. On average, 64% of the biomass is in 4X, 15% in 4W, 11% in 4Vs and 9% in 4Vn.

Indices averaged over the Summer RV survey time series, 1970-2001

NAFO Area	Mean Nos/tow	Mean Wt/tow (Kg)	Proportion of biomass in 4VWX	Mean Wt of fish (Kg)	Mean length of fish (cm)
4Vn	15.6	10.5	0.09	0.70	42.3
4Vs	6.6	4.0	0.11	0.70	40.6
4W	3.3	3.4	0.15	1.04	44.7
4X	11.2	13.5	0.64	1.29	48.8

The depth distribution of white hake as a function of size was available from two industry surveys (4VsW Sentinel and Halibut). Both surveys show that size decreases with depth down to about 180-200 metres and then begins to increase again. This is shown below for data from the Halibut survey in all areas. However, these data do not address the distribution of the very young white hake since small fish are not observed in these surveys.

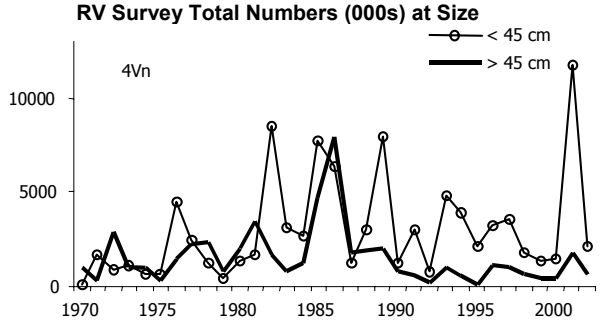


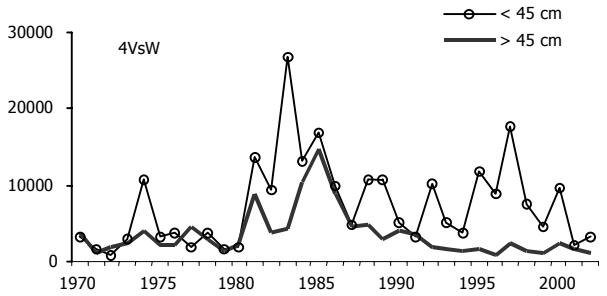
Resource Status

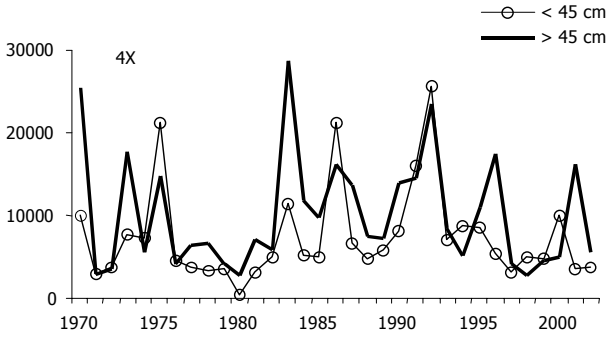
The stock status is based on evaluation of abundance estimates from groundfish research vessel and industry surveys,

commercial catch rates of fishermen who have been consistently directing for white hake since 1990, and mortality estimates from the summer groundfish research vessel survey and the commercial fishery.

Summer research vessel (RV) survey abundance estimates have been low throughout the 1990s. Trends for small fish (<45cm) and large fish (45+) vary in the three areas. The trends in small fish are used as proxies for direct recruitment estimates. In 4Vn, abundance of small fish has been variable, with a peak in 2001 due to fish between 30-45cm. This high abundance may be due to white hake from 4T. In 2000, four very large sets of small white hake (30-45cm) were made in the Cape Breton Trough in 4T. In 2001, these fish were not observed in the 4T survey and may be the fish that are seen in 4Vn in 2001. However, these fish were not observed in 4Vn in 2002. Abundance of large fish has remained low throughout the 1990s. In 4VsW, after a high peak of abundance in the 1980s, abundance of large fish dropped and has remained low. The abundance of small fish has been higher during the 1990s, but these small fish are not surviving to become large fish. In 4X, which typically contains about 64% of the biomass for the 4VWX/5 stock unit, there has been an overall decrease in abundance of large and small fish since the 1980s. Since a low point in 1998, abundance of large fish increased to 2001, but declined again in 2002.





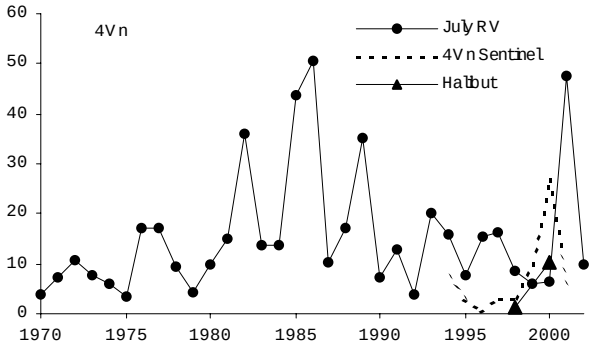


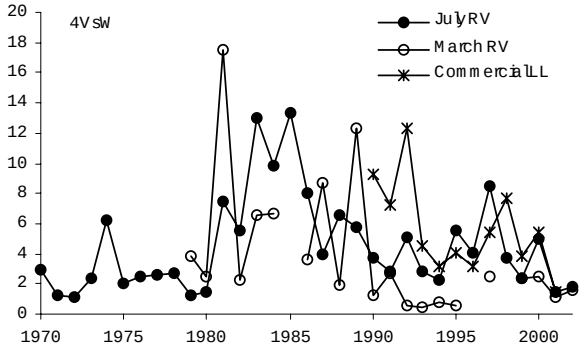
A **spring RV survey** is available for 4VsW only. It is consistent with the summer RV index of abundance for 4VsW. Abundance reached an all time low in 1993, and has since increased, but remains low.

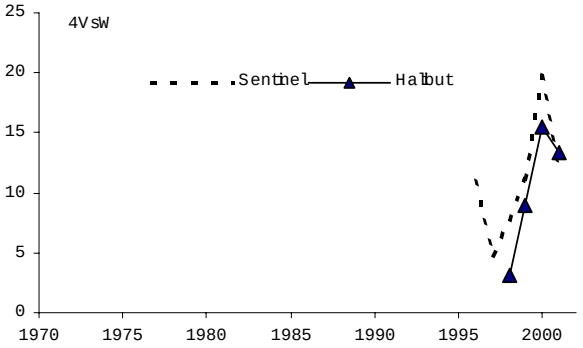
Several **industry surveys** provide additional abundance indices for white hake, the 4Vn Sentinel Survey (1994 to 2001), the 4VsW Sentinel Survey (1996 to 2001), the Halibut Survey (1998 to 2001), the ITQ Survey in 4X (1996 to present), and the Longline Survey on Georges Bank (5Z) (1995 to present). In all areas other than 4VsW, there is good agreement between the industry survey and the RV survey. However, in 4VsW, the industry surveys (Sentinel and Halibut) show an increase in abundance to 2000, whereas the two RV surveys (summer and spring) show no increase.

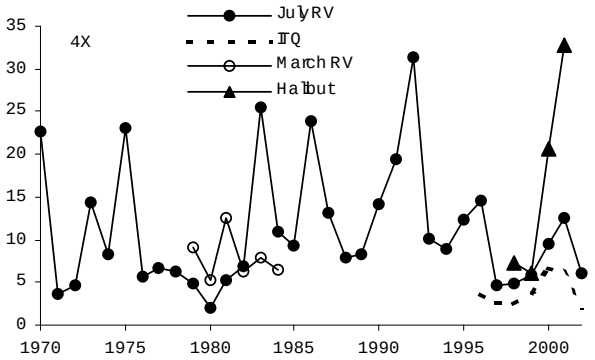
The commercial **catch rate** for index longline fishers in 4VsW decreased during the 1990s and has a similar trend to the two RV surveys.

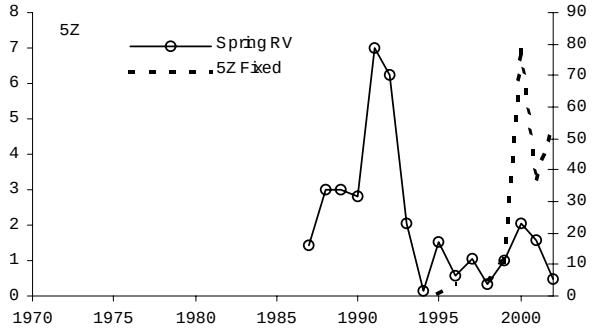
RV Surveys, Industry Surveys and Commercial Catch Rate Abundance Indices





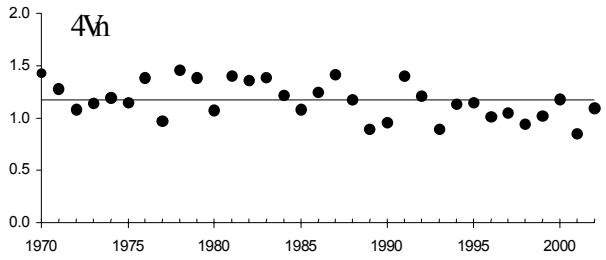


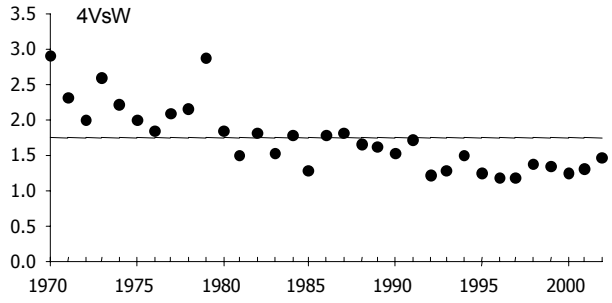


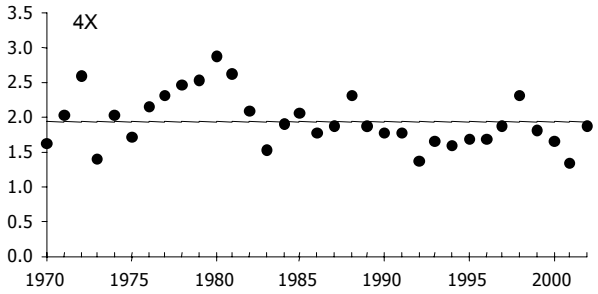


With the exception of 2000, the **mean length and mean weight** of large fish (45+cm) in 4Vn have been below the long-term average since 1993. In 4VsW, mean length and weight have declined throughout the time series. There is no trend in mean length in 4X, but mean weight has been slightly below the long-term mean in 12 of the last 13 years. These data indicate that there may have been a loss of larger fish in all areas, particularly in 4VsW; it may also be affected by changes in growth and recruitment.

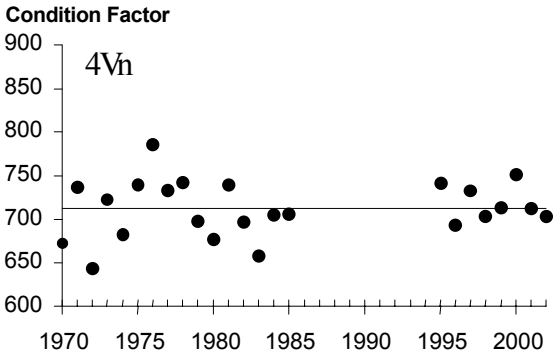
Mean Weight of Large Fish

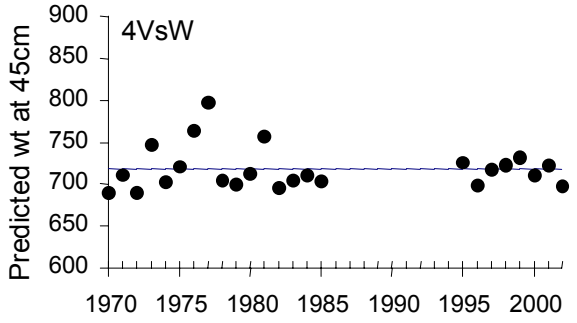


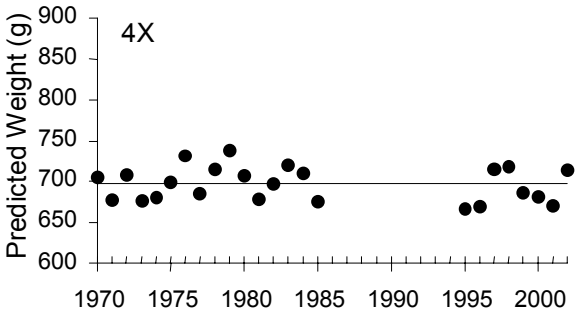




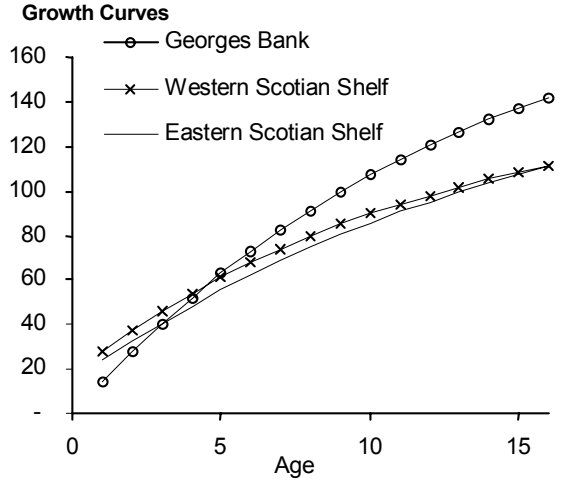
The **condition factor,** the predicted weight at size 45 cm has varied over time but has shown no pattern.



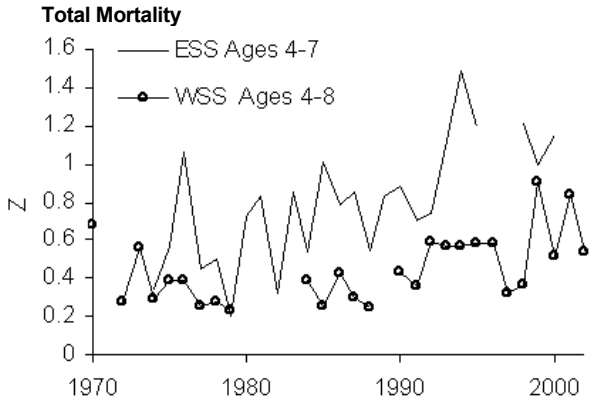




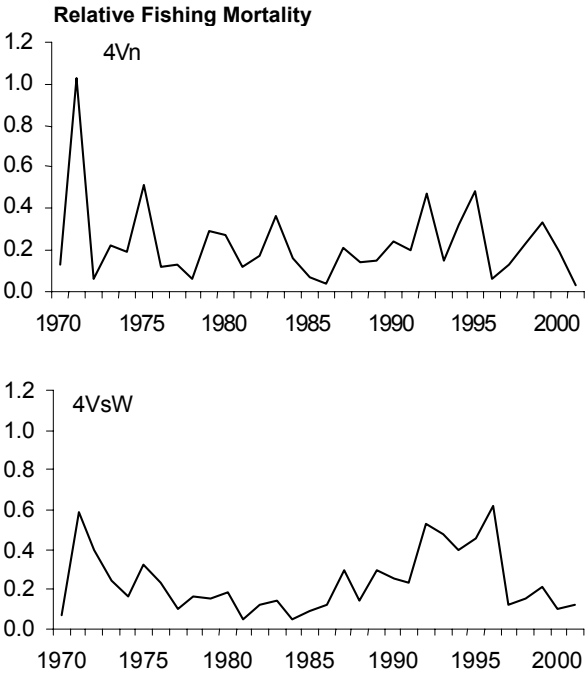
Growth curves, estimated from commercial age at length data for 1998-2000 indicate that there is a small difference in growth rate between east (4VWXmn) and west (4Xopqrs5Zc) for ages 4 to 6. Growth is faster in the west, although white hake tend to be the same size at older ages. Growth in both areas is slightly greater than in the Gulf of St. Lawrence (not shown), but lower than on Georges Bank.

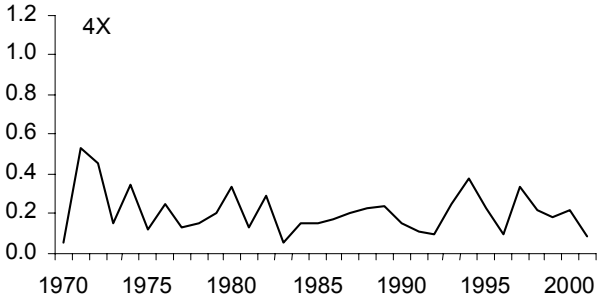


Total mortality rates were estimated from the summer RV numbers at length converted to numbers at age using the growth curves estimated for the eastern and western sections of the Scotian Shelf for 1998-2000. There is currently no age data for Scotian Shelf white hake for the 1970s or 1980s and thus it is not known if the growth rate has remained constant. If there have been growth rate changes, this will affect mortality estimates. Mortality was estimated in three ways and all show that on the western Scotian Shelf, total mortality remained stable until around the early 1980s, and has increased since. On the eastern Scotian Shelf, mortality has been increasing since the 1970s, and the magnitude and absolute value of total mortality is greater than on the western Scotian Shelf. Total mortality was similar in both areas in the 1970s, but they diverged in the early 1980s.



Relative fishing mortality was estimated as landings divided by fishable biomass (45+cm) as estimated by the RV survey. No trends in relative F were evident in 4Vn and 4X. However, in 4VsW, relative F increased from the mid-1980s to a peak in 1996, then abruptly decreased in 1997. Relative F has remained low since then. The increase in relative F from the late 1980s to early 1990s could be due to redirected effort or improved reporting practices.



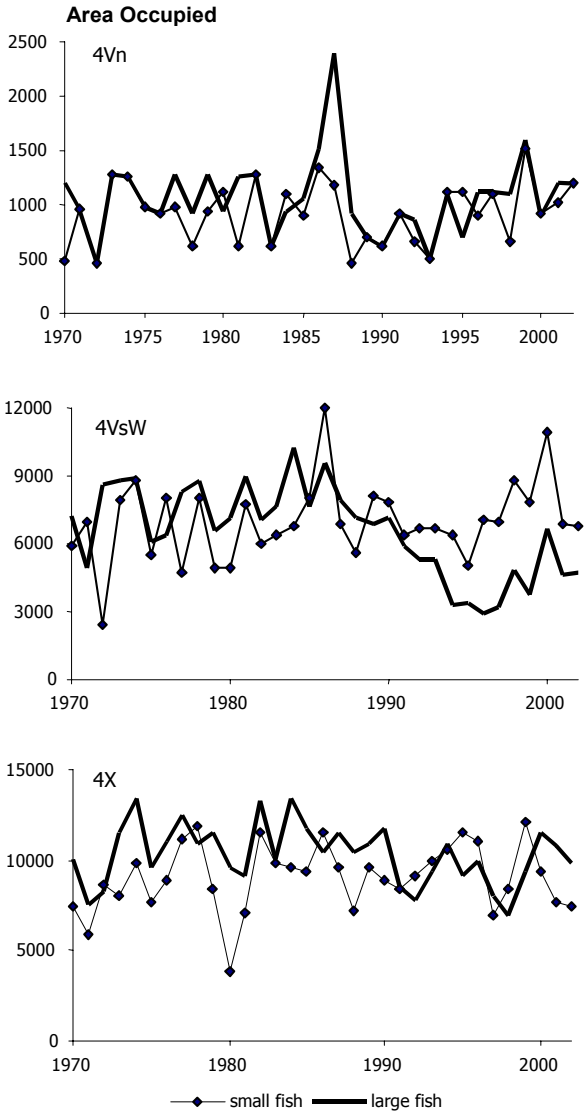


Distributional indices were estimated for each area. **Area occupied** is the proportion of summer RV sets that catch white hake and **density** is the catch rate in only sets where white hake are caught, i.e., non-zero sets. Density of white hake is highly correlated with abundance in each area, and was thus not considered further here since it provides no new information.

In 4Vn, little pattern is evident in the area occupied by large or small fish. The large interannual variation in abundance of small fish (see above) coupled with the relative consistency in area occupied, supports the view that 4T fish are mixing in with 4Vn fish.

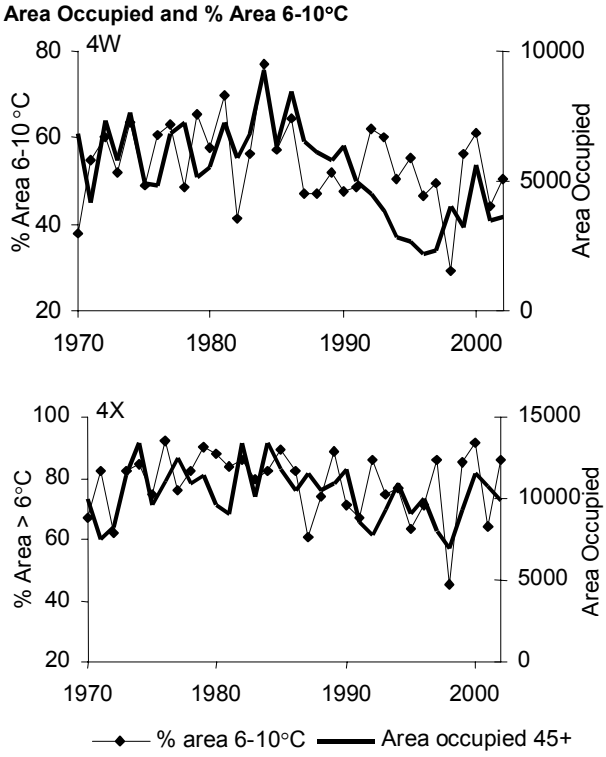
In 4VsW, the area occupied by small fish peaked in 1986, and fell below the long-term mean from 1990 to 1995. Area occupied by large fish was reasonably constant until 1984 and then declined consistently until 1994. This decrease may be due to mortality, distributional changes, or both.

In 4X, there was a decrease in the area occupied of both size classes from the early 1980s until the mid to late 1990s. This is more marked in the larger fish.



Many aspects of the **environment** can affect resource status and distribution. One index is the proportion of bottom that is 6-10°C, which reflects the temperature range occupied by white hake in 4W and 4X, as shown by the July RV survey. In 4W, the trends in the area occupied and temperature indicator for large white hake are similar from 1981 to 1989 and then diverge. A similar but weaker pattern is seen for small white hake (not shown). In 4X, there is some consistency between the area occupied and the temperature indicator throughout the time series for large white hake, although the correlation is low.

The divergence between the area occupied and the temperature indicator in 4W during the 1990s suggests that the decline in area occupied is not primarily caused by redistribution as a result of water cooling. It is more likely to be due to a reduction in abundance.



Sources of Uncertainty

There are several sources of **uncertainty** for this assessment, including uncertainty over stock or sub-stock definition. The RV surveys do not cover the full depth range of white hake distribution, possibly inflating estimates of total mortality, and catchability to the RV survey within the sampled range is not well understood. While total mortality is high, the source of the increase in mortality is unknown. Landings prior to 1993 may be inaccurately reported, due to misreporting as other species. Age and associated growth data have only been collected since 1998, providing no long-term

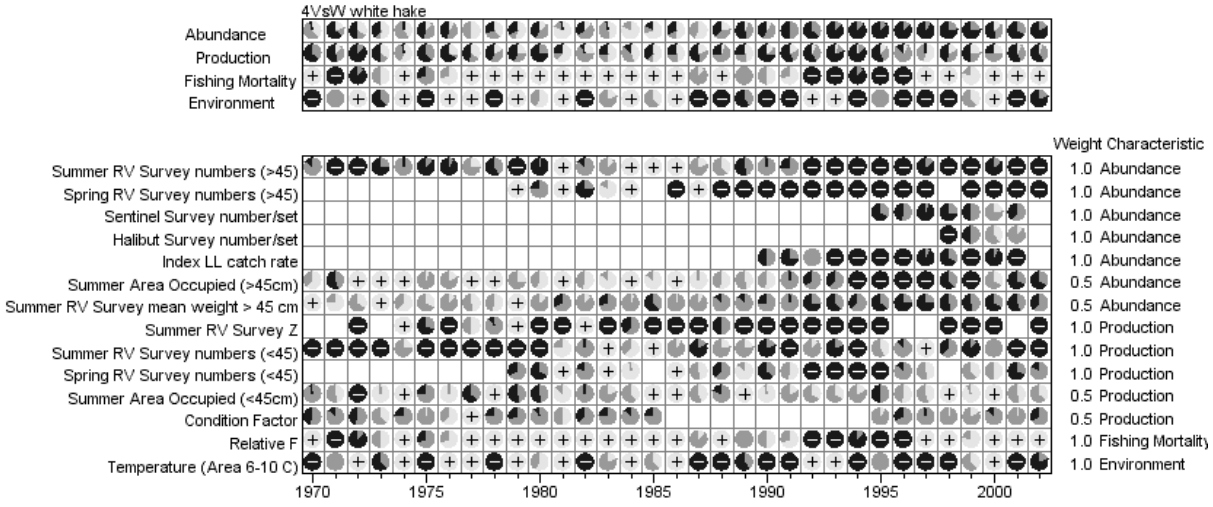
perception of the population age composition or growth changes.

Traffic Light Analysis

The **Traffic Light** table summarises the indicators of stock status shown above. This table shows the annual values of each indicator as a combination of three lights depending on whether they are among the best values for that indicator, among the worst or in between. For indicators such as stock biomass and recruitment, high values are good and have a green light and low values are bad and have a red light. However, for indicators such as mortality, high values are bad and are assigned a red light ⊖ whereas low values are good and receive a green light ⊕. Intermediate values (midpoint between red and green) are yellow ●. A value between red and yellow is expressed as a pie with increasing amounts of red in the pie as the value approaches the red threshold or cut point. Similarly, a value between the midpoint and the green cut point becomes increasingly green in the pie as the green cut point is approached. Empty cells in the table indicate no observation for that year. Uncertainties about the appropriate cut point resulted in a broad yellow zone.

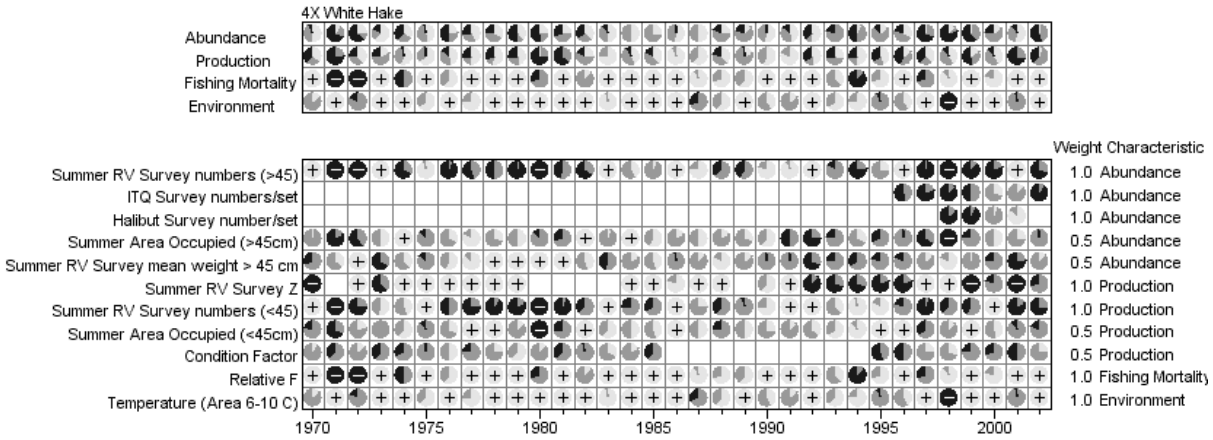
In the traffic light analysis, indicators are summarised into groups which emphasise specific aspects of the resource. These groupings are called characteristics. The following outlook section is cast in terms of these characteristics and each is shown in bold.

Traffic Light Table for 4VsW White Hake



* See Appendix 1 (Table 1) for a description of traffic light indicators, boundary points, weights and rationales for 4VsW white hake.

Traffic Light Table for 4X White Hake



* See Appendix 1 (Table 2) for a description of traffic light indicators, boundary points, weights and rationales for 4X white hake.

Outlook

4VsW

Abundance has remained very low since the early 1990s, but has shown slight improvement. Most indicators of abundance of 4VsW white hake (Summer RV Survey numbers >45cm, Spring RV Survey numbers >45cm, Index LL catch rate, Summer Area Occupied >45cm and Summer RV Survey Mean Weight >45cm) have been poor since the early 1990s. However, the 4VsW Sentinel numbers per set and Halibut Survey numbers per set both show increasing trends to 2000. These surveys have a shorter time series than the RV Surveys, and these different trends cannot be reconciled at this time. However, the 2002 Sentinel and Halibut Survey data are not yet included in this analysis. All survey indices decreased from 2000 to 2001.

Indicators of **productivity** (Summer RV Z, Summer Survey numbers ≤45cm, Spring RV Survey numbers ≤45cm, Summer Area Occupied ≤45cm, Condition Factor) have been variable over time. The last two years, 2001 and 2002 have been the worst years of production since 1994. Total mortality has increased from the 1970s to the mid-1990s and remains high. It is not clear what is causing this mortality.

Relative **fishing mortality** (Relative F) has been low since 1997 after the introduction of a TAC and by-catch quotas in 1996 and the groundfish moratorium.

Environment (Temperature, Area 6-10°C) as measured by the area of suitable bottom temperature has decreased since 2000, possibly indicating poor environment conditions for white hake in 4VsW.

Although there are some positive indications, there does not appear to be a recovery in 4VsW white hake, despite low fishing mortality in recent years. Small fish seen in the RV survey are not surviving and total mortality is high. Although it is possible that total mortality was overestimated in the 1980s due to changes in water temperature, this does not appear to be the case in the 1990s.

The high total mortality causes concern that the stock may be at risk of further decline. The status of white hake in 4VsW is poor and requires rebuilding.

4X

Abundance (Summer RV Survey numbers >45cm, ITQ Survey numbers per set, Halibut Survey numbers per set, Summer Area Occupied >45cm and Summer Survey Mean Weight >45cm) has been poor during most of the 1990s. It had increased in recent years but decreased again in 2002. Indicators of abundance of 4X white hake showed small increases for the 3 to 4 years leading to 2001, but all decreased in 2002 (excluding the Halibut Survey for which there is no data point yet for 2002). The mean weight of large fish in the survey has been variable but is below the long term mean.

Production (Summer RV Survey Z, Summer RV Survey numbers ≤45cm, Summer Area Occupied ≤45cm, Condition Factor) has declined since the 1980s and in 2001 was the worst seen. It has increased slightly in 2002. Indicators of productivity have been variable over time, although all improved slightly from 2001 to 2002. Total mortality is higher in the 1990s than in the 1970s or 1980s.

Relative **fishing mortality** (Relative F) has been low throughout most of the time series.

Environment (Temperature (Area 6-10°C) as measured by the area of suitable bottom temperature has increased recently, possibly indicating favourable environment conditions for white hake in 4X.

White hake in 4X are showing some signs of recovery. The improved abundance in 2001 followed good abundance of small fish in 2000. However production was poor in 2001 and 2002 and abundance declined in 2002. Total mortality is increasing while fishing mortality appears to be low. The source of this other mortality is unknown and this causes concern that the stock may be at risk of further decline. The status of white hake in 4X has been poor and it has shown some signs of recovery. An increase in catches could jeopardise rebuilding.

4Vn

No traffic light analysis was conducted for 4Vn white hake. RV survey abundance of large 4Vn white hake has remained low during the 1990s and the mean weight of large fish is below the long-term mean. Small fish seen in the RV survey are not observed as large fish. A peak of abundance of fish 30 - 45cm seen in 2001 was not seen in 2002. Although the industry surveys indicate increased abundance from 1998 to 2000, overall, there is little sign of recovery of 4Vn white hake.

Summary

Although there are possible signs of recovery in western stock area, i.e., 4X/5, further rebuilding of the stock is required. The abundance of white hake in the eastern area, 4Vn and 4VsW continues to be very low despite reduced catches.

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Appendix 1.

The traffic light approach provides a framework that allows us to incorporate multiple indices of stock status and other relevant indicators. Colour boundaries corresponding to good and bad periods can be established qualitatively for some indicators, but remain problematic for others. For most indicators, the history of the index is short relative to the ecological and evolutionary history of the fish populations or of the ecosystems within which they occur. In the absence of quantitative information to specify colour boundaries they have been established by a process of deliberation, where the weight of expert opinion is used to determine the most reasonable estimates. These represent the best available estimates; however all are subject to improvement through ongoing research.

Table 1. Description of traffic light indicators, boundary points, weights and rationales for 4VsW white hake.

Indicator	Green (+) Boundary	Red (-) Boundary	Characteristic	Weight
Summer RV Survey numbers >45cm	6,000,000 This value cuts across the peaks during the 1980s	2,000,000 This value represents the low abundance years in the early 1990s.	Abundance	1
Spring RV Survey numbers >45cm	7,500,000 This value cuts across the large peak during the 1980s	1,500,000 This value represents the low abundance years in the 1990s.	Abundance	1
Sentinel Survey number/set	30 This is a short time series and thus its true range is uncertain. The green value was set a little above the highest observed in the time series in order to make this uncertainty explicit	4 This represents the low end of the data series.	Abundance	1
Halibut Survey number/set	20 This is a short time series and thus its true range is uncertain. The green value was set a little above the highest observed in the time series in order to make this uncertainty explicit	5 This represents the low end of the data series.	Abundance	1
Index LL catch rate	0.4 Boundary chosen for consistency with the summer RV survey	0.1 Boundary chosen for consistency with the summer RV survey	Abundance	1
Summer Area Occupied >45cm	8,000 This value represents a plateau from the mid 1970s to the early 1980s	4,000 It is assumed that a 50% reduction in area occupied is bad.	Abundance	0.5 Down-weighted because this is an indirect index of abundance
Summer RV Survey Mean Weight >45cm	2.5 This represents the high mean weight values in the 1970s	1.0 This represents the worst years in the data series, during the 1990s.	Abundance	0.5 Down-weighted because this is an indirect index of abundance
Summer RV Survey Z	0.4 This is based on $F_{0.1}$ for cod plus an assumed natural mortality of 0.2..	0.6 This is based on F_{max} for cod plus an assumed natural mortality of 0.2..	Production	1
Summer RV Survey numbers ≤45cm	15,000,000 This value cuts across the main peak in the data series	4,000,000 This value represents the low abundance years in the 1970s.	Production	1
Spring RV Survey numbers ≤45cm	6,000,000 This value cuts across the peaks during the 1980s	1,500,000 This value represents the low abundance years in the early 1990s.	Production	1
Summer Area Occupied ≤45cm	8,000 This value represents the high range of the data points	4,000 Although there is a decline in the data series it is unclear what value is really bad. Thus a low of 0.15, 50% of the green was used	Production	0.5 Down-weighted because this is an indirect index of production
Condition Factor	780 No trend in CF data, therefore no definite good or bad. This value is slightly below a single high value	650 No trend in CF data. This value is slightly below the minimum observed. NB. This indicator has a plateau in order to convey uncertainty	Production	0.5 Down-weighted because this is an indirect index of production
Relative F	0.2 This is based on $F_{0.1}$ for cod.	0.4 This is based on F_{max} for cod.	Mortality	1
Temperature (Area 6-10°C)	60 This value represents a plateau from the early 1970s to the early 1980s	50 This value represents the low values in the data series	Environment	1

Table 2. Description of traffic light indicators, boundary points, weights and rationale for 4X white hake.

Indicator	Green (+) Boundary	Red (-) Boundary	Characteristic	Weight
Summer RV Survey numbers >45cm	15,000,000 This value cuts across a series of peaks in abundance	4,000,000 This value represents the low end of the data series	Abundance	1
ITQ Survey numbers per set	9 This is a short time series and thus its true range is uncertain. The green value was set a little above the highest observed in the time series in order to make this uncertainty explicit	2 This is the lowest value in the time series and corresponds to a low in the RV series.	Abundance	1
Halibut Survey numbers per set	35 This is a short time series and thus its true range is uncertain. The green value was set a little above the highest observed in the time series in order to make this uncertainty explicit	5 This is the lowest value in the time series and corresponds to a low in the RV series.	Abundance	1
Summer Area Occupied 45cm	13,000 This value represents a plateau from the early 1970s to the early 1980s	7,000 This value represents the low end of the data series, observed in the 1990s	Abundance	0.5 Down-weighted because this is an indirect index of abundance
Summer RV Survey Mean Weight >45cm	2.4 This value represents the best mean weights in the times series, which were observed in the 1970s	1.2 This value represents the low end of the data series.	Abundance	0.5 Down-weighted because this is an indirect index of stock structure
Summer RV Survey Z	0.4 This is based on $F_{0.1}$ for cod plus an assumed natural mortality of 0.2.	0.6 This is based on F_{max} for cod plus an assumed natural mortality of 0.2.	Production	1
Summer RV Survey numbers ≤45cm	9,000,000 This value represents the base of the three main peaks in the data series	3,000,000 This value represents the low abundance years in the data series	Production	1
Summer Area Occupied ≤45cm	11,000 This value represents a broad range of peaks in the data series	5,000 Although there is a decline in the data series it is unclear what value is really bad. Thus a low of 0.25, 50% of the green was used.	Production	0.5 Down-weighted because this is an indirect index of production
Condition Factor	760 No trend in CF data, therefore no definite good or bad. This value is slightly above the highest CF value seen	630 No trend in CF data. This value is slightly below the minimum observed. NB. This indicator has a plateau in order to convey uncertainty.	Production	0.5 Down-weighted because of the uncertainty associated with this indicator.
Relative F	0.2 This is based on $F_{0.1}$ for cod.	0.4 This is based on F_{max} for cod.	Mortality	1
Temperature (Area 6-10°C)	80 This value represents a plateau from the early 1970s to the early 1980s	50 This value represents the low end of the data series, observed in the early 1970s and 1990s	Environment	1