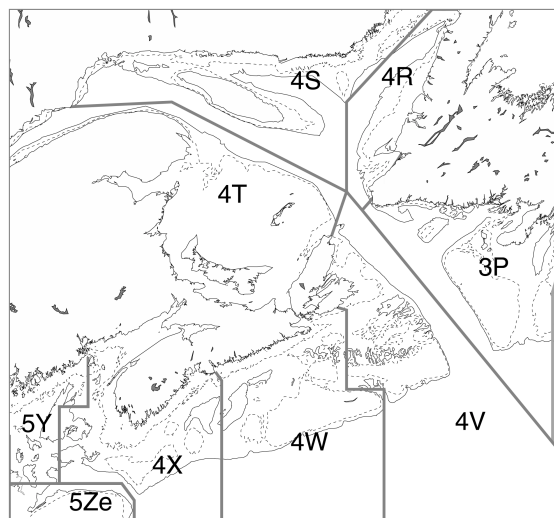


W.B.Scott & M.G.Scott

Wolffish on the Scotian Shelf and Georges Bank and in the Gulf of St. Lawrence (Subarea 4 and Div. 5YZe)



Background

The Atlantic wolffish (*Anarhichas lupus*) occurs on both sides of the North Atlantic. In the Northwest Atlantic their range is from off southern Labrador to Cape Hatteras on the continental shelf and in the deeper slope waters. In the Maritimes, wolffish are most prevalent in the approaches to the Bay of Fundy, Browns, Roseway and LaHave banks, the northeastern portion of the Scotian Shelf adjacent to the Laurentian Channel and in the waters off western Newfoundland. They are a demersal species usually found between 50 and 150m and 0.40 C to 60 C but they have been recorded between 1 and 550m and tolerating temperature from -10 C to 10.0 C. Wolffish are solitary by nature and do not live in schools. Migration is limited but seasonal inshore migrations may occur in the spring, when mature fish are found in shallow waters of 0 to 15m.

In Newfoundland, wolffish spawn in September, in the White Sea in July and in Iceland in January-February. Powles (1967) reported egg masses in abundance south of LaHave Bank in March 1966 and empty egg cases were found near Sable Island in February. The precise spawning time of wolffish in the Maritimes is unknown. The large cohesive eggs range from 5.5 to 6.5 mm, are demersal and are laid in clusters. The egg clusters may be guarded by an adult male and partially hatched larvae are 17-18mm in length. The larvae are pelagic and remain close to the bottom until the yolk sac is absorbed. The entire larval stage is spent near the area where the eggs were laid (Bigelow and Schroeder, 1953). Growth may be rapid for the first year, and then slows; in sub-arctic water, fish at five years of age were only 24cm.

Wolffish feed on rocky bottoms on welks, sea urchins, brittle stars, crabs, scallops (shells are crushed) and occasional redfish (Templeman, 1985). Cod have been reported as predators of small wolffish.

Summary

- Large numbers of immature fish have been caught in research vessel surveys in Subarea 4 through the 1990's.
- Mature biomass is presently low in NAFO Divisions 4VWX and 4T.
- Fishing mortality has been low since the mid 1990's.
- Until recent recruitment matures, and the mature biomass improves, care must be taken not to increase fishing mortality beyond the status quo.

The Fishery

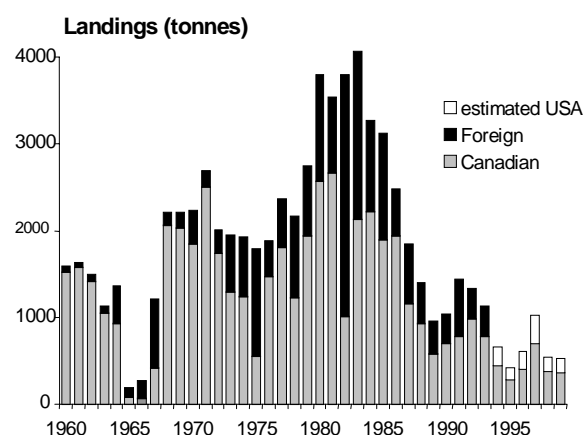
Landings (tonnes)

Année	1994	1995	1996	1997	1998	1999 ²	2000
4RS	9	13	8	73	53	72	
4T	1	1	7	1	1	1	
4VWX	373	238	365	581	291	279	
5Y&5Ze	57	20	16	34	20	18	
USA ¹	215	135	214	338	167	159	
Total	655	406	611	1026	533	529	

1 Estimated 5Y & 5Ze based on recent history

2. Landings refer to the 15 month period from January 1, 1999, to March 31, 2000

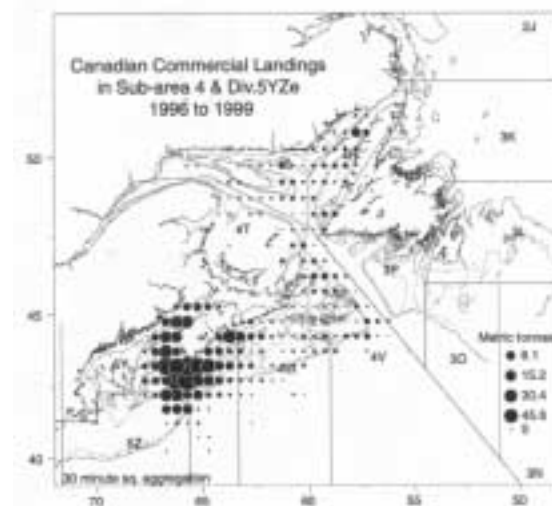
Wolffish landings from NAFO Subarea 4 and Divisions 5Y and 5Ze were between 1000 and 1500 tonnes in the 1960's and rose to over 2000 tonnes between 1968 and 1979. Landings in the 1980's increased, reaching a peak in 1983 of over 4000t. Landings dropped steadily to 1000t in the early 1990's and are presently estimated to average about 625t. Canadian landings represent approximately 55% of this total with the remainder consisting mostly of US landings from 5Y and 5Ze. There is no TAC for this resource and catches are regulated only by general 10% bycatch restrictions, landing restrictions (CAPs) under the Conservation Harvesting Plan and a 20% wolffish bycatch regulation on the mobile fleet in Div 4X from April to October.



Canadian landings from Subarea 4 and 5 of wolffish since 1986 are primarily from Div. 4X and constitute 81% of the total, with Div.

4R contributing 10% and the remainder spread between Divisions 4STVW and Div. 5YZe. The fishery is a bycatch fishery, however about 25% of the landings are from sub-trips, where the major species caught is wolffish. Otter trawlers account for most of the wolffish landed in Div. 4X and 5YZe, while in Div. 4Vs, landings are by both otter trawlers and longliners. In Divisions 4VnRST, most landings are by longliners.

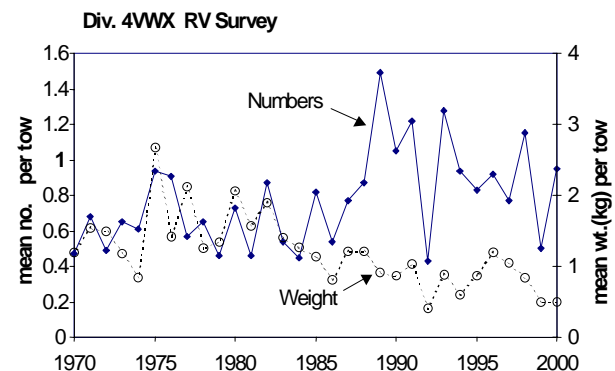
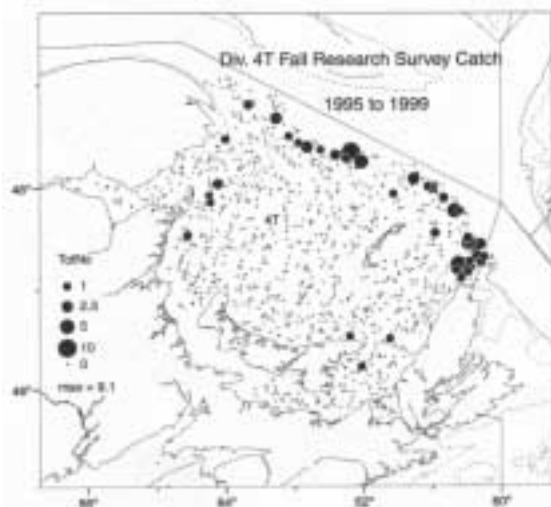
Sampling of commercial landings for this species has been limited and the few samples available do not provide reliable estimates for sizes landed.



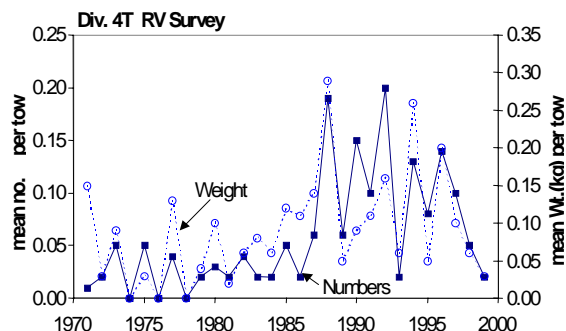
Resource Status

Research vessel (RV) surveys in Subarea 4 show wolffish distributed throughout the area, except on the Magdalen Shallows. In 4T, except for a few catches off Baie de Chaleur and eastern PEI, wolffish are found along slope of the Laurentian Channel. The primary concentration in Div. 4RS is off the west coast of Newfoundland (Div. 4R) although they were found throughout the survey area. In Div. 4VWX, wolffish are found throughout, but in recent years, there has been reduced numbers in the mid-shelf regions (Div. 4W) and greater numbers

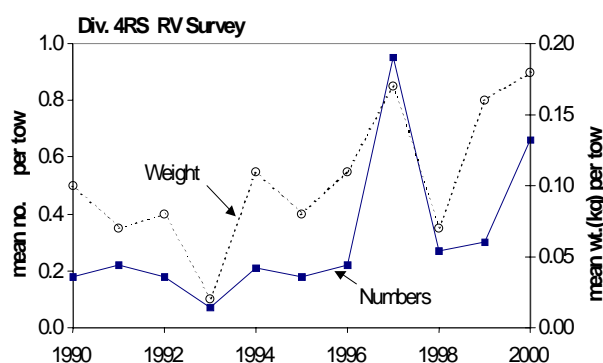
Mean number per tow from the summer RV surveys in Div. 4VWX, while highly variable from year to year, were without apparent trend until the latter half of the 1980's. They increased to the highest values in the series in the early 1990's and have remained above average (1970-2000) since. Mean weight per tow declined over the same period and are presently close to the lowest in the series.



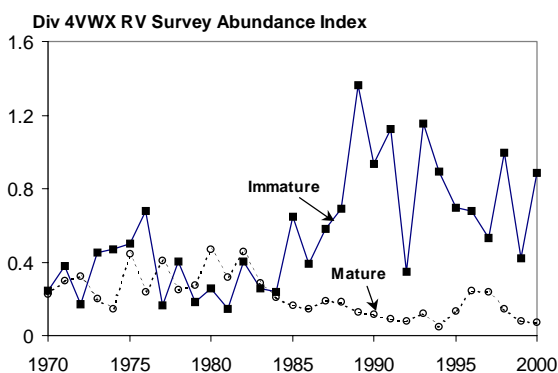
Mean number and weight per tow from the fall RV surveys in Div. 4T also increased to above average after 1987 but have declined to low levels in recent years.



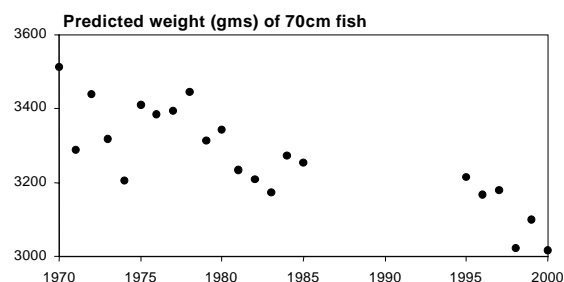
The 4RS summer RV survey estimates, available since 1990, indicate an increasing trend for both mean number and weight per tow.



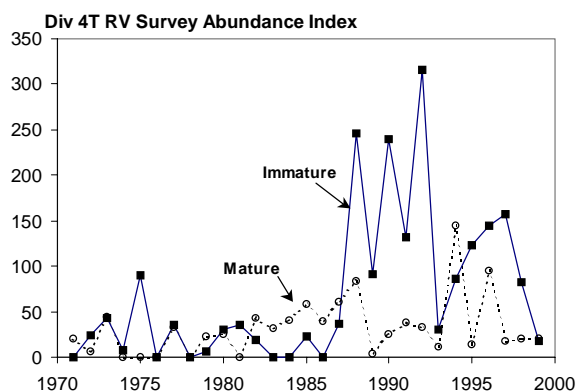
Length frequency data from the 4VWX summer RV survey reveal that the increased abundance since 1986 was due to smaller fish. The number of immature fish (≤ 55 cm) since 1985 has been above average, while the number of mature fish (>55 cm) declined through the period and are presently near the lowest observed in the series.



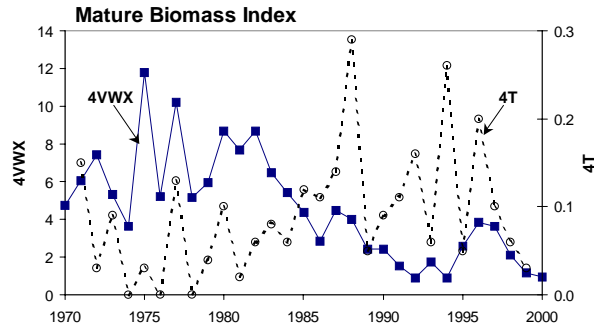
The **condition** of these older fish is also presently lower than the average values.



As was seen in Div. 4VWX, the number of immature fish increased in the Div. 4T fall survey. Mature fish from this survey were also more prevalent, contributing to the increased abundance after 1987 but have declined to low levels in the most recent surveys. Mature fish have seldom been caught in Div. 4RS.



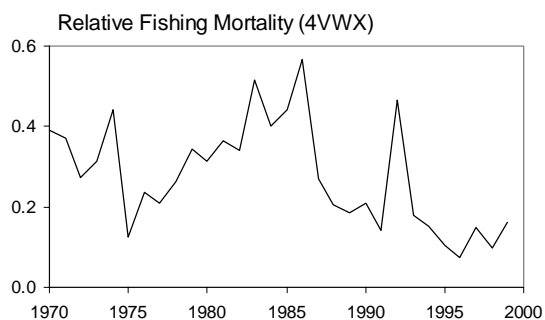
The **mature fish biomass** (>55 cm) in Div. 4VWX was above average without trend early in the series, declined after 1982 to below average values through most of the 1990's and is presently close to the lowest in the series. In Div. 4T, mature biomass was low with no trend until the mid 1980's. It increased sharply in 1987 and remained high but quite variable until the last two surveys.



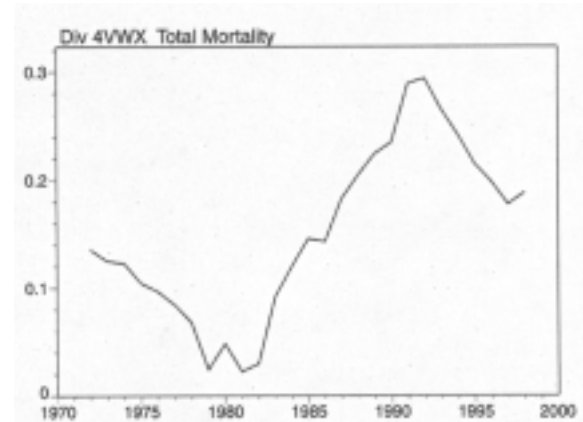
The **area occupied index** is defined as the proportion of the annual RV survey sets in which wolffish occurs. The index for Div. 4VWX wolffish has been lower in the 1990's following a decline in the 1980's. In Div. 4T, the index increased during the early 1980's and has remained at slightly higher values. An index was not produced for Div. 4RS.



Relative fishing mortality in Div. 4VWX, increased steadily from 1975 to 1986 and then dropped quickly to low levels and has remained low. Relative fishing mortality was not calculated for the other areas because of low landings.



An index of **total mortality (Z)** derived from the summer RV survey in Div. 4VWX shows a period of increasing mortality from the early 1982 to 1992 and a decreasing trend since. The patterns of Z's available from catch curve analysis are based on the assumption of a stable age distribution. The recent strong abundance of young fish makes this assumption suspect and there will likely be biases associated with that. While accepting the trends in Z at face value is difficult, it is reasonable to interpret these estimates as indicating that the proportions of older fish declined in the 1980's and since 1992 have increased.



There are inconsistencies between the relative fishing mortality and the total fishing mortality, in some years, but these could not be resolved.

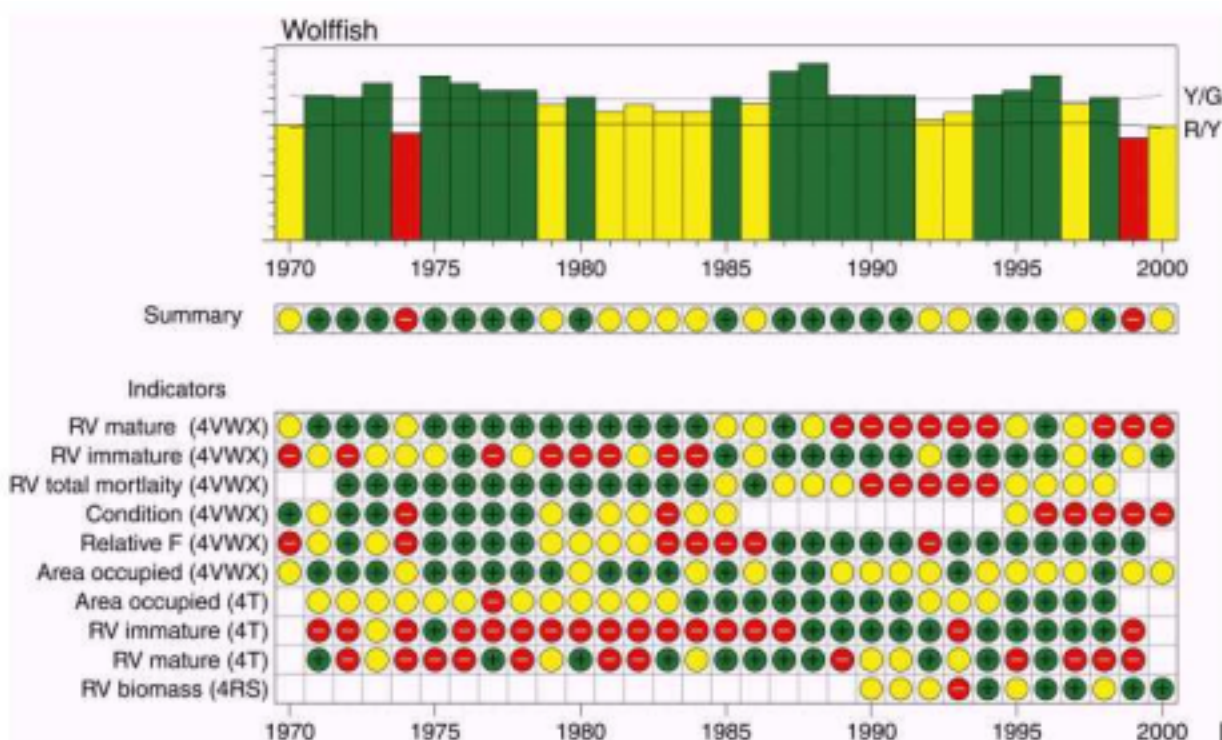
The **Traffic Light** table that follows summarizes the indicators of stock status shown above.

This table shows the annual values of each indicator as one of three lights depending on whether they are among the highest values observed for that indicator, among the lowest 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 are yellow ●.

The results for the indicators combined are shown in the summary line above the array of individual indicators. If most indicators in a particular year are red then the summary light for that year will be red, if most are

green the summary light will be green, and so on. The actual summary scores from the range of indicators in the table are shown in the bar chart above the table. The height of the bar determines the colour for the corresponding year and the horizontal lines on the bar chart indicate the boundaries between the colours (red-yellow and yellow-green).



Outlook

Indices of **abundance** in Subarea 4 are mixed. Mature biomass estimates (RV mature (4VWX), RV mature (4T)) have been low in recent years and in Div. 4VWX, the area occupied has declined (Area occupied (4VWX)). More positive signs are seen in area occupied (Area occupied (4T)) in Div. 4T, which has been above average in recent years and in Div. 4RS biomass estimates (RV biomass (4RS)) which show a small increasing trend.

There is evidence that **productivity** has also been mixed through the 1990's. There are large numbers of small fish (RV immature (4VWX), RV immature (4T)) in Div. 4VWX and Div. 4T and an increasing trend in the numbers of small fish in 4RS. Wolffish grow slowly, not maturing until age 10 or more, so these fish may not be mature yet. The RV total mortality (RV total mortality (4VWX)) was increasing until 1992 and has been decreasing since. Fish condition (Condition (4VWX)), however, is lower now in Div. 4VWX than earlier in the series.

Landings were high in the early 1980's and declined to low values in the 1990's. **Fishing mortality** (Relative F (4VWX)) is presently low.

The summary of indicators for wolffish has fluctuated between green and yellow in the latter half of the series, was green through the mid 1990's and is currently yellow. The bulk of the landings come from Div 4VWX and the low abundance in this area is a concern. Low abundance is a concern, but high productivity and low fishing mortality are encouraging. Until recent recruitment matures, and the mature biomass improves, care must be taken not to increase fishing mortality beyond the status quo.

For More Information

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