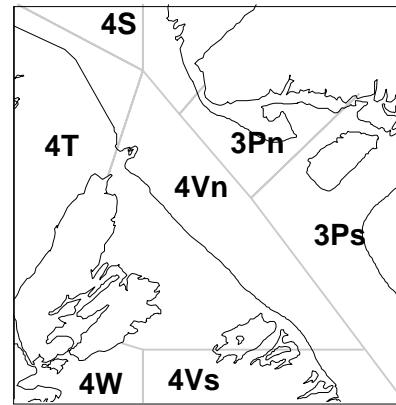


Cod in Sydney Bight



Background

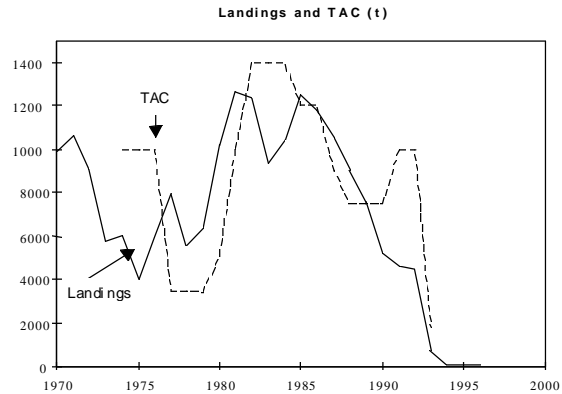
The 4Vn region is known to represent a mixing ground between the resident 4Vn cod stock and larger neighbouring stocks, the 4T stock to the west and the 4VsW stock to the south. In addition, 4T cod overwinter along the shelf edge from Sydney Bight as far as Banquereau Bank region, leaving the Gulf in the late autumn and returning in the spring. During this period, the catch of cod in 4Vn comprises both Gulf and resident cod, although the 4T cod make up the bulk, being a much larger stock. Thus, unknown quantities of 4Vn cod are caught during the overwintering period. Mixing of Gulf of St. Lawrence (4T) cod with the resident stock and inability to apportion landings according to stock have complicated the assessment and management of the 4Vn stock.

Cod in 4Vn grow more slowly than the 4VsW stock to the south but more quickly than 4T cod. They are assumed to be mature at an age of 5. Tagging studies suggest that they over-winter in deeper water. 4Vn cod spawn in Sydney Bight in May.

The Fishery

Landings ('000t)	70-79	80-89	1992	1993	1994	1995	1996
TAC	6.7	10.5	10.0	1.8	*	*	*
Landings**	5.1	8.6	2.3	0.7	<0.1	<0.1	<0.1
Landings***	7.1	10.6	4.5	0.7	<0.1	<0.1	<0.1

- * by-catch only
- ** May - October only
- *** May - December only



Before extended jurisdiction in 1977, the cod fishery in 4Vn was traditionally a summer inshore longline fishery which exploited the banks south of the Laurentian Channel.

During these years, large foreign trawlers fished along the Laurentian Channel edge in deeper water mainly during the winter months. These trawlers were targeting mainly Gulf of St. Lawrence cod which overwinter in the Sydney Bight area; whereas, the fixed gear fishery was prosecuted on the 4Vn resident stock. After the 200 mile limit was declared and foreign boats were denied access to this area, an inshore dragger fleet developed. Cod **landings** in NAFO Subdivision 4Vn have declined sharply during recent years. Throughout most of the 80's, catch quotas restrained the fishery, but after 1990 the catch was substantially less than the TAC. In September 1993, the cod fishery was closed and this moratorium is still in effect. In the few years prior to the closure, vessels using mobile gear generally managed to maintain a catch close to their allocation, whereas the longline fleet fared less well. Furthermore, the dragger fleet which had traditionally caught most of its catch between May and October began to transfer its activities toward the latter part of the year to exploit immigrant 4T cod. The effect was to maintain the overall catch for 4Vn even as the abundance of resident fish fell.

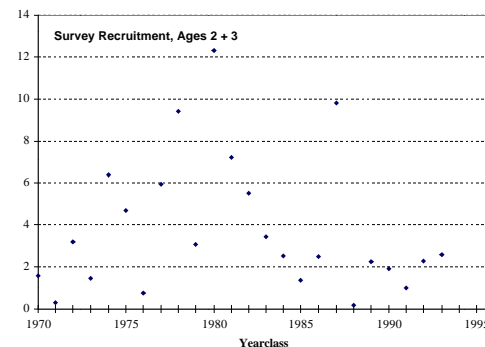
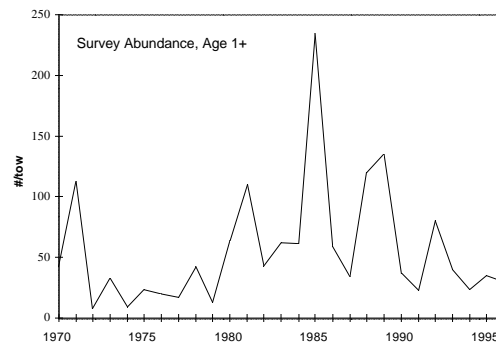
Information on the **overwintering migration** of Gulf of St. Lawrence (4T) cod into the Sydney Bight area was reviewed in the spring of 1994. From patterns of commercial fleet movements and results of tagging studies, it was clear that many 4T cod had departed the Gulf by mid November. Therefore it was decided to modify the 4Vn management unit by redefining the assessment period from May to December, to May to October, inclusive.

Less than 50 tonnes of cod landings were reported in 1995 and 1996, most of which were taken as bycatch from redfish and flounder fisheries.

Resource Status

July Research Vessel (RV) Survey

Interpretation of the **survey** data from 4Vn has always been difficult due to its high variability caused by small sample sizes and periodic incursions of other stocks into the area. Nevertheless, the general trend of the July survey index does seem to reflect the abundance of cod. The index has remained at a very low level, less than 40 (fish per tow), since 1992. The 1991, 1992 and 1993 year classes made up the bulk of the catch with 4 year-olds being slightly more abundant than adjacent year-classes. This stock continues to suffer from low levels of recruitment; the last good year-class seen in this survey is 1987.

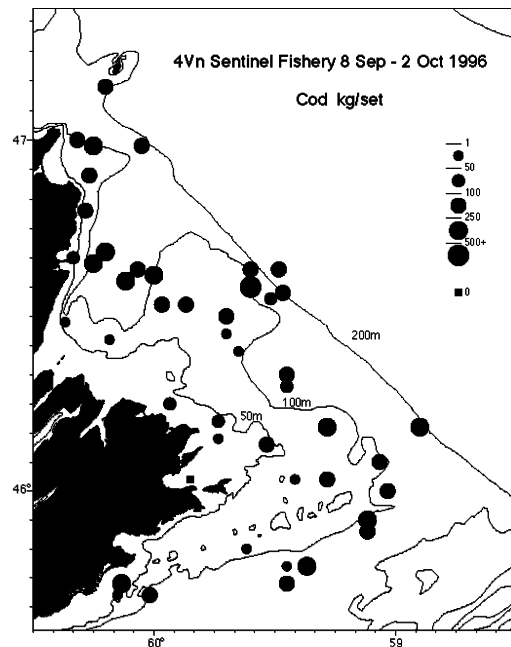


Sentinel Survey

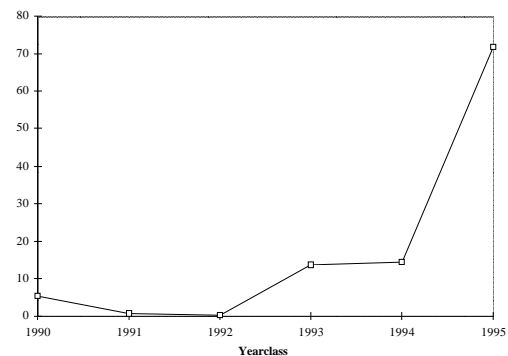
Initiated in 1994, a **4Vn sentinel survey** conducted by commercial longliners follows a stratified random design similar to that used by the July groundfish survey. Five surveys have now been completed; September 1994, and both July and September in 1995 and 1996. The geographic distribution of cod caught in all surveys was similar. The catch rate in September has declined from 1994 to 1996 (110.22, 106.57 and 76.25 kg/1000 hooks, respectively). Catch rates during July 1995 and 1996, although substantially lower, also show a decrease. The disparity between September and July catch rates appears to be a seasonal effect. Longline fishermen have found that July catch rates have historically been lower than in other months.

As was found in 1995, dogfish were much more common in the July survey than in September. However, whereas 21.2 tonnes of dogfish were caught in July 1995, only 1.3 were caught in July of 1996. The fishing industry has reported that high concentrations of dogfish can interfere with the catch rate of cod.

The areal coverage of the sentinel survey is much greater than that of the RV survey; however, the relative abundance or distribution of cod in July 1996 was comparable in locations where sampling coincided. Not unexpectedly and as seen in previous years, proportionally more larger cod are taken by the sentinel survey; no doubt a function of gear selectivity. The research trawl is fitted with a small mesh liner so it is capable of capturing very small cod; whereas, the size of hook used in the commercial longline fishery captures few small fish. Fishermen indicate that cod less than 35 cm (14 in) are rarely taken with number 12 hooks which are used for the survey.

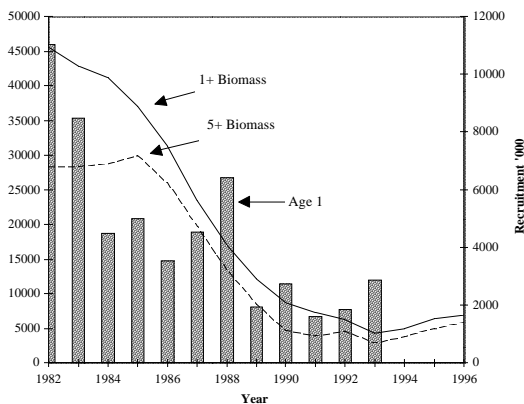
*Inshore Survey*

An **inshore survey** was initiated in 1991 which captures smaller fish than the July RV. The results for age 1 fish, approximated by the number smaller than 15 cm, show an early indication of improved **recruitment** of the 1995 year-class. These fish will have to survive for several years before they can contribute to a fishery or to the reproductive stock.



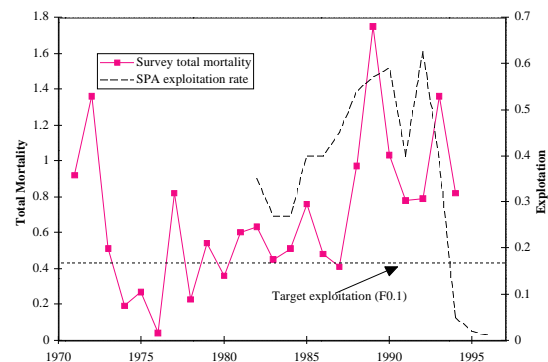
Population trends

A standard age-based **population analysis** was used to estimate the current status of the stock. As 4Vn is a known area of stock mixing, the degree to which the 4Vn area contains fish from other stocks will bias the results. To minimize this effect, the catch at age was reconstructed for the May to October period during 1982 - 1996. Also, there is a much lower sampling rate in the July RV series than for other stocks. The low sampling rate means that the abundance information is more variable than for most stocks and hence the final estimates of stock status are poorer than those for most assessed stocks. The abundance estimates indicate that the population is severely depleted. There has been a slow rate of increase in the adult (age 5+) biomass since the low seen in 1993 (2,800 t). The 1995 and 1996 values being 5,000 and 5,900 t respectively. Since 1987, there have been very few fish over 11 years of age and there are no signs of good or even average recent recruitment. The biomass increase observed in the last few years is due to the growth of older fish which are surviving due to the fishery closure. A retrospective pattern is seen in the biomass estimates, which means that the most recent biomass figures tend to be over-estimated. Thus, the recent status of the stock is probably poorer than is shown in the following figure.



Exploitation rate, the percentage of the recruited population removed by the fishery,

indicates that the fishery was removing increasing fractions of the stock from 1984 to 1992. The September closure of the fishery in 1993, which is still in effect, resulted in the first significant decrease in exploitation levels. 1994 is the first year that the exploitation was beneath the $F_{0.1}$ target. Total mortality rates, estimated from the survey show an increasing trend since the mid-1970s. The mortality remains high even after closure in 1993 which suggests that the cod are not surviving or are emigrating.



Outlook

Only the inshore survey index (age 1)shows any indication of an improvement since the fishery closed in 1993. The potential contribution of these small, less than 15 cm, fish to future recruitment has not been established. Although the fishery has been closed since September, 1993, mortality rates estimated from the research survey are still quite high. Until there is substantial recruitment to the reproductive stock, there can be no thought of reopening the fishery. Because 4Vn is an area of stock mixing, recovery may be influenced by migration to or from neighbouring stocks.

Management Considerations

Tagging results imply that 4Vn fish are mixed with incoming 4T fish during the winter. A preliminary analysis, which linked historical tagging data and the SPA population size estimates, found that during the months of November to May between 10 and 15% of the fish in 4Vn are from the native stock and over 80% is from 4T. The potential impact on the Sydney Bight stock of a 4TVn winter fishery stock must be considered.

For more Information

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