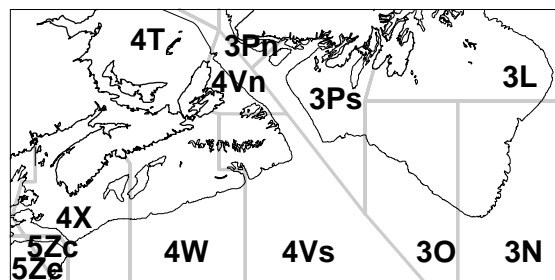


SCOTIAN SHELF AND SOUTHERN GRAND BANK HALIBUT



Background

Atlantic halibut, the largest of the flatfishes, ranges widely over Canada's Atlantic fishing grounds. Halibut are demersal living on or near the bottom at temperatures within a few degrees of 5°C. Atlantic halibut are most abundant at depths of 200-500 m in the deep water channels running between the banks and along the edge of the continental shelf, with larger individuals moving into deeper water in winter. The management unit definition (4VWX3NOPs) was based largely on tagging results which indicated that Atlantic halibut move extensively throughout the Canadian North Atlantic with smaller fish moving further than larger fish. Migrations of larger fish were thought to be related to spawning. Studies have shown that the Brown's Bank area may be an important rearing area for juvenile halibut and that there is a north-eastward movement of fish as they grow. The geographic range of Atlantic halibut in the Northwest Atlantic extends from the coast of Virginia in the south to the waters off Disko Bay, Greenland in the north. Since the early 1990s, there appears to have been a significant reduction in the numbers of halibut in the northern portion of this range, especially along Labrador Shelf.

Although the growth and maturity cycles of Atlantic halibut require further study, it appears that females grow faster than males, and attain a much larger maximum size. Females reach 50% maturity at about 115 cm, while males 50% maturity at about 75 cm. In the absence of a reliable growth information age at maturity remains uncertain. Present fishing regulations require that all halibut less than 82cm in length be released. Halibut are voracious feeders and up to a length of 30 cm, food consists almost exclusively of invertebrates. Between 30 cm and 66 cm both invertebrates and fish are eaten while halibut over this size eat fish almost exclusively.

The Fishery

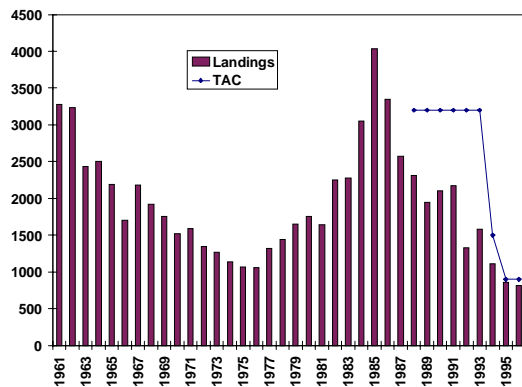
Year	Landings (thousands of tonnes)		1992	1993	1994	1995	1996
	70-79 Avg.	80-89 Avg.					
TAC*	n/a	n/a	3.2	3.2	1.5	0.9	0.9
4VWX							
Canada	0.8	1.5	0.9	0.9	0.9	0.6	0.6
Foreign	0.1	0.1	0.1	0.1	0.1		
3NOPs							
Canada	0.4	0.7	0.3	0.3	0.2	0.2	0.2
Foreign	0.1	0.2	0.1	0.4	0.1	0.1	
Total							
4VWX	0.8	1.6	1.0	0.9	0.9	0.6	0.6
3NOPs	0.5	1.0	0.4	0.7	0.2	0.3	0.2
TOTAL	1.3	2.5	1.4	1.6	1.1	0.9	0.8

N/A - Not applicable

Landings of Atlantic halibut have been recorded for the east coast of Canada since 1883. The long-term average landings from the entire east coast has been about 2000t annually. From 1883 until 1910, landings averaged about 500t annually and from 1911 until the start of the second world war, landings increased to about 2500t per year. Landings declined during the war years but increased to reach a maximum of about 5000t in 1960. Since 1960, landings have shown a gradual decline until the present with the exception of a resurgence during the mid 1980s. Present annual landings are about equivalent to those observed at the beginning of the century. Landings from the present management unit have averaged just under 2000t annually since 1960 and have declined since then with the

exception of a resurgence during the mid 1980s. Until 1988, this fishery was unregulated. Landings in 1996 totalled 811t close to the TAC of 850t.

Longliners are the dominant fleet on both the Scotian Shelf and southern Grand Banks fishery accounting for over 70% of the landings.



Halibut landings by season indicated that the Canadian fishery is prosecuted mainly in the spring and summer in 4VWX and primarily in the spring in 3NOPs. Foreign landings are incidental on the Scotian Shelf, taken as by-catch in the silver hake fishery while in 3NO the European Union (EU) prosecute a spring and summer groundfish fishery outside the 200 mile limit. These EU vessels report variable halibut catches (5-30% of total landings for the stock in the last 5 years) that are not accounted for under the current management plan.

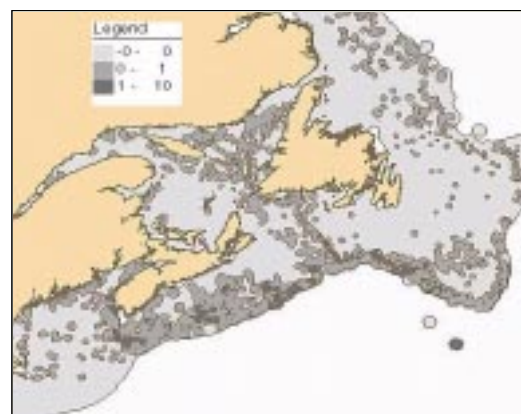
In spite of the precautionary TAC of 3200t imposed in 1988, the halibut fishery remained essentially unrestricted until 1993. **Restrictive management measures** imposed on the less than 65 ft fixed gear fleet since 1993, resulting in monthly quotas and catch and release fisheries, may have affected catch rates and compromised their efficacy as indicators of stock abundance. Industry comments suggested that the restrictive quotas resulted in misreporting of halibut catches in 1995 and 1996.

Inshore fleets have released halibut less than 81 cm since 1994. Licence conditions have been used to enforce the regulation for the inshore

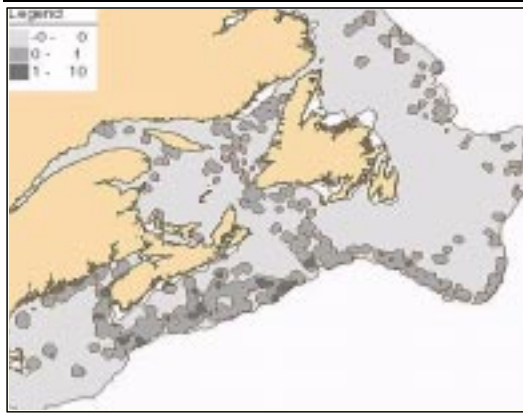
fleets. Offshore management plans and licence conditions also require the release of undersized halibut. In 1994, data from the Fisherman and Scientists Research Society (FSRS) indicated that the amount released could be as high as 25% by weight of the total less than 65 ft landings. Studies using a 16/0 circle hook have shown that the survival of released halibut from longline gear is in the order of 75%. Given these survival rates, the release of these undersized fish could significantly reduce their mortality in the fishery.

Resource Status

The recent **geographic distribution** of Atlantic halibut along the east coast of North America (1990 - 1994) is shown below relative to their distribution during the period 1975 - 1989. Even though the sampling intensity in the latter period is somewhat lower, the geographic coverage is similar and shows a reduced abundance of halibut in the northern portions of the stock area. The continuous distribution of halibut and tagging results showing long distance movements suggest that the stock area may be broader than the present management unit.

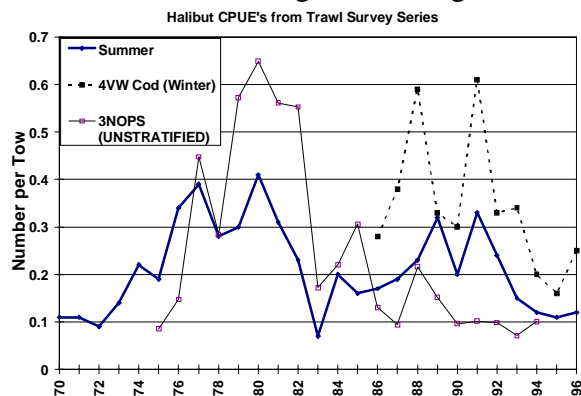


1975 - 1989



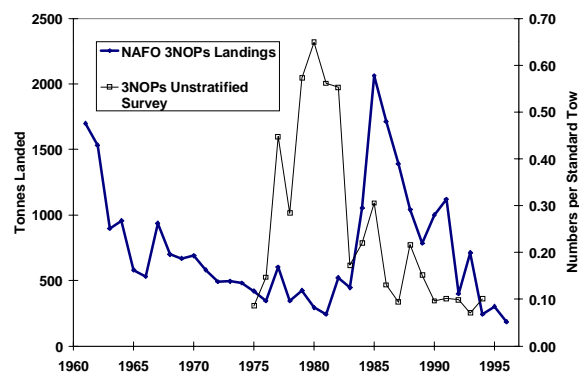
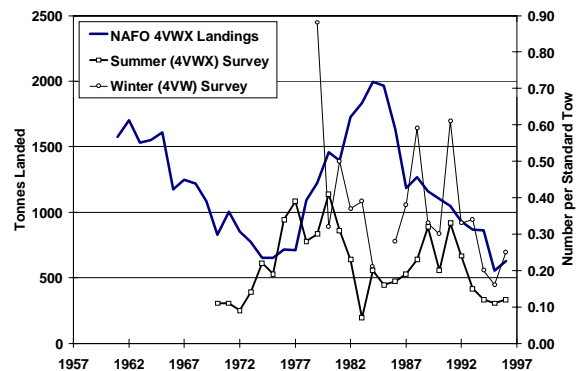
1990-1994

At present, the Department does not have a **survey** which specifically samples the management unit annually. Therefore all available research vessel trawl survey results were examined both within the stock area and in adjacent waters. All of these trawl surveys have very low catch rates for halibut relative to those of other commercially exploited species. These low catch rates are a reflection of the overall lower abundance of halibut and of the fact that halibut are not a schooling species like cod or haddock. As a result, these surveys show a lot of inter-annual variability in halibut catch-rates; however, all the surveys from the stock area and adjacent waters show broadly similar trends. All show an increase in abundance through the 1970s to a maximum in the period 1979-1981 after which they decline. For NAFO Subdivisions 3NOPs, the survey index declines until at least 1994, while on the Scotian Shelf, abundance has been more variable since the low period in the early 1980s. Present estimates from trawl surveys show that halibut abundance is low relative to the long-term average.



Length compositions of halibut caught in surveys of the Scotian Shelf show that small halibut (<40 cm) are more abundant on the southwestern Scotian Shelf and that larger halibut (>40 cm) are more abundant on the northeastern shelf edges. These observations are consistent with a general northeastward movement of halibut as they grow, and are consistent with the results of previous tagging experiments.

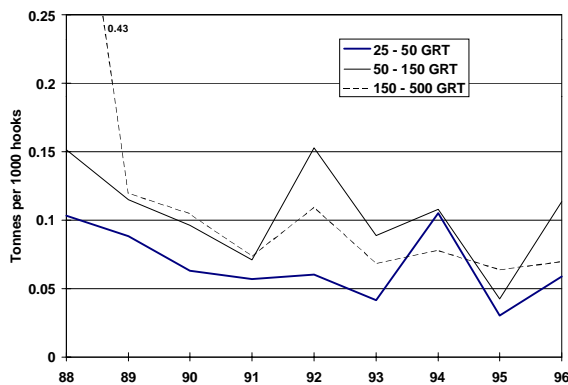
A comparison of landings and survey indices for the northern (3NOPs) and southern (4VWX) portions of the management unit show that the survey abundance may predict landings trends with a lag of approximately 5 years and thus may be indicative of incoming **recruitment**.



In addition to the DFO trawl surveys, a number of other surveys have been conducted jointly with sectors of the fishing industry. The **4VW sentinel survey** jointly sponsored by the Fishermen and Scientists Research Society and the department, has been conducted in 1995 and 1996. This **fixed gear survey** operates on a stratified random design and spans all of NAFO divisions 4V and 4W from inshore to the

continental slope. This survey may become a valuable index for halibut abundance, but has not been in operation for long enough to help in determining present stock status. Preliminary results show that halibut catch per standard set decreased from 1995 to 1996 (3.2 kg per set to 2.6 kg per set).

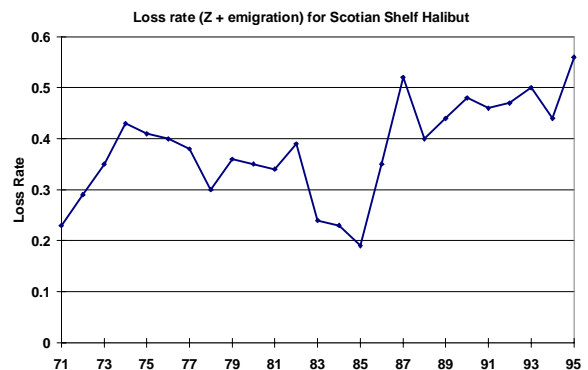
Two sources of information were used to estimate commercial catch per unit of effort (CPUE), DFO catch and effort statistics, and information collected by the Maritimes Region observer program. Using DFO catch and effort statistics, all halibut effort was re-classified to include only that effort where halibut was the single largest proportion, by weight, of the catch for the trip. This was done to respond to a criticism, by industry, that the previous catch rate series may have included effort from trips where halibut was the highest single dollar value portion for the trip, but where the effort was actually directed at other species. The recalculated series shows a decline in CPUE since 1988 for all vessel classes using fixed gear.



Halibut catch rates for the 3NO longline halibut fishery have declined from 1988 to 1993 and have remained low since. From 1988 to 1994, this decline in catch rate is also evident in the 3NOPs research vessel survey results.

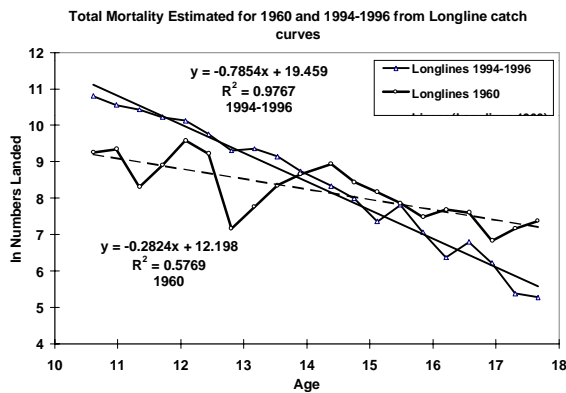
No reliable ageing information is available for 3NOPs4VWX halibut to allow calculation of total mortality. Therefore a growth model developed for the Gulf of St. Lawrence stock was applied to convert length to age for the Scotian Shelf survey results. Even though this

may not be the correct model for this stock, in that the two stocks probably have different growth rates, it allowed us to estimate a trend in mortality for this portion of the stock. A three year running average of population abundance at age estimated from summer survey was used to generate three year average catch curves (natural log of abundance at age) which were then used to estimate total loss rate (total mortality + emigration) for each time period. Given the observed movement of halibut from southwest to northeast within the stock area, and that these results apply only to the Scotian Shelf, the resulting loss rate estimates may include an unquantified migration component in addition to total mortality. The results of these analyses indicated that the loss rate has been increasing since at least the mid 1980s and is now at the highest value since 1971.

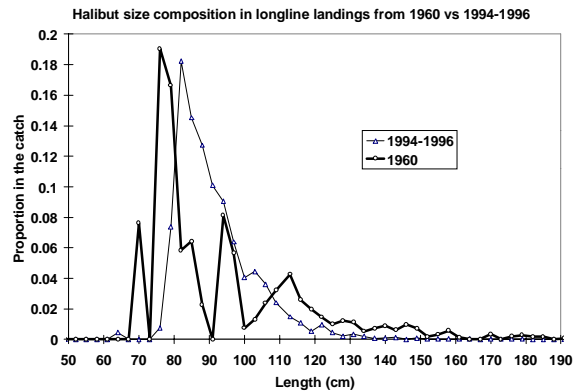


Samples of commercial halibut catches collected during 1960 and the present (1994-1996) were also used to compare estimates of mortality for the two time periods. As with the survey data, the estimates of catch at length were converted to catch at age using the Gulf based growth model. Eventhough this model may prove to be incorrect, it was considered that applying the same growth model to samples from both time periods would allow for the comparison of relative mortality rates. Results of these analyses indicate that mortality rates are presently between 2 and 3 times higher than they were in 1960 and that the age range in the population has been much reduced. Present estimates of total mortality based on these analyses are on the order of 0.5 to 0.8. It should be noted that

these estimates may change once a growth model specific to 3NOPs4VWX halibut is developed. It should also be noted that recent estimates of age compositions do not include samples from 3NOPs. Since there are indications that larger fish may tend to migrate to these more northerly waters, the total mortality values for recent years may be over estimated.



3NOPs while the 1960s size composition included data for 3Ps.



Halibut directed CPUE for longliners has declined since 1988 both for the management unit as a whole and for the Scotian Shelf and southern Grand Banks separately. There are some indications of increased CPUE for 1996.

Outlook

The foregoing analyses suggest that halibut **abundance**, as estimated from the results of research vessel surveys in the management unit, is presently low relative to the available time series. Present landings are also low relative to the long-term (1883 - 1996) history of this resource. Survey results for the geographic range of halibut suggest that declines in abundance have been more evident for the southern Grand Banks than for the Scotian Shelf.

Management Considerations

There is no indication that effort on this resource should be increased but rather that the present restrictive measures should be continued.

Loss rates from the Scotian Shelf have increased since 1971 and are presently at their highest value. The observed increase is likely due to increased mortality since halibut abundance in the northern part of the management unit (3NOPs), where migrating fish are predicted to go, has declined since the early 1980s.

For more Information

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Halibut size compositions show a reduced range of sizes in the present population (1994 - 1996) relative to that for 1960; however, present estimates do not include size information for

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