

# Seafood Assessment



## Atlantic Halibut

*Hippoglossus hippoglossus*

## Atlantic Canada

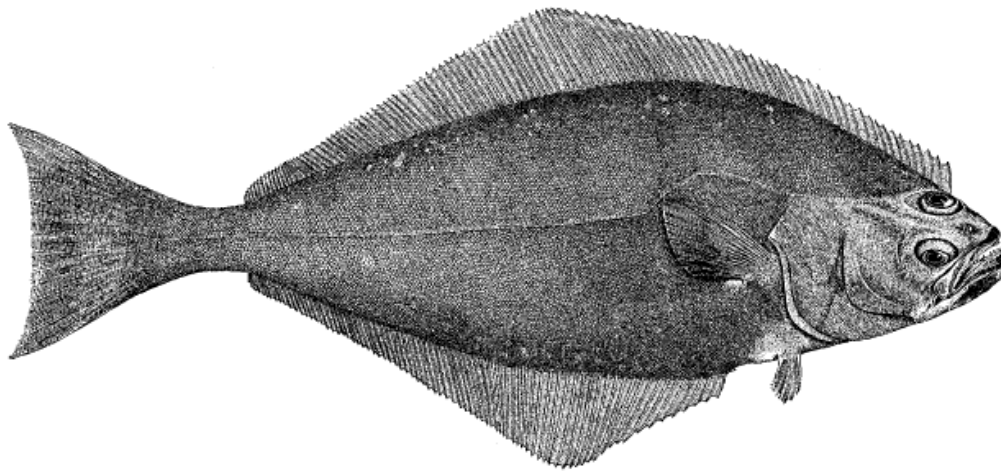


Image: Goode 1884

**Trevor Davies and Julia Baum**

July 2006

Update and Addendum to Stevens, M. 2004. Seafood Watch Report: Commercially Important Atlantic Flatfishes. Monterey Bay Aquarium

## About Sea Choice and the Sea Choice Reports

The SeaChoice® program evaluates the ecological sustainability of wild-caught and farmed seafood commonly found in the Canadian marketplace. SeaChoice® defines sustainable seafood as originating from sources, whether wild-caught or farmed, which can maintain or increase production in the long-term without jeopardizing the structure or function of affected ecosystems. SeaChoice® makes its science-based recommendations available to the public in the form of a pocket guide, Canada's Seafood Guide, that can be downloaded from the Internet ([www.seachoice.org](http://www.seachoice.org)) or obtained from the SeaChoice® program directly by emailing a request to us. The program's goals are to raise awareness of important ocean conservation issues and empower Canadian seafood consumers and businesses to make choices for healthy oceans.

Each sustainability recommendation on Canada's Seafood Guide is supported by a Seafood Assessment by SeaChoice or a Seafood Report by Monterey Bay Aquarium; both groups use the same assessment criteria. Each assessment synthesizes and analyzes the most current ecological, fisheries and ecosystem science on a species, then evaluates this information against the program's conservation ethic/sustainability criteria to arrive at a recommendation of "Best Choices", "Concerns" or "Some Concern". The detailed evaluation methodology is available on our website at [www.seachoice.org](http://www.seachoice.org). In producing Seafood Assessments, SeaChoice® seeks out research published in academic, peer-reviewed journals whenever possible. Other sources of information include government technical publications, fishery management plans and supporting documents, and scientific reviews of ecological sustainability. Information used to evaluate fisheries and aquaculture practices for assessments regularly comes from ecologists, fisheries and aquaculture scientists, members of industry and conservation organizations. Capture fisheries and aquaculture practices are highly dynamic; as the scientific information on each species changes, SeaChoice's sustainability recommendations and the underlying Seafood Assessments will be updated to reflect these changes.

Parties interested in capture fisheries, aquaculture practices and the sustainability of ocean ecosystems are welcome to use Seafood Assessments in any way they find useful, with acknowledgement. For more information about SeaChoice® and Seafood Assessments, please contact the SeaChoice® program via e-mail and telephone information available at [www.seachoice.org](http://www.seachoice.org)

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## **Executive Summary**

Atlantic halibut have a broad range throughout the North Atlantic and are a species moderately vulnerable to fishing pressure. They mature at a relatively late age (8 and 12 years for males and females respectively) and large females can be very fecund producing millions of eggs. Recruitment to the fishery occurs at approximately 8 years of age, leaving the stock vulnerable to recruitment overfishing by females being exposed to removal well before they reach reproductive age.

Stock status varies by management area. The St. Lawrence population is at levels far below historic estimates and no substantial increases in abundance have been observed. The Scotian Shelf and Southern Grand Banks stock is faring better; however, landings are still below historic averages. Catch levels have been increased from 850t to 1375t from 1998 to 2006. The population appears relatively stable; however, there is high uncertainty in current measures of abundance (which are still low compared to historical estimates) and the Department of Fisheries and Oceans Canada (DFO) cannot presently determine whether current catch levels are sustainable. The ranking of stock status is therefore “critical” and “red” for the Gulf of St. Lawrence stock and Scotian Shelf and Southern Grand Banks stock respectively.

The Atlantic halibut fishery has a relatively high level of bycatch with estimates ranging from 46 to 69% (as % weight of all species). This relatively high percentage would likely be greater if bycatch was transformed to number of individuals. This is of particular concern for endangered and threatened bycatch species such as Atlantic cod and cusk populations which may be composed of mostly small, low weight individuals.

Longline gear is known to have some impacts on benthic habitats, but overall the spatial scale of the impact is limited to certain areas and depths. Management has been hindered by lack of long-term and relevant biological data and limited conservation measures were only implemented well after stocks fell to low levels.

While stock status is low, as compared to historical levels, throughout the range of the Atlantic Halibut, the Gulf of St. Lawrence stock is critical concern and halibut from this area is ranked as “Avoid”. Halibut from the Scotian Shelf and Grand Banks is ranked as “Some Concern” as stock status is not critical, and gear impacts with the exception of bycatch are considered minimal as well. Consumers are encouraged to make seafood choices with “Best Choice” rankings; if none are available, consumers are encouraged to choose species listed under the “Some Concerns” category as described under the SeaChoice program.

## Table of Sustainability Ranks

### About the Overall Seafood Recommendation:

- A seafood product is ranked **Avoid** if two or more criteria are of High Conservation Concern (red) OR if one or more criteria are of Critical Conservation Concern (black) in the table above.
- A seafood product is ranked **Some Concerns** if the five criteria “average” to yellow (Moderate Conservation Concern) OR if the “Status of Stocks” and “Management Effectiveness” criteria are both of Moderate Conservation Concern.
- A seafood product is ranked **Best Choice** if three or more criteria are of Low Conservation Concern (green) and the remaining criteria are not of High or Critical Conservation Concern.

Sustainability Criteria	Conservation Concern			
	Low	Moderate	High	Critical
Inherent Vulnerability		√		
Status of Stocks			√ <i>Scotian Shelf &amp; Southern Grand Banks</i>	√ <i>Gulf of St. Lawrence</i>
Nature of Bycatch		√		
Habitat Effects		√		
Management Effectiveness		√		

### Overall Seafood Recommendation:

Scotian Shelf and Southern Grand Banks

Atlantic halibut    Best choice     **Some Concerns**     Avoid 

Gulf of St. Lawrence

Atlantic halibut    Best choice     Some Concerns     **Avoid** 

## **Introduction**

### *Biology*

Atlantic halibut (*Hippoglossus hippoglossus*) are the largest of the Atlantic flatfishes. Similar to other flatfish, Atlantic halibut have the unusual life strategy of lying on their side instead of on their bellies. Atlantic halibut are not born this way; rather, during larval development, their skulls twist so that their left eye, which would otherwise face the sea bottom, migrates around the head until both eyes are on its right side. The mouth generally retains its original form giving it the appearance of opening sideways when feeding.

Atlantic halibut are widely distributed throughout the North Atlantic Ocean and parts of the Arctic Ocean (Cargnelli et al. 1999). Atlantic halibut are demersal (bottom dwelling) and are most abundant at depths of 200 to 500 m with larger individuals preferring deeper water. Atlantic halibut grow relatively quickly and continuously averaging from 7.5 to 8.5 cm per year (Aechambault and Gregoire 1996). Females grow faster, mature later, and reach a larger maximum size. Females reach 50% maturity at about 115 cm (~12 years of age) and have a maximum length of approximately 300 cm. Conversely, males reach 50% maturity at about 75 cm (~8 years of age) and have a maximum length of 240 cm (DFO 2005; Bowering 1986). Maximum reported weight and age for Atlantic halibut are 320 kg and 50 years respectively (Froese and Pauly 2000); however, individuals of this size have likely always been rare. Atlantic halibut captured in recent surveys are less than 100 cm (DFO 2003).

Atlantic halibut are annual batch spawners and are able to release several batches of eggs in a single reproductive season (Methven et al. 1992). Spawning in the western Atlantic is thought to occur at depths approaching 200 m over rough or rocky bottom at temperatures of 4 to 7°C (Miller et al. 1991). Atlantic halibut can be very fecund with large individuals producing up to 7 million eggs (Haug and Gulliksen 1988). Most individuals, however, produce considerably fewer eggs. For example, a 90 kg female contained and estimated 2 182 772 eggs (Collette and Klein-MacPhee 2002). Spawning occurs in Canadian waters in late winter and early spring with maximum egg production occurring in November and December (Collette and Klein-MacPhee 2002).

Once fertilized, Atlantic halibut eggs are 2.96 to 3.8 mm in diameter and drift suspended in the water at depths up to 700 m (Cargnelli et al. 1999). Eggs hatch after 2 to 3 weeks and size at hatching is 6 to 7 mm (Lønning et al. 1982). Larvae live off their yolk sac for 4 to 5 weeks after which time they are able to feed. Juveniles tend to congregate in relatively shallow coastal nursery grounds of 20 to 60 m in depth. It is hypothesized that the areas around the Sable Island Gully on the Scotian Shelf may serve as a nursery area for juveniles prior to their dispersive phase (Stobo et al. 1998)

The diet of juvenile Atlantic halibut (<30 cm) is mainly composed of invertebrates such as krill, small crabs, and shrimp. Fish begin to make up a larger proportion of their diet until they reach approximately 70 cm after which time their diet shifts almost exclusively to fishes including flatfish, members of the cod family, and redfish (DFO 1999).

*Fishery*

Prior to the beginning of the 19<sup>th</sup> century, Atlantic halibut were generally considered to be a nuisance fish by Canadian fishers. Demand at Boston markets was supplied by American fishers whose catches came primarily from the Massachusetts Bay – Cape Cod area and offshore at Georges Bank and the Nantucket Shoals. Canadian involvement in the early years of the fishery is not well documented but landing statistics are available. Atlantic halibut are incidentally caught in bottom trawl fisheries but are directly targeted using fixed gear (i.e. longlines). A minimum landing allowable catch size of 82 cm was implemented in 1998 which required all Atlantic halibut under this size be released.

The number of longliners now employed in a directed Atlantic halibut fishery has dwindled due to costs associated with fishing, reduced stocks and increased gear efficiencies. Only a small number of boats hailing from a few ports in the Maritimes actively pursue this fishery. Many Atlantic halibut are now taken as trawl bycatch. There is concern that the trawl fishery is resulting in high mortality of immature fish (DFO 2006a).

The Canadian Atlantic halibut fishery was unregulated prior to 1988, after which time catch quotas were established. Canada maintains an open access fishery with a global total allowable catch (TAC) quotas and effort control through gear type and boat size. Growing concern about the state of the resource triggered the formation of a special Atlantic halibut working group to advise the Groundfish Advisory Committee in the mid 1980s. A number of management regulations were introduced in 1988 including size restrictions, a variety of regulations to control landings of Atlantic halibut as a bycatch, and a mandatory observer program.

Current management units for Atlantic Halibut in Canada are divided into two areas: the Gulf of St. Lawrence (NAFO areas: 4RST) and the Scotian Shelf and Southern Grand Banks (NAFO areas: 4VWX3NOPs; Figure 1). Management units are based on the findings of a 1987 tagging program and additional data such as size and growth rates (DFO 2004a).

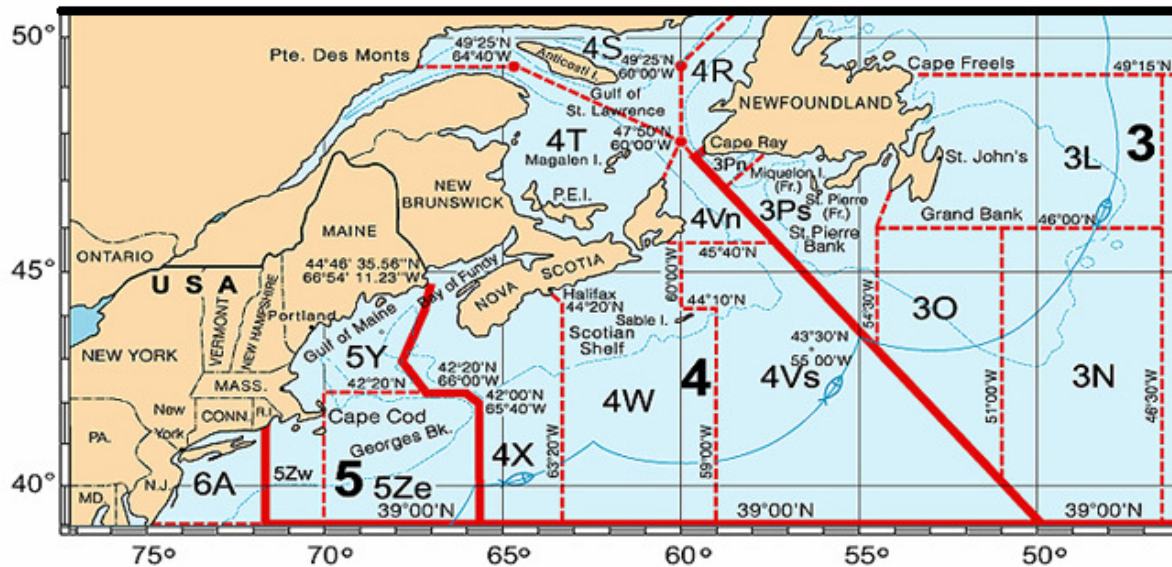


Figure 1. Northwest Atlantic Fisheries Organization (NAFO) management units for Atlantic Halibut. Gulf of St. Lawrence management area corresponds to NAFO areas 4RST. Scotian Shelf and Southern Grand Banks management area correspond to NAFO areas: 4VWX3NOPs. Adapted from NAFO (2006).

### Scope of the analysis and the ensuing recommendation:

This report focuses on Atlantic halibut stocks in Canadian waters in the Gulf of St. Lawrence (NAFO areas: 4RST) and the Scotian Shelf and Southern Grand Banks (NAFO areas: 4VWX3NOPs). Atlantic halibut captured in Canadian waters by hook and line are classified as “some concerns” due to the status of the stocks and fish caught in the trawl fishery are classified as “Avoid”, due to concerns about bycatch and habitat damage.

### Availability of Science

The available science of the Canadian Atlantic halibut fishery is limited. There are high levels of uncertainty in population growth and maturity rates, no current measures for absolute abundance or robust estimates of relative stock abundance.

A tagging program was initiated in the Gulf of St. Lawrence in 1998 to study the movements and stock differentiation of Gulf Atlantic halibut. A longline survey was implemented in the Scotian Shelf and Southern Grand Banks in 1998 in order to give reliable estimates of population size over time. Sequential population analysis (SPA) is used to reconstruct population trajectories and estimate absolute population size and ultimately calculate fishing mortality rates. The data collected thus far is of limited utility as SPA requires long time series of age-structured survey estimates which the dataset is currently unable to provide. The survey is currently incurring logistical constraints due to unacceptable bycatch during survey operations (DFO 2003). Continuation of the survey is necessary to fill in scientific knowledge gaps.

## **Market Availability**

**Common and market names:** Atlantic halibut

**Seasonal availability:** Year round (frequently sold frozen)

**Product forms:** Atlantic halibut is available fresh and frozen, as whole fish, steaks and fillets. Atlantic halibut cheeks are also occasionally sold.

### **Import and export sources and statistics:**

Since 2005, Canada exports approximately 25% of the total Atlantic halibut fishery (Table 1), almost exclusively to the United States. A closely related species, the Pacific halibut (*Hippoglossus stenolepis*), is imported from the United States to Canada but is captured exclusively on the West coast. In 2005, Canada imported ~1382 t of “Pacific halibut” and an additional 6205 t of “halibut” from the United States. Imported “unidentified halibut” is very likely Pacific halibut. Pacific Halibut has been classified as “Good alternative” under the Seafood Watch® program.

Table 1. Summary of export statistics for Atlantic halibut from Canada abroad. A large majority of exported Atlantic halibut (>90%) is to the United States. Quantity is in tons and value in thousands of Canadian dollars. Source DFO (2006b).

	January to May, 2006			January to May, 2005		
	Quantity	Value	\$/kg	Quantity	Value	\$/kg
Atlantic halibut	393	5 364	13.64	437	5 666	12.95

## **Analysis of Seafood Watch® Sustainability Criteria for Wild-caught Species**

### **Criterion 1: Inherent Vulnerability to Fishing Pressure**









In comparison to other commercially caught fish, Atlantic halibut are moderately vulnerable to fishing pressure (Table 2); however, collapse of the American stocks and low abundance of the Gulf of St. Lawrence stock is evidence that this stock can be easily overfished if sustainable catch limits are not enforced. The population intrinsic rate of increase ( $r$ ) and Von Bertalanffy growth coefficient ( $k$ ), are currently unknown for Atlantic halibut. These values may become available with the continuation DFO longline surveys.

Table 2. Life history characteristics of Atlantic halibut.

Age at Maturity	Growth Rates	Maximum Age	Fecundity	Species Range	Special Behaviors	Population Variability
Males: 8 years	Intrinsic population growth rate ( $r$ ) & Von Bertalanffy growth coefficient ( $k$ ):	~50 years	Large females can produce from 2 to 7 million eggs.	Widespread over the northern Atlantic, there has been a significant reduction in numbers in the northern portion of the range, particularly the Labrador shelf.	None	Relatively low
Females: 12 years	Unknown as there is currently no measures of abundance					

**Synthesis**

Overall, the life history characteristics of Atlantic halibut suggest that they have a moderate inherent vulnerability to fishing pressure and are given the rank of “moderate”.

<b>Criterion 1: Inherent Vulnerability to Fishing Pressure</b>	
<b>Primary Factors to Evaluate</b>	<b>Ranking</b>
Intrinsic rate of increase ‘r’ (Not available)	
Age at first maturity (Medium 5 to 10 years)	
von Bertalanfy growth coefficient ‘k’ (Not available)	
Maximum Age (>30 years)	
Reproductive potential (fecundity; high)	
<b>Secondary Factors to Evaluate</b>	
Species range	
Special behaviours or requirements	
Quality of habitat (non-fishery impacts)	

**Inherent Vulnerability Rank:**



**Criterion 2: Status of Wild Stocks**

*Gulf of St. Lawrence*

For management purposes, Atlantic halibut stocks in the Gulf of St. Lawrence are managed under the NAFO areas 4RST.

Factor 1: Management classification status

Atlantic halibut abundance in the Gulf of St. Lawrence was historically quite large. Abundance data for this stock is currently calculated using scientific trawl surveys. These surveys are of limited use as they show high between year variability due to low susceptibility of Atlantic halibut to trawl gear (DFO 2005). Landings of Atlantic halibut in this area averaged around 1500t at the turn of last century but declined significantly in the 1950s (Figure 2).

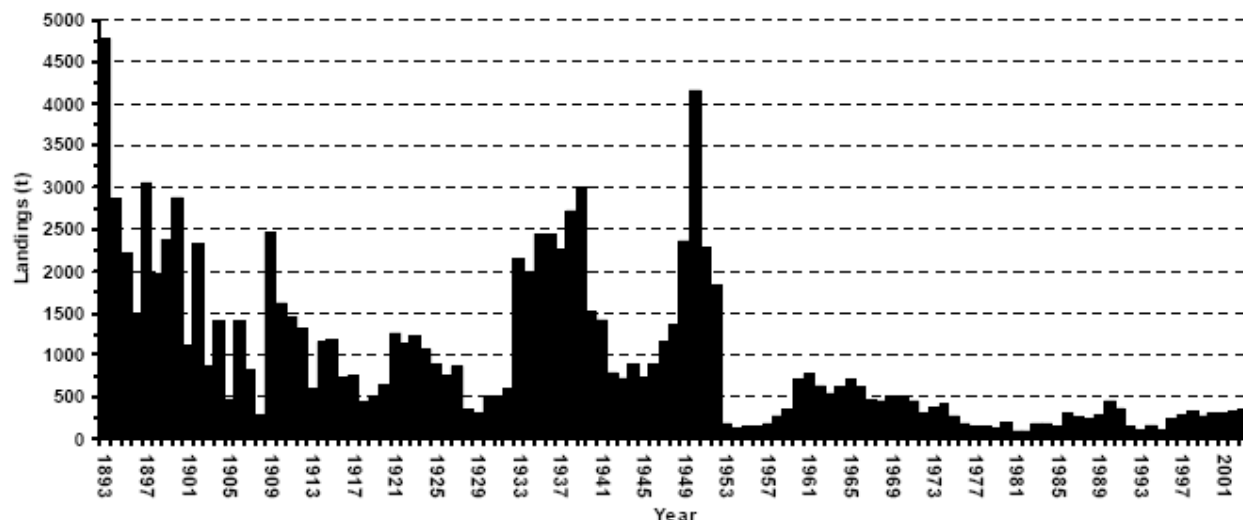


Figure 2. Historical series of commercial annual landings of Gulf of St. Lawrence Atlantic halibut, 1893 to 2004. Source: DFO (2005).

In the Gulf of St. Lawrence, surveys have indicated a slight upward trend in population abundance; however, the stock remains at a very low level compared to population levels of the first half of the 20<sup>th</sup> century (DFO 2005). This factor is given a “red” ranking.

#### Factor 2: Abundance threshold

Atlantic halibut are not managed using  $B_{msy}$  and therefore  $B_{msy}$  estimates are not available. Estimates of stock abundance are well below historic levels. This factor is given a “red” ranking.

#### Factor 3: Occurrence of Overfishing

Regulations limiting catch were introduced to this region in 1988. Landings have generally been below the TAC but were exceeded by 12% in 2004 (Table 3).

Table 3. Atlantic halibut landings in the Gulf of St. Lawrence (t). Source: DFO (2005)

	Year						
	1988 – 1998	1999	2000	2001	2002	2003	2004
TAC	300	450	350	350	350	350	350
Total catch (4RST)	249	340	285	301	282	313	393

These landing statistics, however, underestimate the amount that the quota is exceeded as it does not incorporate quotas granted to the < 65 foot fixed gear fleet. DFO (2005) reports that including these values in the landing statistics indicates that the quota has been exceeded by as much as 300% in some years. Indeed, in 2005 in area 3Ps, the < 65 foot fixed gear fleet captured 267% of their quota (DFO 2006c). This factor is given a “red” ranking.

**Factor 4: Overall degree of uncertainty in status of stock**

This is medium uncertainty in the status of the stock. There is some fishery independent data available; however, the low susceptibility of Atlantic halibut to bottom trawls makes it of limited utility. This factor is given a ranking of “yellow”.

**Factor 5: Long-term trend**

Atlantic halibut in the Gulf of St. Lawrence are at very low level in comparison to historical estimates. This factor is given a ranking of “red”.

**Factor 6: Short term trend**








Abundance estimates of Atlantic halibut appear to be stable although it is at a very low level in comparison to historical estimates. This factor is given a ranking of “yellow”.

**Factor 7: Current age, size, or sex distribution**

There is a high level of uncertainty around the size at sexual maturity of Gulf Atlantic halibut. Under the assumption that they have similar age of maturity as those on the Scotian Shelf (50 % of females mature at ~120cm), the minimum legal size of 81 cm is insufficient to protect spawner biomass (DFO 2005). Average length of captured Atlantic halibut in surveys has steadily decreased since 2002. Average length in 2003 and 2004 was 50 cm. This factor is given a ranking of “red”.

**Synthesis for Gulf of St. Lawrence Stock**

The Gulf of St. Lawrence Atlantic halibut population is at very low levels in comparison to historical estimates. The conservation ranking given to the St. Lawrence Atlantic halibut stock is “critical”.

<b>Criterion 2: Status of Wild Stocks</b>	
<b>Primary Factors to Evaluate</b>	<b>Ranking</b>
Management classification status	
Current population abundance relative to B <sub>MSY</sub>	
Occurrence of overfishing	
Overall degree of uncertainty in status of stock	
Long term trend in abundance	
Short term trend in abundance	
Current age, size, or sex distribution	

**Conservation Concern: Status of Gulf of St. Lawrence stock:**

Low (Healthy)  Moderate  High (Stock Poor)  **Stock Critical** 

***Scotian Shelf and Southern Grand Banks***

For management purposes, Atlantic halibut stocks on the Scotian Shelf and Southern Grand Banks are managed under the NAFO areas 4VWX3NOPs.

**Factor 1: Management classification status**

The fishery on the Scotian Shelf and Southern Grand Banks make up the majority of the Canadian Atlantic halibut fishery, particularly in NAFO areas 4Vs and 4W (Zwanenburg and Wilson 2003). Increases in the TAC have occurred since 1999 from 850 t to the current TAC of 1375 t in 2006/2007 (DFO 2006d).

Recruitment estimates into the fishery have been relatively stable over the past decade even with relatively large increases in the TAC. Population biomass for the Scotian Shelf and Southern Grand Banks seem to be relatively stable based on consistent landing statistics; however, landings are still well below the historical average of approximately 1900t (Figure 3). Abundance estimates calculated with trawl survey data show can only describe very general trends in relative abundance due to its high between year variability. Weight per standard set are well below the long-term average (1970 to 2001 = 0.18 kg); however, numbers of individuals per set are well above the long-term average (1970 to 2001 = 0.59 individuals; DFO 2003). Landings have consistently exceeded TACs levels since 1998 which is further exacerbated by industry reports that there has been an increase in unreported landings, particularly in 2002.

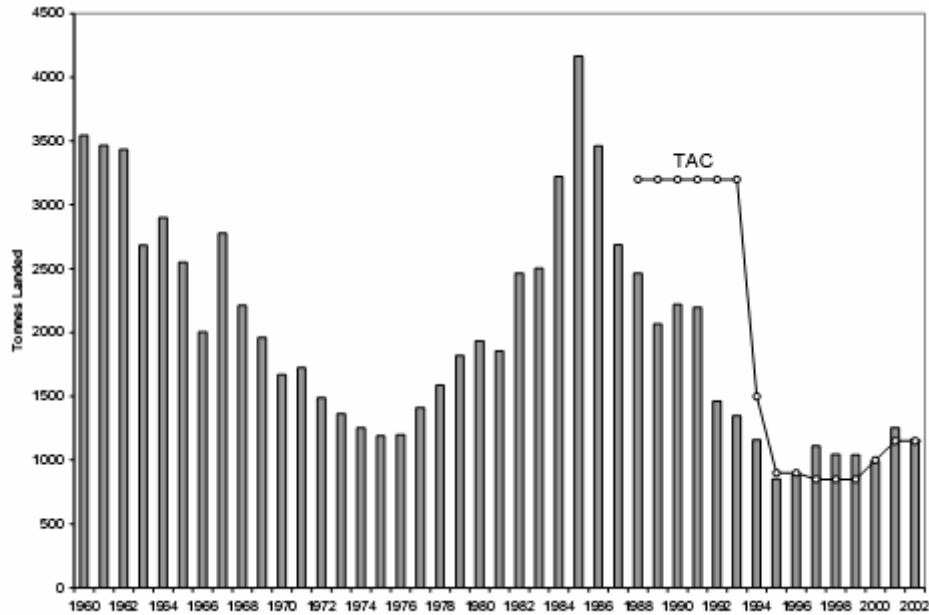


Figure 2. Landings and TACs for Scotian Shelf and Southern Grand Banks Atlantic halibut. Landings for 2003 are as of October 15, 2003 NN (FSR 2003/01).

There are currently no estimates of fishing mortality for this stock due to the absence of robust estimates of abundance. The longline survey and other studies aimed at delineating age structure of the Atlantic halibut population are currently being conducted; unfortunately, more data is needed in order to calculate absolute population abundance. The survey suggests that abundance has been relatively stable since its inception in 1998; however, DFO is currently unable to determine whether current levels of landings are sustainable (DFO 2001). The current minimum legal limit of 81 cm is insufficient to protect spawner biomass as 50% female maturity does not occur until approximately 120 cm. This factor is given a “red” ranking.

#### Factor 2: Abundance threshold

Atlantic are not managed using  $B_{msy}$  and therefore  $B_{msy}$  estimates are not available. Estimates of stock abundance are thought to be below historic levels but landings are approximately 70% of the historic average of 1900t. This factor is given a “yellow” ranking.

#### Factor 3: Occurrence of Overfishing

The lack of estimates of both absolute biomass and fishing mortality makes a determination of whether overfishing is occurring difficult. Between 1997 and 2003, landings exceeded the TAC five times (Zwanenburg et al. 2003); however, population seems to be stable. DFO is currently unable to determine whether current levels of landings are sustainable (DFO 2001). This factor is given a “yellow” ranking.

**Factor 4: Overall degree of uncertainty in status of stock**

There are currently no estimates of fishing mortality or absolute abundance for this stock due to the absence of data. A longline survey which was started in 1998 as well as other studies aimed at delineating age structure of the Atlantic halibut population; unfortunately, more data is needed in order to calculate absolute population abundance. This factor is given a “yellow” ranking.

**Factor 5: Long-term trend**

Atlantic halibut on the Scotian Shelf and Southern Grand Banks are thought to be below historical estimates. Recruitment estimates into the fishery has been relatively stable over the past decade even with relatively large increases in the TAC. Population biomass for the Scotian Shelf and Southern Grand Banks seem to be relatively stable based on consistent landing statistics; however, landings are still below the historical average of approximately 1900t. This factor is given a ranking of “red”.

**Factor 6: Short term trend**








Abundance estimates of Atlantic halibut appear to be stable although landings are below historical averages. This factor is given a ranking of “yellow”.

**Factor 7: Current age, size, or sex distribution**

Size composition shows a reduced range of sizes present in the current population in comparison to that for 1960. This factor is given a ranking of “yellow”.

**Synthesis**

Recruitment estimates into the fishery have been relatively stable over the past decade even with relatively large increases in the TAC. Population biomass for the Scotian Shelf and Southern Grand Banks seem to be relatively stable based on consistent landing statistics; however, landings are still well below the historical average of approximately 1900t. The conservation ranking given to the St. Lawrence Atlantic halibut stock is “High”.

<b>Criterion 2: Status of Wild Stocks</b>	
<b>Primary Factors to Evaluate</b>	<b>Ranking</b>
Management classification status	
Current population abundance relative to $B_{MSY}$	
Occurrence of overfishing	
Overall degree of uncertainty in status of stock	
Long term trend in abundance	
Short term trend in abundance	
Current age, size, or sex distribution	

**Conservation Concern: Status of Scotian Shelf and Southern Grand Banks Stock:**

Low (Healthy)  Moderate  **High (Stock Poor)**  Stock Critical 

**Criterion 3: Nature and Extent of Bycatch**

*Seafood Watch® defines sustainable wild-caught seafood as marine life captured using fishing techniques that successfully minimize the catch of unwanted and/or unmarketable species (i.e., bycatch). Bycatch is defined as species that are caught but subsequently discarded (injured or dead) for any reason. Bycatch does not include incidental catch (non-targeted catch) if it is utilized, accounted for and/or managed in some way.*

**Factor 1: Quantity of Bycatch**

The Atlantic halibut fishery has a relatively high level of bycatch. Estimates from the DFO longline survey on the Shelf and Southern Grand Banks estimate that commercial catches are composed of 46 to 69% non-target species (% weight of all species; Zwanenburg et al. 2003). This percentage would likely be much higher if bycatch was transformed to number of individuals. This is of particular concern for endangered and threatened bycatch species such as Atlantic cod and cusk populations which may be composed of mostly small, low weight individuals.

Bycatch in the Atlantic halibut fishery is composed mainly of White hake, Atlantic cod, cusk, dogfish, and other incidental species (Zwanenburg et al. 2003; Figure 4). Atlantic cod and cusk have been classified as endangered and threatened respectively by the Committee on the status of endangered wildlife in Canada (COSEWIC). Cusk frequently do not survive when brought to the surface from deep waters due to barotrauma (DFO 2004b). This factor is given a ranking of “red”.

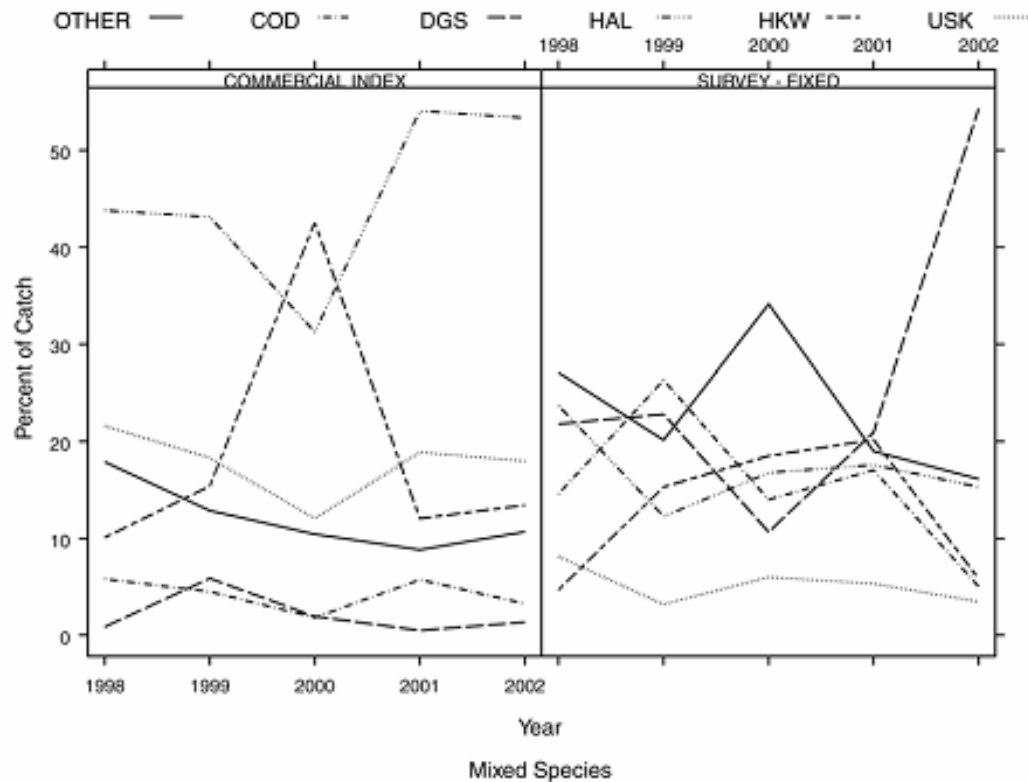


Figure 4. Catch profiles for the commercial index and fixed station index proportions of the Scotian Shelf Southern Grand Banks Atlantic halibut longline survey. Lines represent the proportions (by weight) that each of the indicated species comprise of the average total catch per standard set in that year (Cod = cod, DGS = Spiney dogfish, HAL = Atlantic halibut, HKW = White hake, and USK = Cusk). Source: (Zwanenburg et al. 2003)

#### Factor 2: Population Consequence of the Bycatch

The Atlantic halibut fishery is relatively small and consequently impact on cusk and Atlantic cod is considered to be minimal. This factor is given a ranking of “green”.

#### Factor 3: Trends in Bycatch Rates





Unknown. This factor is given a ranking of “yellow”.

#### Secondary Factor: Ecosystem Impacts

The Atlantic halibut fishery is relatively small and consequently ecosystem impact considered minimal. This factor is given a ranking of “green”.

**Synthesis**

The Atlantic halibut longline fishery involves the setting of long strings of baited hooks. The fishery has low selectivity to demersal fishes and consequently, some endangered and threatened species are captured. The nature of bycatch rank of the Atlantic halibut fishery is “Moderate”.

<b>Criterion 3: Bycatch</b>	
<b>Primary Factors to Evaluate</b>	<b>Ranking</b>
Quantity of bycatch	
Population consequence of bycatch	
Trends in bycatch rates	
<b>Secondary Factors</b>	
Ecosystem Impacts	

**Nature of Bycatch Rank:**

Low (Minimal)  **Moderate**  High (Severe)  Critical 

**Criterion 4: Effect of Fishing Practices on Habitats and Ecosystems**

Factor 1: Impacts of Fishing Gear on Habitat.

All Atlantic halibut captured in the directed fishery are taken with bottom longlines. This method of capture causes far fewer impacts on benthic habitats in comparison to bottom trawling; however, moderate damage can occur by scouring of the bottom due to wave action and when hauling in gear (Chuenpagdee et al. 2003). This factor is given a “yellow” ranking.

Factor 2: Resilience of the Habitat Fished

Longline gear is frequently set on hard bottom (rock or gravel). Organisms attached to these surfaces can be impacted by the scouring by the longlines. Impact by longline gear from an ecosystem context is likely minimal. This factor is given a “yellow” ranking.

Factor 3: Spatial Extent of the Impact.

The footprint of longlining gear is small spatial scale relative to most other fisheries. Damage, however, can still occur to corals and surface associated flora. This factor is given a “yellow” ranking.

**Primary Ecosystem Factors**

Factor 1: Disruption of food webs.






There are no demonstrated ecosystem impacts from the removal of Atlantic halibut and therefore this factor is given a “yellow” ranking.

Factor 2: Changes in ecosystem state.

Ecosystem impacts from longlining have not been demonstrated, and therefore, this factor is given a “yellow” ranking.

**Synthesis**

The Atlantic halibut longline fishery in Canada involves the setting of long strings of baited hooks. This method of capture causes far fewer impacts on benthic habitats in comparison to bottom trawling; however, moderate damage can occur by scouring of the bottom due to wave action and when hauling in gear. The overall effects of fishing practices are “Moderate”.

<b>Criterion 4: Effect of Fishing Practices on Habitats and Ecosystems</b>	
<b>Factors to Evaluate</b>	<b>Ranking</b>
Impacts of Fishing Gear on Habitat	
Resilience of the Habitat	
Spatial Extent of the Impact	
Disruption of food webs	
Changes in ecosystem state	

**Overall Effects of Fishing Practices Rank:**

Benign  **Moderate**  Severe  Critical 

**Criterion 5: Effectiveness of the Management Regime**

Factor 1: Stock Assessments

Robust data for the Atlantic halibut fishery is currently inadequate. No estimates of absolute abundance are possible with current data. There is high uncertainty of the age structure of the stocks as only length based data exists. These issues are being addressed by a longline survey which began in 1998. Stock assessments are published every two years. This factor is given a “yellow” ranking.

**Factor 2: Scientific Monitoring**

Monitoring activities have fishery dependant and fishery independent data. Due to the short time series of the fishery independent data, it is currently of limited use. This factor receives a “yellow” ranking.

**Factor 3: Scientific Advice**

Not enough information to evaluate. This factor is omitted from ranking.

**Factor 4: Management Plans to Control Bycatch**

The Atlantic halibut fishery has proportionally large amount of bycatch, some of which is considered endangered or threatened. The fishery, however, is of relatively small scale and consequently these effects are considered minimal. This factor receives a “yellow” ranking.

**Factor 5: Management Plans to Control Habitat Impacts from Fishing Practices**

Longlining is thought to only moderately impact habitat and is therefore not applicable. This factor is omitted from ranking.

**Factor 6: Catch Monitoring and Enforcement**

Quotas regularly exceeded. In some areas by as much as 300%. This factor receives a “red” ranking.

**Factor 7: Management Track Record**

Conservation measures were only implemented after significant declines in the stock had occurred. Stocks still at very low levels compared to estimated historical abundance. Current catch regulations are summarized in Table 4. Currently, DFO cannot presently determine whether current catch levels are sustainable. This factor receives a “red” ranking.








Table 4. Current catch regulations for Atlantic halibut in Canada.

Management Jurisdictions & Agencies	Total Allowable Catch	Gear Restrictions	Area Closures
DFO	Gulf of St Lawrence: 350t	Release fish <82 cm	None specifically for halibut; however, moratoria on cod and redfish, and shrimpers' use of the Nordmore gate may reduce Atlantic halibut capture as bycatch
	Scotian Shelf and Southern Grand Banks: 1375 t	Directed fishing restricted to longline only	

**Synthesis**

Management is deemed to be “Moderately Effective”.

### Criterion 5: Effectiveness of the Management Regime

Factors to Evaluate	Ranking
Stock Assessments	
Scientific Monitoring	
Scientific Advice	
Bycatch	
Fishing Practices	
Catch Monitoring and Enforcement	
Management Track Record	

**Overall Effectiveness of the Management Regime:**

Highly effective  **Moderate**  Ineffective  Critical 

## **Overall Evaluation and Seafood Recommendation**

Atlantic halibut are a species moderately vulnerable to fishing pressure. They mature at a relatively late age (8 and 12 years for males and females respectively), large females can be very fecund producing millions of eggs and have a broad range throughout the North Atlantic. Recruitment to the fishery occurs at approximately 8 years of age, leaving the stock vulnerable to recruitment overfishing by females being exposed to removal well before they reach reproductive age.

Stock status varies by management area. The St. Lawrence population is at levels far below historic estimates and no substantial increases in abundance have been observed. The Scotian Shelf and Southern Grand Banks stock is faring better; however, landings are still below historic averages. Catch levels have been increased from 850t to 1375t from 1998 to 2006. The population appears relatively stable; however, there is high uncertainty in current measures of abundance (which are still low compared to historical estimates) and DFO cannot presently determine whether current catch levels are sustainable. The ranking of stock status is therefore “critical” and “red” for the Gulf of St. Lawrence stock and Scotian Shelf and Southern Grand Banks stock respectively.

The Atlantic halibut fishery has a relatively high level of bycatch with estimates ranging from 46 to 69% (as % weight of all species). This relatively high percentage would likely be greater if bycatch was transformed to number of individuals. This is of particular concern for endangered and threatened bycatch species such as Atlantic cod and cusk populations which may be composed of mostly small, low weight individuals.

Longline gear is known to have some impacts on benthic habitats, but overall the spatial scale of the impact is limited to certain areas and depths. Management has been hindered by lack of long-term and relevant biological data and limited conservation measures were only implemented well after stocks fell to low levels.


The relatively poor status of stocks (particularly in the Gulf of St. Lawrence) gives Atlantic halibut an overall rank of “Avoid”. Consumers are encouraged to make seafood choices with “Best Choice” rankings; if none are available, consumers are encouraged to choose species listed under the “Good Alternative” category as described under the Seafood Watch® program.

**Table of Sustainability Ranks**

Sustainability Criteria	Conservation Concern			
	Low	Moderate	High	Critical
Inherent Vulnerability		√		
Status of Stocks			√ <i>Scotian Shelf &amp; Southern Grand Banks</i>	√ <i>Gulf of St. Lawrence</i>
Nature of Bycatch		√		
Habitat Effects		√		
Management Effectiveness		√		

Scotian Shelf and Southern Grand Banks

**Atlantic halibut**


Best choice 

**Some Concerns** 

Avoid 

Gulf of St. Lawrence

**Atlantic halibut**

Best choice 

**Some Concerns** 

**Avoid** 

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