



UPDATE OF STOCK STATUS INDICATORS FOR GREENLAND HALIBUT IN THE GULF OF ST. LAWRENCE (4RST) IN 2017

Context

The Gulf of St. Lawrence (4RST) Greenland Halibut (*Reinhardtius hippoglossoides*) stock assessment is conducted every two years and the last assessment took place in February 2017. In the interim years, an update of the main resource indicators is presented to determine if major changes in the status of this stock warrant a complete re-evaluation of the stock and a revision of the advice before the evaluation cycle planned for the winter of 2019.

During the February 2017 assessment, the monitoring indicators and the element that could trigger a stock assessment during an interim year were identified. These monitoring indicators are commercial fishery landings and Fisheries and Oceans Canada (DFO) survey abundance indices. The element that could trigger a stock assessment in an interim year is a more than 30% decrease in the biomass index for fish greater than 40 cm in size, determined by DFO survey data.

This update has been prepared to provide Fisheries Management with an overview of the most recent stock status based on the selected monitoring indicators.

This Science Response is a result of the Science Response Process of December 12, 2017. Update of Stock Status Indicators for Greenland halibut in the Gulf of St. Lawrence (4RST) in 2017.

Analysis

The fishery

A total allowable catch (TAC) of 4,500 t was in place for the 2017-2018 fishing season going from May 15, 2017 to May 14, 2018. The directed Greenland Halibut fishery allocation, limited to fixed gear fleets, is 3,750 t. This allocation has not been reached since 2012. In 2017, preliminary landings based on the quota report of November 15 totaled 1,659 t (Figure 1).

The allocation available to the Greenland Halibut fishery, after quota revision, is split between the Quebec (83%) and the Newfoundland (17%) fleets. By mid-November, Quebec's fixed gear fleets of less than 65 feet had landed 51% of their allocation. Since 2010, for the same period, Quebec fishers had landed more than 90% of their allocation, with the exception of 2013 where landings totaled 64% of the allocation. For their part, Newfoundland fishers landed 33% of their allocation in 2017 compared to more than 75% between 2013 and 2016.

The directed Greenland Halibut fishery is conducted in three main sectors: the western Gulf, North Anticosti and Esquiman. The majority of the catches come from the western Gulf, with more than 80% of total landings since 2014 (Figure 2). It is also in this sector that most of the fishing effort is deployed. In 2017, for a fishing effort comparable to that of 2015 and 2016, nearly 100,000 gillnets, landings were half less (Figure 2).

Quebec Region

Between 2006 and 2014, an increase in fishing effort was observed in the North Anticosti sector. Since then, there has been little activity in this sector and landings total less than 5 t in 2017 (Figure 2). In the Esquiman sector, landings decreased significantly between 2013 and 2016 despite sustained fishing effort. In 2017, landings in Esquiman are the lowest in the series and fishing effort data were not available at the time of writing this Science Response.

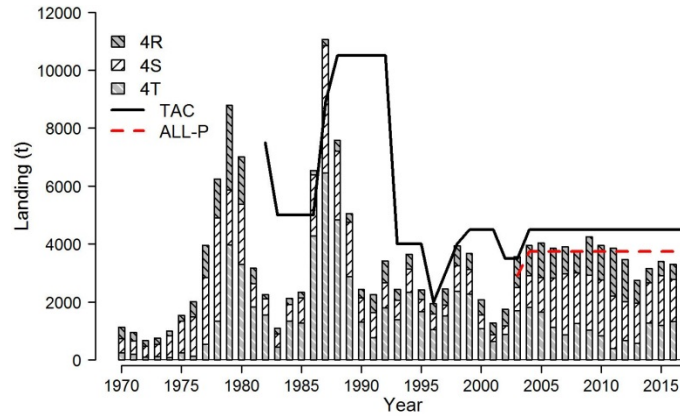


Figure 1. Landings of Greenland Halibut and total allowable catch (TAC) since 1970. The 2017 data are preliminary. The fixed gear fishing allocation (ALL-P) of 3,750 t is indicated.

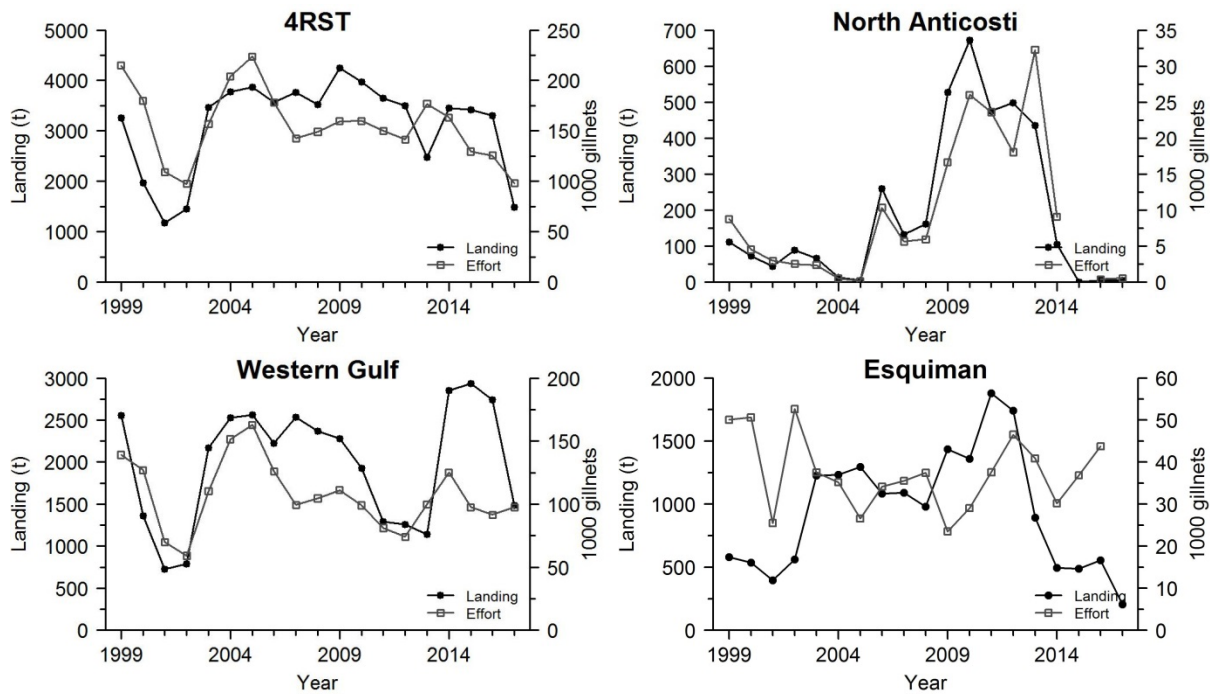


Figure 2. Annual landing and fishing effort for gillnet directed Greenland Halibut fisheries in the Gulf (4RST) and by fishing sector. The 2017 data are preliminary.

Commercial fishery performance index

Fishery performance indices are presented for the entire Gulf (4RST) and by fishing sector. Between 2016 and 2017, the standardized catch per unit of effort (CPUE) index shows a decrease in all sectors and the values are below the average of the respective series (Figure 3).

Quebec Region

The largest decrease is observed in the western Gulf, where most of the fishing effort is deployed. This index was below the series average from 2011 to 2013 and then increased to the highest levels from 2014 to 2016. In 2017, there is a decrease of 51%. This is the largest decrease in the western Gulf since the beginning of this series in 1999. In North Anticosti and Esquiman sectors, the indices have been decreasing and are below the average of their series since 2013. Note that there has been very little fishing effort in the Nord Anticosti sector since 2015 and that 2017 data were not available for the Esquiman sector.

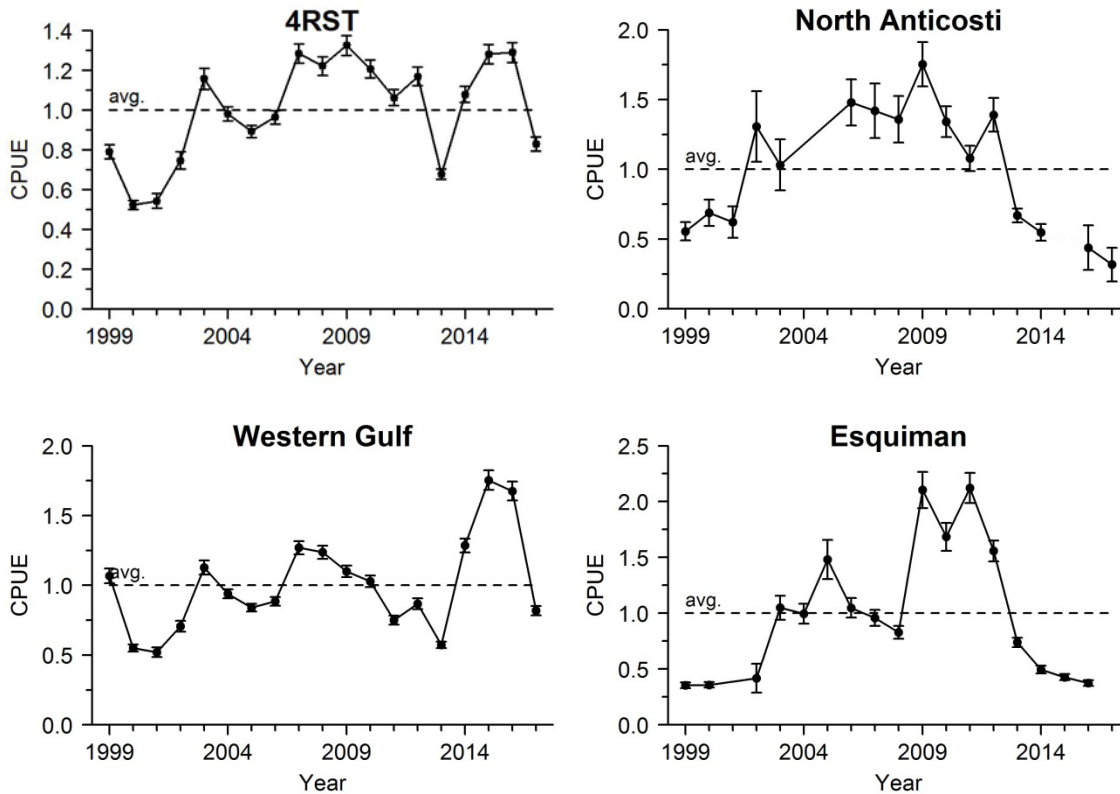


Figure 3. Standardized indices (catch per unit effort (CPUE)) of the performance of the commercial gillnet fishery targeting Greenland Halibut for the entire Gulf (4RST) and by fishing sector. The error bars indicate the 95% confidence interval. The dotted line represents the 1999-2016 average for each series. The 2017 data are preliminary.

Stock status indices

In 2017, total abundance and biomass indices (mean number and weight per tow) of Greenland Halibut from the DFO survey decreased below the series average (1990-2016) and are at values comparable to those of the late 1990s (Figure 4). This is the first time since 1999 that these indices have fallen below the average of their series.

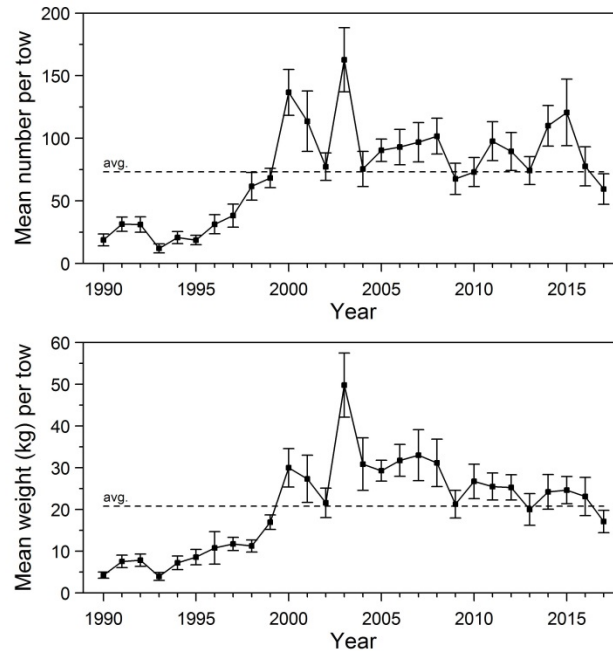


Figure 4. Annual mean number and weight of Greenland Halibut caught per tow during the DFO bottom trawl surveys. The error bars indicate the 95% confidence interval and the dashed horizontal line indicates the average for the period 1990-2016.

When decomposing the index of total mean number per tow in size classes, it is noticeable that the decrease in the total abundance of Greenland Halibut in 2017 is due to the decrease abundance of fish 20-30 cm as well as those larger than 40 cm (Figure 5). The abundance of 0-20 cm (1 year) fish is low and below the series average in 2016 and 2017 (Figure 5), whereas individuals of 20-30 cm and 30-40 cm are of average abundance. The abundance of fish over 40 cm is decreasing since 2015 and is below the average of the series in 2017.

The annual recruitment of Greenland Halibut varies greatly from one year to the next. The 2012, 2013 and 2014 cohorts estimated at age 1 by the DFO survey data were very strong, while the 2015 and 2016 cohorts are of low abundance (Figure 6).

Based on normal growth estimates for individuals of this stock, fish of the 2012, 2013 and 2014 cohorts were expected to average 41, 37 and 33 cm in 2017. Thus a significant increase in abundance of fish in the size range 30-40 cm as well as a more modest increase in the over 40 cm range was expected for 2017. DFO survey data show a different situation (Figure 5). The index for 30-40 cm fish shows an increasing trend in abundance but with a value close to the series average while that of fish over 40 cm is decreasing.

Size frequency distributions of Greenland Halibut suggest a slowdown of about 40% in the growth rate of fish of the 2013 and 2014 cohorts, which could delay their recruitment to the fishery. This is the first time in more than 25 years that such a phenomenon is observed. The weak 2015 cohort seen at one year (length mode of 17 cm in 2016) and two years (length mode of 26 cm in 2017) on the DFO survey seems to have a normal growth rate (Figure 7).

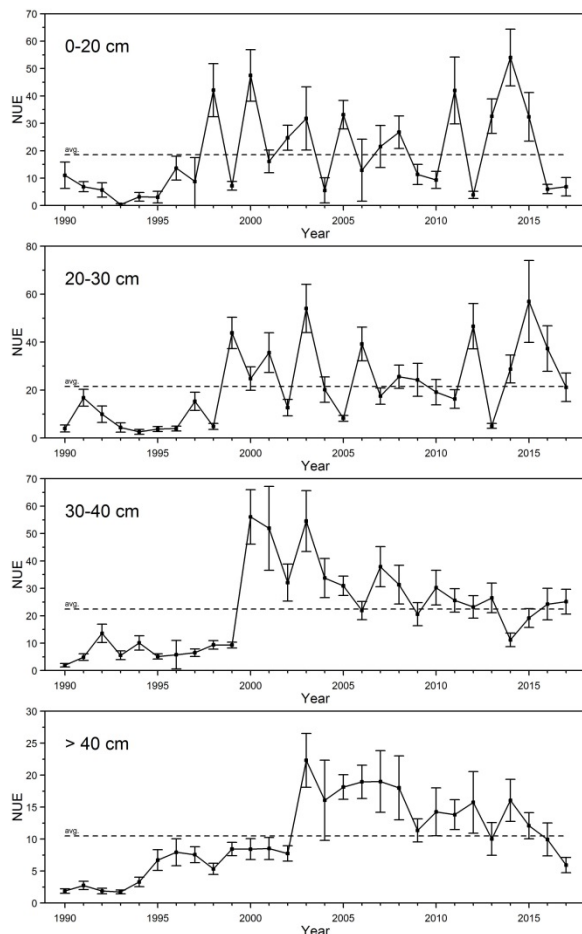


Figure 5. Abundance indices (NUE (number per unit effort)) of Greenland Halibut for different size categories observed in the DFO survey. The error bars indicate the 95% confidence interval and the dashed horizontal line indicates the average of the 1990-2016 period for each series.

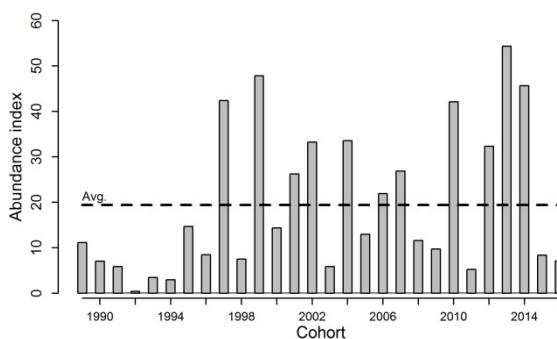


Figure 6. Annual recruitment index determined by the abundance of Greenland Halibut at age 1 from the DFO survey data. The dotted line represents the average of the time series.

The physical condition indices (Fulton) of fish, i.e. the ratio of their length and weight, show low and below-average values of the series for the 2012 to 2015 cohorts (fish of 15 cm from 2013 to 2016) (Figure 8). These lower condition indices are maintained with the growth of fish from these different cohorts. Individuals of the 2016 cohort, which is of low abundance, show a high condition index (Figure 8, fish of the 15 cm series in 2017).

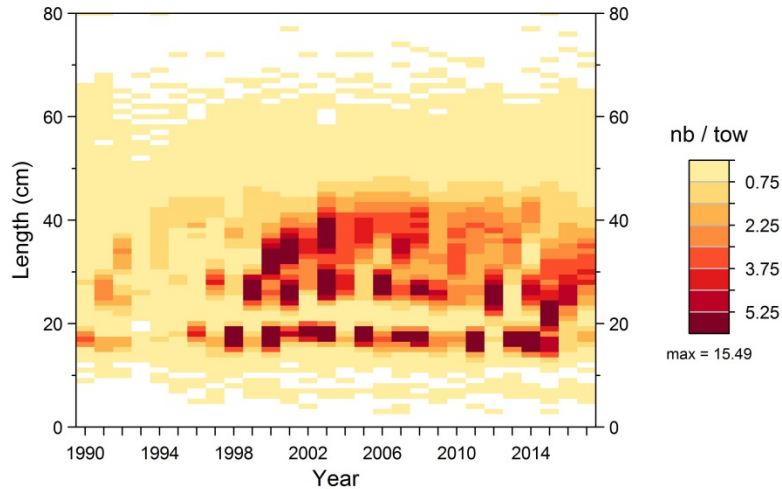


Figure 7. Annual length frequency distributions (mean number per 15 minute tow) observed for Greenland Halibut during the DFO survey.

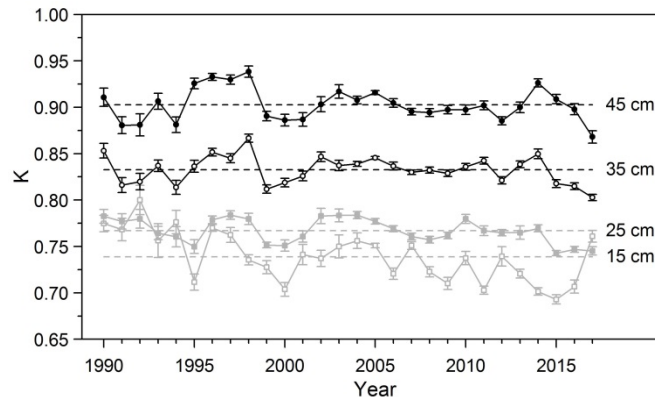


Figure 8. Fulton (K) annual condition indices estimated for 15, 25, 35 and 45 cm fish from the DFO survey data. The error bars indicate the 95% confidence interval and the dashed horizontal lines indicate the average of the 1990-2016 period for each series.

One of the concerns raised during the last assessment of Greenland Halibut stock is the increase in bottom water temperature in the Gulf of St. Lawrence. This temperature increase continued in 2017 and fish were found on average at temperatures above 6 °C, more than 1 °C above the 1990-2016 average and near the observed thermal limit for Greenland Halibut. According to the preliminary data collected in 2017, the temperature of the bottom water will remain high for the next few years.

Exploitation rate indicator

An exploitation rate indicator is obtained by dividing commercial catch in weight by biomass of fish greater than 40 cm estimated by the DFO research survey. This method tracks the relative changes over the years. For the whole Gulf, the exploitation rate decreased slightly in 2017 and is close to the series average for catches that represent only 44% of the fishing allocation (Figure 9). If the landings of 2017 had been comparable to those of the last three years the exploitation rate would have been 13.3%, a rate well above the average (6.5%) of the series. In the North Anticosti sector, the exploitation rate has been practically nil since 2015, the fishing

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effort being very low. In the western Gulf, there has been an increase in the exploitation rate in the last two years, which is now above average. For the Esquiman sector, the exploitation rate has decreased in 2017.

Exploitation rates presented for 2017 are not expected to change significantly by the end of the management cycle on May 14, as there will likely be little fishing activity by then.

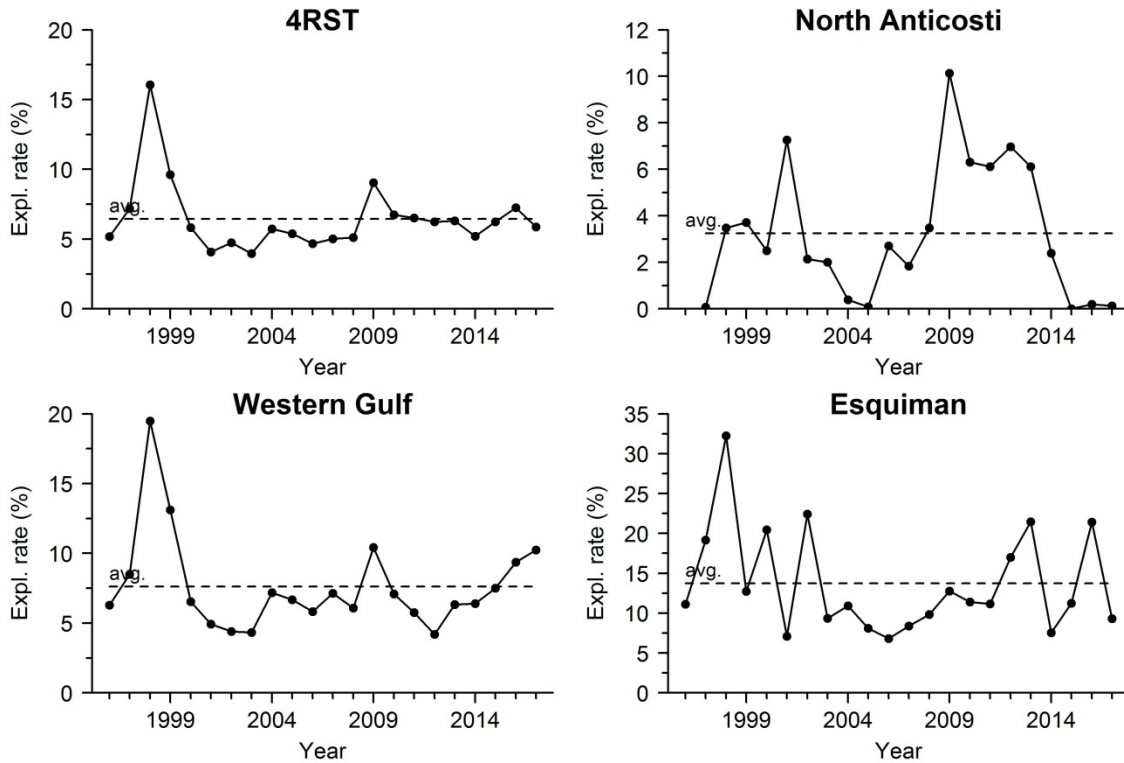


Figure 9. Relative exploitation rate indicator for the Gulf (4RST) and by fishing sector. Horizontal dashed lines indicate the average of the 1990-2016 period for each series.

Interim-year indicator and trigger

The interim-year indicator for monitoring the status of the Greenland Halibut stock consists in the biomass index of fish larger than 40 cm assessed with the DFO survey data. This indicator is considered to be a proxy of the stock mature biomass. The trigger for a reevaluation of the stock was set at a decrease of more than 30% of this indicator when it is in the cautious or critical zone under the precautionary approach framework. The upper reference point has not yet been determined for this stock. However, based on this biomass index, it can be concluded that the stock is currently in the cautious zone (Figure 10). Between 2016 and 2017 there is a decrease of the indicator of 44%.

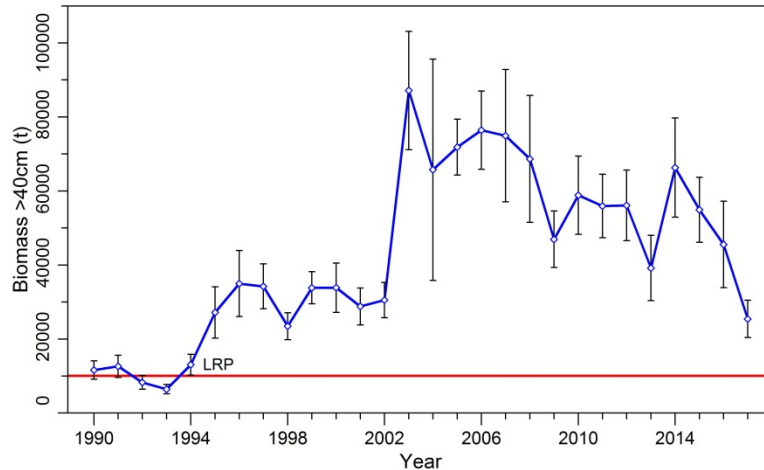


Figure 10. Annual Greenland Halibut biomass for fish greater than 40 cm from the DFO survey series. The error bars indicate the 95% confidence interval. The horizontal red line places the Limit Reference Point (LRP) as part of the precautionary approach framework.

Conclusion

Monitoring indicators, commercial landings and DFO survey indices, have decreased significant in 2017.

In mid-November, in the commercial fishery, preliminary landings totaled 1,659 t compared to 3,254 t in 2016. In addition, catch per unit effort decreased by 51% between 2016 and 2017.

DFO survey biomass and abundance indices decreased in 2017 and are now below the average of their series. The biomass index for fish larger than 40 cm shows a decrease of 44% between 2016 and 2017.

The analysis of the biomass index of fish larger than 40 cm in the last year shows the trigger point has been crossed and a stock re-assessment is warranted. This re-assessment may result in revised catch advice for the fishery.

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Sources of Information

This Science Response Report results from the Science Response Process of December 12, 2017, on Update of Stock Status Indicators for Greenland halibut in the Gulf of St. Lawrence (4RST) in 2017.

DFO. 2016. [Guidelines for providing interim-year updates and science advice for multi-year assessments](#). DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2016/020.

DFO. 2018. Assessment of Greenland Halibut in the Gulf of St. Lawrence (4RST) in 2016. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2017/049.

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